# Submarine Ring of Fire-2012 (SRoF-12) Northeast Lau Basin

R/V *Roger Revelle* Expedition RR1211, Captain Wes Hill

Sept 9 - 25 2012, Suva Fiji to Apia Samoa

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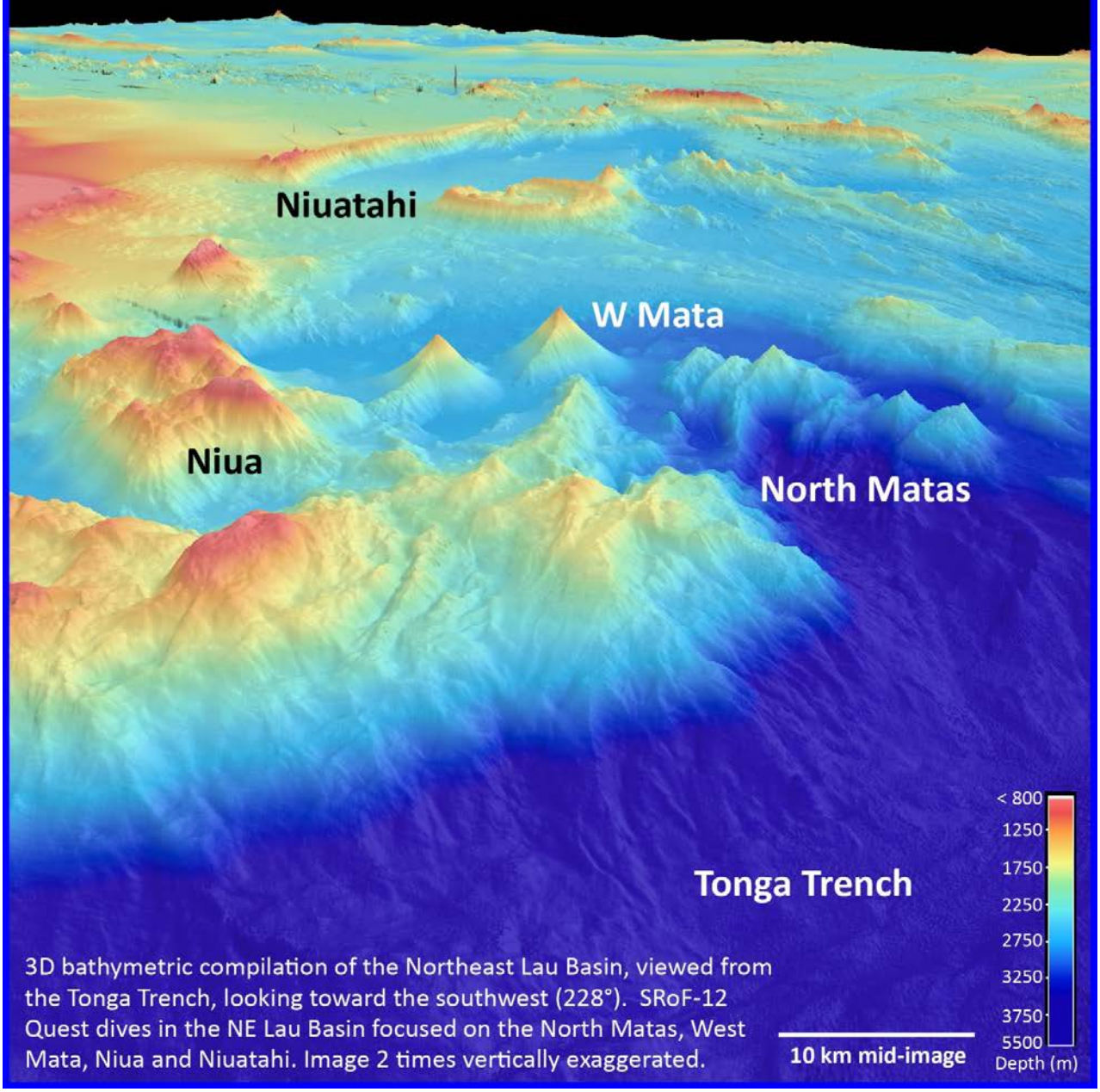
Quest 4000 Expedition Leader Volker Ratmeyer (Dives Q322 to Q333)

Cruise report prepared by Susan Merle




3D bathymetric compilation of the Northeast Lau Basin, viewed from the Tonga Trench, looking toward the southwest (228°). SRoF-12 Quest dives in the NE Lau Basin focused on the North Matas, West Mata, Niua and Niuatahi. Image 2 times vertically exaggerated.

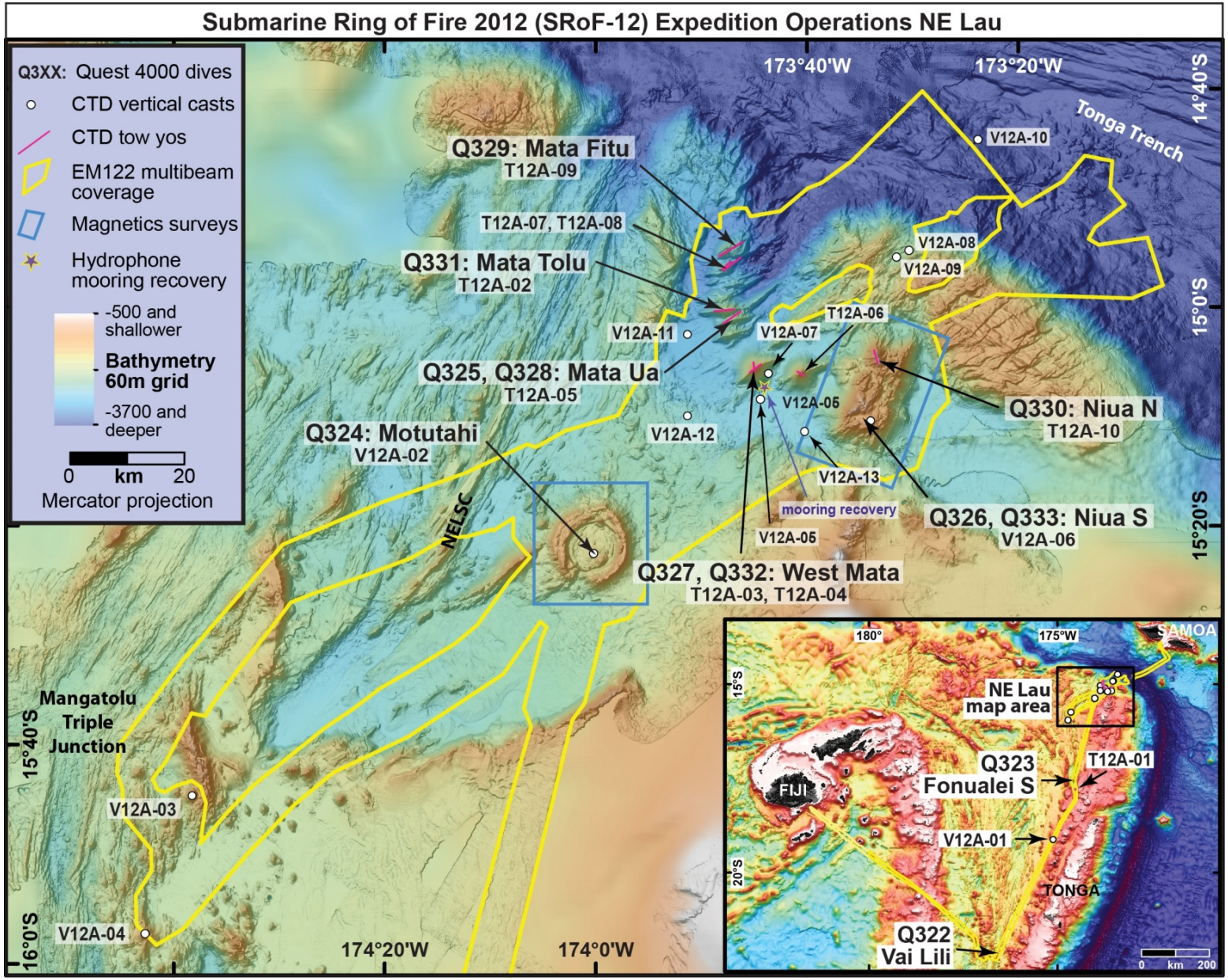



**Fig. 1.0-1**. SRoF'12 operations. Map features the NE Lau Basin area, where the majority of cruise took place. See inset (lr) for view of all tasks.

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# 1.0 Expedition Background and Summary

Joseph Resing and Robert Embley

## Overview

The Lau Basin is home to the Earth's highest subduction rates and fastest-opening backarc basin which results in abundant submarine volcanism and hydrothermal activity. Exploration using water column surveys between 2008-2010 revealed numerous locations of hydrothermal activity and two active eruptions in this area. The primary objective of the Submarine Ring of Fire 2012 (NE Lau) expedition (Scripps designation RR1211) was to conduct dives at multiple sites on the northernmost spreading centers, magmatic arc and backarc regions the northern Lau basin. In addition to water column surveys, several sites had also been surveyed by towed camera sled and a deep-diving autonomous vehicle in 2010 and 2011. Secondary operations during the expedition included: (1) additional water column surveys over both known and new sites, (2) surveys of several areas with a surface-towed magnetometer and shipboard gravimeter, and (3) survey poorly or unmapped areas with the ship's Simrad EM122 multibeam system as time allowed. A total of 164 samples on 12 dives of various types were obtained with QUEST 4000 (65 Biology, 52 geology, 27 vent fluid chemistry and 20 vent fluid gas tights). Water samples were also obtained from the Niskin rosette system during the CTDO (conductivity, temperature, depth, optical) casts and tows (Fig. 1.0-1 and Section 6.7)).

## Background of Expedition: The NE Lau – One of Earth's most dynamic regions

The Earth's ocean basins are like giant conveyor belts, in that new ocean floor is continuously created at mid-ocean ridges (MORs) and ultimately consumed at subduction zones (Fig. 1.0-2).

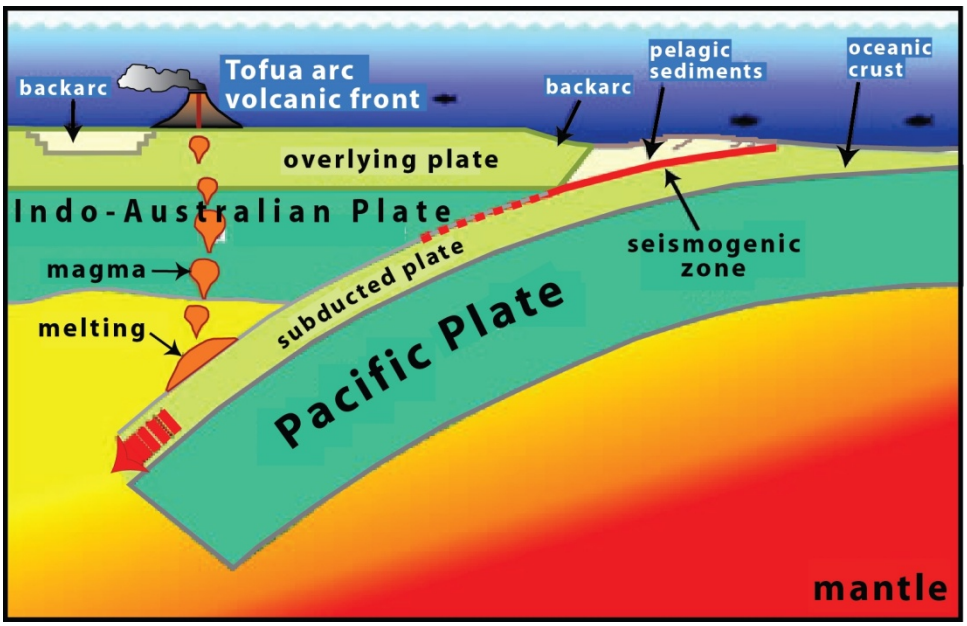


**Fig. 1.0-2.** This illustration shows the Pacific plate in the east colliding with the Indo-Australian plate in the west. At certain depths, usually around 200 kilometers (~100 nautical miles), there is melting of the subducted materials. The melting produces magmas that rise buoyantly to pond in the overlying mantle wedge and periodically erupt on Earth's surface as lavas, forming arc volcanoes. *Image courtesy of GNS Science.*

At MORs, rising magma creates continuous linear volcanoes, while at subduction zones; the descending ocean crust is heated liberating volatiles that enable the production of magmas that build arcs of discrete volcanoes. Both the creation and consumption of ocean crust produces intense and widespread exchange of energy and material between the Earth's lithosphere and the overlying ocean, most notably by eruption and hydrothermal circulation. This conveyor-belt analogy is most apparent on the Pacific Ocean plate, where MORs in the central eastern Pacific and island arcs on the western margin forms a "submarine ring of fire." Some 20,000 km of volcanic arcs, roughly one-third the length of the global MOR system, rim the western Pacific Ocean. Intraoceanic subduction zones, where an older ocean plate descends beneath a younger ocean plate, include hundreds of individual submarine volcanoes along their magmatic arcs and thousands of kilometers of backarc spreading centers and thus remain a key frontier for ocean exploration.

Arc and backarc hydrothermal systems are more varied then MOR systems for several reasons. Hydrothermal fluids have a much wider range of chemical composition because of the broader depth range at which they discharge, the higher gas content in the parental magmas, and a more varied composition of the host volcanic rocks [*de Ronde et al.*, 2003]. In addition, because their summits often rise into shallow water, hydrothermal venting from submarine volcanoes has the potential to affect biological processes in the photic zone. These physical factors also influence the evolution and biogeography of arc and backarc chemosynthetic communities. The geologic and chemical diversity of arc seamounts also creates greater differences in vent faunal community structure and endemism than in any single mid-ocean ridge biogeographic province (T. Shank unpub. data). The observed endemism and community structure may also be influenced by species isolation (e.g., retention of larvae) on active seamounts, and by periodic eruption events impacting communities at different stages of development [*Davis and Moyer*, 2008; *Huber et al*, 2010].

The Tonga-Kermadec arc (Tonga-Tofua arc in north) and the Lau Basin contain the largest and most complex arc/back-arc system on Earth [*Zellmer and Taylor*, 2001]. Five first-order spreading centers have been described within this region (Fig. 1.0-3). The spreading begins in the south along the Valu Fa Ridge and continues along the East and Central Lau spreading centers for more than 600 km. The northeastern Lau Basin is cut by three spreading centers: the Fonualei Rift and spreading center (FRSC) in the south, 2) the Mangatolou Triple Junction spreading center (MTJ) in the middle, and 3) the Northeast Lau spreading center in the north (NELSC). Water column surveys have already found evidence for more than 30 hydrothermal sites along these spreading centers [*Baker et al.*, 2006; *German et al.*, 2006; *Kim et al.*, 2009; *Lisitsyn et al.*, 1992]. Evidence recently collected by the NOAA Vents Program demonstrates that the NE Lau Basin is a "hotspot" for exploration and discovery of diverse chemosynthetic ecosystems. Continued exploration of this frontier meets NOAA's long-term strategic vision in which "ecosystems will be discovered, defined and understood thus enabling them to be protected, restored, and managed." This point is accentuated in the NE Lau basin where increasing pressure from mineral exploration consortiums prospecting for new high-grade sources of copper and other metals may threaten these unique and poorly characterized ecosystems. In addition, these rare and chemically heterogeneous sites are areas of high biodiversity. The characterization of the Mariana arc hydrothermal systems by the SROF expeditions in 2003-06 was an important factor in the determination of boundaries for the Mariana National Marine Monument established in 2009. Finally, the elevated levels of $CO_2$ venting from submarine arc volcanoes make them excellent sites to study the effects of ocean acidification on ocean ecosystems [*Tunnicliffe et al.*,2009]. Discovery of *active* submarine volcanism is a key to understanding the transfer of volatiles and heat

(e.g., $H_2O$, $CO_2$, and $SO_2$) from the Earth's interior to its surface. It is also critical for locating unknown sites of biological and mineral resources.

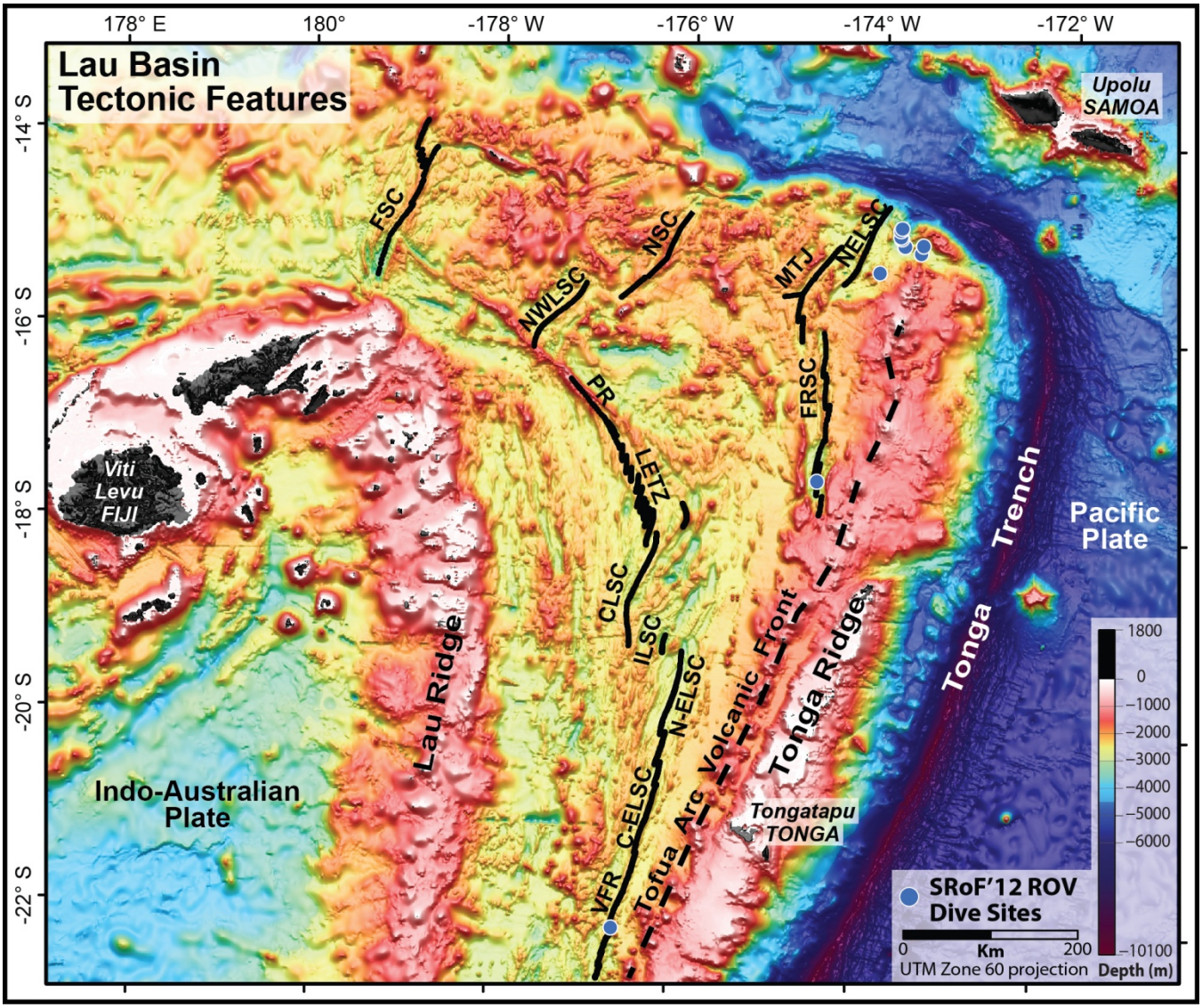


**Fig. 1.0-3**. Lau Basin tectonic features. Valu Fa Ridge (VFR), Central Eastern Lau Spreading Center (C-ELSC), Intermediate Lau Spreading Center (ILSC), Central Lau Spreading Center (CLSC), Lau Extensional Transform Zone (LETZ), Peggy Ridge (PR), North-West Lau Spreading Center (NWLSC), Niuafo'ou Spreading Center (NSC), Futuna Spreading Center (FSC), Mangatolu Triple Junction (MTJ), Fonualei Rift and Spreading Center (FRSC), North-East Lau Spreading Center (NELSC). *Modified from Martinez and Taylor, 2006*.

This expedition was the culmination of several years of exploration and planning. In 2008 an expedition funded by the NOAA VENTS program discovered new hydrothermal sites and two ongoing eruptions, which led directly to a joint NOAA/NSF response expedition in May 2009 on R/V *T.G. Thompson* focused on the Northeast Lau spreading center (Baker et al., 2011) and the actively erupting boninite volcano, West Mata (Resing et al., 2011). A proposal was funded through the NOAA Office Exploration and Research in 2009 to explore the area for additional sites. A major effort in May 2010 on the R/V *Kilo Moana* (KM1008) made 24 CTDO casts (vertical and tow-yos) and 9 camera tows (TowCam provided by D. Fornari, WHOI). Additional active hydrothermal sites were discovered and locations of known sites were refined. In addition a moored hydrophone was deployed near

West Mata volcano that was recovered on the 2012 expedition. A short but very successful dredging cruise on the R/V *Kilo Moana* (KM1024) followed this in December 2010. During the same period, Nautilus Minerals Inc. and a team led by Richard Arculus of the Australian National University collected rock dredges and CTDO casts. In November 2011, Nautilus Minerals Inc. funded an expedition on R/V *Kilo Moana* (KM1129a) that conducted surveys using a deep-towed camera (again using the WHOI TowCam), and the autonomous vehicle *ABYSS* operated by Geomar (Germany) and collected samples using a deep-sea dredge.

Data from all of these sources were used in planning an optimal program for the 2012 expedition. In addition, an NSF-funded team from the Oregon Health and Science University, led by Brad Tebo, joined the expedition to obtain samples from a site SW of Tongatapu. Major funding from the NOAA Office of Exploration, the National Science Foundation and the NOAA VENTS program, supplemented by resources through PMEL Memorandum(s) of Understanding (MOUs) with GNS Science New Zealand and Nautilus Minerals Inc. supported this effort. After an exhaustive vetting of suitable ROVS available for the time period allotted to us for lease of the R/V *Roger Revelle* (September, 2012), the *QUEST 4000* vehicle operated by MARUM (Center for Marine Environmental Sciences), U. Bremen Germany, was selected (through the NOAA procurement process) and leased for the expedition under an MOU with MARUM for scientific and technical collaboration. Considerable effort and expense were made by MARUM, Scripps and PMEL personnel to provide the R/V *Roger Revelle* with the electrical power and physical modifications necessary to operate the *QUEST 4000* safely and efficiently.

## Narrative of Expedition

(*Note -The narrative below is not an exhaustive discussion of the findings of each dive; please refer to the dive logs (Section 7.0) and discipline summary sections (Sections 6.1 – 6.7) for details about the biological and other sampling results at each dive site. Site maps for the dives described here are found in Section 3.5*.

Given the complexity of the logistics etc, an apt summary of the cruise is “Whatever could go wrong *didn’t* go wrong”. Twelve dives (out of a possible 14 dive days) at 9 sites (Figs. 1.0-1, Plates 1 - 12) were successfully made, with 98.5 hours of bottom time and 164 samples for geology, chemistry, biology and microbiology. The remaining days were used for maintenance, transits and for other operations during one period of weather downtime (see below). With the exception of a navigation issue which created some downtime during dives in the first portion of the dive series, the vehicle and topside operations worked remarkably well, given that the system had never operated on a U.S. research vessel previously. This is a testament to the excellent cruise preparation by the Scripps Marine Operations group and the skill and cooperation of the crew of the *Roger Revelle* and the *QUEST-4000* team (Section 3.1). A special project funded by the NOAA Office of Exploration and Research provided a high bandwidth link through the HiSeasNet to broadcast the *QUEST 4000* video in realtime during the dives (Section 5.1).

The twelve dives were each made between the hours of ~0800 and ~2100 (local time). Two dives were cancelled due to weather/other issues on 09/16/12 and 09/17/12. Normal night operations included geophysical surveys using the ship’s magnetometer, gravimeter and multibeam, and/or CTD casts/tow-yos mostly in the NE Lau (see Section 6.0 for details). The geophysical surveys focused on Niuatahi, Niua and the Matas. The objectives of the CTDO stations (Fig. 1.0-1 and Section 6.7) included time-series work over known

hydrothermal sites, exploration for new sites and refinement of the position of sites (e.g., Mata Ua). The CTDO was used to investigate new targets on the transit north from the first dive target (Vai Lili) to the South Fonualei site and on the non-dive days of 09/16/12 and 09/17/12. Two new active hydrothermal sites were located during the CTDO surveys, one on the southernmost Fonualei spreading center and the second in the Mangatolu Triple Junction region. Additional targets remain in the Mangatolu Triple Junction region (Fig. 1.0-1) and our findings there suggest that the entire region contains an extraordinary amount of magmatic activity.

After testing systems on a 1.5 day transit from Suva, Fiji beginning 09/09/12, the first dive, Q-322, began as scheduled on 09/11/12 (Plate 1 and Fig. 3.5-1). This dive had the specific objective of intensive sampling of a Fe-Mn mat that had been discovered there in 2005. Dr. Bradley Tebo headed a team from Oregon Health and Sciences University (OHSU) funded by NSF that used specialized samplers at the site to than 6 samples of the mat. On the day-long transit northward to the South Fonualei rift, two CTDO stations were completed and the multibeam system was used to collect data on unsurveyed areas.

Dive Q-323 on 09/13/12 (Plate 2 and Fig. 3.5-2), was made on the large central volcano at the southernmost end of the Fonualei Rift zone the easternmost spreading center of the northern Lau basin. An AUV survey of a portion of the central volcano in the rift valley in 2011 (see above) targeted sites of suspected hydrothermal activity, one near the summit and another site, this one consisting of a cluster of very tall spires with well-defined turbidity anomalies from the AUV survey, on the NE flank. Some large spires near the summit with no hydrothermal indicators proved to be lava spines. Some active low-temperature diffuse sites and smaller chimney were sampled nearby. There was also a large bed of dead mussel shells coated with manganese that bespoke of an extensive recently active diffuse vent field. The deeper site on the NE flank was visited after a ~2-km traverse northeast and downslope through the water column. Here, the tall spires identified on the AUV map were found to be a group of very tall (up to 30 m), active, high temperature chimneys (254°C measured).

Dives Q-324 through Q-333 were located within the area of the NE Lau basin (Fig. 1.0-1). The first dive, Q-324 (Plate 3 and Fig. 3.5-3) on 09/24/12, targeted the young Motutahi cone within the large caldera of Niuatahi volcano (formerly Volcano O). Previous work here using CTDOs and a towed camera on KM1008, and one ROV dive made by Nautilus minerals in 2008, showed that the cone was in a state of magmatic degassing. A degassing sulfur pit emitting diffuse fluids was discovered at the summit of the cone at ~1250 m, but there was little macrofauna in its immediate proximity. Large amounts of polysaccharide "sacs" were observed in the peripheral area of the pit and some shrimp and polychaetes were found downslope at ~1295 m.

Dive Q-325 on 09/15/12 (Plate 4 and Fig. 3.5-4) was the first attempt to locate the hydrothermal system at Mata Ua volcano (#2 of the northern Matas). Multiple CTDO tows here had determined the likelihood of a high-temperature hydrothermal system and a camera tow in 2010 on KM1008 (CamTow-09) photographed what was interpreted as an extensive high-temperature alteration system on its western side. Dive Q-325 searched the southern and western portion of volcano, but time ran out while surveying the NW flank where biologic indicators hinted at a large active site nearby. A CTDO tow-yo, T12A-05 on September 18, along the NW flank of the volcano confirmed the presence of a high-temperature site slightly deeper than where Q-325 had ended. Deeper exploration on dive Q-328, 09/20/12, discovered an extensive hydrothermal field on the steep slope (Plate 7, Fig. 3.5.4). Prolific long-necked barnacles and other vent animals colonized the slope and older sulfide

chimneys and several black smokers were discovered and sampled in a depth range of 2397-2356 m. At least two of the smokers appeared to be boiling. The maximum temperature recorded was ~360°C but it could have been hotter (boiling at this depth ~380 C). This was the hottest site in the NE Lau to date.

Dive Q-326, 09/18/12, was the first of two dives at Niua South (Plate 5 and Fig. 3.5-5). This extensive hydrothermal site had been discovered by CTDO casts by the R/V *Southern Surveyor* in 2008 (SS07-2008) followed by Nautilus Mineral Inc. dives with a commercial ROV in 2008 that discovered extensive venting and sulfide deposits in a series of large (≥ 200-m-diameter) irregularly-shaped depressions on the southern end of the large rhombohedral-shaped Niua volcano. An *ABYSS* AUV survey in 2011 on KM1129a provided a detailed map used to explore the site. Dive Q-326 began in a previously unexplored small pit located near the SW corner of the southernmost large pit (bottom at 1165 m). Here we discovered diffuse venting in a sedimented old volcanic terrain highlighted by pumice flows on the walls of the pits. After sampling the small pit the dive transited to the southernmost large pit and sampled one of the numerous active black smoker mounds, named Adelaide, where the dive terminated. A maximum temperature of 315°C was measured here. A second dive, Q-333 on 09/25/12, (Plate 12 and Fig. 3.5-5) returned to the small pit to take additional Mn-coated pumice samples for the OHSU group with their specialized tube samplers. The remainder of time on that dive was used to further explore the larger pit visited on Q-326, where numerous smoker chimneys and extinct sulfides were observed. Vent fluid and other samples were taken at sites on the SE corner of the pit that yielded a maximum temperature of 274°C.

Dive Q-327, 09/19/12, was the first dive at West Mata volcano (Plate 6 and Fig. 3.5-6) since the 2009 response cruise that discovered an active eruption and took extensive observations and samples in the summit region. The first return visit was to a new pit crater that was first observed in a multibeam survey conducted in 2011. The dive confirmed that the crater was up to ~80 m in relief on its SW side. Samples were collected and observations made of the post-eruptive ecosystem. No sign of eruptive activity was observed during the dive, consistent with water column measurements made on the cruise. Two small hydrophones were deployed for the duration of the dive at Luo vent on the SW portion of the summit ridge. The ~10 hour record from one of those hydrophones did not record any eruption signals. A second dive, Q-332 on 09/24/12, (Plate 11 and Fig. 3.5-6) took advantage of a fully operational navigation system to confirm that the pit was fully enclosed and likely formed by collapse following magma withdrawal during/after the cessation of eruptive activity. The headwall region of the debris slide on the upper east flank of the volcano showed a major new scarp with remnant dikes left from the collapse, which is consistent with predictions based on the 2011 multibeam map. The ecosystem at West Mata was dramatically changed from the relatively sparse single shrimp species population observed in 2009 to multiple species of shrimp swarming in high- density clusters over the summit region. In addition, other motile species including scaleworms, crabs etc. had colonized the volcano.

Following dive Q-328 at Mata Ua (see above), dive Q-329 (Plate 8 and Fig. 3.5-7) on 09/23/12 explored the hydrothermal systems at Mata Fitu, the northernmost (#7) of the northern Matas. The hydrothermal system was first discovered on KM1008 in 2010 by a CTDO tow and the presence of black smokers was verified by a towed camera on the same expedition (CamTow-06). The dive started to the south of the camera line and sampled lavas in several places. Here, an unusual ridge of broken lava was interpreted to be an old fault structure. The ROV then moved upslope and discovered the first active chimney field at ~2585m. The positions

of the active sulfide areas discovered during this dive closely matched (within ~25m) the positions of the active sites identified on the camera tow. Several lines of smokers were found, two of which were quite active. The deepest sites discovered on the expedition and hottest site at Mata Fitu was the 16-m high **ChimE**, at 2644 m (base) and 331°C.

Dive Q-330 on 09/22/12 was the only dive to the Niua North site (Plate 9 and Fig. 3.5-8). This site, the shallowest of the targets at 715-750 m, was discovered by a CTDO cast on R/V *Southern Surveyor* in 2008 (SS07-2008) with additional information collected by CTDO tow-yo in 2010. The site selection was enhanced with the data collected during KM1129a in 2011. The *ABYSS* AUV survey of the NW-SE trending ridge on the northern end of Niua seamount identified a small depression on its NW flank. A dredge that passed through this area recovered molten sulfur and a TowCam station photographed extensive mussel beds on the adjacent summit of the ridge. This target turned out to be a sulfur pit (the **Hellow** pit) that was similar to, but venting more intensely than, the one discovered on Q-324 on Motutahi cone. It also had a more robust biologic community on its periphery (within ~10 m), including shrimp, solitary tubeworms, mussels, snails and other vent-endemic life. Droplets of liquid $CO_2$ were being emitted from the pit. Diffuse venting supported the large area of mussels and other vent fauna (**Mussel Mania**) seen on the camera tow at the summit of the ridge (715 m) ~200 m from the pit. On the return to the Hellow area, sulfur pit (**Pit)** was discovered at ~720 m. This site is almost on a SE_NW line between the Hellow and Mussel Mania sites and probably reflects a tectonic lineament. At the end of the dive a small ridge or dome mapped by the AUV south of the Hellow site was sampled and determined to be an outcrop of rhyolite. Additional mussel beds were found here also. Niua North, with its profuse venting of magmatic gases and sulfur volcanism, contrasts dramatically with the (presumably) more deeply "rooted" Niua South magma source with its extensive black smoker vent fields.

The final site on the northern Matas was the summit of Mata Tolu (#3) where dive Q-331 was made on 09/23/12 (Plate 10 and Fig. 3.5-9). Mata Tolu is the shallowest of the northern Matas with a summit depth of ~1815 m and characterized by short rift zones extending southwest and northeast. A small plume was discovered by a CTDO tow on KM1008 and imaging of diffuse venting, hydrothermal biology, and a possible active sulfide chimney on CamTow-03 during the same cruise. An approximate 100 x 100 m area of sulfide structures at the summit area was predicted from the *ABYSS* 2011 AUV map (KM1129a) of the site. Dive Q-331 began ~150 m south of the summit and after obtaining some rock samples, quickly traversed to the sulfide area. The remainder of the dive mapped out the sulfide structures and obtained samples for the various disciplines. The hydrothermal area was a mixture of active and inactive structures with a maximum recorded temperature of 271°C. It appears that Mata Tolu, like Mata Fitu and Mata Ua, has had a long phase of hydrothermal activity following cessation of volcanism and development of crustal fracturing by continuing tectonic activity.

Overall, the hydrothermal vent-endemic biology varies from site to site with species of shrimp, long-necked barnacles, mussels, snails, polychaetes and fish being the most visually obvious fauna. One type of tubeworm was found in low densities at the Niua North site. See Section 6.4 for details about the macrobiology.

Following the end of Dive Q-333 at Niua South (see above), the R/V *Roger Revelle* transited to Apia, Samoa, arriving on the morning of 09/26/12.

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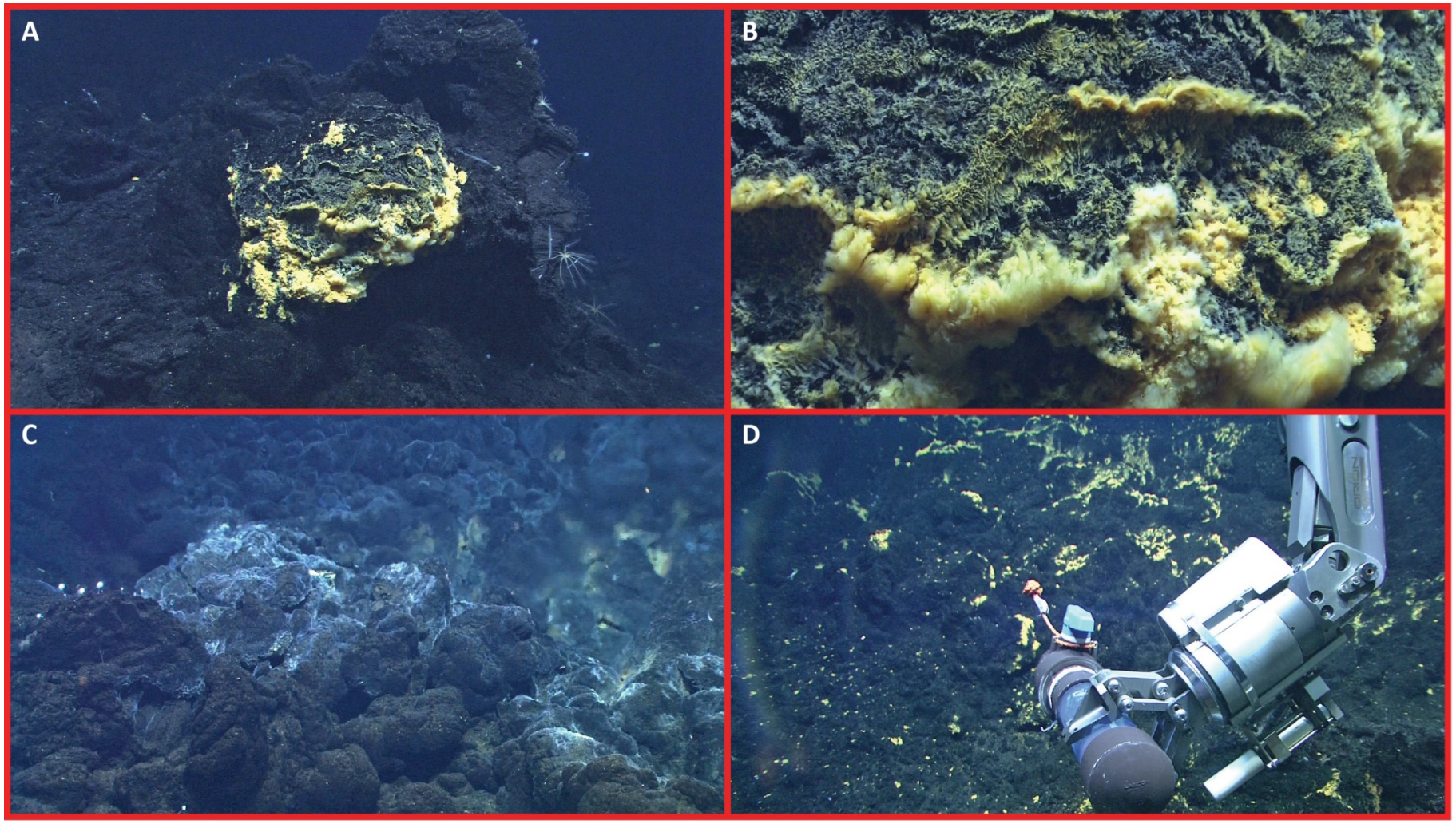


**Plate 1. Vai Lili, Valu Fa Ridge, Dive Q322.** A) 9/11 01-17-49: Manganese-encrusted microbial mats (black) overlaid on iron-oxide encrusted microbial mats (yellow). B) 9/11 01-17-59: Close-up of microbial mats in previous image. 1739 m. C) 9/11 03-43-33: Sulfur mats in large area of diffuse flow. 1742 m. D) 9/11 04-42-55: Using the large Davis sampler to scoop up manganese mats for DNA analysis. 1740 m.

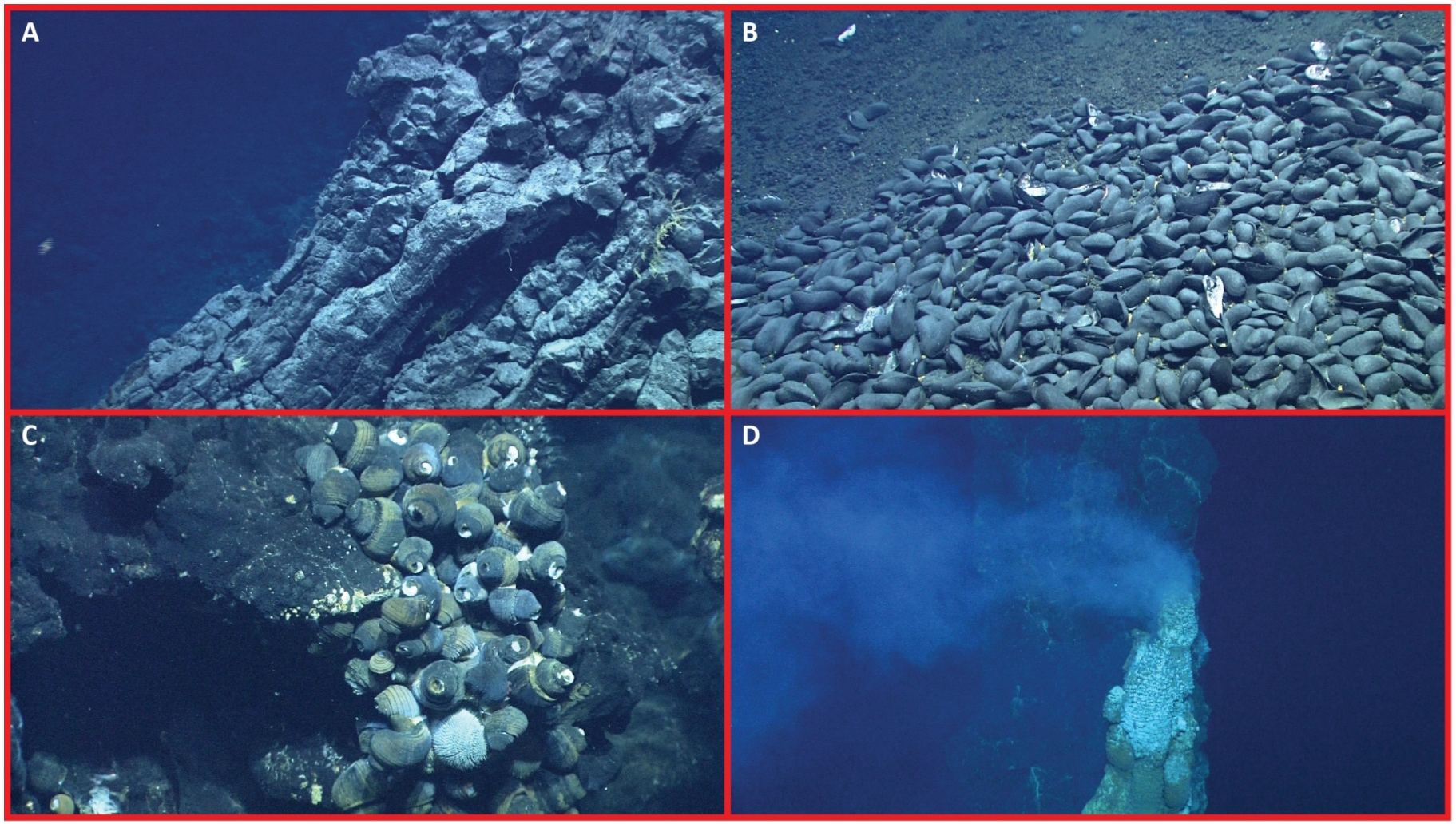


**Plate 2. Fonualei South Dive Q323.** A) 9/14 22-14-39: Toothpaste-like lava tubes near summit of central cone, ~974 m. B) 9/14 23-59-35: Manganese-coated mussel shells mark demise of venting, ~950 m, near summit of central cone. C) 9/15 00-49-02: Solitary live "hairy" snail clings to life amongst deceased (lost their hair), near summit of central cone, ~963 m. D) 9/15 04:31-32: Venting at top of 20 m high chimney, Loloa Kakai vent field, flank of central cone, ~1550 m.

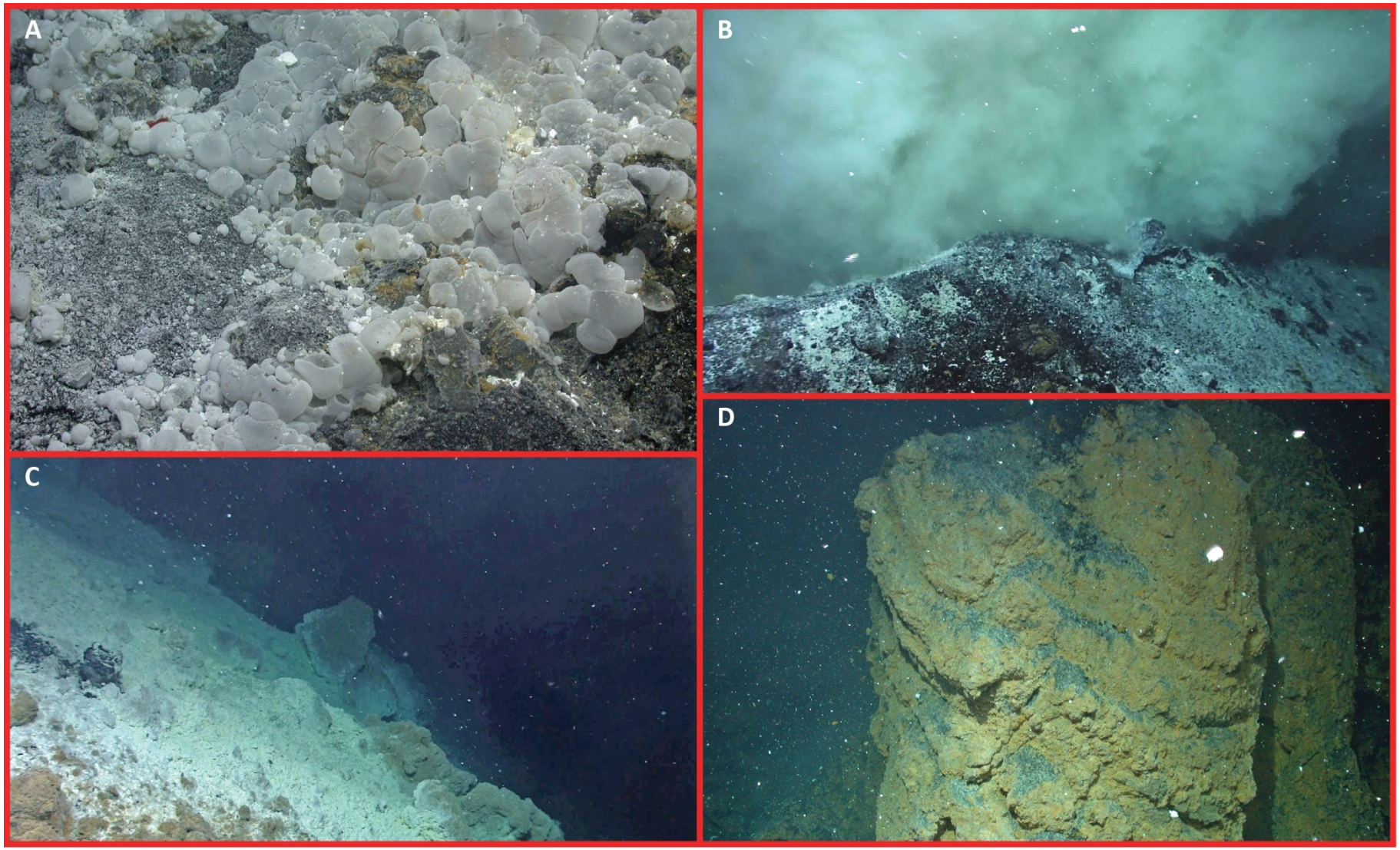


**Plate 3. Motutahi Dive Q324.** A) 9/13 22-03-00: Microbially secreted mucopolysaccharide sacs on upper flank of Motutahi cone, ~1264 m. B) 9/14 02:57:56: Turbid, sulfur-rich cloud venting from pit on summit of cone, ~1244 m. C) 9/14 04-50-05: The sulfur-strewn steep slope just east of the cone summit. ~1260 m. D) 9/14 04-10-00: Lava flows with stretch marks flowing down from summit of cone, ~1259 m.

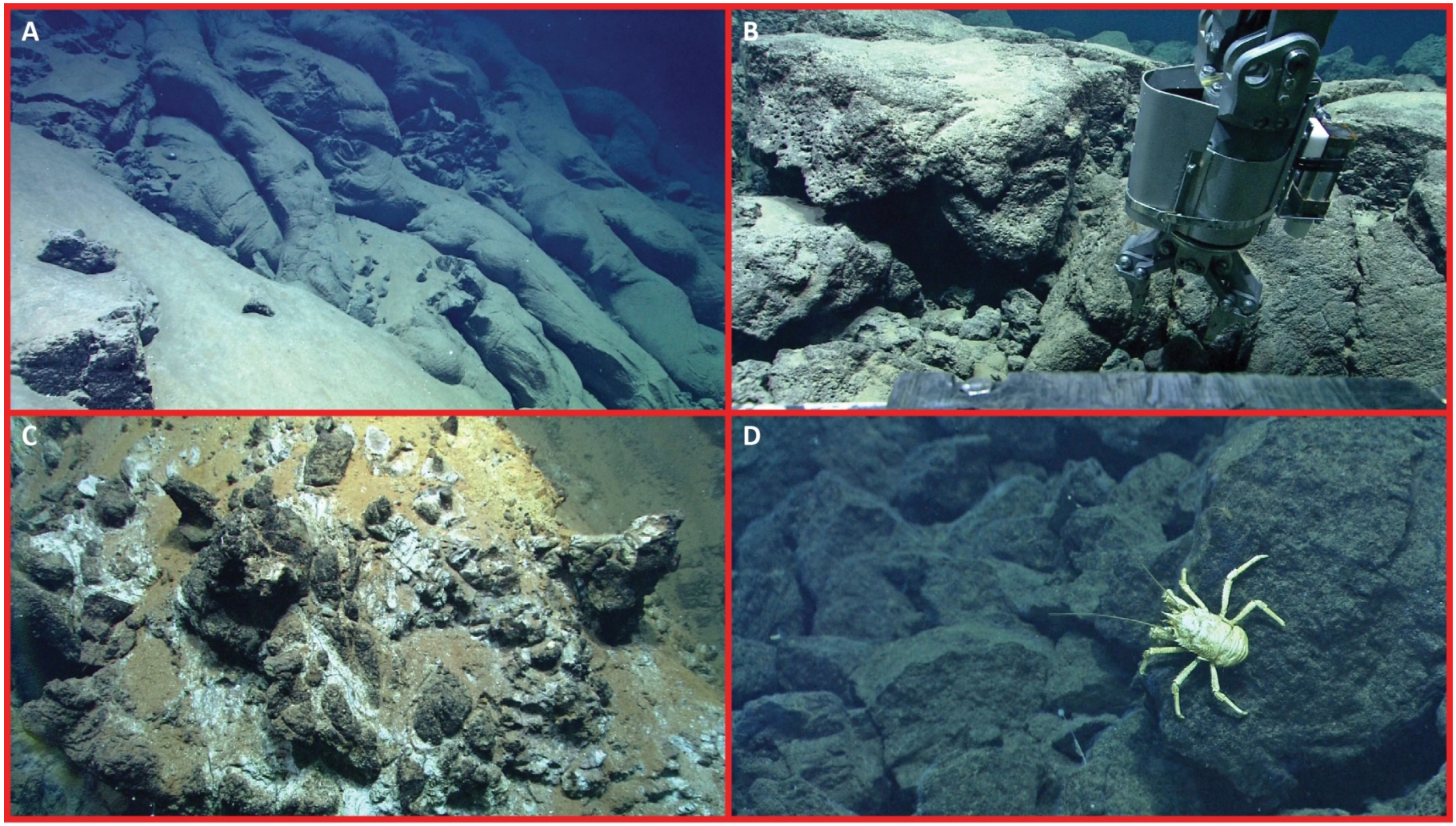


**Plate 4. Mata Ua Dive Q325.** A) 9/14 22-11-58: Sedimented pillow lava tube flows on slope on south flank of Mata Ua, ~2213 m. B) 9/14 23-35-35: Sampling vesicular lavas, southern flank, ~2194 m. C) 9/15 01-30-53: Outcropping hydrothermal alteration zone, ~2135 m. D) 9/15 03-25-27: Squat lobster and lollipop sponges, northwest flank, ~2210 m.

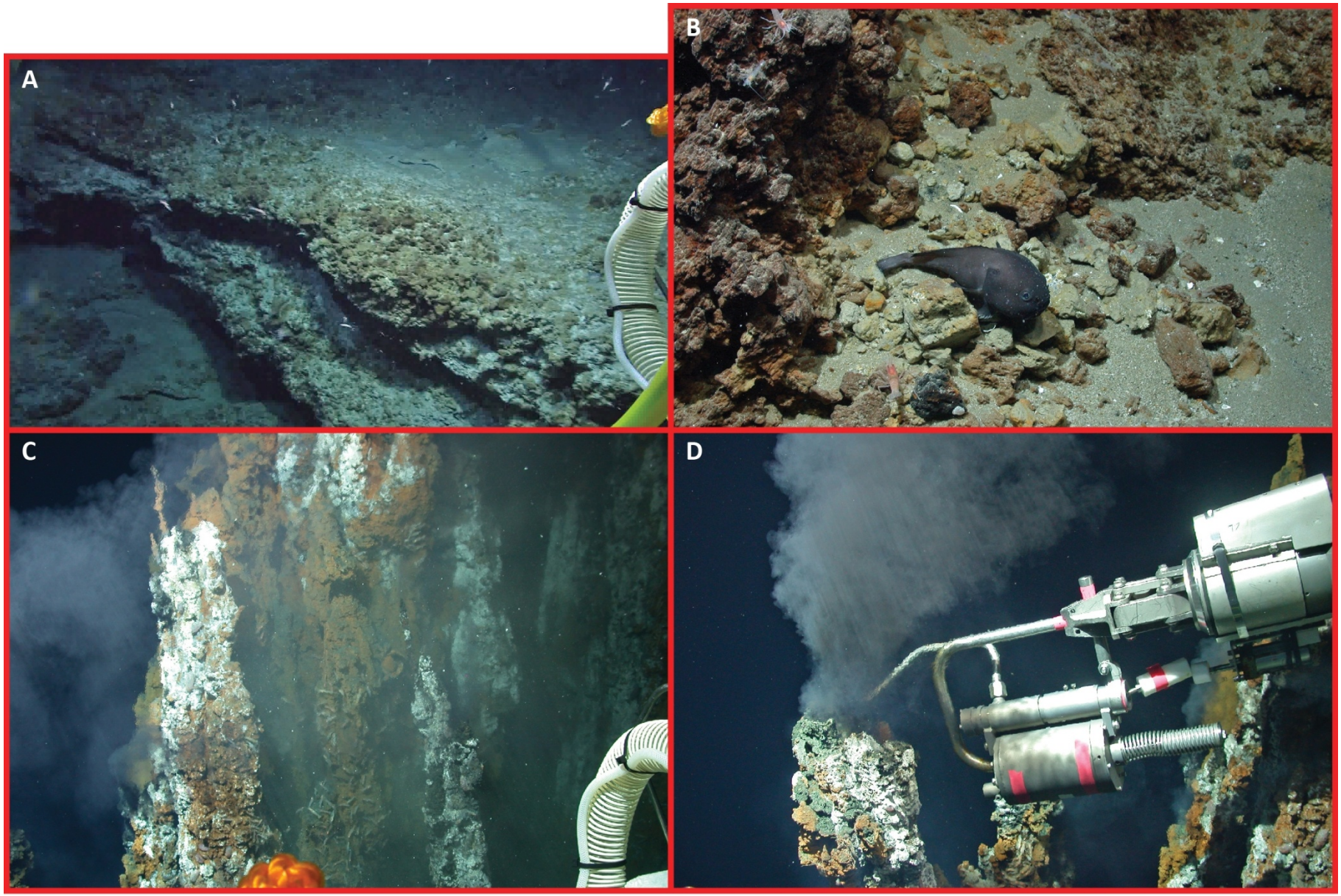


**Plate 5. Niua South Dive Q326.** A) 9/18 00-32-47: Layers of volcanic deposits outcrop on wall of the small pit, ~1158 m. B) 9/18 00-49-00: Fathead sculpin fish and shrimp in the small pit, ~1156 m. C) 9/18 04-27-00: Forest of sulfide chimneys at Adelaide sulfide structure, large pit, ~1162 m. D) Sample hot fluids with “Major" sample bottle, Adelaide, large pit, ~1158 m.

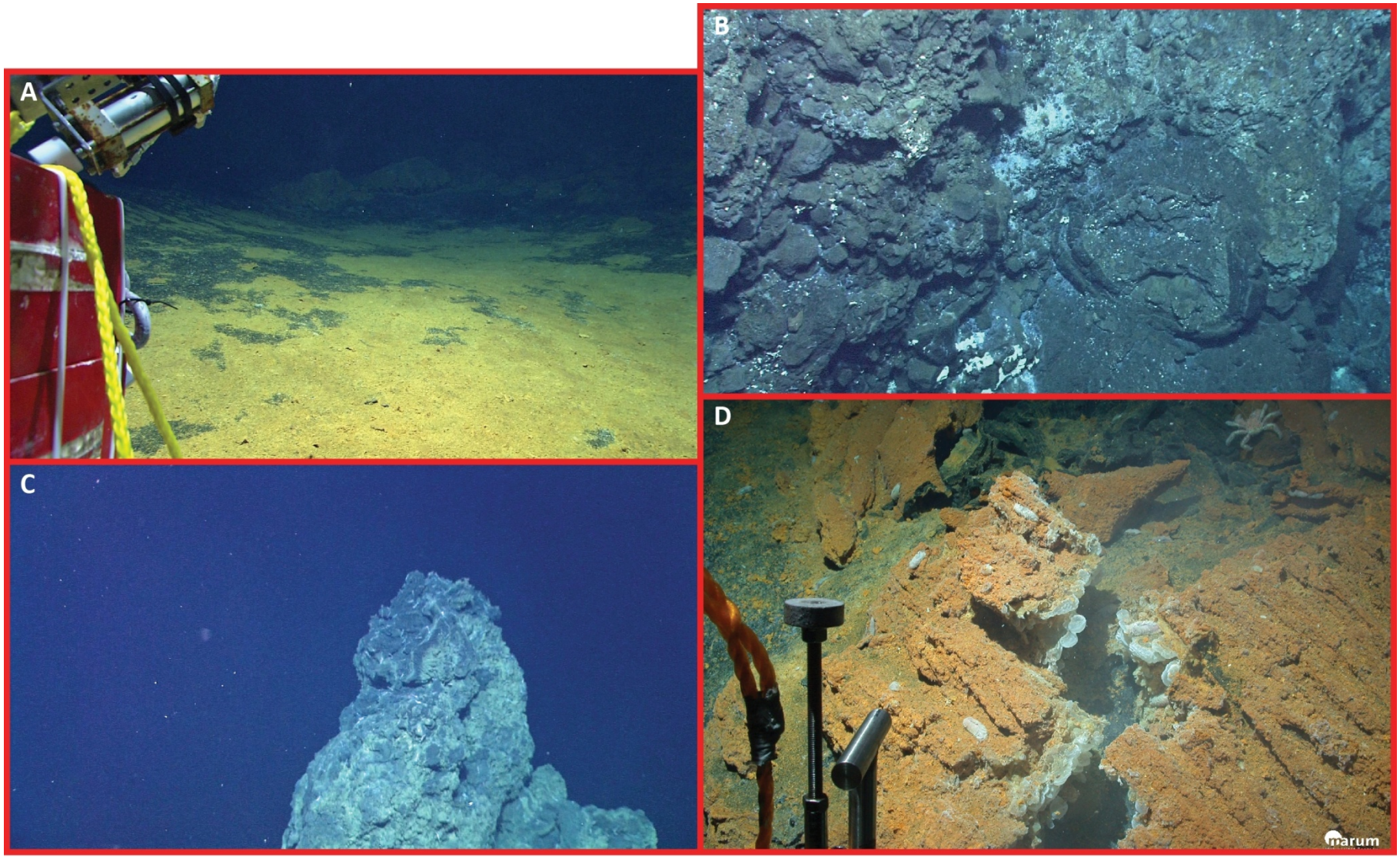


**Plate 6. West Mata Dive Q327.** A) 9/18 21-31-35: Iron microbial mat, Mat Meadows, ~1281 m. B) 9/19 00-02-29: Truncated pillows outcrop on wall of 2010-11 Pit Crater, ~1235 m. C) 9/19 01-48-20: Shrimp swarm on pinnacle on summit of West Mata, ~1161 m. D) 9/19 07-18-00: Scale worms and polysaccharide sacs at Luo site, ~1281 m.

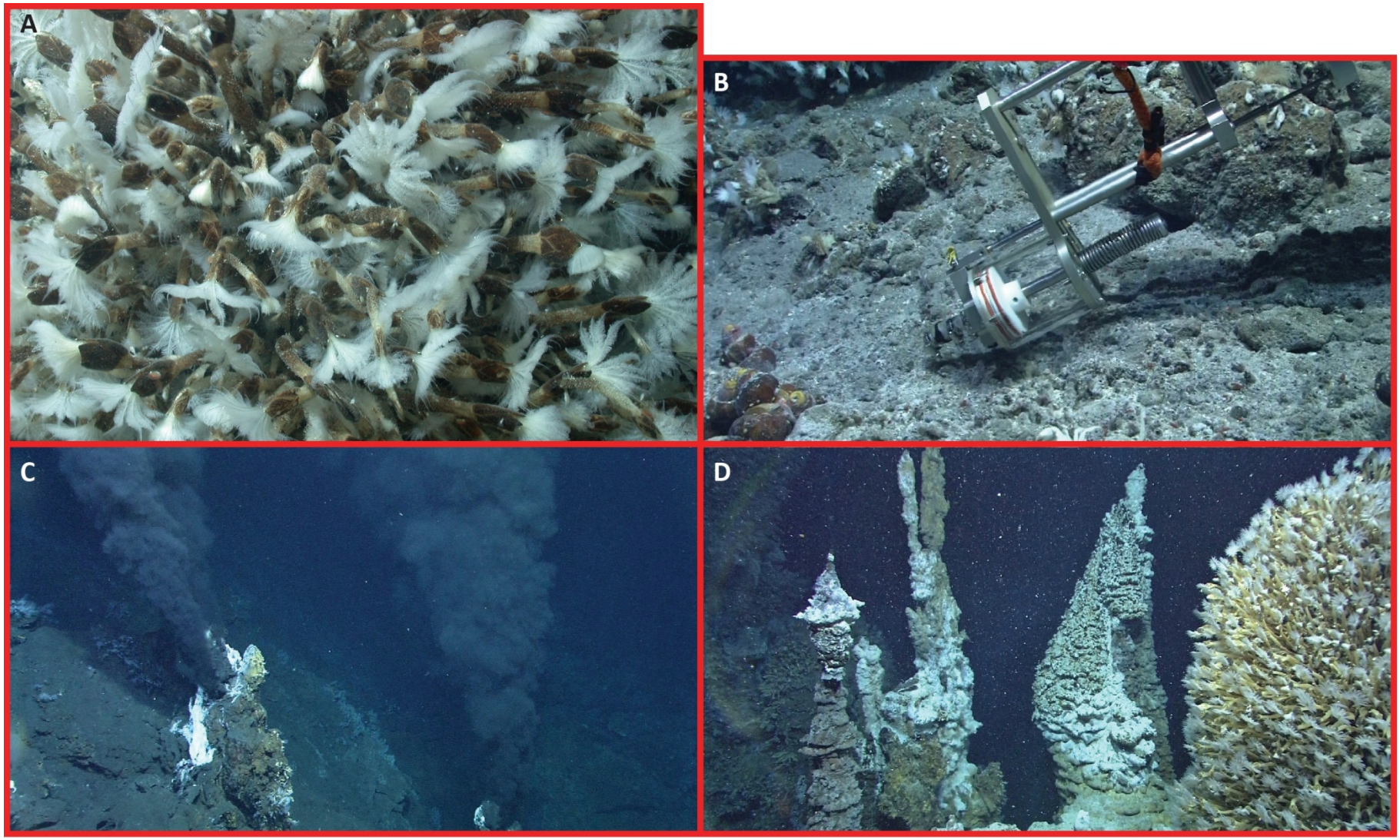


**Plate 7. Mata Ua Dive Q328.** A) 9/20 00-18-00: Long-necked barnacle colony, ~2390 m. B) 9/20 00-41-06: OSU syringe sampling hydrothermal sediments, ~2365m. C) 9/20 01-48-18: "Flashing" black smokers, ~2365 m. D) 9/20 05-32-39: Barnacles colonizing sulfide chimneys, ~2355 m.

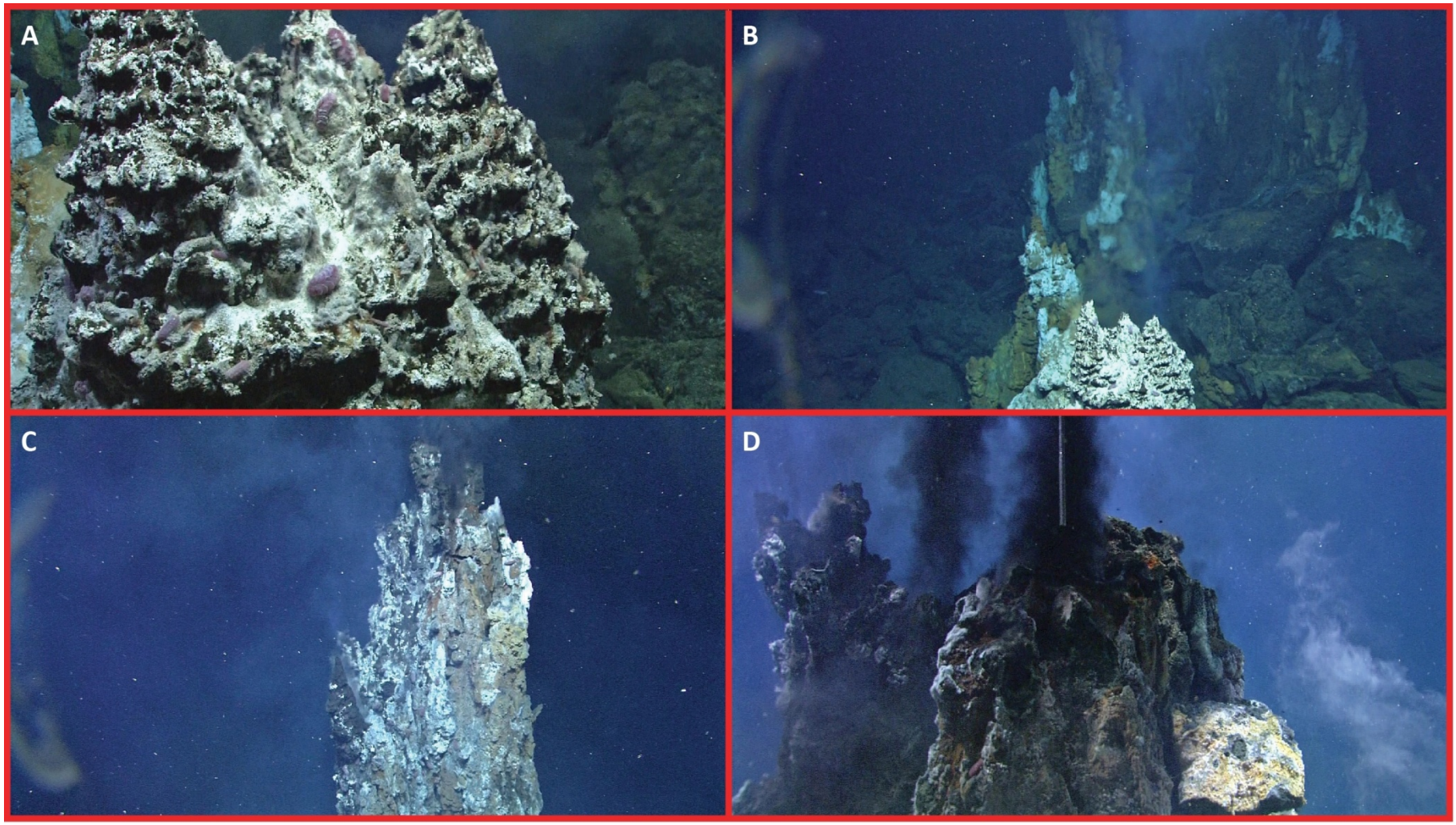


**Plate 8. Mata Fitu Dive Q329.** A) 9/20 23-01-21: Close-up of polychaetes on chimney, ~2605 m. B) 9/20 23-10-56: Line of active chimneys going upslope, ~2602 m. C) 9/21 03-54-00: Top of 17 m ChimE sulfide structure, ~2625 m. D) 9/21 04-59-46: Smoke pours from top of ChimE, ~2625 m.

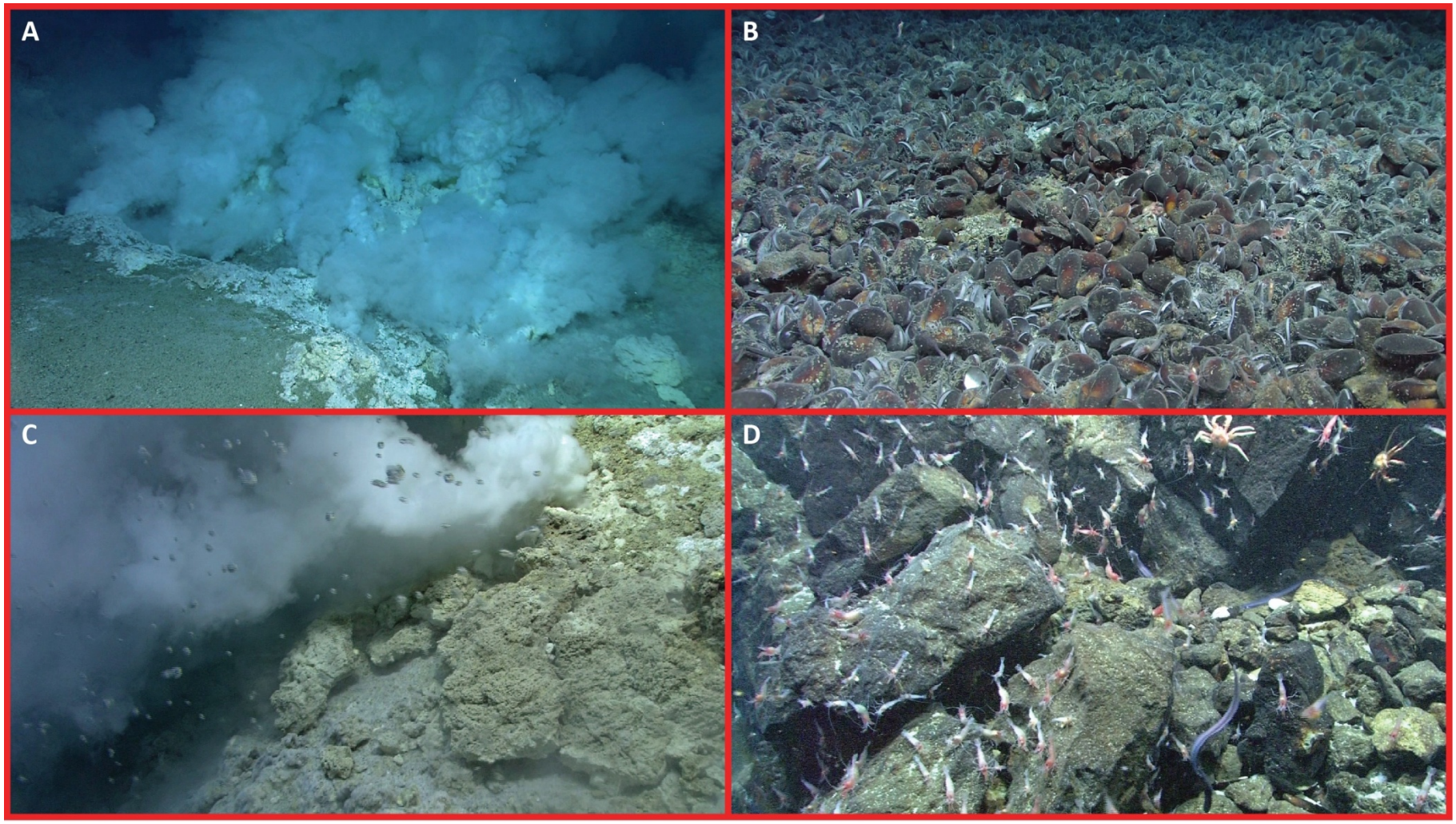


**Plate 9. Niua North Dive Q330.** A) 9/21 22-31-27: "Hellow" sampling site, consisting of multiple sources of venting and sulfur flows. 754 m. B) 9/22 03-33-07: Vast expanse of mussels at the summit of Niua North, named "Mussel Mania". Low-temperature diffuse flow area with biota including paralomis crabs, eel pouts, snails, brachyuran crabs and shrimp. 722 m. C) 9/22 05-14-40: "Hellow" area. Notice the sulfur smoke and liquid CO2 bubbles rising out of the seafloor. 747 m. D) 9/22 05-45-22: Rhyolite outcrop sampled near end of dive. The biota swarming the rocks include: shrimp, eels, and crabs. 745 m.

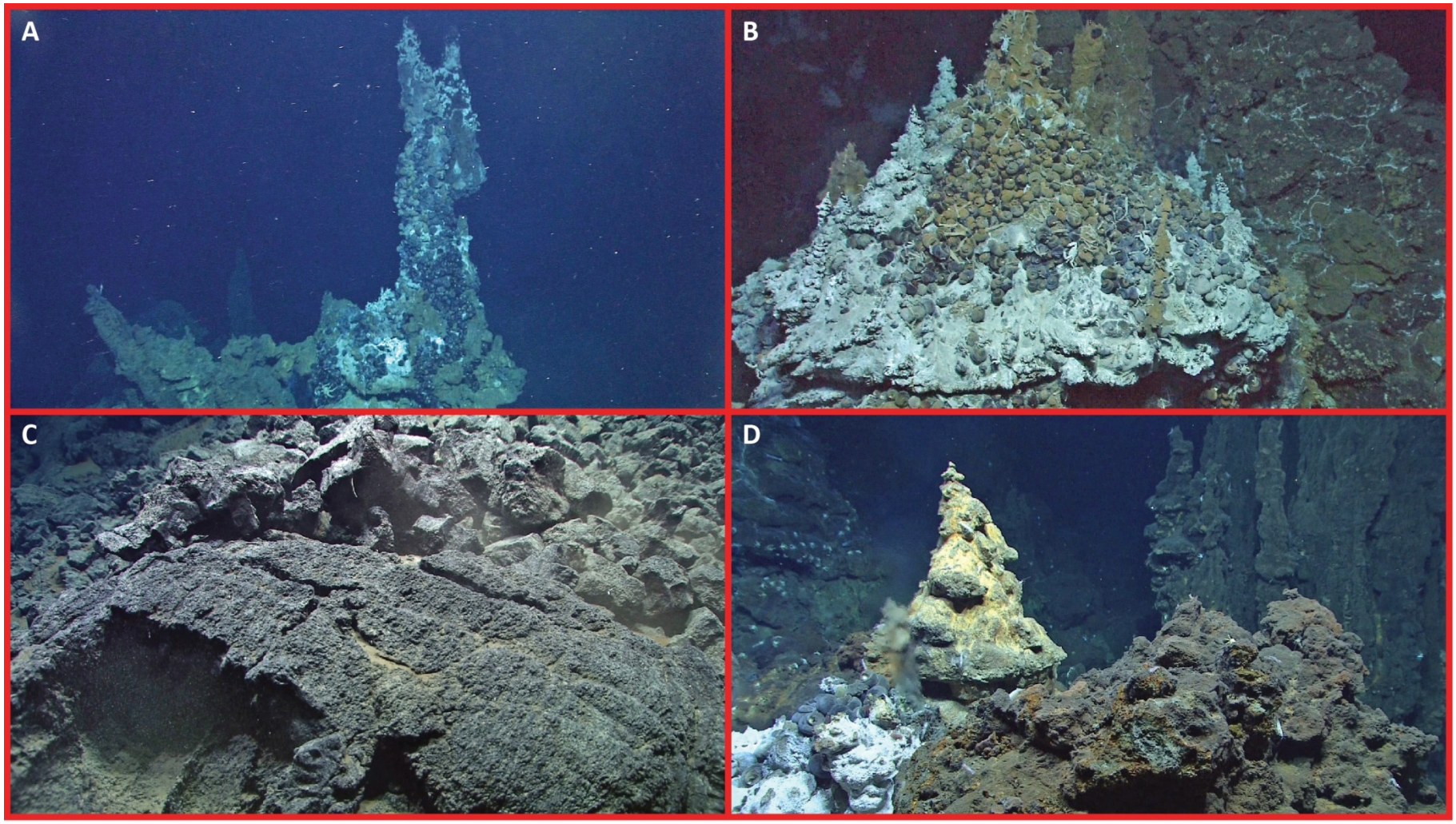


**Plate 10. Mata Tolu Dive Q331.** A) 9/22 22-13-26 8-9 m high "Snail" chimney from a distance. Dense biota, especially snails at the base. Samples 4-15. ~1820m. B) 9/22 22-22-25 Pagoda structures and microbial mat on Snail chimney. Biota includes Ifremieria (gray/dark brown) and Alvinochoncha (light brown, hairy) snails, polynoid worms, crabs, shrimp. C) 9/23 03-46-06 Large in-place boninite pillow lava east of the summit. Glassy outer rind sampled. ~1868 m. D) 9/23 05-54-30 Second chimney sampling site (samples 18-24), central summit. ~1840m.

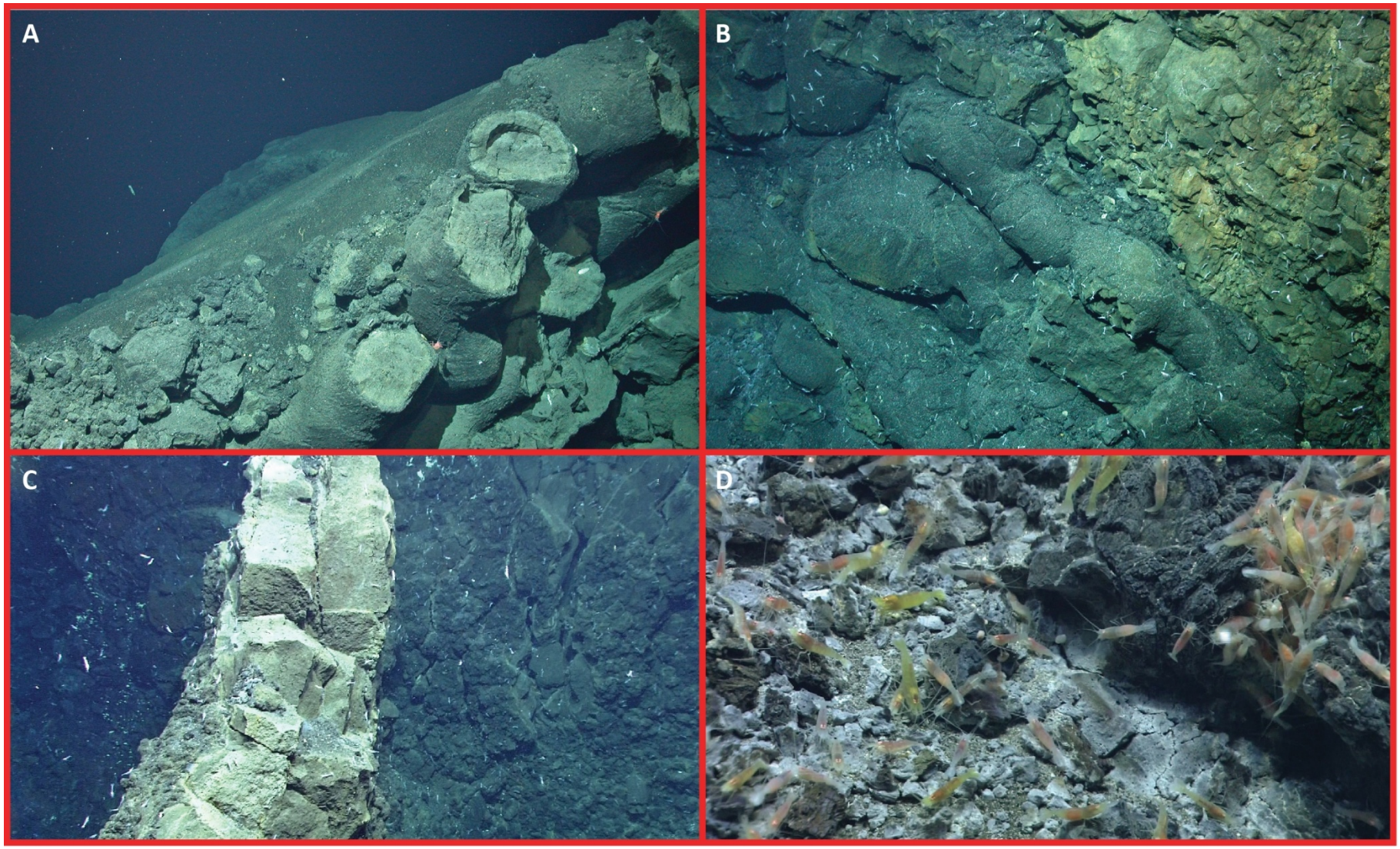


**Plate 11. West Mata Dive Q332.** A) 9/23 21-02-00: Truncated pillows on rim of 2010-11 Pit Crater, ~1255 m. B) 9/23 22-03-00: Shrimps swarm on young pillow tubes impinging older scarp of exposed lavas, ~1205 m. C) 9/23 23-52-26: Dike exposed in headwall area of slide, ~1220 m. D) 9/24 00-49-43: Closeup of shrimp swarm, summit of West Mata, ~1172 m.

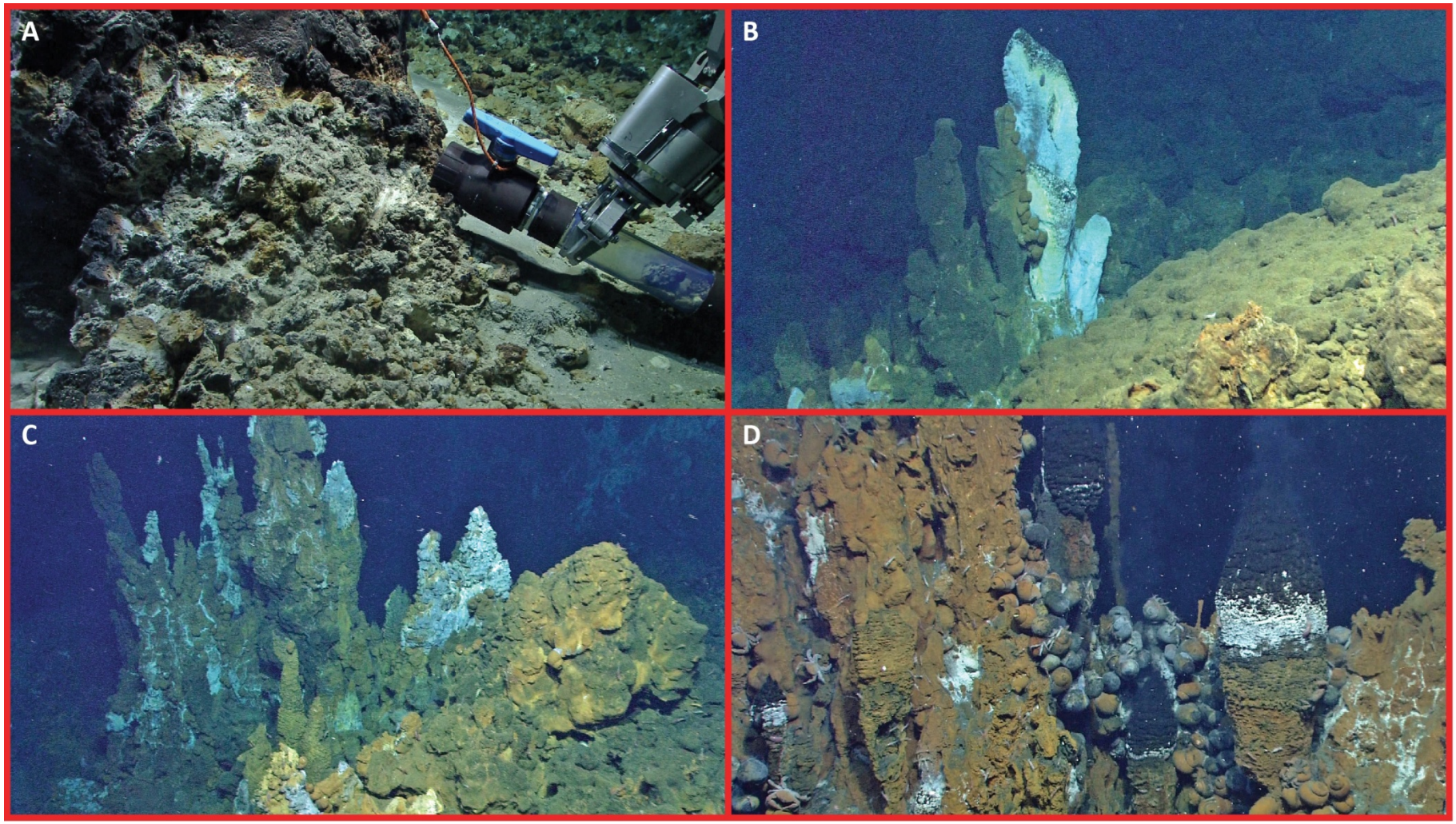


**Plate 12. Niua South Dive Q333.** A) 9/24 20-22-25: Sampling manganese oxide microbial mats in the small pit at Niua South. 1165 m. B) 9/24 21-38-58: Small active (white) and inactive (brown) chimneys on the south slope of the large pit. 1156 m. C) 9/24 22-32-40: Sulfide structure directly south of Adelaide. ~1162 m. D) 9/24 23-56-29: Target E active chimney structure on the eastern edge of the large pit. Samples 4-17 collected, ~1155m.

## 1.1 Operations Log

| date UTC | time UTC | date local | time local | SRoF'12 (RR1211) Operations Log | latitude | longitude |
|---|---|---|---|---|---|---|
| *Fiji is 12 hours ahead of UTC. Samoa is 13 hrs ahead of UTC.* | | | | | | |
| *Blue text: EM122 multibeam. Purple text: Magnetometer. Green text: ROV. Red text: CTD.* | | | | | | |
| 9-Sep | 0400 | 9-Sep | 1600 F | Depart Suva Fiji | -18.14139 | 178.44167 |
| 9-Sep | 0514 | 0-Sep | 1714 F | Performed XBT at 1000m depth. Start logging EM122 bathy and magnetics data. | -18.28000 | 178.46800 |
| 9-Sep | 1638 | 10-Sep | 0438 F 0538 S | Crossed 180° meridian. Bathy file #19. Note bathy fell apart when crossed 180°. Screen display bad. | -19.50000 | 180.00000 |
| 10-Sep | 0145 | 10-Sep | 1445 S | Magnetometer (maggie) turned off. | -20.88486 | -178.16143 |
| 10-Sep | 0201 | 10-Sep | 1501 | Magnetometer recovered MT | -20.91750 | -178.12378 |
| 10-Sep | 0226 | 10-Sep | 1526 | Stopped ship for ROV dunk test. | -20.96650 | -178.06653 |
| 10-Sep | 0250 | 10-Sep | 1550 | Stop logging EM122. | -20.96855 | -178.06437 |
| 10-Sep | 0500 | 10-Sep | 1800 | ROV dunk test cancelled. | -20.96851 | -178.06440 |
| 10-Sep | 0541 | 10-Sep | 1841 | Start logging bathy; subbottom and ADCP. No maggie. | -21.01468 | -178.01022 |
| 10-Sep | 1103 | 11-Sep | 0003 | Ship changing course for bathy survey of feature W of Vai Lili. | -21.72329 | -177.18446 |
| 10-Sep | 1210 | 11-Sep | 0110 | Start survey of feature W of Vai Lili. SOL 61. | -21.93631 | -177.14796 |
| 10-Sep | 1640 | 11-Sep | 0540 | End survey of feature W of Vai Lili. EOL 69. | -22.23127 | -176.87067 |
| 10-Sep | 1749 | 11-Sep | 0649 | XBT fired. | -22.28339 | -176.64782 |
| 10-Sep | 1825 | 11-Sep | 0725 | End EM122 survey over Vai Lili vent field. EOL 73. Heading to dive launch. Stop ADCP. | -22.18143 | -176.60176 |
| 10-Sep | 2020 | 11-Sep | 0920 | ROV deployed for dive Q322 at Vai Lili. | -22.21267 | -176.60988 |
| 11-Sep | 0720 | 11-Sep | 2020 | ROV on deck. End of dive Q322. | -22.21543 | -176.60788 |
| 11-Sep | 0742 | 11-Sep | 2042 | Start EM122 survey (line 74). ~20hr survey to CTD site. Subbottom logging. No maggie. | -22.20884 | -176.60668 |
| 11-Sep | 1829 | 12-Sep | 0729 | XBT #3 | -20.25357 | -175.67034 |
| 11-Sep | 2041 | 12-Sep | 0941 | Deployed gradiometer. | -19.83891 | -175.47029 |
| 11-Sep | 2332 | 12-Sep | 1232 | Magnetometer deployed. Had a leak and had to bring back on board. | -19.31959 | -175.22268 |
| 12-Sep | 0011 | 12-Sep | 1311 | EM122 survey at "First Volcano". SOL 107. | -19.19175 | -175.16410 |
| 12-Sep | 0158 | 12-Sep | 1458 | End EM122 survey at "First Volcano". EOL 110. Stop logging. | -19.12203 | -175.09831 |
| 12-Sep | 0230 | 12-Sep | 1530 | Start V12A-01 (CTD Cast 1) at "First Volcano". Previously unmapped caldera. D | -19.12492 | -175.10867 |
| 12-Sep | 0340 | 12-Sep | 1840 | End V12A-01 | -19.12492 | -175.10867 |
| 12-Sep | 0354 | 12-Sep | 1854 | Start EM122 survey again; heading north. SOL 111. | -19.11460 | -175.10285 |
| 12-Sep | 0604 | 12-Sep | 1904 | Magnetometer deployed | -18.74798 | -174.94030 |
| 12-Sep | 1105 | 13-Sep | 0005 | Magnetometer on deck | -17.86130 | -174.51750 |
| 12-Sep | 1134 | 13-Sep | 0034 | Changing course. Ending EM122 survey. XBT #4. | -17.76100 | -174.51900 |
| 12-Sep | 1303 | 13-Sep | 0203 | Start T12A-01 (CTD Cast 2) Tow Yo at "Second Volcano" - Small seamount south of Fonualei dive site. | -17.79042 | -174.52607 |
| 12-Sep | 1458 | 13-Sep | 0358 | End T12A-01. | -17.77685 | -174.52608 |
| 12-Sep | 1504 | 13-Sep | 0404 | Start EM122 mapping between "Second Volcano" and Fonualei. SOL133 | -17.77633 | -174.52600 |
| 12-Sep | 1700 | 13-Sep | 0600 | EM122 mapping at Fonualei south pre-dive. | -17.56250 | -174.56900 |
| 12-Sep | 1749 | 13-Sep | 0649 | Stop EM122 mapping. EOL 138. | -17.57465 | -174.56768 |
| 12-Sep | 1901 | 13-Sep | 0801 | Stop ADCP logging. | -17.53522 | -174.56700 |
| 12-Sep | 2000 | 13-Sep | 0900 | ROV deployed for dive Q323 at Fonualei South | -17.54483 | -174.58045 |
| 12-Sep | 2028 | 13-Sep | 0928 | ROV back on deck. Dive delayed due to USBL glitch. | -17.54425 | -174.57875 |
| 12-Sep | 2102 | 13-Sep | 1002 | ROV deployed again for dive Q323 at Fonualei South. Did not change dive number. | -17.54410 | -174.57802 |
| 13-Sep | 0803 | 13-Sep | 2103 | ROV on deck. End of dive Q323. | -17.53353 | -174.56645 |
| 13-Sep | 0827 | 13-Sep | 2127 | Magnetometer deployed. ~130 nm to next dive site at Volcano O. | -17.52193 | -174.56378 |
| 13-Sep | 0837 | 13-Sep | 2137 | EM122 mapping from Fonualei to Volcano O. | -17.48900 | -174.55500 |
| 13-Sep | 0857 | 13-Sep | 2157 | Magnetometer all the way out. | -17.42747 | -174.53905 |

| date UTC | time UTC | date local | time local | SRoF'12 (RR1211) Operations Log | latitude | longitude |
|---|---|---|---|---|---|---|
| 13-Sep | 1848 | 14-Sep | 0748 | Magnetometer recovered. | -15.48259 | -174.03138 |
| 13-Sep | 1849 | 14-Sep | 0749 | XBT #5. | -15.48066 | -174.03084 |
| 13-Sep | 1910 | 14-Sep | 0810 | Still logging bathy. SOL 162. Just S of Volcano O southern caldera rim. | -15.41697 | -174.01418 |
| 13-Sep | 1916 | 14-Sep | 0816 | Turned on EM122 water column logging. At the southern edge of Volcano O caldera. | -15.39813 | -174.00935 |
| 13-Sep | 1927 | 14-Sep | 0827 | Stopped ship at ROV dive site. Stop EM122 logging. EOL 162. | -15.37805 | -174.00398 |
| 13-Sep | 2007 | 14-Sep | 0907 | ROV deployed for dive Q324 at Volcano O. | -15.54483 | -174.58045 |
| 14-Sep | 0711 | 14-Sep | 2011 | ROV on deck. End of dive Q324. | -15.37472 | -174.00268 |
| 14-Sep | 0738 | 14-Sep | 2038 | Start V12A-02 (CTD cast 3) at Volcano O over caldera cone. | -15.37582 | -174.00258 |
| 14-Sep | 0858 | 14-Sep | 2158 | End V12A02. | -15.37582 | -174.00258 |
| 14-Sep | 0938 | 14-Sep | 2238 | Magnetometer logging. (Deployed maggie and gravimeter earlier). Performed Volcano O mag survey. Also collected EM122 bathy data. | -15.41266 | -173.95857 |
| 14-Sep | 1741 | 15-Sep | 0641 | Turned on water column data logging (EM122) while over West Mata. | -15.09717 | -173.74756 |
| 14-Sep | 1747 | 15-Sep | 0647 | Water column data logging off. | -15.08362 | -173.75454 |
| 14-Sep | 1753 | 15-Sep | 0653 | Gradiometer off. | -15.07009 | -173.76144 |
| 14-Sep | 1819 | 15-Sep | 0719 | Magnetometer on deck | -15.01403 | -173.79068 |
| 14-Sep | 1921 | 15-Sep | 0821 | ROV deployment for dive Q325 at North Mata Ua. | -15.02294 | -173.78707 |
| 14-Sep | 1931 | 15-Sep | 0831 | ROV back on deck due to ground fault. | -15.02163 | -173.78727 |
| 14-Sep | 2023 | 15-Sep | 0923 | ROV re-deployed for dive Q325 at North Mata Ua. | -15.02468 | -173.78657 |
| 15-Sep | 0720 | 15-Sep | 2020 | ROV on deck. End of dive Q325. | -15.01793 | -173.78810 |
| 15-Sep | 0751 | 15-Sep | 2051 | Start T12A-02 (CTD cast 4) Tow Yo at Volcano O cone. | -15.00660 | -173.81268 |
| 15-Sep | 0800 | 15-Sep | 2100 | Cable on ROV is damaged. Re-terminating. No dive until mid-day Sep 16. | -15.00691 | -173.81225 |
| 15-Sep | 1157 | 16-Sep | 0057 | End T12A-02. | -15.00348 | -173.78120 |
| 15-Sep | 1259 | 16-Sep | 0159 | EM122 multibeam "gap-filling". | -15.11800 | -173.79000 |
| 15-Sep | 1356 | 16-Sep | 0256 | Stop EM122 multibeam. | -15.07074 | -173.70205 |
| 15-Sep | 1446 | 16-Sep | 0346 | Start T12A-03 (CTD cast 5). Tow Yo at West Mata. | -15.09972 | -173.75713 |
| 15-Sep | 1716 | 16-Sep | 0616 | End T12A-03 | -15.08743 | -173.73873 |
| 15-Sep | 1730 | 16-Sep | 0630 | Magnetometer deployed | -15.08768 | -173.73330 |
| 15-Sep | 1757 | 16-Sep | 0657 | Maggie on and recording. Rough seas so bathy during survey is not the best. | -15.09617 | -173.67115 |
| 15-Sep | 1915 | 16-Sep | 0815 | Narrow band deck unit (NB150) indicates a "bit failure". That's the high frequency ADCP. Word is that it has been getting weaker all year… | -15.02396 | -173.77027 |
| 15-Sep | 2145 | 16-Sep | 1045 | Start new EM122 survey after cutting off mag survey SE of W Mata. Heading to the SW; East of the MTJ. | -15.11900 | -173.12000 |
| 15-Sep | 2226 | 16-Sep | 1126 | Stopped logging water column data (wcd). Line 192. | -15.17000 | -173.86000 |
| 16-Sep | 0032 | 16-Sep | 1332 | Magnetometer off. | -15.32333 | -174.27076 |
| 16-Sep | 0102 | 16-Sep | 1402 | Magnetometer on deck MT | -15.36033 | -174.37270 |
| 16-Sep | 0136 | 16-Sep | 1436 | On course- EM122 multibeam. | -15.40580 | -174.48600 |
| 16-Sep | 0341 | 16-Sep | 1641 | Still logging. Change course right after this and data fall apart. | -15.64000 | -174.69000 |
| 16-Sep | 0523 | 16-Sep | 1823 | Multibeam data look so terrible that aborted the survey and are heading to the CTD site nearby. | -15.79509 | -174.69556 |
| 16-Sep | 0621 | 16-Sep | 1921 | Start V12A-03 (CTD cast 6). Vertical cast at Mangatolo flank volcano #1 (small cone E of MTJ). | -15.74500 | -174.63597 |
| 16-Sep | 0720 | 16-Sep | 2020 | End V12A-03. | -15.74500 | -174.63597 |
| 16-Sep | 0915 | 16-Sep | 2215 | Start V12A-04 (CTD cast 7). Vertical cast at Mangatolo flank volcano #2 (with a small caldera). | -15.95415 | -174.71075 |
| 16-Sep | 1033 | 16-Sep | 2333 | End V12A-04. | -15.95415 | -174.71075 |
| 16-Sep | 1142 | 17-Sep | 0042 | Start recording EM122 data again during transit back to dive site at Mata Tolu. | -15.95132 | -174.70307 |
| 16-Sep | 1842 | 17-Sep | 0742 | End EM122 survey near summit of Mata Tolu. | -15.00862 | -173.80635 |

| date UTC | time UTC | date local | time local | SRoF'12 (RR1211) Operations Log | latitude | longitude |
|---|---|---|---|---|---|---|
| 16-Sep | 1847 | 17-Sep | 0747 | XBT #7 | -15.00400 | -173.80256 |
| 16-Sep | 2121 | 17-Sep | 1021 | Sitting on station waiting to decide if we will dive. | -15.00569 | -173.79358 |
| 16-Sep | 2306 | 17-Sep | 1206 | ROV deployed/recovered at Mata Tolu. Dive cancelled. Telemetry problems. | -15.00493 | -173.79553 |
| 17-Sep | 0002 | 17-Sep | 1302 | Heading to mooring recovery site just SE of West Mata. | -15.05471 | -173.77415 |
| 17-Sep | 0056 | 17-Sep | 1356 | Stopped on station for mooring recovery. Mooring info: Mooring #4 Mata; Z=2575; "Jan 29 2010" (probably when it was made). | -15.11667 | -173.73333 |
| 17-Sep | 0130 | 17-Sep | 1430 | Mooring released and heading to the surface | -15.11667 | -173.73333 |
| 17-Sep | 0206 | 17-Sep | 1506 | Mooring Buoy on deck. | -15.14082 | -173.74397 |
| 17-Sep | 0456 | 17-Sep | 1756 | Mooring on deck. | -15.14267 | -173.72570 |
| 17-Sep | 0615 | 17-Sep | 1915 | Start V12A-05 (CTD cast 8). Vertical cast at the mooring site SE of West Mata volcano. | -15.14130 | -173.73907 |
| 17-Sep | 0823 | 17-Sep | 2123 | End V12A-05. | -15.14130 | -173.73907 |
| 17-Sep | 0955 | 17-Sep | 2255 | Start T12A-04 (CTD cast 9) at West Mata. Tow across the summit from S->N. | -15.09820 | -173.74910 |
| 17-Sep | 1147 | 18-Sep | 0047 | End T12A-04. | -15.08463 | -173.75047 |
| 17-Sep | 1313 | 18-Sep | 0213 | Magnetics and EM122 multibeam survey. 11kts. | -15.09300 | -173.67700 |
| 17-Sep | 1740 | 18-Sep | 0640 | EM122 collecting bad data when going into the seas. | -15.16822 | -173.50015 |
| 17-Sep | 1951 | 18-Sep | 0851 | Magnetometer off; but maintaining course. | -15.19361 | -173.64410 |
| 17-Sep | 2035 | 18-Sep | 0935 | Magnetometer on deck. | -15.16460 | -173.71494 |
| 17-Sep | 2036 | 18-Sep | 0935 | XBT #8 | -15.16443 | -173.71409 |
| 17-Sep | 2053 | 18-Sep | 0953 | Multibeam logging on. | -15.16557 | -173.67505 |
| 17-Sep | 2129 | 18-Sep | 1029 | Logging water column data over Niua South (MB line 246). Lots of sector noise but possibly seeing something on stbd side. | -15.16692 | -173.58323 |
| 17-Sep | 2222 | 18-Sep | 1122 | ROV deployed for dive Q326 at Niua South. | -15.16658 | -173.57547 |
| 18-Sep | 0835 | 18-Sep | 2135 | ROV on deck. Had problems with the ships winch. End of dive Q326. | -15.16425 | -173.57452 |
| 18-Sep | 0901 | 18-Sep | 2201 | Start V12A-06 (CTD cast 10) at Niua South. In depression SE of chimneys seen during dive Q326. | -15.17410 | -173.56538 |
| 18-Sep | 1002 | 18-Sep | 2302 | End V12A-06 | -15.17410 | -173.56538 |
| 18-Sep | 1015 | 18-Sep | 2315 | Transit to Mata Ua for CTD tow. | -15.16935 | -173.57011 |
| 18-Sep | 1209 | 19-Sep | 0109 | Start T12A-05 (CTD cast 11) at Mata Ua. Tow along 2300m contour N of summit. | -15.02483 | -173.74910 |
| 18-Sep | 1538 | 19-Sep | 0438 | End T12A-05. | -15.00668 | -173.77092 |
| 18-Sep | 1956 | 19-Sep | 0856 | ROV deployed for dive Q327 at West Mata volcano. | -15.09627 | -173.75010 |
| 19-Sep | 0841 | 19-Sep | 2141 | ROV on deck. | -15.09497 | -173.75035 |
| | | | | **ROV navigation investigated between dives Q327 and Q328. Quest crew removed covers from the transducer in the ship well; and the nav improved!** | | |
| 19-Sep | 0935 | 19-Sep | 2235 | Start T12A-06 (CTD cast 12) at East Mata. | -15.09873 | -173.68140 |
| 19-Sep | 1130 | 20-Sep | 0030 | End T12A-06. | -15.10480 | -173.67057 |
| 19-Sep | 1221 | 20-Sep | 0121 | Start V12A-07 (CTD cast 13) at the SE base of West Mata (at the base of slide area). | -15.10222 | -173.72635 |
| 19-Sep | 1304 | 20-Sep | 0204 | End V12A-07. | -15.10222 | -173.72635 |
| 19-Sep | 1518 | 20-Sep | 0418 | Start T12A-07 (CTD cast 14) at Mata Ono - through the gap in the summit. | -14.94353 | -173.80028 |
| 19-Sep | 1821 | 20-Sep | 0721 | End T12A-07. | -14.92968 | -173.78652 |
| 19-Sep | 1943 | 20-Sep | 0843 | Applying XBT #10 to EM122 data. | -14.99427 | -173.78825 |
| 19-Sep | 2152 | 20-Sep | 1052 | ROV deployed for dive Q328 at Mata Ua. | -15.01598 | -173.78848 |
| 20-Sep | 0755 | 20-Sep | 2055 | ROV on deck. | -15.01717 | -173.78830 |
| 20-Sep | 0856 | 20-Sep | 2156 | Start T12A-08 (CTD cast 15) at Mata Ono - along ~2625 contour S of summit. | -14.94372 | -173.79737 |
| 20-Sep | 1229 | 21-Sep | 0129 | End T12A-08. | -14.92410 | -173.77072 |
| 20-Sep | 1422 | 21-Sep | 0322 | Start V12A-08 (CTD cast 16) at first target north of Niua. | -14.91395 | -173.50513 |

| date UTC | time UTC | date local | time local | SRoF'12 (RR1211) Operations Log | latitude | longitude |
|---|---|---|---|---|---|---|
| 20-Sep | 1550 | 21-Sep | 0450 | End V12A-08. | -14.91395 | -173.50513 |
| 20-Sep | 1930 | 21-Sep | 0830 | ROV deployed for dive Q329 at Mata Fitu. | -14.91610 | -173.77892 |
| 21-Sep | 0813 | 21-Sep | 2113 | ROV on deck. | -14.91388 | -173.78002 |
| 21-Sep | 0843 | 21-Sep | 2143 | Start T12A-09 (CTD cast 17) at Mata Fitu - through 'split' area W of chimneys seen during dive. | -14.92275 | -173.80548 |
| 21-Sep | 1236 | 22-Sep | 0136 | End T12A-09. | -14.90080 | -173.76770 |
| 21-Sep | 1347 | 22-Sep | 0247 | EM122 survey over West Mata. SOL 266. N of W Mata -> E of summit; over summit; W of summit. | -15.03580 | -173.71462 |
| 21-Sep | 1455 | 22-Sep | 0355 | End of W Mata survey. | -15.11543 | -173.78162 |
| 21-Sep | 1630 | 22-Sep | 0530 | Start T12A-10 (CTD cast 18) at the north end of Niua. | -15.08623 | -173.55473 |
| 21-Sep | 1830 | 22-Sep | 0730 | End T12A-10. | -15.06577 | -173.56028 |
| 21-Sep | 1916 | 22-Sep | 0816 | ROV deployed and recovered. | -15.08150 | -173.55523 |
| 21-Sep | 1949 | 22-Sep | 0849 | ROV deployed for dive Q330 at Niua North. | -15.08132 | -173.55485 |
| 22-Sep | 0646 | 22-Sep | 1946 | ROV on deck. | -15.08120 | -173.55443 |
| 22-Sep | 0724 | 22-Sep | 2024 | EM122 survey. SOL 270. North of Niua. | -15.00915 | -173.54127 |
| 22-Sep | 0759 | 22-Sep | 2059 | EM122 end of survey. EOL 271 | -14.92395 | -173.52503 |
| 22-Sep | 0808 | 22-Sep | 2108 | Start V12A-09 (CTD cast 19) at second target N of Niua. | -14.92425 | -173.52507 |
| 22-Sep | 0947 | 22-Sep | 2247 | End V12A-09. | -14.92425 | -173.52507 |
| 22-Sep | 0950 | 22-Sep | 2250 | No multibeam survey on transit out to trench site. | -14.92447 | -173.52500 |
| 22-Sep | 1118 | 23-Sep | 0018 | Start V12A-10 (CTD cast 20). Cast for Lupton in the Tonga Trench. | -14.74450 | -173.39613 |
| 22-Sep | 1327 | 23-Sep | 0227 | End V12A-10. | -14.74450 | -173.39613 |
| 22-Sep | 1347 | 23-Sep | 0247 | EM122 survey from trench site to Mata Tolu. SOL 272. | -14.76005 | -173.42042 |
| 22-Sep | 1833 | 23-Sep | 0733 | End EM122 logging. Sitting near dive site. | -15.00523 | -173.79330 |
| 22-Sep | 1949 | 23-Sep | 0849 | ROV deployed for dive Q331 at Mata Tolu. | -15.00578 | -173.79363 |
| 23-Sep | 0729 | 23-Sep | 2029 | ROV on deck. | -15.00545 | -173.79332 |
| 23-Sep | 0807 | 23-Sep | 2107 | Start logging EM122 bathy between Mata Tolu and CTD cast in basin W of W Mata. | -15.04060 | -173.85380 |
| 23-Sep | 0820 | 23-Sep | 2120 | Start V12A-11 (CTD cast 21) at the basin west of W Mata. | -15.04232 | -173.85423 |
| 23-Sep | 0826 | 23-Sep | 2126 | Stopped logging EM122. | -15.04235 | -173.85430 |
| 23-Sep | 1044 | 23-Sep | 2344 | End V12A-11. | -15.04232 | -173.85423 |
| 23-Sep | 1202 | 24-Sep | 0102 | Start V12A-12 (CTD cast 22) SW of W Mata. | -15.16667 | -173.85450 |
| 23-Sep | 1345 | 24-Sep | 0245 | End V12A-12. | -15.16667 | -173.85450 |
| 23-Sep | 1508 | 24-Sep | 0408 | Start V12A-13 (CTD cast 23) S of E Mata. | -15.19008 | -173.66920 |
| 23-Sep | 1653 | 24-Sep | 0553 | End V12A-13. | -15.19008 | -173.66920 |
| 23-Sep | 1815 | 24-Sep | 0715 | Applied V12A-13 cast to EM122 for SVP. | -15.09391 | -173.75172 |
| 23-Sep | 1908 | 24-Sep | 0808 | ROV deployed for dive Q332 at West Mata. | -15.09397 | -173.75097 |
| 24-Sep | 0619 | 24-Sep | 1919 | ROV on deck. | -15.09255 | -173.74782 |
| 24-Sep | 0638 | 24-Sep | 1938 | Magnetometer deployed. | -15.12525 | -173.76948 |
| 24-Sep | 1519 | 25-Sep | 0419 | Magnetometer on deck. | -15.13647 | -173.55893 |
| 24-Sep | 1547 | 25-Sep | 0547 | Stop logging EM122. | -15.16320 | -173.57433 |
| 24-Sep | 1811 | 25-Sep | 0711 | ROV deployed for dive Q333 at Niua South. | -15.16653 | -173.57577 |
| 25-Sep | 0300 | 25-Sep | 1600 | ROV on deck. | -15.16293 | -173.57718 |
| 25-Sep | 0315 | 25-Sep | 1615 | Start logging EM122 multibeam during transit to Samoa. SOL 306. | -15.12695 | -173.56450 |
| 25-Sep | 1418 | 26-Sep | 0318 | End logging EM122 data. EOL 328. | -13.89004 | -172.25065 |
| 25-Sep | 1900 | 26-Sep | 0800 | Arrived in Apia Samoa. | -13.83333 | -171.73333 |

# 2.0 SRoF'12 (RR1211) Expedition Participants

## SCIENCE PARTY

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| AFFILIATIONS | abbrev. |
|---|---|
| Australian National University, Canberra, Australia | ANU |
| GNS Science, Lower Hutt, New Zealand | GNS |
| Center for Marine Environmental Sciences, University of Breman, Breman, Germany | MARUM |
| Nautilus Minerals, Inc., Australia | Nautilus |
| National Oceanographic and Atmospheric Administration, Office of Ocean Exploration and Research, Charleston, SC, USA | NOAA OE |
| National Oceanographic and Atmospheric Administration, Pacific Marine Environmental Laboratory, Newport OR, and Seattle WA, USA | NOAA PMEL |
| Oregon Health and Science University, Environmental & Biomolecular Systems, Beaverton, OR, USA | OHSU |
| Oregon State University, Hatfield Marine Science Center, Newport, OR, and Corvallis, OR, USA | OSU |
| University of Hawaii, Honolulu, HI, USA | UH |
| University of Washington, Seattle, WA, USA | UW |
| Woods Hole Oceanographic Institution, Woods Hole, MA, USA | Woods Hole |

The science party before disembarking at Apia, Samoa.

# 3.0 *Quest 4000* ROV Operations - SRoF'12 (RR1211)

## 3.1 Remotely Operated Vehicle (ROV) MARUM *QUEST 4000* m

(ROV team: Volker Ratmeyer, Hauke Büttner, Greg Engemann, Phillip Franke, Daniel Hüttich, Ralf Rehage, Christian Reuter, Gerold Wefer, Marcel Zarrouk)

The deepwater ROV (remotely operated vehicle) *QUEST 4000* m used during expedition RR1211 aboard RV *Roger Revelle*, is owned and operated by MARUM, Center for Marine Environmental Sciences at the University of Bremen, Germany. The *QUEST* ROV is based on a commercially available 4000 m rated deepwater robotic vehicle designed and built by Schilling Robotics, Davis CA, USA. Since its installation at Marum in May 2003, it was designed as a truly mobile system especially adapted to meet the requirements of scientific work aboard marine research vessels for worldwide operation. Including this cruise, *QUEST* has a total record of 333 dives on 29 scientific expeditions.

During RR1211, *QUEST* performed a total of 12 dives to maximum water depths of 2643 m. *QUEST* was operated by a team of 9 pilots/technicians on a 12 hour basis during daytime. Detailed data for the individual dives are listed within the dedicated scientific chapters of this report. The ROV crew carried out regular maintenance on a daily basis. A turn-over time of 12 hrs could usually be maintained during the entire cruise.

**Fig 3.1-1**. ROV *QUEST* on the main deck of RV *Roger Revelle*. The A-Frame is equipped with the umbilical block (left), main lift block (middle), the Launch and Recovery System (yellow) and custom built mounting adapters (brown parts). Image courtesy of Sean Diaz, SDProPho.

Dive operations included geological, high-temperature fluid, microbiology and biologic specimen sampling, a variety of in-situ measurements, different instrument and experiment deployments, and high quality digital video and still photo documentation. Close cooperation between the ROV team and ship's crew on deck and the bridge allowed smooth and professional handling during mobilization and each deployment and recovery. During the dives this cooperation allowed precise positioning and navigation of both the ship and the ROV, which in turn was essential for accurate sampling, instrument deployment and cable management with an additional umbilical beacon at depth.

The vehicle performed well during the entire cruise. It was the first time the *QUEST* system was operated from a US vessel and in cooperation with NOAA and all other participating US science institutions. The preparation of this cruise included a long list of work tasks for all involved parties, including NOAA, SIO and MARUM. Preparation tasks ranged from overall evaluation of capabilities of the vehicle for the entire mission, over several dedicated ROV-to-ship adaptations to special scientific instrument interfacing on the ROV. The two major achievements of the technical cooperation were the newly constructed LARS adapter to handle the *QUEST* launch and recovery with the RV *Roger Revelle's* A-Frame (built by SIO), and the development of safe launch and recovery procedures from the vessel's stern together with the ship's crew. *QUEST* host power was provided by a separate 350kW 400VAC diesel power generator, which was installed and continuously maintained by the ships engineers, providing stable electricity for the complete system without any failure during the entire cruise.

An additional challenge was the planning, setup and continuous operation of the *QUEST* dataflow into the ships main lab, to serve a large scientific crew with all possible images and data during the dives, as well as the realtime HDTV video and audio transmission over satellite onto NOAA's Ocean Explorer internet site. The latter had not been setup by the QUEST group, but had to be carefully prepared prior to the cruise and implemented with special adaptations between satellite video transmission system and the *QUEST* control van video routing. Close and precise communication between the scientists in the main lab and the *QUEST* control van was maintained during the entire cruise and was the basis for an effective and successful operation.


**Fig. 3.1-2**. Multiple underwater cameras and the HDTV display in the ship's main lab provided an effective workspace for the scientists participating in the dives*. Image courtesy of Sean Diaz, SDProPho.*

For underwater vehicle positioning, an IXSEA GAPS USBL (ultra short baseline) system was adapted to the vessel, using a dedicated deployment boom and special adapter device inside the aft hangar. Vessel and ROV GPS data were continuously provided within the transmitted data stream.

***QUEST System description***

The total QUEST system weighs around 45 tons (including the vehicle, control van, workshop van, electric winch, 5000 m umbilical, and transportation vans) and can be transported in four standard ISO 20 foot vans. A MacArtney Cormac electric driven storage winch is used to manage up to 5000 m of 17.6 mm umbilical cable manufactured by the German company Norddeutsche Seekabelwerke, (NSW). The *QUEST* ROV vehicle is based on a commercial electric workclass ROV built by Schilling Robotics in 2003. The containerized 20 foot controlvan was built at MARUM and contains all power conditioning, control, display, recording and routing hardware. It provides space for 2 pilots and 2-3 scientists. Here, the underwater imagery is projected onto a large screen as a tiled view composed of seven individual underwater cameras. All data and video are streamed in realtime into the ships main lab. Finally, the system includes a dedicated spare part and workshop van. Everything was fitted onto the vessel without major changes to the vessel or the ROV.

***QUEST internal equipment and online tooling***

The space inside the QUEST 5 toolskid frame allows installation of mission-specific marine science tools and sensors. The vehicle setup includes two manipulators (7-function and 5-function), 7 color video cameras, a digital still camera (Insite SCORPIO, 3.3 Mega-Pixel), a light suite (with various high-intensity discharge lights, HMI lights, lasers, and low-power dimmable incandescent lights), a Sea&Sun online CTD, a tool skid with 2

drawers and an acoustic beacon finder. Total lighting power is almost 3 kW, total additional auxiliary power capacity is 8 kW. In addition, the permanently installed Kongsberg 675kHz Type 1071 forward looking scanning sonar head provides acoustic information of bottom morphology and is also used for detection of gas emissions.

***Video Setup, HDTV and vertical imaging***

Continuous PAL SD video footage was obtained with two color-zoom cameras (Insite PEGASUS or DSPL Seacam 6500). In order to gain a fast overview of the dive without the need of watching hours of video, video is frame-grabbed and digitized at 5sec intervals, covering both PAL and HD video material. For extremely detailed video close up filming, a near-bottom mounted broadcast quality (>1000 TVL) 3CCD HDTV 14 x Zoom video camera was used (Insite Zeus). Spatial Resolution of this camera is 2.2 Mega-Pixel at 59.94 Hz interlaced. Recording was carried out on demand onto tapes in broadcast-standard digital Sony HDCAM format, using uncompressed 1.5 Gbit HD-SDI transmission over a dedicated fibre-optic connection. All video feeds were continuously recorded digitally based on H.264 compression, including HDTV, and transferred as files to the ships science server between dives.

As a standard photo camera, an Insite Scorpio Digital Still camera was used, providing 3.3. Mega-Pixel spatial image resolution and highly corrected underwater optics.

Video distribution was provided by dedicated CAT-6 based VGA transmission hardware, as well as by streaming the main tiled video image into the vessels network.

***Scientific payload integration***

The toolskid-section of the ROV *QUEST* had to be re-organized in terms of scientific payload adaptation. It turned out that the sum of payload requested for this project exceeded previous operations due to the need of different and multiple sampling systems and high sample storage capacities at the same time. In addition, the request for hydraulic sample triggering was a new task for MARUM, although already established by WHOI aboard ROV *JASON*. To overcome the extended payload request, a new setup scheme was developed and defined prior to the cruise, and could be used successfully during all dives to host most of the requested scientific installations.

**Fig. 3.1-3.** (upper) ROV *QUEST* scientific tooling area at the vehicle's front, providing installation and sampling space for a variety of instruments. (lower) Vehicle's lower rear toolskid hosted the rotary suction sampler used for biological sampling. *Image (lower) courtesy of Sean Diaz, SDProPho.*

During RR1211, the following scientific equipment was handled with MARUM *QUEST*:

*ROV based tools, installed on vehicle:*

- ROV interchangeable drawer sample basket with bio-box
- starboard side extended geological sample basket with compartments
- rotary suction sampler (8 samples per dive)
- bio-containers for shrimp and fish sampling
- Sea and Sun CTD realtime probe with turbidity sensor
- Autonomous and cabled realtime high temperature loggers on frame and T-lance
- Microbial ("Tebo-") samplers (2-3 per dedicated dives)
- small triggered "McPhail" sediment samplers
- Hydraulic actuated gastight titanium fluid samplers (3 per dive)
- Hydraulic actuated gas samplers (3 per dive)
- "Hand"-Nets for mussel sampling
- diverse shovels for mussel and shrimp sampling
- acoustic beacon markers
- Simple site markers
- autonomous hydrophone device (used during one dive)

In addition, a volcanic belch sampler was adapted, but could not be used during a dive due to lack of active volcanic eruptions. A microbial pump was installed towards the end of the cruise, but unfortunately could not be run successfully due to a technical interfacing issue with the ROV.

***NOTE: Laser spacing 20 cm (sm).***

***Acknowledgements***

The QUEST team is deeply grateful to the chief scientist Joe Resing for organizing all necessary conversations, and the professional coordination of the various instates, and to Dan Simon for the support and initiating the communications with NOAA. We thank the SIO STS group and research technicians for the close cooperation in planning and building the adaptation hardware and the professional support and cooperation at sea. In addition, the QUEST team gratefully acknowledges the support by the WHOI ROV team and deep submergence lab group for discussions and information and for providing some of the hardware to test the hydraulic sample trigger setup prior to the cruise. We thank all participating scientists for their very disciplined and professional cooperation at sea and for their trust of the foreign ROV team and partly new operations during their important scientific project. Finally, we want to express our special thanks to Capt. Wes Hill and the entire ships crew for the kind welcome, the steady and professional support and the efficient teamwork during this exciting expedition aboard RV *Roger Revelle*.

### 3.1.1 The New MARUM Deep-Sea High Temperature Probe

Tomas Feseker, Bernd Heesemann, and Norbert Kaul

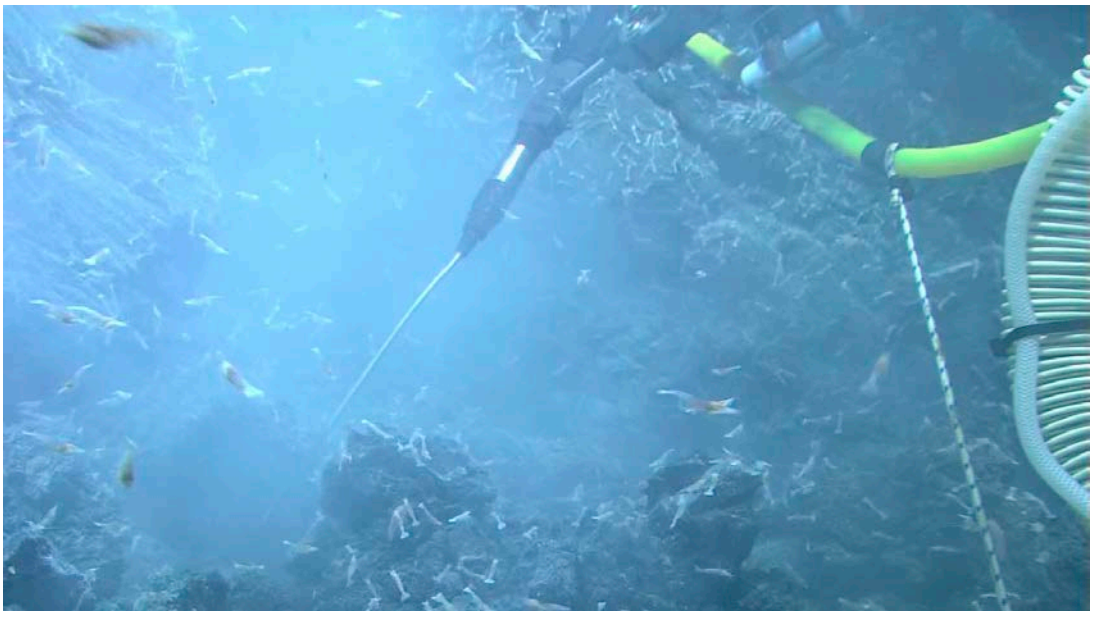


**Fig. 3.1.1-1**. Temperature probe in milky 10°C flow at Shrimp Plethora site during dive Q327 at West Mata.

Water temperature measurements provide important information about the activity of hydrothermal vents. The new MARUM deep-sea high temperature probe was designed to deliver precise temperature measurements over a range of -5 to +600 °C at depths of up to 6,000 m. The probe (image above) consists of a cylindrical housing that contains the electronics and a 0.475 m-long tube made from stainless steel with the high temperature sensor at its tip. The accuracy of the sensor is ±0.1°C at 0°C and ±0.27°C at 100°C with a resolution of around 0.01°C. The sensor tube has a diameter of 8 mm and can be bent into a curved shape in order to facilitate measurements inside individual vents without exposing the electronics to extreme temperatures. The operating temperature of the electronics is monitored by an internal sensor and should not exceed 70 °C.
The MARUM deep-sea high temperature probe is equipped with an internal data logger that has a storage capacity of 522,240 samples, which corresponds to 6 days at a sampling interval of 1 second or 362 days at a sampling interval of 1 minute. For ROV-controlled measurements, the recorded data can be mirrored to an underwater RS232-port in order to transmit the temperature readings to the surface vessel in real time. For long-term monitoring of vent sites, the probe can be operated in a fully autonomous mode for up to several years, depending on the sampling rate and battery capacity. The key properties of the new instrument are summarized in table 3.1.1-1.

**Table 3.1.1-1 Properties of the new MARUM deep-sea high temperature probe**

| | |
|---|---|
| Measuring range | -5 to 600 °C |
| Operating temperature | -30 to 70 °C |
| Accuracy | ±0.1 °C at 0 °C, ±0.27 °C at 100 °C |
| Resolution | 0.01 °C |
| Depth rating | 6,000 m |
| Length overall | 0.85 mm |
| Diameter of the tip | 8 mm |
| Weight | 3 kg (air) / 2.5 kg (water) |
| Sampling rate | 1 s to 10 h |
| Storage capacity | 522,240 samples |

## 3.2 *Quest 4000* Seafloor Video and Imagery

Bill Chadwick

The Quest 4000 ROV team provided the science party with imagery from the following cameras on the vehicle: still images from a digital still camera (DSC), video files from 3 video cameras (1 HD, 2 SD) and frame grab images sampled from the video every 5 seconds, plus video files of the "pilot's view" of all the vehicle cameras tiled together. All of the above cameras were on pan-and-tilt mechanisms, except the HD camera, which could only tilt slightly and generally required the ROV to reposition to frame subjects. The DSC was on the same pan-and-tilt as the lower SD video camera. In the data files provided by the ROV team, the cameras are named as follows:
… under "digital_photos":

1) digstill_pantilt_lwr – these are DSC images with the MARUM logo

2) scorpio_original – the same DSC images without the MARUM logo

… and under "digital_videos":

1) cam_pantilt_lwr – for lower pan-and-tilt standard-definition video camera

2) cam_pantilt_upr – for upper pan-and-tilt standard-definition video camera

3) cam_zeus_toolskid_front – for the HD video camera (zeus is the brand name)

4) pilotscreen – for the tiled view of all the cameras that was displayed in the lab & van

In total, there were 845 DSC images collected, totaling 922 Mb, and 1.1 Tb of HD video files and HD framegrabs collected during the 12 ROV dives. All the video files and automatic framegrabs have filenames that include the cruise ID, dive number, camera name, date, and time. New video files were created every 30 minutes, and the corresponding framegrabs are in folders named "flipbook" that contain files of zipped jpg images every 5 seconds over the same 30 minute periods. The DSC images are jpg files named sequentially (DSCN1764-DSCN2645), and do not have the date and time in the filenames. Instead, the DSC files have the date & time in the header of the jpg file. The header can be accessed on a Windows PC by right clicking on the jpg file and choosing "properties". The date & time info is displayed under one of the tabs. On a Mac computer in Preview, the Inspector window includes the acquisition time in one of the tabs. Alternatively, each DSC filename is also listed when the image was taken in the Quest dive logs under the column heading "Still camera comment".

Operation of the DSC camera required one of the pilots to operate the controls. Likewise, operation of the HD video camera (focus, zoom, in/out movement, or tilt functions) required attention from one of the pilots. This was limiting because the pilots also had many other tasks that they were busy with, and imagery often had to take a back seat to other tasks. For example, while the pilots were attempting to sample with the manipulator arm, they were both fully occupied, so it was generally not possible to take DSC images or adjust the HD camera settings during those times.

The 30-minute-long HD video files provided by the ROV team are MPEG-4 files using the H.264 codec with data rates of 20 Mbit/s and are 4.5 Gb in size. The HD video files include some dive data (dive number, date/time, heading, etc) in a subtitle track that can be viewed using VLC media player software (Video > Subtitles track). In addition, as part of our collaboration with NOAA Ocean Exploration Program, audio was added to the Quest video stream (MARUM usually supplies video without audio), for both the realtime transmission to shore and for recording of the video to hard disk. However, the way this was done at sea led to some difficulties in editing the cruise video files on Apple/Mac computers. The audio was added as an MPEG-1 layer, which is a non-standard combination with MPEG-4 video, so they could not be opened on some Mac computers. The following partial solutions were found:

1) The original Quest video files can be opened with the newest Mac computers running OS 10.8, but the audio and subtitle tracks are dropped if opened in Quicktime 10.2. However, the audio is retained if the files are opened in Final Cut Pro.

2) The original Quest video files generally cannot be opened with Quicktime 10.0 on Mac computers running OS 10.6. However, a solution for these computers was found that involves downloading the free software SmartConverter from the Apple Mac Store. It can quickly convert the audio tracks in the Quest ROV video files to AAC format, which allows Quicktime 10.0 to open and edit them. However, the subtitle track is dropped in this process.

Solution 1 (above) was used to make a set of 54 short video clips (<1 min each) from the Quest ROV dives. Two versions of each video clip were created - one in HD resolution (*.mov; H.264; 1920 x 1080; ~15 Mbit/s; 2.3 Gb total) and a smaller version (*.m4v; H.264; 640 x 360; 2.5 Mbit/s; 398 Mb total). The video clips will be available on the NOAA Ocean Exploration web site: oceanexplorer.noaa.gov/explorations/12fire/. A note about acceptable use and proper credit:

1) Any uses of the cruise video for science uses (presentations at meetings or in publications) or education and outreach (public talks) are OK. However, they should not be posted on-line without proper credit, which should include "NOAA, NSF, and MARUM."

2) Any commercial uses are not allowed without first consulting with MARUM for proper licensing.

## 3.3 *Quest 4000* Dive Statistics

| Dive | *latitude ship* | *longitude ship* | *time (in water) UTC* | *time (on bottom) UTC* | *time (off bottom) UTC* | *time (on deck) UTC* | max Z | btm time | *wet time* |
|---|---|---|---|---|---|---|---|---|---|
| | | | **Samoan local time is 13 hours ahead of UTC** | | | | | | |
| Q322 Vai Lili | -22.21267 | -176.60988 | 9/10/2012 20:20 | 9/10/2012 22:08 | 9/11/2012 5:52 | 9/11/2012 7:20 | 1746 | 7:44 | 9:00 |
| Q323 Fonualei | -17.54390 | -174.57787 | 9/12/2012 21:00 | 9/12/2012 21:52 | 9/13/2012 6:26 | 9/13/2012 8:03 | 1588 | 8:34 | 11:03 |
| Q324 Volcano O | -15.37433 | -174.00343 | 9/13/2012 20:06 | 9/13/2012 21:13 | 9/14/2012 5:59 | 9/14/2012 7:11 | 1307 | 8:45 | 11:05 |
| Q325 Mata Ua | -15.02535 | -173.78645 | 9/14/2012 20:23 | 9/14/2012 22:05 | 9/15/2012 5:14 | 9/15/2102 7:20 | 2323 | 7:09 | 10:57 |
| Q326 Niua S. | -15.16658 | -173.57547 | 9/17/2012 22:22 | 9/17/2012 23:23 | 9/18/2012 6:44 | 9/18/2012 8:35 | 1183 | 7:21 | 10:13 |
| Q327 W. Mata | -15.09627 | -173.75010 | 9/18/2012 19:45 | 9/18/2012 21:22 | 9/19/2012 7:26 | 9/19/2012 8:41 | 1288 | 10:04 | 12:56 |
| Q328 Mata Ua | -15.01598 | -173.78848 | 9/19/2012 21:52 | 9/19/2012 23:41 | 9/20/2012 5:59 | 9/20/2012 7:55 | 2437 | 6:38 | 10:03 |
| Q329 Mata Fitu | -14.91610 | -173.77892 | 9/20/2012 19:30 | 9/20/2012 21:38 | 9/21/2012 6:04 | 9/21/2012 8:13 | 2657 | 8:26 | 12:43 |
| Q330 Niua N. | -15.08100 | -173.55428 | 9/21/2012 19:50 | 9/21/2012 20:36 | 9/22/2012 6:06 | 9/22/2012 6:46 | 774 | 9:30 | 10:56 |
| Q331 Mata Tolu | -15.00567 | -173.79363 | 9/22/2012 19:49 | 9/22/2012 21:15 | 9/23/2012 6:01 | 9/23/2012 7:29 | 1869 | 8:46 | 11:40 |
| Q332 W. Mata | -15.09383 | -173.75097 | 9/23/2012 19:03 | 9/23/2012 20:14 | 9/24/2012 5:15 | 9/24/2012 6:17 | 1350 | 9:01 | 11:14 |
| Q333 Niua S. | -15.16603 | -173.57594 | 9/24/2012 18:09 | 9/24/2012 19:07 | 9/25/2012 1:53 | 9/25/2012 2:50 | 1170 | 6:46 | 8:41 |
| **TOTAL** | | | | | | | | **98:44** | **130:21** |

## 3.4 *Quest 4000* Dive Summaries

Note: Most summary text was taken directly from the Cruise Summary (Sec. 1.0) and Geology (Sec. 6.1) sections of the report, written by Bob Embley and Ken Rubin.

**Q322: Vai Lili, Valu Fa Ridge**

***Bottom time (UTC):*** 9/10/2012 22:08 – 9/11 05:52. 7hrs 44min.

***Launch target:*** 22°12.846'S. 176°36.478'W. Z=1725m. Vai Lili vent field.

***Main goals:*** Locate and take samples at unique mat site; particularly with Davis samplers.

***Sample Information:*** 8 total. 6 biomat; 1 fluid; 1 gas.

***Summary:*** The first dive had the specific objective of intensive sampling of an Iron-Manganese (Fe-Mn) mat that had been discovered at Vai Lili vent field in 2005. Brad Tebo headed a team from Oregon Health and Sciences University (OHSU) that used specialized (Davis) samplers to collect 6 samples from 4 discreet microbial mat sites.

**Q323: South Fonualei Rift**

***Bottom time (UTC):*** 9/14/2012 22:05 – 9/15 02:08; 04:02 - 05:14; (02:08 – 04:02 transit in water column). 8hrs 34min.

***Launch target:*** 17°32.13S 174°34.00'W. Z=1582m. Summit areas of South Fonualei rift volcano.

***Main goals:*** Locate and take samples from active chimney field. Proceed on and sample as needed.

***Sample Information:*** 12 total. 5 biology (4 biomacro - shrimp and mussels, 1 biosed); 1 fluid; 6 geology (4 sulfide, 2 rock).

***Summary:*** The dive at South Fonualei discovered two sites. The first was a low temperature site characterized by diffusely venting old chimneys near the summit of the central volcano. Also observed in the summit area was microbial mat with 39°C water issuing from youngish lobate lava flows, small hydrothermal chimneys, and a huge bed of largely-dead (don't believe there were any alive) mussel shell debris on a steep slope below the summit. 1.2 km NE of the summit area site a group of very tall (up to 30 m) active high temperature chimneys, dubbed "Laloa Kakai" vent field, were sampled.

**Q324: Motutahi (cone at Niuatahi) Volcano O**

***Bottom time (UTC):*** 9/13 21:13 - 9/14 05:59. 8hrs 45min.

***Launch target:*** 15°22.55'S 174°00.21'W. Z=1326m. W/NW of central cone summit.

***Main goals:*** Explore and sample top of young volcanic cone near center of Niuatahi (Volcano O).

***Sample information:*** 12 total. 2 biology (1 biomacro – shrimp, 1 bio-geo – suction of seafloor); 3 fluid; 2 gas; 5 geo (4 rocks, 1 sed).

***Summary:*** The dive traversed NW to SE over the cone, observed unconsolidated rubble/sediments with mats and polysaccharide sacs ~100m below the summit, loosely consolidated sands and sulfur in drifts at the summit (perhaps associated with vent structures), and smoke and sulfur-rich smoke within the pit at the summit. There was little macrofauna here except for a sparse shrimp colony on the upper flank of the cone, 50+m SE of the cone summit.

***Q325: Mata Ua***
***Bottom time (UTC):*** 9/14/2012 22:05 – 9/15 05:14. 7hrs 9min.
**Launch target:** 15°1.421'S 173°47.222'W. Z=2347m. SW of summit.
***Main goals:*** Explore and sample Mata Ua for hydrothermal systems and rock samples.
***Sample information:*** 4 rock samples.
***Summary:*** The dive searched the southern and western portion of the volcano, but time ran out while surveying the NW flank where biologic indicators hinted at proximity to a large active site. Sampling of the knoll on the southwest flank of the volcano summit determined that is a constructional feature of non-boninite composition. Intact pillow tubes interspersed in sediment and talus chutes from the main summit area were also sampled. A high temperature alteration zone was exposed on the western nose of the volcano. One more sample of fresh lava was taken on the rift zone above this altered domain. The dive ended on the northwest flank of the volcano, just upslope of the high temperature vents discovered on dive Q328.

**Q326: Niua South**
***Bottom time (UTC):*** 9/17/2012 23:23 - 9/18 06:44. 7hrs 21min.
***Launch target:*** 15°10.0057'S 173°34.549'W. Z=1143m. Small pit SW of main feature.
***Main goals:*** Explore and sample Niua southern pit.
***Sample information***: 12 total. 1 biomacro (shrimp); 3 fluid; 3 gas; 5 geo (3 rock, 2 sulfides).
***Summary:*** The dive began in a small pit (50m wide by 50m deep) lying SW of the larger pit at South Niua. The small pit exhibited diffuse venting in a sedimented old volcanic terrain (pumice flows observed/sampled on the walls of the pits). After sampling the small pit the ROV moved to the N/NE to the active larger pit. The southern margin of the large pit floor contains many small extinct chimneys plus an unknown number of active chimneys. A large central mound was observed to have black smokers where the maximum temperature was 315°C. The central active black smoker mound, dubbed “Adelaide”, was explored and sampled.

**Q327: West Mata**
***Bottom time (UTC):*** 9/18 21:22 - 9/19 07. Off bottom transiting 04:59 – 05:35. 10hrs 4min.
***Launch target:*** 15°5.760'S 173°45.031'W. Z=1280m. SW of summit.
***Main goals:*** Explore and sample West Mata volcano.
***Sample information:*** 10 total. 5 biology (3 biomacro – shrimp and scaleworms, 2 biosed – for microbiology); 3 fluid; 2 gas.
***Summary:*** The dive started in the region of Mat Meadow / Luo vent sites SW of the summit. 2 small hydrophones were deployed in the area for the duration of the dive. The ~10 hour record from one of these hydrophones did not record any eruption signals. The ROV next traversed to the formerly active Hades volcanic vent site, where a funnel shaped pit was encountered, as expected from multi-beam bathymetry collected in 2011. The dive confirmed that the pit was up to ~80 m in relief on its SW side Diffuse flow venting was observed near the bottom of this pit, and geological observations were made on the ascent. The dive then followed a ridge over to the former Prometheus volcanic site and observed a rough, steep slope with pinnacle remnants of boninite pillows and spatter sticking up over fresh volcanic sands and fragments. Extensive diffuse flow hydrothermal venting and biological colonization were observed here.

**Q328: Mata Ua**

***Bottom time (UTC):*** 9/19/2012 23:41 – 9/20 05:59. 6hrs 38min.

***Launch target:*** 15°1.008'S 173°47.312'W. Z=2400m. Downslope; NW of summit.

***Main goals:*** Explore and sample the source of hydrothermal venting at North Mata Ua.

***Sample information:*** 15 total. 4 biology (2 biomacro – shrimp, 1 biosed – sediment for microbiology; 1 biogeo – rock with barnacles); 2 fluid; 2 gas; 7 geo (5 rocks, 1 sulfide, 1 geobio – rock with mat).

***Summary:*** Quest discovered an extensive hydrothermal field on the steep NW slope of Mata Ua. Prolific long-necked barnacles and other vent animals colonized the slope and older sulfide chimneys and several black smokers were discovered and sampled at depths of 2397-2356 m. At least two of the smokers appeared to be boiling, although the maximum temperature recorded was ~360° C (boiling at this depth ~380° C). This is the hottest site in the NE Lau to date.

**Q329: Mata Fitu**

***Bottom time (UTC):*** 9/20/2012 21:38 – 9/21 06:04. 8hrs 26 min.

***Launch target:*** 14°54.880'S 173°46.803'W. Z=2649m. Downslope SE of summit.

***Main goals:*** Explore and sample the source of hydrothermal venting at North Mata Fitu.

***Sample information:*** 14 total. 2 biomacro (fish and snails); 3 fluid; 3 gas; 6 geo (3 rocks, 3 sulfides).

***Summary:*** The dive started on the volcano's south slope and south of the WHOI Towcam line (expedition KM1108). Lavas, fluids, and gas were sampled in several places. An unusual ridge of broken lava near the beginning of the dive was interpreted to be an old fault structure. Upslope several lines of smokers were found, two of which were quite active. The deepest (of all the sites discovered on the expedition) and hottest site of the dive was the 16-m high **ChimE**, at 2644m (base) and 331°C, where the 2 macrobiology samples were taken.

**Q330: Niua North**

***Bottom time (UTC):*** 9/21/2012 20:36 – 9/22 06:06. 9hrs 30min.

***Launch target:*** 15°4.879'S 173°33.287'W. Z=765m. Sulfur area, NW Niua.

***Main Goals:*** Explore and sample the source of hydrothermal venting at Niua North.

***Sample information:*** 15 total. 8 biology (6 biomacro – crab, shrimp, tubeworms, mussels; 1 biosed, 1 biogeo); 3 fluid; 2 geo (rocks).

***Summary:*** A small depression just west of the northern Niua summit was the initial target, which turned out to be an intensely venting sulfur pit. Droplets of liquid $CO_2$ were being emitted from the pit. The sulfur pit had a robust biologic community on its periphery at several sites within ~200 meters. Biology included shrimp, solitary tubeworms, mussels, snails and other vent-endemic life. At the end of the dive a small ridge mapped by the AUV was sampled and determined to be an outcrop of massive rhyolite.

**Q331: Mata Tolu**

***Bottom time (UTC):*** 9/22/2012 21:15 – 9/23 06:01. 8hrs 46min.

***Launch target:*** 15°0.338'S 173°47.610'W. Z=1866m. Downslope , south of summit

***Main goals:*** Explore and sample Mata Tolu for hydrothermal systems and rock samples.

***Sample information***: 24 total. 9 biomacro (shrimp, crabs, snails); 4 fluid; 4 gas; 8 geo (5 rocks, 3 sulfides).

***Summary***: The dive started on the upper slopes of the south face, just below the summit platform, due east of a small pit. Upon cresting the plateau there was immediate evidence of warm diffuse flow and multiple extinct chimneys. The summit is a complex mix of tall narrow chimneys, squatter chimney structures and broken up lavas. The dive made several attempts to find and descend the pit structure but navigation was difficult because of all the chimneys. Quest continued far enough west to get out of the chimney terrain, then turned east across the north part of the summit, through a chimney field and out again. The dive then returned to the west and sampled fluids and biology in the main vent field. Biological samples included: shrimp, squat lobsters, Brachyuran crabs, Ifremieria and Alvinochoncha snails, polychaetes and non-stalked barnacles. Rocks and sulfides were sampled throughout the dive.

**Q332: West Mata**

***Bottom time (UTC):*** 9/23 20:14 - 9/24 05:15 UTC. 9hrs 1min.

***Launch target:*** 15°5.630'S 173°45.057'W. Z=1360m. Downslope on north side of summit.

***Main goals:*** Complete sampling and exploration goals at West Mata.

***Sample information:*** 21 total. 11 biology (8 biomacro – shrimp, 2 biosed, 1 biomicro – for RNA); 3 fluid; 2 gas; 5 geo (rocks).

***Summary:*** The first half of the dive was dedicated to geological traverses and observations of the post-eruptive terrain at the summit. We observed the rim of the new Hades pit to be constructed of in-place, undercut, truncated pillow lavas and limited volcanic debris. The ROV descended into the pit to its nadir at 1290m for geological observations. The dive then progressed to the former Prometheus site and onward to the NE along a steep, craggy ridgeline. Quest then headed northeast of the summit to investigate the “headwall” formed during a very recent sector collapse on the volcano, descending rapidly down this steep southern face of the volcano to a rubble slope, which we slowly ascended. Moving upwards we encountered a steep cliff with vertical dikes, a funnel shaped breccia pipe structure, and horizontal lava flows at the top Several lava samples were taken on this part of the dive. The second half of the dive was dedicated to sampling water, sediments and shrimp at sites on the NW face of the summit.

**Q333: Niua South**

Bottom time (UTC): 9/24/2012 19:07 – 9/25 01:53. 6hrs 46min.

**Launch target:** 15°10.001'S 173°34.549'W. Z=1143m. Small pit SW of main Niua South site.

***Main goals:*** Sample microbes at small pit to southwest; then travel to larger depression for exploration and sampling.

***Sample information:*** 17 total. 11 biology (7 biomacro – shrimp, crab, snails; 2 biorock – for Mn coating; 2 biosed for pharmacology); 2 fluid; 1 gas; 3 geo ( 2 sulfide, 1 rock).

***Summary:*** The dive started in the same small pit SW of the larger crater visited on Q326 to sample pumice for the Tebo program. It then went to the main pit again, where in-place rhyolite pumice was sampled from the wall, after which several sulfide mounds(with some active sites) in the south and southeast portions of the crater were visited.

## 3.5 *Quest 4000* Dive Maps

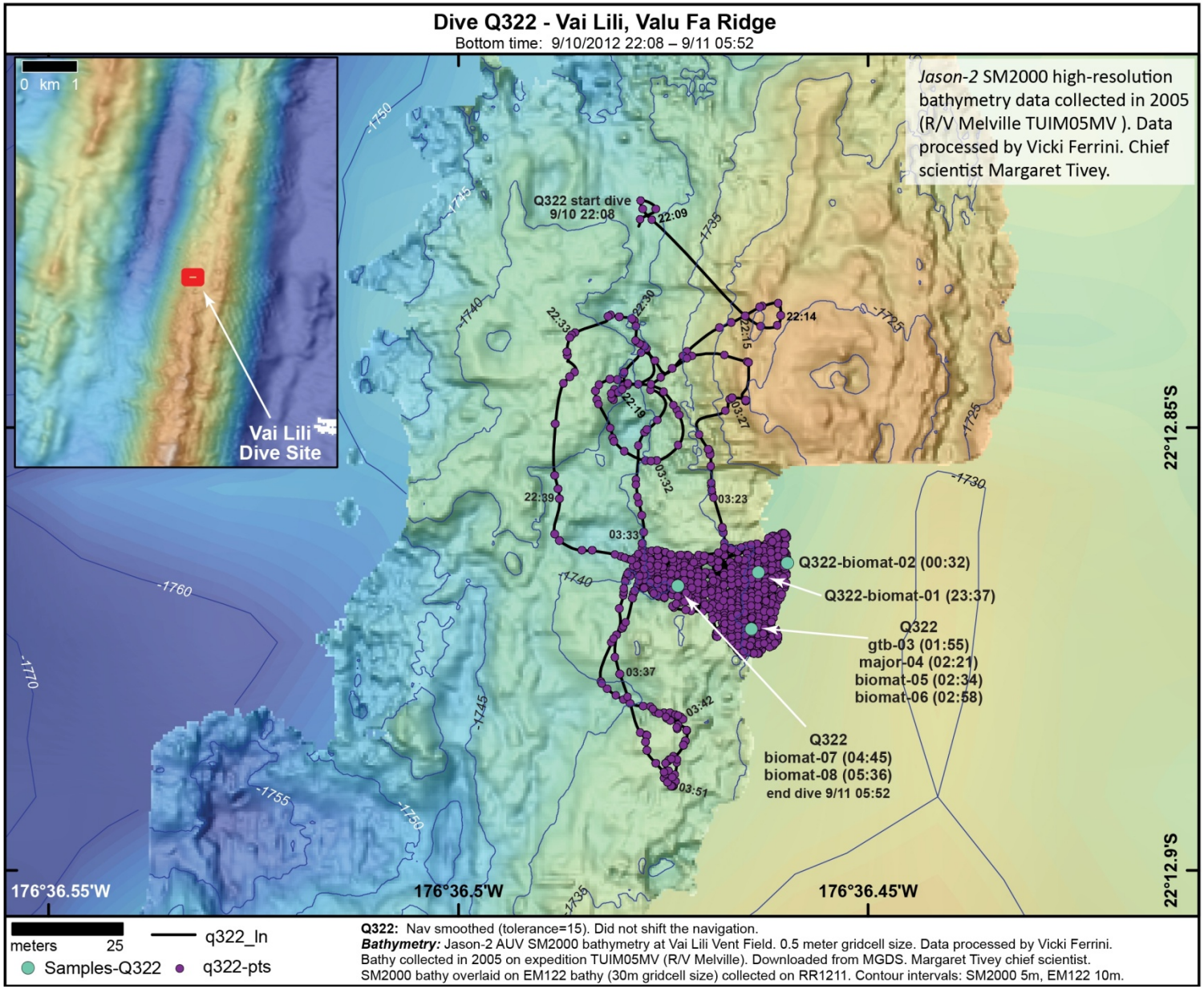



**Fig. 3.5-1.** Dive Q322 – Vai Lili dive map

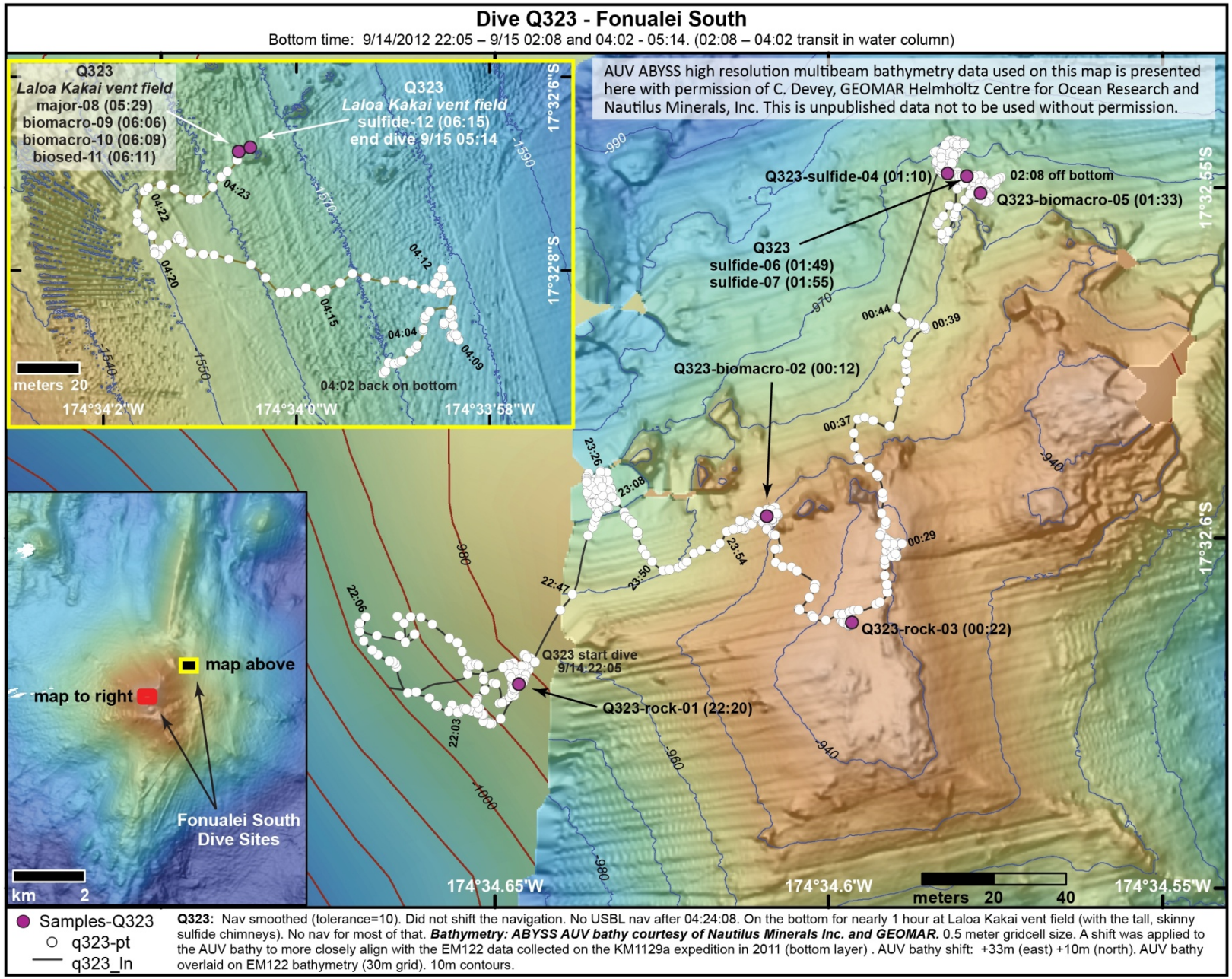



**Fig. 3.5-2.** Dive Q323 – Fonualei South dive map

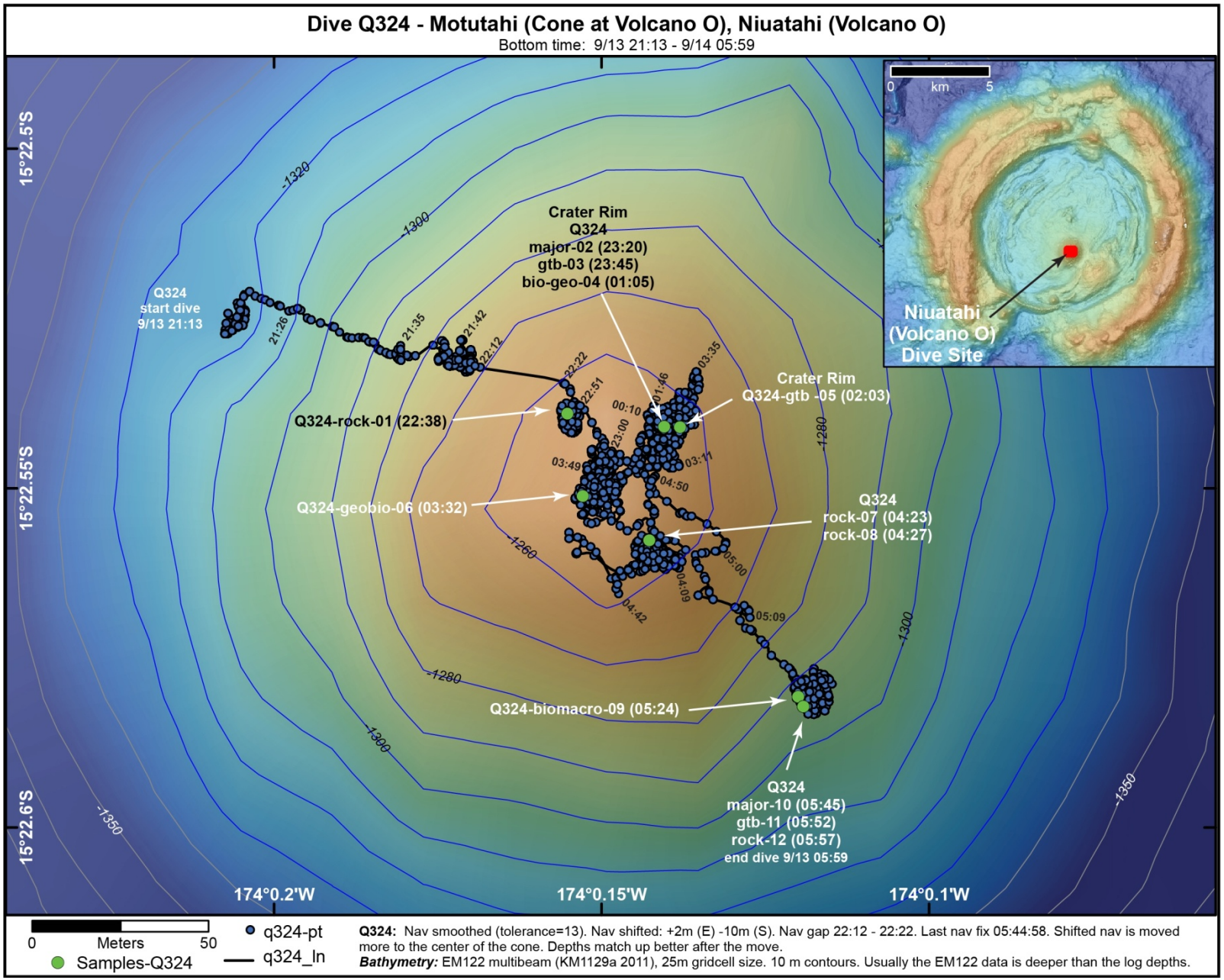



**Fig. 3.5-3.** Dive Q324 – Motutahi dive map

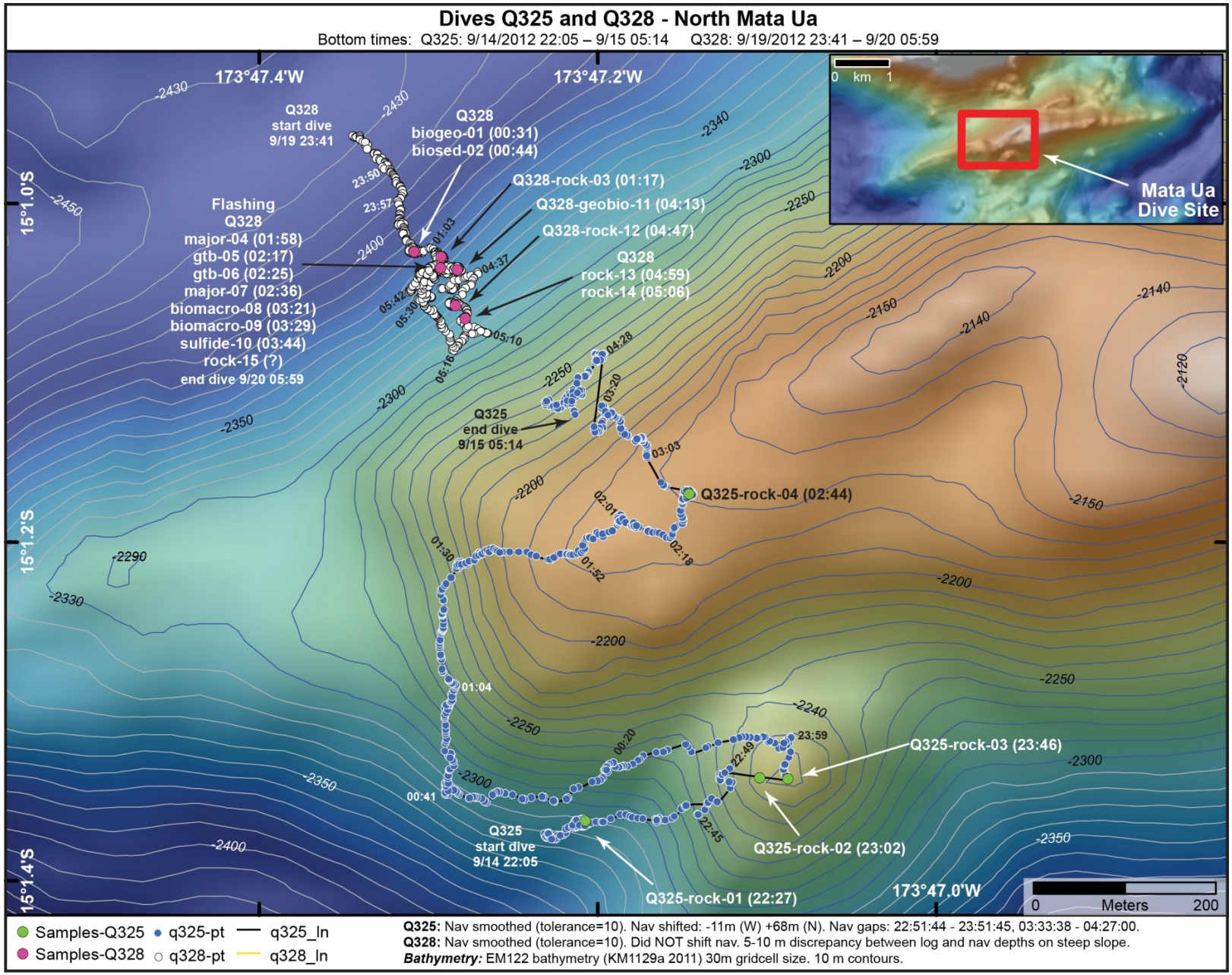



**Fig. 3.5-4.** Dives Q325 and Q328 – North Mata Ua dive map

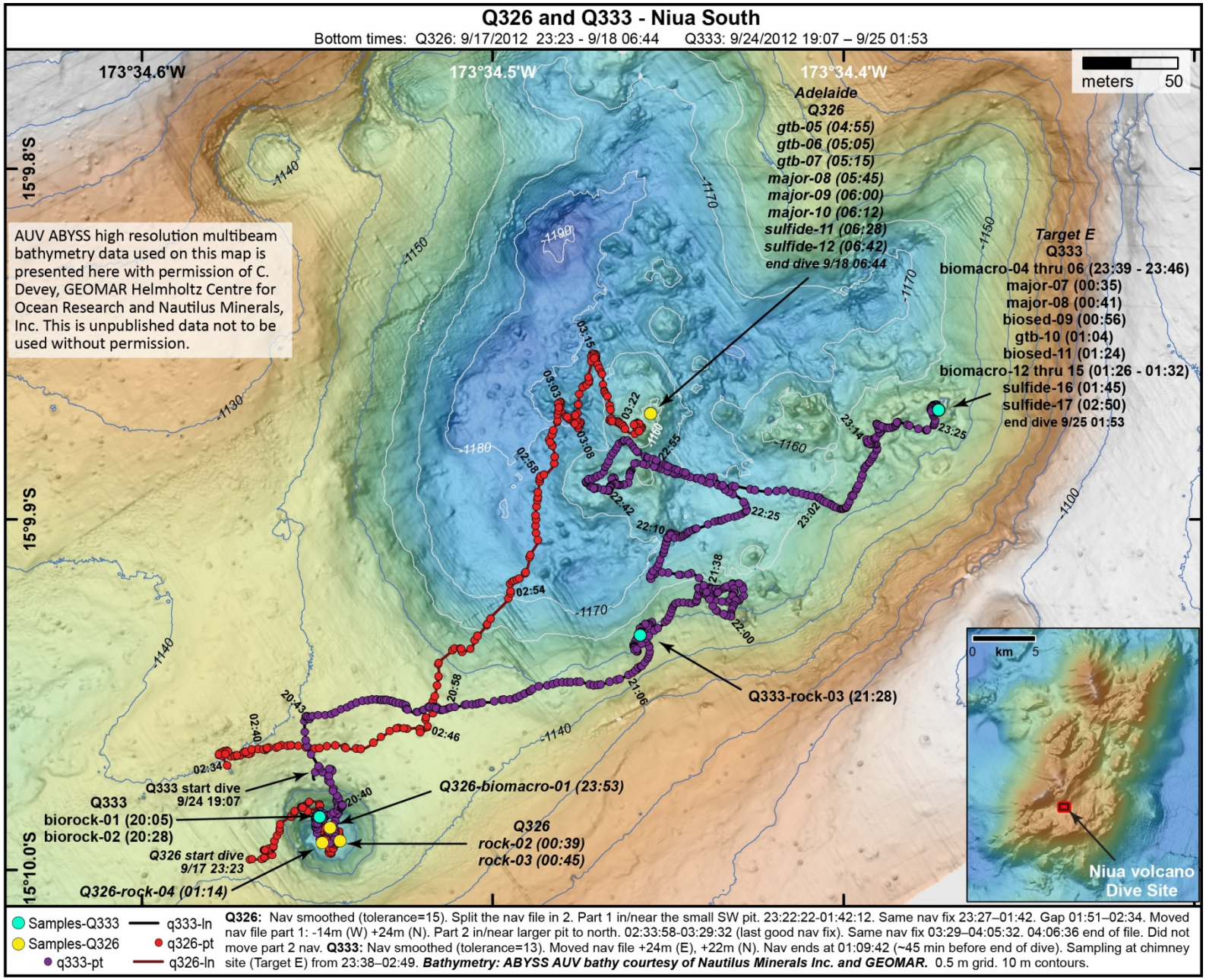



**Fig. 3.5-5.** Q326 and Q333 – Niua South dive map

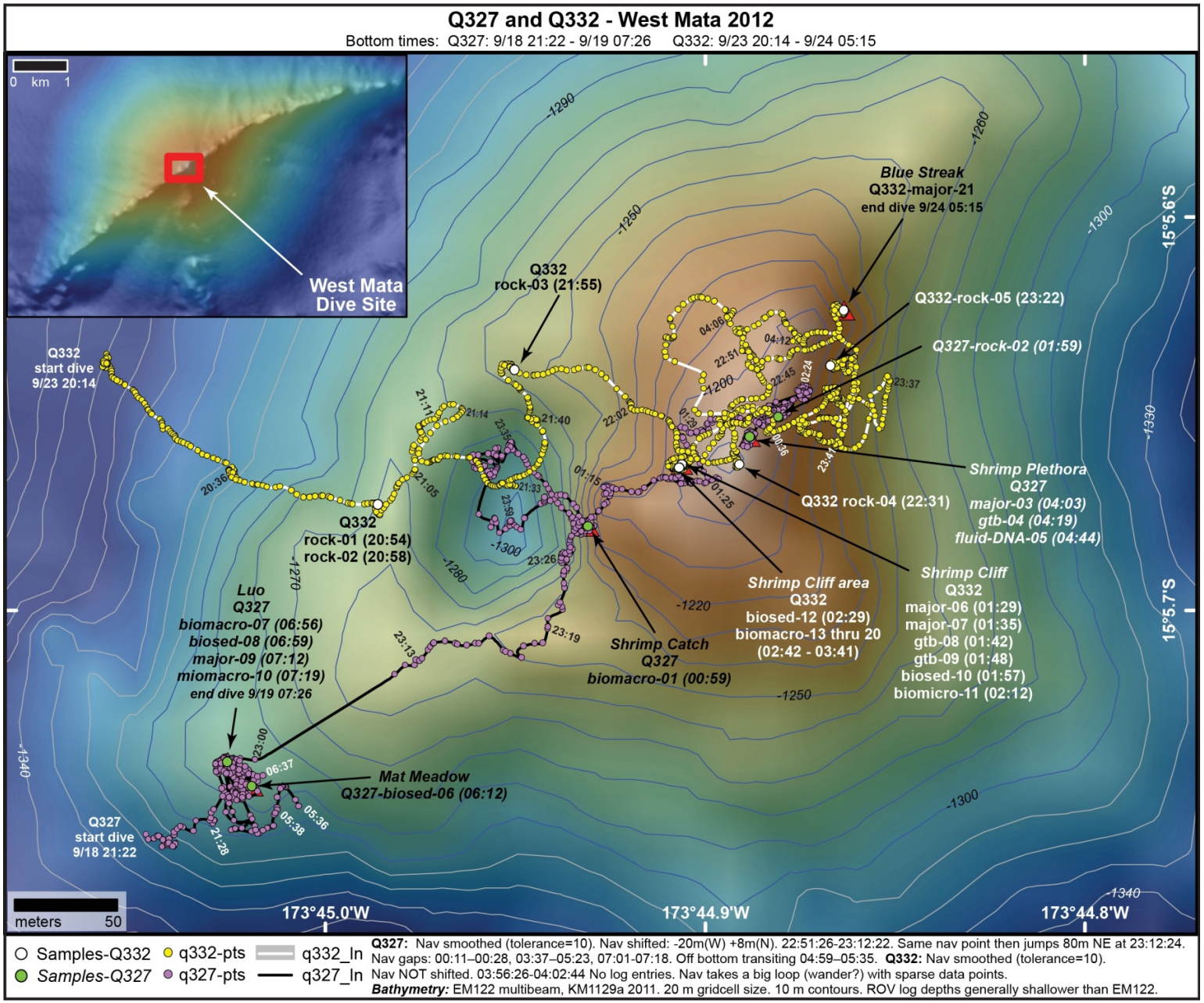



**Fig. 3.5-6.** Q327 and Q332 – West Mata dive map

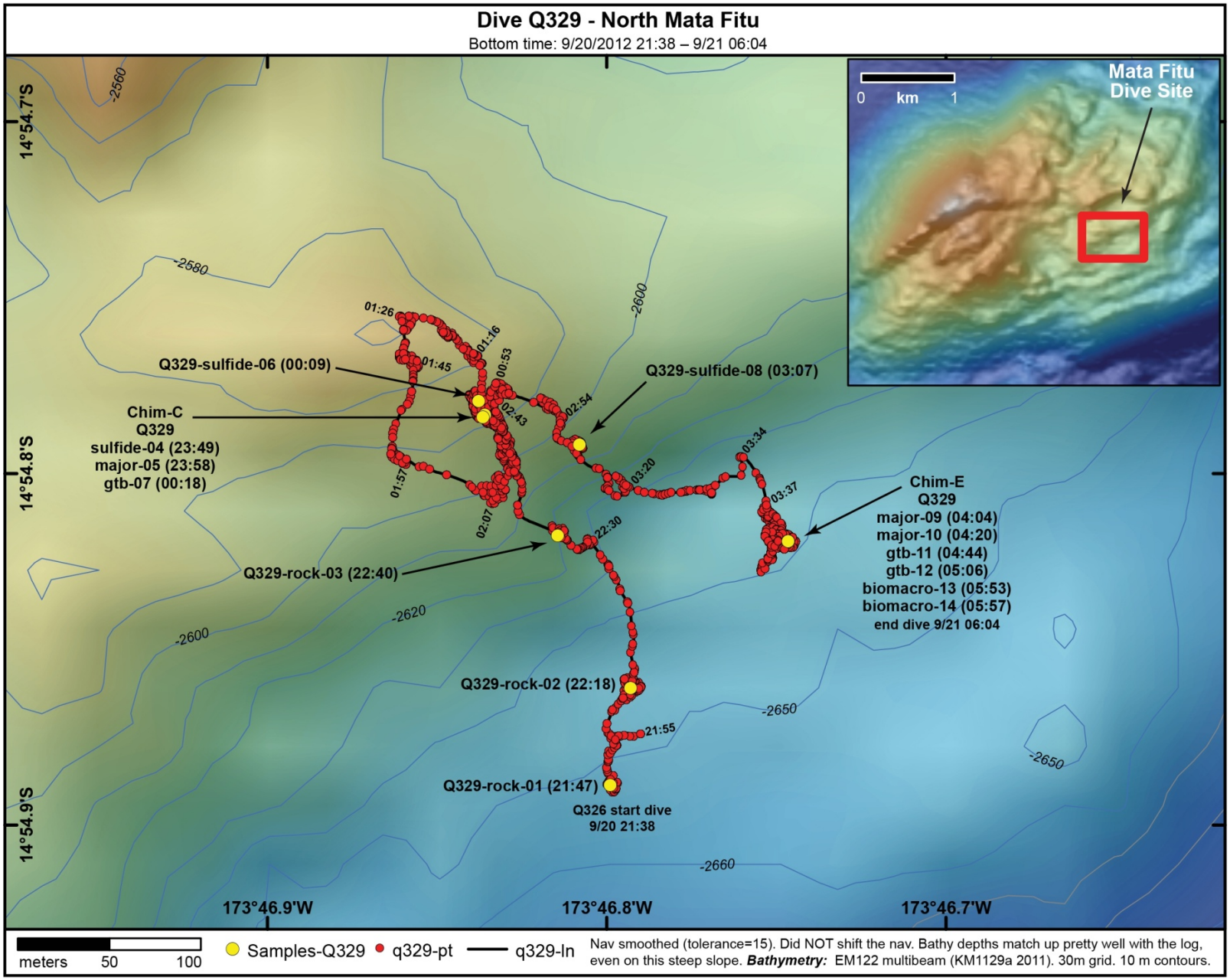



**Fig. 3.5-7.** Q329 – North Mata Fitu dive map

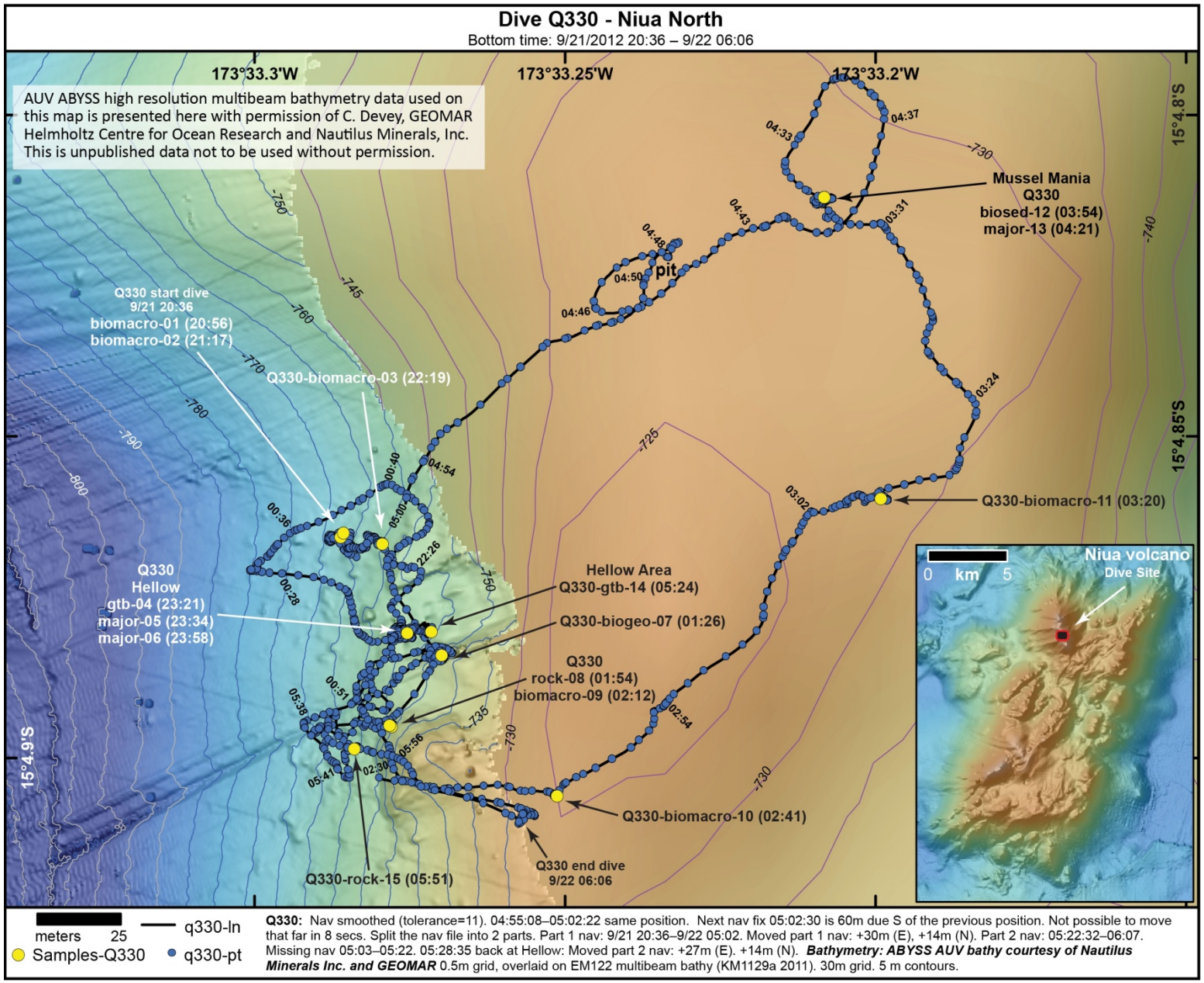



**Fig. 3.5-8.** Q330 – Niua North dive map

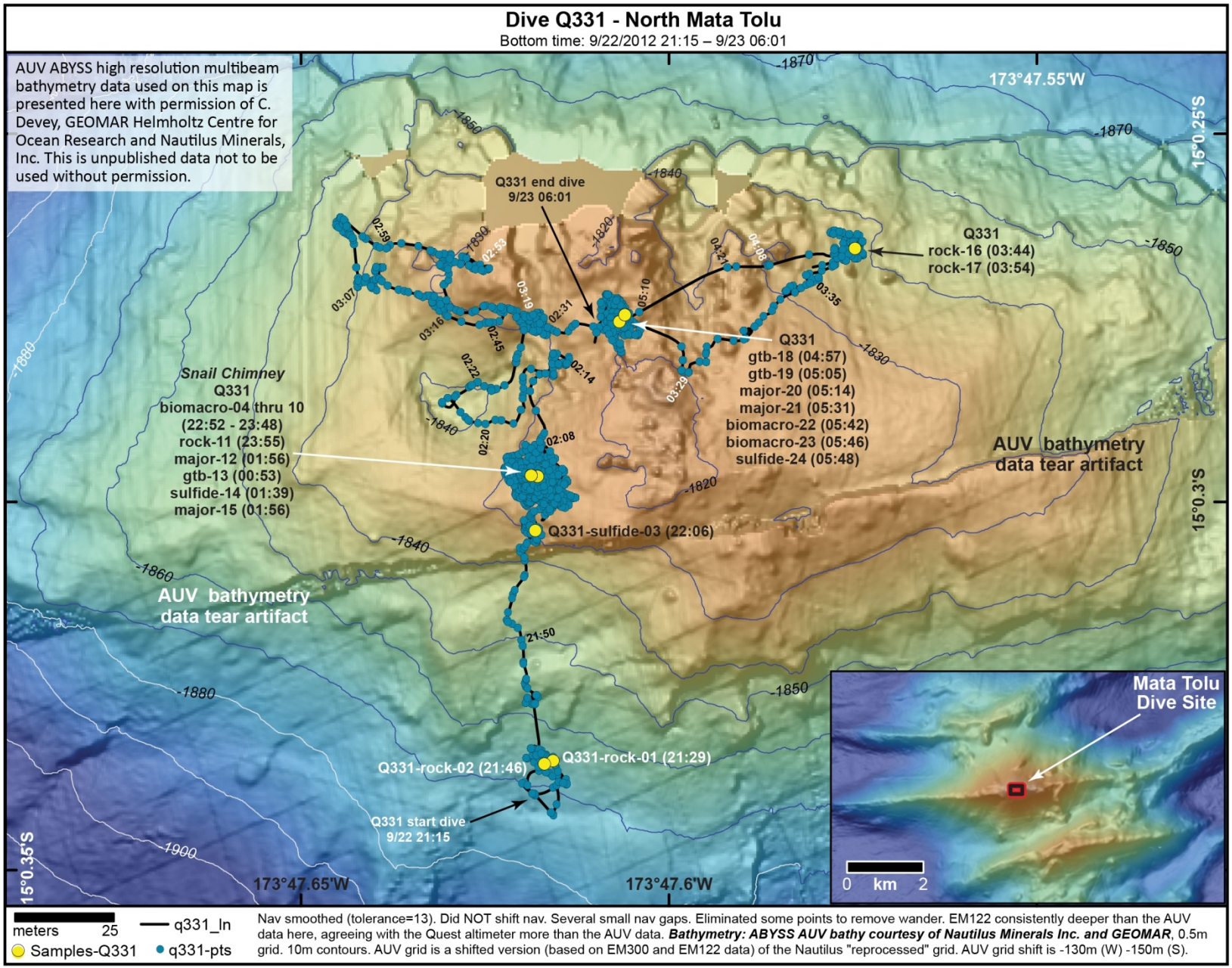



**Fig. 3.5-9.** Q331 – North Mata Tolu dive map

place-holder for print

# 3.6 Quest 4000 Samples

## 3.6.1 Sample Summary

| Sample Type | # Samples | Expected Derived Data Products | Device Type | Investigator(s) Shipboard |
|---|---|---|---|---|
| Biology (incl. combo samples eg. biogio, biosed) | 65 | Species identification (macro and micro), pharmacological products | Manipulator, suction sampler, Davis sampler, McPhail syringe sampler, net | Macrobiology: Shank. Microbiology: Tebo, Davis, Mitchell. |
| Geology | 52 total (37 rocks, 15 sulfides) | Geochemistry, volcanology | Manipulator | Rocks: Rubin. Sulfides: Arculus, Crowhurst. |
| Fluid | 27 | Fluid chemistry | Major samplers | Butterfield; Resing |
| Gas | 20 | Gas chemistry | Gas-tight bottles | Lupton |
| **Total Quest 4000 Samples: 164. This number does not include any subsamples.** | | | | |

## 3.6.2 Sample Logs

### Q322 Sample Log - Vai Lili, Valu Fa Ridge

| **time**UTC | **sample** | **latitude** | **longitude** | **Q322 Vai Lili Sample Comments** | **type** | **Z** | **alt** | **hdg** |
|---|---|---|---|---|---|---|---|---|
| 10-Sep 23.37.03 | Q322-biomat-01 | -22.214439 | -176.607723 | **Q322-biomat-01**. Multiple scoops of mat (looked primarily like yellow mat) with the Davis sampler #3 for DNA (formerly known as "Tebo" sampler). Site is approximately 20m E and 30m S of original dive target. (nav point time 23:20:02) | bio | 1742 | 1 | 152 |
| 11-Sep 00.32.06 | Q322-biomat-02 | -22.214422 | -176.607664 | **Q322-biomat-02**. Scoop of mixture of yellow and black mat with Davis Big Boy #2 for DNA. Approximately 5 meters from first sample. | bio | 1741 | 1 | 166 |
| 01.54.44 | Q322-GTB-03 | -22.214546 | -176.607737 | **Q322-GTB-03**. Blue gastight taken from shimmering water above the manganese oxide mat. Fired twice. (nav point time01:41:14) | gas | 1739 | 1 | 117 |
| 02.21.15 | Q322-major-04 | -22.214546 | -176.607737 | **Q322-major-04.** Firing the white major from over the manganese mat. The flow may be coming up from below and wafting over the "flange-looking" structure with the manganese oxides. Same location as GTB-03. | fluid | 1739 | 1 | 117 |
| 02.34.19 | Q322-biomat-05 | -22.214546 | -176.607737 | **Q322-biomat-05. M**ultiple scoops of mat (saw black in tube) with Davis sampler #1. Same location as samples #3 & #4. | bio | 1739 | 1 | 117 |
| 02.57.41 | Q322-biomat-06 | -22.214546 | -176.607737 | **Q322-biomat-06**. Davis scoop #9 "little gal" for RNA analysis. Looks like a good "dusty" sample through the small blue window in the sampler. Same location as samples #3-5. | bio | 1739 | 1 | 121 |
| 04.44.42 | Q322-biomat-07 | -22.214465 | -176.607887 | **Q322-biomat-07**. Davis sampler #4 for DNA of black mat. Site not as healthy as others (5-6) with no shimmering water. (nav point time 04:30:16) | bio | 1740 | 1 | 44 |
| 05.36.06 | Q322-biomat-08 | -22.214465 | -176.607887 | **Q322-biomat-08.** Davis scoop #8 for RNA. Valve was opened early so the sample may be compromised. | bio | 1740 | 1 | 44 |

## Q323 Sample Log - South Fonualei

| **time**UTC | **sample** | **latitude** | **longitude** | **Q323 South Fonualei Sample Comments** | **type** | **Z** | **alt** | **hdg** |
|---|---|---|---|---|---|---|---|---|
| 12-Sep 22.20.15 | Q323-rock-01 | -17.543681 | -174.577440 | **Q323-rock-01.** From 10m spire/mound at South Fonualei. Rock is a black pillow fragment with slight reddish alteration. | geo | 974 | 7 | 37 |
| 13-Sep 00.11.55 | Q323-biomacro-02 | -17.543281 | -174.576821 | **Q323-biomacro-02.** Mussel shell collected from huge field of dead shells. Surface bio sample: vent mussel. | bio | 951 | 1 | 67 |
| 00.21.57 | Q323-rock-03 | -17.543534 | -174.576609 | **Q323-rock-03.** From top of mound-spatter or small hornito. Rock is a black pillow fragment; vesicular interior to a more glassy exterior covered with bacterial growth on the outside. Surface bio sample: stalked barnacle. | geo | 937 | 0 | 119 |
| 01.10.09 | Q323-sulfide-04 | -17.542465 | -174.576370 | **Q323-sulfide-04**. Inactive chimney piece from area of dying chimneys. Piece is dark colored. The piece was ~25cm long; rather skinny. | geo | 964 | 2 | 75 |
| 01.33.04 | Q323-biomacro-05 | -17.542512 | -174.576288 | **Q323-biomacro-05**. Suction of a brachyuran crab. Also collected a hairy snail. Both animals are part of sample 5. Surface bio sample: brachyuran crab and hairy gastropod) | bio | 957 | 6 | 205 |
| 01.48.49 | Q323-sulfide-06 | -17.542472 | -174.576322 | **Q323-sulfide-06**. Small sulfide piece from top of ~2m chimney. (Same place as biomacro -05). Surface bio sample: non stalked barnacle) | geo | 956 | 2 | 195 |
| 01.55.16 | Q323-sulfide-07 | -17.542472 | -174.576322 | **Q323-sulfide-07**. Another sulfide piece right next to the previous piece at ~2m chimney. This one is larger; longer; gray. Possibly manganese coated spine on the chimney. "Weakly" venting fluid emitting chimney. Very little flow; except from under small flanges near top. **Target chimney 7.** | geo | 956 | 2 | 195 |
| 05.28.51 | Q323-major-08 | -17.535213 | -174.566832 | **Q323-major-08**. The nozzle in and above the orifice. Bouncing around a bit. The gray/white smoke is pouring out of the chimlet here. 254°C fluids. Chimney 30+ m high. (Major dropped and fell down entire height of chimney). Laloa Kakai vent field. (This is last nav fix. No USBL after 04:24) | fluid | 1547 | 27 | 223 (log) |
| 06.06.18 | Q323-biomacro-09 | -17.535213 | -174.566832 | **Q323-biomacro-09**. Suction sample of sulfide and white mat for shrimp near the base of a massive sulfide. There are lots of small shrimp on this mat/sulfide. Surface bio sample: Opaepele shrimp. **Laloa Kakai vent field.** (This is last nav fix. No USBL after 04:24) | bio | 1572 | ? | 152 (log) |
| 06.09.33 | Q323-biomacro-10 | -17.535213 | -174.566832 | **Q323-biomacro-10**. Suction of more shrimp into jar 3. **Laloa Kakai vent field.** (This is last nav fix. No USBL after 04:24). part of sample 9 | bio | 1573 | ? | |
| 06.10.33 | Q323-biosed-11 | -17.535213 | -174.566832 | **Q323-biosed-11**. Sampling sediment at the base of this sulfide structure. Sediment appears gray. Got it. **Laloa Kakai vent field.** (This is last nav fix. No USBL after 04:24) | bio | 1573 | ? | 195 (log) |

| timeUTC | sample | latitude | longitude | Q323 South Fonualei Sample Comments | type | Z | alt | hdg |
|---|---|---|---|---|---|---|---|---|
| 06.15.10 | Q323-sulfide-12 | -17.535202 | -174.566800 | **Q323-sulfide-12.** Going to attempt to grab this dead chimney piece on the seafloor for Richard. It's quite large (~1foot). It is manganese encrusted; black in color with a lighter inner crust. Old chimney piece with hollow interior. Putting it on the porch and are going to hold it there. **Laloa Kakai vent field.** (This is last nav fix. No USBL after 04:24) | geo | 1572 | ? | ? |

## Q324 Sample Log - Motutahi, cone at Niuatahi (Volcano O)

| timeUTC | sample | latitude | longitude | Q324 Motutahi Sample Comments | type | Z | alt | hdg |
|---|---|---|---|---|---|---|---|---|
| 13-Sep 22.38.13 | Q324-rock-01 | -15.375651 | -174.002587 | **Q324-rock-01**. 2 pieces of rock (1 candy bar size the other smaller). Black on the inside and coated on the outside. Fragile (crumbly) rock. From (NW?) summit of dacite cone at Volcano O. | geo | 1244 | 1 | 76 |
| 23.20.05 | Q324-major-02 | -15.375683 | -174.002341 | **Q324-major-02.** White port major. At rim of cone pit with high diffuse shimmering flow. Approximate temperature of sample is 22°C. Tmax in sediments below sample 105.9°C. **Crater Rim site.** | fluid | 1244 | 1 | 338 |
| 23.44.54 | Q324-GTB-03 | -15.375683 | -174.002341 | **Q324-gtb-03.** Blue GTB fired. Same place as major at Crater Rim. Placing the tip near as possible where the water sample was taken. Approximate temperature of sample is 22°C. Tmax in sediments below sample 105.9°C. **Crater Rim site** | gas | 1244 | 1 | 338 |
| 14-Sep 01.04.46 | Q234-bio-geo-04 | -15.375683 | -174.002341 | **Q234-biogeo-04**. Suctioning the seafloor surface coating. Sample probably includes sulfur and ash particles; crust; microbial mats. Looks like they are getting lots of the white material. **Crater Rim site.** | bio and geo | 1244 | 1 | 338 |
| 02.02.49 | Q324-gtb-05 | -15.375685 | -174.0023 | **Q324-gtb-05**. Black gastight sample in this fracture near the edge of the pit where water is pouring out. About 2m away from previous samples. **Crater Rim site.** | fluid | 1247 | 1 | 337 |
| 03.32.29 | Q324-sed-06 | -15.375853 | -174.002548 | **Q324-sed-06**. Scoop of probably volcaniclastic sediment and possibly biological material as well. Black gravelly; cindery type of material. Some white coated material in there as well. Tube about 1/3 full. **Outside the SW(?) rim of the pit crater.** | geo | 1244 | 1 | 337 |
| 04.23.23 | Q324-rock-07 | -15.375962 | -174.002379 | **Q324-rock-07.** Small and coated rock for the microbial studies. Coating fell off when fell into the box and sample now appears black. **SE flank of cone.** | geo | 1258 | 2 | |
| 04.27.29 | Q324-rock-08 | -15.375962 | -174.002379 | **Q324-rock-08.** Looks like a massive piece of dacite with vesicles. Same spot as #07. **SE flank of cone.** | geo | 1258 | 2 | 330 |
| 05.24.07 | Q324-biomacro-09 | -15.376345 | -174.002 | **Q324-biomacro-09**. Slurp sample of shrimp species only found at vent sites; dominant in western Pacific. Many shrimp in water column in this area. Surface bio sample: Opaepele shrimp. | bio | 1301 | 2 | 330 |

| **time**UTC | **sample** | **latitude** | **longitude** | **Q324 Motutahi Sample Comments** | **type** | **Z** | **alt** | **hdg** |
|---|---|---|---|---|---|---|---|---|
| 05.44.42 | Q324-major-10 | -15.37637 | -174.001986 | **Q324-major-10**. Just going to leave it in the holster on the vehicle. Pushing the plunger to fire green major. Nozzle is very close to the seafloor. Measuring ambient water in the area of all these shrimp and polychaetes. Fired successfully. 306°C. | fluid | 1295 | 1 | 305 |
| 05.52.17 | Q324-gtb-11 | -15.37637 | -174.001986 | **Q324-gtb-11.** Going to push the yellow gastight right in the holder on the vehicle just like they did the major. Triggering now. Looks like it was successful. Both were triggered near the bottom in the area of shrimp and polychaetes. (no nav-sample 10 position) | gas | 1295 | 1 | 305 |
| 05.57.18 | Q324-rock-12 | -15.37637 | -174.001986 | **Q324-rock-12**. Rock sample with some crust on it. Some bacterial mat or sulfur coating on this black small tube exterior rock. (no nav- sample 10 position) | geo | 1295 | 1 | 305 |

## Q325 Sample Log - Mata Ua

| **time**UTC | **sample** | **latitude** | **longitude** | **Q325 Mata Ua Sample Comments** | **type** | **Z** | **alt** | **hdg** |
|---|---|---|---|---|---|---|---|---|
| 14-Sep 22.26.31 | Q325-rock-01 | -15.022745 | -173.786789 | **Q325-rock-01** From south flank of pillows flowing down from the north with light sedimentation. Loose piece in pocket between tubes (~25cm diameter). Presuming pieces just fell off the flow. | geo | 2315 | 1 | 14 |
| 23.01.48 | Q325-rock-02 | -15.022321 | -173.785073 | **Q235-rock-02**. Rock is rather flat. It appears to have fractured off of the flow top - essentially in place. Lobate lava crust. Pyramidal in shape. About 40 cm long. It appears hollow. No nav. Picked lat/long based on depth. | geo | 2220 | 3 | 75 |
| 23.46.00 | Q325-rock-03 | -15.022329 | -173.784794 | **Q325-rock-03.** Rock from top of knoll on south flank of volcano summit. Area of in place lavas. No nav. Zlog=2196. Nav point 23:52:26 (first fix after nav came back) | geo | 2195 | 1 | n/a |
| 15-Sep 02.43.39 | Q325-rock-04 | -15.019523 | -173.785765 | **Q325-rock-04.** Fist-sized rock; somewhat altered with some white coating from area of blocky lava rocks (collapsed lava tubes interspersed with sand sediment). Angular fragment of pillow lava. This is in the saddle area west of the summit. | geo | 2175 | 1 | |

## Q326 Sample Log – Niua South

| **time**UTC | **sample** | **latitude** | **longitude** | **Q326 Niua South Sample Comments** | **type** | **Z** | **alt** | **hdg** |
|---|---|---|---|---|---|---|---|---|
| 17-Sep 23.52.36 | Q326-biomacro-01 | -15.166466 | -173.575773 | **Q326-biomacro-01**. Shrimp suction. There are 2 different species of shrimp here. Small piece of pumice was also in the slurp sample. **Small southern pit.** [Note: same nav fix 23:27 - 01:42. This position aprox.] Surface bio sample: Chorocaris and Opaepele shrimp. | bio-geo | 1165 | 1 | 91 |
| 18-Sep 00.38.49 | Q326-rock-02 | -15.166528 | -173.575727 | **Q326-rock-02**. Rock from same pit as shrimp sample but from the wall. Wanted a piece of in-place lava but not sure if this piece came from the welded rock. **Small southern pit.** [Note: same nav fix 23:27 - 01:42. This position aprox.] | geo | 1156 | 6 | 85 |

| **time**UTC | **sample** | **latitude** | **longitude** | **Q326 Niua South Sample Comments** | **type** | **Z** | **alt** | **hdg** |
|---|---|---|---|---|---|---|---|---|
| 00.44.33 | Q326-rock-03 | -15.166528 | -173.575727 | **Q326-rock-03**. From the same location of pit wall but from observed piece of in-place rock. Perfect piece of columnar jointing perhaps from cooling. **Small southern pit.** [Note: same nav fix 23:27 - 01:42. This position aprox.] | geo | 1156 | 6 | 85 |
| 01.13.34 | Q326-rock-04 | -15.166536 | -173.575810 | **Q326-rock-04.** Piece (2 pieces) of white slab covered with deposited tubular veins (biological); fragile. Collected further up the west wall of the pit. **Small southern pit.** [Note: same nav fix 23:27 - 01:42. This position aprox.] Postcruise determined to be rhyolite. rock-04a welded rhyolite ash + worm cast. rock-04b rhyolite pumice. | geo | n/a | n/a | n/a |
| 04.55.21 | Q326-gtb-05. | -15.164496 | -173.574250 | **Q326-gtb-05**. Gastight (green) sample from black smoker chimney structure. Just a meter or so from the top of this massive sulfide structure. Fluids were measure to be 315°C. DSL position only. [Position based on AUV bathymetry. No USBL nav] **Adelaide chimney structure.** | gas | n/a | n/a | |
| 05.04.58 | Q326-gtb-06 | -15.164496 | -173.574250 | **Q326-gtb-06**. Red gastight fired and was in the flow when it fired. Same spot on the chimney in the black smoker flow. [No USBL nav] **Adelaide.** | gas | n/a | n/a | |
| 05.14.55 | Q326-gtb-07 | -15.164496 | -173.574250 | **Q326-gtb-07**. Yellow GTB fired in the clear portion of the fluid as it comes out of the chimney. [No USBL nav] **Adelaide.** | gas | n/a | n/a | |
| 05.45.19 | Q326-major-08 | -15.164496 | -173.574250 | **Q326-major-08**. Blue major sampler in a lower orifice on Adelaide sulfide structure with black smoke pouring out. About 2 meters down from the gastight samples taken previously. [No USBL nav] **Adelaide.** | fluid | n/a | n/a | |
| 06.00.28 | Q326-major-09 | -15.164496 | -173.574250 | **Q326-major-09**. White major from a chimney spire with white mat and iron oxide coating. The nozzle is in the flow. Light gray smoke is pouring out of the orifice.[No USBL nav] **Adelaide.** | fluid | n/a | n/a | |
| 06.12.25 | Q326-major-10 | -15.164496 | -173.574250 | **Q326-major-10.** Red major (bent) from one of the looser-side chimneys a few meters from the top. The pilot thinks this chimney is in between the last sampling site and the top. [No USBL nav] **Adelaide.** | fluid | n/a | n/a | |
| 06.27.36 | Q326-sulfide-11 | -15.164496 | -173.574250 | **Q326-sulfide-11**. Grabbed a piece of inactive chimney from Adelaide sulfide structure. Rust colored; friable; forearm to fist sized. [No USBL nav] | geo | n/a | n/a | |
| 06.42.27 | Q326-sulfide-12 | -15.164496 | -173.574250 | **Q326-sulfide-12.** Sulfide placed in tube 10. Inactive with white and orange staining. Just below the other attempts above. [No USBL nav] **Adelaide.** | geo | n/a | n/a | |

## Q327 Sample Log – West Mata

| timeUTC | sample | latitude | longitude | Q327 West Mata Sample Comments | type | Z | alt | hdg |
|---|---|---|---|---|---|---|---|---|
| 19-Sep 00.58.48 | Q327-biomacro-01 | -15.094645 | -173.748846 | **Q327-biomacro-01**. Net scoop of shrimp from dense congregation of shrimp on top of wall above Hades pit (near summit). At least a dozen - could be up to 30 in net on bottom. Incredible abundance of shrimp in a diffuse flow area. Small pieces of elemental sulfur and white bacterial mat in area. **Shrimp Catch.** Surface bio sample: Chorocaris and Opaepele shrimp; scale worm; gastropod; arthropod; squat lobster. | bio | 1194 | 2 | 141 |
| 01.59.25 | Q327-rock-02 | -15.094182 | -173.748011 | **Q327-rock-02**. Rock fragment - probably boninite. It's a walnut-sized sample. Near the banded area of a summit pinnacle. | geo | 1162 | 10 | 112 |
| 04.02.54 | Q327-major-03 | -15.094264 | -173.748137 | **Q327-major-03**. Blue major in milky 10+°C flow in area with lots of shrimp. **Shrimp Plethora site.** (NO USBL NAV) | fluid | 1172 | 4 | na |
| 04.19.18 | Q327-GTB-04 | -15.094264 | -173.748137 | **Q327-GTB-04**. Black gastight. Not touching the bottom. **Shrimp Plethora site** (milky 10+ degree flow in area with lots of shrimp). (NO USBL NAV) | gas | 1172 | 4 | na |
| 04.44.03 | Q327-fluid-DNA-05 | -15.094264 | -173.748137 | **Q327-fluid-DNA-05**. Filter sample for Huber. DNA and RNA analysis will be performed on the filter. Sample aborted because the pelagic pump was not working. **Shrimp Plethora site** (milky 10+ degree flow in area with lots of shrimp). (NO USBL NAV) | fluid | 1172 | 4 | na |
| 06.12.19 | Q327-biosed-06 | -15.095745 | -173.750322 | **Q327-biosed-06**. Davis sampler #9 for RNA & DNA. Near hydrophone location at **Mat Meadow area**. | bio | 1279 | 2 | 3 |
| 06.55.42 | Q327-biomacro-07 | -15.095643 | -173.750431 | **Q327-biomacro-07**. Suction of scaleworm and sediment. **Luo vent.** Surface bio sample: scale worm. | bio | 1281 | 2 | 74 |
| 06.58.53 | Q327-biosed-08 | -15.095643 | -173.750431 | **Q327-biosed-08.** Rotated chamber for additional suction of scaleworms. Also sediment in the chamber for Ed. Lots of sediment in the second suction chamber and maybe worms as well. **Luo vent.** No scaleworms at surface. | bio | 1281 | 2 | 73 |
| 07.12.30 | Q327-major-09 | -15.095643 | -173.750431 | **Q327-major-09**. Sample from diffuse flow in Luo crack where last 2 samples were taken. Fired and coming up. Slightly different place than worms in the crack. **Luo vent.** | fluid | 1281 | 2 | na |
| 07.18.54 | Q327-biomacro-10 | -15.095643 | -173.750431 | **Q327-biomacro-10**. Another scaleworm into the chamber #3. **Luo vent.** No sample at surface. | bio | 1281 | 2 | na |

## Q328 Sample Log – Mata Ua

| timeUTC | sample | latitude | longitude | Q328 Mata Ua Samples | type | Z | alt | hdg |
|---|---|---|---|---|---|---|---|---|
| 20-Sep 00.30.41 | Q328-biogeo-01 | -15.017139 | -173.788474 | **Q328-biogeo-01**. Rock with many vent barnacles attached. This is the first group of barnacles observed on this expedition. Sample at surface included: Squat lobster;, anemone; stalked and non-stalked barnacles; Polychaetes; limpets. **Barnacle Field site (target).** Surface bio sample: squat lobster; anemone; stalked and non-stalked barnacles; worms; polychaetes and limpets. | bio geo | 2391 | 1 | 87 |

| **time**UTC | **sample** | **latitude** | **longitude** | **Q328 Mata Ua Samples** | **type** | **Z** | **alt** | **hdg** |
|---|---|---|---|---|---|---|---|---|
| 00.44.20 | Q328-biosed-02 | -15.017139 | -173.788474 | **Q328-biosed-02**. McPhail syringe sediment sample. See lots of sediment in the syringe so is good sample. Same location as biogeo-01. **Barnacle Field site (target).** | bio | 2391 | 1 | 87 |
| 01.16.59 | Q327-rock-03 | -15.017192 | -173.788209 | **Q328-rock-03**. Mildly-altered volcanic rock fragment. Angular rock. Looks weathered. Probably fist sized. Mildly-altered volcanic rock fragment. **Near the base of Pedestal Spire.** | geo | 2374 | 2 | 139 |
| 01.58.11 | Q328-major-04 | -15.017300 | -173.788215 | **Q328-major-04**. Fluid sample in the chimney orifice. Looks like the sampler is getting water. Small blacksmoker chimney on this steep slope - vigorously pouring out black smoke. Highest temp reading 360°C at **Flashing chimney.** | fluid | 2366 | 1 | 148 |
| 02.17.01 | Q328-gtb-05 | -15.017300 | -173.788215 | **Q328-gtb-05.** Red gastight in the same black smoker chimney as the previous major. Black smoke is billowing out of the orifice. Possibly super-critical fluid - phase separation. Highest temp reading 360°C at **Flashing chimney.** | gas | 2366 | 1 | 148 |
| 02.24.40 | Q328-gtb-06 | -15.017300 | -173.788215 | **Q328-gtb-06**. Blue gastight in same black smoker orifice. Highest temp reading 360°C at **Flashing** chimney. | gas | 2366 | 1 | 148 |
| 02.36.22 | Q328-major-07 | -15.017300 | -173.788215 | **Q328-major-07.** White major sampler inserted into the same orifice as the last 3 samples here at "Flashing Chimney". Precipitate on the nozzle it's so hot. The shimmer can be seen up the nozzle. Highest temp reading 360°C at Flashing chimney. Dave's guess is that the fluid is actually 380-390°C. | fluid | 2366 | 1 | 148 |
| 03.19.51 | Q328-biomacro-08 | -15.017300 | -173.788215 | **Q328-biomacro-08**. Shrimp in the hose. Going in for another suck. Not sure of the suction contents but believe it may be 1 shrimp and possibly barnacles and a squat lobster. Just north of **Flashing Chimney**. No sample at surface. | bio | 2366 | 1 | 148 |
| 03.28.59 | Q328-biomacro-09 | -15.017300 | -173.788215 | **Q328-biomacro-09**. Got one shrimp. He just got out. The squat lobster is trying to get out. Suctioning in the barnacles. This sample contains at least 1 squat lobster - and not sure what else. Just north of **Flashing Chimney.** No sample at surface. | bio | 2366 | 1 | 148 |
| 03.43.41 | Q328-sulfide-10 | -15.017300 | -173.788215 | **Q328-sulfide-10**. Walnut-sized dark black piece of the top of the sulfide that originally fell off. Very friable. "**Flashing Chimney** position. Surface bio sample: stalked and non-stalked barnacles. | geo | 2366 | 1 | 148 |
| 04.13.10 | Q328-geobio-11 | -15.017319 | -173.788050 | **Q328-geobio-11**. Rock with a lot of fuzzy mat on one side of it. Good sized; angular. From slope above the chimneys. | geo | 2356 | 1 | 126 |
| 04.47.27 | Q328-rock-12 | -15.017672 | -173.788070 | **Q328-rock-12**. Volcanic rock. Fragment from a relatively large piece of pillow sitting beneath a dike. It may have some bacterial mat coating. Facing the south on steep slope. | geo | 2340 | 2 | 168 |
| 04.59.15 | Q328-rock-13 | -15.017796 | -173.787974 | **Q328-rock-13**. In-place rock from volcanic dike. Angular; black appearance; fish-sized. Broken off from the dike (strike ~N050°E). Doesn't look as altered as earlier rocks. | geo | 2327 | 2 | 142 |
| 05.06.01 | Q328-rock-14 | -15.017796 | -173.787974 | **Q328-rock-14**. Rock from dike-proper. Rock samples 13 and 14 were very close together. | geo | 2327 | 2 | |

| **time**UTC | **sample** | **latitude** | **longitude** | **Q328 Mata Ua Samples** | **type** | **Z** | **alt** | **hdg** |
|---|---|---|---|---|---|---|---|---|
| ? | Q328-rock-15 | -15.017300 | -173.788215 | **geo/bio sample: Q328-rock-15.** Added post-dive sample found on porch (rock). Not sure of location. Believe it was probably from "**Flashing**". Surface bio sample: gastropod; worms; non-stalked barnacles. | geo | 2366 | 1 | 148 |

## Q329 Sample Log – Mata Fitu

| **time**UTC | **sample** | **latitude** | **longitude** | **Q329 Mata Fitu Sample Comments** | **type** | **Z** | **alt** | **hdg** |
|---|---|---|---|---|---|---|---|---|
| 20-Sep 21.47.00 | Q329-rock-01 | -14.914812 | -173.779984 | **Q329-rock-01**. Pillow fragment (?) from piece of ledge that looks more or less in place. Very little sediment in area. Small piece - very glassy; from pillow surface. **Landing site (deepest part of dive – also deepest sample of the cruise))** | geo | 2656 | 1 | 324 |
| 22.17.47 | Q329-rock-02 | -14.914351 | -173.779884 | **Q329-rock-02**. Pillow rind from flank of pillows on slope ~40m upslope from landing site (and previous sample). Broke in pieces when placed in bin. (22:115:01 nav stamp) | geo | 2652 | 1 | 288 |
| 22.40.27 | Q329-rock-03 | -14.913628 | -173.780243 | **Q329-rock-03**. Pieces of unusually flakey rock. It's quite fragile. Iron-oxide hydroxide-laced crust? Red muds underneath. Hydrothermal crust most likely. Nice sample. | geo | 2614 | 1 | 308 |
| 23.48.56 | Q329-sulfide-04 | -14.913055 | -173.780599 | **Q329-sulfide-04**. Active lower chimney near base of taller structure with biota with clear fluids. For GNS deRonde. (Area named **Chim-C** postcruise. Quest Tmax was 77°C. Actual temp probably higher.) | geo | 2585 | 3 | 201 |
| 23.58.08 | Q329-major-05 | -14.913055 | -173.780599 | **Q329-major-05**. Blue major fluid sample from chimney just sampled (sulfide-04). Active chimney with clear fluids. (Area named **Chim-C** postcruise. Quest Tmax was 77°C. Actual temp probably higher.) | fluid | 2586 | 3 | 201 |
| 21-Sep 00.09.08 | Q329-sulfide-06 | -14.912990 | -173.780631 | **Q329-sulfide-06.** Inactive chimney top that was adjacent to the active sulfide (#04). Fell on edge and disintegrated into pieces. (Area named **Chim-C** postcruise. Quest Tmax was 77°C. Actual temp probably higher.) | geo | 2585 | 3 | 201 |
| 00.17.31 | Q329-GTB-07 | -14.913067 | -173.780610 | **Q329-gtb-07**. Gastight sample of the same active chimney as major-05. Black gastight. Active chimney with clear fluids. (Area named **Chim-C** postcruise. Quest Tmax was 77°C. Actual temp probably higher.) | gas | 2585 | 3 | 201 |
| 03.07.26 | Q329-sulfide-08 | -14.913196 | -173.780135 | **Q329-sulfide-08**. Brownish/reddish-colored sulfide piece from an extinct chimney. Fist-sized - small piece. Heavily-oxidized material. It crumbled a bit. (03:10:19 nav fix) | geo | 2610 | 1 | 88 |
| 04.03.37 | Q329-major-09 | -14.913654 | -173.779111 | **Q329-major-09**. White major sample in the black smoke at boiling chimney. **Chim-E (~16m chimney; seafloor Z=2643m; Quest T=331°C).** | fluid | 2627 | 16 | 222 |
| 04.19.42 | Q329-major-10. | -14.913654 | -173.779111 | **Q329-major-10**. Red major sample in the black smoke at boiling chimney. Sample may be compromised because it was pulled out of the main flux. **Chim-E (~16m chimney; seafloor Z=2643m; Quest T=331°C).** | fluid | 2627 | 16 | 236 |

| **time**UTC | **sample** | **latitude** | **longitude** | **Q329 Mata Fitu Sample Comments** | **type** | **Z** | **alt** | **hdg** |
|---|---|---|---|---|---|---|---|---|
| 04.44.03 | Q329-gtb-11 | -14.913654 | -173.779111 | **Q329-gtb-11**. Yellow gastight sample right in the black smoker that was boiling. It has been confirmed bubbles are coming out.(postcruise: not sure there are bubbles; look more like phase separation) **Chim-E (~16m chimney; seafloor Z=2643m; Quest T=331°C).** | gas | 2627 | 16 | |
| 05.05.51 | Q329-gtb-12 | -14.913654 | -173.779111 | **Q329-gtb-12.** Green gastight sample fired in the black smoker orifice at the top of the chimney at the super-critical state of phase separation. **Chim-E (~16m chimney; seafloor Z=2643m; Quest T=331°C).** | gas | 2627 | 16 | |
| 05.52.58 | Q329-biomacro-13 | -14.913654 | -173.779111 | **Q329-biomacro-13**. Fish slurped up and stowed in bucket from base of large chimney. **Chim-E (~16m chimney; seafloor Z=2643m; Quest T=331°C).** Surface bio sample: fish. | bio | 2643 | 2 | 35 |
| 05.56.59 | Q329-biomacro-14 | -14.913654 | -173.779111 | **Q329-biomacro-14**. Gastropod (snail) from near the fish sample - taken with slurp and stowed in bucket. From the base of large chimney. **Chim-E (~16m chimney; seafloor Z=2643m; Quest T=331°C).** Surface bio sample: Dhymorynchus snail | bio | 2643 | 2 | 52 |

## Q330 Sample Log – Niua North

| **time**UTC | **sample** | **latitude** | **longitude** | **Q330 Niua North Sample Comments** | **type** | **Z** | **alt** | **hdg** |
|---|---|---|---|---|---|---|---|---|
| 21-Sep 20.55.49 | Q330-biomarco-01 | -15.081095 | -173.554769 | **Q330-biomacro-01. C**rab and a shrimp slurped into chamber #1. Surface bio sample: crabs; polychaetes; Alvinocaris shrimp) L**anding site / former sulfur pond/lake.** | bio | 765 | 1 | 97 |
| 21.16.57 | Q330-biomacro-02. | -15.081084 | -173.554761 | **Q330-biomacro-02**. Multiple shrimp and sulfur sediments slurped and transferred to the bucket. Surface bio sample: Alvinocaris shrimp. **Landing site / former sulfur pond/lake**. | bio | 764 | 1 | 86 |
| 22.18.55 | Q330-biomacro-03 | -15.081112 | -173.554657 | **Q330-biomacro-03**. Tubeworms with roots - in the sulfur patch. Sampled 3 whole tubeworms including the terminus end (root). No tubeworm sample at surface. | bio | 758 | 1 | 141 |
| 23.20.33 | Q330-GTB-04 | -15.081343 | -173.554590 | **Q330-GTB-04**. Blue gastight sample from the hole with a high temp of 112°C. Yellow and white smoke with sulfur balls in front of hole on sediment. **Hellow vent site.** | gas | 754 | 0 | 53 |
| 23.33.30 | Q330-major-05 | -15.081343 | -173.554590 | **Q330-major-05**. White major fluid sample in same location as previous gastight. Hole with a high temp of 112°C. Yellow and white smoke with sulfur balls in front of hole on sediment. **Hellow vent site.** | fluid | 754 | 0 | 47 |
| 23.57.38 | Q330-major-06 | -15.081343 | -173.554590 | **Q330-major-06**. Blue major fluid sample taken at same orifice as 2 previous samples; after some excavating of the rock. Hole with a high temp of 112°C. Yellow and white smoke with sulfur balls in front of hole on sediment. **Hellow vent site.** | fluid | 754 | 0 | 47 |

| timeUTC | sample | latitude | longitude | Q330 Niua North Sample Comments | type | Z | alt | hdg |
|---|---|---|---|---|---|---|---|---|
| 22-Sep 01.25.53 | Q330-biogeo-07 | -15.081401 | -173.554498 | **Q330-biogeo-07**. Biological mat on the sulfur sediments just to the right of solid sulfur with smoke pouring out - using the smaller Davis sampler #9 (blue). Dark sediments are sulfur dissolved in the water that precipitates. Also yellow sulfur particles. The white is microbial mat. (SW? side to Hellow). **Hellow area.** | bio | 748 | 1 | 37 |
| 01.53.56 | Q330-rock-08 | -15.081586 | -173.554633 | **Q330-rock-08**. Angular fragment of crumbly rock. Probably dacite. Manganese coated. From rock debris bedrock outcrop. **"mound S of sulfur area".** | geo | 749 | 2 | 116 |
| 02.11.32 | Q330-biomacro-09 | -15.081583 | -173.554638 | **Q330-biomacro-09**. Slurped up at least 1 shrimp. Putting it in the shrimp bucket with the other shrimp (mixed sample with sample 2). | bio | 749 | 2 | 116 |
| 02.40.54 | Q330-biomacro-10 | -15.081765 | -173.554188 | **Q330-biomacro-10**. Mussels scooped up with the net. May be one in there. Moving upslope on rock/sediment slope. Area has variety of macrofauna. This sample includes mussels - and rocks as a subsample. Surface bio sample: mussel parts and commensal organisms. | bio | 721 | 1 | 108 |
| 03.19.34 | Q330-biomacro-11 | -15.080995 | -173.553319 | **Q330-biomacro-11.** Brownish-tan skinny tubeworm with a red plume and black area that is probably part of the tubeworm. If it is a Lemellibracchia they don't need any heat. Live off the wafting plumes. Tim notes that there has never been a temperature anomaly where these guys live. Surface bio sample: tubeworm; anemone; stalked barnacles. | bio | 723 | 0 | 212 |
| 03.54.13 | Q330-biosed-12 | -15.080214 | -173.553471 | **Q320-biosed-12**. McPhail sample in the sediments beneath these healthy mussels covered with microbial mat and diverse biota. In an area of shimmering water (8.9°C.) here at **"Mussel Mania"**. | bio | 722 | 0 | 167 |
| 04.21.25 | Q330-major-13 | -15.080214 | -173.553471 | **Q330-major-13**. Red major water sample in diffuse flow down in the mussel beds of **Mussel Mania.** Highest temperature was 8.9°C. | fluid | 722 | 0 | 171 |
| 05.24.20 | Q330-gtb-14 | -15.081340 | -173.554526 | **Q330-gtb-14.** Red gastight bottle triggered In sulfur vent pouring out smoke and huge wobbly CO2 bubbles (probably liquid CO2). The smoke is white droplets with an occasional yellow tinge. **Hellow area.** | gas | 748 | 2 | 64 |
| 05.51.15 | Q330-rock-15 | -15.081643 | -173.554732 | **Q330-rock-15**. Rock broken off from massive outcrop on a "dome" south of the sulfur pit. Outcrop has tilted columnar jointing. | geo | 745 | 2 | 90 |

## Q331 Sample Log – Mata Tolu

| timeUTC | sample | latitude | longitude | Q331 Mata Tolu Sample Comments | type | Z | alt | hdg |
|---|---|---|---|---|---|---|---|---|
| 22-Sep 21.29.02 | Q331-rock-01 | -15.005586 | -173.793596 | **Q331-rock-01**. From outcrop of lava tubes at the landing site. Some sessile animals at the site and light sediment coating and patch of mat. Got a second piece from same outcrop as well. **Landing Site.** (nav time 21:28:22) | geo | 1856 | 3 | 336 |

| timeUTC | sample | latitude | longitude | Q331 Mata Tolu Sample Comments | type | Z | alt | hdg |
|---|---|---|---|---|---|---|---|---|
| 21.45.30 | Q331-rock-02 | -15.005593 | -173.793616 | **Q331-rock-02**. From the lava mound just on top of the dike we ascended on. The dike is the "feeder system" for the lava mound. Sample has exterior (glass) and interior surfaces. This nav position is questionable. Should be upslope from here to agree with logged and nav depths. | geo | 1841 | 6? | 9 |
| 22.06.05 | Q331-sulfide-03 | -15.005065 | -173.793636 | **Q331-sulfide-03.** Big piece of old (extinct) sulfide located upslope from rocks 1 and 2. Covered with mat film and also has a shrimp and crabs on it. Can see minerals in the sulfide spire. Placed in biobox to preserve biology. (21:57:20 nav time) Target: sulfite 3 in nav. | geo | 1820 | 2 | 60 |
| 22.52.25 | Q331-biomacro-04 | -15.004942 | -173.793631 | **Q331-biomacro-04.** Large net sample of Alvinochonca and hairy snails (30?) as well as several (5?) Brachyuran crabs. Sampled large sulfide structure. (22:44:58 nav time). Surface bio sample 04 (changed from biomacro-14): brachyuran crabs; Ifremieria snails; Alvinoconcha snails; non-stalked barnacles. | bio | 1819 | 5 | 251 |
| 23.20.47 | Q331-biomacro-05 | -15.004940 | -173.793646 | **Q331-biomacro-05.** Shrimp collected next to brown snail cluster. Into chamber #1. 24°C temperature here in the shimmering water near biological sampling. (23:40:53 nav time) **Snail Chimney**. Surface bio sample 05 – 10: Alvinocaris Chorocaris and Opaepele shrimp; squat lobsters. | bio | 1821 | 1 | 244 |
| 23.24.39 | Q331-biomacro-06 | -15.004940 | -173.793646 | **Q331-biomacro-06.** Suction of shrimp with a snail (chaser). (23:40:53 nav time) **Snail Chimney.** . Surface bio sample 05 – 10: Alvinocaris Chorocaris and Opaepele shrimp; squat lobsters. | bio | 1821 | 1 | 245 |
| 23.33.57 | Q331-biomacro-07 | -15.004940 | -173.793646 | **Q331-biomacro-07.** A few shrimp and a crab. Into chamber #3. 24°C temperature here in the shimmering water near biological sampling. (23:40:53 nav time) **Snail Chimney.** . Surface bio sample 05 – 10: Alvinocaris Chorocaris and Opaepele shrimp; squat lobsters. | bio | 1821 | 1 | 245 |
| 23.42.55 | Q331-biomacro-08 | -15.004940 | -173.793646 | **Q331-biomacro-08**. Looks like some of the crabs were blocking and then a few shrimp dropped. Sample of shrimp and crabs into chamber #4. 24°C temperature here in the shimmering water near biological sampling. (23:40:53 nav time) **Snail Chimney.** . Surface bio sample 05 – 10: Alvinocaris Chorocaris and Opaepele shrimp; squat lobsters. | bio | 1821 | 1 | 245 |
| 23.46.17 | Q331-biomacro-09 | -15.004940 | -173.793646 | **Q331-biomacro-09**. Crab and shrimp (and possibly a snail). Into chamber #5. **(23:40:53 nav time) Snail Chimney.** . Surface bio sample 05 – 10: Alvinocaris Chorocaris and Opaepele shrimp; squat lobsters. | bio | 1821 | 1 | 245 |
| 23.48.24 | Q331-biomacro-10 | -15.004940 | -173.793646 | **Q331-biomacro-10**. Shrimp (#?). Into chamber #6. 24°C temperature here in the shimmering water near biological sampling. **(23:40:53 nav time) Snail Chimney.** . Surface bio sample 05 – 10: Alvinocaris Chorocaris and Opaepele shrimp; squat lobsters. | bio | 1821 | 1 | 245 |

| timeUTC | sample | latitude | longitude | Q331 Mata Tolu Sample Comments | type | Z | alt | hdg |
|---|---|---|---|---|---|---|---|---|
| 23.54.47 | Q331-rock-11 | -15.004940 | -173.793646 | **Q331-rock-11.** From base of chimney where the shrimp were suctioned. Rock is probably a sulfide. **Snail Chimney.** Surface bio sample: non-stalked barnacles. | geo | 1822 | 1 | 245 |
| 23-Sep 00.39.22 | Q331-major-12 | -15.004940 | -173.793646 | **Q331-major-12**. Red major in smoking vent near chimney top. Fluid clear to milky color. 271.4°C Quest temperature reading in fluids. **Snail Chimney** (where samples 5-11 were taken). | fluid | 1817 | 7 | 210 |
| 00.52.47 | Q331-GTB-13 | -15.004940 | -173.793646 | **Q331-GTB-13**. Yellow gastight from the same smoking vent as major-12. Fluid clear to milky color. Same ROV position and heading. 271.4°C Quest temperature reading in fluids. **Snail Chimney.** | gas | 1817 | 7 | 210 |
| 01.39.06 | Q331-sulfide-14 | -15.004940 | -173.793646 | **Q331-sulfide-14**. Piece of active sulfide from the top of the chimney where we got the 270°C fluid. It's a small black piece. There was another piece that fell by the temperature probe that may contribute to the sample. **Snail Chimney.** | geo | 1820 | 2 | 170 |
| 01.55.35 | Q331-major-15 | -15.004940 | -173.793646 | **Q331-major-15.** Blue major fluid sample in this area of diffuse flow above the hairy snails and brachyuran crabs at the base of **Snail Chimney.** | fluid | 1820 | 2 | 205 |
| 03.44.06 | Q331-rock-16 | -15.004426 | -173.792912 | Q331-rock-16. Piece of the outer rind on large pillow lava. Fist sized? Drain-out surface in foreground. Rock looks very rough (elephant-skin type lava from cooling and cracking). Probably quite crystal-rich. Boninite pillow. (03:45:39 nav time) **East of summit** | geo | 1866 | 3 | 184 |
| 03.54.15 | Q331-rock-17 | -15.004426 | -173.792912 | **Q331-rock-17**. Going for another piece of the rind just a bit higher up on the pillow. This one will be for microbial analysis of the rind (Tebo's group). This is a boninite pillow. **East of summit** | geobio | 1866 | 3 | 184 |
| 04.57.15 | Q331-gtb-18 | -15.004592 | -173.793446 | **Q331-gtb-18**. Green gastight fired over the top of the flow from broken off small sulfide chimney. The chimney has a thick rind of chalcopyrite with intense flow. 242°C Quest temperature reading. (04:52:19 nav time) **Chimney summit area.** | gas | 1840 | 1 | 244 |
| 05.05.25 | Q331-gtb-19 | -15.004592 | -173.793446 | **Q331-gtb-19**. Black gastight fired far into the chimney flow. Great sample. 242°C Quest temperature reading. **Chimney summit area.** | gas | 1840 | 1 | 244 |
| 05.13.31 | Q331-major-20 | -15.004592 | -173.793446 | **Q331-major-20**. White major sampler is down in the chimney orifice quite a way. This looks like a great sample. 242°C Quest temperature reading. **Chimney summit area.** | fluid | 1840 | 1 | 244 |
| 05.31.27 | Q331-major-20 | -15.004576 | -173.793433 | Fluid sample: **Q331-DNA-RNA-21**. Fluid filter sample for DNA and RNA analysis - using the pelagic pump (hose from pump attached to the suction sample hose). The hose is positioned over the bacterial mat in more diffuse flow just to the left of the hot chimney we have been sampling. Sample for Julie Huber. (05:21:20 nav) **Chimney summit area**. Surface: DNA microbio sample appears good. | fluid | 1840 | 1 | 244 |

| timeUTC | sample | latitude | longitude | Q331 Mata Tolu Sample Comments | type | Z | alt | hdg |
|---|---|---|---|---|---|---|---|---|
| 05.41.36 | Q331-biomacro-22 | -15.004576 | -173.793433 | **Q331-biomacro-22**. Suction sampling shrimp. They have collected lots of shrimp here. Not sure how many of them have stayed in the chamber. **Chimney summit area.** Postcruise: suspect no sample at surface? | bio | 1840 | 1 | 244 |
| 05.45.45 | Q331-biomacro-23 | -15.004576 | -173.793433 | **Q331-biomacro-23**. Suction sampling more the shrimp. Lots of shrimp collected. Seems like most of them stayed in the chamber. **Chimney summit area.** Postcruise: suspect no sample at surface? | bio | 1840 | 1 | 244 |
| 05.47.38 | Q331-sulfide-24. | -15.004576 | -173.793433 | **Q331-sulfide-24.** Hot smoker chimney piece. Got it. Beautiful piece with chalcopyrite lining inside. Beautiful chimney. Fist-sized. **Chimney summit area.** | geo | 1840 | 1 | 244 |

## Q332 Sample Log - West Mata

| timeUTC | sample | latitude | longitude | Q332 West Mata Sample Comments | type | Z | alt | hdg |
|---|---|---|---|---|---|---|---|---|
| 23-Sep 20.53.41 | Q332-rock-01 | -15.094552 | -173.749769 | **Q332-rock-01**. Piece of pillow crust from the west edge of Hades pit at 1257m. Sample is friable so probably from eruption within the past few years. First piece broke up so took another piece of the same crust. Sample for Tebo microbial studies. **W rim of Hades Pit** | geo | 1256 | 2 | 115 |
| 20.58.16 | Q332-rock-02 | -15.094552 | -173.749769 | **Q332-rock-02**. Pieces of same pillow crust for Rubin. Pillow from edge of a rim of fresh lavas. Larger piece with crumbled first piece. **W rim of Hades Pit** | geo | 1256 | 2 | 77 |
| 21.54.35 | Q332-rock-03 | -15.093982 | -173.749169 | **Q332-rock-03**. Piece of young (2-yr old?) lava on north rim of pit. Need piece of glass on it. Near target C. **N rim of Hades Pit.** | geo | 1240 | 2 | 197 |
| 22.30.50 | Q332-rock-04 | -15.094384 | -173.748182 | **Q332-rock-04**. At pinnacle (near summit) - very new lava. Piece of crust. | geo | 1171 | 3 | 295 |
| 23.22.14 | Q332-rock-05 | -15.093964 | -173.747782 | **Q332-rock-05**. Piece of new lava from contact of new pillow lavas over brecciated flow at N/NE summit rim. | geo | 1179 | 5 | 187 |
| 24-Sep 01.28.59 | Q332-major-06 | -15.094384 | -173.748435 | **Q332-major-06**. Sampling in this crack under a pillow where the temp reading was 19.3°C. This is the white major. The flow is slightly milky. **Shrimp Cliff (between the summit high and Hades pit).** | fluid | 1176 | 3 | 222 |
| 01.34.52 | Q332-major-07 | -15.094384 | -173.748435 | **Q332-major-07**. Sampling with the red major in this crack under a pillow where the temp reading was 19.3°C. The flow is slightly milky. **Shrimp Cliff**. | fluid | 1176 | 3 | 222 |
| 01.42.19 | Q332-gtb-08 | -15.094384 | -173.748435 | **Q332-gtb-08**. The blue gastight in the same orifice as the last 2 major samples. The temp here was 19.3°C in slightly milky flow coming out from under a pillow lobe. **Shrimp Cliff.** | gas | 1176 | 3 | 222 |
| 01.48.20 | Q332-gtb-09 | -15.094384 | -173.748435 | **Q332-gtb-09. T**he red gastight in the same orifice as the last 3 samples. The temp here was 19.3C in slightly milky flow coming out from under a pillow lobe. **Shrimp Cliff.** | gas | 1176 | 3 | 222 |

| **time**UTC | **sample** | **latitude** | **longitude** | **Q332 West Mata Sample Comments** | **type** | **Z** | **alt** | **hdg** |
|---|---|---|---|---|---|---|---|---|
| 01.56.37 | Q332-biosed-10 | -15.094384 | -173.748435 | **Q332-biosed-10.** The McPhail syringe sampler is in the sediments adjacent to the hole where the fluid samples were collected (19.3°C in flow). Grey/black/red colored sediments. No obvious heat or microbial mat at the exact sampling site. **Shrimp Cliff.** | bio | 1176 | 3 | 222 |
| 02.12.11 | Q332-biomicro-11 | -15.094384 | -173.748435 | **Q332-biomicro-11.** DNA/RNA filter sample for Julie Huber. The pelagic pump attached to the suction sampler will suck up water coming out of the same hole where the majors and gastights were collected (19.3°C in flow). **Shrimp Cliff.** Surface sample appears good. | bio | 1176 | 3 | 222 |
| 02.28.42 | Q332-biosed-12 | -15.094397 | -173.748447 | **Q332-biosed-12**. Suction sample of sediments pharmacological analysis. Sediments are gray; probably volcaniclastic. **Shrimp Cliff** site. | bio | 1175 | 3 | 222 |
| 02.42.11 | Q332-biomacro-13 | -15.094397 | -173.748447 | **Q332-biomacro-13.** Rotated the suction canister after observing several shrimp in the chamber. Hopefully there will be some shrimp in jar 2. **Shrimp Cliff** site. Surface bio samples 13-19: Opaepele and Opaepele gravid shrimp. | bio | 1176 | 3 | 222 |
|  | Q332-biomacro-14 | -15.094397 | -173.748447 | **Q332-biomacro-14.** Suction of shrimp into canister 3. These shrimp are really small so are hard to keep in the canister chamber. **Shrimp Cliff** site. Surface bio samples 13-19: Opaepele and Opaepele gravid shrimp. | bio | 1176 | 3 | 222 |
|  | Q332-biomacro-15 | -15.094397 | -173.748447 | **Q332-biomacro-15.** Suction of shrimp into canister 4. The shrimp are covering the rocks in this area. These shrimp are really small. Looks like there are some in the jar. **Shrimp Cliff** site. Surface bio samples 13-19: Opaepele and Opaepele gravid shrimp. | bio | 1176 | 3 | 222 |
| 03.04.05 | Q332-biomacro-16 | -15.094397 | -173.748447 | **Q332-biomacro-16.** Suction of shrimp into canister 5. The shrimp are covering the rocks in this area. These shrimp are really small. Looks like there are some (3) in jar 5. **Shrimp Cliff** site. Surface bio samples 13-19: Opaepele and Opaepele gravid shrimp. | bio | 1176 | 3 | 222 |
| 03.06.05 | Q332-biomacro-17 | -15.094397 | -173.748447 | **Q332-biomacro-17.** Suction of shrimp into canister 6. The shrimp are covering the rocks in this area. These shrimp are really small. Looks like there are some (3) in jar 6. **Shrimp Cliff** site. Surface bio samples 13-19: Opaepele and Opaepele gravid shrimp. | bio | 1176 | 3 | 222 |
| 03.07.03 | Q332-biomacro-18 | -15.094397 | -173.748447 | **Q332-biomacro-18.** Suction of shrimp into canister 7. The shrimp are covering the rocks in this area. These shrimp are really small. Looks like there are a few in jar 7. **Shrimp Cliff** site. Surface bio samples 13-19: Opaepele and Opaepele gravid shrimp. | bio | 1176 | 3 | 222 |
| 03.18.41 | Q332-biomacro-19 | -15.094397 | -173.748447 | **Q332-biomacro-19.** Suction of shrimp into canister 8. The shrimp are covering the rocks in this area. These shrimp are really small. Looks like there are a few in jar 8. **Shrimp Cliff** site. Surface bio samples 13-19: Opaepele and Opaepele gravid shrimp. | bio | 1176 | 3 | 222 |

| timeUTC | sample | latitude | longitude | Q332 West Mata Sample Comments | type | Z | alt | hdg |
|---|---|---|---|---|---|---|---|---|
| 03.40.59 | Q332-biomacro-20 | -15.094397 | -173.748447 | **Q332-biomacro-20** Shrimp captured in the butterfly net. It's going into the biobox. There are probably at least a dozen shrimp in the net. **Shrimp Cliff** site. No surface sample. | bio | 1176 | 3 | 222 |
| 05.10.37 | Q332-major-21 | -15.093730 | -173.747724 | **Q332-major-21.** Sampling diffuse fluid. Gray rocks in the area of diffuse flow with a light coating of bacterial mat. Temperature here was 10.1°C. **Blue Streak** venting site. | bio | 1243 | 2 | 284 |

## Q333 Sample Log – Niua South

| timeUTC | sample | latitude | longitude | Q333 Niua South Sample Comments | type | Z | alt | hdg |
|---|---|---|---|---|---|---|---|---|
| 24-Sep 20.05.20 | Q333-biorock-01 | -15.166415 | -173.575824 | **Q333-biorock-01**. Davis sampler scoop of manganese coating on pumice rocks at the bottom of the small (southwestern-most) pit with diffuse hydrothermal venting. Some sample moved in the lower chamber. Used small Davis #9 (double-chamber) sampler. **The small southern pit.** (20:23:16 nav fix) | bio | 1164 | 1 | 334 |
| 20.27.38 | Q333-biorock-02 | -15.166415 | -173.575824 | **Q333-biorock-02**. Scrape of big rock's black manganese coating with Davis sampler #1 (large for DNA analysis). Quite a large sample. **The small southern pit.** (21:16:14 nav fix). Surface bio sample: clam. | bio | 1164 | 1 | 349 |
| 21.27.54 | Q333-rock-03 | -15.165550 | -173.574299 | **Q333-rock-03**. Sample of in-place lava rock from outcrop. Sample has orange coating. Location is **near the southern rim of the large pit** (which has active hydrothermal systems in the bottom). | geo | 1154 | 1.7 | 113 |
| 23.38.54 | Q333-biomacro-04 | -15.164479 | -173.572880 | **Q333-biomacro-04.** Suctioning shrimp off the sulfide chimney in the oxidized area. Several shrimp when in container 1. **(Target D chimney original name - actually Target E sulfide structure).** Surface bio samples 04-06: Opaepele and Alvinocaris shrimp; brachyuran crab. | bio | 1150 | 4 | 76 |
| 23.40.23 | Q333-biomacro-05 | -15.164479 | -173.572880 | **Q333-biomacro-05**. Sucking shrimp off the sulfide chimney in the oxidized area. Several shrimp went into chamber 2. **(Target D? actually Target E sulfide structure). ).** Surface bio samples 04-06: Opaepele and Alvinocaris shrimp; brachyuran crab. | bio | 1150 | 5 | 76 |
| 23.45.36 | Q333-biomacro-06 | -15.164479 | -173.572880 | **Q333-biomacro-06.** Sucking shrimp off the sulfide chimney near white microbial mat area - just a little lower on the chimney and to the right of previous 2 samples. Shrimp into chamber 3. Good haul that time; possibly close to a dozen. **(Target D? actually Target E sulfide structure).** Surface bio samples 04-06: Opaepele and Alvinocaris shrimp; brachyuran crab. | bio | 1150 | 5 | 76 |
| 25-Sep 00.34.55 | Q333-major-07 | -15.164479 | -173.572880 | **Q333-major-07**. Red major in the black smoke flow at the base of this chimney; among the snails that ended up there after the chimney fell apart. Quest temp reading: 274°C flow. **(Target D? actually Target E sulfide structure)** | fluid | 1150 | 1 | 98 |

| timeUTC | sample | latitude | longitude | Q333 Niua South Sample Comments | type | Z | alt | hdg |
|---|---|---|---|---|---|---|---|---|
| 00.40.43 | Q333-major-08 | -15.164479 | -173.572880 | **Q333-major-08**. White major in the black smoke flow at the base of this chimney among the snails that ended up there after the chimney fell apart. Quest temp reading: 274°C flow. **(Target D? actually Target E sulfide structure)** | fluid | 1150 | 1 | 98 |
| 00.55.46 | Q333-biosed-09 | -15.164479 | -173.572880 | **Q333-biosed-09**. McPhail syringe sample of gray sediment to the left of the flow where 2 previous major samples were taken. The sediment is most likely partly beehive material and partly oxidized sulfide. Is there any sediment in the syringe? **(Target D? actually Target E sulfide structure)** | bio | 1150 | 1 | 98 |
| 01.04.27 | Q333-gtb-10 | -15.164479 | -173.572880 | **Q333-gtb-10**. Green gastight in the black smoke flow at the base of the chimney among the snails that ended up there after the chimney fell apart. The tip is in the vent. Looks like a good sample. Quest temp reading: 274°C flow. **(Target D? actually Target E sulfide structure)** | gas | 1150 | 1 | 98 |
| 01.24.14 | Q333-biosed-11 | -15.164479 | -173.572880 | **Q333-biosed-11**. Suctioning up the black sediment (beehive) and possibly some iron oxide/sulfide material at the base of the chimney. That's a nice sample. Sample for McPhail pharmacological studies. **(Target D? actually Target E sulfide structure)** | bio | 1150 | 1 | 98 |
| 01.25.28 | Q333-biomacro-12 | -15.164479 | -173.572880 | **Q333-biomacro-12**. Suction biology: brachyuran and some shrimp into container 5. **(Target D? actually Target E sulfide structure).** Surface bio samples 12-15: Opaepele shrimp. | bio | 1150 | 1 | 98 |
| 01.26.14 | Q333-biomacro-13 | -15.164479 | -173.572880 | **Q333-biomacro-13**. Suctioning more biology: Shrimp? Into container 6. **(Target D? actually Target E sulfide structure).** Surface bio samples 12-15: Opaepele shrimp. | bio | 1150 | 1 | 98 |
| 01.31.13 | Q333-biomacro-14 | -15.164479 | -173.572880 | **Q333-biomacro-14**. Suctioning more biology: Crab and a shrimp? Into container 7. Possibly some sulfide pieces? **(Target D? actually Target E sulfide structure).** Surface bio samples 12-15: Opaepele shrimp. | bio | 1150 | 1 | 98 |
| 01.32.07 | Q333-biomacro-15 | -15.164479 | -173.572880 | **Q333-biomacro-15**. Suctioning more biology: Crab and a Shrimp? Into container 8. Possibly some sulfide pieces? **(Target D? actually Target E sulfide structure).** Surface bio samples 12-15: Opaepele shrimp. | bio | 1150 | 1 | 98 |
| 01.45.16 | Q333-sulfide-16 | -15.164479 | -173.572880 | **Q333-sulfide-16**. A large piece of sulfide is in the claw. Grabbed from near the top of the sulfide complex. It's orangish brown and inactive. Held in the claw for the ascent; but was not in the claw when got to the surface. **(Target D? actually Target E sulfide structure)** | geo | 1150 | 1 | 98 |
| 02.49.47 | Q333-sulfide-17 | -15.164479 | -173.572880 | **Q333-sulfide-17**. Piece of sulfide found on the back of the vehicle on its return. Described as outer rind of probably inactive sulfide. Most likely from Target D**?( actually Target E sulfide structure.)** | geo | 1150 | 1 | |

# 4.0 Navigation

## 4.1 Lau Basin *Quest 4000* ROV Navigation Processing

Andra Bobbitt

ROV Quest navigation utilized an Ultra Short Baseline (USBL) navigation system with software modified from the WHOI ROV *JASON* group for data logging. Quest ROV navigation was logged at 2-second intervals when fixes were obtainable. Navigation data initially appeared to have a problem with the recording of significant digits, by logging insufficient digits for longitude which had not been seen on our recent JASON expeditions. At small scale map displays the dive navigation appears to align along longitude lines due to this lack of precision in the original navigation as well as in the post-processed data (Fig 4.1-1 below). The magnitude of the significant digit error was ultimately less than 1.5 meters, determined to be within reasonable navigational errors expected at this depth.

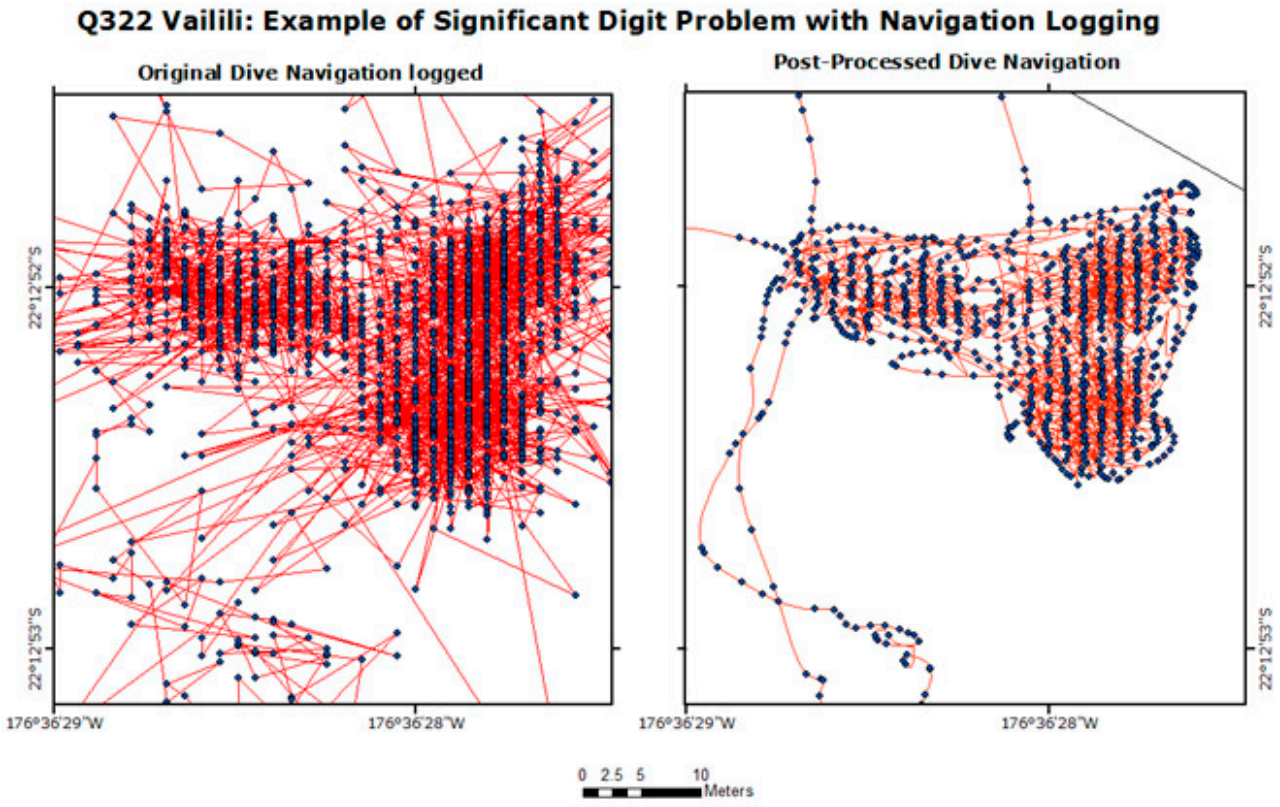



**Fig. 4.1-1.** Raw (l) and processed (r) Quest navigation.

Unfortunately for dives Q322-327, a cover had been left on the USBL transducer in the ships well, interfering with USBL navigation and positioning during those dives. Navigation significantly improved for dives Q328 – Q333.

Final navigation processing was complicated by the lack of post-processing software such as *JASON's* RENAV, which reprocesses USBL navigation incorporating ROV speed/depth/heading information and merging it with Doppler navigation. We decided not to attempt to obtain and reprogram the RENAV software for this expedition; instead we post-processed the data using smoothing algorithms available through our GIS software. Figure 4.1-2 shows the processing steps and resulting final navigation for Q325. The basic ArcGIS processing schema was to edit out extreme navigation points (Fig 4.1-2A); create point and line shapefiles; utilize "SmoothLine" through several iterations to obtain a reasonable navigation path (Fig 4.1-2B); use "Snap" to then place the navigation points on the smoothed line and recalculate their latitude/longitude values (green dots of navigator log entries on Fig 4.1-2C). Some dives were further processed by shifting the navigation using ArcGIS to match bathymetric depth values and features (Fig 4.1-2D). Figure 4.1-2 shows all the navigation steps combined. Table 4.1-1 lists each particular process used on each of the Quest dives.

**Table 4.1-1. Navigation Processing Parameters for *Quest 4000* Dives**

| Dive | Location | Smooth Tolerance | Shift Lat/Long (Y/X meters) | Notes |
|---|---|---|---|---|
| Q322 | Vai Lili | 15 | none | |
| Q323 | Fonualei | 10 | none | 02:08-04:02 water column transit |
| Q324 | Motutahi | 13 | +2 / -10 | navigation gap 22:12-22:22 |
| Q325 | N. Mata Ua | 10 | -11 / +68 | nav gaps 22:51-23:51, 03:33-04:27 |
| Q326 | Niua S. 23:22:22-01:42:12 | 15 | -14 / +24 | nav gap 01:51-02:34 |
| | Niua S. 02:33:58-03:29:32 | | none | |
| Q327 | W. Mata | 10 | -20 / +8 | nav gaps 00:11-00:28; 03:37-05:23; 07:01-07:18; transit 04:59-05:35 |
| Q328 | N. Mata Ua | 10 | none | |
| Q329 | N. Mata Fitu | 15 | none | |
| Q330 | Niua N. 20:36-05:02 | 11 | +30 / +14 | 04:55-05:02 at same position; fix at 05:02:30 not possible to move 60mS in 8 secs; navigation gap 05:03-:05:22 |
| | Niua N. 05:28-end | | +27 / +14 | |
| Q331 | N. Mata Tolu | 13 | none | several small nav gaps |
| Q332 | W. Mata | 10 | none | no log entries 03:56:26-04:02:44 with nav making big loop |
| Q333 | Niau S. | 13 | +24 / +22 | navigation ends at 01:16:44, ~30 minutes before coming off bottom |

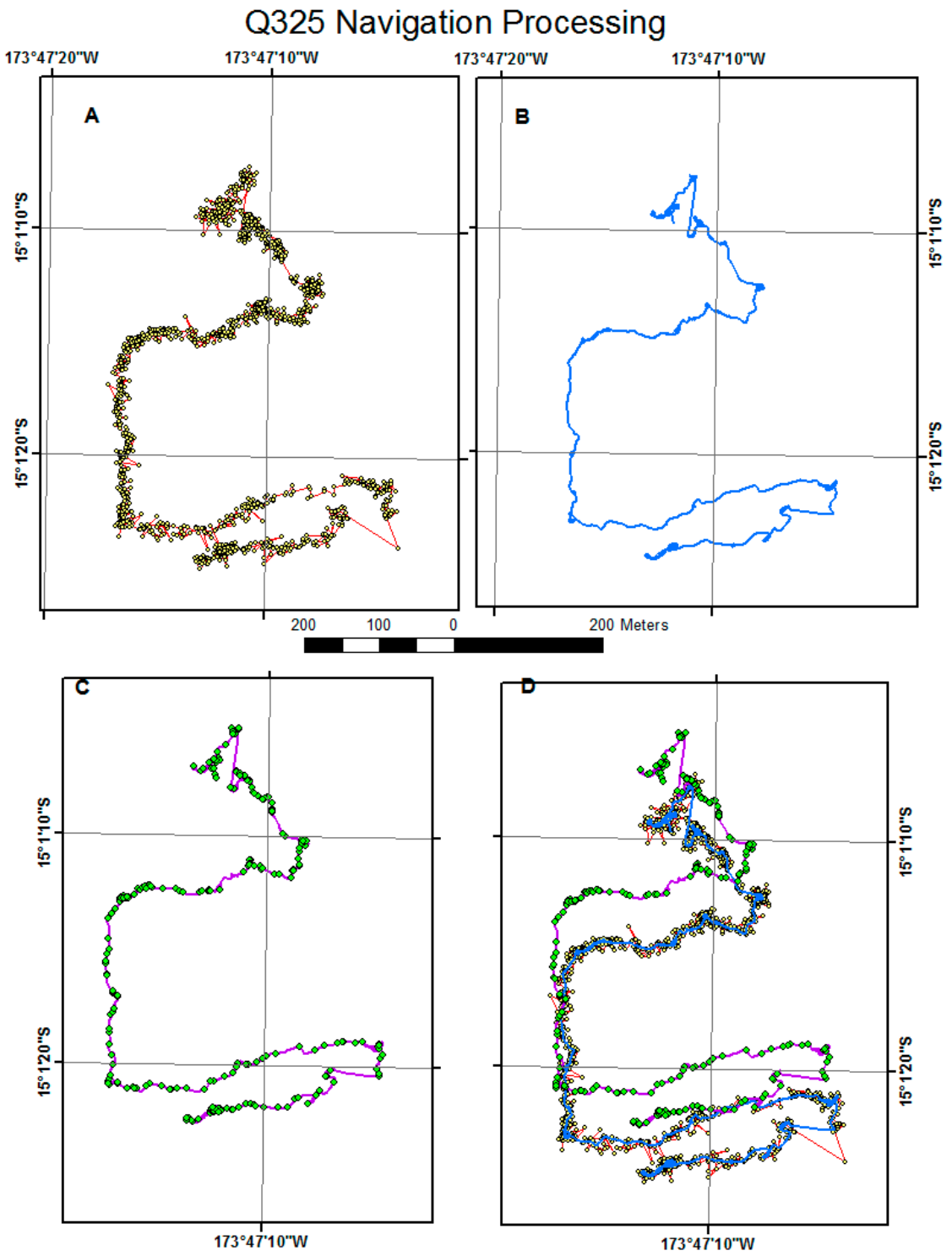



**Fig. 4.1--2.** GIS navigation processing steps. A) Edit out extreme nav points. B) Smooth the nav line. C) Snap the log entry points to the smoothed line. D) Shift the smoothed line and points if necessary.

Another complication regarding navigation data was the absence of a logging program which allowed for a dive logger to record significant events synced with the ROV navigation and time. Loggers improvised by using an EXCEL spreadsheet to record events with a time stamp. The time stamp field in the excel table was later used as the link to extract final Quest navigation information (latitude, longitude, depth, altitude) from the 2-second navigation data, and add it to the logger's event logging information (of variable time intervals) using EXCEL's VLOOKUP function. This syncing of data information to the event logger was completed as the last processing step to obtain data log entries that could be mapped along the smoothed (sometimes shifted) navigation line.

## 4.2 Quest 4000 Dive Maps: Navigation and Bathymetry Information

Susan Merle

Refer to dive maps in section 3.5 (pages 47 – 55).

AUV *ABYSS* high resolution multibeam bathymetry data used on several divemaps* is presented here with permission of C. Devey, GEOMAR Helmholtz Centre for Ocean Research and Nautilus Minerals, Inc. These are unpublished data not to be used without permission.
**ABYSS* data used on divemaps at Fonualei South, Niua North, Niua South and Mata Tolu.

*Jason-2* SM2000 bathymetry used on the Vai Lili divemap (Q322) was downloaded from MGDS. Data processed by Vicki Ferrini. Bathy collected in 2005 on expedition TUIM05MV (R/V *Melville*). Margaret Tivey chief scientist.

**Note: A portion of the navigation information below is also presented in the preceding Table 4.1-1.**

**Dive Q322 - Vai Lili, Valu Fa Ridge (Fig. 3.5-1)**
Bottom time: 9/10/2012 22:08 – 9/11 05:52
***Nav smoothed (tolerance=15). Did not shift the navigation.***
***Bathymetry:*** *Jason-2* AUV SM2000 bathymetry at Vai Lili Vent Field. 0.5 meter gridcell size. Data processed by Vicki Ferrini. Bathy collected in 2005 on expedition TUIM05MV (R/V Melville). Downloaded from MGDS. Margaret Tivey chief scientist. SM2000 bathy overlaid on EM122 bathy (30m gridcell size) collected on RR1211. Contour intervals: SM2000 5m, EM122 10m.

**Dive Q323 - Fonualei South, Fonualei Rift and Spreading Center (Fig. 3.5-2)**
Bottom time: 9/14/2012 22:05 – 9/15 02:08 and 04:02 - 05:14. (02:08 – 04:02 transit in water column)
***Nav smoothed (tolerance=10). Did not shift the navigation.*** No USBL nav after 04:24:08. On the bottom for nearly 1 hour at Laloa Kakai vent field (with the tall, skinny sulfide chimneys). No nav for most of that.
***Bathymetry:*** AUV *Abyss* bathy at Fonualei South. 0.5 meter gridcell size. A shift was applied to the AUV bathy to more closely align with the EM122 data collected on the KM1129a expedition in 2011. AUV bathy shift: +33m (east) +10m (north). AUV bathy overlaid on EM122 bathymetry (30m grid). 10m contours.

**Dive Q324 - Motutahi (Cone at Volcano O), Niuatahi (Volcano O) (Fig. 3.5-3)**
Bottom time: 9/13 21:13 - 9/14 05:59
***Nav smoothed (tolerance=13). Nav shifted: +2m (E) -10m (S).*** Nav gap 22:12 - 22:22. Last nav fix 05:44:58. Shifted nav is moved more to the center of the cone. Depths match up better after the move.
***Bathymetry:*** EM122 multibeam (KM1129a 2011), 25m gridcell size. 10 m contours. Usually the EM122 data is deeper than the log depths.

**Dive Q325 – North Mata Ua (Fig. 3.5-4)**
Bottom time: 9/14/2012 22:05 – 9/15 05:14
***Nav smoothed (tolerance=10). Nav shifted: -11m (W) +68m (N).*** Nav gaps: 22:51:44 - 23:51:45, 03:33:38 - 04:27:00.
***Bathymetry:*** EM122 multibeam (KM1129a 2011) 25m gridcell size. 10 m contours.

**Q326 - Niua South (Fig. 3.5-5)**
Bottom time: 9/17/2012 23:23 - 9/18 06:44
***Nav smoothed (tolerance=15). Split the nav file into 2 parts.*** Part 1 in/near the small SW pit. 23:22:22 - 01:42:12. Same nav fix 23:27 – 01:42. Gap 01:51 – 02:34. ***Moved nav file part 1: -14m (W) +24m (N)***. Part 2 in/near larger pit to north. 02:33:58 - 03:29:32 (last good nav fix). Same nav fix 03:29 – 04:05:32. 04:06:36 end of file. ***Did not move part 2 nav***.
***Bathymetry:*** AUV *Abyss* bathy 0.5 m grid. 10 m contours.

**Dive Q327 - West Mata 2012 (Fig. 3.5-6)**
Bottom time: 9/18 21:22 - 9/19 07:
***Nav smoothed (tolerance=10). Nav shifted: -20m(W) +8m(N).*** 22:51:26 - 23:12:22. Same nav point then jumps 80m NE at 23:12:24. Nav gaps: 00:11 – 00:28, 03:37 – 05:23, 07:01 - 07:18. Off bottom transiting 04:59 – 05:35.
***Bathymetry:*** EM122 multibeam, KM1129a 2011. 20 m gridcell size. 10 m contours. ROV log depths generally shallower than EM122.

**Q328 – North Mata Ua (Fig. 3.5-4)**
Bottom time: 9/19/2012 23:41 – 9/20 05:59
***Nav smoothed (tolerance=10). Did NOT shift nav.*** 5-10 m discrepancy between log and nav depths on steep slope.
***Bathymetry:*** EM122 multibeam (KM1129a 2011) 25m gridcell size. 10 m contours.

**Dive Q329 - North Mata Fitu (Fig. 3.5-7)**
Bottom time: 9/20/2012 21:38 – 9/21 06:04
***Nav smoothed (tolerance=15). Did NOT shift nav.*** Bathy depths match up pretty well with the log, even on this steep slope.
***Bathymetry:*** EM122 multibeam (KM1129a 2011). 30m grid. 10 m contours.

**Dive Q330 - Niua North (Fig. 3.5-8)**
Bottom time: 9/21/2012 20:36 – 9/22 06:06
***Nav smoothed (tolerance=11).*** 04:55:08 – 05:02:22 same position. Next nav fix 05:02:30 is 60m due S of the previous position. Not possible to move that far in 8 secs. ***Split the nav file into 2 parts***. Part 1 nav:

9/21 20:36 – 9/22 05:02***. Moved part 1 nav: +30m (E), +14m (N).*** Part 2 nav: 05:22:32 – 06:07. Missing nav 05:03 – 05:22. 05:28:35 back at Hellow: ***Moved part 2 nav: +27m (E). +14m (N).***
***Bathymetry:*** AUV *Abyss* bathy, 0.5m grid, overlaid on EM122 multibeam bathy (KM1129a 2011), 30m grid. 5 m contours.

**Dive Q331 - North Mata Tolu (Fig. 3.5-9)**
Bottom time: 9/22/2012 21:15 – 9/23 06:01
***Nav smoothed (tolerance=13). Did NOT shift nav.*** Several small nav gaps. Eliminated some points to remove wander. EM122 depths are consistently deeper than the AUV data here, and tend to agree with the Quest altimeter more than the AUV data do. ***Bathymetry:*** AUV *Abyss* bathy, 0.5m grid. 10m contours. AUV grid is a shifted version (based on EM300 and EM122 data) of the Nautilus "reprocessed" grid. AUV grid shift is -130m (W) -150m (S).

**Q332 - West Mata 2012 (Fig. 3.5-6)**
Bottom time: 9/23 20:14 - 9/24 05:15
***Nav smoothed (tolerance=10). Nav NOT shifted.*** No log entries 03:56:26 - 04:02:44. Nav takes a big loop (wander?) with sparse data points. That is probably not real.
***Bathymetry:*** EM122 multibeam, KM1129a 2011. 20 m gridcell size. 10 m contours. ROV log depths generally shallower than EM122.

**Q333 - Niua South (Fig. 3.5-5)**
Bottom time: 9/24/2012 19:07 – 9/25 01:53
***Nav smoothed (tolerance=13). Moved nav file +24m (E), +22m (N).*** Nav ends at 01:16:44 (~30 min before coming off bottom). Sampling at chimney site (Target E) from 23:38 – 02:49.
***Bathymetry:*** AUV *Abyss* bathy 0.5 m grid. 10 m contours.

# 5.0 Ocean Exploration and Research (OER) Mobile Telepresence and Outreach

## 5.1 Development and Field Trial of OER's Mobile Telepresence Unit Aboard the R/V *Roger Revelle*, Streaming *Quest 4000* Video and Audio

Roland Brian: Contractor to OER, Steve Foley: UCSD HSN, Webb Pinnear: NOAA OER, Joseph Resing: JISAO-UW/NOAA PMEL, Sharon Walker: NOAA PMEL

***INTRODUCTION:***

NOAA's Office of Ocean Exploration and Research (OER) recently designed and built their first Mobile Telepresence Unit (MTU). The MTU is capable of streaming live high-definition video with audio commentary from any oceanographic research vessel with adequate lab/storage space and appropriate satellite communication system to the OceanExplorer website, YouTube Live and mobile devices. The system was initially developed to support the recently completed 2012 Submarine Ring of Fire Expedition to the NE Lau basin. The MTU allowed scientists and public audiences worldwide to watch live underwater video from a Remotely Operated Vehicle (ROV) and listen to actual observations and reactions from shipboard scientists as they explored extensive hydrothermal features and unique chemosynthetic biological communities.
The cruise included an international team of scientists and engineers. Also onboard was the *QUEST-4000* ROV, operated by the MARUM Center for Marine Environmental Sciences, University of Bremen, Germany and OER's Mobile Telepresence Unit.

***Background:***

In May 2012 at the request of Chief Scientist Joe Resing, PMEL Oceanographer Sharon Walker contacted Webb Pinner, Telepresence Team Lead for OER's Okeanos Explorer Program, to discuss the possibilities of broadcasting live underwater video from a high definition camera on the German *QUEST-4000* ROV to the Internet. In addition to video, the science team wanted to record and embed audio commentary into the live video stream as well as the raw video being recorded by the ROV team's video recording system. Timing was a serious concern because the cruise was scheduled to begin in 15 weeks.

Work began planning and budgeting for a system that would meet the functionality requirements. Simultaneously, discussions started between OER, PMEL, HiSeasNet (the ship's satellite provider), the MARUM ROV team, and the Inner Space Center (ISC) at the University of Rhode Island (URI) Graduate School of Oceanography (GSO). The major difficulties facing the project were: equipment procurement, equipment delivery lead times, the hiring of support personnel, acquiring improved satellite bandwidth, interfacing with the ROV's high-definition camera, and disseminating the live video over the Internet.

The proposed design and budget estimates were submitted to OER leadership for approval. OER Director Tim Arcano and Deputy Director John McDonough both saw the potential in promoting the cruise through the use of live video as well as the value of investing in the development of a mobile telepresence capability that could be used on UNOLS as well as other vessels supporting

ocean exploration and research. The plan and budgets were approved and OER funded the project in full.

***Design and Development**:*

The first task was to ensure the ship's satellite equipment could support the minimum bandwidth requirements for streaming video. The *R/V Roger Revelle* was equipped with a 2.4m SeaTel 9797 satellite antenna. During normal deployments the vessel operates with a 96kbps Internet connection. This connection provides email and basic web access to the ship's crew and science party. This project would require the existing antenna, satellite modem and amplifier to support a 1.5Mbps outbound data pipe, representing a 1600% increase.

Steve Foley from HiSeasNet concluded that the existing equipment on the *R/V Roger Revelle* would be able to support the higher bandwidth. However for monetary reasons and scheduling constraints there was no way to test the link prior to the start of the cruise.

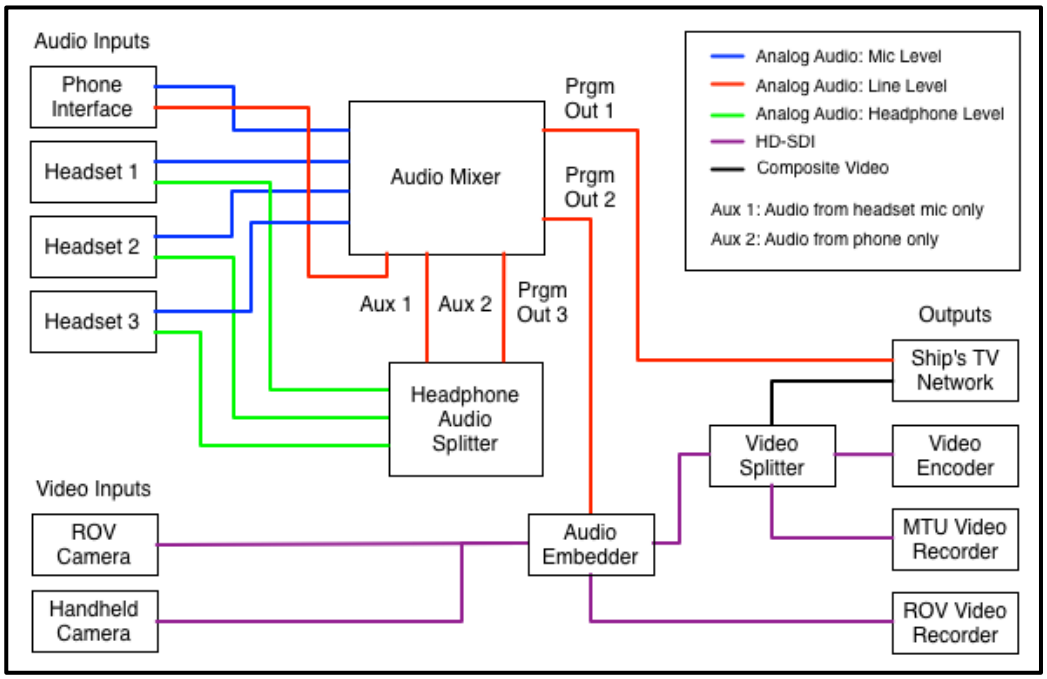



**Fig. 5.1-1.** High-level design for the MTU01.

The next challenge was solving how to disseminate the live video over the Internet. For this OER leveraged their existing partnership with the ISC. Once the video reached the HiSeasNet Earth station at USCD, it would be sent via network to the ISC in Rhode Island. Re-tasking equipment typically used to compress and distribute video from the NOAA Ship *Okeanos Explorer*, the ISC had to ingest, convert and upload a properly formatted video stream to streaming servers at the ISC's Content Distribution Network (CDN). The CDN provided the required services and bandwidth to support an almost unlimited number of Internet viewers, including those tuning in via mobile devices (Android and iOS devices). The ISC technical staff was supported through the cooperative agreement between OER and URI.

A team at PMEL procured all necessary equipment for the MTU. This included the video encoder, audio mixer, audio embedder, supporting equipment (cabling, connectors, spares), tooling and shipping supplies. Despite the time required to process procurement requests and equipment lead times, all parts arrived at the new OMAO Port Office in Davisville, Rhode Island by the required date. Roland Brian, a broadcast engineering contractor who has been previously used to support the telepresence system aboard the NOAA Ship *Okeanos Explorer,* was brought in to assist in the build out of the MTU.

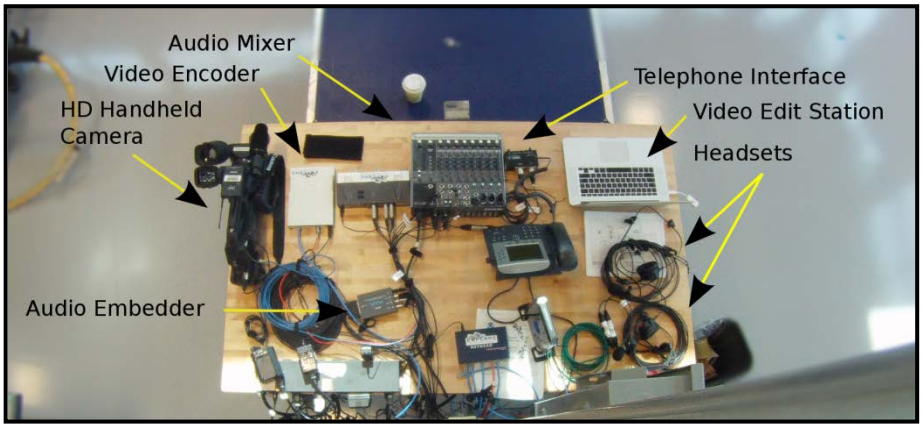



**Fig. 5.1-2.** Primary Components of the MTU01

The equipment began to appear at the NOAA Port Office in Davisville Rhode Island approximately 3 weeks prior to the cruise. For the next week Webb Pinner and Roland Brian, assembled what is now called OER's first Mobile Telepresence Unit (MTU01).

In addition to meeting all original requirements, OER wanted to extend the functionality of the MTU such that it could collect video from sources other than the ROV. For the MTU01's first deployment the additional equipment was provided on loan from the *NOAA Ship Okeanos Explorer.* The loaned equipment included an HD handheld camera, tripod, 4 GoPro point-of-view (POV) cameras with various mounting options, camera lights, a HD video recorder with 6TB of video storage, and a video edit station. On August 24$^{th}$, 2012 the completed system shipped from Davisville, RI to the port of departure (Suva, Fiji) via air freight. The entire system fit on a single shipping pallet and weighed approximately 325 lbs.

**Fig. 5.1-3.** OER's MTU01 ready for shipment to Fiji.

From early on in the planning stage it was apparent that the system would be too complex to setup and operate without a dedicated technician. For that task Roland Brian joined the science team on the ship in Fiji to install and support the equipment for the duration of the cruise. In addition to installing and maintaining the system, Roland would collect additional topside footage of the scientists and ROV team at work and produce dive highlight videos. The additional topside video of shipboard activities can be used to develop video products that tell the complete story of the cruise.

***The Cruise Begins:***

The MTU01 was loaded onto the *R/V Roger Revelle* at 4:30pm on Friday, September 7th, 2012. With the equipment onboard, Roland worked to run the necessary cabling, setup and secured equipment for sea and began training the science party on the use of the headsets that would capture their observations. The team from HiSeasNet, lead by Steve Foley, successfully increased the outbound bandwidth on the vessel by 1600%. Shortly thereafter, the first live images of the ship's main lab reached the ISC in Rhode Island. Within an hour the stream was redirected to the ISC's CDN and was being viewed on the OceanExplorer website and YouTube Live .

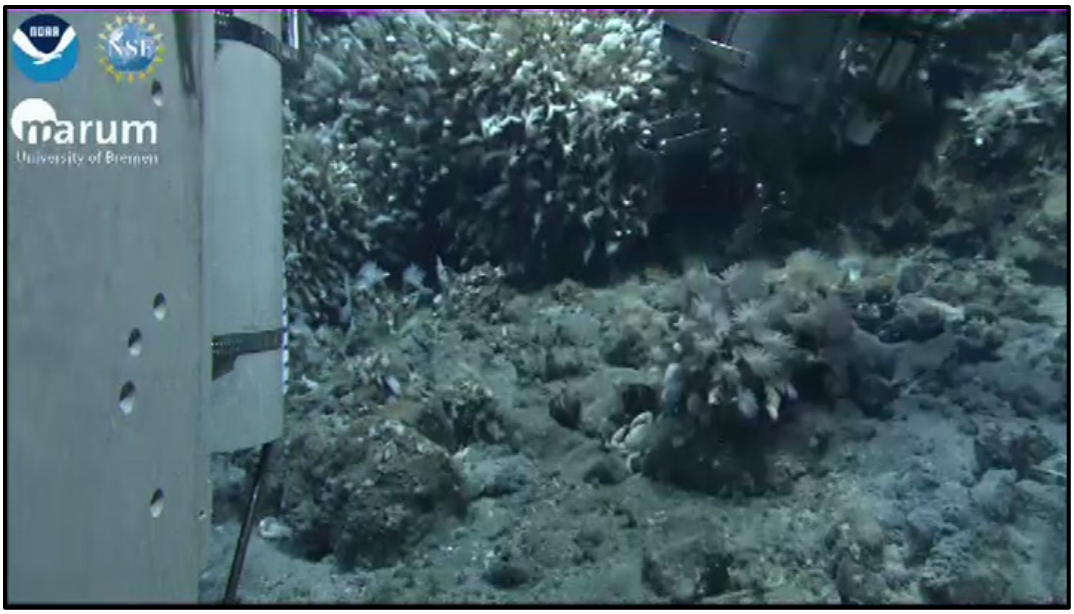



**Fig. 5.1-4.** Screen grab from ROV off the OceanExplorer website.


**Fig. 5.1-5.** Screen grab from the ROV off the OceanExplorer website.

The vessel departed Suva, Fiji on Sunday, September 9th, 2012. As the days progressed the daily operations fell into a steady rhythm: at 0800 ship local time the ROV team launched the vehicle. At 2000 ship local time the ROV was recovered. Video of each ROV launch and recovery was captured by the MTU's handheld camera and streamed live to the Internet. Once the ROV was in the water, the video stream switched to the ROV's HD camera.

Throughout the dive Roland recorded a subset of the underwater footage using the MTU's video recorder. Each night the MTU would stream the raw underwater highlights from the previous ROV dive. This model insured there was live or otherwise interesting video streamed to the Internet 24 hours a day. In addition to streaming raw video, the ship also hosted a live outreach event with the San Francisco Exploratorium.

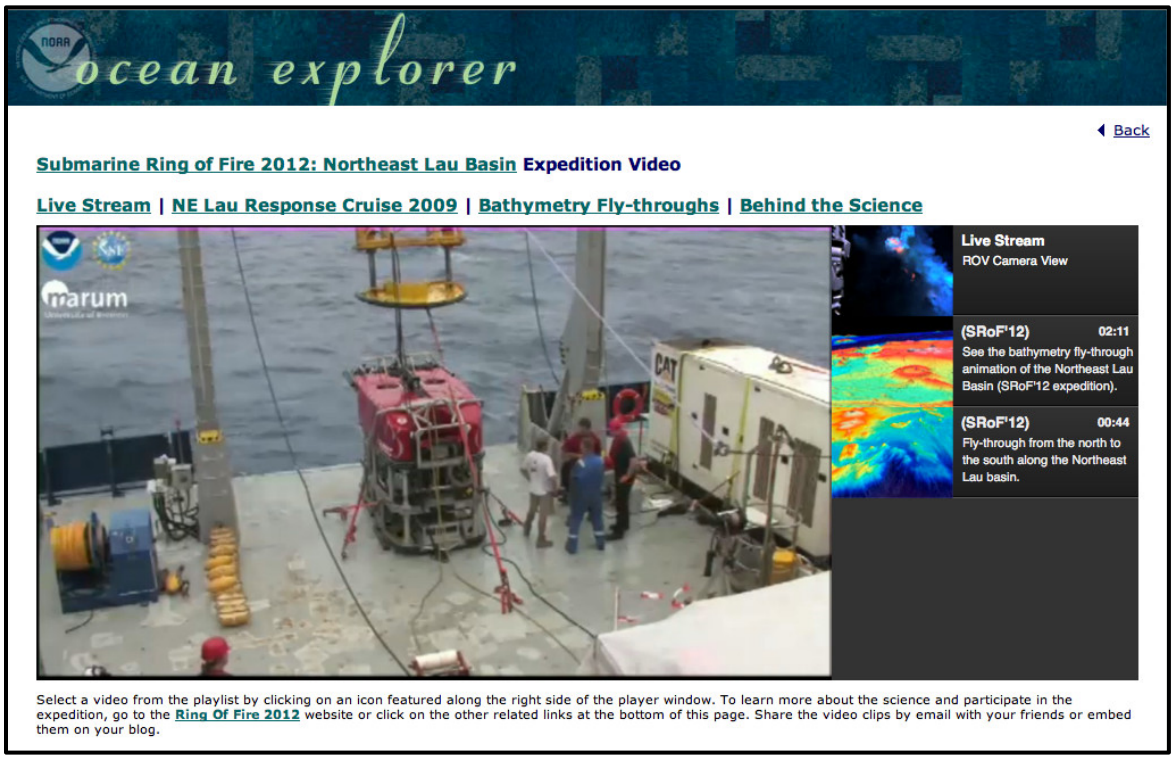



**Fig. 5.1-6**. Screen grab of the OceanExplorer website during the launch of the ROV.

***Conclusion of the Cruise:***

The cruise completed on September 27th, 2012 in Apia, Samoa. This mobile telepresence investment greatly enhanced the outreach capabilities of this exciting expedition. The MTU01 demonstrated that this capability is well within the reach of the ocean science community, even on short notice and on vessels operating on the far side of the world.

As part of the arrangement for this project, the Mobile Telepresence Unit (MTU)01 is the property of OER and will be managed by the Okeanos Explorer Program. The system will reside at the Port Office for the NOAA Ship *Okeanos Explorer* in Davisville Rhode Island. As demonstrated during this cruise, and as the name implies, the MTU is a portable system. In addition to physical space and satellite communication system requirements, use of the MTU requires a single bunk for a supporting broadcast engineer.

It is the hope of OER that the ocean science community will request to use the MTU on future cruises. As usage increases and budgets allow, OER plans to further develop the MTU and increase its capabilities. The cost model for use of the system and the ancillary expenses are still being discussed but it is the hope of OER that the ocean science community will ask to use the MTU again on future oceanographic expeditions.

## 5.2 Submarine Ring of Fire Expedition 2012 NE Lau Basin - Education and Outreach

Paula Keener

Education and Outreach for the Submarine Ring of Fire 2012 Lau Basin Expedition was the result of pre-mission, during mission, and post-mission efforts. The mission was featured on the NOAA Office of Ocean Exploration and Research OceanExplorer Website at http://oceanexplorer.noaa.gov/explorations/12fire/welcome.html. The offering consisted of five Science Content Essays with imagery, an Interactive Map of Proposed Dive Sites, two virtual flythroughs, eight 3-D high resolution multibeam images of proposed dive sites, and a Photo and Video Log. The site included an Expedition Education Module featuring 19 lessons for educators of Grades 5-12, OceanAGE career connections, and multimedia discovery mission interactive activities. Lessons were correlated to national standards and the Ocean Literacy Essential Principals and Fundamental Concepts, where appropriate. An Explorers Biographic Feature was also featured on the site.

The expedition was chronicled daily on the OceanExplorer site with "Stay Tuned" elements documenting the next day's dive targets and Daily Updates to succinctly capture daily activities. A total of 18 Daily Web Logs and supporting imagery (over 100 images) were produced by 17 contributors onboard the expedition. An Ask an Explorer Feature enabled audiences to email questions and receive answers from expedition scientists while at sea.

Telepresence technologies enabled real-time video from the *Quest 4000* ROV and audio from the R/V *Roger Revelle* during dives to be sent via satellite to the University of Rhode Island's Inner Space Center. From the Inner Space Center, the dive video and audio was broadcast to audiences worldwide via Internet 1 through the OceanExplorer Website, enabling anyone having access to the Internet to become engaged in the NE Lau Basin exploration efforts. A video technical support specialist was dedicated to the mission providing telepresence technical support as well as videodocumenting the entire mission at sea. A total of 22 dives have been added post- mission to the Video Playlist component of the OceanExplorer site to date.

Outreach activities included a tour of the R/V *Roger Revelle* for approximately 50 visitors, including students from the University of the South Pacific, journalists, television media, staff of the U.S. Embassy and U.S. Ambassador Frankie Reed. During the tour, they heard from scientists about the unique deepwater geology and associated ecosystems in the Lau Basin and the state-of-the-art technologies used by the science team to explore them. All had the opportunity to see the *Quest 4000* ROV, sit inside the small ROV control van and view very impressive high definition underwater video from previous dives in other parts of the world ocean. Additional outreach efforts included an audio webcast with The Exploratorium in San Francisco during the mission (Keener, Chadwick), a live Q&A audio cast with a public audience at the Long Beach Aquarium of the Pacific (Keener, Resing, Embley, and a live Q&A audio cast with museum visitors at the Smithsonian Institution National Museum of Natural History's Sant Ocean Hall (Keener, Resing, Embley, Gorell, Le Voyer). The Hatfield Marine Science Center was also streaming real-time ROV video and audio to public audiences during the mission.

*Note: Paula Keener is a Marine Biologist and Director of the Education Program at the Office of Ocean Exploration and Research*

# 6.0 SRoF'12 Discipline Summaries

## 6.1 Geology

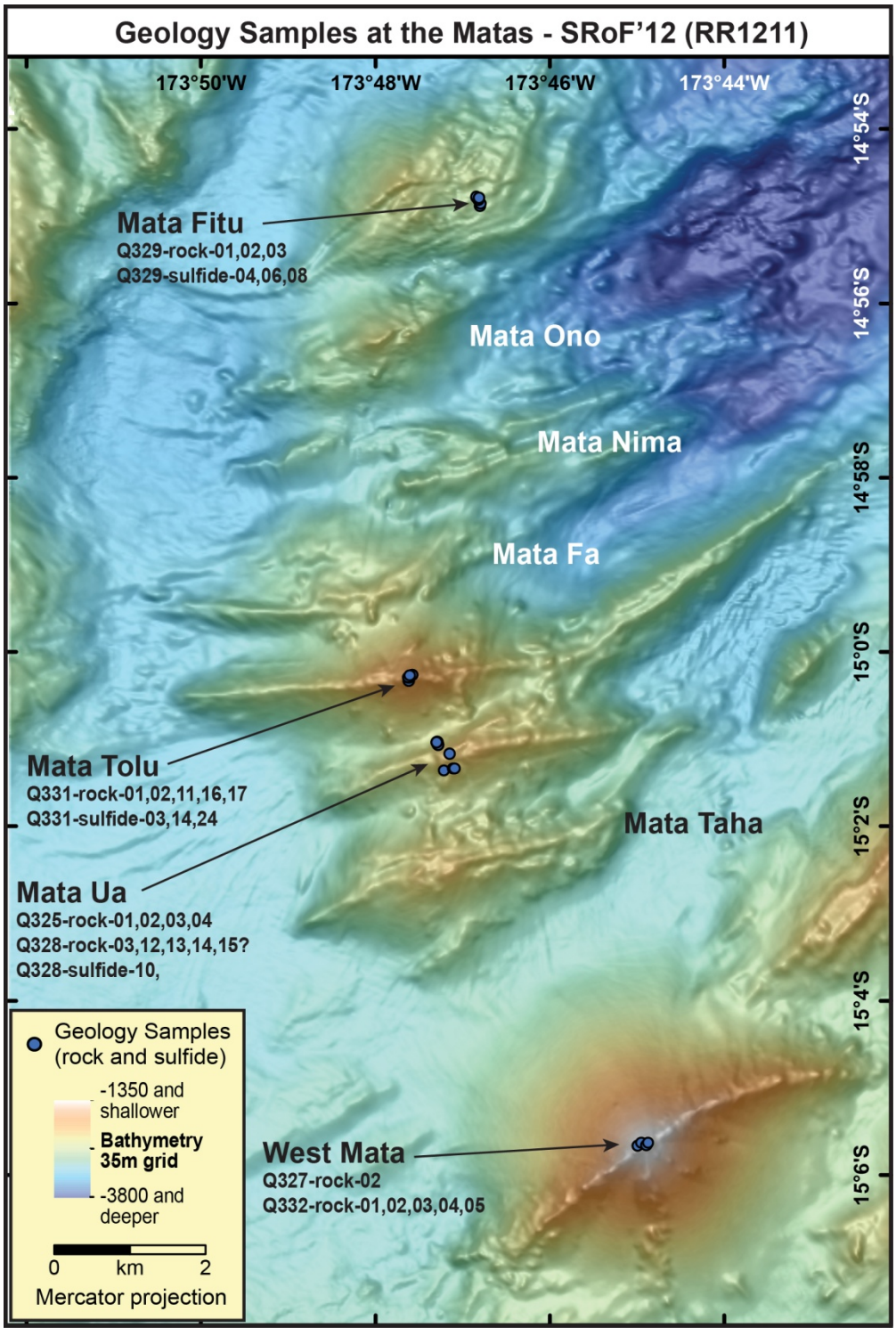



**Figure 6.1-1.** Geological samples at the Mata volcanoes.

### 6.1.1 Geological Observations and Geo-Sampling

Ken Rubin, Bob Embley

Geological observations and sampling were conducted on all of the Quest4000 dives of this research program. The study sites fit into three general tectonic settings: rear arc volcanoes, arc volcanoes and backarc spreading center volcanoes, exemplified by the Mata volcanoes (Fig 6.1.1-1), Niua volcano, and Fonualei spreading center, respectively. Most of the geo-sampling (and related observations) was focused on sites in the NE corner of the Lau basin and adjacent Tofua arc.

The main objective of the geo-sampling and geo-mapping was to investigate the volcanic and tectonic history of several volcanoes via in situ visual observation and follow-on rock compositional analysis, adding to and refining what our group has learned since 2008 at these sites during earlier work by bottom sampling (dredging) and/or towed camera surveys (on R/V *Kilo Moana* cruises KM1008, KM1024, KM1129a), plus ROV observation and sampling at West Mata volcano (on R/V *Thompson* cruise TN234).

Results of Quest4000 field observations on RR1211 and post-cruise laboratory studies of the geological specimens are being used to understand the petrological history of the target volcanoes, the relationship of rock chemistry to hydrothermal fluid composition at each study site, and the geological control on hydrothermal activity at these sites. The main benefit of in situ sampling is the ability to place the samples in stratigraphic and structural context, which is information we do not have from our dredge sample collections. A companion SROF12 geological program to sample hydrothermal deposits is described elsewhere in this report.

ROV dive objectives and specific sampling targets at each site were chose in consideration of our existing bottom camera, rock sampling, plume localization and bathymetric mapping data sets. The geological program was fully integrated into the overall SROF12 program objective to discover and observe hydrothermal vent sites and to sample fluids, mineral deposits, and biota at them. In general, geological observations were made at the beginning and end of each dive in the form of 100-200m transects in and around the vent sites, with occasional forays further afield (particularly at West Mata volcano).

In all, 43 numbered geological specimens were taken at 9 volcanoes on the SROF12 expedition (see table 6.1.1-1). Rear arc volcano sites included the Mata seamounts (a series of nine roughly NE-SW trending small elongate volcanoes of varying heights and sizes) and Volcano 'O' (also known as Niuatahi), a large caldera volcano supporting a resurgent intra-caldera volcanic cone and extensive extra-caldera lava flows. Arc sites were situated at Niua volcano on the Tofua Arc, in and around previously defined hydrothermal sites called Niua North and Niua South. Two back arc spreading center sites were also investigated elsewhere in the Lau basin, at the southern portion of Fonualei Spreading Center and on the Valu Fa Ridge (although this latter site was primarily visited for microbiological objectives).

Lava and pyroclastic samples collected on the cruise generally conformed to expectations based on our prior sampling efforts (i.e., there were no surprises). Lava samples from the Mata group of volcanoes were all crystal rich (20-40%), boninite or boninite-like lithologies of varying degree of freshness and presumed age. Samples recovered from Volcano 'O' were glassy dacites. Rhyolites were recovered from the sites at Niua.

Highlights of the geo-sample observations, some of which include results of ongoing shore-based petrological analyses (by S. Glancy, K. Rubin and E. Hellebrand at the University of Hawaii), include: (a) detailed examination of end-of-eruption volcanic features at West Mata volcano, including discovery of what appear to be small amounts of post-collapse volcanism and investigation of the shallow volcanic conduit beneath the once active Prometheus volcanic vent; (b) a broader than expected compositional range of lavas (both boninite and non-boninite compositions) over relatively small special domains at Mata Ua, Mata Tolu and Mata Fitu, contrasting with limited compositional range at West Mata; and (c) discovery of very high silica, quartz-bearing submarine rhyolite pyroclastic deposits at Niua North, along with very recently active (perhaps on-going) native sulfur "volcanism" at several sites on the western edge of the summit plateau. All of these observations and sample sets will be key, along with our other recent to collections, to understanding mantle melting processes, crustal magmatic conditions, and eruption histories at these closely-spaced yet compositionally diverse volcanoes. Site-specific observations at all of the study sites are discussed below.

All geo-sample specimens (Table6.1.1-1) are being curated at the Univ. of Hawaii. Each sample has been assigned a unique International Geosample Number (IGSN) and registered with SESAR, a sample registry managed by Lamont Doherty Earth Observatory. Sample data and meta data are searchable at http://www.geosamples.org. Please include IGSN and the RR1211 sample names (beginning with dive number, Table 6.1.1-1) when referring to these specimens in publications. Splits of many samples have been distributed to other cruise participants, including Nautilus minerals, who gave samples an additional internal sample identifier. Sample disposition and Nautilus sample identifiers are listed in Table 6.1.2-1.

### Site Specific Observations, by Dive Number

***Q322 Vai lili.*** Dive was dedicated to observations at 3 closely-spaced microbial mat sites. Blocky, presumably high silica, lava was observed near these sites but not sampled.

***Q323 Fonualei South***. Examined spires at the volcano summit that appeared in 2011 AUV surveys, which turned out to be constructional remnants of volcanic material. This was sampled. Also observed microbial mat with 39° C water issuing from youngish lobate lava flows in the summit area, small hydrothermal chimneys, and a huge bed of largely-dead mussel shell debris on a steep slope below the summit. Moved the vehicle to a second site 1.2 km away by blue water where large active smoker chimneys were observed (see dive map).

***Q324 Volcano O Central Cone (Motutahi)***. The dive traversed west to east over the cone, observed unconsolidated rubble/sediments with mats and polysaccharide gel blobs ~100m below the summit, loosely consolidated sands and sulfur in drifts at the summit (perhaps associated with vent structures), and smoke and sulfur-rich smoke within the pit at the summit. Much of the substrate at the summit had a white surficial coating. Several samples of dacite lava and lava fragments were taken.

***Q325 Mata Ua***. The dive ascended and sampled the knoll southwest of the volcano summit from the west, which is a construction feature of non-boninite composition, as well as intact pillow tubes interspersed in sediment and talus shoots from the main summit area, which were also sampled. The dive then headed west to a steep headwall dissecting the southwestern rift zone, where we encountered altered zones in the cliff face, but no active venting at the suspected target depth). One more sample of fresh lava was taken on the rift zone above this altered domain.

***Q326 Niua South.*** The dive descended into a small ~50m wide by 50m deep pit that lies just SW of a larger pit that was the main target for the dive. The walls of the small pit were formed of volcanic ash and unconsolidated pumice, but one small, denser rocky outcrop was found and sampled above a diffuse flow spring. Outside the pit on the east side several elongate pillow forms were encountered but not sampled. Most of the flat terrain between the pits was winnowed sediment drifts and microbial mat. The south rim of the main pit is composed of mostly angular fragments of fresh, blocky rubble. The southern margin of the pit floor contains many small extinct chimneys plus a handful of larger weakly chimneys. A central mound was observed to have black smokers where the maximum temperature was 315°C.

***Q327 West Mata***. The dive started in the region of Mat meadow, a microbial mat draped pyroclastic drift deposit that looked broadly similar to when we observed it in 2009, as did the diffuse flow Luo vent site in that area. Next the dive traversed to the coordinates of the formerly active Hades volcanic vent site, where a funnel shaped pit was encountered, as expected from multi-beam bathymetry collected in 2011. Diffuse flow venting was observed near the bottom of this pit; the pit walls are constructed of sheeted dikes, pillow lavas, volcanic breccia and agglutinated spatter, with more of the latter near the top. The dive then followed a ridge over to the former Prometheus volcanic site and observed a rough, steep slope with pinnacle remnants of boninite pillows and spatter sticking up over fresh volcanic sands and fragments. Extensive diffuse flow hydrothermal venting and extensive colonization was observed at the base of a steep slope beneath this site. Geological sampling was limited to one rock from the former Prometheus site and two sediment scoops (the latter from the Luo site, where the dive returned at the end).

***Q328 Mata Ua, North Face.*** The dive started on volcanic sands and occasional volcanic rubble lying upon the gently sloping sea bed in the saddle between Matas Ua and Tolu, traversing up the base of the north face of Mata Ua. Larger rubble and occasional dikes were encounter early in the dive, as the slope steepened, where we also encountered a heavily colonized diffuse hydrothermal flow site surrounding a chimney field with several black smokers ($T_{max}$ = 360°C). Upslope above this vent field the sea bed was formed of volcanic rubble and sediments. The dive descended the slope again about 100m W of the upslope traverse encountered massive dikes trending nearly parallel to the face and dipping nearly vertically, forming steep slopes and buttressing the wall. Traversing eastward again to the original smoker site we encountered several more inactive and active chimneys.

***Q329 Mata Fitu.*** This dive began downslope of a tongue-shaped rock formation on the volcano south face that lay below the platform known to host an active hydrothermal field imaged with the WHOI Towcam on KM1108. After landing in an area of volcanic debris in ridges with some large fragments (e.g. rock 1), which we hypothesized might be nearly in place, we encountered a massive pillow flow, which we also sampled (rock 2). Up slope there were many inactive, oxidized chimney structures surrounding a small group of active, 10+m tall chimneys at the base of a constructional volcanic mound. The dive then traversed 100m to the south, mostly at 10-20m altitude, to a more southerly chimney field previously also previously imaged with the Towcam. These chimneys were more active than the other site. One was 17m tall.

***Q330 Niua North.*** This dive began on the west side of the upper summit cone on a mostly pumice talus and sediment slope until encountering a sulfur pit just below the summit plateau. The pit had sulfur flows coming out on one side and a drain back crust, giving the impression that a molten sulfur flow had cooled and dammed the outer margin of a mound structure, and then drained back into the interior to leave a fuming pit. A large mussel bed and diffuse flow hydrothermal activity lay above this, on the northern portion of the plateau. On a traverse back to the initial sulfur pit the dive observed a second, smaller sulfur pit due north of the first one The dive continued a southward traversed to a huge, several 10s of m tall, dome-like face of dark grey rhyolite containing smoky quartz phenocrysts which had another mussel bed on its flat summit.

***Q331 Mata Tolu.*** This dive started on the upper slopes of the south face, just below the summit platform, due east of a small pit. The steep slope had both talus and in-place pillow lavas of varying degrees of freshness, which were sampled. Upon cresting the plateau there was immediate evidence of warm diffuse flow and multiple extinct chimneys. The summit is a complex mix of tall narrow chimneys, squatter chimney structures and broken up lavas. The dive made several attempts to find and descend the pit structure but navigation was difficult because of all the chimneys. Moving to the SW in the dive encountered a small, steep-sided depression that may be related to the pit and then continued far enough west to get out of the chimney terrain. The dive then turned east across the north part of the summit, through a chimney field and out again, descending a slope on the north side of the volcano off of the summit plateau. In place pillow lavas among rubble were sampled (rocks 16 and 17). The dive then returned to the west and sampled fluids and biology in the main vent field. Our impression is that most of this vent field is now inactive, but that it extended over more than 100m of summit, making it a quite large hydrothermal field.

***Q332 West Mata.*** This dive revisited West Mata and the first half or so was dedicated to geological traverses and observations of the post-eruptive terrain at the summit. The dive started roughly 200m NW of the recently-formed crater in unconsolidated volcanic sands and rocky fragments, rocky talus shoots, and in-place pillow lavas. The initial portion of the dive was along a very similar path to the opening part of dive J2-413, the first dive of the 2009 NE Lau eruption response cruise, when we discovered two actively erupting volcanic vent sites that we named Hades and Prometheus. On Q332 we observed the rim of the new Hades pit to be constructed of in-place, undercut, truncated pillow lavas and limited volcanic debris. This and structures observed on the wall of the pit during a descent to its nadir at 1290m strongly suggest that the pit was formed by collapse due to shut off of the magma supply, rather than an explosive crater-forming event. The dive then progressed over a terrain of rubble, fresh pillow lavas, and steep, shrimp-colonized remnant volcanic crags to the former Prometheus site. We saw significant evidence of slope failure and collapse. The dive traversed to the NE along a steep, craggy ridgeline towards a previously identified diffuse flow venting site from 2009 called Kohu. The sharp crag was difficult to follow because it was descending away from the ROV, so we cut this part of the dive short to nose around to the other side of the craggy ridge to investigate a steep cliff face, the “headwall” formed during a very recent sector collapse on the volcano. We encountered some in-place young pillow lava overlying older rock on this side of the crest which presumably postdates the collapse, although chemically the lavas are identical to samples taken in 2009. The dive then descended rapidly down this steep face to a rubble slope, which we slowly ascended. Moving upwards we encountered a steep cliff with vertical dikes, a funnel shaped breccia pipe structure, and horizontal lava flows at the top. Our impression is that we were observing a “cut-away” view of the shallow remnant of a volcanic conduit, perhaps the very one that had fed Prometheus vent. Several lava samples were taken on this part of the dive. The second half of the dive was dedicated to sampling water, sediments and shrimp at sites on the NW face of the summit, near the former “shrimp city” site and the old Creamsickle site to the NE, which had talus, pillows and sediments streaked with white microbial mat and some orange-coated rocks.

***Q333 Niua South.*** This dive started in the same small pit SW of the larger crater visited on Q326 to sample pumice for the Tebo program. It then went to the main pit again, where in-place rhyolite pumice was sampled from the wall, after which several sulfide mounds in the south center portion of the crater were visited.

**Table 6.1.1-1. Summary of Geological Specimens and Sampling Meta Data Collected on SROF12 (RR12110)**

| Sample Name | IGSN | physiographic feature name | Field classification | Sample description | Latitude | Longitude | Depth (m) | Collection date |
|---|---|---|---|---|---|---|---|---|
| Q323-Rock 01 | KHR000080 | Fonualei S | basalt/basalt andesite | Pillow | -17.54368 | -174.57744 | 974 | 9/13/2012 |
| Q323-Rock 03 | KHR000081 | Fonualei S | basalt/basalt andesite | Pillow | -17.54353 | -174.57661 | 937 | 9/13/2012 |
| Q324-Rock 01 | KHR000082 | Central cone, volcano 'O' | dacite | lava | -15.37565 | -174.00259 | 1244 | 9/14/2012 |
| Q324-Giobio6 | KHR000083 | Central cone, volcano 'O' | dacite | lava fragments | -15.37585 | -174.00255 | 1244 | 9/14/2012 |

| Sample Name | IGSN | physiographic feature name | Field classification | Sample description | Latitude | Longitude | Depth (m) | Collection date |
|---|---|---|---|---|---|---|---|---|
| Q324-Rock 07 | KHR000084 | Central cone, volcano 'O' | dacite | lava | -15.37596 | -174.00238 | 1258 | 9/14/2012 |
| Q324-Rock 08 | KHR000085 | Central cone, volcano 'O' | dacite | lava | -15.37596 | -174.00238 | 1258 | 9/14/2012 |
| Q324-biomacro9 | KHR000086 | Central cone, volcano 'O' | dacite | lava fragments | -15.37635 | -174.002 | 1301 | 9/14/2012 |
| Q324-Rock 12 | KHR000087 | Central cone, volcano 'O' | dacite | lava | -15.37637 | -174.00199 | 1295 | 9/14/2012 |
| Q325-Rock 01 | KHR000088 | Mata Ua | boninite | Pillow | -15.02275 | -173.78679 | 2315 | 9/15/2012 |
| Q325-Rock 02 | KHR000089 | Mata Ua | boninite | lava | -15.02232 | -173.78507 | 2220 | 9/15/2012 |
| Q325-Rock 03 | KHR00008A | Mata Ua | boninite | lava | -15.02233 | -173.78479 | 2195 | 9/15/2012 |
| Q325-Rock 04 | KHR00008B | Mata Ua | boninite | Pillow | -15.01952 | -173.78577 | 2175 | 9/15/2012 |
| Q326-biomacro 01 | KHR00008C | Niua south | rhyolite pumice | pumice | -15.16647 | -173.57577 | 1165 | 9/18/2012 |
| Q326-Rock 02 | KHR00008D | Niua south | rhyolite pumice | pumice | -15.16653 | -173.57573 | 1156 | 9/18/2012 |
| Q326-Rock 03 | KHR00008E | Niua south | rhyolite pumice | pumice | -15.16653 | -173.57573 | 1156 | 9/18/2012 |
| Q326-Rock 04a | KHR00008F | Niua south | rhyolite ash | pumice | -15.16654 | -173.57581 | 1156* | 9/18/2012 |
| Q326-Rock 04b | KHR000090 | Niua south | rhyolite pumice | sediment | -15.16654 | -173.57581 | 1156* | 9/18/2012 |
| Q327-Biomacro 01 | KHR000091 | West Mata | boninite | lava fragments | -15.09465 | -173.74885 | 1194 | 9/19/2012 |
| Q327-Rock 02 | KHR000092 | West Mata | boninite | lava | -15.09418 | -173.74801 | 1162 | 9/19/2012 |
| Q327-Biosed 06 | KHR000093 | West Mata | boninite | lava fragments | -15.09575 | -173.75032 | 1279 | 9/19/2012 |
| Q328-biogeo-01 | KHR000094 | Mata Ua | boninite | lava | -15.01714 | -173.78847 | 2391 | 9/20/2012 |
| Q328-Rock 03 | KHR000095 | Mata Ua | boninite | lava | -15.01719 | -173.78821 | 2374 | 9/20/2012 |
| Q328-Geobio 11 | KHR000096 | Mata Ua | boninite | lava | -15.01732 | -173.78805 | 2356 | 9/20/2012 |
| Q328-Rock 12 | KHR000097 | Mata Ua | boninite | lava | -15.01767 | -173.78807 | 2340 | 9/20/2012 |
| Q328-Rock 13 | KHR000098 | Mata Ua | boninite | lava | -15.0178 | -173.78797 | 2327 | 9/20/2012 |
| Q328-Rock 14 | KHR000099 | Mata Ua | boninite | lava | -15.0178 | -173.78797 | 2327 | 9/20/2012 |
| Q328-Rock-15 | KHR00009A | Mata Ua | boninite | altered boninite | -15.0173 | -173.78822 | 2366 | 9/20/2012 |
| Q329-Rock 01 | KHR00009B | Mata Fitu | boninite | pillow | -14.91481 | -173.77998 | 2656 | 9/21/2012 |
| Q329-Rock 02 | KHR00009C | Mata Fitu | boninite | pillow | -14.91435 | -173.77988 | 2652 | 9/21/2012 |
| Q329-Rock 03 | KHR00009D | Mata Fitu | hydrothermal crust | hydrothermal rind | -14.91363 | -173.78024 | 2614 | 9/21/2012 |
| Q330-Rock 08 | KHR00009E | Niua North | rhyolite pyroclatic | pyroclastic deposit | -15.08159 | -173.55463 | 749 | 9/22/2012 |
| Q330-Rock 15 | KHR00009F | Niua North | rhyolite | pyroclastic deposit | -15.08164 | -173.55473 | 745 | 9/22/2012 |
| Q331-Rock 01 | KHR000100 | Mata Tolu | boninite | pillow | -15.00559 | -173.7936 | 1856 | 9/23/2012 |
| Q331-Rock 02 | KHR000101 | Mata Tolu | boninite | pillow | -15.00559 | -173.79362 | 1841 | 9/23/2012 |
| Q331-Rock 11 | KHR000102 | Mata Tolu | boninite | altered boninite pillow | -15.00494 | -173.79365 | 1822 | 9/23/2012 |
| Q331-Rock 16 | KHR000103 | Mata Tolu | boninite | lobate lava | -15.00443 | -173.79291 | 1866 | 9/23/2012 |
| Q331-Rock 17 | KHR000104 | Mata Tolu | boninite | lobate lava | -15.00443 | -173.79291 | 1866 | 9/23/2012 |
| Q332-Rock 01 | KHR000105 | West Mata | boninite | pillow | -15.09455 | -173.74977 | 1256 | 9/24/2012 |
| Q332-Rock 02 | KHR000106 | West Mata | boninite | pillow | -15.09455 | -173.74977 | 1256 | 9/24/2012 |
| Q332-Rock 03 | KHR000107 | West Mata | boninite | lobate lava | -15.09398 | -173.74917 | 1240 | 9/24/2012 |
| Q332-Rock 04 | KHR000108 | West Mata | boninite | lobate lava | -15.09438 | -173.74818 | 1171 | 9/24/2012 |
| Q332-Rock 05 | KHR000109 | West Mata | boninite | pillow | -15.09396 | -173.74778 | 1179 | 9/24/2012 |
| Q333-Rock 03 | KHR00010A | Niua south | rhyolite pumice | pumice | -15.16555 | -173.5743 | 1154 | 9/25/2012 |
| | | | | | | | | |
| * approximate sampling depth | | | | | | | | |
| IGSN is a unique, international geosample identifier registered at http://www.geosamples.org/; please reference this number in all publications involving one or more of these specimens. | | | | | | | | |

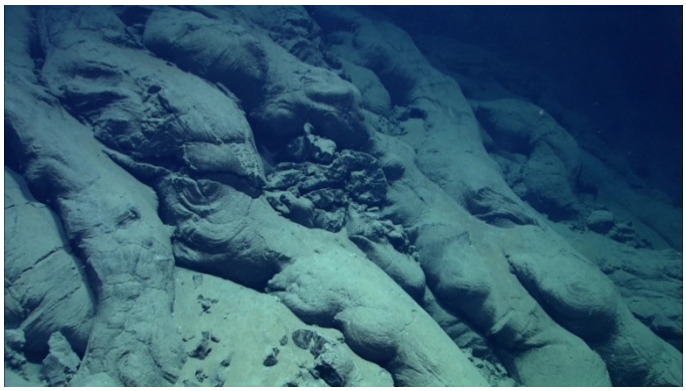
## Table 6.1.1-2. RR1211- Geo-Sample Curation Info.

All samples curated at UH with additional distribution as noted.

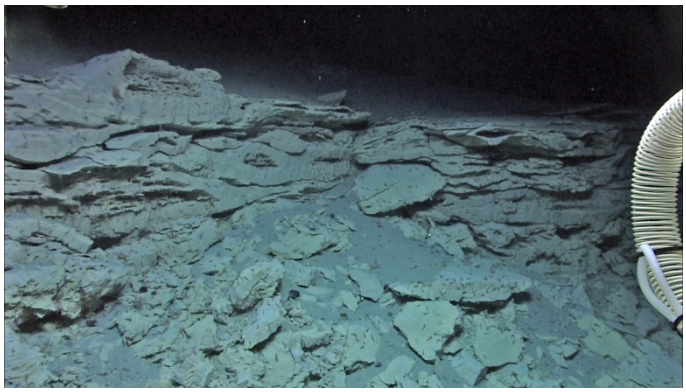
| Sample Name | Glass | small sample? | UH Bucket | other curation (e.g., Nautilus sample numbers) |
|---|---|---|---|---|
| Q322-biomat-06 | - | - | - | Entire sample is nautilus – 25130 (none at UH) |
| Q323-Rock 01 | Y | Y | 4-Jan | nautilus – 25113 |
| Q323-Rock 03 | N | N | 4-Jan | |

| Sample Name | Glass | small sample? | UH Bucket | other curation (e.g., Nautilus sample numbers) |
|---|---|---|---|---|
| Q324-Rock 01 | Y-all | Y | gl | |
| Q324-Giobio6 | Y-all | Y | gl | glass spilt to Richard |
| Q324-Rock 07 | N | Y | 4-Jan | |
| Q324-Rock 08 | Y | Y | 4-Jan | |
| Q324-Rock 12 | Y | Y | 4-Jan | |
| Q324-biomacro9 | N | Y | 4-Jan | |
| Q325-Rock 01 | Y | N | 4-Jan | glass spilt to Richard |
| Q325-Rock 02 | N | N | 4-Jan | |
| Q325-Rock 03 | Y | N | 4-Jan | |
| Q325-Rock 04 | Y | Y | 4-Jan | |
| Q326-biomacro 01 | N | N | 4-Feb | |
| Q326-Rock 02 | N | N | 4-Feb | 1 piece to Richard |
| Q326-Rock 03 | Y | N | 4-Feb | 1 piece to Richard |
| Q326-Rock 04a | N | Y | 4-Feb | |
| Q326-Rock 04b | N | Y | 4-Feb | |
| Q327-Biomacro 01 | N | N | 4-Feb | |
| Q327-Rock 02 | Y | Y | 4-Feb | |
| Q327-Biosed 06 | Y | Y | 4-Feb | |
| Q328-Biomacro 01 | N | N | 4-Feb | |
| Q328-Rock 03 | Y | N | 4-Feb | |
| Q328-Geobio 11 | Y | N | 4-Feb | glass to Richard - some clean vesicles. Good xrf candidate |
| Q328-Rock 12 | Y | Y | 4-Feb | |
| Q328-Rock 13 | N | N | 4-Feb | |
| Q328-Rock 14 | N | Y | 4-Feb | |
| Q328-Geobio 15 | N | N | 4-Feb | 1 piece to nautilus - 25119 |
| Q329-Rock 01 | Y | N | 4-Mar | glass to Richard; sample to nautilus - 25129 |
| Q329-Rock 02 | Y | N | 4-Mar | glass to Richard |
| Q329-Rock 03 | N | N | 4-Mar | sample to Richard |
| Q330-Rock 08 | N | N | 4-Mar | |
| Q330-Rock 15 | N | N | 4-Mar | |
| Q331-Rock 01 | Y | N | 4-Mar | |
| Q331-Rock 02 | Y | N | 4-Mar | |
| Q331-Rock 11 | N | N | 4-Mar | Richard, Nautilus and Cornel pieces; nautilus - 25128 |
| Q331-Rock 16 | Y | N | 4-Mar | |
| Q331-Rock 17 | N | N | 4-Mar | |
| Q332-Rock 01 | Y-all | Y | gl | same as rock02; entire piece initially went to Tebo's group and was later given to us, after it was crushing to small cubes and soaked in sea water. The sample was then sonified it in milli-q |
| Q332-Rock 02 | Y | Y | gl | pillow rind chips stowed with the glass |
| Q332-Rock 03 | Y | N | 4-Mar | lots of glass leff/broke up during sampling |
| Q332-Rock 04 | Y | N | 4-Mar | lots of glass leff/broke up during sampling; sample to Richard |
| Q332-Rock 05 | Y | N | 4-Mar | lots of glass leff/broke up during sampling |
| Q333-Rock 03 | N | Y | 4-Apr | |

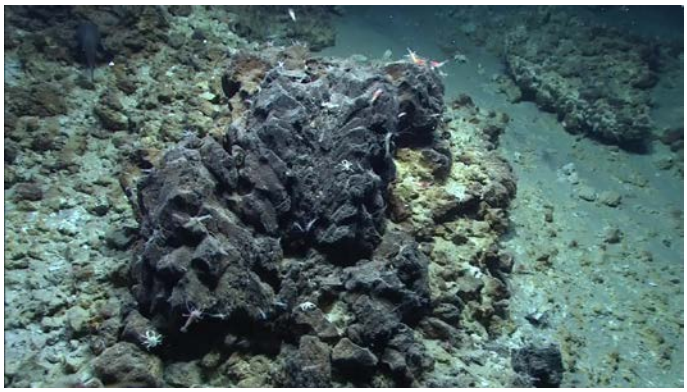
## Selected Geological Images



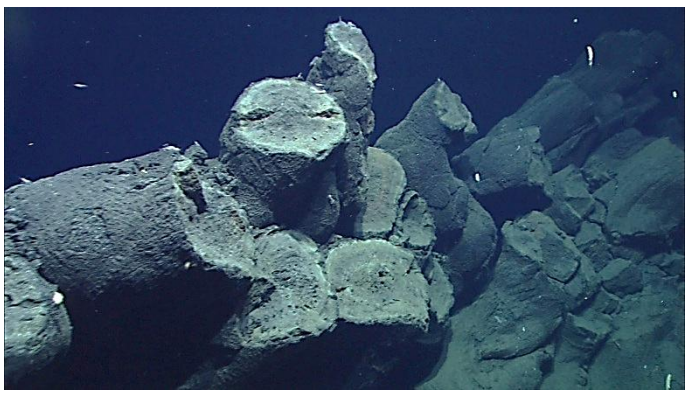
Pillow lavas encountered early in dive Q325 at Mata Ua.



Solidified platy sulfur deposits at the margins of a sulfur pit, dive Q330 at Niua North



Block welded pyroclastic rhyolite deposit on the wall of a small pit on the Niua South summit, dive Q326



Truncated pillow lavas at the rim of the new pit crater at the W. Mata summit, dive Q332. Pillow are truncated on their upslope sides and unsupported on their upper sides due to collapse of the underlying substrate.

## Tables 6.1.1-3 SRoF-12 (RR1211) Rock Descriptions

| | Dive Q323 Fonualei South | | |
|---|---|---|---|
| | **Sample #** | **Q323-Rock 01** | **Q323-Rock 03** |
| **Sample Description** | **IGSN (if known)** | | |
| | **Rock Type** | basalt/bas andesite? | basalt/bas andesite? |
| | **Size** | 20 x 15 x 10 cm | 30 x 20 x10 cm |
| | **Mineralogy** | nearly aphyric, rare opx, rare plag ppx | nearly aphyric, rare opx, rare plag ppx |
| | **Crust or alteration** | light manganese dusting, plus minor Fe stain | light manganese dusting, plus interior surfaces Fe stain |
| | **Glass** | ~2mm rind and glassish matrix | none |
| | **Vesicularity** | variable, up to 20% in center | variable, up to 25% in center |
| | **Comments** | pillow toe | pillow frag |
| **Curation** | **Glass** | Y | N |
| | **XRF Hunk, bucket#** | N | N |
| | **Photo (Y, N)** | Y | Y |
| | **Bucket (n= xx)** | 1/4 | 1/4 |
| | **Small sample?** | Y | N |

| **Dive Number Q324 Motutahi (Central cone) at Niuatahi (VolcanoO)** | | | | | | | |
|---|---|---|---|---|---|---|---|
| | **Sample #** | **Q324-Rock 01** | **Q324-Giobio6** | **Q324-Rock 07** | **Q324-Rock 08** | **Q324-Rock 12** | **Q324-biomacro9** |
| **Sample Description** | **IGSN (if known)** | | | | | | |
| | **Rock Type** | dacite | dacite | dacite | dacite | dacite | dacite |
| | **Size** | two @ 4 x 3 x 2 cm | various | 5 x 4 x 2 cm | 6 x 6 x 5 cm | 10 x 7 x 4 | various |
| | **Mineralogy** | small cpx, rare plag | unknown | rare plag | rare cpx, rare plag | 3-4 mm rare plag | rare plag |
| | **Crust or alteration** | fresh | fresh, mild white stain | moderate Fe-ox stain on 3 faces | somewhat fresher but still light Fe-Ox stain | somewhat fresher but still light Fe-Ox stain | some variable white coating (sulfur?) |
| | **Glass** | all grlass, spun/frothy upper surface | all grlass, spun/frothy upper surface | all marginally glassy matrix | all marginally glassy matrix | all marginally to failry glassy matrix | all marginally to failry glassy matrix |
| | **Vesicularity** | stretched, 20% | variable | variable shape, 25% | variable shape, 25% | stretched, 15% | stretched, 15% |
| | **Comments** | 2 pieces, plus 2 smaller fragments that look like it, but were set down on the wrong rock sheet | some sulfur balls too - sediment scoop | sample taken from an area of extensive microbial mat. Bio stuff fell off on rov ascent | same exact location ar R07 | sampled at end of dive | slupr chamber 2 |
| **Curation** | **Glass** | Y-all | Y-all | N | Y | Y | N |
| | **XRF Hunk, bucket#** | N | N | N | N | N | N |
| | **Photo (Y, N)** | Y | Y | Y | Y | Y | Y |
| | **XRF Hunk, bucket#** | (glass) | (glass) | 1/4 | 1/4 | 1/4 | 1/4 |
| | **Small sample?** | Y | Y | Y | Y | Y | Y |
| | **Other curation** | glass spilt to Richard | | | | | |

| Dive Number Q325 Mata Ua | | | | | |
|---|---|---|---|---|---|
| | **Sample #** | **Q325-Rock 01** | **Q325-Rock 02** | **Q325-Rock 03** | **Q325-Rock 04** |
| **Sample Description** | **IGSN (if known)** | | | | |
| | **Rock Type** | boninite? | boninite? | boninite? | boninite? |
| | **Size** | 10 x 10 x 7 cm | 25 x 13 x 10 cm | | |
| | **Mineralogy** | ol + cpx, < 5% | ol + cpx, 10% | ol + cpx, < 5% | ol + cpx, < 5%, opx too? |
| | **Crust or alteration** | Mn ox, Fe-ox staining, white stain on interior cracks | Mn ox, Fe-ox staining | Mn ox, Fe-ox staining | |
| | **Glass** | 2-3 mm | none | 2-3 mm | 2-3 mm, plus glass matrix |
| | **Vesicularity** | 20%, round, up to 10 mm | 2-3%, fine bubbles | 50%, decent size gradient from crust to interior | 50%, strong size gradient from crust to interior |
| | **Comments** | not young looking | very fresh interior | more glass left on rock | some mud in some vesicles |
| **Curation** | **Glass** | Y | N | Y | Y |
| | **XRF Hunk, bucket#** | N | Y | N | N |
| | **Photo (Y, N)** | Y | Y | Y | Y |
| | **Bucket (n= xx)** | 1/4 | 1/4 | 1/4 | 1/4 |
| | **Small sample?** | N | N | N | Y |
| | **Other curation** | glass spilt to Richard | | | |

| Dive Number Q326 Mata Ua | | | | | | |
|---|---|---|---|---|---|---|
| | **Sample #** | **Q326-biomacro 01** | **Q326-Rock 02** | **Q326-Rock 03** | **Q326-Rock 04a** | **Q326-Rock 04b** |
| **Sample Description** | **IGSN (if known)** | | | | | |
| | **Rock Type** | rhyolite pumice | rhyolite pumice | rhyolite pumice | welded rhyolite ash + worm cast | rhyolite pumice |
| | **Size** | 6 x 3 x 3 cm; 3x 3 x 3 cm | 10 x 10 x 5 cm | 20 x 10 x 7 cm | 10 x 5 x 2cm; 5 x 3 x 1 cm | 5 x 4 x 3 cm |
| | **Mineralogy** | plag + dark ferromagnesian mineral (px?) | plag + dark ferromagnesian mineral (px?) | plag + dark ferromagnesian mineral (px?) | n/a | plag + dark ferromagnesian mineral (px?) |
| | **Crust or alteration** | light MnO2 staining on some exterior surfaces | MnO2 staining on some exterior surfaces | MnO2 staining on some exterior surfaces | sulfure in one area | light MnO2 staining on some exterior surfaces |
| | **Glass** | none | none | none | none | none |
| | **Vesicularity** | >50% | >50% | >50% | n/a | >50% |
| | **Comments** | one piec e hard whitish mat with sulfir smell on some surfaces when wet, gone when dry | from "inplace" block on pit wall | from "inplace" block on pit wall | 2 pieces of well-indurated layer in pit wall | not sure of the exact source of this rock, it was in with sample 4 |
| | | | 1 piece to richard | 1 piece to richard | | |
| **Curation** | **Glass** | N | N | N | N | N |
| | **XRF Hunk, bucket#** | N | N | N | N | N |
| | **Photo (Y, N)** | Y | Y | Y | Y | Y |
| | **Bucket (n= xx)** | 2/4 | 2/4 | 2/4 | 2/4 | 2/4 |
| | **Small sample?** | N | N | N | Y | Y |
| | **Other curation** | | 1 piece to richard | 1 piece to richard | | |

| Dive Number Q327 West Mata | | | | |
|---|---|---|---|---|
| | **Sample #** | **Q327-Biomacro 01** | **Q327-Rock 02** | **Q327-Biosed 06** |
| | | sample from shrimp net | | |
| **Sample Description** | **IGSN (if known)** | | | |
| | **Rock Type** | boninite | boninite | boninite |
| | **Size** | various, largest: 8 x 7 x 5 cm | 5 x 3 x 2 cm | 3 x 2 x 2 cm |
| | **Mineralogy** | opx>cpx~ol. 3 or 4 sulfur balls | opx>cpx~ol. | opx>cpx~ol. |
| | **Crust or alteration** | very mild fe-ox stain | none | none |
| | **Glass** | none | 3-5 mm + glassy matrix | all glass |
| | **Vesicularity** | ~25% | <5% | <5% |
| | **Comments** | various talus pieces put in shrimp sample net for weight. Gave one fresh piece to Bob as a souvenir. | small piece of striped formation on tall pinnacle near prometheus site | water sonified glassy substrate of Fe-Ox mat from mat-meadow. Sample had amon.chloride, citric acid and edta soak for 24 hrs, so I sonified it in millipore for 1 hr, changing often. Glass is quite fresh |
| **Curation** | **Glass** | N | Y | Y |
| | **XRF Hunk, bucket#** | N | N | N |
| | **Photo (Y, N)** | Y | Y | Y |
| | **Bucket (n= xx)** | 2/4 | 2/4 | 2/4 |
| | **Small sample?** | N | Y | Y |

| Dive Number Q328 Mata Ua (north face) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | **Sample #** | **Q328-Biomacro 01** | **Q328-Rock 03** | **Q328-Geobio 11** | **Q328-Rock 12** | **Q328-Rock 13** | **Q328-Rock 14** | **Q328-Geobio 15** |
| | | sample from shrimp net | | | | | | |
| **Sample Description** | **IGSN (if known)** | | | | | | | |
| | **Rock Type** | boninite | boninite | boninite | boninite | boninite? | boninite | altered boninite |
| | **Size** | 18 x 7 x 5 cm | 5 x 3 x 2 cm | 10 x 10 x 10 cm wedge | 8 x 5 x 4 cm | 12 x 6 x 4 cm | 6 x 6 x 3 cm | 25 x 15 x 15 cm |
| | **Mineralogy** | opx>cpx~ol, + some secondary pyrite xtals | opx>cpx~ol. | opx>cpx~ol. | opx>cpx~ol. | ol>cpx (opx?)) | opx>cpx~ol | clays, pyrite, olivine and opx remnants |
| | **Crust or alteration** | Mn-Ox on 2 sides, strong alteration halo of ~1cm extends into the roc, plus all looks somewhat altered | Fe-Ox exterior coating, alteration to light grey throughout+ white vesicle lining | MnO2 on outside, mild stain ijn parts of interior | Fe-Ox exterior coating, + some MnO2 | Fe-Ox exterior coating | Mn-Ox in parts and Fe-Ox stains | altered through out, plus halo |
| | **Glass** | none | locally 3mm thick | 5 mm | 3 mm | none | none | none |
| | **Vesicularity** | ~10% | <5% | 40% | 25% | 2-3% | 15% | 15% |
| | **Comments** | vrock from high biomass diffuse flow area. Sample was covered with barnacles | | some clean vesicles. Good xrf candidate | | angular dike fragment | porphoritic | |
| **Curation** | **Glass** | N | Y | Y | Y | N | N | N |
| | **XRF Hunk, bucket#** | N | N | N | N | N | N | N |
| | **Photo (Y, N)** | Y | Y | Y | Y | Y | Y | Y |
| | **Bucket (n= xx)** | 2/4 | 2/4 | 2/4 | 2/4 | 2/4 | 2/4 | 2/4 |
| | **Small sample?** | N | N | N | Y | N | Y | N |

| Dive Number Q329 Mata Fitu | | | | |
|---|---|---|---|---|
| | Sample # | Q329-Rock 01 | Q329-Rock 02 | Q329-Rock 03 |
| Sample Description | IGSN (if known) | | | |
| | Rock Type | boninite | boninite | hydrothermal crust |
| | Size | 15 x 15 x 10 cm | 5 x 10 x 10 cm | 20 x 2 x 2 cm |
| | Mineralogy | opx~cpx~ol, malachite deposits near base an in glass | opx~cpx~ol | Fe-ox layers, bloor red to rust colored, faint sulfide smell |
| | Crust or alteration | MnO2 plus some mud on interior | MnO2 on bottom and Fe-Ox + mud on top | MnO2 on upper surface |
| | Glass | 10+ mm | all glass to glassy mesoxtaline transition | n/a |
| | Vesicularity | | >50% | n./a |
| | Comments | pillow fragment | glassy top of massive pillow flow | old h-therm mat or diffuse flow deposit? |
| | | sample to Nautilus; glass to richard | glass to Richard | sample to richard |
| Curation | Glass | Y | Y | N |
| | XRF Hunk, bucket# | N | N | N |
| | Photo (Y, N) | Y | Y | Y |
| | Bucket (n= xx) | 3/4 | 3/4 | 3/4 |
| | Small sample? | N | N | N |

| Dive Number Q330 Niua North (west face and top) | | | |
|---|---|---|---|
| | Sample # | Q330-Rock 08 | Q330-Rock 15 |
| Sample Description | IGSN (if known) | | |
| | Rock Type | rhyolite pyroclatic | rhyolite |
| | Size | 15 x 7 x 7 cm | 13 x 5 x 3 cm |
| | Mineralogy | quartz phenos | quartz phenos |
| | Crust or alteration | light MnO2 | light MnO2 |
| | Glass | no rind | no rind |
| | Vesicularity | n/a | n/a |
| | Comments | near sulfur pit 1 | in place from huge face |
| Curation | Glass | N | N |
| | XRF Hunk, bucket# | N | N |
| | Photo (Y, N) | Y | Y |
| | Bucket (n= xx) | 3/4 | 3/4 |
| | Small sample? | N | N |

| Dive Number Q331 Mata Tolu summit | | | | | | |
|---|---|---|---|---|---|---|
| | Sample # | Q331-Rock 01 | Q331-Rock 02 | Q331-Rock 11 | Q331-Rock 16 | Q331-Rock 17 |
| Sample Description | IGSN (if known) | | | | | |
| | Rock Type | boninite | boninite | altered boninite | boninite | boninite |
| | Size | 20 x 10 x 10 cm | 8 x 7 x 4 cm | 12 x 12 x 5 cm | 17 x 5 x 4 cm | |
| | Mineralogy | opx, cpx, ol | opx, cpx, ol | green C-Ox (?), deep red cubes of ??, pyrite | opx, cpx, ol | opx, cpx, ol |
| | Crust or alteration | Extensive Fe-Ox, Mn-Ox | Fe-Ox, Mn-Ox | entire rock is altered | mild Mn-Ox | mild Mn-Ox |
| | Glass | 2-3 mm | 2-3 mm | none | 5 mm | |
| | Vesicularity | 10% | 15% | 10% | 25% | |
| | Comments | hard to chip glass | altered pillow frag | from chimney base, active flow | fresh. Some glass left on rock | same rock, piece went to Tebo, they chipped some glass and gave me the rest- I left that glass on the rock |
| | | | | richard, Nautilus and Cornel pieces | | |
| Curation | Glass | Y | Y | N | Y | N |
| | XRF Hunk, bucket# | N | N | N | N | N |
| | Photo (Y, N) | Y | Y | Y | Y | Y |
| | Bucket (n= xx) | 3/4 | 3/4 | 3/4 | 3/4 | 3/4 |
| | Small sample? | N | N | N | N | N |

| Dive Number Q332 West Mata | | | | | | | |
|---|---|---|---|---|---|---|---|
| | **Sample #** | **Q332-Rock 01** | **Q332-Rock 02** | **Q332-Rock 03** | **Q332-Rock 04** | **Q332-Rock 05** | **Q332-Rock MISC** |
| **Sample Description** | **IGSN (if known)** | | | | | | |
| | **Rock Type** | boninite | boninite | boninite | boninite | boninite | boninite |
| | **Size** | ?? | 5 x 4 x 4 cm | 18 x 5 x 4 cm | 20 x 12 x 8 cm | 25 x 15 x 13 cm | 2 pieces, ea ~ 7 x 7 x 7 |
| | **Mineralogy** | n/a | opx, cpx~ol | opx, cpx~ol | opx, cpx~ol | opx, cpx~ol | opx, cpx~ol |
| | **Crust or alteration** | fresh | fresh | fresh | fresh | fresh | fresh |
| | **Glass** | n/a | 1 cm | 1 cm, frothy | 1 cm, frothy | 1 cm | none |
| | **Vesicularity** | n/a | 25% | 25% | 25% | 25% | 25% |
| | **Comments** | entire piece went to Tebo then he decided he didn't want it, after crushing it to small cubes and soaking it in sea water; I sonified it in milli-q | pillow rind chips | lobate | lobate | pillow frag | pillow frag |
| | | **same stuff as rock-2** (all sample w/glass) | (all sample w/glass) | lots of glass leff/broke up during sampling | lots of glass leff/broke up during sampling; sample to richard | lots of glass leff/broke up during sampling | interior pieces recovered from rov porch |
| **Curation** | **Glass** | Y-all | Y-all | Y | Y | Y | Y |
| | **XRF Hunk, bucket#** | N | N | N | N | N | N |
| | **Photo (Y, N)** | Y | Y | Y | Y | Y | Y |
| | **Bucket (n= xx)** | - | 4/4 | 4/4 | 4/4 | 4/4 | 4/4 |
| | **Small sample?** | Y | Y | N | N | N | N |

| Dive Number Q333 Niua south | | |
|---|---|---|
| | **Sample #** | **Q333-Rock 03** |
| **Sample Description** | **IGSN (if known)** | |
| | **Rock Type** | rhyolite pumice |
| | **Size** | 12 x 8 x 7 cm |
| | **Mineralogy** | qz, something black (small) |
| | **Crust or alteration** | Mn-Ox on some surfaces |
| | **Glass** | none |
| | **Vesicularity** | >50% |
| | **Comments** | sampled in place |
| **Curation** | **Glass** | N |
| | **XRF Hunk, bucket#** | N |
| | **Photo (Y, N)** | Y |
| | **Bucket (n= xx)** | 4/4 |
| | **Small sample?** | Y |

## 6.1.2 RR1211 Nautilus Geology Report

Peter Crowhurst and Simon Richards

Nautilus joined the RR1211 cruise to contribute to the discovery of new vent fields in the North East Lau Basin. The principal aim of Nautilus was to utilise background research and existing knowledge of the region to help direct the sampling of both active and inactive sulfide chimneys. During the cruise 17 samples were collected, some of which will be assessed for their mineral content. Knowledge of the mineralogy of these chimneys may be utilised by other researchers on the cruise to attempt to better understand the mineralogical evolution of sulfide chimneys.

Fonualei South, the northern Matas and Niua were selected as regions where active sulfide chimneys could be observed and sampled for petrological and geochemical analysis. Previous research including AUV mapping, CTD casts and tow yo's and camera tows had identified several key locations where chimneys may be discovered. Detailed AUV mapping of Fonualei South revealed two chimney bearing sites (960m and 1580m depth). The first chimney field located near the top of the volcanic structure contained a mixture of active and inactive chimneys. An attempt was made to sample both an active and an inactive chimney. Two samples were collected from this site (Q323-sulfide-04 and -06) (Figs. 6.1.2-1 and 6.1.2-2 below). Both samples showed evidence of concentric zones of sulfide mineralisation around either a single or multiple internal fluid channel ways. Minerals identified in hand specimen include chalcopyrite, pyrite, bornite, barite.

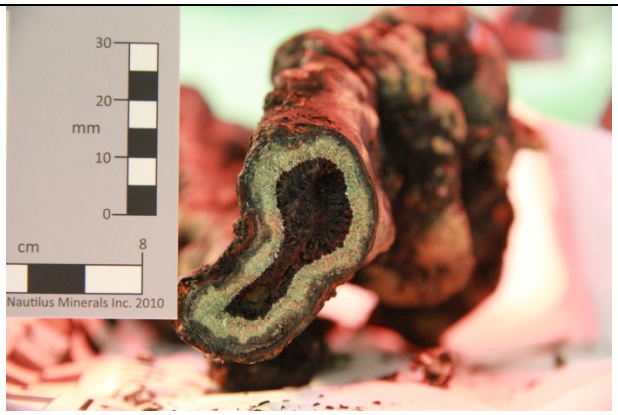



**Fig.6.1.2-1a**. Sample Q323-sulfide-06. View looking at the base of the chimney.


**Fig. 6.1.2-1b**. Sample Q323-sulfide-04. Photo of chimney sample.

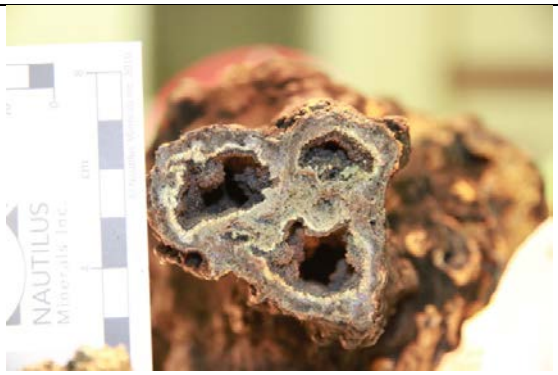


**Fig. 6.1.2-2a**. Sample Q323-sulfide-04 – view looking at the base of the chimney sample shown in the photo to the right.


**Fig. 6.1.2-2b**. Sample Q323-sulfide-04. Photo of chimney sample from Fonualei South.

The second chimney field at Fonualei South (named Loloa Kakai) was located on the northeastern flanks of the volcano where multiple chimneys over 20m in height were discovered. Several structures had been highlighted in the AUV bathymetry prior to the ROV dive and these targets were visited to 1) confirm the occurrence of chimneys and, 2) to attempt to collect samples of both old and young chimneys for further analysis. Chimneys were actively venting white smoke. Sample Q323-sulfide-12 was a piece of collapsed chimney (i.e. chimney talus) collected from the ocean floor at the base of one of the large, 25m high chimneys (Figs 6.1.2-3a and 5.1.2-3b). On returning to the surface, the sample had mostly disintegrated into small, <10cm pieces which were collected for analysis. Some minerals identified in hand specimen included chalcopyrite, sphalerite and barite.

**Fig. 6.1.2-3a.** Sample Q323-sulfide-12. Sample pieces are approximately 4-5cm across. Entire sample is shown in photo 3b to the right.

**Fig. 6.1.2- 3b.** Sample Q323-sulfide-12. Disintegrated sample collected from base of tall chimneys at the site named Loloa Kakai meaning "Tall People" in Tongan.

The visit to Niua South was driven by the scientists wanting to sample high T fluids and biology samples. This chimney field was discovered in 2008 during a commercial ROV exploration campaign. Nautilus collected samples here to augment their existing collection recovered in 2008.

Dive number Q326 to Niua South was aimed at exploring a single small pit (25m diameter x 25m deep) to the south of the main, larger pit to the north. No sulfides were found within the small pit, however, active sulfide chimneys had been identified previously at the main, larger pit. Attempts were made to sample sulfides. Samples Q326-sulfide-11 and 12 were collected from this site (Figs 6.1.2-4 and 6.1.2-5). A second dive to Niua South (Q333) resulted in further observations of chimneys within the large pit (Fig. 6.1.2-6). Minerals identified in samples from both dives include chalcopyrite, sphalerite and barite.

**Fig. 6.1.2-4**. Sample Q326-sulfide-11 – sample is approximately 8cm in its longest axis.

**Fig. 6.1.2-5**. Sample Q326-sulfide-12 – sample is approximately 5 cm long.

**Fig. 6.1.2-6.** Sample Q333-sulfide-17 – base of photo is approximately 5cm.

Chimneys were discovered on the northwest flank of Mata Ua on dive Q328. Time constraints limited this site to only one sample from an active black smoker. The top of the chimney photographed below was knocked onto the seafloor and later recovered. The sample is rich in chalcopyrite as seen in photograph below (Fig. 6.1.2-7).

**Fig. 6.1.2-7**. Q328-sulfide-10 – Sample is approximately 8cm tall. Chimney sample dominated by chalcopyrite.

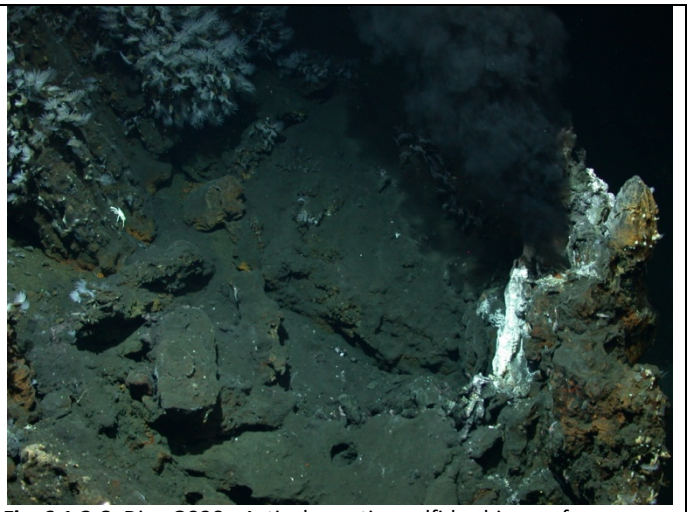


**Fig. 6.1.2-8**. Dive Q328 - Actively venting sulfide chimney from which sample sulfide-10 was collected.

Dive Q329 to Mata Fitu resulted in the discovery of several active chimneys. Two main samples of sulfide chimney were collected here. The site was visited following previous indications from camera tows and CTD plume hunting. Sample Q329-sulfide-04 and 06 (Figs. 6.1.2-9 and 6.1.2-10). An attempt was made to sample an actively venting chimney and a less active chimney. In both cases it was interpreted that the samples were from active and very recently active locations. Nevertheless, the samples both contained sulfide minerals. The dominant mineral in these samples was chalcopyrite with some sphalerite and barite. Sample Q329-sulfide-04 shows a spectacular internal zoning and a distinctive fluid channel within the center of the chimney. Sample photograph shown below represents only the top half of the chimney sampled.

**Fig. 6.1.2-9**. Q329-sulfide-04 – Chimney sample is approximately 6cm wide across the base and 27cm long. Yellow chalcopyrite can be seen within the center of the chimney.

**Fig. 6.1.2-10.** Q329-sulfide-06 – base of photo is approximately 8cm across

The final dive where sulfide chimneys were present was dive Q331 to Mata Tolu. Chimneys had been previously identified at this location using a camera tow and the ROV dive was planned to re-visit these chimneys and explore for other active vents. A single chimney was sampled here (Fig. 6.1.2-11). The sample contained multiple channel ways containing abundant chalcopyrite as seen in photo below. At this location both active and inactive chimneys were identified. Attempts were made to sample a single large upright active chimney; however, the sample disintegrated and was recovered. The sample collected below was from a chimney venting mostly clear hot fluids.

**Fig. 6.1.2-11**. Sample Q331-sulfide-24. Sample contains abundant chalcopyrite in exposed fluid flow channels.

Locations visited that exhibited sulfide chimneys and where samples of sulfide bearing rocks were collected are: Dive Q323 – Fonualei South; Dive Q326 and Q333 – Niua South; Dive Q328 – Mata Ua; Dive Q329 - Mata Fitu; Dive Q331 - Mata Tolu. A complete list of sulfide samples is in Table 6.1.2-1 below.

**Table 6.1.2-1 - RR1211-sulfides inventory** (Ken Rubin)

| **all samples went to GNS+Nautilus except where notes** | |
|---|---|
| **Sample Number** | **other curation** |
| Q323-Sulfide04 | nautilus - 25115 |
| Q323-Sulfide06/07 | nautilus - 25114 |
| Q323-Sulfide12 | nautilus - 25121 |
| Q326-Sulfide-11 | nautilus - 25116 |
| Q326-Sulfide-12 | nautilus - 25118 |
| (Q327-Biomacro-01) | |
| Q328-Sulfide-10 | nautilus - 25117, small split to John Lupton |
| Q329-Sulfide-04 | nautilus - 25127 |
| Q329-sulfide-06 | nautilus - 25120 |
| Q329-sulfide-08 | nautilus - 25122 |
| Q331-Sulfide-03 | nautilus - 25125 |
| Q331-Sulfide-14 | nautilus - 25124 |
| Q331-Sulfide-24 | nautilus - 25126, small split to John Lupton |

## 6.2 Gravity and Magnetic Acquisition

Fabio Caratori Tontini

More than 600 km of gravity and magnetic data have been acquired, focused on producing detailed maps of Volcano O and Niua. The tracklines were oriented in order to cross perpendicular to the relevant bathymetry features and to complement previous surveys in these regions.

Gravity was collected by using the Bell Aerospace/Textron BGM III Dual Gravity Measuring System installed in the main lab, close to the ship's center of mass. The system consists of a gravity sensor unit, an auxiliary battery drawer, and a stabilized platform. Gravity data were interpolated to the GPS-navigation and continuously recorded at 1 Hz. The raw gravity values are calculated by using a scale factor of 4.99975539 and a bias factor of 855366.626 for the BELL gravity meter. Gravity data were raw gravity values, which were tied to a gravity reference station in Apia at the geophysical observatory (13° 48.894' S, 171°46.829' W) on Aug 28,2012. The drift of the gravity meter was determined from the two in-port gravity station ties in Apia on Aug 28 and Sept 26. Free-air anomalies were determined by using the 1980 Gravity formula and by filtering the raw gravity data using a Butterworth low-pass filter with cut-off wavelength of 200 s.

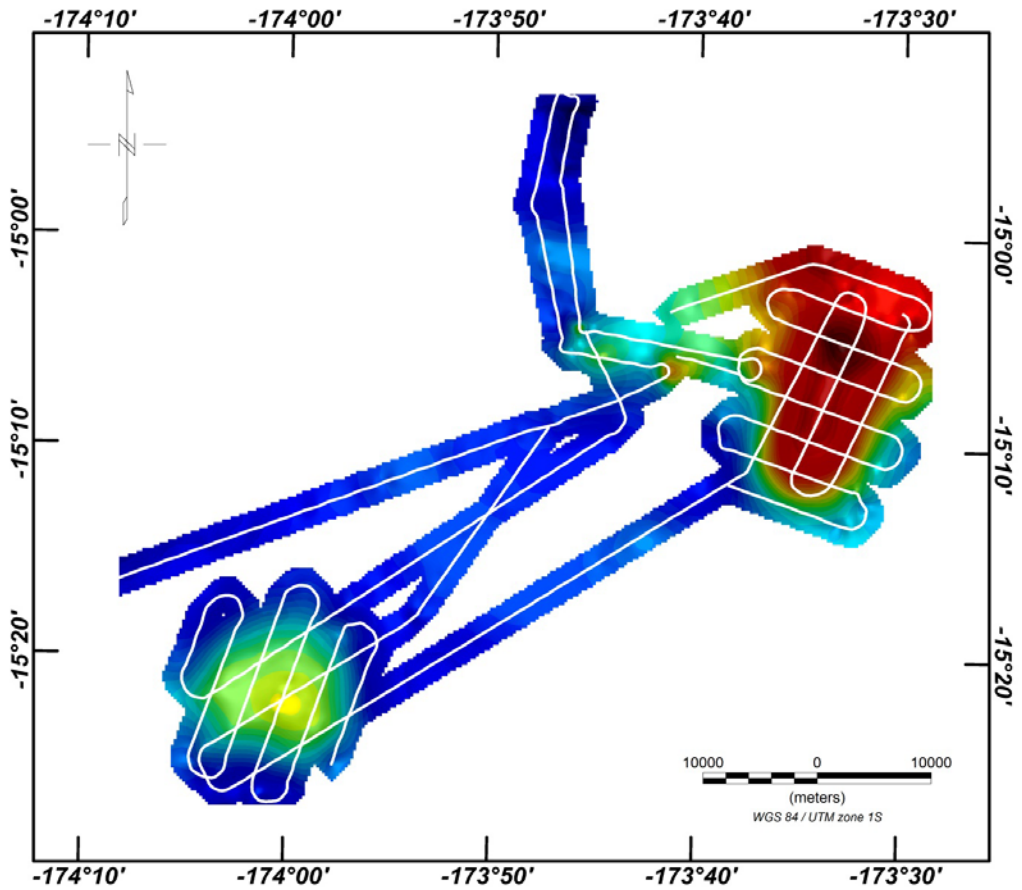



**Fig. 6.2.-1.** The free-air map is shown above with anomalies from 65 mGal (blue), to 130 mGal (red). Free-air Gravity anomaly physical units are mGal (milligal).

Magnetic data were collected by using two Marine Magnetics Seaspy magnetometers towed in a longitudinal gradient configuration. The two sensors were spaced 100 m apart and system was towed 700 m behind the ship's stern to reduce the magnetic noise of the vessel. The sensor locations were estimated by applying a corresponding lag correction to the ship GPS data. Total-intensity magnetic anomaly was calculated by subtracting the IGRF reference field.

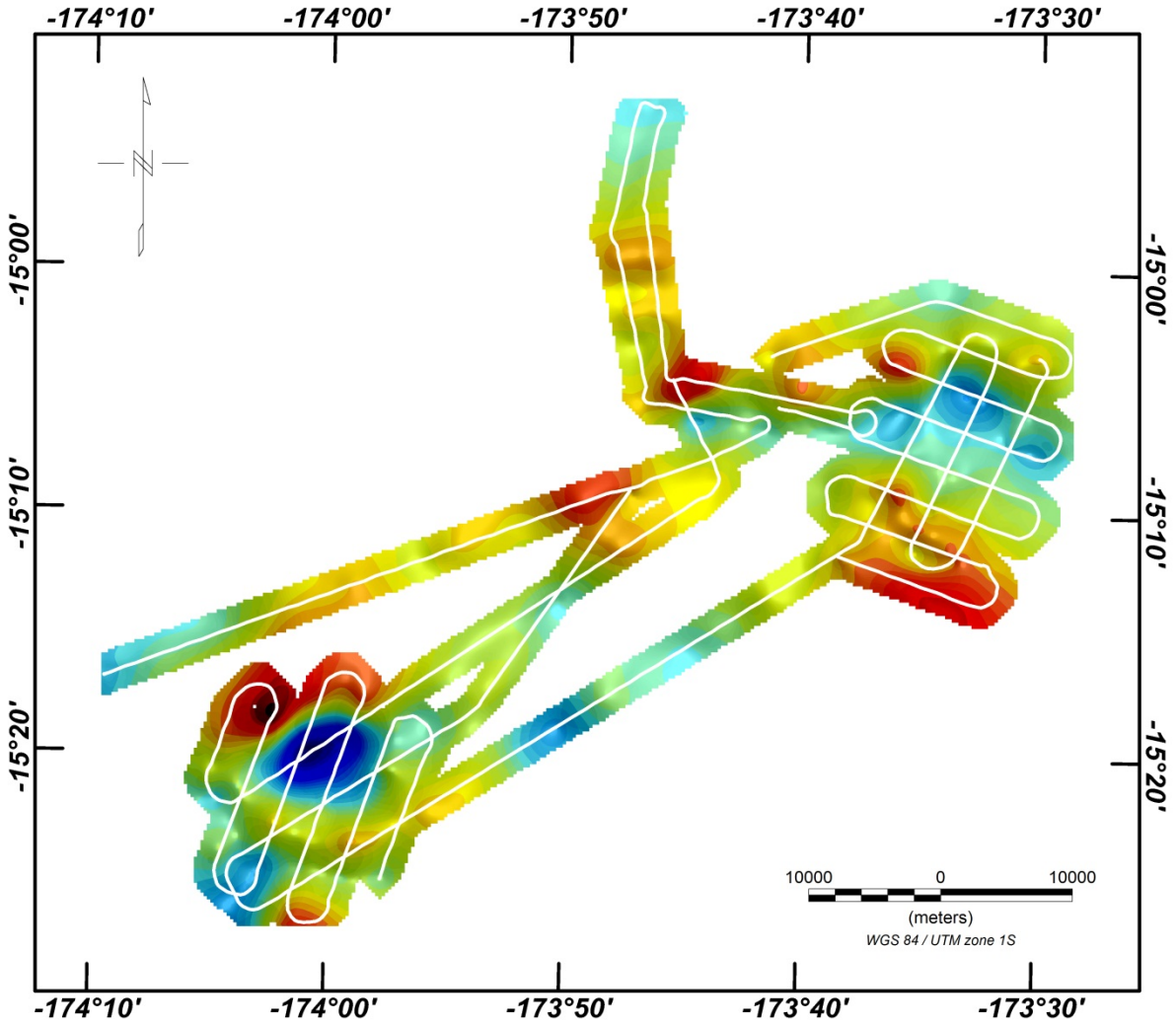



**Fig. 6.2.-2.** Total-intensity magnetic anomaly map is shown above, with anomalies in the range-500 nT (blue) to 300 nT (red). Magnetic units are nanoTesla (nT).

## 6.3 R/V *Revelle* EM122 Multibeam Mapping Operations

Susan G. Merle, OSU

EM122 multibeam data (bathymetry and backscatter) were collected during transits and magnetics surveys, as well as during opportune times between ROV dives and CTDs. The total EM122 coverage (raw data) was 21,000 $km^2$, 19,000 $km^2$ in the western hemisphere, 2,000 $km^2$ in the eastern hemisphere (Fig. 6.3-1). Most of the data collected in areas not previously surveyed have been cleaned with mbedit (MBSystem). Files that did not add to the PMEL Vents Program database were not cleaned and will not be used in bathymetric compilations.

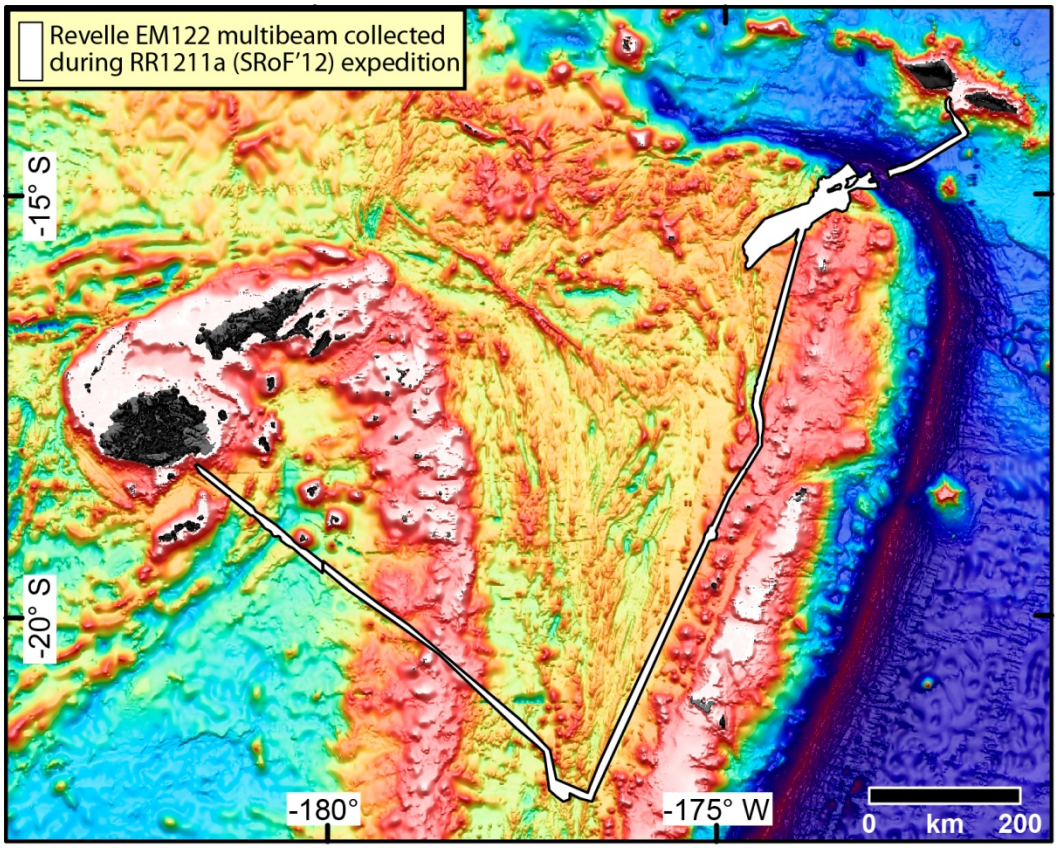



**Fig. 6.3-1.** Total EM122 multibeam coverage on expedition RR1211.

During the transit from Fiji to the first dive site a six hour EM122 survey was conducted of a seamount-like feature 40 km west of the Valu Fa Ridge. Between the Vai Lili and South Fonualei dives a 2 hour EM122 survey was conducted over a previously unmapped caldera dubbed "First Volcano". The seamount rose over 1000 meters to within 700 meters of the surface (Fig.6.3.-2).

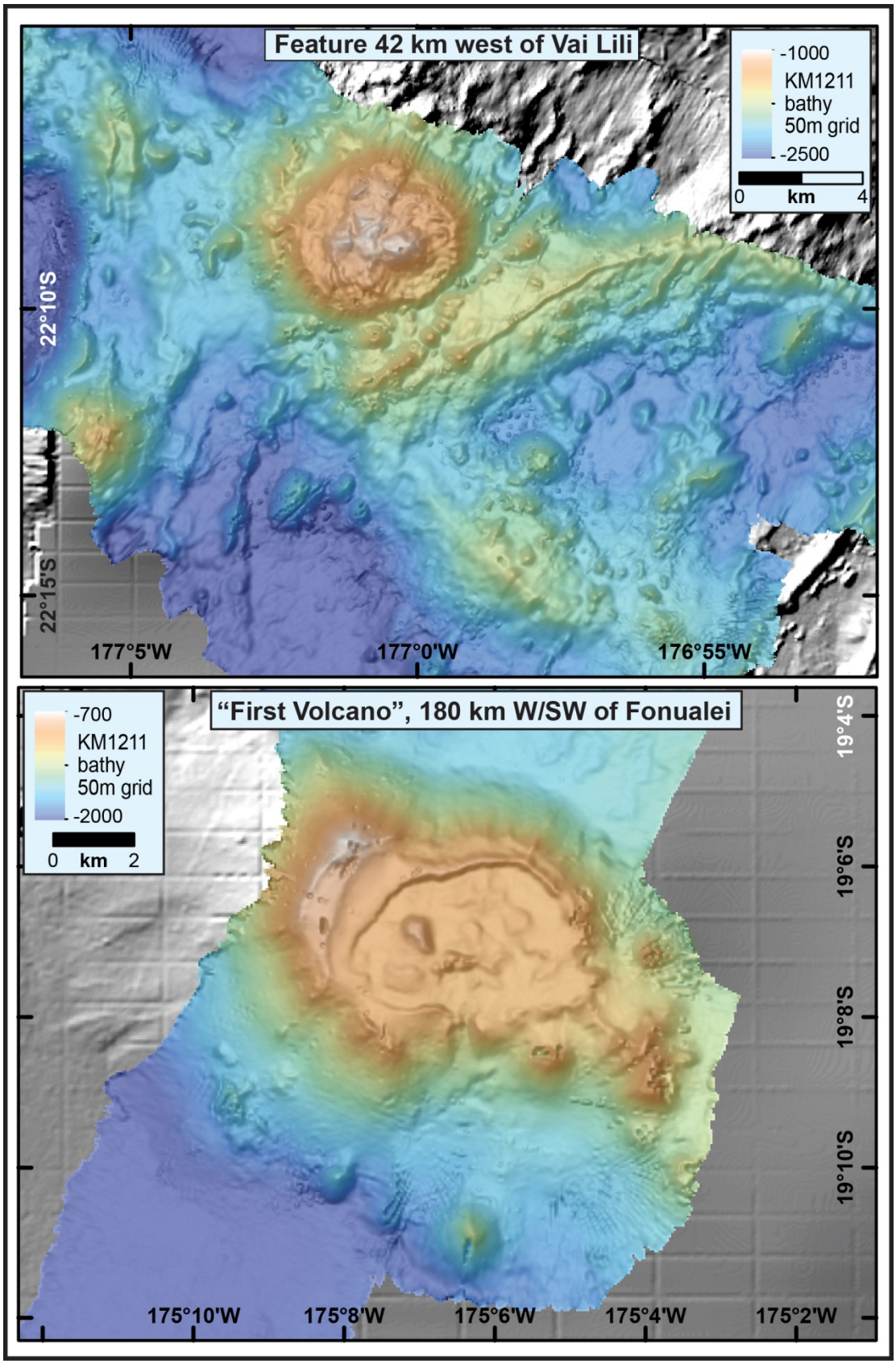



**Fig. 6.3-2.** EM122 surveys during the transit to the NE Lau basin.

There were several issues with the EM122 mapping system on the R/V *Revelle*. The bathymetry data were generally quite noisy with data dropouts repeated over many pings, causing big gouges that degrade the data even after editing. There were also lesser, more persistent bad beams along a single ping or many pings that also reduced the data quality (Fig. 6.3-3). Multibeam data collected during the magnetics survey at Niua were noisy due to high seas and ship speeds over 10 kts. Transit speeds averaged 12 knots, which is too fast for optimum bathymetric surveying, and that also contributed to reduced data quality. Even during instances when the ship slowed down for specific survey targets, like the re-survey of West Mata for surface differencing, the data collected with the R/V *Revelle* EM122 system were inferior to data collected on the R/V *Kilo Moana* on previous expeditions (Fig. 6.3-4)

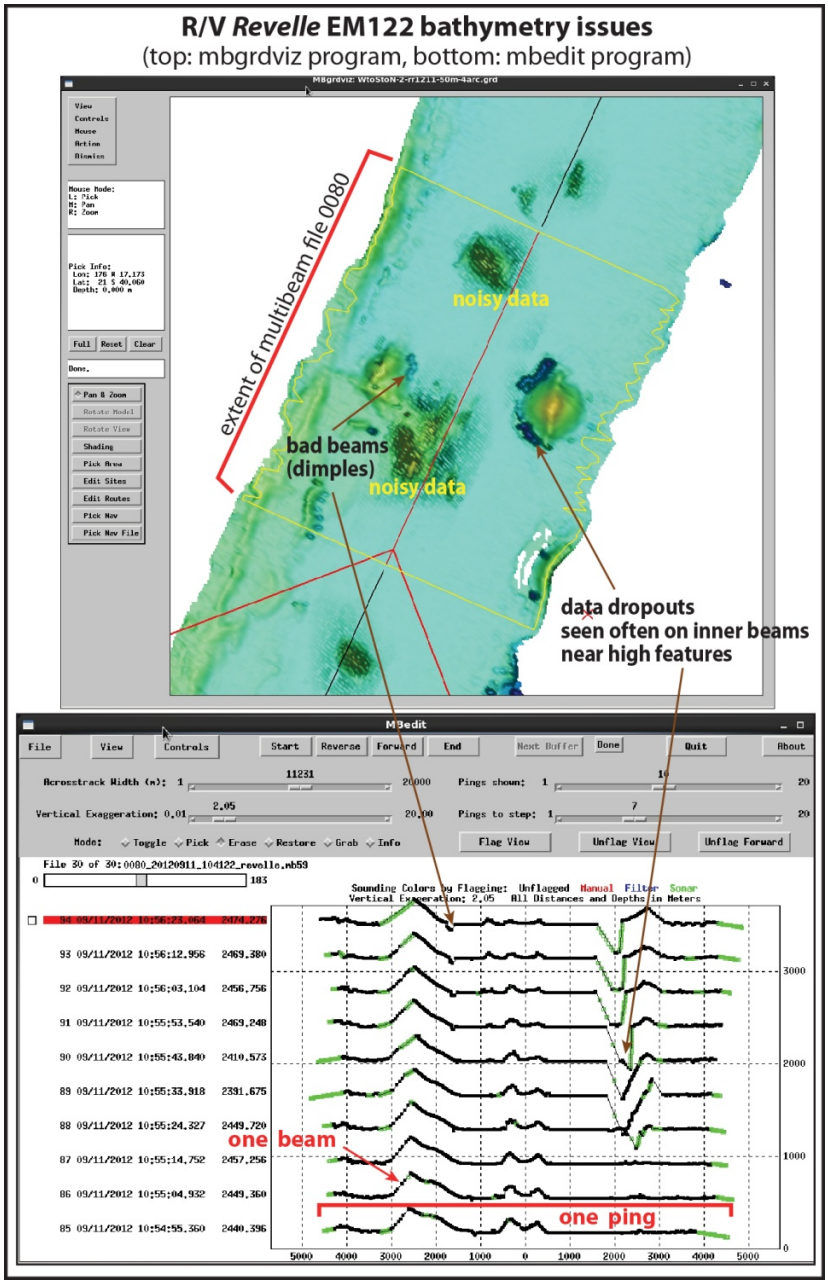



**Fig. 6.3-3.** Example of R/V *Revelle* EM122 bathymetry data quality issues. MBSystem programs (mbgrdviz top, mbedit bottom) used to analyze data quality and edit errant bathymetry beams and pings.

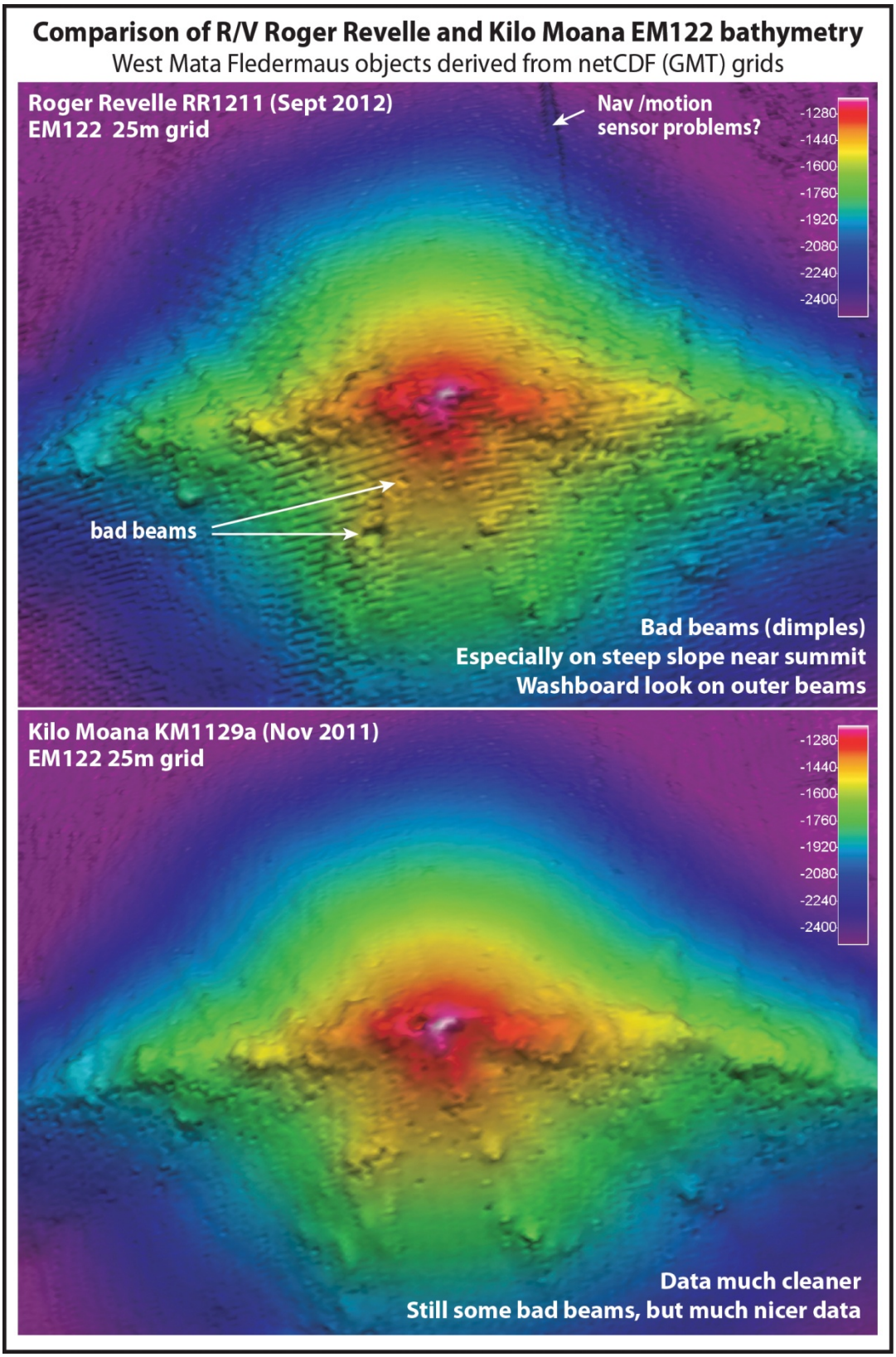



**Fig. 6.3-4.** Comparison of EM122 data at West Mata. Top, R/V *Roger Revelle* data. Bottom, R/V *Kilo Moana* data.

## 6.4 Macrobiology: Observations and Sampling during SROF12 (RR1211)

Tim Shank

The main macro-biological objectives of the program were to investigate the community composition, distribution, and biogeographic character of the rear arc volcanoes, arc volcanoes and backarc spreading center volcanoes, specifically, Mata and Niua volcanoes, as well as the Fonualei spreading center. This was undertaken via *in situ* visual observation, biological sampling, and post-cruise comparative analysis. This work follows on from our activities in the region since 2008 via bottom sampling and/or towed camera surveys (on R/V *Kilo Moana* cruises KM1008, KM1024, KM1129a), plus ROV observation and sampling at West Mata volcano (on R/V *Thompson* cruise TN234).

The comparative results of Quest4000 field observations on RR1211 and post-cruise laboratory studies of the biological samples are seeking to understand the composition, distribution, diversity, associated geochemical an geological settings and habitats, and in some cases, to understand the temporal changes in biological community structures taking place on the target volcanoes (e.g., West Mata). As such, our post-cruise analysis will include the relationship of vent fluid chemistry to biological community structure at each study site, and correlations to the geological controls (settings) on hydrothermal activity at these sites.

The biological program was fully integrated into the overall SROF12 program objective to discover and observe hydrothermal vent sites and to sample fluids, mineral deposits, and biota at them. In general, biological observations were made throughout each dive, including transits in and around the vent sites.

A total of 45 numbered biological samples were taken at 8 volcanoes on the SROF12 expedition (see Table 6.4-1). Rear arc volcano sites included the Mata seamounts (a series of nine roughly NE-SW trending small elongate volcanoes of varying heights and sizes) and Volcano 'O' (also known as Niuatahi). Arc sites were situated at Niua volcano on the Tofua Arc, in and around previously defined hydrothermal sites called Niua North and Niua South. Two back arc spreading center sites were also investigated elsewhere in the Lau basin, at the southern portion of Fonualei Spreading Center and on the Valu Fa Ridge (visited for non-macrofaunal objectives).

All bio-sample specimens (Table 6.4.-2) are curated at the Woods Hole Oceanographic Institution. Each sample has been assigned a unique ID and registered in the Shank laboratory, a sample database managed by Molecular Ecology and Evolution Lab, Biology Department.

There are at least three major biological findings to date:

**1. Faunal Community Composition**

• The differences in discovered faunal composition among the volcanic seamounts were significant.

• Perhaps seamounts hosting long-term persistent venting fed by a deeper-heat source (e.g., Niua South?, Mata Ua?) also hosted a different suite of fauna (e.g., vent snails, mussels, and barnacles) than did relatively shallow heat-sourced seamounts (e.g., shrimp at West Mata? and tubeworms at Mata Tolu?) These observed patterns differed markedly with what we discovered in one dive at Fonualei South, where perhaps the largest, most

expansive, chemosynthetic mussel bed (hundreds of square meters, comprised mostly of dead mussels) was observed.

• The collection of a total of 778 individual organisms yielded 38 species.

**Table 6.4-1 Numbered Biological Samples**

| Site | # of indiv. collected |
|---|---|
| Fonualei South | 117 |
| Mata Fitu | 2 |
| Mata Tolu | 144 |
| Mata Ua | 339 |
| Niua North | 88 |
| Niua South | 41 |
| Volcano O | 1 |
| W. Mata | 46 |

**2. Potential New Species**

• As a result of our surveys and collections, there are possibly 4 new invertebrate species discovered during our expedition. These are vent-endemic shrimp, a gastropod snail, and a polychaete worm. Samples were only recently returned (February, 2013) to the Shank lab for further analysis, where molecular genetic and morphological analysis will take place.

**3. Biological Findings at West Mata**

While the eruptive activity apparently ceased at West Mata, the creation and persistence of hydrothermal habitats as well as the rapid development of the hydrothermal vent communities was dramatic.

• We discovered polychaete worms (at least three species), shrimp (2 species), crabs (3 species) and other grazers on microbial material, as well as predators, such as the zoarcid fish, that increased the known faunal diversity at West Mata from just two species in 2009 (including one species, a vent fish, observed only once) to at least 13.

Interestingly, these species encompass all trophic levels, indicative that a complex system for chemosynthetic energy flow now exists on West Mata, where it did not previously. Mobile fauna continue to dominate the vents at this seamount. However, several mobile species, including the two species of giant snails and mussels, known from the Lau region have not been observed here (yet). Sessile fauna, such as tubeworms or stalked barnacles, which we know to be in the thousands covering massive sulfide pillars at seamount vents just 20km from West Mata have similarly not been observed.

Also interesting is the dramatic change in abundance and distribution of the dominant species- a shrimp (*Opaepele loihi*). The *Opaepele* shrimp were again present on West Mata, but in an abundance significantly greater than previously observed on any Lau Basin / seamount site in the Mata region. So numerous were these shrimp bathed in shimmering vent water that preliminary estimates suggest that their density is likely the

highest of any shrimp species clustered at a diffuse flow vent site in the world. There are perhaps more than 1000 per $m^2$, second to only the density of *Rimicaris* shrimp (at 2500 indiv per $m^2$) which cluster on the sides of active Atlantic and Central Indian black smokers.

**4. Temporal Changes in Community Structure at West Mata**

In 2009, exploration of the West Mata Volcano discovered active volcanism and hydrothermal venting associated with primarily two vents on the central promontory: Hades and Prometheus "vents", from which explosive activity and lava fragmentation, high-temperature venting, and lava flowing downslope were observed. In these "explosive areas" on the crest of the volcano, there was a notable absence of macrofauna. The active and ongoing creation of new seafloor via volcanic activity may have prevented the colonization of sessile and mobile fauna. Interestingly, the diffuse venting fluids (~5 to 25°C), issuing through cracks and crevices ~15 to 40 m distant to the vents, played host to only one type of vent fauna – alvinocarid shrimp. This shrimp, confirmed later via genetic analysis to be *Opaepele loihi* , the same species as those inhabiting Mariana seamount vents, seamounts north of Guam and Loihi Seamount off eastern Hawaii. The shrimp were abundant (near 100 per $m^2$) grazing on microbes (confirmed from later isotope analyses) growing on rock surfaces bathed in the clear diffuse venting fluids. Several zoarcid eelpout fish were documented within 40 meters of these main vents. The only fauna attached to the seafloor were observed far away from the explosive vents- as much as ~450m. These included a clump of "non-vent" stalked barnacles and a single deep-sea coral.

ROV surveys during RR1211 included the western flank at a place called Mat Meadow, a mounded area covered with extensive white microbial mats in 2009. In 2012, this area was covered in rust colored mats and sediments, with hundreds of polychaete worms swimming just over the seafloor by undulating in the water column traversing meters above the seafloor, zoarcid eelpout fish of two sizes, and polynoid or scales worms were scouring rocks in the Meadow. Soon we came upon the "Luo" site to discover it was still venting but less vigorously. As in 2009, white shrimp were here, yet much less abundant. As we then moved to the east along a fissure, we found more venting with red scale worms, large zoarcid fish, more white shrimp, squat lobster crabs, and large ("square headed") *Paralomis* crabs, resembling those from the Lau Basin, amidst dark volcanic sediments and rocks. We arrived at the site where the explosive Hades vent was erupting lava in 2009, building up the seafoor. Where *Hades* once stood tall, there was a deep pit active with venting. *Hades Pit* was teeming with shrimp, two species now, the white *Opaepele* form and also a larger shrimp with two well-defined eye stalks (unlike *Opaepele*) resembling those observed in the Lau Basin. This shrimp was actively feeding on other shrimp. Zoarcid fish (at least 35 observed) and inch-long red worms inhabited the upper section of the Hades Pit site. The abundance of shrimp in this area more than tripled the highest density observed in 2009. As the dive grew late, we reach a site we called "Shrimp City" in 2009 due to this area hosting the highest density of shrimp. The *Opaepele* shrimp were again still here, but in an abundance that completely covered meters of seafloor. So numerous were these shrimp bathed in shimmering vent water, that preliminary estimates suggest that their density is likely the highest of any shrimp clustered at a diffuse flow vent site, perhaps more than 1000 per $m^2$, second to only the density of *Rimicaris* shrimp (at 2500 indiv per $m^2$) on the sides of Atlantic and Central Indian black smokers.

Macro-biological observations and were conducted on all dives. Only micro-biological samples were taken on dive Q322 at Vai Lili. Macro-biology was sampled on all other Quest4000 dives of this research program.

## Site Specific (Preliminary) Observations, by Dive Number

***Q322 Vai Lili.*** Dive was dedicated to observations at 3 closely-spaced microbial mat sites. Numerous isidid, bamboo, and a chrysogorgid corals were observed during transit to and past the target site that was missed; not much else. At the manganese oxide mat area, no mobile fauna observed. Whip corals (sparse) were observed on the margin of the mat area. Sampled mat - did not observe amphipods or other mat associated fauna. Did observe lollipop hydroids adjacent to mats (mostly black mat - manganese oxide mats). In addition, white stalkless crinoids were most abundant on the black mat areas sampled for chemistry and microbes. Mussel shells were seen at 0341 with an unreadable marker spotted in the area. Brachyuran crab, shrimp, eel pout were also observed at the site. Marker dropped called sulfur mats. Next to this area is an iron/manganese mat area which has boulders on the perimeter with octocorals- chrysogorgids.

***Q323 Fonualei South.*** Beginning of dive on pillows and broken pillows (black). In transit to spire area, observed crinoids, small cup sponges, a cirrate octopus, chrysogorgid coral, two shrimp morphs, nematocarcinid and one alvinocarid like morph), barnacles (short stalked and black) on bulbous and broken pillows; then at 2300 in iron oxide staining/mat where measured temps of 39°C and higher. No megafauna were observed at this site. At area of "known venting" observed large snails nestled among numerous pipe-organ like spires, but mostly very small shrimp on the surface of sulfide towers up to 36m tall. Collected 80 small shrimp (*Opaepele*), at the active base of a spire and collected barnacles from a rock.

***Q324 Volcano O central cone (Motutahi).*** The dive traversed west to east over cone and observed unconsolidated rubble/sediments with mats and polysaccharide gel blobs ~100m below the summit. Loosely consolidated sands and sulfur in drifts at the summit (perhaps associated with small vent structures), and smoke and sulfur-rich smoke within the pit at the summit. At top of summit, found crater (called crater rim) with lots of polysaccharides- small rock chips on white mat material- no observed megafauna throughout this area. Current theory is that the fluids are too acidic, silica and iron too high, or sulfur dioxide to permit megafaunal life. Saw some scaleworms and shrimp at the end of the dive on the S/SE flank at ~1300 meters depth.

***Q325 Mata Ua.*** The dive ascended and sampled the knoll southwest of the volcano summit from the west. Previously TowCam #9 from KM1008 show very little fauna in this region. Observations were largely the same- a few yellow urchins, isidid whip corals, and white holothurians imaged among rocks. Orange staining at early part of tow. In fact, all of the faunal species observed in Towcam09 were observed on this dive, as well as *Abyssocladia* sponges, zoarcid fish, galatheid crabs, and pelagic polychaetes.

***Q326 Niua South.*** Began the dive at small 30m pit 100m SW of the central mound with white shrimp (*Opaepele* aff) and red cephalothorax shrimp with black eye stalks (*Alvinocaris lusca* aff); zoarcid fish, and diffuse flow. *Alvinocaris* was observed on several occasions carrying other shrimp, presumably a feeding activity. The zoarcids were mostly small (10-15cm in length) and observed lying on the seafloor surface or between pumice rocks. Large slabs of ash were observed with brown snails on them. Brown "tubes" that appeared to be organic agglutinated material were associated with lighter colored sediment almost as if they were pushed up through the sediment from the subsidence of the seamount. Proceeding to the northeast, we encountered a large pit with sulfide deposits, small inactive chimneys, white shrimp, galatheids, and chimney crabs. One particular area hosted white seafloor, presumably microbial mat, with numerous small galatheid crabs. During this transit, a group of outcropping rocks was observed hosting barnacles – stalked and a golden color. These were attached in bouquets around all sides of the rocks. Nearer to Target F in the center of the large pit, a group of small chimneys, active with diffuse flow, and either white mat or anhydrite hosted both *Ifremieria* and *Alvinoconcha* snails. *Alvinoconcha* snails were mostly denuded of their shell hair. The *Alvinoconcha* occupied areas of

seemingly higher diffuse flow activity (very good footage here). Shrimp and brachyuran crabs also here. Scale worms were observed on the feet of the *Alvinoconcha* snails. *Alvinoconcha* of different sizes were noted. A single brown limpet was observed on the bare surface of an *Alvinoconcha* snail. A field of inactive chimneys was host to scattered individual *Opaepele*-like shrimp, brachyuran and galatheid crabs. Proceeding upslope (and SE) we encountered active black smokers – a cathedral, now called Adelaide, hosted white shrimp (*Opaepele* aff) and red cephalothorax shrimp with black eye stalks (*Alvinocaris lusca* aff). At the base of smaller chimneys, groups of snails, both *Alvinoconcha* and *Iremeria* were observed.

***Q327 West Mata.*** The dive started in the region of Mat Meadow, a microbial mat draped pyroclastic drift deposit that looked broadly similar to when we observed in in 2009, as did the diffuse flow Luo vent site in that area. At Mat Meadow, orange swimming polychaetes, zoarcid fish, white polychaetes and galatheid crabs were present on rocky outcrops. At Luo, swimming polychaetes, ribbon worms, zoarcids, galatheid crabs, *Opaepele* shrimp, Paralomis crabs, white and red scale worms were observed. At Hades Pit, *Opaepele* shrimp, a red shrimp, and brachyuran crabs were observed. A transit to an area near Shrimp City revealed a "Shrimp Metropolis", with large Opaepele shrimp, and brown turrid gastropods. None of the large *Alvinoconcha* or *Ifremeria* snails were observed on this dive.

***Q328 Mata Ua, north face.*** The dive started on volcanic sands and occasional volcanic rubble lying upon the gently sloping sea bed in the saddle between Matas Ua and Tolu, traversing up the base of the north face of Mata Ua. The dive began at 2435m with ripples heading along NE, with only the occasional white crinoid on outcropping rock. A diffuse hydrothermal flow site was discovered with chimneys heavily colonized by *Vulcanolepas* barnacles and Neoplas barnacles surrounding an active chimney field with several black smokers ($T_{max}$ = 360°C). Sampling of these active areas yielded gastropod limpets and polychaetes. Little other megafauna were observed on this dive.

***Q329 Mata Fitu.*** This dive began downslope of a tongue-shaped rock formation on the volcano south face that lay below the platform known to host an active hydrothermal field. On bottom, we observed *Bathysaurus* fish and whip corals. Of the two vent fields encountered, the more active vent field consisted of at least 8 cathedral-like vents structures, with white-capped spires. At 2604m depth, these were on a NW to SE line. At this depth on the chimneys, we observed branchypolynoe polychaetes, small red polychaetes, one white shrimp, and paralvinellid polychaetes. Moving upslope, neolepas barnacles on the active sides of the chimneys, as well as chirodotid holothurians, brachyuran crabs, white shrimp, *Alvinoconcha* snails, *Ifremieria* snails, and limpets on barnacles were observed.

***Q330 Niua North.*** This dive began on the west side of the upper summit cone on a mostly pumice talus and sediment slope until encountering a sulfur pit just below the summit plateau. The pit had old sulfur flows coming out on one side and a drain back crust, giving the impression that a molten sulfur flow had cooled and dammed the outer margin of a mound structure, and then drained back into the interior to leave a fuming pit. A previous Towcam survey here documented mussels, large snails, red shrimp, white shrimp, tubeworms, red and white crabs, and eel pout fish. All of these fauna were observed on this dive. A massive mussel bed (labeled "Mussel Mania") and diffuse flow hydrothermal activity lay above this, on the northern portion of the plateau at ~720m. On a traverse back to the initial sulfur pit the dive observed a second, smaller sulfur pit northeast of the first one The dive continued southward and traversed to a huge, several 10s of m tall, rhyolite dome-like feature which hosted another large mussel bed on its flat summit.

***Q331 Mata Tolu.*** This dive started at 1865m depth on the upper slopes of the south face, just below the summit platform. The dive made several attempts to find and descend the pit structure but navigation was difficult because of all the chimneys. While moving upslope occasional *phymorynchus* snails and galatheid crabs were observed. The dive turned east across the north part of the summit, through a chimney field and out again, descending a slope on the north side of the volcano off of the summit plateau. Outside of this field, the tubeworm resembling Lamellibrachia columna was observed. The dive then returned to the west and sampled fluids and large snails (*Alvinoconcha* and *Ifremieria* snails) that were on the active chimneys in the main vent field. White shrimp resembling *Opaepele* were also observed.

***Q332 West Mata.*** This dive revisited West Mata and the first half or so was dedicated to geological traverses and observations of the post-eruptive terrain at the summit. As with our previous dive, white swimming polynoid polychaetes, Opaepele shrimp, ophidiid and zoarcid fish were observed near the edge of the HADES Pit. Amidst truncated pillows on margin of pit, both *Opaepele* and a red vent shrimp were observed (2104). When exploring down in the pit, no fauna (with the exception of sparse white polychaetes) were observed among the small sulfur balls and volcanic sediment. Among the white lineations up the side of the SE wall, yellow stalked barnacles were observed. While taking pillow sample (2150), we observed big red shrimp with large rostrum (different morphology than observed before). At the Pit edge, *Opaepele* shrimp were highly abundant along with iron staining, white polychaetes and brachyuran crabs. The traverse from the Pit revealed a continuous distribution of shrimp throughout, with a mixture of orange and white staining for at least 30-40m. At 2205 observed contact with new pillows with shrimp becoming highly abundant. *Branchionotogluma* polychaetes were also present. At 2209, we observed a massive group of shrimp on the seafloor, with gravid red shrimp and sparse lepetodrilid limpets in diffuse flow. At the former Prometheus site (1168-1175m), we observed shrimp, zoarcid fish, brachyuran crabs, *Branchionotogluma* polychaetes. From Prometheus, we transited northeast over iron-stained pillows, some venting diffuse flow with zoarcid fish, and highly abundant *Opaepele* shrimp. Once we transited back toward Kohu, we found "Blue Streak" site hosting white polynoid polychaetes on rock in shimmering water, abundant shrimp, yellow and red *Branchionotogluma* polychaetes, and zoarcid fish.

***Q333 Niua South.*** This dive started in the same small pit SW of the larger crater visited on Q326 to sample pumice for the Tebo program. It then went to the main pit again, where in-place rhyolite pumice was sampled from the wall, after which several sulfide mounds in the south center portion of the crater were visited. The previous dive in this area imaged and collected *Ifremeria* and *Alvinoconcha* snails. Our focus was thus on other fauna for this final dive. The dominant fauna observed and sampled at this site were shrimp of two varieties – *Opaepele* and an *Alvinocaris* species. Brachyuran crabs were also abundant.

## Table 6.4.-2 Macrobiological Samples

| ID | Site | Date | Time | Dive | Sample ID | Depth | Latitude | Longitude | Shipboard ID | Preservation | Common ID |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | Fonualei South | 9/12/2012 | 0:11:55 | Q323 | Q323-biomacro-02 | 951 | -17.543281 | -174.576821 | Mussel shells | dry | Vent mussel |
| 2 | Fonualei South | 9/12/2012 | 0:21:57 | Q323 | Q323-rock-03 | 936 | -17.543534 | -174.576609 | Barnacle morph 1 | frozen | Stalked barnacle |
| 3 | Fonualei South | 9/12/2012 | 1:33:04 | Q323 | Q323-biomacro-05 | 957 | -17.542512 | -174.576288 | *Alvinoconcha* snail | frozen | Hairy Gastropod |
| 4 | Fonualei South | 9/12/2012 | 1:33:04 | Q323 | Q323-biomacro-05 | 957 | -17.542512 | -174.576288 | *Austinograea* crab | frozen | Brachyuran crab |
| 5 | Fonualei South | 9/12/2012 | 1:48:49 | Q323 | Q323-sulfide-06 | 957 | -17.542472 | -174.576322 | Barnacle morph 2 | frozen | Non stalked barnacle |
| 6 | Fonualei South | 9/12/2012 | 1:48:49 | Q323 | Q323-sulfide-06 | 957 | -17.542472 | -174.576322 | Barnacle morph 2 | Etoh 70% | Non stalked barnacle |
| 7 | Fonualei South | 9/12/2012 | 6:06:18 | Q323 | Q323-biomacro-09 | 1572 | -17.535213 | -174.566832 | *Opaepele* affn shrimp | frozen | Opaepele affn sp. |
| 8 | Fonualei South | 9/12/2012 | 6:09:33 | Q323 | Q323-biomacro-09 | 1573 | -17.535213 | -174.566832 | *Opaepele* affn shrimp | Etoh 70% | Opaepele affn sp. |
| 9 | Volcano O | 9/13/2012 | 5:24:07 | Q324 | Q324-biomacro-09 | 1301 | -15.37635 | -174.002 | Sediment Wash | Etoh 70% | |
| 10 | Niua South | 9/17/2012 | 23:52:36 | Q326 | Q326-biomacro-01 | 1165 | -15.166466 | -173.575773 | *Opaepele* shrimp | Etoh 70% | Chorocaris/Opaepele affn sp. |
| 11 | West Mata | 9/18/2012 | 23:58:45 | Q327 | Q327-biomacro-01 | 1165 | -15.094645 | -173.748846 | *Chorocaris* / *Opaepele* shrimp | frozen | Chorocaris/Opaepele affn sp. |
| 12 | West Mata | 9/19/2012 | 0:58:45 | Q327 | Q327-biomacro-01 | 1196 | -15.094645 | -173.748846 | *Chorocaris* / *Opaepele* shrimp | frozen | Chorocaris/Opaepele affn sp. |
| 13 | West Mata | 9/19/2012 | 6:55:42 | Q327 | Q327-biomarco-07 | 1281 | -15.094645 | -173.748846 | *Branchinotogluma* | frozen | Scale Worm |
| 14 | West Mata | 9/19/2012 | 0:58:45 | Q327 | Q327-biomacro-01 | 1196 | -15.094645 | -173.748846 | *Branchinotogluma* | frozen | Polycheata sp. |
| 15 | West Mata | 9/19/2012 | 0:58:45 | Q327 | Q327-biomacro-01 | 1196 | -15.094645 | -173.748846 | Gastropod Anthropod, Polychaeta sp. | Etoh 70% | Gastropod, Anthropod, Polychaeta sp. |
| 16 | Mata Ua | 9/20/2012 | 0:31:41 | Q328 | Q328-biomacro-01 | 2390 | -15.017139 | -173.788474 | *Munidopsis lauensis* | frozen | Squat Lobster |
| 17 | Mata Ua | 9/20/2012 | 0:31:41 | Q328 | Q328-biomacro-01 | 2390 | -15.017139 | -173.788474 | Anenome Morph 1 | frozen | Anemone |
| 18 | Mata Ua | 9/20/2012 | 0:31:41 | Q328 | Q328-biomacro-01 | 2390 | -15.017139 | -173.788474 | *Desbruyresia* sp. | frozen | Desbruyresia sp. |
| 19 | Mata Ua | 9/20/2012 | 0:31:41 | Q328 | Q328-biomacro-01 | 2390 | -15.017139 | -173.788474 | Non-stalked barnacles Morph 2 | frozen | Non-stalked Barnacles |
| 20 | Mata Ua | 9/20/2012 | 0:31:41 | Q328 | Q328-biomacro-01 | 2390 | -15.017139 | -173.788474 | *Volcanolepus* sp. | frozen | Stalked Barnacles |
| 21 | Mata Ua | 9/20/2012 | 0:31:41 | Q328 | Q328-biomacro-01 | 2390 | -15.017139 | -173.788474 | *Volcanolepus* sp. | frozen | Stalked Barnacles |
| 22 | Mata Ua | 9/20/2012 | 0:31:41 | Q328 | Q328-biomacro-01 | 2390 | -15.017139 | -173.788474 | *Volcanolepus* sp. | frozen | Stalked Barnacles |
| 23 | Mata Ua | 9/20/2012 | 0:31:41 | Q328 | Q328-biomacro-01 | 2390 | -15.017139 | -173.788474 | *Volcanolepus* sp. | frozen | Stalked Barnacles |
| 24 | Mata Ua | 9/20/2012 | 0:31:41 | Q328 | Q328-biomacro-01 | 2390 | -15.017139 | -173.788474 | *Eunice* sp. | frozen | Worms |
| 25 | Mata Ua | 9/20/2012 | 0:31:41 | Q328 | Q328-biomacro-01 | 2390 | -15.017139 | -173.788474 | *Branchiotogluma trifurcus* | frozen | Scale Worm |
| 26 | Mata Ua | 9/20/2012 | 0:31:41 | Q328 | Q328-biomacro-01 | 2390 | -15.017139 | -173.788474 | Non-stalked barnacles 2 | frozen | Non-stalked Barnacles |
| 28 | Mata Ua | 9/20/2012 | 0:31:41 | Q328 | Q328-biomacro-01 | 2390 | -15.017139 | -173.788474 | Non-stalked barnacles 3 | frozen | Non-stalked Barnacles |
| 29 | Mata Ua | 9/20/2012 | 0:31:41 | Q328 | Q328-biomacro-01 | 2390 | -15.017139 | -173.788474 | 13 Polychaetes 3 limpets Unsorted | Etoh 70% | Polychaetes and Limpets |
| 30 | Mata Ua | 9/20/2012 | 3:43:41 | Q328 | Q328-biogeo-15 | 2365 | -15.017300 | -173.788215 | Lepetodilid sp. | frozen | Gastropod |
| 31 | Mata Ua | 9/20/2012 | 3:43:41 | Q328 | Q328-biogeo-15 | 2365 | -15.017300 | -173.788215 | *Amphisamytha* sp. | frozen | Worm |
| 32 | Mata Ua | 9/20/2012 | 3:43:41 | Q328 | Q328-biogeo-15 | 2365 | -15.017300 | -173.788215 | *Paralvinella* sp. | frozen | Worm |
| 33 | Mata Ua | 9/20/2012 | 3:43:41 | Q328 | Q328-biogeo-15 | 2365 | -15.017300 | -173.788215 | Volunteers on basket *Vuclanolepus* sp. | Etoh 70% | Non-stalked Barnacles |

| ID | Site | Date | Time | Dive | Sample ID | Depth | Latitude | Longitude | Shipboard ID | Preservation | Common ID |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 34 | Mata Ua | 9/20/2012 | 3:43:41 | Q328 | Q328-biogeo-15 | 2365 | -15.017300 | -173.788215 | Non-stalked barnacles 2 | Etoh 70% | Non-stalked Barnacles |
| 35 | Mata Ua | 9/20/2012 | 3:43:41 | Q328 | Q328-biogeo-15 | 2365 | -15.017300 | -173.788215 | *Amphisamytha* sp. *Paralvinella* sp. | Etoh 70% | Worms |
| 36 | Mata Ua | 9/20/2012 | 3:43:41 | Q328 | Q328-sulphide-10 | 2365 | -15.017300 | -173.788215 | *Eochinonelasmus* Barnacle | frozen | Non-stalked Barnacles |
| 37 | Mata Ua | 9/20/2012 | 3:43:41 | Q328 | Q328-sulphide-10 | 2365 | -15.017300 | -173.788215 | *Vulcanolepus* sp. | frozen | Stalked Barnacles |
| 38 | Mata Ua | 9/20/2012 | 3:19:51 | Q328 | Q328-biomacro-08 | 2365 | -15.017300 | -173.788215 | *Munidopsis lauensis* | frozen | Squat Lobster |
| 39 | Mata Ua | 9/20/2012 | 3:19:51 | Q328 | Q328-biomacro-08 | 2365 | -15.017300 | -173.788215 | *Alvinocaris* sp. | frozen | Shrimp |
| 40 | Mata Ua | 9/20/2012 | 3:19:51 | Q328 | Q328-biomacro-08 | 2365 | -15.017300 | -173.788215 | *Alvinocaris* sp. | Etoh 70% | Shrimp |
| 41 | Mata Ua | 9/20/2012 | 3:25:09 | Q328 | Q328-biomacro-09 | 2365 | -15.017300 | -173.788215 | *Vulcanolepus* sp. | frozen | Stalked Barnacles |
| 42 | Mata Ua | 9/20/2012 | 3:25:09 | Q328 | Q328-biomacro-09 | 2365 | -15.017300 | -173.788215 | *Vulcanolepus* sp. | frozen | Stalked Barnacles |
| 43 | Mata Ua | 9/20/2012 | 3:25:09 | Q328 | Q328-biomacro-09 | 2365 | -15.017300 | -173.788215 | *Munidopsis lauensis* | frozen | Squat Lobster |
| 44 | Mata Fitu | 9/21/2012 | 5:52:58 | Q329 | Q329-biomacro-13 | 2643 | -14.913654 | -173.779111 | Fish | frozen | |
| 45 | Mata Fitu | 9/21/2012 | 5:56:59 | Q329 | Q329-biomacro-14 | 2643 | -14.913654 | -173.779111 | *Dhymorynchus* Snail | frozen | Dhymorynchus Snail |
| 46 | Niua North | 9/22/2012 | 20:55:49 | Q330 | Q330-biomacro-01 | 764 | -15.081095 | -173.554769 | *Paralomis* Crab 1 | frozen | Crab |
| 47 | Niua North | 9/22/2012 | 20:55:49 | Q330 | Q330-biomacro-01 | 764 | -15.081095 | -173.554769 | *Paralomis* Crab 2 | frozen | Crab |
| 48 | Niua North | 9/22/2012 | 20:55:49 | Q330 | Q330-biomacro-01 | 764 | -15.081095 | -173.554769 | *Paralomis* Crab 3 | frozen | Crab |
| 49 | Niua North | 9/22/2012 | 20:55:49 | Q330 | Q330-biomacro-01+11 | 764 | -15.081095 | -173.554769 | Polynoid /Polychaete | Etoh 70% | Polychaetes |
| 50 | Niua North | 9/22/2012 | 20:55:49 | Q330 | Q330-biomacro 01 + 02 | 764 | -15.081095 | -173.554769 | *Alvinocaris* sp. | frozen | Alvinocaris Shrimp |
| 51 | Niua North | 9/22/2012 | 21:16:57 | Q330 | Q330-biomacro 02 | 764 | -15.081084 | -173.554761 | *Alvinocaris* sp. | Etoh 70% | Alvinocaris Shrimp |
| 52 | Niua North | 9/22/2012 | 2:40:54 | Q330 | Q330-biomacro-10 | 720 | -15.081765 | -173.554188 | Mussel 1 Mantle | frozen | Mussel Mantle |
| 53 | Niua North | 9/22/2012 | 2:40:54 | Q330 | Q330-biomacro-10 | 720 | -15.081765 | -173.554188 | Mussel 1 Gill | frozen | Mussel Gill |
| 54 | Niua North | 9/22/2012 | 2:40:54 | Q330 | Q330-biomacro-10 | 720 | -15.081765 | -173.554188 | Mussel 1 Foot | frozen | Mussel Foot |
| 55 | Niua North | 9/22/2012 | 2:40:54 | Q330 | Q330-biomacro-10 | 720 | -15.081765 | -173.554188 | Mussel 1 Adductor | frozen | Mussel Adductor |
| 56 | Niua North | 9/22/2012 | 2:40:54 | Q330 | Q330-biomacro-10 | 720 | -15.081765 | -173.554188 | Mussel 2 Mantle | frozen | Mussel Mantle |
| 57 | Niua North | 9/22/2012 | 2:40:54 | Q330 | Q330-biomacro-10 | 720 | -15.081765 | -173.554188 | Mussel 2 Gill | frozen | Mussel Gill |
| 58 | Niua North | 9/22/2012 | 2:40:54 | Q330 | Q330-biomacro-10 | 720 | -15.081765 | -173.554188 | Mussel 2 Foot | frozen | Mussel Foot |
| 59 | Niua North | 9/22/2012 | 2:40:54 | Q330 | Q330-biomacro-10 | 720 | -15.081765 | -173.554188 | Mussel 2 Adductor | frozen | Mussel Adductor |
| 60 | Niua North | 9/22/2012 | 2:40:54 | Q330 | Q330-biomacro-10 | 720 | -15.081765 | -173.554188 | Mussel 3 Mantle | frozen | Mussel Mantle |
| 61 | Niua North | 9/22/2012 | 2:40:54 | Q330 | Q330-biomacro-10 | 720 | -15.081765 | -173.554188 | Mussel 3 Gill | frozen | Mussel Gill |
| 62 | Niua North | 9/22/2012 | 2:40:54 | Q330 | Q330-biomacro-10 | 720 | -15.081765 | -173.554188 | Mussel 3 Foot | frozen | Mussel Foot |
| 63 | Niua North | 9/22/2012 | 2:40:54 | Q330 | Q330-biomacro-10 | 720 | -15.081765 | -173.554188 | Mussel 3 Adductor | frozen | Mussel Adductor |
| 64 | Niua North | 9/22/2012 | 2:40:54 | Q330 | Q330-biomacro-10 | 720 | -15.081765 | -173.554188 | Mussel 4 Mantle | frozen | Mussel Mantle |
| 65 | Niua North | 9/22/2012 | 2:40:54 | Q330 | Q330-biomacro-10 | 720 | -15.081765 | -173.554188 | Mussel 4 Gill | frozen | Mussel Gill |
| 66 | Niua North | 9/22/2012 | 2:40:54 | Q330 | Q330-biomacro-10 | 720 | -15.081765 | -173.554188 | Mussel 4 Foot | frozen | Mussel Foot |
| 67 | Niua North | 9/22/2012 | 2:40:54 | Q330 | Q330-biomacro-10 | 720 | -15.081765 | -173.554188 | Mussel 4 Adductor | frozen | Mussel Adductor |
| 68 | Niua North | 9/22/2012 | 2:40:54 | Q330 | Q330-biomacro-10 | 720 | -15.081765 | -173.554188 | Mussel 5 Mantle | frozen | Mussel Mantle |
| 69 | Niua North | 9/22/2012 | 2:40:54 | Q330 | Q330-biomacro-10 | 720 | -15.081765 | -173.554188 | Mussel 5 Gill | frozen | Mussel Gill |
| 70 | Niua North | 9/22/2012 | 2:40:54 | Q330 | Q330-biomacro-10 | 720 | -15.081765 | -173.554188 | Mussel 5 Foot | frozen | Mussel Foot |
| 71 | Niua North | 9/22/2012 | 2:40:54 | Q330 | Q330-biomacro-10 | 720 | -15.081765 | -173.554188 | Mussel 5 Adductor | frozen | Mussel Adductor |
| 72 | Niua North | 9/22/2012 | 2:40:54 | Q330 | Q330-biomacro-10 | 720 | -15.081765 | -173.554188 | Mussel 6 Mantle | frozen | Mussel Mantle |
| 73 | Niua North | 9/22/2012 | 2:40:54 | Q330 | Q330-biomacro-10 | 720 | -15.081765 | -173.554188 | Mussel 6 Gill | frozen | Mussel Gill |
| 74 | Niua North | 9/22/2012 | 2:40:54 | Q330 | Q330-biomacro-10 | 720 | -15.081765 | -173.554188 | Mussel 6 Foot | frozen | Mussel Foot |
| 75 | Niua North | 9/22/2012 | 2:40:54 | Q330 | Q330-biomacro-10 | 720 | -15.081765 | -173.554188 | Mussel 6 Adductor | frozen | Mussel Adductor |
| 76 | Niua North | 9/22/2012 | 2:40:54 | Q330 | Q330-biomacro-10 | 720 | -15.081765 | -173.554188 | Mussel 7 Mantle | frozen | Mussel Mantle |
| 77 | Niua North | 9/22/2012 | 2:40:54 | Q330 | Q330-biomacro-10 | 720 | -15.081765 | -173.554188 | Mussel 7 Gill | frozen | Mussel Gill |

| ID | Site | Date | Time | Dive | Sample ID | Depth | Latitude | Longitude | Shipboard ID | Preservation | Common ID |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 78 | Niua North | 9/22/2012 | 2:40:54 | Q330 | Q330-biomacro-10 | 720 | -15.081765 | -173.554188 | Mussel 7 Foot | frozen | Mussel Foot |
| 79 | Niua North | 9/22/2012 | 2:40:54 | Q330 | Q330-biomacro-10 | 720 | -15.081765 | -173.554188 | Mussel 7 Adductor | frozen | Mussel Adductor |
| 80 | Niua North | 9/22/2012 | 2:40:54 | Q330 | Q330-biomacro-10 | 720 | -15.081765 | -173.554188 | Mussel 7 Commensal | frozen | Commensal Organism |
| 81 | Niua North | 9/22/2012 | 2:40:54 | Q330 | Q330-biomacro-10 | 720 | -15.081765 | -173.554188 | Mussel 8 Mantle | frozen | Mussel Mantle |
| 82 | Niua North | 9/22/2012 | 2:40:54 | Q330 | Q330-biomacro-10 | 720 | -15.081765 | -173.554188 | Mussel 8 Gill | frozen | Mussel Gill |
| 83 | Niua North | 9/22/2012 | 2:40:54 | Q330 | Q330-biomacro-10 | 720 | -15.081765 | -173.554188 | Mussel 8 Foot | frozen | Mussel Foot |
| 84 | Niua North | 9/22/2012 | 2:40:54 | Q330 | Q330-biomacro-10 | 720 | -15.081765 | -173.554188 | Mussel 8 Adductor | frozen | Mussel Adductor |
| 85 | Niua North | 9/22/2012 | 2:40:54 | Q330 | Q330-biomacro-10 | 720 | -15.081765 | -173.554188 | Mussel 8 Commensal | frozen | Commensal Organism |
| 86 | Niua North | 9/22/2012 | 2:40:54 | Q330 | Q330-biomacro-10 | 720 | -15.081765 | -173.554188 | Mussel 9 Mantle | frozen | Mussel Mantle |
| 87 | Niua North | 9/22/2012 | 2:40:54 | Q330 | Q330-biomacro-10 | 720 | -15.081765 | -173.554188 | Mussel 9 Gill | frozen | Mussel Gill |
| 88 | Niua North | 9/22/2012 | 2:40:54 | Q330 | Q330-biomacro-10 | 720 | -15.081765 | -173.554188 | Mussel 9 Foot | frozen | Mussel Foot |
| 89 | Niua North | 9/22/2012 | 2:40:54 | Q330 | Q330-biomacro-10 | 720 | -15.081765 | -173.554188 | Mussel 9 Adductor | frozen | Mussel Adductor |
| 90 | Niua North | 9/22/2012 | 2:40:54 | Q330 | Q330-biomacro-10 | 720 | -15.081765 | -173.554188 | Mussel 10 Mantle | frozen | Mussel Mantle |
| 91 | Niua North | 9/22/2012 | 2:40:54 | Q330 | Q330-biomacro-10 | 720 | -15.081765 | -173.554188 | Mussel 10 Gill | frozen | Mussel Gill |
| 92 | Niua North | 9/22/2012 | 2:40:54 | Q330 | Q330-biomacro-10 | 720 | -15.081765 | -173.554188 | Mussel 10 Foot | frozen | Mussel Foot |
| 93 | Niua North | 9/22/2012 | 2:40:54 | Q330 | Q330-biomacro-10 | 720 | -15.081765 | -173.554188 | Mussel 10 Adductor | frozen | Mussel Adductor |
| 94 | Niua North | 9/22/2012 | 2:40:54 | Q330 | Q330-biomacro-10 | 720 | -15.081765 | -173.554188 | Mussel 11 Mantle | frozen | Mussel Mantle |
| 95 | Niua North | 9/22/2012 | 2:40:54 | Q330 | Q330-biomacro-10 | 720 | -15.081765 | -173.554188 | Mussel 11 Gill | frozen | Mussel Gill |
| 96 | Niua North | 9/22/2012 | 2:40:54 | Q330 | Q330-biomacro-10 | 720 | -15.081765 | -173.554188 | Mussel 11 Foot | frozen | Mussel Foot |
| 97 | Niua North | 9/22/2012 | 2:40:54 | Q330 | Q330-biomacro-10 | 720 | -15.081765 | -173.554188 | Mussel 11 Adductor | frozen | Mussel Adductor |
| 98 | Niua North | 9/22/2012 | 2:40:54 | Q330 | Q330-biomacro-10 | 720 | -15.081765 | -173.554188 | Mussel 12 | frozen | Mussel |
| 99 | Niua North | 9/22/2012 | 2:40:54 | Q330 | Q330-biomacro-10 | 720 | -15.081765 | -173.554188 | Mussel shells | Airdry | *Bathymodiolus brevior* |
| 100 | Niua North | 9/22/2012 | 3:19:34 | Q330 | Q330-biomacro-11 | 723 | -15.080995 | -173.553319 | Phylodocid worm? | Etoh 70% | Tubeworm |
| 101 | Niua North | 9/22/2012 | 3:19:34 | Q330 | Q330-biomacro-11 | 723 | -15.080995 | -173.553319 | *Lamellibrachia* | frozen | Tubeworm |
| 102 | Niua North | 9/22/2012 | 3:19:34 | Q330 | Q330-biomacro-11 | 723 | -15.080995 | -173.553319 | Anemome Morph 2 | frozen | Anenome |
| 103 | Niua North | 9/22/2012 | 3:19:34 | Q330 | Q330-biomacro-11 | 723 | -15.080995 | -173.553319 | Barnacle *Neolepas*? | frozen | Stalked Barnacles |
| 104 | Niua North | 9/22/2012 | 3:19:34 | Q330 | Q330-biomacro-11 | 723 | -15.080995 | -173.553319 | *Lamellibrachia* tube | Airdry | Tubeworm stalk |
| 105 | Mata Tolu | 9/23/2012 | 23:20:47 | Q331 | Q331-biomacro-05-10 | 1821 | -15.004940 | -173.793646 | *Alvinocaris* sp. | frozen | Shrimp |
| 106 | Mata Tolu | 9/23/2012 | 23:20:47 | Q331 | Q331-biomacro-05-10 | 1821 | -15.004940 | -173.793646 | *Alvinocaris* sp. | frozen | Shrimp |
| 107 | Mata Tolu | 9/23/2012 | 23:20:47 | Q331 | Q331-biomacro-05-10 | 1821 | -15.004940 | -173.793646 | *Alvinocaris* sp. | frozen | Shrimp |
| 108 | Mata Tolu | 9/23/2012 | 23:20:47 | Q331 | Q331-biomacro-05-10 | 1821 | -15.004940 | -173.793646 | *Alvinocaris* sp. | frozen | Shrimp |
| 109 | Mata Tolu | 9/23/2012 | 23:20:47 | Q331 | Q331-biomacro-05-10 | 1821 | -15.004940 | -173.793646 | *Alvinocaris* sp. | frozen | Shrimp |
| 110 | Mata Tolu | 9/23/2012 | 23:20:47 | Q331 | Q331-biomacro-05-10 | 1821 | -15.004940 | -173.793646 | *Alvinocaris* sp. | frozen | Shrimp |
| 111 | Mata Tolu | 9/23/2012 | 23:20:47 | Q331 | Q331-biomacro-05-10 | 1821 | -15.004940 | -173.793646 | *Alvinocaris* sp. | frozen | Shrimp |
| 112 | Mata Tolu | 9/23/2012 | 23:20:47 | Q331 | Q331-biomacro-05-10 | 1821 | -15.004940 | -173.793646 | Alvinocaris sp. | frozen | Shrimp |
| 113 | Mata Tolu | 9/23/2012 | 23:20:47 | Q331 | Q331-biomacro-05-10 | 1821 | -15.004940 | -173.793646 | Alvinocaris sp. | frozen | Shrimp |
| 114 | Mata Tolu | 9/23/2012 | 23:20:47 | Q331 | Q331-biomacro-05-10 | 1821 | -15.004940 | -173.793646 | Alvinocaris sp. | frozen | Shrimp |
| 115 | Mata Tolu | 9/23/2012 | 23:20:47 | Q331 | Q331-biomacro-05-10 | 1821 | -15.004940 | -173.793646 | Alvinocaris sp. | frozen | Shrimp |
| 116 | Mata Tolu | 9/23/2012 | 23:20:47 | Q331 | Q331-biomacro-05-10 | 1821 | -15.004940 | -173.793646 | Alvinocaris sp. | frozen | Shrimp |
| 117 | Mata Tolu | 9/23/2012 | 23:20:47 | Q331 | Q331-biomacro-05-10 | 1821 | -15.004940 | -173.793646 | *Alvinocaris* sp. | frozen | Shrimp |
| 118 | Mata Tolu | 9/23/2012 | 23:20:47 | Q331 | Q331-biomacro-05-10 | 1821 | -15.004940 | -173.793646 | *Alvinocaris* sp. | frozen | Shrimp |
| 119 | Mata Tolu | 9/23/2012 | 23:20:47 | Q331 | Q331-biomacro-05-10 | 1821 | -15.004940 | -173.793646 | *Alvinocaris* sp. | frozen | Shrimp |
| 120 | Mata Tolu | 9/23/2012 | 23:20:47 | Q331 | Q331-biomacro-05-10 | 1821 | -15.004940 | -173.793646 | *Alvinocaris* sp. | frozen | Shrimp |
| 121 | Mata Tolu | 9/23/2012 | 23:20:47 | Q331 | Q331-biomacro-05-10 | 1821 | -15.004940 | -173.793646 | *Alvinocaris* sp. | frozen | Shrimp |
| 122 | Mata Tolu | 9/23/2012 | 23:20:47 | Q331 | Q331-biomacro-05-10 | 1821 | -15.004940 | -173.793646 | *Alvinocaris* sp. | frozen | Shrimp |
| 123 | Mata Tolu | 9/23/2012 | 23:20:47 | Q331 | Q331-biomacro-05-10 | 1821 | -15.004940 | -173.793646 | *Alvinocaris* sp. | frozen | Shrimp |
| 124 | Mata Tolu | 9/23/2012 | 23:20:47 | Q331 | Q331-biomacro-05-10 | 1821 | -15.004940 | -173.793646 | *Alvinocaris* sp. | frozen | Shrimp |

| ID | Site | Date | Time | Dive | Sample ID | Depth | Latitude | Longitude | Shipboard ID | Preservation | Common ID |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 125 | Mata Tolu | 9/23/2012 | 23:20:47 | Q331 | Q331-biomacro-05-10 | 1821 | -15.004940 | -173.793646 | *Nautilocaris* | frozen | Shrimp |
| 126 | Mata Tolu | 9/23/2012 | 23:20:47 | Q331 | Q331-biomacro-05-10 | 1821 | -15.004940 | -173.793646 | *Chorocaris* Shrimp | frozen | Shrimp |
| 127 | Mata Tolu | 9/23/2012 | 23:20:47 | Q331 | Q331-biomacro-05-10 | 1821 | -15.004940 | -173.793646 | *Opaepele* sp. | frozen | Shrimp |
| 128 | Mata Tolu | 9/23/2012 | 23:20:47 | Q331 | Q331-biomacro-05-10 | 1821 | -15.004940 | -173.793646 | *Opaepele* sp. | frozen | Shrimp |
| 129 | Mata Tolu | 9/23/2012 | 23:20:47 | Q331 | Q331-biomacro-05-10 | 1821 | -15.004940 | -173.793646 | *Opaepele* sp. | frozen | Shrimp |
| 130 | Mata Tolu | 9/23/2012 | 23:20:47 | Q331 | Q331-biomacro-05-10 | 1821 | -15.004940 | -173.793646 | *Opaepele* sp. | frozen | Shrimp |
| 131 | Mata Tolu | 9/23/2012 | 23:20:47 | Q331 | Q331-biomacro-05-10 | 1821 | -15.004940 | -173.793646 | *Opaepele* sp. | frozen | Shrimp |
| 132 | Mata Tolu | 9/23/2012 | 23:20:47 | Q331 | Q331-biomacro-05-06 | 1821 | -15.004940 | -173.793646 | *Munidopsis lauensis* | frozen | Squat Lobster |
| 133 | Mata Tolu | 9/23/2012 | 23:20:47 | Q331 | Q331-biomacro-05-06 | 1821 | -15.004940 | -173.793646 | *Munidopsis lauensis* | frozen | Squat Lobster |
| 134 | Mata Tolu | 9/23/2012 | 23:20:47 | Q331 | Q331-biomacro-05-06 | 1821 | -15.004940 | -173.793646 | *Munidopsis lauensis* | frozen | Squat Lobster |
| 135 | Mata Tolu | 9/23/2012 | 23:20:47 | Q331 | Q331-biomacro-05-10 | 1821 | -15.004940 | -173.793646 | *Nautilocaris* | Etoh 70% | Shrimp |
| 136 | Mata Tolu | 9/23/2012 | 23:20:47 | Q331 | Q331-biomacro-05-10 | 1821 | -15.004940 | -173.793646 | *Alvinocaris* sp. | Etoh 70% | Shrimp |
| 137 | Mata Tolu | 9/23/2012 | 22:52:25 | Q331 | Q331-biomacro-04 (changed from biomacro-14) | 1819 | -15.004942 | -173.793631 | Brachyuran Crab sp. | frozen | Brachyuran crab |
| 138 | Mata Tolu | 9/23/2012 | 22:52:25 | Q331 | Q331-biomacro-04 (changed from biomacro-14) | 1819 | -15.004942 | -173.793631 | Brachyuran Crab sp. | frozen | Brachyuran crab |
| 139 | Mata Tolu | 9/23/2012 | 22:52:25 | Q331 | Q331-biomacro-04 (changed from biomacro-14) | 1819 | -15.004942 | -173.793631 | Brachyuran Crab sp. | frozen | Brachyuran crab |
| 140 | Mata Tolu | 9/23/2012 | 22:52:25 | Q331 | Q331-biomacro-04 (changed from biomacro-14) | 1819 | -15.004942 | -173.793631 | Brachyuran Crab sp. | frozen | Brachyuran crab |
| 141 | Mata Tolu | 9/23/2012 | 22:52:25 | Q331 | Q331-biomacro-04 (changed from biomacro-14) | 1819 | -15.004942 | -173.793631 | Brachyuran Crab sp. | frozen | Brachyuran crab |
| 142 | Mata Tolu | 9/23/2012 | 22:52:25 | Q331 | Q331-biomacro-04 (changed from biomacro-14) | 1819 | -15.004942 | -173.793631 | Brachyuran Crab sp. | frozen | Brachyuran crab |
| 143 | Mata Tolu | 9/23/2012 | 22:52:25 | Q331 | Q331-biomacro-04 (changed from biomacro-14) | 1819 | -15.004942 | -173.793631 | Brachyuran Crab sp. | frozen | Brachyuran crab |
| 144 | Mata Tolu | 9/23/2012 | 22:52:25 | Q331 | Q331-biomacro-04 (changed from biomacro-14) | 1819 | -15.004942 | -173.793631 | Brachyuran Crab sp. | frozen | Brachyuran crab |
| 145 | Mata Tolu | 9/23/2012 | 22:52:25 | Q331 | Q331-biomacro-04 (changed from biomacro-14) | 1819 | -15.004942 | -173.793631 | Brachyuran Crab sp. | frozen | Brachyuran crab |
| 146 | Mata Tolu | 9/23/2012 | 22:52:25 | Q331 | Q331-biomacro-04 (changed from biomacro-14) | 1819 | -15.004942 | -173.793631 | Brachyuran Crab sp. | frozen | Brachyuran crab |
| 147 | Mata Tolu | 9/23/2012 | 22:52:25 | Q331 | Q331-biomacro-04 (changed from biomacro-14) | 1819 | -15.004942 | -173.793631 | *Ifremieria nautilei* | frozen | Snail |
| 148 | Mata Tolu | 9/23/2012 | 22:52:25 | Q331 | Q331-biomacro-04 (changed from biomacro-14) | 1819 | -15.004942 | -173.793631 | *Ifremieria nautilei* | frozen | Snail |
| 149 | Mata Tolu | 9/23/2012 | 22:52:25 | Q331 | Q331-biomacro-04 (changed from biomacro-14) | 1819 | -15.004942 | -173.793631 | *Ifremieria nautilei* | frozen | Snail |
| 150 | Mata Tolu | 9/23/2012 | 22:52:25 | Q331 | Q331-biomacro-04 (changed from biomacro-14) | 1819 | -15.004942 | -173.793631 | *Ifremieria nautilei* | frozen | Snail |
| 151 | Mata Tolu | 9/23/2012 | 22:52:25 | Q331 | Q331-biomacro-04 (changed from biomacro-14) | 1819 | -15.004942 | -173.793631 | *Ifremieria nautilei* | frozen | Snail |
| 152 | Mata Tolu | 9/23/2012 | 22:52:25 | Q331 | Q331-biomacro-04 (changed from biomacro-14) | 1819 | -15.004942 | -173.793631 | *Ifremieria nautilei* | frozen | Snail |
| 153 | Mata Tolu | 9/23/2012 | 22:52:25 | Q331 | Q331-biomacro-04 (changed from biomacro-14) | 1819 | -15.004942 | -173.793631 | *Ifremieria nautilei* | frozen | Snail |
| 154 | Mata Tolu | 9/23/2012 | 22:52:25 | Q331 | Q331-biomacro-04 (changed from biomacro-14) | 1819 | -15.004942 | -173.793631 | *Ifremieria nautilei* | frozen | Snail |
| 155 | Mata Tolu | 9/23/2012 | 22:52:25 | Q331 | Q331-biomacro-04 (changed from biomacro-14) | 1819 | -15.004942 | -173.793631 | *Ifremieria nautilei* | frozen | Snail |

| ID | Site | Date | Time | Dive | Sample ID | Depth | Latitude | Longitude | Shipboard ID | Preservation | Common ID |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 156 | Mata Tolu | 9/23/2012 | 22:52:25 | Q331 | Q331-biomacro-04 (changed from biomacro-14) | 1819 | -15.004942 | -173.793631 | *Ifremieria nautilei* | frozen | Snail |
| 157 | Mata Tolu | 9/23/2012 | 22:52:25 | Q331 | Q331-biomacro-04 (changed from biomacro-14) | 1819 | -15.004942 | -173.793631 | *Ifremieria nautilei* | frozen | Snail |
| 158 | Mata Tolu | 9/23/2012 | 22:52:25 | Q331 | Q331-biomacro-04 (changed from biomacro-14) | 1819 | -15.004942 | -173.793631 | *Ifremieria nautilei* | frozen | Snail |
| 159 | Mata Tolu | 9/23/2012 | 22:52:25 | Q331 | Q331-biomacro-04 (changed from biomacro-14) | 1819 | -15.004942 | -173.793631 | *Ifremieria nautilei* | frozen | Snail |
| 160 | Mata Tolu | 9/23/2012 | 22:52:25 | Q331 | Q331-biomacro-04 (changed from biomacro-14) | 1819 | -15.004942 | -173.793631 | *Ifremieria nautilei* | frozen | Snail |
| 161 | Mata Tolu | 9/23/2012 | 22:52:25 | Q331 | Q331-biomacro-04 (changed from biomacro-14) | 1819 | -15.004942 | -173.793631 | *Ifremieria nautilei* | frozen | Snail |
| 162 | Mata Tolu | 9/23/2012 | 22:52:25 | Q331 | Q331-biomacro-04 (changed from biomacro-14) | 1819 | -15.004942 | -173.793631 | *Ifremieria nautilei* | frozen | Snail |
| 163 | Mata Tolu | 9/23/2012 | 22:52:25 | Q331 | Q331-biomacro-04 (changed from biomacro-14) | 1819 | -15.004942 | -173.793631 | *Ifremieria nautilei* | frozen | Snail |
| 164 | Mata Tolu | 9/23/2012 | 22:52:25 | Q331 | Q331-biomacro-04 (changed from biomacro-14) | 1819 | -15.004942 | -173.793631 | *Ifremieria nautilei* | frozen | Snail |
| 165 | Mata Tolu | 9/23/2012 | 22:52:25 | Q331 | Q331-biomacro-04 (changed from biomacro-14) | 1819 | -15.004942 | -173.793631 | *Ifremieria nautilei* | frozen | Snail |
| 166 | Mata Tolu | 9/23/2012 | 22:52:25 | Q331 | Q331-biomacro-04 (changed from biomacro-14) | 1819 | -15.004942 | -173.793631 | *Ifremieria nautilei* | frozen | Snail |
| 167 | Mata Tolu | 9/23/2012 | 22:52:25 | Q331 | Q331-biomacro-04 (changed from biomacro-14) | 1819 | -15.004942 | -173.793631 | *Ifremieria nautilei* | frozen | Snail |
| 168 | Mata Tolu | 9/23/2012 | 22:52:25 | Q331 | Q331-biomacro-04 (changed from biomacro-14) | 1819 | -15.004942 | -173.793631 | *Ifremieria* no shell | frozen | Snail |
| 169 | Mata Tolu | 9/23/2012 | 22:52:25 | Q331 | Q331-biomacro-04 (changed from biomacro-14) | 1819 | -15.004942 | -173.793631 | *Alvinoconcha* snail | frozen | Hairy Gastropod |
| 170 | Mata Tolu | 9/23/2012 | 22:52:25 | Q331 | Q331-biomacro-04 (changed from biomacro-14) | 1819 | -15.004942 | -173.793631 | *Alvinoconcha* snail | frozen | Hairy Gastropod |
| 171 | Mata Tolu | 9/23/2012 | 22:52:25 | Q331 | Q331-biomacro-04 (changed from biomacro-14) | 1819 | -15.004942 | -173.793631 | *Alvinoconcha* snail | frozen | Hairy Gastropod |
| 172 | Mata Tolu | 9/23/2012 | 22:52:25 | Q331 | Q331-biomacro-04 (changed from biomacro-14) | 1819 | -15.004942 | -173.793631 | *Alvinoconcha* snail | frozen | Hairy Gastropod |
| 173 | Mata Tolu | 9/23/2012 | 22:52:25 | Q331 | Q331-biomacro-04 (changed from biomacro-14) | 1819 | -15.004942 | -173.793631 | *Alvinoconcha* snail | frozen | Hairy Gastropod |
| 174 | Mata Tolu | 9/23/2012 | 22:52:25 | Q331 | Q331-biomacro-04 (changed from biomacro-14) | 1819 | -15.004942 | -173.793631 | *Alvinoconcha* snail | frozen | Hairy Gastropod |
| 175 | Mata Tolu | 9/23/2012 | 22:52:25 | Q331 | Q331-biomacro-04 (changed from biomacro-14) | 1819 | -15.004942 | -173.793631 | *Alvinoconcha* snail | frozen | Hairy Gastropod |
| 176 | Mata Tolu | 9/23/2012 | 22:52:25 | Q331 | Q331-biomacro-04 (changed from biomacro-14) | 1819 | -15.004942 | -173.793631 | *Alvinoconcha* snail | frozen | Hairy Gastropod |
| 177 | Mata Tolu | 9/23/2012 | 22:52:25 | Q331 | Q331-biomacro-04 (changed from biomacro-14) | 1819 | -15.004942 | -173.793631 | *Alvinoconcha* snail | frozen | Hairy Gastropod |
| 178 | Mata Tolu | 9/23/2012 | 22:52:25 | Q331 | Q331-biomacro-04 (changed from biomacro-14) | 1819 | -15.004942 | -173.793631 | *Alvinoconcha* snail | frozen | Hairy Gastropod |
| 179 | Mata Tolu | 9/23/2012 | 22:52:25 | Q331 | Q331-biomacro-04 (changed from biomacro-14) | 1819 | -15.004942 | -173.793631 | *Alvinoconcha* snail | frozen | Hairy Gastropod |
| 180 | Mata Tolu | 9/23/2012 | 22:52:25 | Q331 | Q331-biomacro-04 (changed from biomacro-14) | 1819 | -15.004942 | -173.793631 | Polychaete 3 | frozen | Polychaete |

| ID | Site | Date | Time | Dive | Sample ID | Depth | Latitude | Longitude | Shipboard ID | Preservation | Common ID |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 181 | Mata Tolu | 9/23/2012 | 22:52:25 | Q331 | Q331-biomacro-04 (changed from biomacro-14) | 1819 | -15.004942 | -173.793631 | *Olgasolaris* Limpets | Etoh 70% | |
| 182 | Mata Tolu | 9/23/2012 | 22:52:25 | Q331 | Q331-biomacro-04 (changed from biomacro-14) | 1819 | -15.004942 | -173.793631 | Leptodrillid limpet Polychaete 3 | Etoh 70% | |
| 183 | Mata Tolu | 9/23/2012 | 22:52:25 | Q331 | Q331-biomacro-04 (changed from biomacro-14) | 1819 | -15.004942 | -173.793631 | Unidentified snail | Etoh 70% | |
| 184 | Mata Tolu | 9/23/2012 | 22:52:25 | Q331 | Q331-biomacro-04 (changed from biomacro-14) | 1819 | -15.004942 | -173.793631 | Lepetodrillid ovalis-type | frozen | Non-stalked Barnacles |
| 185 | Mata Tolu | 9/23/2012 | 23:54:57 | Q331 | Q331-rock-11 | 1821 | -15.004940 | -173.793646 | Non-stalked barnacles | frozen | Non-stalked Barnacles |
| 186 | W. Mata | 9/24/2012 | 2:42:11 | Q332 | Q332-biomacro 13-19 | 1176 | -15.094397 | -173.748447 | *Opaepele* sp. Gravid | frozen | Shrimp |
| 187 | W. Mata | 9/24/2012 | 2:42:11 | Q332 | Q332-biomacro 13-19 | 1176 | -15.094397 | -173.748447 | *Opaepele* sp. Gravid | frozen | Shrimp |
| 188 | W. Mata | 9/24/2012 | 2:42:11 | Q332 | Q332-biomacro 13-19 | 1176 | -15.094397 | -173.748447 | *Opaepele* sp. Gravid | frozen | Shrimp |
| 189 | W. Mata | 9/24/2012 | 2:42:11 | Q332 | Q332-biomacro 13-19 | 1176 | -15.094397 | -173.748447 | *Opaepele* sp. Gravid | frozen | Shrimp |
| 190 | W. Mata | 9/24/2012 | 2:42:11 | Q332 | Q332-biomacro 13-19 | 1176 | -15.094397 | -173.748447 | *Opaepele* sp. Gravid | frozen | Shrimp |
| 191 | W. Mata | 9/24/2012 | 2:42:11 | Q332 | Q332-biomacro 13-19 | 1176 | -15.094397 | -173.748447 | *Opaepele* sp. Gravid | frozen | Shrimp |
| 192 | W. Mata | 9/24/2012 | 2:42:11 | Q332 | Q332-biomacro 13-19 | 1176 | -15.094397 | -173.748447 | *Opaepele* sp. Gravid | frozen | Shrimp |
| 193 | W. Mata | 9/24/2012 | 2:42:11 | Q332 | Q332-biomacro 13-19 | 1176 | -15.094397 | -173.748447 | *Opaepele* sp. Gravid | frozen | Shrimp |
| 194 | W. Mata | 9/24/2012 | 2:42:11 | Q332 | Q332-biomacro 13-19 | 1176 | -15.094397 | -173.748447 | *Opaepele* sp. Gravid | frozen | Shrimp |
| 195 | W. Mata | 9/24/2012 | 2:42:11 | Q332 | Q332-biomacro 13-19 | 1176 | -15.094397 | -173.748447 | *Opaepele* sp. Gravid | frozen | Shrimp |
| 196 | W. Mata | 9/24/2012 | 2:42:11 | Q332 | Q332-biomacro 13-19 | 1176 | -15.094397 | -173.748447 | *Opaepele* sp. Gravid | frozen | Shrimp |
| 197 | W. Mata | 9/24/2012 | 2:42:11 | Q332 | Q332-biomacro 13-19 | 1176 | -15.094397 | -173.748447 | *Opaepele* sp. Gravid | frozen | Shrimp |
| 198 | W. Mata | 9/24/2012 | 2:42:11 | Q332 | Q332-biomacro 13-19 | 1176 | -15.094397 | -173.748447 | *Opaepele* sp. Gravid | frozen | Shrimp |
| 199 | W. Mata | 9/24/2012 | 2:42:11 | Q332 | Q332-biomacro 13-19 | 1176 | -15.094397 | -173.748447 | *Opaepele* sp. Gravid | frozen | Shrimp |
| 200 | W. Mata | 9/24/2012 | 2:42:11 | Q332 | Q332-biomacro 13-19 | 1176 | -15.094397 | -173.748447 | *Opaepele* sp. Gravid | frozen | Shrimp |
| 201 | W. Mata | 9/24/2012 | 2:42:11 | Q332 | Q332-biomacro 13-19 | 1176 | -15.094397 | -173.748447 | *Opaepele* sp. Gravid | frozen | Shrimp |
| 202 | W. Mata | 9/24/2012 | 2:42:11 | Q332 | Q332-biomacro 13-19 | 1176 | -15.094397 | -173.748447 | *Opaepele* sp. Gravid | frozen | Shrimp |
| 203 | W. Mata | 9/24/2012 | 2:42:11 | Q332 | Q332-biomacro 13-19 | 1176 | -15.094397 | -173.748447 | *Opaepele* sp. Gravid | frozen | Shrimp |
| 204 | W. Mata | 9/24/2012 | 2:42:11 | Q332 | Q332-biomacro 13-19 | 1176 | -15.094397 | -173.748447 | *Opaepele* sp. Gravid | frozen | Shrimp |
| 205 | W. Mata | 9/24/2012 | 2:42:11 | Q332 | Q332-biomacro 13-19 | 1176 | -15.094397 | -173.748447 | *Opaepele* sp. Gravid | frozen | Shrimp |
| 206 | W. Mata | 9/24/2012 | 2:42:11 | Q332 | Q332-biomacro 13-19 | 1176 | -15.094397 | -173.748447 | *Opaepele* sp. Gravid | frozen | Shrimp |
| 207 | W. Mata | 9/24/2012 | 2:42:11 | Q332 | Q332-biomacro 13-19 | 1176 | -15.094397 | -173.748447 | Opaepele | frozen | Shrimp |
| 208 | W. Mata | 9/24/2012 | 2:42:11 | Q332 | Q332-biomacro 13-19 | 1176 | -15.094397 | -173.748447 | *Opaepele* | frozen | Shrimp |
| 209 | W. Mata | 9/24/2012 | 2:42:11 | Q332 | Q332-biomacro 13-19 | 1176 | -15.094397 | -173.748447 | *Opaepele* | frozen | Shrimp |
| 210 | W. Mata | 9/24/2012 | 2:42:11 | Q332 | Q332-biomacro 13-19 | 1176 | -15.094397 | -173.748447 | *Opaepele* | frozen | Shrimp |
| 211 | W. Mata | 9/24/2012 | 2:42:11 | Q332 | Q332-biomacro 13-19 | 1176 | -15.094397 | -173.748447 | *Opaepele* | frozen | Shrimp |
| 212 | W. Mata | 9/24/2012 | 2:42:11 | Q332 | Q332-biomacro 13-19 | 1176 | -15.094397 | -173.748447 | *Opaepele* | frozen | Shrimp |
| 213 | W. Mata | 9/24/2012 | 2:42:11 | Q332 | Q332-biomacro 13-19 | 1176 | -15.094397 | -173.748447 | *Opaepele* | frozen | Shrimp |
| 214 | W. Mata | 9/24/2012 | 2:42:11 | Q332 | Q332-biomacro 13-19 | 1176 | -15.094397 | -173.748447 | *Opaepele* | frozen | Shrimp |
| 215 | W. Mata | 9/24/2012 | 2:42:11 | Q332 | Q332-biomacro 13-19 | 1176 | -15.094397 | -173.748447 | *Opaepele* | frozen | Shrimp |
| 216 | W. Mata | 9/24/2012 | 2:42:11 | Q332 | Q332-biomacro 13-19 | 1176 | -15.094397 | -173.748447 | *Opaepele* | frozen | Shrimp |
| 217 | W. Mata | 9/24/2012 | 2:42:11 | Q332 | Q332-biomacro 13-19 | 1176 | -15.094397 | -173.748447 | *Opaepele* | frozen | Shrimp |
| 218 | W. Mata | 9/24/2012 | 2:42:11 | Q332 | Q332-biomacro 13-19 | 1176 | -15.094397 | -173.748447 | *Opaepele* | frozen | Shrimp |
| 219 | W. Mata | 9/24/2012 | 2:42:11 | Q332 | Q332-biomacro 13-19 | 1176 | -15.094397 | -173.748447 | *Opaepele* | frozen | Shrimp |
| 220 | W. Mata | 9/24/2012 | 2:42:11 | Q332 | Q332-biomacro 13-19 | 1176 | -15.094397 | -173.748447 | *Opaepele* | frozen | Shrimp |
| 221 | W. Mata | 9/24/2012 | 2:42:11 | Q332 | Q332-biomacro 13-19 | 1176 | -15.094397 | -173.748447 | *Opaepele* | frozen | Shrimp |
| 222 | W. Mata | 9/24/2012 | 2:42:11 | Q332 | Q332-biomacro 13-19 | 1176 | -15.094397 | -173.748447 | *Opaepele* | Etoh 70% | Shrimp |

| ID | Site | Date | Time | Dive | Sample ID | Depth | Latitude | Longitude | Shipboard ID | Preservation | Common ID |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 223 | NE Lau Basin | 9/25/2012 | 23:38:54 | Q333 | Q333-biomacro-04-06 | 1150 | -15.164479 | -173.572880 | *Opaepele* | frozen | Shrimp |
| 224 | NE Lau Basin | 9/25/2012 | 23:38:54 | Q333 | Q333-biomacro-04-06 | 1150 | -15.164479 | -173.572880 | *Opaepele* | frozen | Shrimp |
| 225 | NE Lau Basin | 9/25/2012 | 23:38:54 | Q333 | Q333-biomacro-04-06 | 1150 | -15.164479 | -173.572880 | *Opaepele* | frozen | Shrimp |
| 226 | NE Lau Basin | 9/25/2012 | 23:38:54 | Q333 | Q333-biomacro-04-06 | 1150 | -15.164479 | -173.572880 | *Opaepele* | frozen | Shrimp |
| 227 | NE Lau Basin | 9/25/2012 | 23:38:54 | Q333 | Q333-biomacro-04-06 | 1150 | -15.164479 | -173.572880 | *Opaepele* | frozen | Shrimp |
| 228 | NE Lau Basin | 9/25/2012 | 23:38:54 | Q333 | Q333-biomacro-04-06 | 1150 | -15.164479 | -173.572880 | *Opaepele* | frozen | Shrimp |
| 229 | NE Lau Basin | 9/25/2012 | 23:38:54 | Q333 | Q333-biomacro-04-06 | 1150 | -15.164479 | -173.572880 | *Opaepele* | frozen | Shrimp |
| 230 | NE Lau Basin | 9/25/2012 | 23:38:54 | Q333 | Q333-biomacro-04-06 | 1150 | -15.164479 | -173.572880 | *Opaepele* | frozen | Shrimp |
| 231 | NE Lau Basin | 9/25/2012 | 23:38:54 | Q333 | Q333-biomacro-04-06 | 1150 | -15.164479 | -173.572880 | *Opaepele* | frozen | Shrimp |
| 232 | NE Lau Basin | 9/25/2012 | 23:38:54 | Q333 | Q333-biomacro-04-06 | 1150 | -15.164479 | -173.572880 | *Opaepele* | frozen | Shrimp |
| 233 | NE Lau Basin | 9/25/2012 | 23:38:54 | Q333 | Q333-biomacro-04-06 | 1150 | -15.164479 | -173.572880 | *Opaepele* | frozen | Shrimp |
| 234 | NE Lau Basin | 9/25/2012 | 23:38:54 | Q333 | Q333-biomacro-04-06 | 1150 | -15.164479 | -173.572880 | *Opaepele* | frozen | Shrimp |
| 235 | NE Lau Basin | 9/25/2012 | 23:38:54 | Q333 | Q333-biomacro-04-06 | 1150 | -15.164479 | -173.572880 | *Opaepele* | frozen | Shrimp |
| 236 | NE Lau Basin | 9/25/2012 | 23:38:54 | Q333 | Q333-biomacro-04-06 | 1150 | -15.164479 | -173.572880 | *Opaepele* | frozen | Shrimp |
| 237 | NE Lau Basin | 9/25/2012 | 23:38:54 | Q333 | Q333-biomacro-04-06 | 1150 | -15.164479 | -173.572880 | *Opaepele* | frozen | Shrimp |
| 238 | NE Lau Basin | 9/25/2012 | 23:38:54 | Q333 | Q333-biomacro-04-06 | 1150 | -15.164479 | -173.572880 | *Opaepele* | frozen | Shrimp |
| 239 | NE Lau Basin | 9/25/2012 | 23:38:54 | Q333 | Q333-biomacro-04-06 | 1150 | -15.164479 | -173.572880 | *Opaepele* | frozen | Shrimp |
| 240 | NE Lau Basin | 9/25/2012 | 23:38:54 | Q333 | Q333-biomacro-04-06 | 1150 | -15.164479 | -173.572880 | *Opaepele* | frozen | Shrimp |
| 241 | NE Lau Basin | 9/25/2012 | 23:38:54 | Q333 | Q333-biomacro-04-06 | 1150 | -15.164479 | -173.572880 | *Opaepele* | frozen | Shrimp |
| 242 | NE Lau Basin | 9/25/2012 | 23:38:54 | Q333 | Q333-biomacro-04-06 | 1150 | -15.164479 | -173.572880 | *Opaepele* | frozen | Shrimp |
| 243 | NE Lau Basin | 9/25/2012 | 23:38:54 | Q333 | Q333-biomacro-04-06 | 1150 | -15.164479 | -173.572880 | *Opaepele* | frozen | Shrimp |
| 244 | NE Lau Basin | 9/25/2012 | 23:38:54 | Q333 | Q333-biomacro-04-06 | 1150 | -15.164479 | -173.572880 | *Opaepele* | frozen | Shrimp |
| 245 | NE Lau Basin | 9/25/2012 | 1:25:28 | Q333 | Q333-biomacro-12-15 | 1150 | -15.164479 | -173.572880 | *Opaepele* | frozen | Shrimp |
| 246 | NE Lau Basin | 9/25/2012 | 1:25:28 | Q333 | Q333-biomacro-12-15 | 1150 | -15.164479 | -173.572880 | *Opaepele* | frozen | Shrimp |
| 247 | NE Lau Basin | 9/25/2012 | 1:25:28 | Q333 | Q333-biomacro-12-15 | 1150 | -15.164479 | -173.572880 | *Opaepele* | frozen | Shrimp |
| 248 | NE Lau Basin | 9/25/2012 | 1:25:28 | Q333 | Q333-biomacro-12-15 | 1150 | -15.164479 | -173.572880 | *Opaepele* | frozen | Shrimp |
| 249 | NE Lau Basin | 9/25/2012 | 1:25:28 | Q333 | Q333-biomacro-12-15 | 1150 | -15.164479 | -173.572880 | *Opaepele* | frozen | Shrimp |
| 250 | NE Lau Basin | 9/25/2012 | 1:25:28 | Q333 | Q333-biomacro-12-15 | 1150 | -15.164479 | -173.572880 | *Opaepele* | frozen | Shrimp |
| 251 | NE Lau Basin | 9/25/2012 | 23:38:54 | Q333 | Q333-biomacro-04-06 | 1150 | -15.164479 | -173.572880 | *Alvinocaris* sp. | frozen | Shrimp |
| 252 | NE Lau Basin | 9/25/2012 | 23:38:54 | Q333 | Q333-biomacro-04-06 | 1150 | -15.164479 | -173.572880 | *Alvinocaris* sp. | frozen | Shrimp |
| 253 | NE Lau Basin | 9/25/2012 | 23:38:54 | Q333 | Q333-biomacro-04-06 | 1150 | -15.164479 | -173.572880 | *Alvinocaris* sp. | frozen | Shrimp |
| 254 | NE Lau Basin | 9/25/2012 | 23:38:54 | Q333 | Q333-biomacro-04-06 | 1150 | -15.164479 | -173.572880 | *Alvinocaris* sp. | frozen | Shrimp |
| 255 | NE Lau Basin | 9/25/2012 | 23:38:54 | Q333 | Q333-biomacro-04-06 | 1150 | -15.164479 | -173.572880 | Brachyuran Crab | frozen | Brachyuran crab |
| 256 | NE Lau Basin | 9/25/2012 | 23:38:54 | Q333 | Q333-biomacro-04-06 | 1150 | -15.164479 | -173.572880 | Brachyuran Crab #2 | frozen | Brachyuran crab |
| 257 | NE Lau Basin | 9/25/2012 | 23:38:54 | Q333 | Q333-biomacro-04-06 | 1150 | -15.164479 | -173.572880 | Unidentified | Etoh 70% | |
| 258 | NE Lau Basin | 9/25/2012 | 20:27:38 | Q333 | Q333-geobio-2 | 1164 | -15.166415 | -173.575824 | Unsorted | Etoh 70% | |
| 259 | NE Lau Basin | 9/25/2012 | 20:27:38 | Q333 | Q333-geobio-2 | 1164 | -15.166415 | -173.575824 | Clam | frozen | Clam |

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## 6.5 Microbiology

### 6.5.1 Microbial Manganese and Sulfur Oxidation at Hydrothermal Vents

Bradley M. Tebo, Richard E. Davis, Carolyn J. Sheehan

Our primary objective for this cruise was to study the process of microbial manganese oxidation at hydrothermal vents. Manganese is a common metal found in hydrothermal vent fluids and much of it is oxidized to manganese (IV) oxides by microbial mats forming black mats and crusts in the area surrounding the hydrothermal vent. The mechanisms of bacterial manganese oxidation in deep-sea environments are still unknown. We will use comparative environmental genomics (metagenomics) to help identify potential manganese oxidizing genes from manganese oxide-encrusted microbial communities. A secondary objective for the cruise was to sample acidic sulfur-cycling communities around white smoker vents. The molecular mechanism of sulfur oxidation in these high-biomass bacterial communities is not yet understood.

We sampled the mat using two types of scoop samplers designed to collect the samples while minimizing their disruption after collection. Our typical scoops have a wide bore and can hold about two liters of sediment and/or water samples and are used for DNA (genomic) analysis. The “double scoops” are similar but are smaller and have two chambers that allow the sample to be collected and then mixed with preservative *in situ* (at depth) to prevent messenger RNA from degrading, which can happen within 15 minutes of collection without preservation. The samples were primarily preserved by freezing them at -80°C for eventual nucleic acid extraction.

**Dive Q322 Vai Lili Vent Field**

Vai Lili was our primary dive target to collect manganese-encrusted microbial mats. Previous dives at Vai Lili have observed these microbial mats growing in the area; however they have never been characterized. We were able to collect six samples from four discreet microbial mat sites. The microbial mats were growing over diffuse hydrothermal vents with temperatures ranging from 10-43°C (Fig. 6.5.1-1).

The microbial mat material was generally intact as 2-4cm pieces in the scoops after recovery. The pieces were quickly sorted by size and frozen at -80°C. Manganese oxide content in the samples was confirmed using a colormetric leucoberbelin blue assay after recovery.

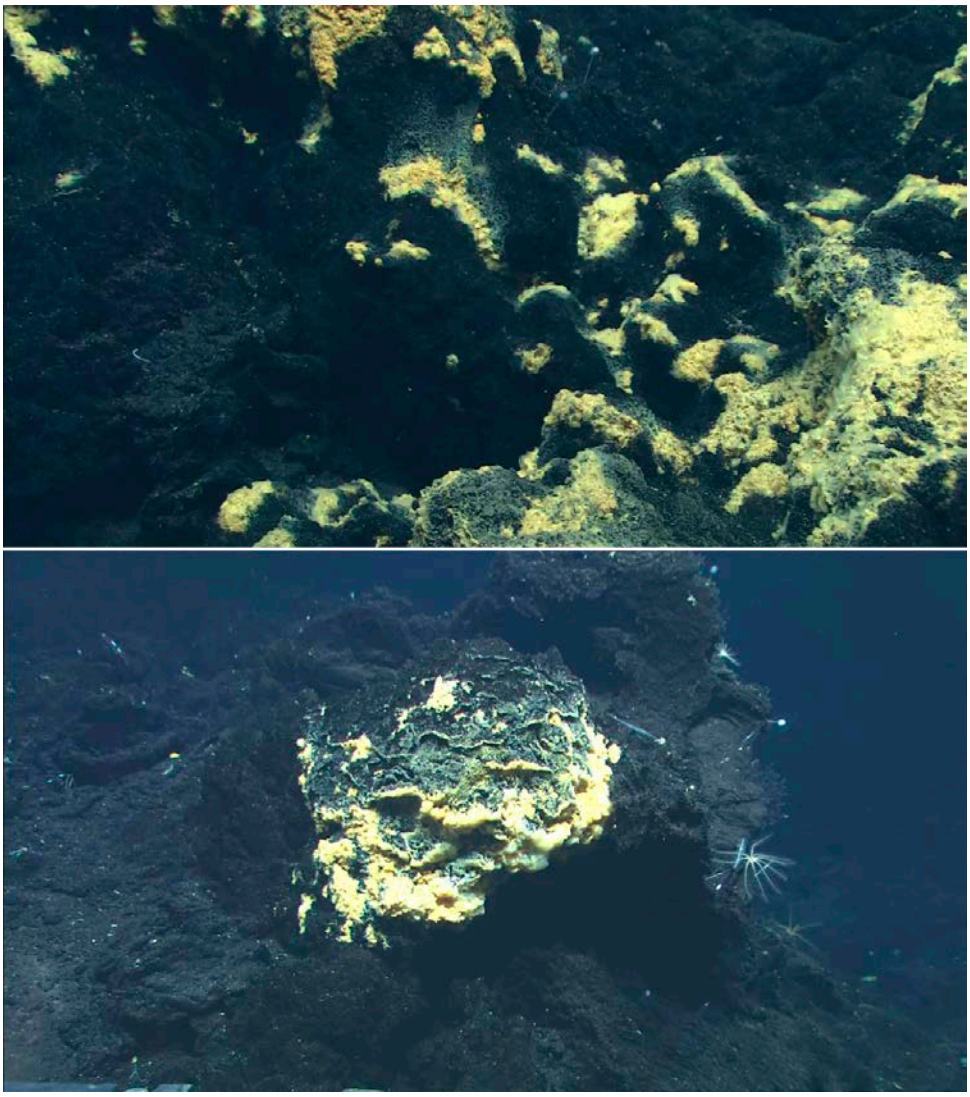


**Fig. 6.5.1-1**. Manganese encrusted microbial mats at Vai Lili Vent Field. Site 1 (top image) shows the black manganese oxide-encrusted microbial mat growing over the iron oxide-encrusted mat (yellow). Site 3 (bottom image) shows a microbial mat growing on the side of a rock outcrop.

**Dive Q324 Motutahi (cone at Niuatahi) – formerly Volcano O**

Loose rock and microbial mat was sampled near the edge of a pit crater. The white mat was near a white smoker vent and appeared to be encrusted in oxidized sulfur (Fig. 6.5.1-2 top).

**Fig. 6.5.1-2.** Sulfur cycling microbial mats and sediments were sampled at Niuatahi (top) and Niua North (bottom). These samples contained large filamentous microbial mats and solidified elemental sulfur.

**Dive Q327 West Mata**

We scooped an iron oxide-encrusted microbial mat from Mat Meadow near the hydrophone site. These mats look similar to mats that we have sampled from Loihi Seamount, Hawaii. The large fields of sulfur-oxidizing microbial mats that we observed at this site in 2009 were no longer present, however there were lots of signs of iron oxide staining that was similar to staining left by iron-dominated microbial mats after the vents no longer produce reduced iron.

**Dive Q330 Niua North**

We scooped a microbial mat and sediment next to a white smoker. The vent had visible liquid $CO_2$ rising around it and much of the sediments that we scooped consisted of solidified elemental sulfur (Fig.6.5.1-2 bottom).

**Dive Q331 Mata Tolu**

We sampled a piece of pillow lava rind made of boninite that was covered in a thin layer of manganese oxides. The rock sample was placed in a biobox to prevent contamination from surface seawater. After the rock was

recovered, we aseptically removed the glassy rind that was covered with manganese oxides and froze them at -80°C (Fig.6.5.1-3 top).

**Dive Q333 Niua South**

We sampled pumice from the edge of a small pit on Niua South. The pumice appeared to be formed in the pit and was coated with manganese oxides. The vesicular nature of the pumice may provide a unique endolithic microbial habitat that could support high microbial biomass. Pieces of pumice were removed from a large outcrop and transferred directly into our scoops (Fig. 6.5.1-3 bottom).

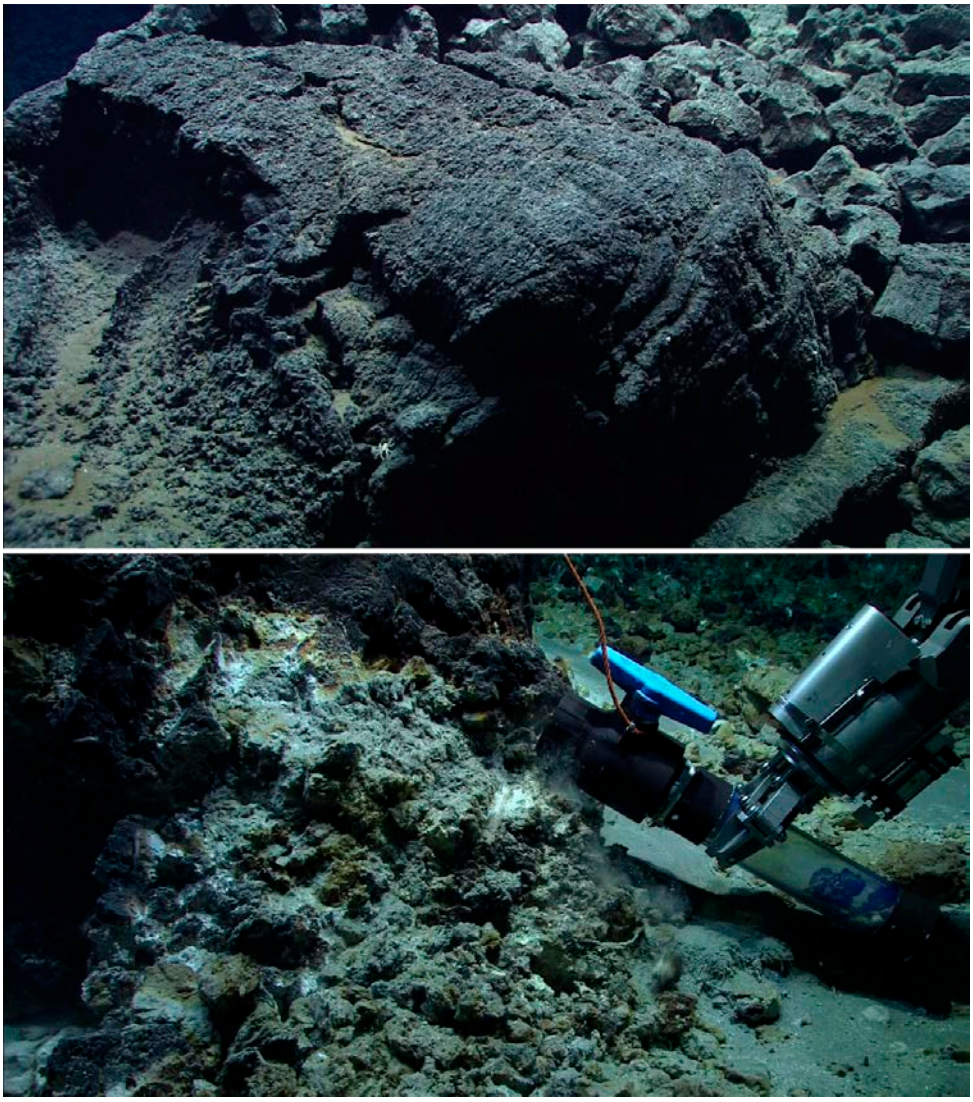


**Fig. 6.5.1-3.** Manganese oxide encrusted rocks sampled from Mata Tolu and Niua South. The glassy rind was broken off a large pillow lava at Mata Tolu (top image) and recovered in a biobox to analyze what microbes are living in the manganese oxide crust. Manganese oxide stained pumice from Niua South (bottom image) was soft enough to scoop directly with our large scoops.

## Table 6.5.1-1. Microbial Samples for Tebo's Lab

| Dive | Sample | Log Sample | Time | Latitude | Longitude | Depth | Scoop Type |
|---|---|---|---|---|---|---|---|
| Q322 | Q322Sc3 | Q322-biomat-01 | 23.37.03 | -22.214439 | -176.607723 | 1742 | Single |
| Vai Lili Site #1. Manganese mat growing over iron mat. | | | | | | | |
| Q322 | Q322Sc2 | Q322-biomat-02 | 00.32.06 | -22.214422 | -176.607664 | 1741 | Single |
| Vai Lili Site #2. Manganese mat-- crustier than site 1 | | | | | | | |
| Q322 | Q322Sc1 | Q322-biomat-05 | 02.34.19 | -22.214546 | -176.607737 | 1739 | Single |
| Vai Lili Site #3. Mat growing on mound. | | | | | | | |
| Q322 | Q322Sc9 | Q322-biomat-06 | 02.57.41 | -22.214546 | -176.607737 | 1739 | Double |
| Vai Lili Site #3. RNA scoop-- mat growing on mound | | | | | | | |
| Q322 | Q322Sc4 | Q322-biomat-07 | 04.44.42 | -22.214465 | -176.607887 | 1740 | Single |
| Vai Lili Site #4. Older manganese crust. Low temperature. | | | | | | | |
| Q322 | Q322Sc8 | Q322-biomat-08 | 05.36.06 | -22.214465 | -176.607887 | 1740 | Double |
| Vai Lili Site #4. RNA Scoop-- Older manganese crust. Low temperature. | | | | | | | |
| Q324 | Q324Sc9 | Q324-geo-bio-06 | 03.32.29 | -15.375853 | -174.002548 | 1244 | Single |
| Niua Tahi on crater wall. Scoop of sediments and sulfur-encrusted microbial mat | | | | | | | |
| Q327 | Q327Sc9 | Q327-biosed-06 | 06.12.19 | -15.095745 | -173.750322 | 1279 | Single |
| West Mata. Iron oxide-encrusted microbial mat attached to rock at Mat Meadow. Low/no fluid flow | | | | | | | |
| Q330 | Q330Sc9 | Q330-biogeo-07 | 01.25.53 | -15.081401 | -173.554498 | 748 | Double |
| Niua North. Sulfur-encrusted microbial mat and solidified elemental sulfur near white smoker | | | | | | | |
| Q331 | Q331R17 | Q331-rock-17 | 03.54.15 | -15.004426 | -173.792912 | 1866 | Grab Sample |
| Mata Tolu. Pillow lava glass with manganese oxide crust. | | | | | | | |
| Q333 | Q333Sc9 | Q333-biorock-01 | 20.05.20 | -15.166415 | -173.575824 | 1164 | Double |
| Niua South. Manganese oxide stained pumice chunks. | | | | | | | |
| Q333 | Q333Sc1 | Q333-biorock-02 | 20.27.38 | -15.166415 | -173.575824 | 1164 | Single |
| Niua South. Manganese oxide stained pumice chunks. From same rock as Q333Sc9. | | | | | | | |

### 6.5.2 Deep-Sea Vent Microorganisms as a Source of Medicinally Relevant Small Molecule Natural Products

Kerry McPhail, Mark Zabriskie

Structurally complex natural products from diverse biological sources continue to be a critical source of lead compounds for drug development and molecular tools to define new cellular targets for rational drug design. Chemical diversity directly correlates with biological diversity, and thus phylogenetically unique organisms from rare or extreme ecosystems are rational sources of novel chemotypes with important biological activities.

Marine microbial organisms have become a major focus for discovering new sources of natural products with little to no effort focused on hydrothermal systems. Therefore, frozen collections of microbial mats and sediment hosting microbial communities will be selectively cultured and identified. Large scale cultures of singly or co-cultured bacteria will be grown and chemically extracted with organic solvents or resin beads before testing for activity against human cancer cell lines, and eukaryotic (e.g. malarial and trypanosomal parasites) and prokaryotic (e.g. *Pseudomonas aeruginosa, Klebsiella pneumonia and Vibrio cholerae*) microbial pathogens. Subsequent bioassay-guided HPLC fractionation of active crude fractions from extracts of field-collected and laboratory-cultured microbes will be used to obtain pure active compounds. These fractionations will also be guided by chemical profiling using mass spectrometry (LC-MS/MS) and capillary microflow nuclear magnetic resonance (NMR) spectroscopy in a "secondary metabolomics" approach. Molecular structure elucidation of new compounds will be carried out by NMR spectroscopy using a standard 5 mm or a cryogenic NMR probe on 500 or 700 MHz spectrometers available at OSU. This project is the focus of OSU College of Pharmacy Ph.D. graduate student Oliver Vining, with assistance from faculty research associate Edward Mitchell.

Biological samples for this project were obtained from ROV *QUEST* dives Q322 – Q324, Q327, Q328, and Q330 – Q333 by suction via syringe sampler (200 mL volume) or ROV-mounted suction sampler. A portion (5 mL) of each sample was transferred into a sterile screw cap tube with 1 mL of glycerol. The tubes were frozen at -70°C for later processing in the laboratory. Enrichment culture medium was inoculated with a loopful of sample prior to being streaked on four basal media types. After approximately 2 weeks of growth individual colonies were picked off and streaked until purity was reached. DNA was extracted, the 16S sequences were obtained, and any novel strains of bacteria were subjected to larger scale culture to determine secondary metabolite production.

*Oregon State University, College of Pharmacy*

## 6.6 Vent Fluid Chemistry

### 6.6.1 Vent Fluid Sampling and Shipboard Analysis

Dave Butterfield

Sampling of vent fluids with the Quest 4000 was accomplished using 750-ml capacity titanium major sampler syringes borrowed from MBARI, HURL, and WHOI/NDSF. New handles were manufactured to match the dimensions of the Quest manipulator and a hydraulic ram mount was made to attach onto the Quest robotic arm. It was possible to arrange 3 major samplers and 3 gas-tight samplers on the front of the vehicle for nearly every dive. We collected a total of 26 major samples from 9 different sites (Fonualei South, Mata Fitu, Mata Tolu, Mata Ua, West Mata, Niua North, Niua South, Vai Lilli, and Volcano O (Niuatahi). Dave Butterfield and Kevin Roe set up and processed the major samplers. Eric Olson analyzed methane and hydrogen from major samples and CTD water samples on the SRI gas chromatograph. John Lupton did all of the gas-tight work.

Our shipboard analysis included pH (Ross Sureflow electrode), total alkalinity (manual titration with Dosimat and Ross electrode), total hydrogen sulfide (spectrophotometric, modified Cline method), ammonia (spectrophotometric, phenol-nitroprusside-hypochlorite), and dissolved silica (spectrophotometric, molydate).

Our standard sample processing/preservation for this cruise was:

| | |
|---|---|
| Shipboard gas (CH4, H2) | 10ml |
| H2S | 20ml |
| pH/Alk | 35ml |
| Major elements | 65ml filtered through 0.2micron |
| Nutrients | 45ml, filtered 0.2 micron, purged w N2, frozen |
| Trace metals | 350ml, in I-Chem bottles, acidified w ultrapure HCl |
| Cell counts | 3ml, +0.3ml 37% formaldehyde (sm. Vol. due to shortage of formaldehyde) |
| O/H isotopes | 10ml |
| Sulfite | 12ml, in glass vial w 50 to 200µL formaldehyde |
| Sulfur isotopes | 45ml, glass vial w 1ml 10wt% Cd Acetate soln |
| DOC | 100ml, in cleaned, muffled glass bottles, frozen |

Temperature measurements in the vents were done with the Quest temperature sensor (an RTD). Calibration was done by the Quest group prior to the cruise. We had questions about the accuracy of the sensor after observing what we were convinced was a boiling vent and getting a temperature reading that was 20 degrees below the predicted boiling point for the depth. We did a simple 2-point calibration on deck to make sure there was no problem with the sensor, and to make sure that the readout did not require subtracting the ambient temperature. We obtained readings of +1.2°C in ice water and 99.1°C in boiling water. We concluded that there was no significant issue with the temperature sensor. It is recommended that the Quest group perform a calibration at high-temperature in Germany when possible.

We had a Pelagic impeller pump coupled to a Millipore cartridge filter and flow gauge to do in-situ filtration to collect DNA from diffuse vents. The ROV group had too many technical issues to deal with and could not deal with interfacing the pump until 1 week into the cruise. There was a ground fault that occurred on the first two

attempts to use it, then an alternative pump was tested and rejected, and finally the pump sampling system was used on dives 331 (Mata Tolu) and 332 (West Mata). Only these 2 DNA samples were collected. Approximately 10ml of the fluid from the Q331 DNA filter cartridge were taken for pH measurement, and approximately 40ml of Q332 DNA filter cartridge were taken for pH, H2S, silica and major elements. Both samples had hydrothermal content indicating that the pump system worked.

**Table 6.6.1-1. Fluid Volumes Saved for Analysis**

| Sample# DB (dive) | pH/ alk | gas | H2S | majors | nutrients | O/H iso | sulfite | S iso | DOC | T. M. | cell counts | single cell genomics |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | JH | JH |
| Q322MW (4) | 35 | 20 | 30 | 65 | 45 | 10 | | 45 | 100 | 400 | 36 | 3 |
| Q323MW (8) | 35 | 110 | 25 | 60 | 50 | 15 | 25 | 45 | | 400 | | |
| Q324MG (10) | 35 | 30 | 20 | 65 | 45 | 15 | | | | 200 | 6 | |
| Q324MW (2) | 35 | 10 | 25 | 65 | | 12 | 24 | 45 | 100 | 300 | | |
| Q326MBlue (8) | 35 | 10 | 25 | 65 | 45 | | | | 100 | 500 | | |
| Q326MRed (10) | 35 | 10 | 25 | 60 | 45 | 10 | 25 | 45 | | 300 | | |
| Q326MW (9) | 35 | 10 | 25 | 60 | 45 | 12 | 25 | 45 | 100 | 300 | | |
| Q327MBlue (3) | 35 | 10 | 25 | 60 | 50 | 10 | | 45 | 100 | 400 | 6 | 3 |
| Q327MW (9) | 35 | 70 | 25 | 60 | 50 | 10 | | 45 | 100 | 100 | | |
| Q328MB (4) | 35 | 10 | 10 | 50 | 40 | 10 | 36 | 45 | | 475 | | |
| Q328MW (7) | 35 | 10 | 15 | 62 | 45 | 10 | | 45 | 50 | 40 | | |
| Q329MB (5) | 35 | 10 | 25 | 65 | 45 | | | 45 | 90 | 420 | | |
| Q329MR (10) | 35 | 10 | 20 | 60 | 45 | 10 | 36 | 45 | 60 | 450 | | |
| Q329MW (9) | 35 | 10 | 25 | 65 | 50 | 15 | | | | 550 | | |
| Q330MB (6) | 35 | 10 | 25 | 65 | 30 | 10 | 30 | 45 | | 450 | X | 3 |
| Q330MR (13) | 35 | 10 | 30 | 65 | 40 | 10 | | | | 400 | 6 | 3 |
| Q330MW (5) | 35 | 10 | 25 | 65 | 30 | | 30 | 45 | | 400 | | |
| Q331DNA (21) | 10 | | 15 | | | | | | | | | |
| Q331MB (15) | 35 | 10 | 30 | 65 | 40 | 10 | | | | 500 | X | x |
| Q331MR (12) | 35 | 10 | 20 | 65 | 40 | 15 | 30 | 45 | 100 | 400 | | |
| Q331MW (20) | 35 | 10 | 25 | 65 | 35 | 15 | 36 | 45 | 50 | 250 | | |
| Q332DNA (11) | 10 | | 10 | 15 | | | | | | 15 | | |
| Q332MB (21) | 35 | 10 | 25 | 65 | 45 | 12 | | | | 500 | | |
| Q332MR (7) | 35 | 15 | 30 | 65 | 45 | 15 | | 45 | | 450 | 6 | 3 |
| Q332MW (6) | 35 | 10 | 25 | 65 | 45 | 10 | | 45 | | 500 | 6 | 3 |
| Q333MR (7) | 35 | | 25 | 65 | 50 | | 30 | 45 | | 500 | | |
| Q333MW (8) | 35 | | 25 | 65 | | 15 | 30 | 45 | | 180 | | |

Sample number is the lab ID for chemical analysis, consisting of the dive number plus M for major plus a letter corresponding to the color on the sampler. The sequential dive sample number is in parentheses. All samples are in custody of Dave Butterfield except the cell count and single cell genomics samples, sent to Julie Huber. See the sample tables earlier in this report (Section 3.6.2) for details of each sample.

The major samplers were generally of good quality, reflecting fast skill development by the Quest ROV team. High-temperature smoker samples have measured Mg (post-cruise analysis) in the range of 2.5 to 16 mmol/kg.

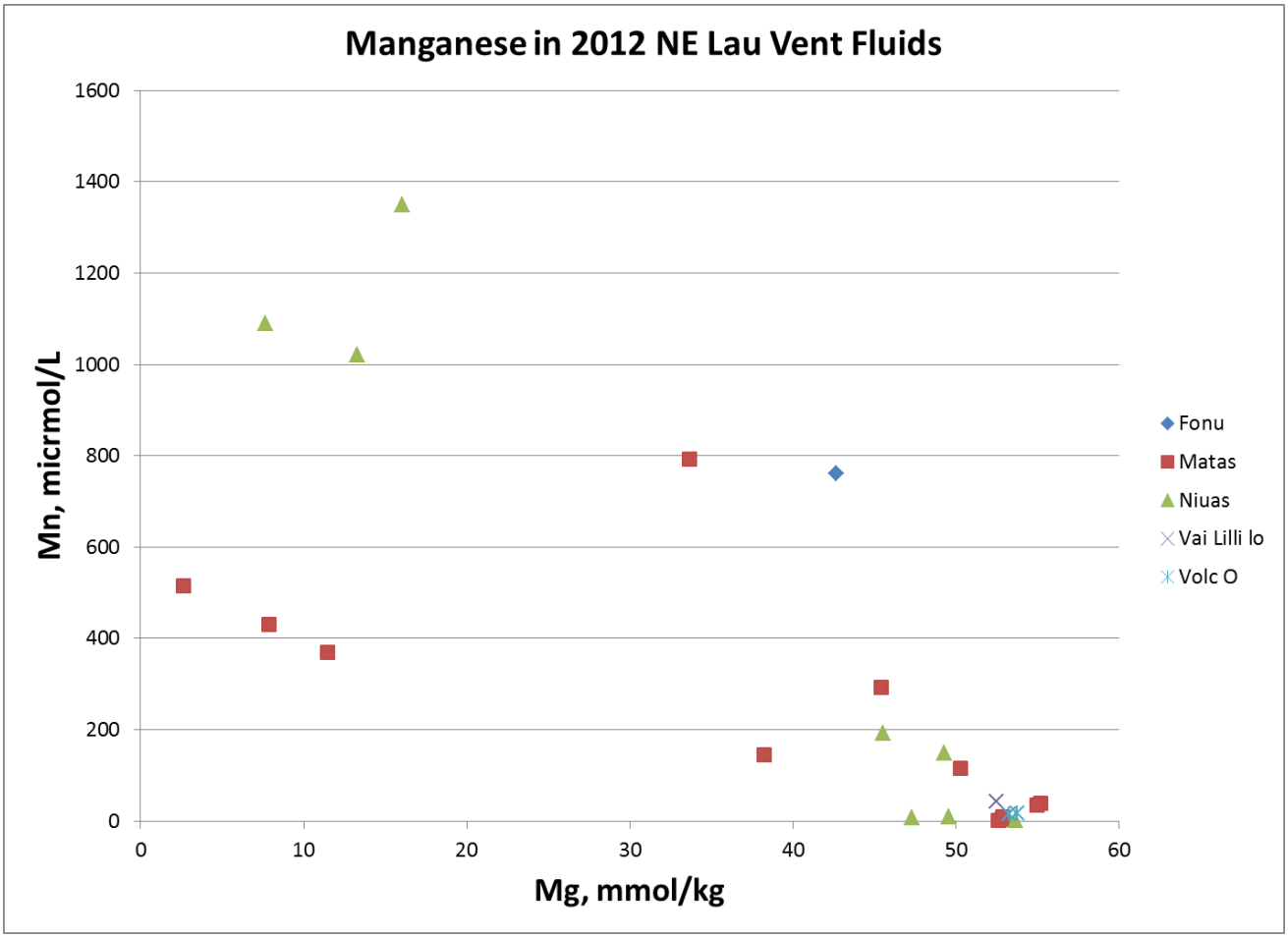



**Fig. 6.6.1-1.** Dissolved Mn versus Mg in vent fluids collected during the 2012 NE Lau expedition. Overall, the quality of the samples was good and we are developing a picture of the range of compositions among the different vent sites.

## 6.6.2 Dissolved Gases in Vent Fluid

Eric Olson

Most of the shipboard dissolved gases work was on samples collected by others. Some CTD water column samples were analyzed shipboard for dissolved hydrogen and methane concentrations (about the same total number as were collected for 3He analysis). Preliminary hydrogen and methane analyses were also run shipboard from the 23 major samples that Dave Butterfield collected in major samplers from the various vents. There are susbsamples for shore side analysis of fixed gases and C1-C4 hydrocarbons collected from all the gas-tight samples collected by John Lupton.

### 6.6.3 Vent Samples Collected for Gas Analysis

John Lupton

The majority of the samples for gas analysis were collected in special titanium gas-tight bottles with ~150 cc internal volume. These were deployed in discrete mode on the ROV, and triggered with a hydraulic slave cylinder mounted underneath the starboard arm. In a few cases when no gas tight bottle samples were available, subsamples from the titanium major samplers were drawn into evacuated flasks then processed on the seagoing vacuum line. A total of 22 discrete vent fluid samples were collected for gas analyses, 20 from gas tight bottles, and 2 subsampled from major samplers. The total gas contents varied considerably, ranging from 2 mM/kg up to 155 mM/kg at one vent on Mata Ua. During the processing of the samples at sea, splits of the extracted gases were sealed into glass ampoules. One set of splits will be analyzed for helium, helium isotopes, and neon by mass spectrometry in the Helium Isotope Laboratory, NOAA/PMEL in Newport, Oregon. A second set of splits will be analyzed for carbon dioxide, methane, nitrogen, oxygen, and other gases by gas chromatography in Marv Lilley's laboratory at the University of Washington. The table below summarizes the vent fluid gas samples that were collected.

**Table 6.6.3-1 Samples for Gas Analysis**

| sample | date | location | vent Temp | total gas | total gas |
|---|---|---|---|---|---|
| | | | °C | ccSTP/g | m-mole/kg |
| Q322-GTB-03 Blue | 9/11/2012 | Vai Lili | diffuse | 0.053 | 2.4 |
| Q323-Major White Fl. 22 subsample | 9/13/2012 | Fonualei South | 250 | 0.224 | 10.0 |
| Q324-GTB-3 Blue | 9/14/2012 | Motutahi (Volcano O cone) | 22 | 0.54 | 24.0 |
| Q324-GTB-11 Yellow | 9/15/2012 | Motutahi (Volcano O cone) | low | 0.083 | 3.7 |
| Q324-GTB-5 Black | 9/15/2012 | Motutahi (Volcano O cone) | | 0.245 | 10.9 |
| Q326-GTB-5 Green | 9/18/2012 | Niua South | | 0.152 | 6.8 |
| Q326-GTB-7 Yellow | 9/19/2012 | Niua South | | 0.52 | 23.3 |
| Q327-GTB-6 Red | 9/19/2012 | Niua South | | 0.184 | 8.2 |
| Q327-Major White Fl. 22 subsample | 9/20/2012 | West Mata | | 0.072 | 3.2 |
| Q328-GTB-5 Red | 9/21/2012 | Mata Ua | 360 | 0.104 | 4.6 |
| Q328-GTB-6 Blue | 9/21/2012 | Mata Ua | 360 | 3.57 | 159.3 |
| Q329-GTB-7 Black | 9/22/2012 | Mata Fitu | | 0.35 | 15.5 |
| Q329-GTB-12 Green | 9/22/2102 | Mata Fitu | | 0.73 | 32.7 |
| Q329-GTB-11 Yellow | 9/22/2012 | Mata Fitu | | 0.094 | 4.2 |
| Q330-GTB-04 Blue | 9/23/2012 | Niua North | | 1.77 | 79.1 |
| Q330-GTB-14 Red | 9/23/2012 | Niua North | | 2.98 | 133.0 |
| Q331-GTB-13 Yellow | 9/23/2012 | Mata Tolu | 270 | 0.32 | 14.1 |
| Q331-GTB-18 Green | 9/24/2012 | Mata Tolu | 242 | 0.47 | 21.0 |
| Q331-GTB-19 Black | 9/24/2012 | Mata Tolu | 242 | 1.06 | 47.2 |
| Q332-GTB-08 Blue | 9/24/2012 | West Mata | diffuse | 0.18 | 7.9 |
| Q332-GTB-09 Red | 9/24/2012 | West Mata | diffuse | 0.156 | 7.0 |
| Q333-GTB-09 Green | 9/24/2012 | Niua South | 274 | in shipment | |

## 6.7 Hydrothermal Plume Studies: CTDO Operations

Edward Baker, Sharon Walker, Joseph Resing, John Lupton, Eric Olson, Nathan Buck

The primary objectives of the CTDO (conductivity, temperature, depth, optical) operations were to: explore for new hydrothermal sites (south of the Fonualei dive site, near the Mangatolo Triple Junction, and north of Niua volcano), to help refine target areas for ROV dive operations, to acquire discrete water samples for chemical analyses, and to compare measurements acquired during this cruise with those from earlier cruises to this area (November 2008, May 2009, and April-May 2010). A total of 23 CTD casts (13 vertical casts and 10 tows) were completed; see table 5.7.1-1 and figure 1.0-1 for CTD cast locations. Sensors on the CTD included the standard hydrographic sensors (conductivity, temperature and pressure) as well as optical backscattering, oxidation-reduction potential (ORP) and an altimeter. A total of 1267 water samples were taken for the following analyses: helium (264 samples), methane and hydrogen (213), pH (280), $CO_2$ (100), total(Fe,Mn) (242), dissolved(Fe,Mn) (45), particulate bulk chemistry (XRF) (57), particle morphology/type (SEM) (10), Mn(III) (21), peptides (2), silica (20), and microbiology (13). Some water samples were analyzed at sea while others need to be analyzed in laboratories on shore.

**Volcanoes south of Fonualei dive site**

One vertical cast was done over a previously unmapped volcano ("First Volcano") about two thirds of the way (north) between the Vai Lili hydrothermal field and the Fonualei dive site. No particle or ORP anomalies were detected. A tow over "Second Volcano", ~26 km south of the Fonualei dive site ($17^o$ 47.1'S $173^o$ 31.55'W, T12A-01) had very slight (dNTU = 0.005) particle anomalies and a more distinct ORP anomaly (-17 mv), which indicates diffuse low temperature venting occurs near the summit of this volcano.

**Volcanoes near the Mangatolo Triple Junction**

One vertical cast was done at each of two volcanoes on the east flank of the Mangatolo Triple Junction (MTJ). Of these volcanoes, the northern one (V12A-03) showed no hydrothermal anomalies. The southern volcano ($15^o$ 57.25'S $174^o$ 42.65'W, V12A-04) has a small (~500m diameter, 100-150 m deep) caldera at the summit and is hydrothermally active. Particle (dNTU = 0.050) and ORP (-26 mv) anomalies were present within the caldera from the depth of the caldera rim (1200 m) to the seafloor (1320 m).

**Niuatahi (Volcano O)**

One vertical cast over the summit of the cone within the very large caldera of Volcano O defined a 55 m thick optically intense plume (dNTU to 0.700) with ORP anomalies of almost -90 mv centered at 1200 m water depth (~50 meters above bottom). The plume was about 40 m thicker in 2010 (rising to a depth of 1130 m in 2010 compared to 1170 m in 2012), with more intense optical (dNTU > 4) and ORP (up to -200 mv) anomalies. These results suggest the intensity of hydrothermal output at this cone site may have decreased from 2010 to 2012.

**West Mata**

We conducted two CTD tows over the summit of West Mata volcano. Maximum particle (dNTU = 0.3) and ORP (-30) anomalies were greatly reduced in 2012 compared to previous years when West Mata was actively erupting (2008, 2009 and 2010). By comparison, in 2008 the plume over West Mata had particle concentrations above the limit of the sensor (dNTU > 5.0) from ~1000 m water depth (~200 m above the summit) to the bottom, was still intense (dNTU > 4.0) in 2010 with a rise height of ~300 m (to 900 m water depth), but rose only 40-50

meters above bottom in 2012. Maximum ORP anomalies in 2012 were -30 mv compared to -450 mv seen while West Mata was actively erupting.

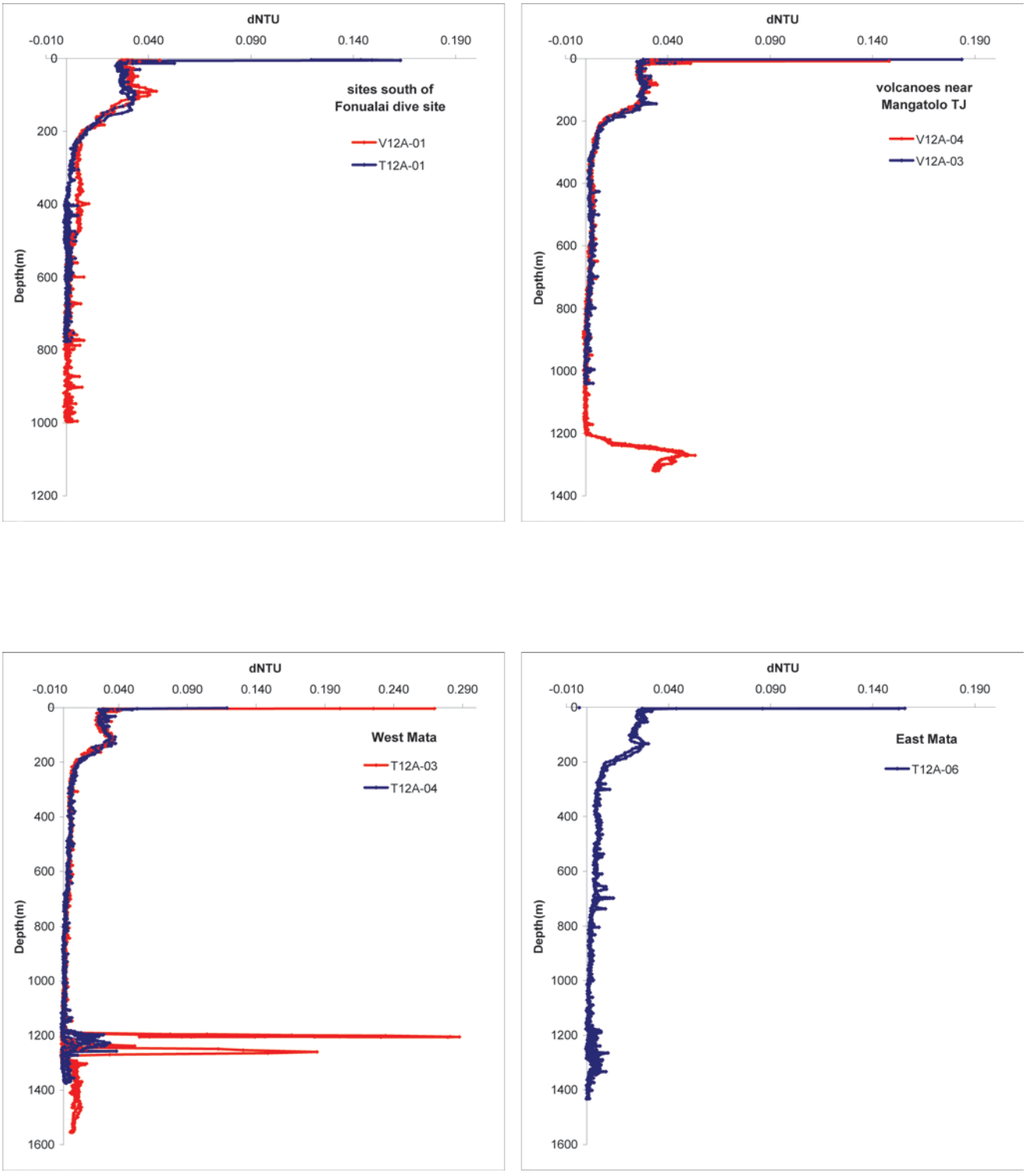
**Basin surrounding West Mata**

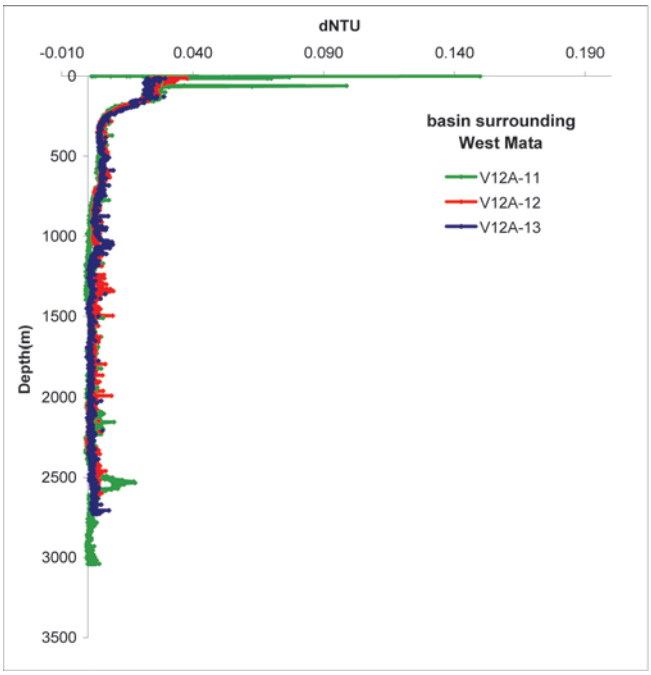
Five vertical casts were done on the flanks and in the deep basin surrounding West Mata. Deep particle plumes without hydrothermal components, similar to deep particle plumes encountered at other actively erupting volcanoes (Kavachi, NW Rota and Monowai), had been seen in this area in 2008 and 2010. Bathymetry differencing at West Mata also showed a large, recent slope failure east of the active eruptive vents. Deep plumes are thought to be the result of gravity flows initiated by landslides and eruptive activity and can carry fine particulates tens of kilometers away from a volcano. A mooring with current meter and MAPRs was deployed in 2010 to monitor for deep particle plumes. This mooring was recovered during this cruise so one cast was located at the mooring site (V12A-05) to provide a complete profile of water column properties at the end of the deployment period. Two casts located in the deep basin northwest and southwest of West Mata were stations repeated from earlier cruises (V12A-11 was in the same location as V04A-05 and V10B-04 and about 5 km from V08C-13; V12A-12 was in the same location as V08C-21 and V10B-07). Casts V12A-07 was located at the base of the slide area on the southeast flank of West Mata. No deep particle plumes were seen in the basin surrounding West Mata in 2012.

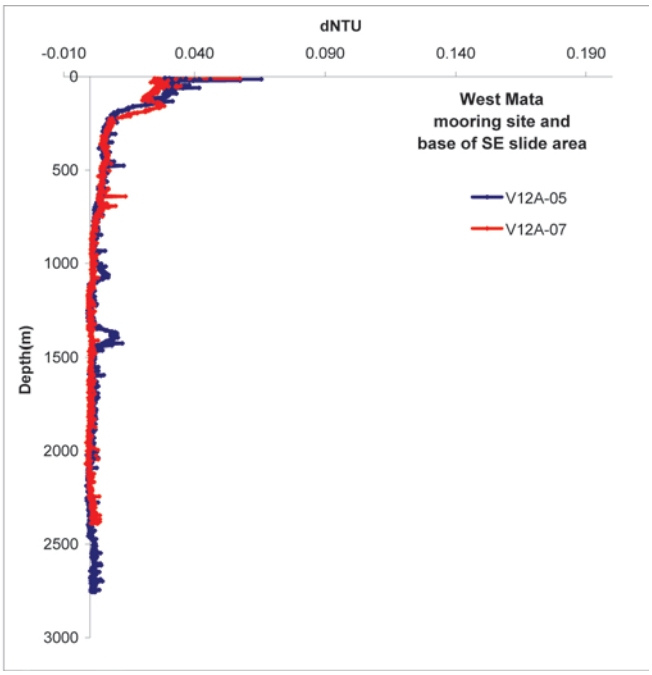
**North Matas**

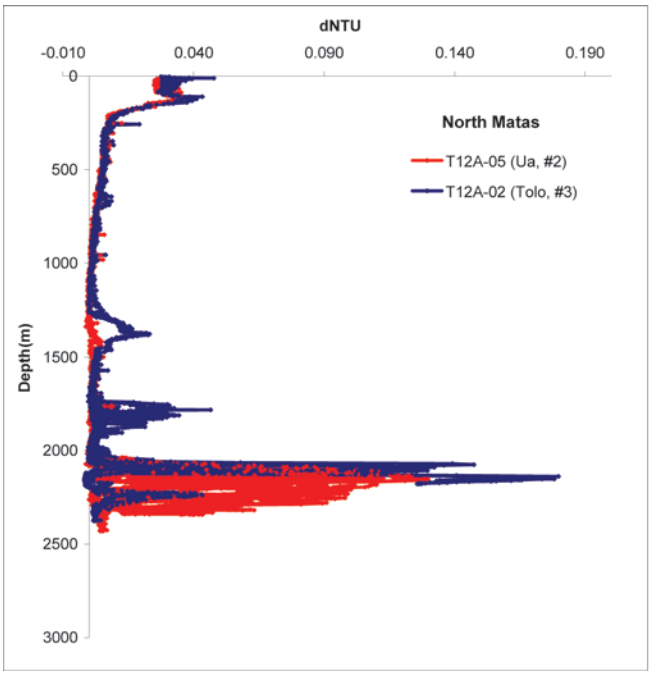
Four of the North Mata volcanoes (Mata Ua (#2), Mata Tolu (#3), Mata Ono (#6) and Mata Fitu (#7)) were the focus of ROV dives during this cruise. CTD tows were conducted at each of these volcanoes to help refine dive targets by identifying the areas with the strongest plume signals. ROV dives were highly successful at locating vent sites on the seafloor.

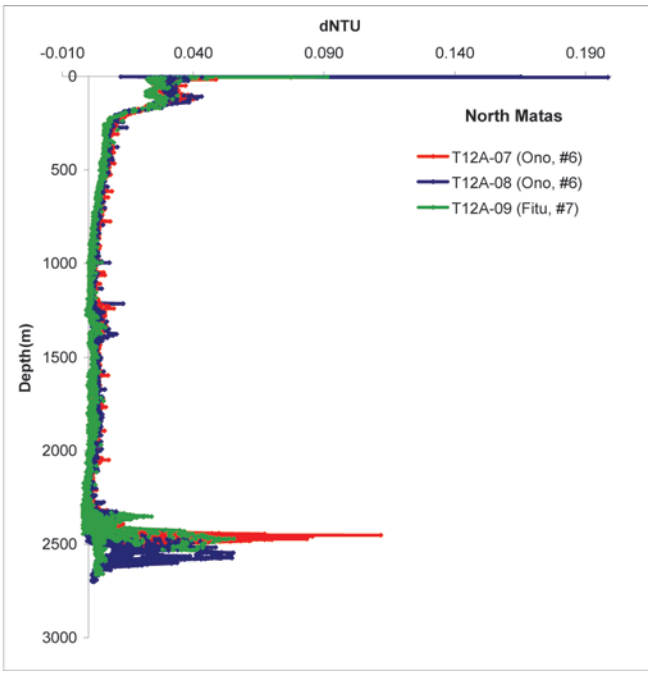
**Fig. 6.7-1.** Particle anomaly (dNTU) profiles of all CTD casts and tows grouped by geographic location.

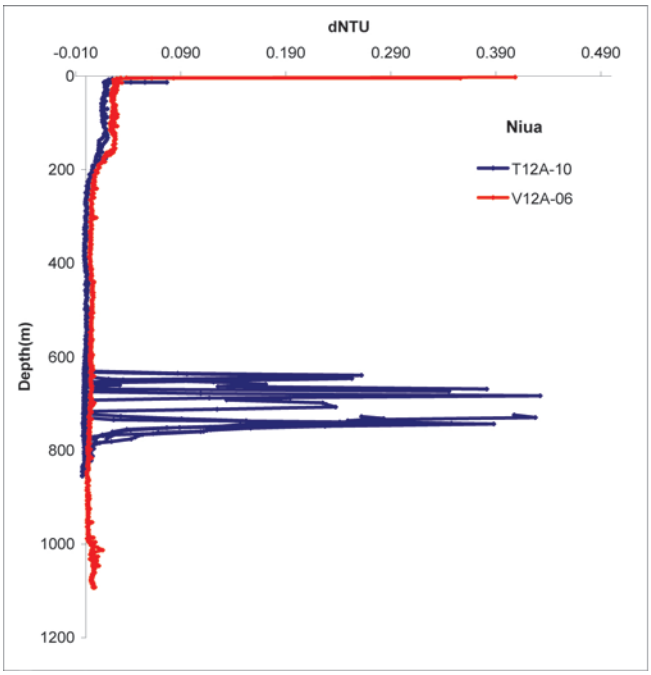


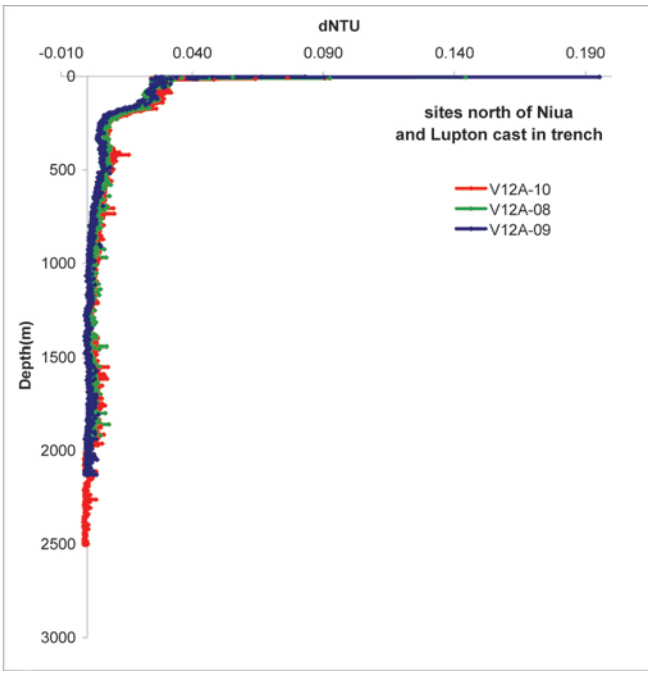

dNTU
-0.010
0.040
0.090
0.140
0.190
0
500
1000
1500
2000
2500
3000
3500
Depth(m)
basin surrounding
West Mata
V12A-11
V12A-12
V12A-13


dNTU
-0.010
0.040
0.090
0.140
0.190
0
500
1000
1500
2000
2500
3000
Depth(m)
West Mata
mooring site and
base of SE slide area
V12A-05
V12A-07


dNTU
-0.010
0.040
0.090
0.140
0.190
0
500
1000
1500
2000
2500
3000
Depth(m)
North Matas
T12A-05 (Ua, #2)
T12A-02 (Tolo, #3)


dNTU
-0.010
0.040
0.090
0.140
0.190
0
500
1000
1500
2000
2500
3000
Depth(m)
North Matas
T12A-07 (Ono, #6)
T12A-08 (Ono, #6)
T12A-09 (Fitu, #7)


dNTU
-0.010
0.090
0.190
0.290
0.390
0.490
0
200
400
600
800
1000
1200
Depth(m)
Niua
T12A-10
V12A-06


dNTU
-0.010
0.040
0.090
0.140
0.190
0
500
1000
1500
2000
2500
3000
Depth(m)
sites north of Niua
and Lupton cast in trench
V12A-10
V12A-08
V12A-09

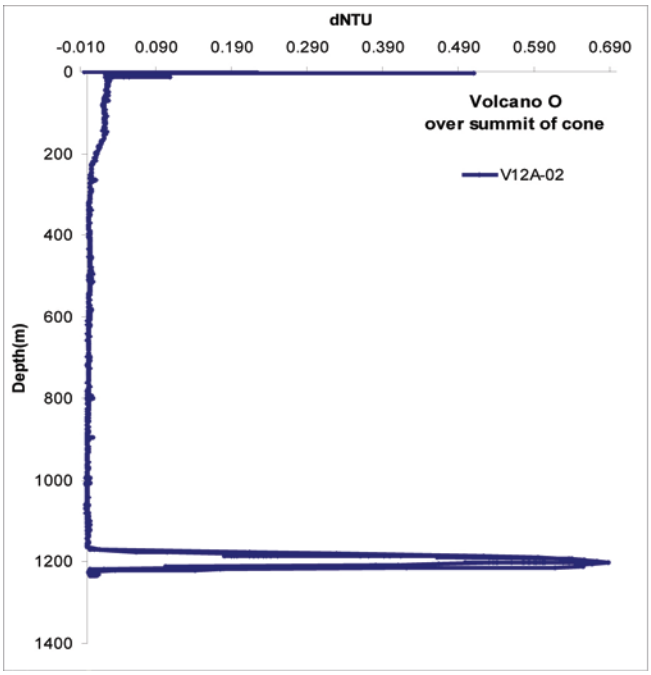
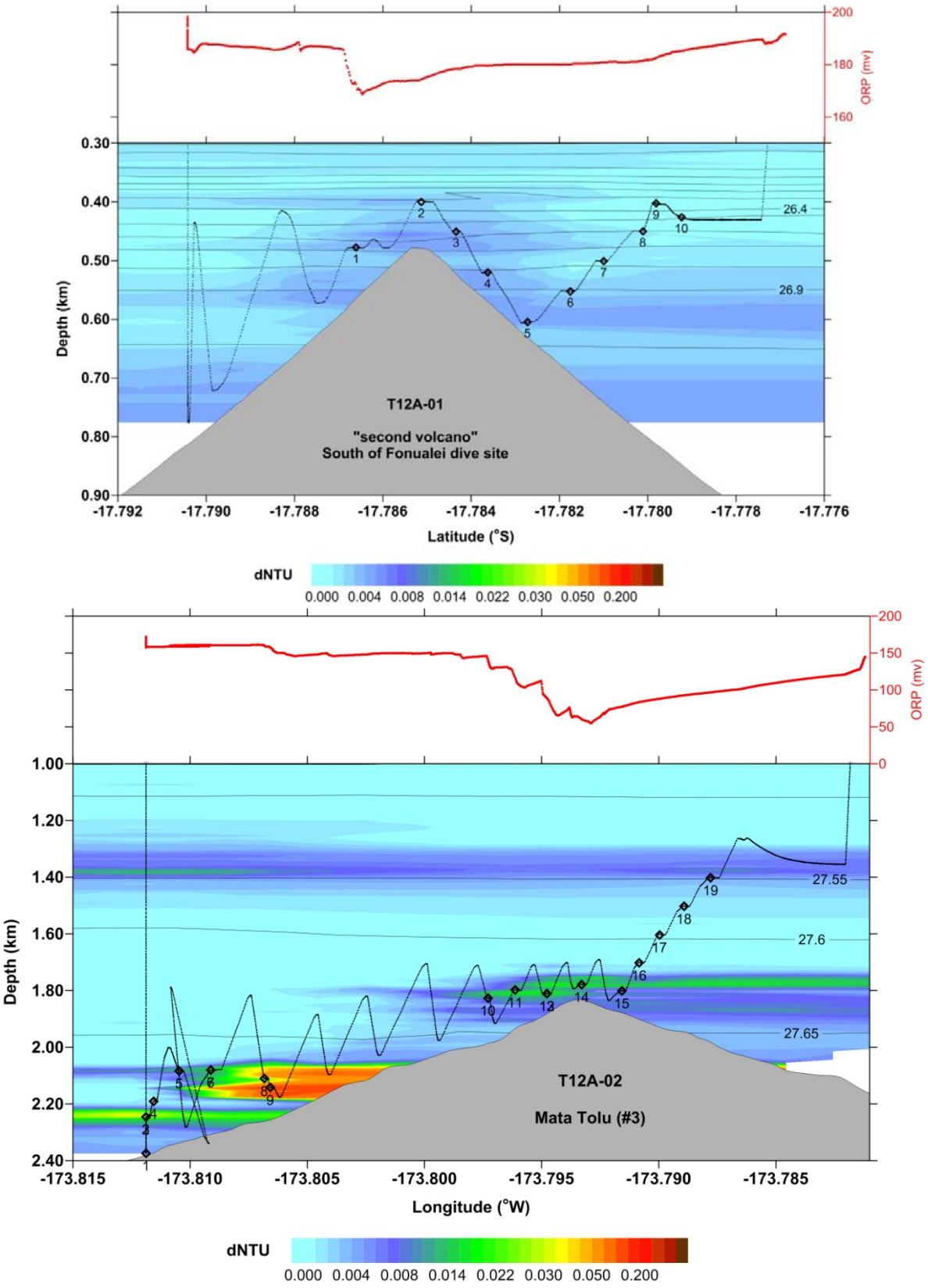
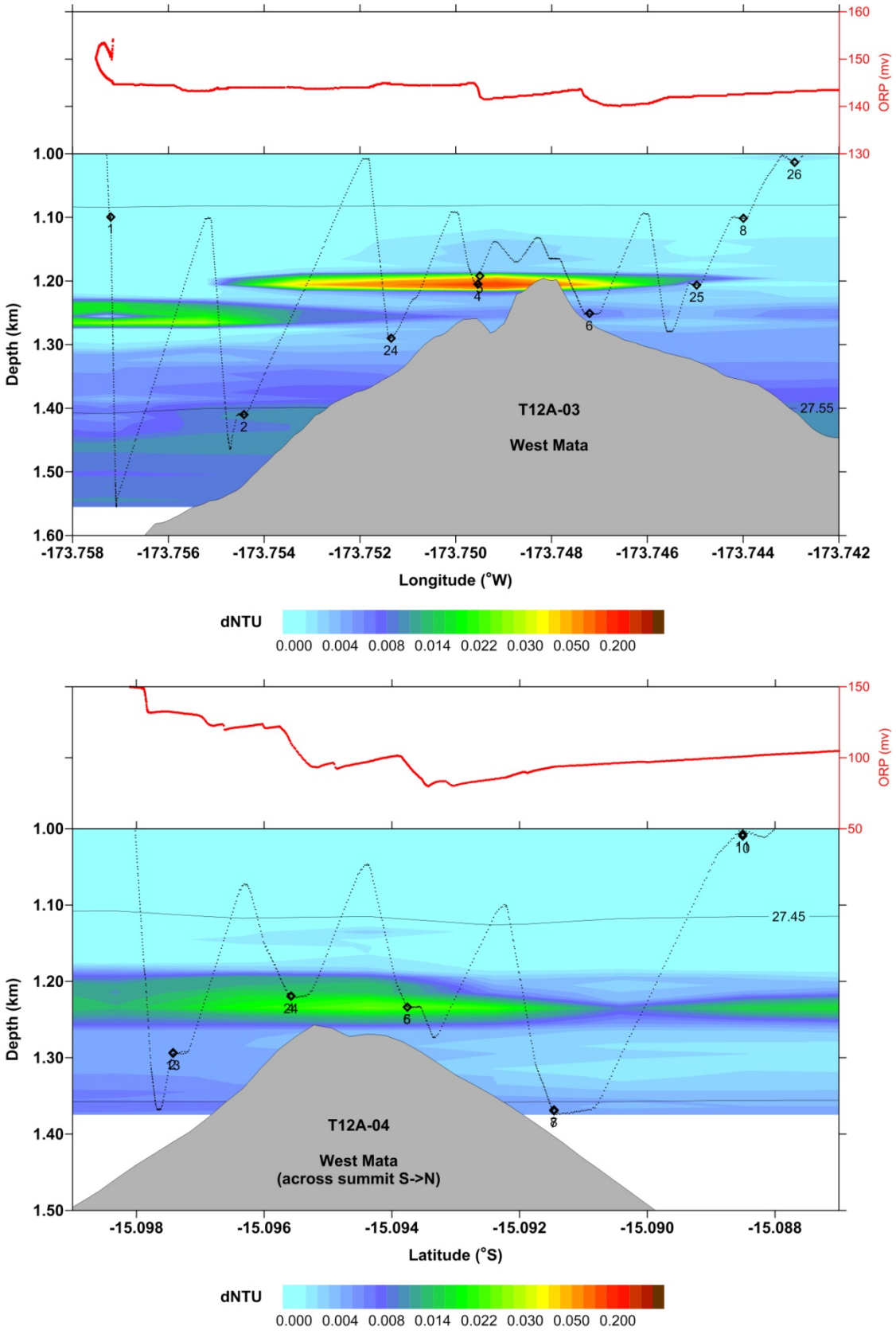
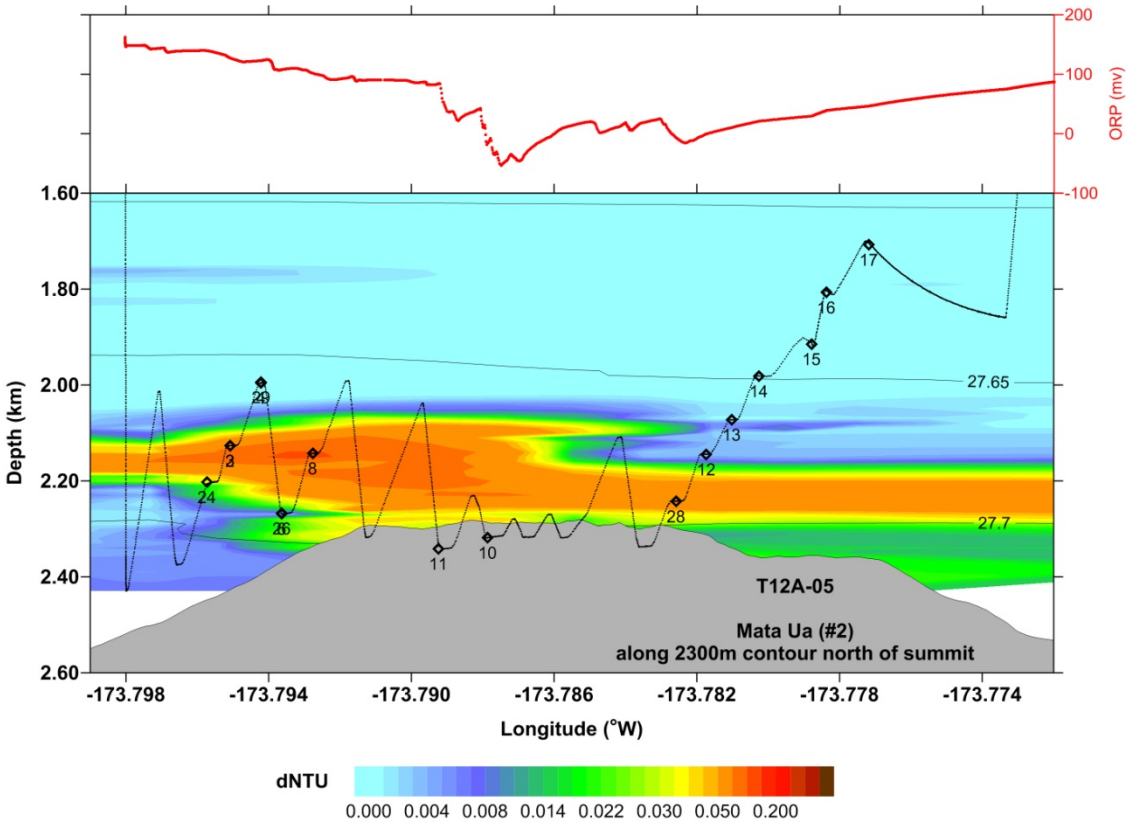
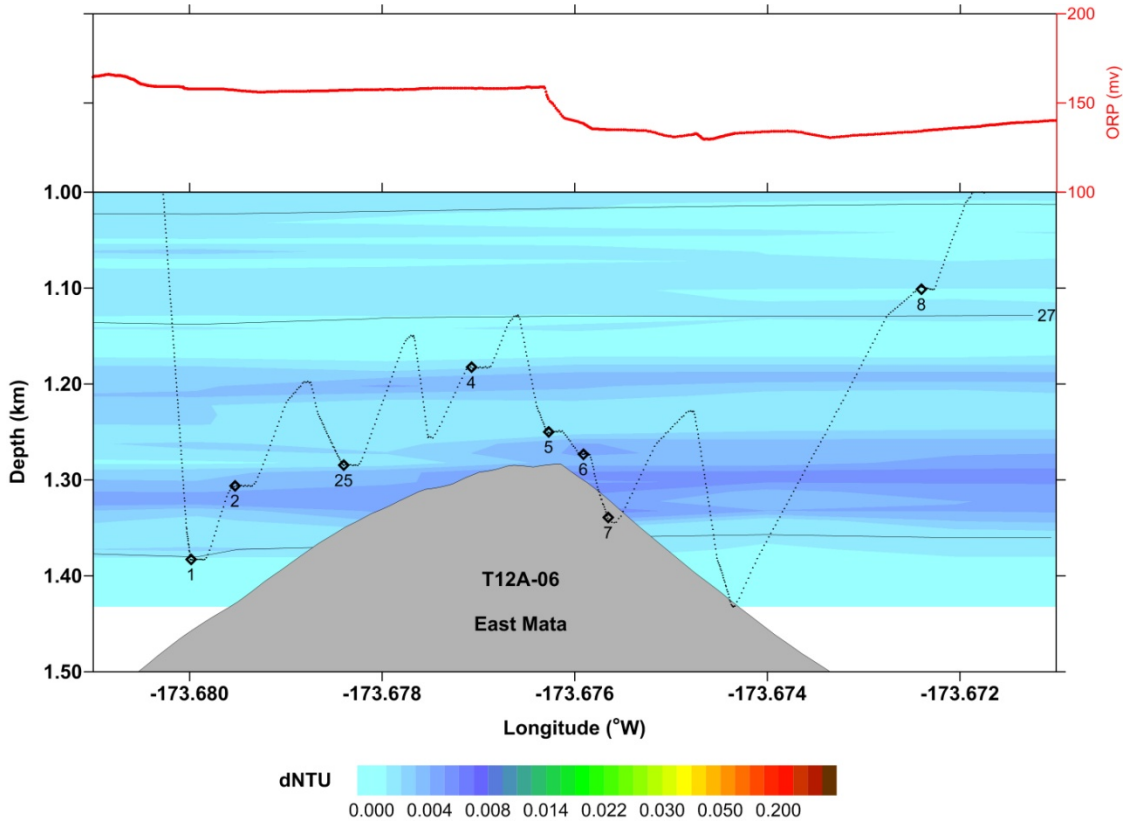

dNTU
-0.010
0.090
0.190
0.290
0.390
0.490
0.590
0.690
0
200
400
600
800
1000
1200
1400
Depth(m)
Volcano O
over summit of cone
V12A-02

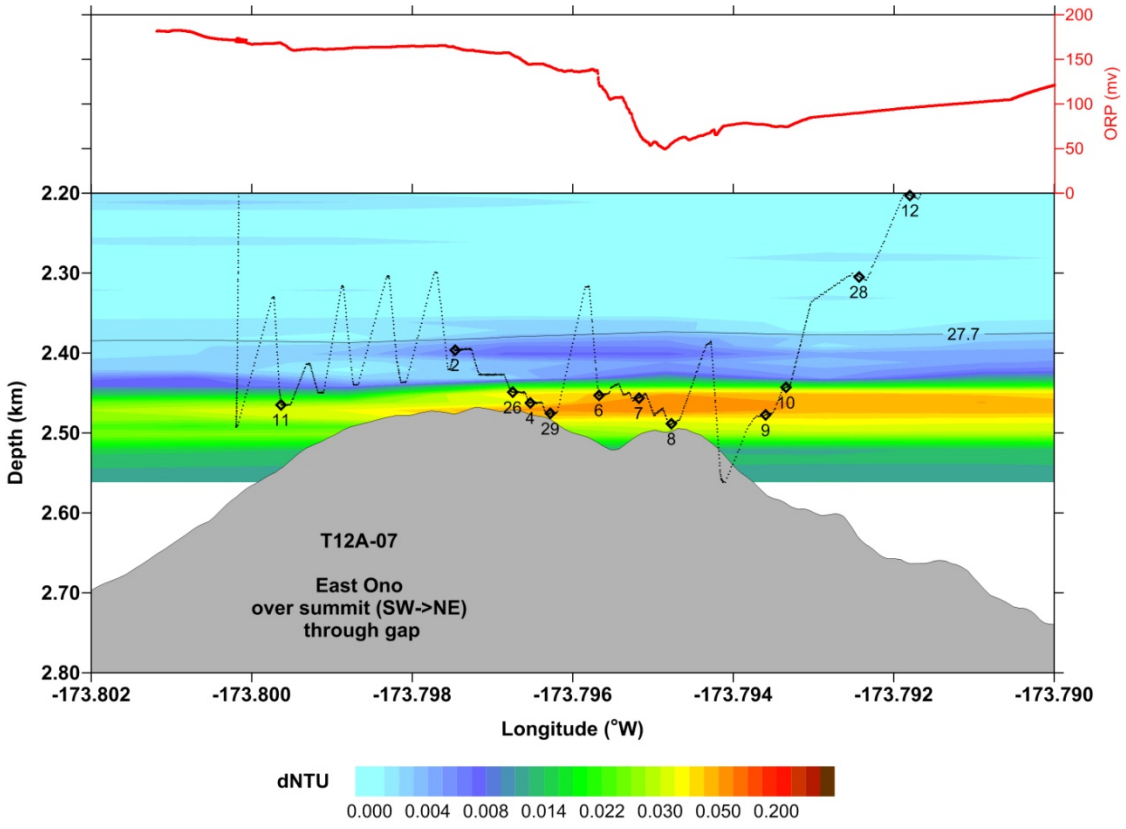
**Fig. 6.7-2**. Particle anomaly (dNTU) contour plots from all CTD tows with oxidation-reduction potential (ORP) plotted above (red line).

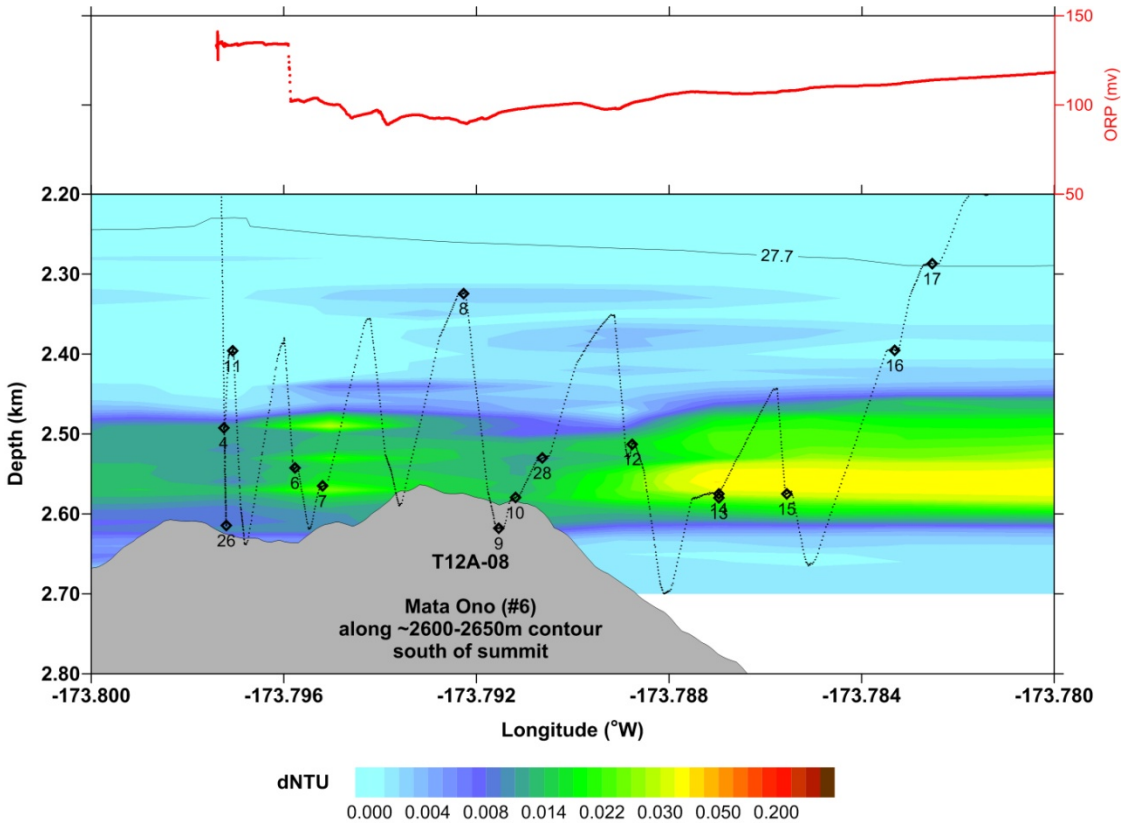


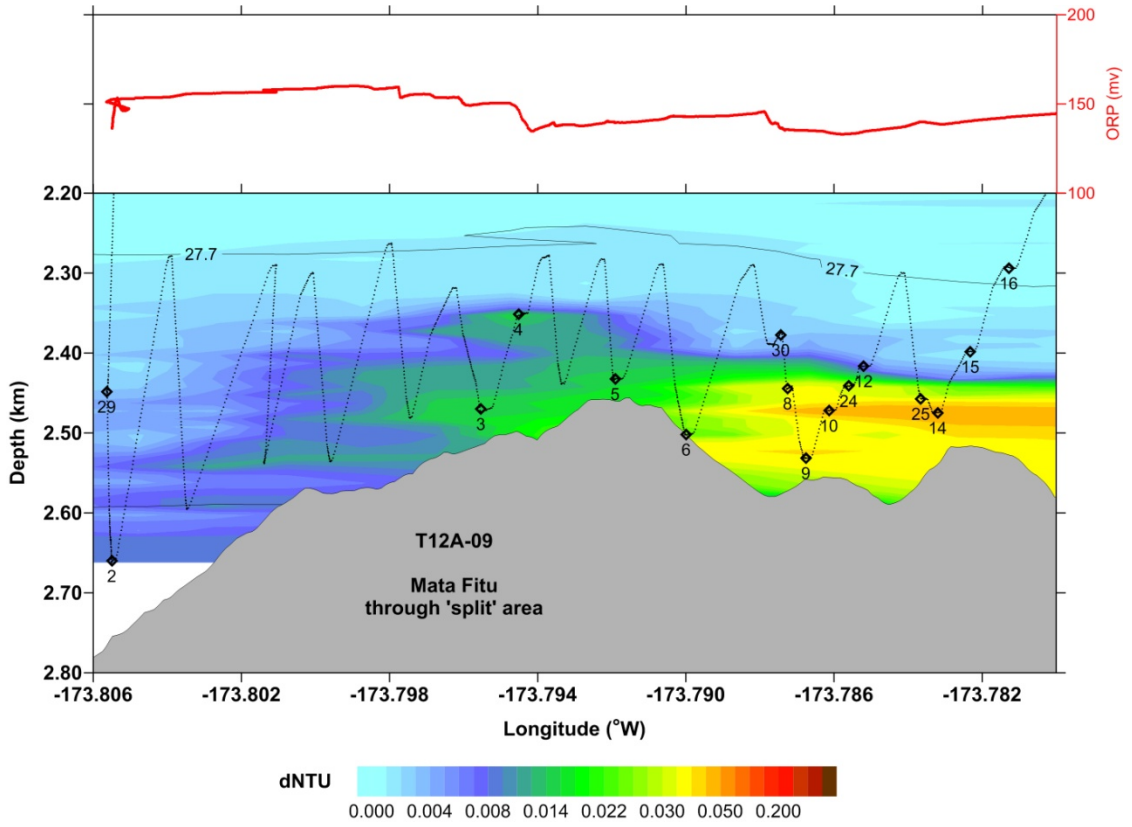

ORP (mv)
160
150
140
130
1.00
1.10
1.20
1.30
1.40
1.50
1.60
Depth (km)
1
2
24
4
6
25
8
26
27.55
T12A-03
West Mata
-173.758
-173.756
-173.754
-173.752
-173.750
-173.748
-173.746
-173.744
-173.742
Longitude (°W)
dNTU
0.000 0.004 0.008 0.014 0.022 0.030 0.050 0.200
ORP (mv)
150
100
50
1.00
1.10
1.20
1.30
1.40
1.50
Depth (km)
10
27.45
24
6
23
8
T12A-04
West Mata
(across summit S->N)
-15.098
-15.096
-15.094
-15.092
-15.090
-15.088
Latitude (°S)
dNTU
0.000 0.004 0.008 0.014 0.022 0.030 0.050 0.200

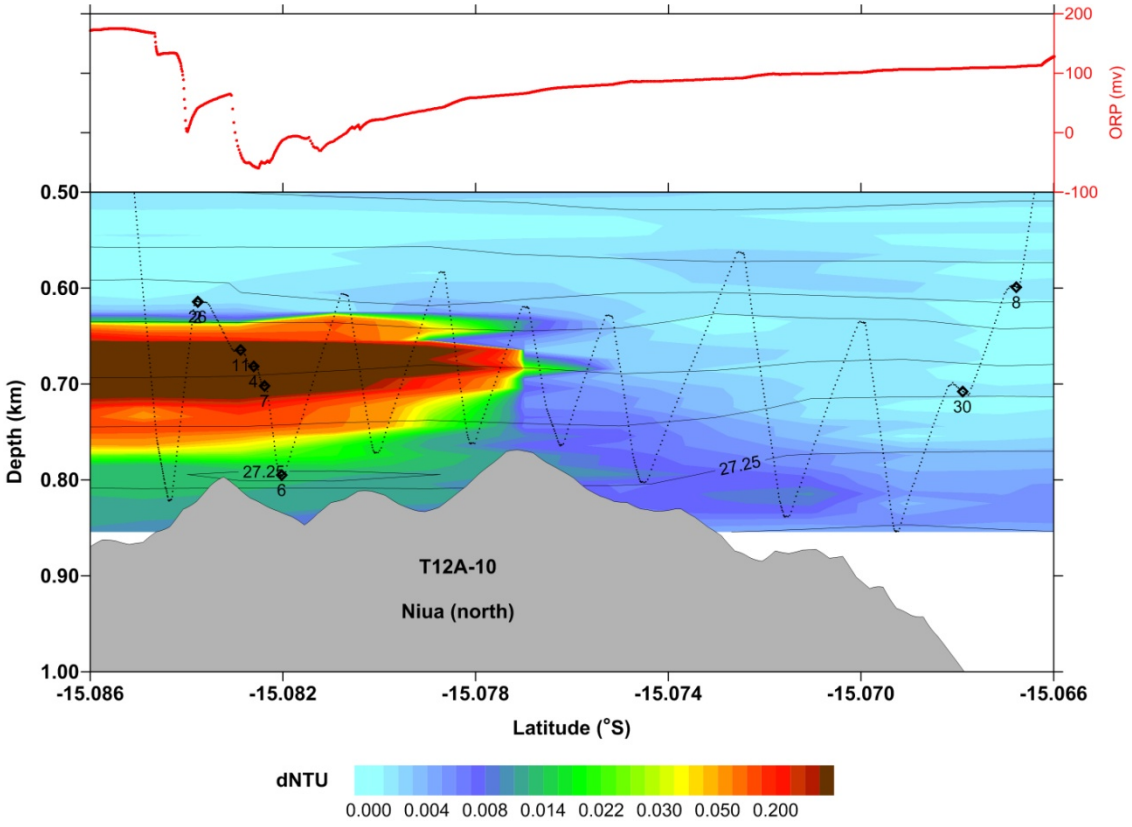

ORP (mv)
200
100
0
-100
1.60
1.80
2.00
2.20
2.40
2.60
Depth (km)
27.65
27.7
T12A-05
Mata Ua (#2)
along 2300m contour north of summit
-173.798
-173.794
-173.790
-173.786
-173.782
-173.778
-173.774
Longitude (°W)
dNTU
0.000 0.004 0.008 0.014 0.022 0.030 0.050 0.200


ORP (mv)
200
150
100
1.00
1.10
1.20
1.30
1.40
1.50
Depth (km)
27
T12A-06
East Mata
-173.680
-173.678
-173.676
-173.674
-173.672
Longitude (°W)
dNTU
0.000 0.004 0.008 0.014 0.022 0.030 0.050 0.200


ORP (mv)
200
150
100
50
0
Depth (km)
2.20
2.30
2.40
2.50
2.60
2.70
2.80
27.7
12
28
2
11
26
4
29
6
7
8
9
10
T12A-07
East Ono
over summit (SW->NE)
through gap
-173.802
-173.800
-173.798
-173.796
-173.794
-173.792
-173.790
Longitude (°W)
dNTU
0.000 0.004 0.008 0.014 0.022 0.030 0.050 0.200


ORP (mv)
150
100
50
Depth (km)
2.20
2.30
2.40
2.50
2.60
2.70
2.80
27.7
17
8
11
16
4
6
7
28
12
26
10
9
13
15
T12A-08
Mata Ono (#6)
along ~2600-2650m contour
south of summit
-173.800
-173.796
-173.792
-173.788
-173.784
-173.780
Longitude (°W)
dNTU
0.000 0.004 0.008 0.014 0.022 0.030 0.050 0.200


ORP (mv)
200
150
100
Depth (km)
2.20
2.30
2.40
2.50
2.60
2.70
2.80
27.7
27.7
29
2
3
4
5
6
30
8
9
12
24
10
25
14
15
16
T12A-09
Mata Fitu
through 'split' area
-173.806
-173.802
-173.798
-173.794
-173.790
-173.786
-173.782
Longitude (°W)
dNTU
0.000 0.004 0.008 0.014 0.022 0.030 0.050 0.200


ORP (mv)
200
100
0
-100
Depth (km)
0.50
0.60
0.70
0.80
0.90
1.00
26
11
4
7
6
27.25
27.25
8
30
T12A-10
Niua (north)
-15.086
-15.082
-15.078
-15.074
-15.070
-15.066
Latitude (°S)
dNTU
0.000 0.004 0.008 0.014 0.022 0.030 0.050 0.200

## Table 6.7-1 CTD Vertical Casts and Tows – SRoF'12 / RR1211

| Cast | StaName | Start End (2012) | Z | pH | 3He | H2 & CH4 | CO2 | Total | TDMe | XRF | SEM | Tebo Mn (III) | Tebo pep tide | bio. | Si | Latitude | Longitude |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | V12A-01 | 12-Sep 02:30 | 1045 | 19 | 10 | 9 | | 10 | | 1 | | | | | | -19.124917 | -175.108667 |
| | | 12-Sep 03:40 | | | | | | | | | | | | | | | |
| | | **"first volcano" - previously unmapped volcano. This is a caldera - cast placed in the middle of it** | | | | | | | | | | | | | | | |
| 2 | T12A-01(start) | 12-Sep 13:03 | | | | | | | | | | | | | | -17.790417 | -174.526067 |
| | T12A-01(end) | 12-Sep 14:58 | | 10 | 10 | 10 | | 10 | | 1 | | | | | | -17.776850 | -174.526083 |
| | | **"second volcano" - south of Fonualei dive site** | | | | | | | | | | | | | | | |
| 3 | V12A-02 | 14-Sep 07:38 | 1254 | 18 | 12 | 12 | 8 | 10 | 5 | 5 | 1 | 1 | 1 | | | -15.375817 | -174.002583 |
| | | 14-Sep 08:58 | | | | | | | | | | | | | | | |
| | | **Volcano O - over summit of cone inside caldera** | | | | | | | | | | | | | | | |
| 4 | T12A-02(start) | 15-Sep 07:51 | | | | | | | | | | | | | | -15.006600 | -173.812683 |
| | T12A-02(end) | 15-Sep 11:57 | | 19 | 15 | 15 | 8 | 17 | 5 | 5 | 2 | 4 | | | | -15.003483 | -173.781200 |
| | | **Mata Tolu (#3) - tow over summit along ridge** | | | | | | | | | | | | | | | |
| 5 | T12A-03(start) | 15-Sep 14:43 | | | | | | | | | | | | | | -15.099717 | -173.757133 |
| | T12A-03(end) | 15-Sep 17:15 | | 11 | 11 | 11 | | 11 | 1 | 1 | | | | 1 | | -15.087433 | -173.738733 |
| | | **West Mata - tow over summit along ridge** | | | | | | | | | | | | | | | |
| 6 | V12A-03 | 16-Sep 06:21 | 1064 | 7 | 7 | 7 | | 7 | | | | | | | | -15.745000 | -174.635967 |
| | | 16-Sep 07:20 | | | | | | | | | | | | | | | |
| | | **Mangatolo flank volcano #1** | | | | | | | | | | | | | | | |
| 7 | V12A-04 | 16-Sep 09:15 | 1335 | 14 | 11 | 11 | 6 | 10 | 4 | 4 | 1 | 1 | | | | -15.954150 | -174.710750 |
| | | 16-Sep 10:33 | | | | | | | | | | | | | | | |
| | | **Mangatolo flank volcano #2 (with caldera)** | | | | | | | | | | | | | | | |
| 8 | V12A-05 | 17-Sep 06:15 | 2785 | 14 | 14 | 14 | 12 | 14 | 2 | 2 | | | | | | -15.141300 | -173.739067 |
| | | 17-Sep 08:23 | | | | | | | | | | | | | | | |
| | | **West Mata mooring site (vertical cast just after mooring recovery)** | | | | | | | | | | | | | | | |
| 9 | T12A-04(start) | 17-Sep 09:55 | | | | | | | | | | | | | | -15.098200 | -173.749100 |
| | T12A-04(end) | 17-Sep 11:47 | | 15 | 10 | 10 | 8 | 10 | 3 | 3 | | 1 | 1 | 6 | | -15.084633 | -173.750467 |
| | | **West Mata - tow across summit S->N** | | | | | | | | | | | | | | | |
| 10 | V12A-06 | 18-Sep 09:01 | 1122 | 10 | 7 | 7 | 6 | 7 | 3 | 4 | | 4 | | | | -15.174100 | -173.565383 |
| | | 18-Sep 10:02 | | | | | | | | | | | | | | | |
| | | **Niua (aka Volcano P) - in depression southeast of chimneys seen during dive** | | | | | | | | | | | | | | | |
| 11 | T12A-05(start) | 18-Sep 12:09 | | | | | | | | | | | | | | -15.024833 | -173.798017 |
| | T12A-05(end) | 18-Sep 15:38 | | 17 | 14 | 14 | 10 | 14 | 6 | 5 | 1 | 2 | | | | -15.006683 | -173.770917 |
| | | **Mata Ua (#2) - tow along 2300m contour north of summit to see if plumes are coming from there** | | | | | | | | | | | | | | | |
| 12 | T12A-06(start) | 19-Sep 09:34 | | | | | | | | | | | | | | -15.098733 | -173.681400 |
| | T12A-06(end) | 19-Sep 11:25 | | 12 | 12 | 6 | | 9 | | | | | | | | -15.104800 | -173.670567 |
| | | **East Mata** | | | | | | | | | | | | | | | |
| 13 | V12A-07 | 19-Sep 12:19 | 2429 | | | | | | | 3 | | | | | | -15.102217 | -173.726350 |
| | | 19-Sep 13:49 | | | | | | | | | | | | | | | |
| | | **SE base of West Mata (at base of slide area)** | | | | | | | | | | | | | | | |
| 14 | T12A-07(start) | 19-Sep 15:18 | | | | | | | | | | | | | | -14.943533 | -173.800283 |
| | T12A-07(end) | 19-Sep 18:21 | | 13 | 13 | 13 | 7 | 13 | 3 | 4 | 1 | | | | | -14.929683 | -173.786517 |
| | | **Mata Ono (#6) - through gap in summit** | | | | | | | | | | | | | | | |
| 15 | T12A-08(start) | 20-Sep 08:56 | | | | | | | | | | | | | | -14.943717 | -173.797367 |
| | T12A-08(end) | 20-Sep 12:29 | | 20 | 20 | 11 | 3 | 18 | 5 | 5 | | 4 | | 4 | | -14.924100 | -173.770717 |

| Cast | StaName | Start End (2012) | Z | pH | 3He | H2 & CH4 | CO2 | Total | TDMe | XRF | SEM | Tebo Mn (III) | Tebo pep tide | bio. | Si | Latitude | Longitude |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | **Mata Ono (#6) - along ~2600-2650 contour south of summit** | | | | | | | | | | | | | | | |
| 16 | V12A-08 | 20-Sep 14:22 | 1935 | 10 | 10 | 7 | | | | | | | | | | -14.913950 | -173.505133 |
| | | 20-Sep 15:50 | | | | | | | | | | | | | | | |
| | | **first target north of Niua** | | | | | | | | | | | | | | | |
| 17 | T12A-09(start) | 21-Sep 08:43 | | | | | | | | | | | | | | -14.922750 | -173.805483 |
| | T12A-09(end) | 21-Sep 12:36 | | 19 | 21 | 14 | 11 | 19 | 5 | 5 | 1 | 3 | | 2 | | -14.900800 | -173.767700 |
| | | **Mata Fitu (#7) - through 'split' area west of chimneys seen during dive** | | | | | | | | | | | | | | | |
| 18 | T12A-10(start) | 21-Sep 16:30 | | | | | | | | | | | | | | -15.086233 | -173.554733 |
| | T12A-10(end) | 21-Sep 18:30 | | 9 | 9 | 0 | 5 | 9 | | 2 | 1 | 1 | | | | -15.065767 | -173.560283 |
| | | **north end of Niua** | | | | | | | | | | | | | | | |
| 19 | V12A-09 | 22-Sep 08:08 | 2147 | 10 | 10 | 10 | | 10 | | | | | | | | -14.924250 | -173.525067 |
| | | 22-Sep 09:47 | | | | | | | | | | | | | | | |
| | | **second target north of Niua** | | | | | | | | | | | | | | | |
| 20 | V12A-10 | 22-Sep 11:18 | ~6000 | | 20 | 7 | | 20 | | | | | | | 20 | -14.744500 | -173.396133 |
| | | 22-Sep 13:27 | | | | | | | | | | | | | | | |
| | | **Lupton cast - in trench** | | | | | | | | | | | | | | | |
| 21 | V12A-11 | 23-Sep 08:20 | 3069 | 15 | 10 | 7 | 7 | 15 | 3 | 3 | 1 | | | | | -15.042317 | -173.854233 |
| | | 23-Sep 10:44 | | | | | | | | | | | | | | | |
| | | **Basin west of W Mata** | | | | | | | | | | | | | | | |
| 22 | V12A-12 | 23-Sep 12:00 | 2655 | 9 | 9 | 9 | 9 | 9 | | 3 | | | | | | -15.166667 | -173.854500 |
| | | 23-Sep 13:44 | | | | | | | | | | | | | | | |
| | | **SW of W Mata** | | | | | | | | | | | | | | | |
| 23 | V12A-13 | 23-Sep 15:08 | 2747 | 9 | 9 | 9 | | | | 1 | 1 | | | | | -15.190083 | -173.669200 |
| | | 23-Sep 16:53 | | | | | | | | | | | | | | | |
| | | **South of E Mata** | | | | | | | | | | | | | | | |
| | | **Totals** | **1267** | **280** | **264** | **213** | **100** | **242** | **45** | **57** | **10** | **21** | **2** | **13** | **20** | | |

## 6.8 Mooring Operations

Sharon Walker, Matt Fowler

The mooring deployed near West Mata (Fig. 1.0-2) in May 2010 was recovered during this expedition. The mooring included one Haruphone, one current meter and 5 Miniature Autonomous Plume Recorders (MAPR). Refer to the mooring diagram (Fig. 6.8-1) for instrument depths. Data return from the MAPRs was poor: MAPR-24 flooded, MAPR-18 and -24 failed to return any data, and MAPR-32 and -57 returned very short data records (MAPR-32 recorded for 6 months but there was NO LSS data; MAPR-57 recorded for only 2 months but data quality for all sensors - temperature, pressure, LSS and ORP - was good).

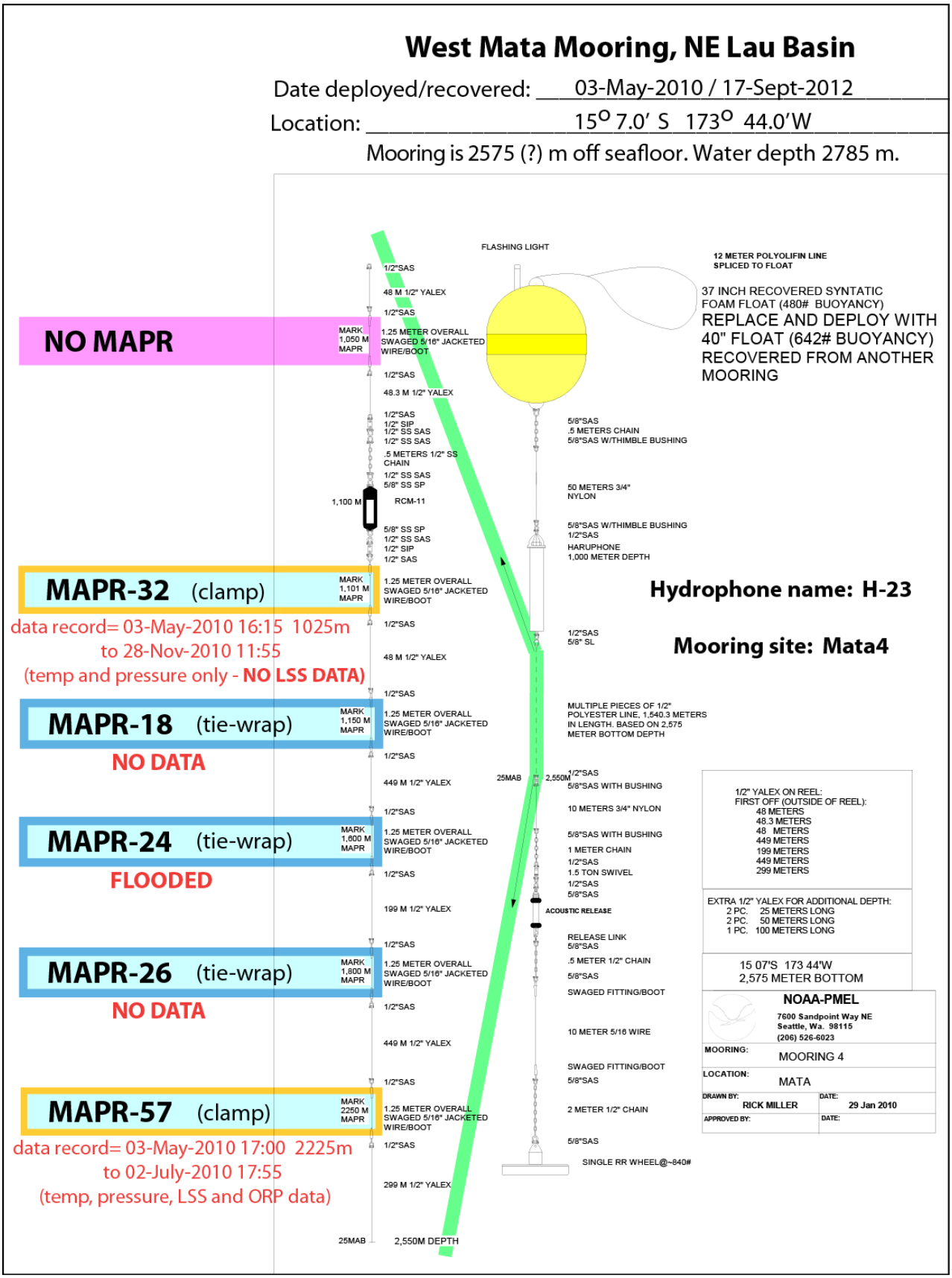



**Fig 6.8-1**. West Mata mooring diagram.

place holder for print

# 7.0 SRoF'12 Quest 4000 Dive Logs (Q322 – Q333)

## 7.1 Q322 Vai Lili, Valu Fa Ridge Dive Log

| date | time | latitude | longitude | Z | alt | hdg | Q322 - Vai Lili, Valu Fa Ridge Dive Comments |
|---|---|---|---|---|---|---|---|
| **Main Goal:** Locate and take samples at unique mat site; particularly with Davis samplers. | | | | | | | |
| **Setup:** 6 Davis samplers; 3 gastights; 3 majors; McPhail sampler; small biobox | | | | | | | |
| **Launch target:** 22°12.846' S 176°36.478' W Z=1725m Vai Lili vent field | | | | | | | |
| **Nav Notes:** bottom time 9/10/2012 22:08 – 9/11 05:52. Nav smoothed (tolerance=15). Did not shift the navigation. | | | | | | | |
| **DIVE LOG POSITION INFORMATION: latitude; longitude; Z; alt; hdg values are derived from finalized Quest nav. Any lat/long values in the dive comments column were recorded at sea and are preliminary.** | | | | | | | |
| 10-Sep | 20.13.29 | | | | | | ROV Quest off the deck. |
| 10-Sep | 20.19.48 | | | | | | **Quest in the water.** |
| 10-Sep | 20.36.11 | | | | | | Quest wire transponder in the water. |
| 10-Sep | 20.37.13 | | | | | | Quest is at 87 meters depth; switching to USBL positions. |
| 10-Sep | 21.15.13 | | | | | | Stopped winch at 785m with problem. |
| 10-Sep | 21.25.02 | | | | | | Descending again. |
| 10-Sep | 21.49.58 | | | | | | 1350m depth. |
| 10-Sep | 21.56.12 | | | | | | 1500m depth (1735 meters is the dive target depth). |
| 10-Sep | 22.01.13 | | | | | | 1600m depth. |
| 10-Sep | 22.05.28 | | | | | | Altimeter is on - 32m off the bottom. |
| 10-Sep | 22.07.39 | -22.21378 | -176.60796 | 1737 | 6 | 326 | **Can see bottom.** |
| 10-Sep | 22.08.18 | -22.21378 | -176.60796 | 1742 | 1 | 327 | Small discrepancy in depth. |
| 10-Sep | 22.08.24 | -22.21378 | -176.60796 | 1742 | 1 | 327 | Seeing lava flows with corals on them. |
| 10-Sep | 22.09.04 | -22.21378 | -176.60796 | 1741 | 1 | 340 | Sponge and worms. |
| 10-Sep | 22.10.38 | -22.21374 | -176.60796 | 1741 | 1 | 340 | Holding position while doing bottom checks. |
| 10-Sep | 22.10.36 | -22.21374 | -176.60796 | 1742 | 1 | 340 | Problem with time stamp in previous record. |
| 10-Sep | 22.12.28 | -22.21393 | -176.60768 | 1741 | 2 | 338 | Lost HD video; came right back. |
| 10-Sep | 22.13.52 | -22.21396 | -176.60768 | 1743 | 2 | 231 | Lava flow variety with sponges; some pillows. |
| 10-Sep | 22.14.42 | -22.21396 | -176.60775 | 1742 | 3 | 233 | Corals and sea whips; not young volcanic area. |
| 10-Sep | 22.16.18 | -22.21404 | -176.60793 | 0 | 0 | 0 | Shrimp! (just a single). |
| 10-Sep | 22.17.34 | -22.21401 | -176.60797 | 1741 | 3 | 199 | Quite a bit of sediment on the lava flow with a variety of lava forms. |
| 10-Sep | 22.19.09 | -22.21409 | -176.60800 | 1742 | 2 | 193 | Some distinct pillows; lots of sediment; sea star. |
| 10-Sep | 22.19.58 | -22.21410 | -176.60801 | 1742 | 2 | 211 | Ridge ahead (heading now 207). |
| 10-Sep | 22.22.28 | -22.21407 | -176.60792 | 1740 | 2 | 178 | Picked up some sediment while panning around. |
| 10-Sep | 22.23.14 | -22.21413 | -176.60789 | 1739 | 3 | 182 | More coral. |
| 10-Sep | 22.26.24 | -22.21419 | -176.60802 | 1741 | 2 | 324 | Conducting search pattern for dive site. |
| 10-Sep | 22.26.39 | -22.21417 | -176.60802 | 1741 | 2 | 327 | Sedimented lava flows. |
| 10-Sep | 22.27.10 | -22.21410 | -176.60805 | 1741 | 2 | 0 | Looking due north at a slight ridge; sedimented lava flows. |
| 10-Sep | 22.28.20 | -22.21406 | -176.60800 | 1741 | 2 | 4 | Sediment in pockets of lava with corals clinging to rocks. |
| 10-Sep | 22.28.40 | -22.21407 | -176.60792 | 1742 | 2 | 359 | Moving due north with older lava flows. |
| 10-Sep | 22.29.50 | -22.21398 | -176.60797 | 1741 | 2 | 337 | Moved about 10m north of original dive target. |
| 10-Sep | 22.30.30 | -22.21396 | -176.60798 | 1742 | 2 | 294 | Moving west in search pattern. |
| 10-Sep | 22.31.47 | -22.21396 | -176.60801 | 1744 | 2 | 181 | Circling to the south after moving about 10m to the west. |
| 10-Sep | 22.33.06 | -22.21399 | -176.60810 | 1745 | 2 | 184 | 5m off bottom (lower visibility) looks like a ridge ahead. |
| 10-Sep | 22.34.46 | -22.21406 | -176.60810 | 1743 | 4 | 187 | Older lava flow with fine sediment layer; sloping west (heading south). |
| 10-Sep | 22.38.30 | -22.21430 | -176.60813 | 1740 | 6 | 182 | Moved about 30m south in search of mats. |
| 10-Sep | 22.41.49 | -22.21442 | -176.60795 | 1740 | 2 | 78 | Small fissure in the lava. |
| 10-Sep | 22.43.36 | -22.21444 | -176.60782 | 1742 | 3 | 58 | Staining - see some mat. |
| 10-Sep | 22.44.28 | -22.21444 | -176.60775 | 1739 | 5 | 44 | Seeing more mat to the right - increasing mat (hdg 88). |
| 10-Sep | 22.45.32 | -22.21440 | -176.60771 | 1738 | 4 | 60 | Some mat may be darker (manganese). |
| 10-Sep | 22.47.03 | -22.21437 | -176.60767 | 0 | 0 | 0 | Target #4 input at the mat site. |
| 10-Sep | 22.48.25 | -22.21437 | -176.60767 | 1740 | 3 | 145 | Site is approx. 20m east/30m south of original target. |
| 10-Sep | 22.51.26 | -22.21439 | -176.60768 | 1742 | 1 | 151 | Shimmering water. |
| 10-Sep | 22.54.19 | -22.21437 | -176.60767 | 1741 | 1 | 152 | Probing the material to see what is solid underneath. |
| 10-Sep | 22.55.52 | -22.21441 | -176.60767 | 1742 | 1 | 151 | Quest is probing the mat. Looks like it is the correct mat - manganese and oxide and pretty thick. |
| 10-Sep | 22.59.38 | -22.21439 | -176.60768 | 1742 | 1 | 152 | The basket on Quest is coming out front. Preparing to sample this manganese oxide mat. |
| 10-Sep | 23.00.53 | -22.21441 | -176.60768 | 1741 | 1 | 151 | Preparing to take a temperature reading of this mat. The mat is overlain on jumbled silicic black lava. |
| 10-Sep | 23.03.10 | -22.21441 | -176.60780 | 0 | 0 | 0 | Shank's temperature probe is on the end of the stbd arm. Perched over the shimmering water rising out of the manganese oxide mat. |

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| 10-Sep | 23.04.23 | -22.21441 | -176.60767 | 1742 | 1 | 151 | The temperature is being recorded - we won't know what it is until the instrument gets to the surface. |
| 10-Sep | 23.07.51 | -22.21447 | -176.60772 | 0 | 0 | 0 | Still taking the temperature here at the mat/water interface. |
| 10-Sep | 23.10.41 | -22.21442 | -176.60771 | 1742 | 1 | 151 | The lbl fix is good for the sampling site. 22 12.864 176 36.458. z=1742m. |
| 10-Sep | 23.11.18 | -22.21440 | -176.60772 | 1742 | 1 | 151 | Stowing the temperature probe. Preparing to sample mat here with the Big Boy scoop for DNA. |
| 10-Sep | 23.13.43 | -22.21442 | -176.60768 | 1742 | 1 | 151 | We are now using the yellow port side temperature probe in the same position prior to sampling. |
| 10-Sep | 23.20.02 | -22.21444 | -176.60772 | 1742 | 1 | 152 | Storing the temp probe now and will sample next. |
| 10-Sep | 23.25.18 | -22.21441 | -176.60774 | 1742 | 1 | 151 | Preparing to take mat sample (big boy #3). |
| 10-Sep | 23.31.26 | -22.21443 | -176.60775 | 1742 | 1 | 152 | Sampler in manipulator; preparing for scoop. |
| 10-Sep | 23.32.41 | -22.21446 | -176.60776 | 1742 | 1 | 151 | Opening valve. |
| 10-Sep | 23.35.57 | -22.21446 | -176.60774 | 1742 | 1 | 152 | Scooping sediment. |
| 10-Sep | 23.37.03 | -22.21446 | -176.60774 | 1742 | 1 | 151 | **Bio Sample: Q322-biomat-01**. Scooping with the big boy sampler #3 for DNA. |
| 10-Sep | 23.38.17 | -22.21440 | -176.60771 | 1741 | 1 | 151 | Continuing to scoop with big boy #3 for Q322-biomat-01. |
| 10-Sep | 23.38.58 | -22.21445 | -176.60774 | 1742 | 1 | 151 | Can see mat going into tube. |
| 10-Sep | 23.39.17 | -22.21446 | -176.60772 | 1742 | 1 | 152 | Turbidity sensor on ROV not registering the floc in water. |
| 10-Sep | 23.41.02 | -22.21443 | -176.60774 | 1742 | 1 | 151 | Using other manipulator to coax the sediment into the tube. |
| 10-Sep | 23.43.48 | -22.21450 | -176.60770 | 1742 | 1 | 151 | Scooping more microbial mat-buried tube in mat. |
| 10-Sep | 23.46.54 | -22.21447 | -176.60775 | 1742 | 1 | 151 | Continuing to scoop for first microbial mat sample. |
| 10-Sep | 23.51.03 | -22.21445 | -176.60776 | 1742 | 1 | 151 | Tapping the sediment down into the tube. |
| 10-Sep | 23.52.22 | -22.21449 | -176.60768 | 0 | 0 | 0 | Transferring the sampler to other arm to close the valve. |
| 10-Sep | 23.54.40 | -22.21445 | -176.60775 | 1742 | 1 | 151 | Closed valve on big boy #3. |
| 10-Sep | 23.55.40 | -22.21450 | -176.60772 | 1742 | 1 | 151 | Stowing the scoop; putting a target on the map; then move north. |
| 10-Sep | 23.57.44 | -22.21444 | -176.60776 | 1742 | 1 | 151 | Sample drawer closed; stowing the arms. |
| 11-Sep | 00.00.27 | -22.21445 | -176.60778 | 1742 | 1 | 151 | **Q322 Target: Scoop 3** position -22 12.869 176 36.463 |
| 11-Sep | 00.02.36 | -22.21446 | -176.60775 | 1741 | 2 | 151 | Heading uphill at 152°C to next sample site on a slope for ease of sampling. |
| 11-Sep | 00.04.25 | -22.21447 | -176.60774 | 1740 | 3 | 118 | Looking for a better sampling site with black mat. |
| 11-Sep | 00.05.30 | -22.21448 | -176.60772 | 1740 | 3 | 126 | Orange iron oxide mat and black is manganese oxide mat. |
| 11-Sep | 00.06.28 | -22.21444 | -176.60772 | 1741 | 2 | 135 | Stopping for look at biology; active bacteria when see chunks of material flying by. |
| 11-Sep | 00.09.03 | -22.21442 | -176.60766 | 1741 | 1 | 136 | Crinoid photo op. |
| 11-Sep | 00.09.23 | -22.21442 | -176.60783 | 1740 | 2 | 136 | Continuing to find sample site without animal contamination of the DNA (heading 165). |
| 11-Sep | 00.11.20 | -22.21443 | -176.60770 | 1741 | 1 | 165 | In position for next sample. |
| 11-Sep | 00.11.52 | -22.21441 | -176.60775 | 1741 | 1 | 165 | Preparing to take temperature probe measurement before sample. |
| 11-Sep | 00.13.58 | -22.21441 | -176.60774 | 1740 | 2 | 166 | Red stbd temperature probe used for measurement. |
| 11-Sep | 00.16.00 | -22.21439 | -176.60778 | 1741 | 1 | 165 | Moving probe closer to the black mat in small crevice. |
| 11-Sep | 00.17.34 | -22.21445 | -176.60772 | 1741 | 2 | 166 | Lollipop hydroid at the temperature probe site. |
| 11-Sep | 00.19.47 | -22.21447 | -176.60767 | 1742 | 2 | 165 | Temperature probe touched surface and it is a rock surface not mat. |
| 11-Sep | 00.19.54 | -22.21442 | -176.60771 | 1741 | 2 | 166 | Rocks have the larger animals and mat doesn't. |
| 11-Sep | 00.20.27 | -22.21438 | -176.60771 | 1741 | 2 | 166 | Temperature probe now in soft mat. |
| 11-Sep | 00.21.37 | -22.21449 | -176.60785 | 1741 | 2 | 166 | Stowing Red STBD temperature probe. |
| 11-Sep | 00.23.48 | -22.21444 | -176.60772 | 1741 | 2 | 166 | Retrieving big boy #2 from basket. |
| 11-Sep | 00.25.23 | -22.21446 | -176.60768 | 1742 | 2 | 166 | Passing sediment scoop between arms to open the valve. |
| 11-Sep | 00.26.35 | -22.21445 | -176.60771 | 1741 | 2 | 166 | Valve opened. |
| 11-Sep | 00.27.32 | -22.21450 | -176.60770 | 1741 | 2 | 165 | Passing back to other arm for sampling. |
| 11-Sep | 00.32.06 | -22.21442 | -176.60766 | 1741 | 2 | 166 | **Bio Sample: Q322-biomat-02**. Scooping with Big Boy #2 for DNA. |
| 11-Sep | 00.32.15 | -22.21442 | -176.60766 | 1741 | 1 | 165 | Scooping a mixture of yellow and black mat (<5 meters from first site). |
| 11-Sep | 00.35.16 | -22.21445 | -176.60774 | 1741 | 2 | 171 | Moving around a little bit to find a softer area for scooping. |
| 11-Sep | 00.35.48 | -22.21442 | -176.60774 | 1741 | 1 | 171 | Found some nice black scoopable material (clogging the top of sampler). |
| 11-Sep | 00.38.46 | -22.21440 | -176.60770 | 1741 | 1 | 171 | Scooping and shaking to move the mat down the tube. |
| 11-Sep | 00.41.09 | -22.21441 | -176.60770 | 1741 | 1 | 171 | Good sample of material. |
| 11-Sep | 00.43.15 | -22.21445 | -176.60768 | 1742 | 1 | 171 | Another scoop of manganese mat. |
| 11-Sep | 00.44.08 | -22.21445 | -176.60771 | 1742 | 1 | 171 | Passing sampler to other arm to close valve. |
| 11-Sep | 00.46.21 | -22.21440 | -176.60767 | 1741 | 1 | 171 | Closing the valve to the sampler. |
| 11-Sep | 00.48.32 | -22.21446 | -176.60767 | 1741 | 1 | 171 | Moving the sampler back to other arm then the basket. |
| 11-Sep | 00.50.26 | -22.21439 | -176.60776 | 1742 | 1 | 171 | Stowing the sample box and will get a good nav fix here. |
| 11-Sep | 00.54.39 | -22.21446 | -176.60770 | 1742 | 1 | 171 | Good nav position: Target Scoop 2: 22°C 12.866 S/ 176°C 36.473 W. |
| 11-Sep | 00.55.03 | -22.21437 | -176.60767 | 1742 | 1 | 171 | Switching pilots in the van; Joe Resing moving to van. |
| 11-Sep | 01.04.52 | -22.21442 | -176.60776 | 1742 | 2 | 140 | Rick is on the microphone. |

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| 11-Sep | 01.06.06 | -22.21439 | -176.60776 | 1742 | 2 | 133 | We're going to reposition near the first sampling site. Searching for a pristine area with softer stuff. Looking for flow. Will take water samples and last 2 scoops. |
| 11-Sep | 01.09.45 | -22.21446 | -176.60778 | 1739 | 3 | 139 | We're looking for a spot that is mat not rock. Want soft mat not rock. Went beyond the original spot. |
| 11-Sep | 01.12.30 | -22.21448 | -176.60774 | 1740 | 2 | 134 | The animals grow very slowly on these mats. |
| 11-Sep | 01.14.05 | -22.21454 | -176.60775 | 1738 | 2 | 91 | Still looking around for more flow and mat. Looking at all these little mounds and see shimmer in each one. Each one is its own "vent". |
| 11-Sep | 01.15.11 | -22.21451 | -176.60774 | 1738 | 2 | 122 | Rick wants to go and look at this feature. He says it looks great. Go with that one. |
| 11-Sep | 01.16.17 | -22.21451 | -176.60774 | 1738 | 1 | 117 | Rick says this is all manganese crust - just what he's looking for. It's a vertical ledge. |
| 11-Sep | 01.18.01 | -22.21451 | -176.60774 | 1739 | 1 | 117 | Took a couple of still pics of this sampling spot. Base of the feature is where the iron-oxidizers are growing. It's a bit gelatinous. |
| 11-Sep | 01.19.05 | -22.21453 | -176.60775 | 1739 | 1 | 117 | The microbes are oxidizing the iron and getting energy out of it. |
| 11-Sep | 01.19.33 | -22.21450 | -176.60771 | 1739 | 1 | 117 | This is a zoom shot of the sampling site. First will take some still photos of this site before sampling. |
| 11-Sep | 01.21.43 | -22.21453 | -176.60775 | 1738 | 1 | 117 | Scheme is still photos; temperature probe; major or gastight; and then "big boy" to scoop it up. |
| 11-Sep | 01.24.29 | -22.21452 | -176.60776 | 1739 | 1 | 117 | These mats occur when there is no sulfide in the area. If was sulfide in the area would find large white mats. Sulfur is much higher energy than manganese and iron. These mats grow much more slowly. |
| 11-Sep | 01.25.25 | -22.21454 | -176.60772 | 1739 | 1 | 117 | Rattail in the background. |
| 11-Sep | 01.25.42 | -22.21450 | -176.60771 | 0 | 0 | 0 | The basket is coming out and are now removing the port yellow temperature probe. |
| 11-Sep | 01.31.18 | -22.21450 | -176.60772 | 1738 | 1 | 117 | This sampling site looks almost like a flange. A lot of the black we're seeing is manganese coating (not just lava rock). |
| 11-Sep | 01.33.13 | -22.21455 | -176.60772 | 1739 | 1 | 117 | Pulled the port-yellow temperature probe away from the flow. |
| 11-Sep | 01.34.43 | -22.21446 | -176.60775 | 1739 | 1 | 117 | Stowing the temperature probe. |
| 11-Sep | 01.35.10 | -22.21453 | -176.60776 | 1738 | 1 | 118 | Will sample the vent with a gas tight in the shimmering water (not in the mat which would gunk up the nozzle). |
| 11-Sep | 01.41.14 | -22.21455 | -176.60774 | 1739 | 1 | 117 | Quest is having a little bit of a dilemma picking up the gastight. |
| 11-Sep | 01.41.22 | -22.21453 | -176.60769 | 1738 | 1 | 117 | The claw has the gastight and is manipulating it. Trying to position is over the flow. It's twirling it in 360 degree circles. |
| 11-Sep | 01.45.21 | -22.21450 | -176.60778 | 1739 | 1 | 117 | Positioning the nozzle so it's in the hydrothermal flow. |
| 11-Sep | 01.45.48 | -22.21450 | -176.60772 | 1738 | 1 | 117 | He's going to have to position the nozzle and then lock it into place before actually firing the gastight. |
| 11-Sep | 01.47.37 | -22.21456 | -176.60778 | 1738 | 1 | 117 | Volker is going to try to re-grip the bottle so first he has to re-holster it. |
| 11-Sep | 01.50.32 | -22.21455 | -176.60769 | 1738 | 1 | 117 | They are having some problems with the arm right now. |
| 11-Sep | 01.50.57 | -22.21449 | -176.60771 | 1739 | 1 | 117 | Looks like the arm is under control now. Going for the gastight bottle again. |
| 11-Sep | 01.52.42 | -22.21458 | -176.60769 | 1738 | 1 | 117 | That's looking better. Looks like he has a better grip on it now. |
| 11-Sep | 01.54.44 | -22.21457 | -176.60768 | 1739 | 1 | 117 | **Gas Sample: Q322-GTB-03**. Fired the blue gastight in the shimmering water above the manganese oxide mat. Hdg 117deg. |
| 11-Sep | 01.56.14 | -22.21452 | -176.60772 | 0 | 0 | 0 | Hoping that the first time it tripped. The second time it missed completely according to Eric. Looks like they are going to try one more time. |
| 11-Sep | 01.56.50 | -22.21457 | -176.60775 | 1739 | 1 | 117 | Just fired it again. Finished sample Q322-GTB-03 - blue gastight. |
| 11-Sep | 01.57.34 | -22.21450 | -176.60772 | 1739 | 1 | 117 | Stowing the gastight. |
| 11-Sep | 01.59.26 | -22.21452 | -176.60775 | 1738 | 1 | 117 | The gastight is stowed. |
| 11-Sep | 02.03.02 | -22.21453 | -176.60775 | 1739 | 1 | 117 | We are going to do a major sample here and a couple scoops. Then we'll do another temperature reading because the vent will be opened up more. Perhaps a more accurate temp probe then. |
| 11-Sep | 02.03.08 | -22.21453 | -176.60775 | 1738 | 1 | 117 | Pulling out the major sampler (red). Will sample in the same spot as the gastight. |
| 11-Sep | 02.05.25 | -22.21452 | -176.60772 | 1739 | 1 | 117 | Quest has the red major sampler in its stbd claw. Lowering it over the flow (very slowly). |
| 11-Sep | 02.06.36 | -22.21456 | -176.60774 | 1739 | 1 | 117 | Want the snorkel below the mat where the flow is coming out. |
| 11-Sep | 02.09.34 | -22.21459 | -176.60776 | 1739 | 1 | 117 | Dave thinks we are probably above the main flow. Looks like shimmer all around the wand . |
| 11-Sep | 02.10.31 | -22.21456 | -176.60769 | 1739 | 1 | 117 | Red major sample in same position as gastight. Fired the major but did not see the spring come up. Will release it and hit it again. |
| 11-Sep | 02.14.48 | -22.21456 | -176.60772 | 1739 | 1 | 117 | Watching the major to make sure it fires. The major did not fire. Looking for a major with a larger bolt. |
| 11-Sep | 02.15.40 | -22.21451 | -176.60781 | 1739 | 1 | 117 | The red major did not fire. Will try another major. |
| 11-Sep | 02.15.43 | -22.21451 | -176.60781 | 1739 | 1 | 117 | Stored the red major. |

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| 11-Sep | 02.17.47 | -22.21450 | -176.60779 | 1738 | 1 | 117 | Retrieving the white major sampler. It has a longer spring on it. |
| 11-Sep | 02.21.11 | -22.21452 | -176.60773 | 1739 | 1 | 117 | The white major is approaching the flow. Looks like he has a good grip on the major. The flow may be coming up from below and wafting over the "flange-looking" structure with the manganese oxides. |
| 11-Sep | 02.21.15 | -22.21449 | -176.60778 | 1739 | 1 | 117 | **Fluid Sample: Q322-major-04** Firing the white major. Looks like it worked. That's the first fluid sample of the expedition. It takes a while for the spring to fully extend. |
| 11-Sep | 02.23.03 | -22.21448 | -176.60783 | 1739 | 1 | 117 | Stowing the white major sampler. Will do a scoop next. |
| 11-Sep | 02.25.37 | -22.21448 | -176.60779 | 1739 | 1 | 117 | The white major sampler is stowed on the vehicle. |
| 11-Sep | 02.29.00 | -22.21453 | -176.60775 | 1738 | 1 | 117 | The next task is to collect another 'big boy" scoop sample of this manganese iron mat. |
| 11-Sep | 02.31.00 | -22.21449 | -176.60782 | 1739 | 1 | 117 | Removing sampler #1 from the ROV. |
| 11-Sep | 02.32.39 | -22.21454 | -176.60777 | 1739 | 1 | 117 | They are hoping to find the manganese oxidizer on this expedition. It should exist but hasn't been discovered yet. |
| 11-Sep | 02.34.19 | -22.21451 | -176.60776 | 1739 | 1 | 117 | **Bio Sample: Q322-biomat-05** with big boy scoop sampler #1. Anticipating the largest sample so far. They have opened the valve and will start sampling soon. It's a 2-step process. |
| 11-Sep | 02.36.34 | -22.21455 | -176.60781 | 1739 | 1 | 113 | Scooping up the mat. Sampling for DNA with big boy #1. |
| 11-Sep | 02.39.39 | -22.21453 | -176.60782 | 1739 | 1 | 122 | Going in for another scoop. It's a bit rocky but hoping to get more. Got lots of black stuff in the scoop as well as mat. Not sure if it is manganese crust or not. Will find out when analyze it in the lab back on shore. |
| 11-Sep | 02.41.46 | -22.21458 | -176.60777 | 1739 | 1 | 122 | Going in for one last scoop to fill it up. |
| 11-Sep | 02.43.05 | -22.21456 | -176.60778 | 1739 | 1 | 121 | That's a good sample. |
| 11-Sep | 02.44.53 | -22.21455 | -176.60779 | 1738 | 1 | 121 | Closing the valve on the sampler. |
| 11-Sep | 02.47.40 | -22.21457 | -176.60778 | 1739 | 1 | 122 | The scoop sampler is stowed back in the port side box where it came from. |
| 11-Sep | 02.48.34 | -22.21456 | -176.60775 | 1739 | 1 | 121 | Going to wait for the junk in the water to clear a bit and then probably take a temperature reading again and get a good positional fix. |
| 11-Sep | 02.50.06 | -22.21454 | -176.60772 | 1739 | 1 | 121 | Pulling in the port box. |
| 11-Sep | 02.52.06 | -22.21458 | -176.60775 | 1739 | 1 | 121 | Going to try to scoop up a little more of the material. |
| 11-Sep | 02.52.58 | -22.21447 | -176.60771 | 1739 | 1 | 122 | Will use a small sampler here to get more of the black and orange material. |
| 11-Sep | 02.54.13 | -22.21456 | -176.60776 | 1739 | 1 | 121 | Picked up small (little gal) scoop #9 for RNA analysis. Will scoop with the top section of the scoop. Open the bottom valve with the preservative to mix with the top microbes. |
| 11-Sep | 02.54.57 | -22.21457 | -176.60775 | 1739 | 1 | 121 | Bringing it up through the water column causes the bacteria to go into survival mode and change their gene expression completely. |
| 11-Sep | 02.55.38 | -22.21457 | -176.60778 | 1739 | 1 | 121 | This (the preservative in the bottom half of the scoop) arrests that moment and we can see what genes they are actually expressing at the moment in their home on the seafloor. |
| 11-Sep | 02.57.41 | -22.21460 | -176.60776 | 1739 | 1 | 121 | **Bio Sample: Q322-biomat-06**. Scoop #9 "little gal" for RNA analysis. Looks like a good "dusty" sample through the small blue window in the sampler. |
| 11-Sep | 03.01.33 | -22.21459 | -176.60776 | 1739 | 1 | 122 | This is a two-arm operation. Looks like they are handling it quite well. |
| 11-Sep | 03.03.01 | -22.21460 | -176.60776 | 1739 | 1 | 122 | Stowing it now and will take a temperature probe here. They suspect the temperature will be warmer after sampling than before. |
| 11-Sep | 03.06.05 | -22.21458 | -176.60774 | 1739 | 1 | 122 | Stbd temperature probe (red tape) in the same place as the sampling. Not much sign of active venting after the sampling process. |
| 11-Sep | 03.07.17 | -22.21458 | -176.60775 | 1739 | 1 | 121 | These are diffuse vents probably somewhere below 40°C according to Rick. |
| 11-Sep | 03.08.02 | -22.21458 | -176.60775 | 1739 | 1 | 121 | Removed the temperature probe and stowing it. |
| 11-Sep | 03.09.55 | -22.21455 | -176.60775 | 1739 | 1 | 121 | Pulling in the baskets and tucking things in for a short trip to look for more of the softer mats. |
| 11-Sep | 03.11.38 | -22.21454 | -176.60774 | 1739 | 1 | 122 | Good fix for samples 3 - 6: **Nav Target scoop 1**: 22°12.874'S 176°36.467W. Z=1739. |
| 11-Sep | 03.18.07 | -22.21458 | -176.60775 | 1739 | 1 | 122 | Shift change. Will move north toward the first sampling site. Will decide what to do when we get there. |
| 11-Sep | 03.18.30 | -22.21456 | -176.60776 | 1738 | 2 | 104 | We're on the move. |
| 11-Sep | 03.19.17 | -22.21458 | -176.60774 | 1737 | 3 | 109 | We're looking at corals on the right side of the screen. |
| 11-Sep | 03.20.40 | -22.21448 | -176.60779 | 1737 | 5 | 346 | Tim is looking at the biology and requests some still images. |
| 11-Sep | 03.22.37 | -22.21427 | -176.60782 | 1738 | 1 | 355 | The 2 sampling site are about 20 meters apart. |
| 11-Sep | 03.23.07 | -22.21424 | -176.60782 | 1740 | 0 | 335 | Took some stills of the whip coral (soft coral). |
| 11-Sep | 03.23.45 | -22.21427 | -176.60782 | 0 | 0 | 0 | Soft coral with a squat lobster in it just passed by it. |
| 11-Sep | 03.24.46 | -22.21421 | -176.60782 | 1738 | 2 | 28 | Tim says these soft corals can be a couple hundred years old. The little dots inside the corals can be shrimp or crabs. |
| 11-Sep | 03.25.31 | -22.21420 | -176.60789 | 1739 | 1 | 9 | Big fish (and it's not a rattail). |
| 11-Sep | 03.26.38 | -22.21412 | -176.60775 | 1739 | 1 | 13 | Tim is on the loggers microphone now while we are transiting. |
| 11-Sep | 03.27.03 | -22.21411 | -176.60778 | 0 | 0 | 0 | Lots of sediment on the lavas here. |

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| 11-Sep | 03.28.11 | -22.21403 | -176.60779 | 1741 | 1 | 275 | Here comes the bottom again. |
| 11-Sep | 03.28.14 | -22.21403 | -176.60779 | 1741 | 1 | 276 | We've circled back around but now are moving downslope (which is not great for bottom visibility) |
| 11-Sep | 03.28.44 | -22.21403 | -176.60788 | 1742 | 3 | 271 | More deep sea corals in the cam. |
| 11-Sep | 03.29.00 | -22.21403 | -176.60786 | 1742 | 3 | 265 | Changing heading and turning south to head back toward the mat again. |
| 11-Sep | 03.30.10 | -22.21409 | -176.60794 | 1743 | 1 | 181 | Lots of long skinny corals that are either whip or bamboo corals. Hard to tell unless you zoom in on them. |
| 11-Sep | 03.32.26 | -22.21423 | -176.60794 | 1740 | 2 | 178 | The sedimented seafloor has sporadic corals and sponges visible. |
| 11-Sep | 03.34.58 | -22.21448 | -176.60798 | 1742 | 3 | 181 | Old lavas here. They're heavily sedimented. |
| 11-Sep | 03.36.42 | -22.21463 | -176.60800 | 1742 | 3 | 171 | More of those little white patches on the seafloor. There are corals in front. The little white blobs are against the rocks. |
| 11-Sep | 03.39.20 | -22.21469 | -176.60794 | 1743 | 2 | 181 | We just saw a shrimp. |
| 11-Sep | 03.40.12 | -22.21470 | -176.60791 | 1741 | 2 | 130 | It's a large area of white mat ahead of us. The visibility is pretty poor. |
| 11-Sep | 03.40.19 | -22.21470 | -176.60791 | 1741 | 2 | 130 | Lots of shimmering water coming out of a large crack in the seafloor. Something we haven't seen before this. |
| 11-Sep | 03.41.06 | -22.21471 | -176.60792 | 1743 | 0 | 194 | White filamentous mat with lots of sulfur here. High flow. |
| 11-Sep | 03.41.41 | -22.21471 | -176.60789 | 1742 | 2 | 194 | Looks like an old probe in the seafloor. |
| 11-Sep | 03.42.31 | -22.21472 | -176.60790 | 1742 | 1 | 241 | In the iron and manganese mats don't see lots of fauna. The iron is not palatable. |
| 11-Sep | 03.42.57 | -22.21471 | -176.60791 | 1743 | 0 | 247 | These sulfur mats have really high biomass. Lots of animals living on this. |
| 11-Sep | 03.43.53 | -22.21476 | -176.60787 | 1743 | 0 | 265 | Putting a target down here and will come back to this large area of diffuse flow and sulfur mats. |
| 11-Sep | 03.44.13 | -22.21476 | -176.60787 | 1743 | 0 | 265 | **Sulfur mats target: 22 12.866 176 36.475 Z=1742m** |
| 11-Sep | 03.45.26 | -22.21480 | -176.60789 | 1741 | 2 | 155 | All of a sudden the mats are much yellower. More iron and manganese and not hardly any venting. |
| 11-Sep | 03.46.04 | -22.21473 | -176.60789 | 1741 | 2 | 140 | See a big coral on top of this yellow mat. These are all soft corals - no hard videos. |
| 11-Sep | 03.47.15 | -22.21479 | -176.60790 | 1742 | 0 | 111 | Going to poke at the yellow mat to see what's going on. |
| 11-Sep | 03.49.28 | -22.21484 | -176.60789 | 1743 | 0 | 110 | Where the flow is here in this manganese iron area the white mat is right at the flow. The black mat traps all the heat in and biomass. |
| 11-Sep | 03.49.33 | -22.21484 | -176.60789 | 1743 | 0 | 110 | Rick is talking about the chemosynthesis going on in the area. |
| 11-Sep | 03.50.13 | -22.21482 | -176.60789 | 1742 | 0 | 110 | Clawing at the black; yellow and white mat here. |
| 11-Sep | 03.51.12 | -22.21477 | -176.60788 | 1742 | 0 | 110 | Seeing some diffuse flow here. |
| 11-Sep | 03.51.44 | -22.21483 | -176.60789 | 0 | 0 | 0 | Discussion about whether to stay at this site or move. |
| 11-Sep | 03.52.23 | -22.21482 | -176.60791 | 1742 | 0 | 53 | These mats don't look cohesive they're chunky. |
| 11-Sep | 03.52.27 | -22.21482 | -176.60791 | 1742 | 0 | 57 | Moving toward the first sampling site. |
| 11-Sep | 03.53.47 | -22.21478 | -176.60795 | 1740 | 3 | 19 | **Rocky Mat target: 22 12.885 S 176 36.477 E z=1741m.** Area of darker chunky mat and yellow/white mat. |
| 11-Sep | 03.54.53 | -22.21467 | -176.60799 | 1743 | 2 | 329 | Moving back toward the area we first sampled. |
| 11-Sep | 04.00.48 | -22.21446 | -176.60783 | 1742 | 3 | 150 | Looking for a good sampling site (black is good). |
| 11-Sep | 04.01.15 | -22.21444 | -176.60783 | 1741 | 3 | 131 | Zooming in on large black area for sampling (can't tell if rock or mat). |
| 11-Sep | 04.01.42 | -22.21447 | -176.60782 | 1740 | 2 | 132 | appears to be rocky with a lollipop hydroid on it. |
| 11-Sep | 04.02.23 | -22.21447 | -176.60786 | 1741 | 2 | 111 | Lots of mat here but more yellow than black. |
| 11-Sep | 04.03.16 | -22.21451 | -176.60782 | 1742 | 2 | 130 | Large crusts of yellow mat being displaced as pan around with ROV. |
| 11-Sep | 04.04.04 | -22.21449 | -176.60785 | 1741 | 2 | 82 | Motion of ROV disturbing the mat; looking for more stable landing site for ROV. |
| 11-Sep | 04.04.50 | -22.21447 | -176.60783 | 1741 | 2 | 116 | Yellow snow (iron oxidizing bacterial mat). |
| 11-Sep | 04.06.03 | -22.21446 | -176.60779 | 1741 | 2 | 114 | Waiting for mat material to settle out while looking for a good landing spot. |
| 11-Sep | 04.09.10 | -22.21448 | -176.60783 | 1741 | 2 | 113 | Basket pulled out to retrieve the temperature probe. |
| 11-Sep | 04.09.32 | -22.21448 | -176.60785 | 1741 | 2 | 114 | Want the yellow port temperature probe. Had to move to open basket. |
| 11-Sep | 04.11.05 | -22.21446 | -176.60786 | 1741 | 1 | 84 | Black material in front is rock-need to find black mat (softer). |
| 11-Sep | 04.11.45 | -22.21446 | -176.60783 | 1742 | 1 | 85 | Basket fully pulled out and will poke with temp probe to find soft black mat. |
| 11-Sep | 04.12.47 | -22.21449 | -176.60789 | 1741 | 1 | 85 | Poking with the arm-not the probe. Looks good-it is soft. |
| 11-Sep | 04.13.42 | -22.21442 | -176.60784 | 1741 | 1 | 85 | Iron-oxidized mat covering manganese-oxidized crust. |
| 11-Sep | 04.15.05 | -22.21441 | -176.60787 | 0 | 0 | 0 | Had to move around again to get the ROV in a good position for sampling. |
| 11-Sep | 04.18.14 | -22.21443 | -176.60787 | 1740 | 2 | 43 | Pulling out drawer again and retrieving the yellow temp. probe. |
| 11-Sep | 04.20.55 | -22.21441 | -176.60790 | 1740 | 2 | 43 | Arm has the port yellow temperature probe. |
| 11-Sep | 04.21.42 | -22.21445 | -176.60789 | 1740 | 2 | 43 | Putting temperature probe above the mat. |
| 11-Sep | 04.22.51 | -22.21445 | -176.60786 | 1740 | 1 | 44 | Taking another temperature reading above the manganese mat. |
| 11-Sep | 04.23.29 | -22.21446 | -176.60785 | 1740 | 1 | 45 | Poking probe into the black manganese mat. |
| 11-Sep | 04.25.21 | -22.21444 | -176.60784 | 1740 | 1 | 44 | Reaching out with the arm to put the probe into the mat. |
| 11-Sep | 04.25.23 | -22.21444 | -176.60784 | 0 | 0 | 0 | Probe is in small crack into the mat. Will leave in mat for 30 seconds. |

| date | time | latitude | longitude | Z | alt | hdg | Q322 - Vai Lili, Valu Fa Ridge Dive Comments |
|---|---|---|---|---|---|---|---|
| 11-Sep | 04.26.03 | -22.21448 | -176.60783 | 1740 | 1 | 44 | Tip came out of mat and now putting it back in. Probe takes a reading every 2 seconds. |
| 11-Sep | 04.27.11 | -22.21447 | -176.60786 | 1740 | 1 | 44 | Finished the temperature probe reading. |
| 11-Sep | 04.28.14 | -22.21446 | -176.60789 | 1740 | 1 | 44 | Stowing the temperature wand and will next take the last DNA scoop. |
| 11-Sep | 04.31.26 | -22.21444 | -176.60787 | 1740 | 1 | 43 | Retrieving scoop #4 from the left biobox. |
| 11-Sep | 04.33.36 | -22.21444 | -176.60787 | 1740 | 1 | 32 | Got it out of the basket. |
| 11-Sep | 04.37.24 | -22.21447 | -176.60789 | 1740 | 1 | 32 | Scoop for DNA with the 'big boy' #4 is now in the port hand. Turning the lever to open the valve. |
| 11-Sep | 04.40.13 | -22.21446 | -176.60786 | 1740 | 1 | 30 | DNA 'big boy' #4 scoop is ready to go. Passing it to the stbd claw. |
| 11-Sep | 04.42.42 | -22.21447 | -176.60787 | 1740 | 1 | 32 | Grind them up and extract the DNA from the samples. Use computers to assemble them into the original genomes. |
| 11-Sep | 04.43.29 | -22.21444 | -176.60789 | 1740 | 1 | 31 | Manganese oxidation occurs in other sites as well. |
| 11-Sep | 04.44.42 | -22.21446 | -176.60790 | 1740 | 1 | 31 | **Bio Sample: Q322-biomat-07**. Starting the sample for DNA with 'big boy' #4. Hard angle for scooping. Want to get the manganese mat - not rock and that's hard because they look identical says Rick. |
| 11-Sep | 04.46.10 | -22.21446 | -176.60791 | 1740 | 1 | 33 | Can't get in there very well. Repositioning a bit. |
| 11-Sep | 04.49.17 | -22.21442 | -176.60789 | 1741 | 2 | 48 | Down into the rocks down here. Need to move up a bit more. |
| 11-Sep | 04.50.00 | -22.21445 | -176.60793 | 1741 | 1 | 49 | This is definitely rock because there is coral on it. |
| 11-Sep | 04.51.36 | -22.21446 | -176.60794 | 1741 | 2 | 48 | Rick really wants the black mat. |
| 11-Sep | 04.53.08 | -22.21445 | -176.60792 | 1741 | 2 | 48 | Trying to get some black mat here but having a bit of trouble. |
| 11-Sep | 04.55.01 | -22.21446 | -176.60794 | 1741 | 2 | 41 | Q322-biomat-07 cont. Still sampling. This site is not as healthy as the other. Don't really see any shimmering water. |
| 11-Sep | 04.57.23 | -22.21445 | -176.60795 | 1741 | 2 | 42 | Looks like that's the sample. Holding it up and looking at it. |
| 11-Sep | 05.00.26 | -22.21444 | -176.60794 | 1741 | 1 | 42 | Closing the valve on the big boy and preparing to stow it back where it came from in the port basket. |
| 11-Sep | 05.07.55 | -22.21443 | -176.60797 | 1741 | 1 | 42 | **Position for sample 7: 22 12.866 176 36.478 z=1741m.** |
| 11-Sep | 05.09.06 | -22.21441 | -176.60800 | 1741 | 1 | 42 | Going to do one quick RNA sample here in the same place as the previous sample 7. |
| 11-Sep | 05.10.31 | -22.21445 | -176.60795 | 1741 | 1 | 42 | We're wondering where the other major went? It wasn't even used. It's missing (the green major). |
| 11-Sep | 05.14.36 | -22.21442 | -176.60791 | 1742 | 1 | 41 | Picking up the small RNA sampler #8 for another sample. |
| 11-Sep | 05.14.44 | -22.21446 | -176.60799 | 1742 | 1 | 41 | They are looking around for the major sampler before taking the last sample. |
| 11-Sep | 05.18.36 | -22.21444 | -176.60794 | 1742 | 1 | 42 | Using the camera on the ROV arm to see if it's (the major) dangling off the basket. |
| 11-Sep | 05.20.38 | -22.21443 | -176.60792 | 1742 | 1 | 42 | It's still attached to the basket and upside down. It's dangling from the bungee. Don't think the arm can get in and grab it. |
| 11-Sep | 05.22.25 | -22.21446 | -176.60794 | 1742 | 1 | 42 | Trying to figure out what to do. May just try to grab it on the way up and hold on to the handle so that it doesn't come loose on the way to the surface. |
| 11-Sep | 05.23.58 | -22.21446 | -176.60789 | 1742 | 1 | 42 | Quest is trying to grab the snorkel of the major. Looks like they have it! |
| 11-Sep | 05.25.41 | -22.21449 | -176.60789 | 1742 | 1 | 42 | Unfortunately the bungee is also still wrapped around it making it hard to put back in the holder. |
| 11-Sep | 05.26.33 | -22.21445 | -176.60793 | 1742 | 1 | 42 | It fell out of the claw. |
| 11-Sep | 05.27.50 | -22.21445 | -176.60793 | 1742 | 1 | 43 | Looks like they have it free of the bungee. Looking much better now. |
| 11-Sep | 05.29.48 | -22.21449 | -176.60791 | 1742 | 1 | 41 | Great job by the Quest team. The major sampler is now in the front port box. |
| 11-Sep | 05.31.48 | -22.21448 | -176.60794 | 1742 | 1 | 42 | Stowed the major. Will put the arm over it on the descent to keep it in the basket. |
| 11-Sep | 05.32.20 | -22.21448 | -176.60793 | 1742 | 1 | 42 | Back to the sample. |
| 11-Sep | 05.36.06 | -22.21447 | -176.60796 | 1742 | 1 | 44 | **Bio Sample: Q322-biomat-08.** Scoop #8 for RNA. Scooping now. Valve was opened early so perhaps the sample is compromised? Rick has hope. He said it's the scoop that wasn't meant to be so probably the best sample of the whole trip. Hope so. |
| 11-Sep | 05.38.31 | -22.21447 | -176.60794 | 1742 | 1 | 42 | Will scoop it now and will do what we can to close the top valve. Turning the sample over. |
| 11-Sep | 05.40.31 | -22.21446 | -176.60791 | 1742 | 1 | 42 | Great scoop of mat. Hopefully they can close the valve. |
| 11-Sep | 05.44.13 | -22.21443 | -176.60798 | 1742 | 1 | 42 | Wow they were able to grab the end of the broken knob and close it up. |
| 11-Sep | 05.45.57 | -22.21443 | -176.60797 | 1742 | 1 | 42 | Moving the last sample to the port box before heading to the surface. |
| 11-Sep | 05.49.36 | -22.21441 | -176.60797 | 1742 | 1 | 42 | Impressive manipulating. The samples and samplers are all stowed for the trip to the surface. Positioning the claw over the major sampler in the basket. |
| 11-Sep | 05.50.47 | -22.21441 | -176.60783 | 1741 | 1 | 43 | The end of the dive. |
| 11-Sep | 05.51.54 | -22.21442 | -176.60798 | 1739 | 4 | 37 | **Leaving the bottom.** |
| 11-Sep | 07.09.09 | | | | | | Quest is at the surface. |

| date | time | latitude | longitude | Z | alt | hdg | Q322 - Vai Lili, Valu Fa Ridge Dive Comments |
|---|---|---|---|---|---|---|---|
| 11-Sep | 07.19.50 | | | | | | **Quest is on board. End of dive Q322 at Vai Lili - Valu Fa Ridge.** |

## 7.2 Q323 South Fonualei Rift Dive Log

| date | time | latitude | longitude | Z | alt | hdg | Q323 - South Fonualei Rift Dive Comments |
|---|---|---|---|---|---|---|---|
| **Main Goals:** Locate and take samples from Active chimney field. Proceed on and sample as needed. | | | | | | | |
| **Setup:** 3 gastights; 3 majors; temp probe; 1 Davis sampler; 1 McPhail sampler; suction sampler; large biobox | | | | | | | |
| **Launch target:** 17°32.13 S 174°34.00' W Z=1582m South Fonualei rift volcano summit area | | | | | | | |
| **Nav Notes:** bottom time 9/14/2012 22:05 – 9/15 02:08; 04:02 - 05:14; (02:08 – 04:02 transit in water column). Nav smoothed (tolerance=10). Did not shift nav. No USBL after 04:24:08. No nav for nearly 1 hour at Laloa Kakai vent field. | | | | | | | |
| **DIVE LOG POSITION INFORMATION: latitude; longitude; Z; alt; hdg values are derived from finalized Quest nav. Any lat/long values in the dive comments column were recorded at sea and are preliminary.** | | | | | | | |
| 12-Sep | 19.13.24 | -17.54446 | -174.57802 | 127 | 31 | 218 | Waiting for launch at South Fonualei Rift. |
| 12-Sep | 19.46.48 | -17.54446 | -174.57802 | 127 | 31 | 218 | Anticipating starting the dive at the southern target of chimneys (or spires) near the summit. |
| 12-Sep | 19.48.47 | -17.54446 | -174.57802 | 127 | 31 | 218 | Top Chimney target is -17.54369 -174.57750. |
| 12-Sep | 19.50.52 | -17.54446 | -174.57802 | 127 | 31 | 218 | ROV Quest lifted off deck but returned to attach cable retrieval line. |
| 12-Sep | 19.53.53 | -17.54446 | -174.57802 | 127 | 31 | 218 | ROV Quest off the deck. |
| 12-Sep | 19.57.45 | -17.54446 | -174.57802 | 127 | 31 | 218 | ROV in water. |
| 12-Sep | 20.03.39 | -17.54446 | -174.57802 | 127 | 31 | 218 | All flotation on wire; we are diving. |
| 12-Sep | 20.08.19 | -17.54446 | -174.57802 | 127 | 31 | 218 | Holding at 90m water depth. |
| 12-Sep | 20.15.29 | -17.54446 | -174.57802 | 127 | 31 | 218 | No USBL so we are recovering the ROV. |
| 12-Sep | 20.21.15 | -17.54446 | -174.57802 | 127 | 31 | 218 | ROV at surface. |
| 12-Sep | 20.21.19 | -17.54446 | -174.57802 | 127 | 31 | 218 | Recovering floatation from wire. |
| 12-Sep | 20.26.40 | -17.54446 | -174.57802 | 127 | 31 | 218 | ROV out of the water. |
| 12-Sep | 20.28.01 | -17.54446 | -174.57802 | 127 | 31 | 218 | ROV on deck. |
| 12-Sep | 20.52.37 | -17.54446 | -174.57802 | 127 | 31 | 218 | USBL repaired and preparing to re-launch. |
| 12-Sep | 20.57.27 | -17.54446 | -174.57802 | 127 | 31 | 218 | ROV off the deck. |
| 12-Sep | 20.57.30 | -17.54446 | -174.57802 | 127 | 31 | 218 | Lowering to the water. |
| 12-Sep | 21.00.54 | -17.54446 | -174.57802 | 127 | 31 | 218 | **ROV in water.** |
| 12-Sep | 21.03.18 | -17.54446 | -174.57802 | 127 | 31 | 218 | Attaching flotation to the ROV wire. |
| 12-Sep | 21.06.48 | -17.54446 | -174.57802 | 127 | 31 | 218 | All flotation on wire; we are diving again. |
| 12-Sep | 21.10.32 | -17.54446 | -174.57802 | 127 | 31 | 218 | Passed 100m depth. |
| 12-Sep | 21.12.03 | -17.54446 | -174.57802 | 127 | 31 | 218 | USBL is updating. |
| 12-Sep | 21.20.27 | -17.54432 | -174.57821 | 301 | 31 | 181 | Passing 300m depth with a bottom target depth of 954m. |
| 12-Sep | 21.25.20 | -17.54431 | -174.57834 | | | | Passing 400m depth. |
| 12-Sep | 21.35.55 | -17.54362 | -174.57780 | 628 | 31 | 284 | Joe Resing is on the headset in the control van. Andra Bobbitt in hydro lab. |
| 12-Sep | 21.38.17 | -17.54353 | -174.57776 | 674 | 31 | 198 | Looking for sulfides to map and collect along the ridge. |
| 12-Sep | 21.39.22 | -17.54369 | -174.57790 | 687 | 31 | 184 | Estimated height of the sulfide spires is 20m; should be able to see on the ROV sonar. |
| 12-Sep | 21.42.33 | -17.54362 | -174.57779 | 766 | 31 | 284 | Passing 754m; about 200m off the bottom at 25+ m/min descent. |
| 12-Sep | 21.47.54 | -17.54369 | -174.57780 | 864 | 31 | 288 | Passing 854m; about 100m off the bottom. |
| 12-Sep | 21.51.12 | -17.54364 | -174.57747 | | | | Altimeter working at 25m off bottom. |
| 12-Sep | 21.51.52 | -17.54365 | -174.57743 | 965 | 6 | 275 | Can see the bottom. |
| 12-Sep | 21.52.11 | -17.54363 | -174.57740 | | | | **On the bottom.** |
| 12-Sep | 21.52.31 | -17.54363 | -174.57740 | 967 | 3 | 276 | Pillow fragments. |
| 12-Sep | 21.53.43 | -17.54363 | -174.57742 | 969 | 2 | 241 | Pillow fragments and blocks of lava. |
| 12-Sep | 21.54.20 | -17.54361 | -174.57743 | 969 | 2 | 260 | Sonar may be seeing some mounds. |
| 12-Sep | 21.54.24 | -17.54361 | -174.57743 | 968 | 2 | 263 | Looks volcanic. |
| 12-Sep | 21.55.17 | -17.54361 | -174.57743 | 969 | 2 | 249 | Columnar pillars. |
| 12-Sep | 21.55.38 | -17.54364 | -174.57743 | 970 | 2 | 273 | Pillow lava spire with some sonar targets within 10's of meters. |
| 12-Sep | 21.55.47 | -17.54364 | -174.57743 | 971 | 2 | 273 | Lava looks rubbly. |
| 12-Sep | 21.56.19 | -17.54369 | -174.57745 | 972 | 1 | 256 | Pillow fragments in the spire. |
| 12-Sep | 21.57.03 | -17.54364 | -174.57746 | | | | Biology: crinoid. |
| 12-Sep | 21.57.35 | -17.54363 | -174.57747 | 970 | 5 | 326 | Big pillows with radial fractures. |
| 12-Sep | 21.58.14 | -17.54368 | -174.57745 | 973 | 3 | 191 | Turning ROV toward south. |
| 12-Sep | 21.59.10 | -17.54372 | -174.57748 | 972 | 8 | 196 | Landscape is rough in this area; using sonar to determine targets. |
| 12-Sep | 21.59.58 | -17.54374 | -174.57754 | 985 | 1 | 191 | Dumbo octopus. |
| 12-Sep | 22.00.38 | -17.54376 | -174.57753 | 984 | 1 | 233 | Picking up some sediment. |
| 12-Sep | 22.01.23 | -17.54373 | -174.57755 | 984 | 1 | 272 | Pulled off bottom and view obscured by sediment. |
| 12-Sep | 22.01.48 | -17.54375 | -174.57753 | 984 | 1 | 276 | Rubble and sediment with a sloped bottom. |
| 12-Sep | 22.02.20 | -17.54375 | -174.57754 | 983 | 4 | 315 | Steep slope as we turn to the north. |
| 12-Sep | 22.02.30 | -17.54374 | -174.57758 | 983 | 6 | 267 | Talus slope. Eel Fish (probably an eelpout). |
| 12-Sep | 22.03.18 | -17.54375 | -174.57761 | 982 | 4 | 311 | Fish-nice view. |
| 12-Sep | 22.03.44 | -17.54371 | -174.57766 | 980 | 8 | 2 | Very steep slope with lots of rubble. Some is constructional with pillow lumps and blocks in place. |

| date | time | latitude | longitude | Z | alt | hdg | Q323 - South Fonualei Rift Dive Comments |
|---|---|---|---|---|---|---|---|
| 12-Sep | 22.04.27 | -17.54364 | -174.57775 | 982 | 7 | 348 | Heading east of north to the target area with big pillow tubes coming down the slope. |
| 12-Sep | 22.04.47 | -17.54363 | -174.57775 | 981 | 9 | 357 | Nested pillows exposed in the slope. |
| 12-Sep | 22.05.09 | -17.54361 | -174.57779 | 981 | 13 | 18 | Young volcanics as we move upslope. |
| 12-Sep | 22.05.52 | -17.54352 | -174.57782 | 980 | 13 | 95 | Massive pillows; quite young with little sediment. |
| 12-Sep | 22.06.25 | -17.54357 | -174.57774 | 978 | 7 | 88 | Straight uphill here as we go up; pillow outcrop very little rubble. |
| 12-Sep | 22.06.27 | -17.54357 | -174.57774 | 979 | 7 | 88 | More sand and rubble as slope is less. Biology anemone: Venus fly-trap. |
| 12-Sep | 22.07.48 | -17.54352 | -174.57771 | 973 | 7 | 33 | Slope eased up with more rubble and gravel. |
| 12-Sep | 22.08.10 | -17.54352 | -174.57768 | 973 | 5 | 92 | Scree slope. |
| 12-Sep | 22.08.25 | -17.54357 | -174.57761 | 974 | 4 | 119 | Lobes and fragments. |
| 12-Sep | 22.08.39 | -17.54358 | -174.57759 | 975 | 3 | 123 | Very steep; quite a cliff. |
| 12-Sep | 22.08.58 | -17.54363 | -174.57756 | 975 | 3 | 101 | Pillows and a feeder dike. |
| 12-Sep | 22.09.27 | -17.54364 | -174.57756 | 973 | 7 | 52 | Coral of some type on the wall. Beautiful pillows; slope failure with exposed pillows. |
| 12-Sep | 22.09.51 | -17.54364 | -174.57756 | 970 | 8 | 54 | Steep spire with lava tube and a crinoid growing on it. |
| 12-Sep | 22.10.21 | -17.54364 | -174.57756 | 971 | 7 | 93 | Spires look volcanic exposed at a collapse event. |
| 12-Sep | 22.11.08 | -17.54372 | -174.57754 | 971 | 16 | 3 | Estimated height of the spire is 25m. |
| 12-Sep | 22.12.01 | -17.54370 | -174.57752 | 970 | 12 | 6 | AUV features here appear to be all volcanic so will the other targets be sulfides or volcanic? |
| 12-Sep | 22.12.08 | -17.54367 | -174.57753 | 970 | 8 | 72 | Fish. |
| 12-Sep | 22.12.26 | -17.54368 | -174.57750 | 972 | 10 | 46 | Smaller mound or spire with fish in the water. |
| 12-Sep | 22.12.59 | -17.54373 | -174.57749 | 972 | 13 | 359 | Sheet flows visible on the mound or laminar flows. |
| 12-Sep | 22.13.30 | -17.54370 | -174.57746 | | | | Going to attempt to sample a rock here. |
| 12-Sep | 22.15.09 | -17.54366 | -174.57746 | 972 | 9 | 35 | Biology on the top of the mound. Estimated height of 10m. |
| 12-Sep | 22.15.40 | -17.54367 | -174.57744 | 972 | 8 | 41 | A crab was viewed in one of the cracks on the spire. |
| 12-Sep | 22.16.17 | -17.54366 | -174.57742 | 973 | 2 | 52 | Lavas here are not really new as they have biology growing on them (gastropod on rocks and fish swam by). |
| 12-Sep | 22.17.06 | -17.54366 | -174.57745 | 973 | 5 | 49 | Preparing to sample with many loose rocks on the top of the mound. |
| 12-Sep | 22.17.41 | -17.54366 | -174.57742 | 973 | 6 | 50 | See brown stains where the lava rocks have broken off. |
| 12-Sep | 22.19.24 | -17.54368 | -174.57744 | 973 | 7 | 37 | Shrimp seen in hole between rocks on the mound. |
| 12-Sep | 22.20.15 | -17.54368 | -174.57744 | 974 | 7 | 35 | **Geo Sample: Q323-rock-01.** From 10m spire/mound at South Fonualei. Shrimp leaving while sampling. Rock is a black pillow fragment with slight reddish alteration. |
| 12-Sep | 22.22.19 | -17.54368 | -174.57744 | 973 | 8 | 2 | Taking still photos of the sample. Sample placed in tube #2. |
| 12-Sep | 22.25.42 | -17.54368 | -174.57744 | 975 | 5 | 324 | Back on bottom after sampling and turning - heading to north. |
| 12-Sep | 22.26.18 | -17.54368 | -174.57744 | 971 | 8 | 335 | At the same spire we saw at the beginning. (25m spire) |
| 12-Sep | 22.26.44 | -17.54368 | -174.57744 | 970 | 9 | 21 | Lost GAP signal. |
| 12-Sep | 22.27.04 | -17.54368 | -174.57744 | 971 | 7 | 22 | Big pillow lavas-several meters across. Radial jointing. |
| 12-Sep | 22.27.38 | -17.54368 | -174.57744 | 971 | 5 | 54 | Heading 025 east of north. |
| 12-Sep | 22.28.13 | -17.54368 | -174.57744 | 972 | 3 | 44 | Lots of biology growing on top of rocks (barnacles). |
| 12-Sep | 22.29.38 | -17.54368 | -174.57744 | | | | Lots of sand; gravel; and pillow bits on this slope. Barnacles growing on these pillow fragments. |
| 12-Sep | 22.30.17 | -17.54368 | -174.57744 | 966 | 3 | 16 | Going upslope. Brownish fragments on the gray. Going up the side of westward facing slope. |
| 12-Sep | 22.31.05 | -17.54368 | -174.57744 | 964 | 2 | 28 | Barnacles and coral on a big pillow. |
| 12-Sep | 22.31.18 | -17.54368 | -174.57744 | 963 | 3 | 34 | Navigation issue. Sitting here till sort it out. |
| 12-Sep | 22.31.54 | -17.54368 | -174.57744 | 964 | 2 | 39 | Crinoids; shrimp; and barnacles on the pillows. |
| 12-Sep | 22.32.54 | -17.54368 | -174.57744 | 964 | 2 | 33 | Took still camera pics of biology. |
| 12-Sep | 22.33.23 | -17.54368 | -174.57744 | 963 | 2 | 34 | Crabs and all sorts of biology on seafloor. |
| 12-Sep | 22.33.52 | -17.54368 | -174.57744 | 963 | 2 | 25 | Fairly old pillow lavas here. Still pics. |
| 12-Sep | 22.34.59 | -17.54368 | -174.57744 | 963 | 2 | 36 | Tim thinks all the little white specs are sponges. |
| 12-Sep | 22.35.32 | -17.54368 | -174.57744 | 963 | 2 | 27 | Recording HD to tape. |
| 12-Sep | 22.36.30 | -17.54368 | -174.57744 | 962 | 2 | 49 | The orange guy is a crab. Some webbed material near the crab. Don't know what it is. |
| 12-Sep | 22.38.22 | -17.54368 | -174.57744 | 962 | 2 | 65 | Shrimp is an Alvinocaris. Tim doesn't know if it is the same as the vent species Alvinocaris. Crinoid in front view. |
| 12-Sep | 22.40.01 | -17.54368 | -174.57744 | 962 | 2 | 44 | Anemone on lava. HD still rolling. |
| 12-Sep | 22.41.15 | -17.54368 | -174.57744 | 962 | 3 | 45 | We're about to come up a bit to see if this is a shadow event on the USBL. |
| 12-Sep | 22.41.46 | -17.54368 | -174.57744 | 958 | 5 | 252 | HD off about a half minute ago. |
| 12-Sep | 22.42.08 | -17.54368 | -174.57744 | 956 | 8 | 251 | Up 10 meters off the seafloor and climbing. |
| 12-Sep | 22.44.34 | -17.54351 | -174.57734 | 952 | 11 | 251 | Getting USBL positions again 11 meter off the bottom. The Quest team thinks the problem was a "shadow effect". |
| 12-Sep | 22.45.15 | -17.54351 | -174.57734 | 952 | 11 | 251 | Going to follow the black line on the nav map. |

| date | time | latitude | longitude | Z | alt | hdg | Q323 - South Fonualei Rift Dive Comments |
|---|---|---|---|---|---|---|---|
| 12-Sep | 22.46.42 | -17.54347 | -174.57731 | 958 | 5 | 355 | Lost the nav signal again. |
| 12-Sep | 22.46.57 | -17.54347 | -174.57731 | 958 | 5 | 355 | The navigation is coming and going. |
| 12-Sep | 22.47.10 | -17.54347 | -174.57731 | 958 | 5 | 355 | Shimmering water here. We're not even at a target. |
| 12-Sep | 22.47.39 | -17.54347 | -174.57731 | 958 | 5 | 355 | The blue trail is the Doppler. The green fixes are the USBL fixes (which are coming and going). |
| 12-Sep | 22.48.57 | -17.54333 | -174.57727 | 965 | 1 | 30 | Going to test the temperature probe right now. |
| 12-Sep | 22.49.30 | -17.54331 | -174.57725 | 964 | 1 | 28 | A large area of diffuse flow here. White-ish mat on the rocks here. |
| 12-Sep | 22.54.17 | -17.54324 | -174.57723 | 968 | 1 | 98 | Retrieving temperature probe. |
| 12-Sep | 22.58.08 | -17.54324 | -174.57722 | 968 | 1 | 98 | Preparing to take temperature in the shimmering diffuse flow. |
| 12-Sep | 22.59.09 | -17.54322 | -174.57722 | 968 | 1 | 98 | Probe now in view of HD screen. |
| 12-Sep | 23.01.54 | -17.54323 | -174.57722 | 968 | 1 | 98 | There is no temperature readout in the hydro lab. Will fix for next dive. |
| 12-Sep | 23.07.05 | -17.54323 | -174.57724 | 967 | 1 | 98 | Iron oxidizing bacteria in the flow. |
| 12-Sep | 23.07.52 | -17.54323 | -174.57721 | 967 | 1 | 98 | Temperature 5°C on CTD with ROV on bottom in this diffuse flow. |
| 12-Sep | 23.10.20 | -17.54320 | -174.57722 | 968 | 1 | 98 | 8.4°C reading on one of the readings. |
| 12-Sep | 23.11.18 | -17.54322 | -174.57723 | 968 | 1 | 98 | 5.2 and 7.9 are the 2 temperature readings inside the control van. |
| 12-Sep | 23.12.14 | -17.54320 | -174.57723 | 968 | 1 | 98 | Would like a reading with the probe tip in the flow crack. |
| 12-Sep | 23.12.49 | -17.54324 | -174.57721 | 967 | 1 | 98 | 9.6 with some readings up to 10; 10.5-12-as move probe around. |
| 12-Sep | 23.12.52 | -17.54326 | -174.57722 | 968 | 1 | 98 | Temperature 14…17…19.9…over 20 briefly. |
| 12-Sep | 23.13.46 | -17.54320 | -174.57723 | 968 | 1 | 98 | 26…28…30…33…35..38 in the crack. High of 39°C. |
| 12-Sep | 23.14.41 | -17.54320 | -174.57723 | 967 | 1 | 98 | Moving probe out and will store before moving on. |
| 12-Sep | 23.17.35 | -17.54320 | -174.57723 | 968 | 1 | 98 | Stowing the temperature probe. |
| 12-Sep | 23.21.07 | -17.54320 | -174.57723 | 968 | 1 | 98 | Moving up in water column to get good position. |
| 12-Sep | 23.22.43 | -17.54320 | -174.57723 | 968 | 1 | 98 | Moving the ship to improve navigation and look at the sonar for targets. |
| 12-Sep | 23.24.18 | -17.54320 | -174.57723 | 967 | 1 | 98 | Moving the ROV now. |
| 12-Sep | 23.24.35 | -17.54320 | -174.57723 | 967 | 2 | 98 | Pillow lumps. |
| 12-Sep | 23.26.16 | -17.54320 | -174.57723 | 964 | 6 | 92 | Extensive area (20m or more) of diffuse flow from seeps. |
| 12-Sep | 23.26.48 | -17.54320 | -174.57723 | 963 | 6 | 24 | Off bottom 6m to get sonar targets and better USBL navigation. |
| 12-Sep | 23.28.10 | -17.54320 | -174.57723 | | | | Some issue with navigation. USBL not updating. |
| 12-Sep | 23.28.12 | -17.54320 | -174.57723 | 965 | 5 | 181 | Out of diffuse flow area into area with shell fragments. |
| 12-Sep | 23.28.59 | -17.54320 | -174.57723 | 958 | 11 | 181 | Neither Doppler nor USBL are updating. |
| 12-Sep | 23.29.01 | -17.54320 | -174.57723 | 958 | 11 | 181 | Moving up higher for nav and sonar. |
| 12-Sep | 23.30.20 | -17.54320 | -174.57723 | 954 | 15 | 181 | Ship has moved north and we are 15m off the bottom. |
| 12-Sep | 23.42.33 | -17.54324 | -174.57721 | 954 | 15 | 90 | Still working on ROV navigation. |
| 12-Sep | 23.46.55 | -17.54320 | -174.57724 | 963 | 6 | 90 | Navigation is working and we are headed back down. |
| 12-Sep | 23.47.12 | -17.54321 | -174.57726 | 964 | 5 | 91 | Over the diffuse flow when we reached the bottom. |
| 12-Sep | 23.48.04 | -17.54327 | -174.57718 | 961 | 5 | 90 | Driving east over bacterial mat on platy lava. |
| 12-Sep | 23.48.38 | -17.54328 | -174.57717 | 960 | 5 | 119 | See mat around pillows. Spire is about 50m away in the sonar. |
| 12-Sep | 23.49.56 | -17.54337 | -174.57712 | 954 | 5 | 92 | So far we moved only about 100m from the drop location. |
| 12-Sep | 23.50.20 | -17.54339 | -174.57711 | 952 | 5 | 87 | Scree and rubble slope. Lava fragments with sand and gravel. |
| 12-Sep | 23.50.47 | -17.54341 | -174.57706 | 950 | 5 | 73 | Steep slope with more outcrop. |
| 12-Sep | 23.52.43 | -17.54332 | -174.57692 | 951 | 5 | 75 | Shell fragments on the seafloor (mussels). |
| 12-Sep | 23.53.12 | -17.54331 | -174.57688 | 953 | 3 | 68 | Getting a closer look at the mussels and big snails.. |
| 12-Sep | 23.53.58 | -17.54331 | -174.57688 | 953 | 3 | 67 | Large expanse of mussels and some snails. Incredible concentration of dead shells. |
| 12-Sep | 23.54.28 | -17.54331 | -174.57689 | 952 | 3 | 68 | Could be a vent field above with this concentration of dead shells. |
| 12-Sep | 23.55.31 | -17.54331 | -174.57688 | 954 | 3 | 68 | Taking still photos of the mussels and shells. |
| 12-Sep | 23.56.22 | -17.54329 | -174.57689 | 954 | 3 | 68 | Taping on HD tape. |
| 12-Sep | 23.57.02 | -17.54329 | -174.57689 | 953 | 2 | 68 | Clams; snails and mussels. |
| 12-Sep | 23.58.10 | -17.54329 | -174.57689 | 953 | 2 | 68 | Going to go upslope to see if there are live communities. |
| 12-Sep | 23.58.23 | -17.54330 | -174.57686 | 952 | 3 | 68 | Sonar targets upslope as well. |
| 12-Sep | 23.58.45 | -17.54327 | -174.57684 | 951 | 3 | 68 | Moving up slope at 67deg with some more fresher shells. |
| 12-Sep | 23.59.38 | -17.54329 | -174.57684 | 950 | 3 | 69 | Climbing up slope and came to a boundary of volcanic sediment vs. the shells. |
| 12-Sep | 23.59.59 | -17.54329 | -174.57684 | 950 | 3 | 69 | Shrimp (live). |
| 13-Sep | 00.00.54 | | | | | | Planning to take a sample of the shells before moving any further upslope. |
| 13-Sep | 00.02.01 | | | | | | Getting a close-up view of the shells. Could be that the hydrothermal source dried up and they died - or the source is upslope. |
| 13-Sep | 00.03.25 | -17.54331 | -174.57682 | 951 | 2 | 68 | Dating shells could tell the history of the hydrothermal/venting of this area. |
| 13-Sep | 00.04.21 | -17.54331 | -174.57682 | 951 | 2 | 67 | Moving arm to prepare for sampling. Using just the claw to sample. |
| 13-Sep | 00.05.37 | -17.54327 | -174.57684 | 951 | 2 | 68 | Sampling the dead shells. |
| 13-Sep | 00.06.37 | -17.54326 | -174.57680 | 951 | 2 | 68 | Coating on the shells so they could be older than we think. First grab of shells dropped by claw. |

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|---|---|---|---|---|---|---|---|
| 13-Sep | 00.08.58 | -17.54327 | -174.57684 | 951 | 2 | 68 | Sample dropped to the side of the box on top of slurp. Trying for get another shell grab. |
| 13-Sep | 00.10.36 | -17.54329 | -174.57681 | 951 | 2 | 68 | Looks like small spider climbed out of sampling area. Galatheid crab. |
| 13-Sep | 00.11.51 | -17.54329 | -174.57681 | 951 | 2 | 67 | Dropping into tube #2. |
| 13-Sep | 00.11.55 | -17.54327 | -174.57684 | 951 | 1 | 68 | **Bio Sample: Q323-biomacro-02.** Huge gastropod field of dead shells. Collected a mussel shell. |
| 13-Sep | 00.14.27 | -17.54331 | -174.57682 | 950 | 3 | 126 | Sample Q323-biomacro-02 is with Q323-rock-01 in tube #2. |
| 13-Sep | 00.14.49 | -17.54333 | -174.57681 | 948 | 3 | 131 | Shrimp as we turn around to look around. |
| 13-Sep | 00.15.13 | -17.54333 | -174.57680 | | | | Shells appear to be formed in place instead of falling down slope. |
| 13-Sep | 00.15.54 | -17.54340 | -174.57678 | 943 | 3 | 117 | Steep mounds with streaks. Live shrimp. May have been mass wasting downslope. Some mussels may have been covered up. |
| 13-Sep | 00.16.10 | -17.54340 | -174.57678 | 943 | 3 | 117 | Very sandy now with less biology and a few rocks. |
| 13-Sep | 00.16.25 | -17.54340 | -174.57678 | 943 | 3 | 117 | Pillow fragments mixed in with shells and more sand. |
| 13-Sep | 00.16.43 | -17.54341 | -174.57674 | 939 | 3 | 117 | Moving quickly upslope with shells and rocks. |
| 13-Sep | 00.17.01 | -17.54345 | -174.57670 | 939 | 2 | 143 | Reddish brown to gray to black gravel. |
| 13-Sep | 00.17.20 | -17.54347 | -174.57671 | 938 | 3 | 149 | No sign of warm water in this area. Fish and shrimp. |
| 13-Sep | 00.17.29 | -17.54350 | -174.57674 | 939 | 3 | 134 | Small lava outcrops and extensive mussels. |
| 13-Sep | 00.17.58 | -17.54352 | -174.57671 | 937 | 2 | 89 | Crinoid and pillow fragments (quite large). Shells & shrimp. |
| 13-Sep | 00.18.13 | -17.54352 | -174.57670 | 936 | 2 | 107 | Still going uphill with pillow lava mound. |
| 13-Sep | 00.18.37 | -17.54352 | -174.57664 | 936 | 2 | 108 | Coming up to the top with remnant lava and avalanching. |
| 13-Sep | 00.19.00 | -17.54352 | -174.57664 | 935 | 2 | 120 | Massive lava flow and lots of shells. |
| 13-Sep | 00.19.25 | -17.54352 | -174.57663 | 936 | 1 | 122 | Animals growing on the rocks. |
| 13-Sep | 00.19.53 | -17.54351 | -174.57660 | | | | Cross section of a pillow tube. |
| 13-Sep | 00.21.07 | -17.54353 | -174.57662 | 936 | 0 | 121 | At top of this mound. |
| 13-Sep | 00.21.39 | -17.54354 | -174.57661 | 936 | 0 | 120 | Taking some digital stills. |
| 13-Sep | 00.21.57 | -17.54353 | -174.57661 | 937 | 0 | 119 | **Geo Sample: Q323-rock-03.** From top of mound-spatter or small hornito. Rock is a black pillow fragment; vesicular interior to a more glassy exterior covered with bacterial growth on the outside. |
| 13-Sep | 00.24.23 | -17.54353 | -174.57662 | 936 | 1 | 121 | Placing sample in tube 1. |
| 13-Sep | 00.24.30 | -17.54352 | -174.57663 | 936 | 2 | 121 | Lifting off this site. |
| 13-Sep | 00.25.14 | -17.54351 | -174.57660 | 935 | 2 | 132 | HD focused. |
| 13-Sep | 00.25.40 | -17.54349 | -174.57655 | 936 | 2 | 137 | More sediment covering lava outcrops. Iron oxide mats. |
| 13-Sep | 00.25.52 | -17.54349 | -174.57654 | 935 | 2 | 66 | No shells here in the shimmering water. |
| 13-Sep | 00.26.40 | -17.54340 | -174.57653 | | | | Staining at the bases of the lava outcrops. Shrimp on top. Warm water seeps with shells on the floor. Anemone. |
| 13-Sep | 00.27.11 | -17.54335 | -174.57651 | 937 | 2 | 65 | Heading is 064 at 937m. |
| 13-Sep | 00.27.48 | -17.54335 | -174.57652 | 937 | 2 | 66 | Will be waiting for the ship to move before ROV moves to the NE. |
| 13-Sep | 00.28.05 | -17.54335 | -174.57651 | 937 | 2 | 66 | Looks like active iron mat on the rocks. Some flow here. |
| 13-Sep | 00.28.31 | -17.54335 | -174.57652 | 938 | 1 | 65 | Base of rock and in crack there is some shimmer with the mats. |
| 13-Sep | 00.28.48 | -17.54334 | -174.57649 | 938 | 1 | 65 | Looks like lava-regularly jointed pillows. |
| 13-Sep | 00.28.59 | -17.54335 | -174.57648 | 938 | 1 | 64 | Sponges. |
| 13-Sep | 00.31.08 | -17.54338 | -174.57651 | 938 | 1 | 77 | Appears to be a lot of biology on the other side of this structure. |
| 13-Sep | 00.31.26 | -17.54335 | -174.57652 | 938 | 1 | 76 | Zooming in on the bacterial mats and see shimmer in the cracks. |
| 13-Sep | 00.33.13 | -17.54338 | -174.57651 | 939 | 0 | 75 | Ready to move to the next target to the NE as the ship has moved north. |
| 13-Sep | 00.33.57 | -17.54337 | -174.57650 | 938 | 0 | 83 | Taking some still photos of the area. |
| 13-Sep | 00.34.30 | -17.54335 | -174.57652 | 938 | 1 | 51 | ROV is lifting off of this mound. |
| 13-Sep | 00.34.46 | -17.54333 | -174.57654 | 938 | 1 | 71 | Heading NE at 056. |
| 13-Sep | 00.35.12 | -17.54329 | -174.57652 | 938 | 1 | 98 | Pockets with microbial mat within the lava. |
| 13-Sep | 00.35.38 | -17.54323 | -174.57653 | 938 | 1 | 82 | Small amount of warm water; more shimmer here. |
| 13-Sep | 00.35.53 | -17.54319 | -174.57654 | 937 | 4 | 72 | Another spire with shimmer. |
| 13-Sep | 00.36.25 | -17.54314 | -174.57659 | 937 | 12 | 78 | Going by pinnacle of lava. At least 5m high. |
| 13-Sep | 00.36.57 | -17.54305 | -174.57659 | 938 | 15 | 103 | Cliff with very steep slope. |
| 13-Sep | 00.37.47 | -17.54299 | -174.57649 | 941 | 15 | 123 | Broken up lava and pillows as going down slope. Looks like dike coming through. |
| 13-Sep | 00.37.59 | -17.54296 | -174.57647 | 942 | 15 | 115 | Anemones on the rocks (fairly common). |
| 13-Sep | 00.38.22 | -17.54292 | -174.57647 | 950 | 9 | 107 | Off bottom as came over steep slope. |
| 13-Sep | 00.38.56 | -17.54282 | -174.57645 | 950 | 8 | 109 | Need to move the ship in order to go further north. |
| 13-Sep | 00.39.13 | -17.54284 | -174.57642 | 950 | 8 | 85 | Pillows and broken up lava. |
| 13-Sep | 00.39.49 | -17.54283 | -174.57643 | 951 | 7 | 78 | Going downslope. Moving at an angle (054). |
| 13-Sep | 00.42.27 | -17.54283 | -174.57643 | 951 | 7 | 78 | Back into dead clams and broken lava. |
| 13-Sep | 00.43.16 | -17.54282 | -174.57646 | 958 | 3 | 82 | Lava fragments and dead shells. Galatheid crab and some shimmer in the water. Eel swimming. |
| 13-Sep | 00.43.50 | -17.54279 | -174.57650 | 959 | 4 | 82 | Different microbial mat in this area. |

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| 13-Sep | 00.43.52 | -17.54279 | -174.57650 | 960 | 4 | 84 | Getting some still photos. |
| 13-Sep | 00.44.22 | -17.54279 | -174.57650 | 959 | 7 | 87 | Lots of snails (dead) in the lava rubble. |
| 13-Sep | 00.45.10 | -17.54279 | -174.57650 | 960 | 10 | 83 | Still waiting for the ship to move north before we can move north. |
| 13-Sep | 00.46.02 | -17.54279 | -174.57650 | 964 | 8 | 86 | May be chimney-like structures. |
| 13-Sep | 00.46.22 | -17.54279 | -174.57650 | 963 | 6 | 100 | Chimney in the HD, |
| 13-Sep | 00.46.42 | -17.54279 | -174.57650 | 963 | 5 | 94 | Snails on the chimney. |
| 13-Sep | 00.47.06 | -17.54244 | -174.57635 | 963 | 4 | 97 | Low amount of flow here with snails and crab. |
| 13-Sep | 00.47.21 | -17.54240 | -174.57635 | 964 | 4 | 82 | Live crabs and larger spires. |
| 13-Sep | 00.47.33 | -17.54243 | -174.57637 | 963 | 4 | 83 | HD recording on tape. |
| 13-Sep | 00.48.21 | -17.54244 | -174.57636 | 964 | 4 | 104 | Sulfides and swimming fish. There is some shimmer but not seeing any smoking chimneys. Covered in manganese oxide. |
| 13-Sep | 00.48.59 | -17.54245 | -174.57638 | 964 | 4 | 112 | Susan Merle in the lab. Different types of gastropods on the sulfides. Hairy snail. |
| 13-Sep | 00.50.41 | -17.54243 | -174.57637 | 965 | 5 | 88 | Moving the ROV around to see the area a bit better. |
| 13-Sep | 00.51.18 | -17.54239 | -174.57636 | 965 | 5 | 100 | Anemone and crab with shrimp on the sulfide. |
| 13-Sep | 00.51.34 | -17.54240 | -174.57634 | 965 | 5 | 104 | Looks like flow under the flange. Lots of shrimp around the flange. |
| 13-Sep | 00.52.58 | -17.54239 | -174.57634 | 965 | 6 | 103 | Definitely water coming up from around the flanges. |
| 13-Sep | 00.56.42 | -17.54239 | -174.57636 | 965 | 5 | 96 | There is flow on some of the sides of the chimneys. We're going up to check out the tops for active venting. |
| 13-Sep | 00.57.49 | -17.54243 | -174.57636 | 964 | 2 | 56 | Choro-O shrimp; possibly an anemone; some type of crab. |
| 13-Sep | 00.58.41 | -17.54244 | -174.57635 | 965 | 3 | 90 | This is a dying chimney field. Clear fluid coming out. Richard estimates 20C water coming out. |
| 13-Sep | 00.59.40 | -17.54243 | -174.57636 | 964 | 3 | 149 | Polynoid worms on the chimneys. |
| 13-Sep | 00.59.57 | -17.54243 | -174.57635 | 965 | 4 | 150 | Going to get a sample of one of these chimneys for Cornel. |
| 13-Sep | 01.00.46 | -17.54243 | -174.57635 | 964 | 3 | 149 | Limpets living with the snails on these dying chimneys. |
| 13-Sep | 01.01.28 | -17.54242 | -174.57636 | 964 | 4 | 149 | This is a big area. Earlier we saw 50 - 100 m of clams. Now this large dying chimney field. |
| 13-Sep | 01.03.15 | -17.54244 | -174.57640 | 963 | 5 | 58 | There is partition of the snails. Hairy snail on one spot and the ifremieria snail in another spot. |
| 13-Sep | 01.03.19 | -17.54245 | -174.57639 | 963 | 5 | 57 | First we'll try to get a chimney that is inactive and one that is active. |
| 13-Sep | 01.04.14 | -17.54244 | -174.57638 | 964 | 2 | 57 | Some of these chimneys are covered in snails. |
| 13-Sep | 01.05.29 | -17.54244 | -174.57640 | 964 | 3 | 65 | We're presuming that something with biology on it is active. Without biology is probably dead. |
| 13-Sep | 01.06.01 | -17.54246 | -174.57637 | 965 | 3 | 74 | Eels in the video. |
| 13-Sep | 01.06.22 | -17.54247 | -174.57637 | 964 | 2 | 75 | Several eels in this area. |
| 13-Sep | 01.06.33 | -17.54246 | -174.57638 | | | | Going in for a chimney grab. The first chimney Quest touched broke very easily. A chunk fell down. Hard to grasp. |
| 13-Sep | 01.07.47 | -17.54247 | -174.57637 | 965 | 3 | 74 | Eelpout (white eels) in video. |
| 13-Sep | 01.08.12 | -17.54246 | -174.57638 | 964 | 3 | 75 | Photos and frame grabs of sample before we put it in the box. |
| 13-Sep | 01.10.09 | -17.54247 | -174.57637 | 964 | 3 | 75 | **Geo Sample: Q323-sulfide-04**. Inactive chimney piece from this area of dying chimneys. Piece is dark colored. The piece was ~25cm long; rather skinny. |
| 13-Sep | 01.14.00 | -17.54241 | -174.57640 | 965 | 5 | 108 | Picked up and moving around to another sampling site. |
| 13-Sep | 01.14.21 | -17.54244 | -174.57640 | 966 | 5 | 129 | Dave is in the van now and would like to look for more active flow on the chimney tops. |
| 13-Sep | 01.15.29 | -17.54242 | -174.57635 | 963 | 4 | 84 | Chimneys are several meters tall; nicely flanged. Chimneys are thin and it's quite a vast field. |
| 13-Sep | 01.16.11 | -17.54246 | -174.57637 | 958 | 6 | 110 | Still going up to the top of these structures. Some have bright white bacterial mat. We're at 7 meters up now. Galatheid crab on big chimney. |
| 13-Sep | 01.17.01 | -17.54247 | -174.57633 | 958 | 7 | 105 | Just clear fluid coming out as far as we can see (so far). This area was formed with higher temperature flow. |
| 13-Sep | 01.17.44 | -17.54247 | -174.57634 | 957 | 7 | 165 | Filamentous bacterial coating many of these chimneys. |
| 13-Sep | 01.18.47 | -17.54250 | -174.57631 | 958 | 3 | 220 | This field is 10's of meters wide. |
| 13-Sep | 01.18.53 | -17.54250 | -174.57631 | 959 | 4 | 199 | We're about 4 meters up now. The last growth of the chimneys are very narrow (at the top). |
| 13-Sep | 01.19.18 | -17.54248 | -174.57632 | 960 | 3 | 193 | Hot water coming out of the seafloor at the base of the structures in this area. Shimmering… |
| 13-Sep | 01.20.17 | -17.54249 | -174.57629 | 959 | 5 | 192 | Some gastropods on this big chimney in front of us. They are hairy snails. |
| 13-Sep | 01.20.51 | -17.54250 | -174.57629 | 958 | 6 | 193 | Taking some still images of these chimneys. |
| 13-Sep | 01.21.28 | -17.54250 | -174.57627 | 957 | 7 | 192 | Brachyuran crab; limpets; hairy snails. HD highlights on. |
| 13-Sep | 01.22.29 | -17.54249 | -174.57630 | 957 | 6 | 197 | Has to be somewhat active because of all of the biology. Brachyuran crab and hairy snails. Choro-O shrimp (Tim's abbreviation for either chorocaris or opaepele shrimp). |

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|---|---|---|---|---|---|---|---|
| 13-Sep | 01.26.16 | -17.54250 | -174.57630 | 958 | 6 | 187 | Will try to suction sample these gastropods first. Then try to sample the top of the chimney; then hope water may come out so can sample that too. |
| 13-Sep | 01.27.01 | -17.54249 | -174.57630 | 957 | 6 | 187 | No obvious flow but must be something that is feeding this biological community. |
| 13-Sep | 01.28.16 | -17.54249 | -174.57627 | 957 | 7 | 189 | We're about 10 meters SE of the last sampling site. |
| 13-Sep | 01.28.18 | -17.54249 | -174.57627 | 957 | 7 | 188 | The spires we saw earlier near the summit were lava spires 10-20 m tall. |
| 13-Sep | 01.28.47 | -17.54249 | -174.57629 | 957 | 8 | 187 | These hydrothermal chimneys here are ~5 m high. |
| 13-Sep | 01.29.16 | -17.54250 | -174.57626 | 957 | 7 | 191 | Metallic sulfide chimneys with biology in this area. |
| 13-Sep | 01.29.53 | -17.54250 | -174.57629 | | | | Pulling out the suction hose to sample the biology on top this chimney spire. |
| 13-Sep | 01.30.56 | -17.54252 | -174.57628 | 958 | 4 | 234 | This area is quite obviously cooling - but still some heat indicated by the biology associated with the chimneys. |
| 13-Sep | 01.33.04 | -17.54251 | -174.57629 | 957 | 6 | 205 | **Bio Sample: Q323-biomacro-05.** The suction hose grabbed the brachyuran crab. They are continuing to suction. They also collected a hairy snail in this suction. Both animals are part of sample 5. |
| 13-Sep | 01.40.03 | -17.54251 | -174.57627 | 957 | 8 | 205 | There is a hairy snail stuck in the end of the suction tube. It was dropped. |
| 13-Sep | 01.40.05 | -17.54251 | -174.57627 | 957 | 7 | 205 | Both a crab (brachyuran) and a hairy snail were put in suction sample chamber 1. |
| 13-Sep | 01.41.35 | -17.54247 | -174.57633 | 957 | 9 | 177 | Next we're going in for a small spire on the top of that same chimney. |
| 13-Sep | 01.42.54 | -17.54249 | -174.57626 | 957 | 7 | 188 | Turned off HD at 0142. |
| 13-Sep | 01.43.21 | -17.54251 | -174.57628 | 958 | 7 | 188 | Next task is to sample the spire. |
| 13-Sep | 01.43.47 | -17.54251 | -174.57627 | 957 | 7 | 187 | Beautiful flange spire with hot water venting under the small flanges. |
| 13-Sep | 01.45.33 | -17.54250 | -174.57629 | 957 | 6 | 209 | Moving in to try to capture a piece of this chimney. |
| 13-Sep | 01.46.26 | -17.54253 | -174.57627 | 957 | 6 | 208 | The claw is positioned above the chimney spires. |
| 13-Sep | 01.46.38 | -17.54253 | -174.57627 | 958 | 6 | 210 | Grabbed a portion of the chimney top - did not get it. |
| 13-Sep | 01.48.42 | -17.54251 | -174.57628 | 957 | 6 | 189 | The chimney is quite fragile and crumbles to the touch. |
| 13-Sep | 01.48.49 | -17.54251 | -174.57628 | 957 | 6 | 195 | **Geo Sample: Q323-sulfide-06**. Small piece of top of chimney. Sulfide piece from top of this ~2m chimney. |
| 13-Sep | 01.55.16 | -17.54247 | -174.57637 | | | | **Geo Sample: Q323-sulfide-07**. Grabbing another piece right next to the previous piece. Same ~2m chimney. This one is larger; longer; gray. Possibly manganese coated spine on the chimney. Into bucket 5 with sample 6. Both are from the same chimney. **Target chimney 7.** "Weakly" fluid emitting chimney. Saw very little flow; except from under small flanges near top. |
| 13-Sep | 02.03.11 | -17.54249 | -174.57627 | 957 | 7 | 190 | We're going to try to go downslope to target A where the active chimneys are. We're going to go for a couple hundred meters through the water column to see how it goes. |
| 13-Sep | 02.04.54 | -17.54250 | -174.57634 | 955 | 9 | 92 | Pulling off the bottom now. |
| 13-Sep | 02.06.50 | -17.54258 | -174.57639 | 957 | 9 | 55 | The bottom is still in sight. Still seeing chimneys as we are heading to the northeast. Chimneys are 5-8 meters high; some of them anyway. |
| 13-Sep | 02.08.12 | -17.54250 | -174.57629 | 952 | 14 | 52 | Now the bottom is out of sight. |
| 13-Sep | 02.08.12 | -17.54250 | -174.57629 | 952 | 14 | 52 | Going to continue on this heading for another 1000 meters. Just passed the 200 meter mark of transiting through the water column. We'll proceed to target A which is where we planned to start the dive initially. Peter wants to see that chimney field. |
| 13-Sep | 03.07.59 | -17.53920 | -174.57026 | 920 | 27 | 57 | We're traveling 27 meters over the bottom. Just saw a shrimp go by. |
| 13-Sep | 03.39.27 | -17.53665 | -174.56667 | 960 | 27 | 59 | About 100 meters to go. We're heading to Act vent. |
| 13-Sep | 04.02.19 | -17.53584 | -174.56641 | 1491 | 27 | 1 | Diving toward the bottom. Approximately 1.5 hours remain in this dive. |
| 13-Sep | 04.03.29 | -17.53582 | -174.56636 | 1514 | 27 | 1 | Approaching a potentially hydrothermally active site (Target: Act Vent) |
| 13-Sep | 04.03.41 | -17.53579 | -174.56634 | 1523 | 27 | 360 | Smoke in the water as we approach. |
| 13-Sep | 04.03.50 | -17.53578 | -174.56632 | 1526 | 27 | 360 | Thick smoke in the water. 50m off the bottom so this is quite a plume. |
| 13-Sep | 04.04.22 | -17.53573 | -174.56630 | 1540 | 27 | 360 | Altimeter working at 30m. Doppler reset. |
| 13-Sep | 04.04.53 | -17.53570 | -174.56630 | 1549 | 28 | 0 | Sonar not working yet as we are too high off the bottom. Plume was 50m high. |
| 13-Sep | 04.05.31 | -17.53567 | -174.56628 | 1559 | 19 | 0 | 10m off the bottom. |
| 13-Sep | 04.06.02 | -17.53571 | -174.56624 | 1574 | 5 | 0 | Bottom seen with 5m off. |
| 13-Sep | 04.07.31 | -17.53575 | -174.56622 | 1574 | 5 | 1 | May see pillars in the HD camera; Changing pilots in van with 6m off bottom. |
| 13-Sep | 04.08.18 | -17.53576 | -174.56620 | 1574 | 6 | 3 | Making some adjustments with the ROV including the winch before heading all the way to the bottom. |
| 13-Sep | 04.09.01 | -17.53576 | -174.56620 | 1574 | 5 | 360 | Sonar seeing an acoustic shadow to the left (facing upslope). |
| 13-Sep | 04.10.10 | -17.53562 | -174.56625 | 1574 | 6 | 0 | Image in HD was actually dust but we are seeing bottom in the pilot camera. |
| 13-Sep | 04.10.40 | -17.53562 | -174.56622 | 1574 | 6 | 3 | Switching navigation screen to 50m/div instead of the current 100. |
| 13-Sep | 04.11.10 | -17.53558 | -174.56624 | 1577 | 3 | 357 | Coming in closer to the bottom. |
| 13-Sep | 04.11.39 | -17.53558 | -174.56626 | 1577 | 3 | 340 | Bottom looks like sediment below ROV. Bathymetry makes sense here from previous expedition. |

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|---|---|---|---|---|---|---|---|
| 13-Sep | 04.12.11 | -17.53562 | -174.56625 | 1576 | 3 | 261 | Turning west-upslope. (Did not change navigation screen). |
| 13-Sep | 04.12.27 | -17.53562 | -174.56625 | 1576 | 3 | 261 | Moving upslope over sedimented bottom and sonar looks like no chimney structures-just slope. |
| 13-Sep | 04.13.18 | -17.53559 | -174.56641 | 1573 | 3 | 260 | Trawl tracks in the HD camera. Shrimp floating by in water. |
| 13-Sep | 04.13.42 | -17.53559 | -174.56641 | 1573 | 3 | 261 | No targets on forward looking sonar. |
| 13-Sep | 04.14.05 | -17.53558 | -174.56647 | 1569 | 3 | 261 | Substantial plumes in water on descent but no evidence so far of venting. |
| 13-Sep | 04.14.40 | -17.53562 | -174.56660 | 1565 | 3 | 260 | Heading west and upslope over sediment. |
| 13-Sep | 04.14.55 | -17.53561 | -174.56664 | 1562 | 3 | 261 | Smooth slope with few rocks. |
| 13-Sep | 04.15.38 | -17.53558 | -174.56675 | 1559 | 2 | 298 | Turning right 90deg to see if any sonar targets. |
| 13-Sep | 04.15.54 | -17.53552 | -174.56686 | 1557 | 2 | 294 | Sandy and gravelly bottom when changed direction. |
| 13-Sep | 04.16.10 | -17.53551 | -174.56690 | 1556 | 3 | 294 | More rocks and bigger fragments. Some staining and mats. |
| 13-Sep | 04.16.27 | -17.53551 | -174.56693 | 1556 | 2 | 283 | Crab and darker sediment with murkier water. |
| 13-Sep | 04.16.47 | -17.53551 | -174.56697 | 1555 | 2 | 287 | Snow in water and some shimmering water in front of us. |
| 13-Sep | 04.17.02 | -17.53551 | -174.56697 | 1555 | 2 | 284 | Shimmering water in the sediment. |
| 13-Sep | 04.17.38 | -17.53547 | -174.56699 | 1555 | 2 | 243 | Still looking for big plume. Anemones on seafloor. |
| 13-Sep | 04.17.52 | -17.53547 | -174.56699 | 1554 | 2 | 240 | Heading upslope over diffuse venting with white mat. |
| 13-Sep | 04.18.08 | -17.53546 | -174.56700 | 1554 | 2 | 222 | Heading is now 223 upslope with more intact boulders. |
| 13-Sep | 04.18.25 | -17.53548 | -174.56699 | 1555 | 1 | 215 | Kicked up some sediment with the vehicle. |
| 13-Sep | 04.19.00 | -17.53548 | -174.56704 | 1552 | 2 | 216 | Looks like some snails may be alive. Lavas on the bottom with shimmering water. |
| 13-Sep | 04.19.24 | -17.53550 | -174.56707 | 1551 | 3 | 215 | White snails and getting into more lava; less sediment. More snails. |
| 13-Sep | 04.19.56 | -17.53551 | -174.56706 | 1551 | 3 | 306 | Sea star with large pillows and more sediment. Heading NW at 297. |
| 13-Sep | 04.21.02 | -17.53542 | -174.56712 | 1551 | 2 | 313 | Big pillow with crinoid. Water is murky so venting is somewhere. |
| 13-Sep | 04.21.50 | -17.53531 | -174.56705 | 1554 | 1 | 94 | Going to head east to intersect a mound that appears on the bathymetry map. Harder to see as we drive downslope. |
| 13-Sep | 04.22.38 | -17.53535 | -174.56697 | 1559 | 1 | 25 | Bottom pretty flat with white bacterial mat growing on sedimented bottom. |
| 13-Sep | 04.23.15 | -17.53529 | -174.56688 | 1561 | 2 | 15 | Heading more northerly and following the bacterial mat and visibility poor. |
| 13-Sep | 04.23.16 | -17.53529 | -174.56688 | 1561 | 2 | 12 | Looks like chimneys with mussels on the seafloor. |
| 13-Sep | 04.23.52 | -17.53522 | -174.56683 | 1564 | 3 | 5 | Hear it is-Smokey water and big chimneys. Didn't see it in sonar until we already saw it visually. |
| 13-Sep | 04.24.14 | -17.53521 | -174.56683 | 1563 | 3 | 3 | Great chimney structure and now recording to HD tape. |
| 13-Sep | 04.24.34 | -17.53521 | -174.56683 | 1563 | 3 | 3 | Going to slowly rise up to see top of chimney structure. |
| 13-Sep | 04.25.24 | -17.53521 | -174.56683 | 1563 | 3 | 3 | Recording to HD tape and taking stills. |
| 13-Sep | 04.25.29 | -17.53521 | -174.56683 | 1563 | 3 | 3 | Lots of gray smoke in the area. It seems to be coming from behind these chimneys. We do see some other chimneys in the background. |
| 13-Sep | 04.26.21 | -17.53521 | -174.56683 | 1563 | 3 | 3 | Scale worms and shrimp on top of chimneys with clear shimmering water. |
| 13-Sep | 04.26.36 | -17.53521 | -174.56683 | 1563 | 3 | 3 | Floating animal looks like a pelagic holothurian or a salp. |
| 13-Sep | 04.27.22 | -17.53521 | -174.56683 | 1563 | 3 | 3 | Still a diffuse haze coming out of these chimneys. Scale worms; crabs; snails in this area. |
| 13-Sep | 04.28.15 | -17.53521 | -174.56683 | 1563 | 3 | 3 | Small beehive with gray smoke coming out. |
| 13-Sep | 04.28.26 | -17.53521 | -174.56683 | 1563 | 3 | 3 | Polychaete (scaleworm) on chimney. |
| 13-Sep | 04.29.15 | -17.53521 | -174.56683 | 1563 | 3 | 3 | Changing out HD tape. |
| 13-Sep | 04.29.41 | -17.53521 | -174.56683 | 1563 | 3 | 3 | Moving to other side of the chimneys to straighten the umbilical. |
| 13-Sep | 04.30.20 | -17.53521 | -174.56683 | 1563 | 3 | 3 | 10 meters off the b bottom and still not at the top of this structure. |
| 13-Sep | 04.30.56 | -17.53521 | -174.56683 | 1563 | 3 | 3 | We're 15 meters above the bottom. Not at the top of the chimney yet. These chimneys are really narrow. This one in the HD video is smoking. We're 20m off the bottom. |
| 13-Sep | 04.31.31 | -17.53521 | -174.56683 | 1563 | 3 | 3 | We're going to get a good look at the top of this one and then head to the other sonar targets. |
| 13-Sep | 04.32.11 | -17.53521 | -174.56683 | 1563 | 3 | 3 | The new HD tape is now recording. |
| 13-Sep | 04.32.33 | -17.53521 | -174.56683 | 1563 | 3 | 3 | Taking a look at this really big much fatter chimney. Lots of snails on this chimney. Lots of white mat. |
| 13-Sep | 04.33.22 | -17.53521 | -174.56683 | 1563 | 3 | 3 | There are shrimp on this chimney too. See venting coming out of beehives on this chimney. |
| 13-Sep | 04.34.19 | -17.53521 | -174.56683 | 1563 | 3 | 3 | Zooming in on this chimney. We're at 18+ meters here. |
| 13-Sep | 04.35.11 | -17.53521 | -174.56683 | 1563 | 3 | 3 | Zooming in on snails on side of chimney. Lots of shrimp on the white patches. |
| 13-Sep | 04.35.47 | -17.53521 | -174.56683 | 1563 | 3 | 3 | We're still climbing. More snails. Wow. This is beautiful. |
| 13-Sep | 04.36.16 | -17.53521 | -174.56683 | 1563 | 3 | 3 | The smoke seems to be coming out of small beehives all around the chimney. |
| 13-Sep | 04.36.52 | -17.53521 | -174.56683 | 1563 | 3 | 3 | We keep going up but the altimeter doesn't seem to be changing so it's probably seeing the base of the chimney. |
| 13-Sep | 04.37.37 | -17.53521 | -174.56683 | 1563 | 3 | 3 | What a beautiful column. More venting and bacterial mat. |
| 13-Sep | 04.38.04 | -17.53521 | -174.56683 | 1563 | 3 | 3 | We're near the top. The altitude says 28 meters. This is at least 30 meters high! |

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| 13-Sep | 04.38.49 | -17.53521 | -174.56683 | 1563 | 3 | 3 | We see some flow coming out of the top but not black or gray smoke. |
| 13-Sep | 04.39.31 | -17.53521 | -174.56683 | 1563 | 3 | 3 | We're going to go down to the bottom and find the other sonar target before we decide to do our sampling. |
| 13-Sep | 04.41.20 | -17.53521 | -174.56683 | 1563 | 3 | 3 | Now we're seeing the neighboring chimney. We're still going down. |
| 13-Sep | 04.42.09 | -17.53521 | -174.56683 | 1563 | 3 | 3 | We're going to come back to this one. Turning to the left about 12 meters off the bottom. |
| 13-Sep | 04.43.10 | -17.53521 | -174.56683 | 1563 | 3 | 3 | Here's another chimney right behind us. |
| 13-Sep | 04.43.12 | -17.53521 | -174.56683 | 1563 | 3 | 3 | This chimney is to the east of the other. There are a bunch of shrimp on this structure. Lots of mat. |
| 13-Sep | 04.43.59 | -17.53521 | -174.56683 | 1563 | 3 | 3 | Moving to the side of the structure and heading up. |
| 13-Sep | 04.44.21 | -17.53521 | -174.56683 | 1563 | 3 | 3 | Tether maintenance here. |
| 13-Sep | 04.44.48 | -17.53521 | -174.56683 | 1563 | 3 | 3 | White beehive-type chimney with smoke coming out on the side of this huge structure. |
| 13-Sep | 04.45.14 | -17.53521 | -174.56683 | 1563 | 3 | 3 | Heading to the top. |
| 13-Sep | 04.45.56 | -17.53521 | -174.56683 | 1563 | 3 | 3 | Still climbing. Another active beehive on the side. |
| 13-Sep | 04.46.25 | -17.53521 | -174.56683 | 1563 | 3 | 3 | Smokier here on the top. Now we can see a pointy top on this one. |
| 13-Sep | 04.47.19 | -17.53521 | -174.56683 | 1563 | 3 | 3 | This one is also more than 30 meters high! And wider than the previous chimney. |
| 13-Sep | 04.48.05 | -17.53521 | -174.56683 | 1563 | 3 | 3 | This little beehive looks like a good sampling site. |
| 13-Sep | 04.48.52 | -17.53521 | -174.56683 | 1563 | 3 | 3 | Lots of white fluid coming out at this area with a couple small beehives. |
| 13-Sep | 04.49.34 | -17.53521 | -174.56683 | 1563 | 3 | 3 | First will try to grab the top of the small white chimney with a manipulator. If it's competent enough it will be a sulfide sample. We'll get the temperature probe out and then we'll try to do some fluid sampling. |
| 13-Sep | 04.50.37 | -17.53521 | -174.56683 | 1563 | 3 | 3 | The parts of the chimney that aren't white look pretty solid. |
| 13-Sep | 04.50.59 | -17.53521 | -174.56683 | 1563 | 3 | 3 | There are lots of spickets on this structure. |
| 13-Sep | 04.51.53 | -17.53521 | -174.56683 | 1563 | 3 | 3 | Still recording HD. |
| 13-Sep | 04.52.29 | -17.53521 | -174.56683 | 1563 | 3 | 3 | At the beginning of the dive we were investigating spires and they turned out to be lava pillars/erosional remnants. This is another site where the spires looked similar in the bathy and these are really spectacular sulfide chimneys. You have to see them to know the difference. |
| 13-Sep | 04.53.54 | -17.53521 | -174.56683 | 1563 | 3 | 3 | Here comes the arm. To sample this smaller chimney with a crab on it. The crab is a galatheid. |
| 13-Sep | 04.54.43 | -17.53521 | -174.56683 | 1563 | 3 | 3 | Using the stbd manipulator arm. Going to try to grab the top of this small chimney for a sample of the sulfide materials growing at this vent. |
| 13-Sep | 04.55.23 | -17.53521 | -174.56683 | 1563 | 3 | 3 | Shrimp are also on the orange part of the chimney in large numbers. |
| 13-Sep | 04.56.21 | -17.53521 | -174.56683 | 1563 | 3 | 3 | Went in for the grab and knocked the top of it over. May be able to pick it up off the side of the chimney here. Lots of shrimp swimming around in the water. |
| 13-Sep | 04.57.22 | -17.53521 | -174.56683 | 1563 | 3 | 3 | Looks like the chimney is still there so it's not that friable. It appears to still be venting even though it is half broken off. |
| 13-Sep | 04.58.33 | -17.53521 | -174.56683 | 1563 | 3 | 3 | That piece got away. |
| 13-Sep | 04.58.47 | -17.53521 | -174.56683 | 1563 | 3 | 3 | We're going to move on to pull out high temp probe; then will try to get a water sample. The smoke is really pouring out of the orifice now. |
| 13-Sep | 05.00.48 | -17.53521 | -174.56683 | 1563 | 3 | 3 | This vent field has been named **"Loloa Kakai"**. It means "tall people" in Tongan. |
| 13-Sep | 05.03.53 | -17.53521 | -174.56683 | 1563 | 3 | 3 | The temperature probe is in the stbd arm. Moving in to take a temperature. The port arm will also be involved in this temperature-taking process. |
| 13-Sep | 05.05.59 | -17.53521 | -174.56683 | 1563 | 3 | 3 | Orienting the temp probe before approaching the chimney again. |
| 13-Sep | 05.06.43 | -17.53521 | -174.56683 | 1563 | 3 | 3 | Extending the port arm. |
| 13-Sep | 05.07.21 | -17.53521 | -174.56683 | 1563 | 3 | 3 | Slowly creeping back in to see what we can do. |
| 13-Sep | 05.08.32 | -17.53521 | -174.56683 | 1563 | 3 | 3 | Moving in on this orifice that is venting whitish-gray smoke for the temperature probe. |
| 13-Sep | 05.09.14 | -17.53521 | -174.56683 | 1563 | 3 | 3 | Temp ;started at 30; up to 97; up to 160; 180…225 and it came out of the orifice. It was still going up. |
| 13-Sep | 05.10.23 | -17.53521 | -174.56683 | 1563 | 3 | 3 | They're going in for another try. |
| 13-Sep | 05.11.01 | -17.53521 | -174.56683 | 1563 | 3 | 3 | Darker gray smoke is now coming out. |
| 13-Sep | 05.11.24 | -17.53521 | -174.56683 | 1563 | 3 | 3 | The probe temp got up to 190C this time before coming out again. |
| 13-Sep | 05.12.18 | -17.53521 | -174.56683 | 1563 | 3 | 3 | Going to try it again at an angle. |
| 13-Sep | 05.13.12 | -17.53521 | -174.56683 | 1563 | 3 | 3 | Poking at the venting area with the temp probe. Having a bit of difficulty getting the tip into the venting area. |
| 13-Sep | 05.14.00 | -17.53521 | -174.56683 | 1563 | 3 | 3 | The highest temperature reading was above 225 and was still climbing. |
| 13-Sep | 05.15.08 | -17.53521 | -174.56683 | 1563 | 3 | 3 | One more attempt at temperature probe here. |
| 13-Sep | 05.15.36 | -17.53521 | -174.56683 | 1563 | 3 | 3 | There are lots of shrimp on this structure. |

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| 13-Sep | 05.16.26 | -17.53521 | -174.56683 | 1563 | 3 | 3 | Temperature probe is rising. 242 and rising. Highest temp was 254. |
| 13-Sep | 05.17.37 | -17.53521 | -174.56683 | 1563 | 3 | 3 | Putting the temp probe away next and will pull out the major sampler next. |
| 13-Sep | 05.18.04 | -17.53521 | -174.56683 | 1563 | 3 | 3 | Looks like the probe got bent a bit. |
| 13-Sep | 05.18.37 | -17.53521 | -174.56683 | 1563 | 3 | 3 | Good image of the huge sulfide chimney. The temp probe did fit in its slot. |
| 13-Sep | 05.20.21 | -17.53521 | -174.56683 | 1563 | 3 | 3 | Will analyze the chemistry of the vent fluids when they are back up on the ship. |
| 13-Sep | 05.21.12 | -17.53521 | -174.56683 | 1563 | 3 | 3 | The temperature probe is stowed. |
| 13-Sep | 05.23.35 | -17.53521 | -174.56683 | 1563 | 3 | 3 | This will be a fluid sample with the white major sampler. |
| 13-Sep | 05.24.10 | -17.53521 | -174.56683 | 1563 | 3 | 3 | Lining up the major. |
| 13-Sep | 05.26.05 | -17.53521 | -174.56683 | 1563 | 3 | 3 | Moving in on the venting orifice where the temperature was previously recorded. Lots of gray smoke pouring out. |
| 13-Sep | 05.27.21 | -17.53521 | -174.56683 | 1563 | 3 | 3 | Want to position the ROV up against the chimney to stabilize. I's a challenging operation. |
| 13-Sep | 05.28.14 | -17.53521 | -174.56683 | 1563 | 3 | 3 | There is a hole in the top of the major sampler that shows if fluid is coming in. |
| 13-Sep | 05.28.51 | -17.53521 | -174.56683 | 1563 | 3 | 3 | **Fluid Sample: Q323-major-08**. The nozzle is in and above the orifice. Bouncing around a bit. The gray/white smoke is pouring out of the chimlet here. 254°C fluids. Chimney is 30+ meters high. Got a sample. **(NOTE: This is not a cursor fix. Just read it off the nav screen - too busy right now)** Heading was 223 degrees. Laloa Kakai vent field. |
| 13-Sep | 05.30.57 | -17.53521 | -174.56683 | 1563 | 3 | 3 | They just dropped the major sampler and it fell a long way. This chimney is 30+ meters high. |
| 13-Sep | 05.31.43 | -17.53521 | -174.56683 | 1563 | 3 | 3 | The HD is not recording. Not sure when the tape was stopped. |
| 13-Sep | 05.32.02 | -17.53521 | -174.56683 | 1563 | 3 | 3 | Looks like they are going to go down and try to find the major before doing any more sampling. |
| 13-Sep | 05.36.44 | -17.53521 | -174.56683 | 1563 | 3 | 3 | We're down on the seafloor at the base of this chimney. Searching for the major sampler. |
| 13-Sep | 05.37.23 | -17.53521 | -174.56683 | 1563 | 3 | 3 | Beautiful pillow lava in the foreground. |
| 13-Sep | 05.39.58 | -17.53521 | -174.56683 | 1563 | 3 | 3 | Looking around the base of this structure. Lots of broken sulfide pieces and some pillow lavas. |
| 13-Sep | 05.40.25 | -17.53521 | -174.56683 | 1563 | 3 | 3 | Nest of big pillow blocks at the bottom of this chimney. Large amount of collapsed chimney debris. Lots of little spires that are now inactive. Lots of shrimp in the water. |
| 13-Sep | 05.41.12 | -17.53521 | -174.56683 | 1563 | 3 | 3 | Beautiful pillows. |
| 13-Sep | 05.42.28 | -17.53521 | -174.56683 | 1563 | 3 | 3 | Richard would like them to grab one of these smaller chimneys at the bottom because we have no geochemistry from this part of Fonualei. |
| 13-Sep | 05.43.44 | -17.53521 | -174.56683 | 1563 | 3 | 3 | Still looking for the major sampler. |
| 13-Sep | 05.46.29 | -17.53521 | -174.56683 | 1563 | 3 | 3 | **Found it!!** It is near the base of the chimney laying in same mat/sediment? It looks so small compared to the chimney. It's not quite all the way at the base. Close at 1574 meters. We were sampling about 30 meters higher than this. |
| 13-Sep | 05.52.32 | -17.53521 | -174.56683 | 1563 | 3 | 3 | Happy outcome in this case. Wow. |
| 13-Sep | 05.52.49 | -17.53521 | -174.56683 | 1563 | 3 | 3 | Discussing with the pilots what we have time to do before the end of the dive. |
| 13-Sep | 05.56.08 | -17.53521 | -174.56683 | 1563 | 3 | 3 | Will try to suction some of the shrimp on the base of the chimney and some sediment with that. Will also try to get a small sulfide. |
| 13-Sep | 05.58.09 | -17.53521 | -174.56683 | 1563 | 3 | 3 | The ROV team is also concerned about time and the umbilical. |
| 13-Sep | 05.59.05 | -17.53521 | -174.56683 | 1563 | 3 | 3 | Beautiful pillow lava formations at the bottom of this chimney. They're not that young but not that much sediment on them. |
| 13-Sep | 06.00.47 | -17.53521 | -174.56683 | 1563 | 3 | 3 | There's an anemone there on the side of the chimney. The chimneys are dark black (manganese) the brown is sulfide. Lots of parallel chimneys growing up on this structure. |
| 13-Sep | 06.01.39 | -17.53521 | -174.56683 | 1563 | 3 | 3 | The lighter white color is bacterial mat with lots of shrimp all over it. |
| 13-Sep | 06.02.10 | -17.53521 | -174.56683 | 1563 | 3 | 3 | The red sulfide oxidizes into the manganese coating on the surface; with the help of the bacteria. |
| 13-Sep | 06.03.23 | -17.53521 | -174.56683 | 1563 | 3 | 3 | Getting the suction hose out to try to sample some shrimp here near the base of this massive sulfide structure. |
| 13-Sep | 06.05.35 | -17.53521 | -174.56683 | 1563 | 3 | 3 | Attempting suction sample for shrimp and sediments. Tim wants the shrimp. Ed wants the sediment for Pharmacology purposes. |
| 13-Sep | 06.06.12 | -17.53521 | -174.56683 | 1563 | 3 | 3 | Positioning the suction sampler. |
| 13-Sep | 06.06.18 | -17.53521 | -174.56683 | 1563 | 3 | 3 | **Bio Sample: Q323-biomacro-09**. Suction sample started. Suctioning in this area of sulfide and white mat for shrimp. There are lots of small shrimp on this mat/sulfide. Into jar 2. Going in for another slurp. Laloa Kakai vent field. Near base of massive sulfide. |

| date | time | latitude | longitude | Z | alt | hdg | Q323 - South Fonualei Rift Dive Comments |
|---|---|---|---|---|---|---|---|
| 13-Sep | 06.09.33 | -17.53521 | -174.56683 | 1563 | 3 | 3 | **Bio Sample: Q323-biomacro-10**. More shrimp Into jar 3. Laloa Kakai vent field. |
| 13-Sep | 06.10.33 | -17.53521 | -174.56683 | 1563 | 3 | 3 | **Bio/Geo Sample: Q323-biosed-11**. Into jar 4. Sampling sediment at the base of this sulfide structure. Sediment appears gray. Got it. Laloa Kakai vent field. |
| 13-Sep | 06.12.30 | -17.53521 | -174.56683 | 1563 | 3 | 3 | The folded layer in front is the glass layer detaching from the pillow. It's covered in shrimp. |
| 13-Sep | 06.13.12 | -17.53521 | -174.56683 | 1563 | 3 | 3 | Looking for a chimney for Richard next. |
| 13-Sep | 06.15.10 | -17.53521 | -174.56683 | 1563 | 3 | 3 | **Geo Sample: Q323-sulfide-12.** Going to attempt to grab this dead chimney piece on the seafloor for Richard. It's quite large (~1foot). It's manganese encrusted; black in color with a lighter inner crust. Old chimney piece; hollow inside. Putting it on the porch and are going to hold it there. Laloa Kakai vent field. **Q323-sulfide-12**. |
| 13-Sep | 06.18.58 | -17.53521 | -174.56683 | 1563 | 3 | 3 | End of Dive Q323 at Fonualei Rift. NE Lau Basin. |
| 13-Sep | 06.24.59 | -17.53521 | -174.56683 | 1563 | 3 | 3 | Still near the bottom. Stirring up lots of sediment. |
| 13-Sep | 06.25.30 | -17.53521 | -174.56683 | 1563 | 3 | 3 | **Taking off for the surface.** |
| 13-Sep | 06.27.20 | -17.53521 | -174.56683 | 1563 | 3 | 3 | We're still rising through the chimneys. We're too heavy. They are going to get rid of some of the sulfide sample. They squeezed it and broke it up. Better now. |
| 13-Sep | 07.26.04 | -17.53418 | -174.56797 | 579 | 30 | 302 | Still ascending; ROV at 575m depth. |
| 13-Sep | 8:03:00 | -17.53418 | -174.56797 | 579 | 30 | 302 | ROV on deck. |

## 7.3 Q324 Motutahi (Cone at Volcano O) Dive Log

| date | time | latitude | longitude | Z | alt | hdg | Q324 - Motutahi (Cone at Volcano O) Dive Comments |
|---|---|---|---|---|---|---|---|
| **Main Goals:** Explore and sample top of young volcanic cone near center of Niuatahi (Volcano O). | | | | | | | |
| **Setup:** 3 gastights; 3 majors; temp probe; 1 Davis sampler; 1 McPhail sampler; large biobox; suction sampler | | | | | | | |
| **Launch target:** 15°22.55' S 174°00.21' W Z=1326m W/NW of central cone summit | | | | | | | |
| **Nav Notes:** bottom time 9/13 21:13 - 9/14 05:59. Nav smoothed (tolerance=13). Nav shifted: +2m (E) -10m (S). Nav gap 22:12 - 22:22. Last nav fix 05:44:58. Shifted nav is moved more to the center of the cone. Depths match up better after the move. | | | | | | | |
| **DIVE LOG POSITION INFORMATION: latitude; longitude; Z; alt; hdg values are derived from finalized Quest nav. Any lat/long values in the dive comments column were recorded at sea and are preliminary.** | | | | | | | |
| 13-Sep | 19.53.53 | | | | | | Preparing for launch. |
| 13-Sep | 19.54.45 | | | | | | Launch target is 15.37580°S / 174.00352°W. 15°22.55'S / 174°00.21'W Depth: 1326m. |
| 13-Sep | 20.00.43 | | | | | | Unstrapping vehicle from deck. |
| 13-Sep | 20.03.11 | | | | | | ROV off the deck |
| 13-Sep | 20.05.54 | | | | | | **Quest is in the water.** |
| 13-Sep | 20.09.49 | | | | | | Attaching flotation to the wire. |
| 13-Sep | 20.13.40 | | | | | | Diving. |
| 13-Sep | 20.15.16 | | | | | | OE RR1211L1 Dive #3 (This is how OE will be archiving the dive and how they will be referred to on the video tapes). |
| 13-Sep | 20.43.50 | | | | | | Passing 700m depth. Target depth is 1326m. |
| 13-Sep | 20.59.37 | | | | | | About 300m off the bottom. |
| 13-Sep | 21.07.55 | | | | | | At 1200m depth on the way to 1326m. |
| 13-Sep | 21.08.14 | | | | | | Cone is made of dacite. |
| 13-Sep | 21.09.03 | | | | | | Smoke in the water as descending. 100m off bottom. |
| 13-Sep | 21.11.34 | | | | | | Water is still smoky. |
| 13-Sep | 21.11.38 | | | | | | Altimeter detected bottom. 25m off bottom. |
| 13-Sep | 21.12.32 | | | | | | More smoke in the water. |
| 13-Sep | 21.13.15 | -15.37546 | -174.00345 | 1305 | 4 | 178 | **See bottom.** |
| 13-Sep | 21.13.30 | -15.37545 | -174.00345 | 1305 | 3 | 160 | Bottom is gravelly. |
| 13-Sep | 21.14.30 | -15.37546 | -174.00346 | 1305 | 3 | 147 | Pelagic polychaetes in the water. |
| 13-Sep | 21.15.07 | -15.37543 | -174.00345 | 1305 | 3 | 168 | Collapsed sediment. |
| 13-Sep | 21.16.18 | -15.37546 | -174.00345 | | | | Shells in the bottom amongst the volcanic clasts with perhaps sulfur. |
| 13-Sep | 21.17.08 | -15.37546 | -174.00345 | 1305 | 2 | 93 | Debris slope of volcanic debris intermixed with shells or fragments. |
| 13-Sep | 21.17.23 | -15.37541 | -174.00341 | 1305 | 2 | 98 | Coarse volcanic fragments not particularly fresh. |
| 13-Sep | 21.17.41 | -15.37542 | -174.00343 | | | | Highly corrosive which influences shape quickly. |
| 13-Sep | 21.18.20 | -15.37540 | -174.00341 | 1304 | 2 | 100 | Yellow on rocks could be sulfur. Lots of worms. White blobs could also be sulfur. |
| 13-Sep | 21.18.52 | -15.37542 | -174.00341 | 1305 | 1 | 99 | Coarse rocks and white looks like sulfur. |
| 13-Sep | 21.19.27 | -15.37543 | -174.00342 | 1305 | 1 | 99 | Seeing some shelled and perhaps scale worms. |
| 13-Sep | 21.20.03 | -15.37543 | -174.00343 | 1305 | 2 | 102 | Orange and yellow staining from reaction of hot seawater with rock. |
| 13-Sep | 21.20.36 | -15.37541 | -174.00343 | 1306 | 1 | 108 | Debris field has become coarser (melon-sized chunks). |
| 13-Sep | 21.21.01 | -15.37540 | -174.00341 | 1305 | 1 | 104 | Gelatinous coating on the rocks. |
| 13-Sep | 21.21.29 | -15.37542 | -174.00341 | 1305 | 1 | 103 | HD tape recording on. |
| 13-Sep | 21.22.44 | -15.37541 | -174.00343 | 1303 | 3 | 164 | Looking a bit downslope at 166deg. |
| 13-Sep | 21.23.44 | -15.37535 | -174.00340 | 1303 | 5 | 115 | Going to start moving the ROV upslope to the top of the cone. |
| 13-Sep | 21.24.11 | -15.37536 | -174.00341 | 1304 | 3 | 115 | Water is murky with biology floating in the water column. |
| 13-Sep | 21.24.22 | -15.37536 | -174.00338 | 1302 | 2 | 116 | Angular debris and a fish. |
| 13-Sep | 21.24.55 | -15.37537 | -174.00336 | 1300 | 4 | 116 | At 1300m as we move upslope with angular debris. Hdg 115. |
| 13-Sep | 21.26.20 | -15.37539 | -174.00327 | 1296 | 3 | 110 | Polychaetes still swimming around. |
| 13-Sep | 21.27.05 | -15.37539 | -174.00327 | 1294 | 3 | 99 | Rocks are stained with iron and sulfur probably coming from a vent system upslope and cascading downslope. |
| 13-Sep | 21.27.30 | -15.37542 | -174.00325 | 1293 | 3 | 99 | This type of magma typically erupts slowly. Seeing coarse volcanic pieces. |
| 13-Sep | 21.27.47 | -15.37542 | -174.00325 | 1292 | 3 | 99 | More angles and jointing where they break into fragments. |
| 13-Sep | 21.28.02 | -15.37543 | -174.00322 | 1290 | 3 | 98 | Could be sulfur beads all over the surface of the lava fragments. |
| 13-Sep | 21.28.19 | -15.37543 | -174.00322 | 1290 | 3 | 98 | Turning lasers on and HD tape turned off. |
| 13-Sep | 21.28.38 | -15.37544 | -174.00318 | 1288 | 3 | 99 | Lasers are 20m apart (not visible on HD). |
| 13-Sep | 21.29.04 | -15.37544 | -174.00318 | 1288 | 2 | 93 | Now can see lasers on in HD. |
| 13-Sep | 21.29.40 | -15.37547 | -174.00314 | 1285 | 2 | 90 | Gelatinous (bag creatures?) on the rocks. |
| 13-Sep | 21.30.09 | -15.37547 | -174.00312 | 1285 | 3 | 94 | Bags only seen in post-eruptive areas. |
| 13-Sep | 21.30.37 | -15.37547 | -174.00312 | 1283 | 2 | 93 | Heading is 093 and depth is 1283 as we move upslope. |
| 13-Sep | 21.31.05 | -15.37546 | -174.00311 | 1282 | 2 | 89 | Pieces have gotten smaller and more sand-like. (Apple-sized). |
| 13-Sep | 21.32.03 | -15.37548 | -174.00308 | 1280 | 2 | 84 | Finer grained material on the left with larger pieces to the right. |
| 13-Sep | 21.32.21 | -15.37549 | -174.00307 | 1280 | 2 | 82 | Continuing upslope. |

| date | time | latitude | longitude | Z | alt | hdg | Q324 - Motutahi (Cone at Volcano O) Dive Comments |
|---|---|---|---|---|---|---|---|
| 13-Sep | 21.32.45 | -15.37550 | -174.00306 | 1279 | 2 | 75 | Very steep with a wall in front on the sonar display. Hdg 076. |
| 13-Sep | 21.33.13 | -15.37552 | -174.00302 | 1277 | 3 | 80 | Bags seen on the Juan de Fuca post-eruptions but origins not understood. |
| 13-Sep | 21.33.38 | -15.37550 | -174.00301 | 1276 | 3 | 98 | Sediment (brown) around the larger pieces of rubble. |
| 13-Sep | 21.34.48 | -15.37552 | -174.00302 | 1277 | 2 | 97 | Going to sit down to look at the color of the sediment. |
| 13-Sep | 21.35.10 | -15.37550 | -174.00301 | 1277 | 1 | 98 | Thinking there could be some microbial mats on the surface. |
| 13-Sep | 21.35.29 | -15.37551 | -174.00303 | 1277 | 1 | 97 | Clearly there is mat here. HD tape is on. |
| 13-Sep | 21.37.06 | -15.37550 | -174.00301 | 1277 | 1 | 99 | Mat is heavily coating some fine-grained surface. Contrast to loose rubble further downslope. |
| 13-Sep | 21.38.37 | -15.37552 | -174.00301 | 1277 | 1 | 102 | Looking at some of the biology in the upper right corner of the HD. |
| 13-Sep | 21.39.31 | -15.37549 | -174.00302 | 1276 | 3 | 108 | The biology could be some type of worms. HD tape is off. |
| 13-Sep | 21.39.49 | -15.37549 | -174.00301 | 1274 | 3 | 100 | Seafloor looks carpeted by microbial mat and sediment. |
| 13-Sep | 21.40.12 | -15.37552 | -174.00301 | 1272 | 3 | 92 | Some larger lava pieces within the sediment and mats. |
| 13-Sep | 21.40.34 | -15.37548 | -174.00293 | 1269 | 3 | 94 | Pillow tube buried and other lava pillows (old) in the sediments. |
| 13-Sep | 21.40.48 | -15.37551 | -174.00291 | 1270 | 2 | 93 | More angular fragments. |
| 13-Sep | 21.41.31 | -15.37552 | -174.00291 | 1265 | 5 | 82 | Sulfur stripes (chutes) coming down the summit. |
| 13-Sep | 21.42.01 | -15.37553 | -174.00287 | 1265 | 2 | 89 | Looks more like sulfur than microbial mat and more bags. |
| 13-Sep | 21.42.18 | -15.37553 | -174.00282 | 1264 | 2 | 91 | Looks like once molten sulfur. |
| 13-Sep | 21.42.43 | -15.37555 | -174.00284 | 1265 | 2 | 91 | High proportion of gel sacks with sulfur. |
| 13-Sep | 21.44.04 | -15.37551 | -174.00285 | 1265 | 2 | 91 | Want slurp of both gelatinous bags and white sulfur. |
| 13-Sep | 21.46.05 | -15.37554 | -174.00283 | 1265 | 2 | 91 | Pilot change before slurp samples. |
| 13-Sep | 21.46.36 | -15.37554 | -174.00281 | 1265 | 2 | 91 | Want 2 slurps; first with bags and darker material and second of the sulfur sediments. |
| 13-Sep | 21.47.13 | -15.37549 | -174.00283 | 1265 | 2 | 90 | Bags are more concentrated on the darker sediments than the sulfur. |
| 13-Sep | 21.48.03 | -15.37550 | -174.00283 | 1265 | 2 | 92 | Daniel is piloting with Ralph on the arm. First will take temperature reading. |
| 13-Sep | 21.49.57 | -15.37553 | -174.00282 | 1265 | 2 | 93 | Samples will be taken from the slope of the cone (west side) in area first large concentration of sulfur deposits (striped downslope). |
| 13-Sep | 21.51.10 | -15.37554 | -174.00285 | 1265 | 1 | 92 | Probe for temperature has been placed in the arm. |
| 13-Sep | 21.52.48 | -15.37554 | -174.00286 | 1264 | 2 | 95 | Placing temperature probe in the bag creatures. |
| 13-Sep | 21.53.10 | -15.37554 | -174.00286 | 1265 | 2 | 87 | Ambient 4.7°C; seeing no change with probe in the sediment. |
| 13-Sep | 21.53.47 | -15.37552 | -174.00286 | 1265 | 2 | 80 | Trying second probe into the sediment. |
| 13-Sep | 21.55.54 | -15.37552 | -174.00286 | 1265 | 1 | 95 | Probe is in the sediment. |
| 13-Sep | 21.56.10 | -15.37554 | -174.00286 | 0 | 0 | 0 | Moving the probe into the bags with bag remaining intact after piercing. Temperature remains at ambient. |
| 13-Sep | 21.56.53 | -15.37554 | -174.00286 | 1265 | 2 | 93 | HD tape recording has been on. Turned on when landed. Only .1 degree increase in temperature. |
| 13-Sep | 21.57.49 | -15.37553 | -174.00282 | 1266 | 1 | 94 | Without any temperature increase we will not be suction sampling here. |
| 13-Sep | 21.58.10 | -15.37555 | -174.00284 | 1266 | 2 | 94 | Stowing the temperature probe. |
| 13-Sep | 21.59.01 | -15.37553 | -174.00288 | 1265 | 2 | 94 | Rocks with sacks and sediments. |
| 13-Sep | 21.59.16 | -15.37553 | -174.00286 | 1265 | 1 | 94 | Stills will be taken before we move on. |
| 13-Sep | 22.00.28 | -15.37553 | -174.00286 | 1266 | 2 | 94 | Bag creature when detached looks like a jellyfish. |
| 13-Sep | 22.01.10 | -15.37553 | -174.00283 | 1265 | 2 | 94 | Temp probe is in holster. |
| 13-Sep | 22.03.26 | -15.37554 | -174.00288 | 1265 | 2 | 100 | Speculating that there has been an eruption in the last few years due to the presence of these bags. |
| 13-Sep | 22.04.36 | -15.37553 | -174.00289 | 1265 | 2 | 108 | Taking still photos before getting underway. |
| 13-Sep | 22.05.55 | -15.37550 | -174.00289 | 1265 | 1 | 111 | HD tape is off. |
| 13-Sep | 22.06.55 | -15.37551 | -174.00290 | 1265 | 2 | 69 | Lifting off this area to return journey upslope. |
| 13-Sep | 22.07.13 | -15.37552 | -174.00291 | 1265 | 2 | 68 | Loose unconsolidated volcaniclastic sediments. |
| 13-Sep | 22.08.23 | -15.37552 | -174.00289 | 1263 | 2 | 90 | Moving upslope at 090. |
| 13-Sep | 22.09.32 | -15.37547 | -174.00285 | 1261 | 2 | 90 | Loose sands and intermittent staining with white material (probably sulfur). |
| 13-Sep | 22.10.25 | -15.37547 | -174.00286 | 1259 | 3 | 91 | Steep slope with very altered rocks. More white staining between the rocks. |
| 13-Sep | 22.10.40 | -15.37547 | -174.00286 | 1259 | 3 | 91 | Sulfur coating the medium-sized rocks. |
| 13-Sep | 22.11.08 | -15.37547 | -174.00286 | 1259 | 3 | 91 | Previous samples have been very corrosive materials. |
| 13-Sep | 22.11.10 | -15.37547 | -174.00286 | 1259 | 3 | 91 | More smoke in the water as we approach summit (about 50m to go). |
| 13-Sep | 22.11.57 | -15.37554 | -174.00281 | 1254 | 4 | 91 | Large amount of the bag material. Orange-brown is staining. |
| 13-Sep | 22.12.31 | -15.37553 | -174.00282 | 1250 | 7 | 90 | Coming over angular block (very large). Eel in water. |
| 13-Sep | 22.12.50 | -15.37553 | -174.00282 | 1250 | 7 | 90 | Lost bottom contact but can see sulfur coating of seafloor ahead. |
| 13-Sep | 22.13.32 | -15.37553 | -174.00282 | 1250 | 7 | 90 | Large rounded rock with very corroded surface. |
| 13-Sep | 22.13.34 | -15.37553 | -174.00282 | 1250 | 7 | 90 | Looks like snow-bed with no bio-film. More extensively weathered by hot fluids. |
| 13-Sep | 22.14.17 | -15.37553 | -174.00282 | 1250 | 7 | 90 | Some shimmer in the water and heavily coated |
| 13-Sep | 22.14.31 | -15.37553 | -174.00282 | 1250 | 7 | 90 | More shimmer all over the summit. |
| 13-Sep | 22.15.02 | -15.37553 | -174.00282 | 1250 | 7 | 90 | Consensus is to keep going to look for more focused flow. |

| date | time | latitude | longitude | Z | alt | hdg | Q324 - Motutahi (Cone at Volcano O) Dive Comments |
|---|---|---|---|---|---|---|---|
| 13-Sep | 22.15.49 | -15.37553 | -174.00282 | 1250 | 7 | 90 | Sonar is not showing the vehicle in a small crater-looks like a slope with some shadow-zones. No hard return on the sonar to the right. |
| 13-Sep | 22.16.06 | -15.37553 | -174.00282 | 1250 | 7 | 90 | Still not on the summit. No USBL at the moment. |
| 13-Sep | 22.16.49 | -15.37553 | -174.00282 | 1250 | 7 | 90 | Looks like steep slope with no ridge. |
| 13-Sep | 22.17.25 | -15.37553 | -174.00282 | 1250 | 7 | 90 | No USBL for 10 minutes. |
| 13-Sep | 22.17.40 | -15.37553 | -174.00282 | 1250 | 7 | 90 | Summit is to the east of ROV. |
| 13-Sep | 22.18.21 | -15.37553 | -174.00282 | 1250 | 7 | 90 | Trying to get the USBL to reset for a nav fix. |
| 13-Sep | 22.19.42 | -15.37553 | -174.00282 | 1250 | 7 | 90 | Unconsolidated material with the corrosive water may not lead to any areas where there will be focused flow. |
| 13-Sep | 22.21.57 | -15.37559 | -174.00258 | 1246 | 3 | 91 | USBL is reestablished. |
| 13-Sep | 22.22.10 | -15.37559 | -174.00258 | 1246 | 3 | 90 | Continuing upslope. Hdg 090. |
| 13-Sep | 22.23.33 | -15.37559 | -174.00258 | 1247 | 3 | 110 | Lots of shimmer in the water. |
| 13-Sep | 22.23.51 | -15.37559 | -174.00258 | 1247 | 3 | 110 | Going to continue upslope to get a look at the summit. |
| 13-Sep | 22.24.30 | -15.37559 | -174.00258 | 1247 | 3 | 110 | Lots of debris in the water from the thrusters. |
| 13-Sep | 22.24.52 | -15.37558 | -174.00259 | 1246 | 2 | 133 | Very altered rocks coated with sulfur. Looks like cloud up ahead. |
| 13-Sep | 22.25.09 | -15.37565 | -174.00256 | 1245 | 2 | 149 | Saw these clouds of white smoke in the camera tows. |
| 13-Sep | 22.25.27 | -15.37563 | -174.00257 | 1245 | 3 | 149 | Mostly at the summit but in the sonar there are reflections ahead. |
| 13-Sep | 22.25.45 | -15.37560 | -174.00258 | 1245 | 3 | 135 | Little flat area and looks like a bit of a crater on the sonar. |
| 13-Sep | 22.26.18 | -15.37565 | -174.00257 | 0 | 0 | 0 | Using the sonar to hunt around this crater. |
| 13-Sep | 22.26.50 | -15.37566 | -174.00256 | 1243 | 3 | 172 | Looking around the summit with steep piles of unconsolidated material all coated with sulfur. |
| 13-Sep | 22.27.14 | -15.37567 | -174.00257 | 1243 | 3 | 172 | Lots of smoke above the vehicle. |
| 13-Sep | 22.27.38 | -15.37567 | -174.00257 | 1243 | 3 | 171 | Small finger-like structures protruding from the seafloor. Maybe 10-20cm high. |
| 13-Sep | 22.29.14 | -15.37569 | -174.00259 | 1244 | 1 | 138 | Probably worth out while to take a piece of this rock here. |
| 13-Sep | 22.29.45 | -15.37570 | -174.00257 | 1244 | 2 | 133 | Here at the top of Volcano O cone we're seeing little bit of warm water coming from the seabed. Large grains coated with sulfur. Piece of material protruding out of seabed. |
| 13-Sep | 22.30.40 | -15.37568 | -174.00260 | 1244 | 1 | 135 | HD turned on. |
| 13-Sep | 22.31.03 | -15.37569 | -174.00257 | 1244 | 2 | 101 | Want to get that sulfur structure in the HD. |
| 13-Sep | 22.31.06 | -15.37569 | -174.00257 | 1244 | 2 | 92 | Over the last 15 minutes: Moved from a terrain of angular rock fragments; to microbial biofilm on the surface; to steep slope into uneven topography summit; undulating constructural topography. |
| 13-Sep | 22.32.06 | -15.37565 | -174.00260 | 1245 | 1 | 97 | We see diffuse flow; coarse sands; no obvious macrofauna on the seabed here. Could be microbes. Harsher more caustic environment than we saw just outside the summit region of the cone. |
| 13-Sep | 22.32.49 | -15.37563 | -174.00260 | 1244 | 1 | 79 | Looks like foliated dacite (the rock here) covered with sulfurous coating. |
| 13-Sep | 22.33.17 | -15.37564 | -174.00260 | 1244 | 1 | 80 | Will grab the rock first then look around for a place to sample the water. Here at the summit of the cone. Then will collect some water (preferably clear water and then some smoky shimmering water). |
| 13-Sep | 22.35.01 | -15.37569 | -174.00259 | 1244 | 1 | 78 | The sample disintegrated. It is not dacite?? It crumbled. They are trying to pick up a piece of the rock/sulfur.. |
| 13-Sep | 22.36.24 | -15.37565 | -174.00257 | 1244 | 1 | 79 | Seems like we need a bag scoop. The rock looks black on the inside. It's not altered to clay. |
| 13-Sep | 22.37.01 | -15.37564 | -174.00260 | | | | Attempting to pick up a piece of this rock again. Other rocks collected in the past have been more competent. This rock probably started out that way - just ended up in the wrong place. |
| 13-Sep | 22.38.13 | -15.37565 | -174.00259 | 1244 | 1 | 76 | **Geo Sample: Q324-rock-01**. Grabbed a piece of this rock (candy bar size). Black on the inside and coated on the outside. Fragile (crumbly) rock. Grabbing another small piece into same sample box 7. Got 2 pieces of the crumbled rock. |
| 13-Sep | 22.41.25 | -15.37568 | -174.00259 | 1244 | 1 | 77 | At the summit of the dacite cone at Volcano O. |
| 13-Sep | 22.42.38 | -15.37569 | -174.00257 | 1244 | 1 | 43 | History of Volcano O name. Richard's group started with volcano A through volcano P. |
| 13-Sep | 22.44.59 | -15.37566 | -174.00257 | 1244 | 1 | 34 | **Target Q324-rock-01.** |
| 13-Sep | 22.45.02 | -15.37566 | -174.00257 | 1244 | 1 | 36 | The sulfur appears to be only skin deep. It's a thin layer. The top of the edifice is formed of coarse unfocussed flow. High porosity through these coarse sediments. |
| 13-Sep | 22.49.29 | -15.37568 | -174.00260 | 1244 | 1 | 37 | HD shows where the crust was broken through while sampling and seeing some more flow. |
| 13-Sep | 22.50.22 | -15.37568 | -174.00259 | 1244 | 2 | 41 | ROV doing some cable management while here. Going east toward contact being seen in the sonar. |
| 13-Sep | 22.51.29 | -15.37563 | -174.00259 | 1242 | 4 | 101 | Greg is piloting. Switching scientists in the van. |
| 13-Sep | 22.51.42 | -15.37563 | -174.00259 | 1242 | 4 | 102 | Seeing some smoke in the HD. |

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|---|---|---|---|---|---|---|---|
| 13-Sep | 22.52.45 | -15.37563 | -174.00260 | 1242 | 3 | 102 | Chadwick and Embley now in control van. |
| 13-Sep | 22.54.07 | -15.37570 | -174.00251 | 1241 | 3 | 102 | Smoke in the water (haze) while hovering above this cone area. Unlike the clear water we had been seeing. |
| 13-Sep | 22.54.28 | -15.37570 | -174.00251 | 1242 | 2 | 104 | ROV looking east at 100deg. |
| 13-Sep | 22.55.01 | -15.37571 | -174.00250 | 1243 | 1 | 102 | Very smoky water. Lots of particulates in the water. |
| 13-Sep | 22.55.50 | -15.37571 | -174.00250 | 1241 | 3 | 102 | Heading along at 103deg. Clouds of denser smoke must be close to venting. |
| 13-Sep | 22.56.04 | -15.37571 | -174.00250 | 0 | 0 | 0 | Very dense fog (smoke). |
| 13-Sep | 22.56.34 | -15.37575 | -174.00245 | 1241 | 3 | 102 | Nothing much on the sonar. Some small reflections to the south (ridge on the right). |
| 13-Sep | 22.57.29 | -15.37577 | -174.00248 | 1243 | 1 | 103 | Dipping below the cloud. |
| 13-Sep | 22.57.48 | -15.37580 | -174.00247 | 1243 | 2 | 82 | Heading 102 and below the smoke again-just cleared then back in. |
| 13-Sep | 22.57.58 | -15.37580 | -174.00247 | 1243 | 1 | 78 | Sulfurous fog over the cone. |
| 13-Sep | 22.58.10 | -15.37580 | -174.00247 | 1243 | 2 | 77 | Volcanic sand on the bottom. |
| 13-Sep | 22.58.45 | -15.37573 | -174.00250 | 1243 | 2 | 78 | Fog has yellow tinge. Fish-eye lens very yellow. |
| 13-Sep | 22.59.00 | -15.37580 | -174.00248 | 1242 | 2 | 62 | Searching for source of the fog. |
| 13-Sep | 22.59.11 | -15.37572 | -174.00249 | | | | Downslope is clear. |
| 13-Sep | 22.59.57 | -15.37575 | -174.00245 | 1242 | 1 | 81 | Our current bathymetry has the vehicle near the center of the cone. |
| 13-Sep | 23.01.18 | -15.37578 | -174.00240 | 1242 | 1 | 78 | Thickest smoke on all cameras. |
| 13-Sep | 23.02.00 | -15.37576 | -174.00241 | 1242 | 2 | 78 | Edge of smoke. Particularly murky compared to other systems. |
| 13-Sep | 23.02.46 | -15.37575 | -174.00238 | 1242 | 2 | 342 | Looks like the edge of a pit that may be the source. |
| 13-Sep | 23.02.57 | -15.37576 | -174.00234 | 1241 | 2 | 338 | Seeing former sulfur flows on the edge of the pit. |
| 13-Sep | 23.03.13 | -15.37576 | -174.00231 | 1242 | 2 | 338 | Smoke is coming from the pit. |
| 13-Sep | 23.03.40 | -15.37576 | -174.00236 | 1240 | 4 | 335 | Looking over the edge of the pit. |
| 13-Sep | 23.04.19 | -15.37574 | -174.00235 | 1237 | 12 | 318 | Moving laterally around the edge of this pit to keep the ROV looking forward. |
| 13-Sep | 23.05.20 | -15.37574 | -174.00237 | 1240 | 4 | 333 | On the side of the cone with clear water and water shimmering. Seeing edge again with smoke rising from the pit. |
| 13-Sep | 23.05.39 | -15.37574 | -174.00235 | 1239 | 5 | 328 | 40m across this pit. |
| 13-Sep | 23.06.44 | -15.37573 | -174.00234 | 1240 | 3 | 320 | Edge of pit again. Correction: the pit is only 10m across. |
| 13-Sep | 23.07.02 | -15.37574 | -174.00235 | 1240 | 4 | 318 | Emitting dense clouds of sulfurous material. |
| 13-Sep | 23.07.21 | -15.37571 | -174.00240 | | | | Looks like source below here with thick concentration of the plume. |
| 13-Sep | 23.07.31 | -15.37571 | -174.00237 | 1242 | 3 | 315 | Facing 316. |
| 13-Sep | 23.08.02 | -15.37572 | -174.00231 | 1243 | 3 | 303 | Moving around the pit-looks center on of crater on our bathymetric map. |
| 13-Sep | 23.08.42 | -15.37567 | -174.00231 | 1244 | 2 | 302 | Can see shimmering water from the edges of the pit and rocks. |
| 13-Sep | 23.09.15 | -15.37566 | -174.00230 | 1245 | 2 | 301 | Would be good to get sample of the shimmering water at the edge of the pit. |
| 13-Sep | 23.11.42 | -15.37568 | -174.00230 | 1244 | 1 | 298 | Will get temperature reading first before taking water sample. |
| 13-Sep | 23.12.23 | -15.37565 | -174.00233 | 1244 | 2 | 298 | No marine animals in this area at all. |
| 13-Sep | 23.13.53 | -15.37568 | -174.00226 | 1244 | 2 | 298 | Intense diffuse flow at the top edge of the pit. |
| 13-Sep | 23.15.07 | -15.37568 | -174.00231 | 1245 | 1 | 298 | Will sample with the major before getting a temperature reading. |
| 13-Sep | 23.15.38 | -15.37567 | -174.00230 | 1244 | 1 | 298 | Retrieved the white major from the basket. |
| 13-Sep | 23.20.05 | -15.37567 | -174.00231 | 1244 | 1 | 299 | **Fluid Sample: Q324-major-02** .Fired using White port major. At rim of cone pit with high diffuse flow. |
| 13-Sep | 23.20.22 | -15.37566 | -174.00231 | 1244 | 2 | 298 | Fired the white port major. Will take temperature after. |
| 13-Sep | 23.22.35 | -15.37566 | -174.00231 | 1244 | 1 | 299 | HD tape on. Taking still photos. |
| 13-Sep | 23.23.33 | -15.37567 | -174.00229 | 1244 | 1 | 299 | USBL fix is good here. **Crater Rim location**. |
| 13-Sep | 23.25.01 | -15.37568 | -174.00233 | 1244 | 2 | 298 | Putting major back in holster. |
| 13-Sep | 23.26.23 | -15.37574 | -174.00235 | 1244 | 2 | 298 | HD tape off (only on a minute). |
| 13-Sep | 23.28.34 | -15.37569 | -174.00236 | 1244 | 1 | 298 | Major is secured in holster. |
| 13-Sep | 23.31.18 | -15.37568 | -174.00234 | 1244 | 1 | 298 | Retrieving the blue GTB from the basket to sample at the same location (Crater Rim). |
| 13-Sep | 23.36.27 | -15.37568 | -174.00234 | 1244 | 1 | 303 | Blue GTB removed from basket. |
| 13-Sep | 23.38.43 | -15.37570 | -174.00233 | 1244 | 2 | 301 | Positioning the probe. |
| 13-Sep | 23.44.54 | -15.37570 | -174.00236 | 1244 | 1 | 302 | **Gas Sample: Q324-gtb-03.** Blue gastight fired. Same place as major at Crater Rim. Placing the tip near as possible where the water sample was taken. |
| 13-Sep | 23.46.23 | -15.37570 | -174.00233 | 1244 | 2 | 302 | HD tape 23:45-23:46 was on during sampling. |
| 13-Sep | 23.47.07 | -15.37568 | -174.00233 | 1245 | 1 | 302 | Stowing the blue GTB. |
| 13-Sep | 23.48.27 | -15.37569 | -174.00233 | 1244 | 1 | 302 | Everything looks white here due to the coating of sulfur. |
| 13-Sep | 23.49.18 | -15.37569 | -174.00233 | 1244 | 1 | 301 | GTB secured. |
| 13-Sep | 23.49.33 | -15.37570 | -174.00234 | | | | Next will retrieve the temperature probe. |
| 13-Sep | 23.51.55 | -15.37570 | -174.00231 | 1244 | 2 | 302 | Taking still photos. |
| 13-Sep | 23.54.58 | -15.37568 | -174.00238 | 1244 | 2 | 302 | Looks like more sulfur smoke coming out of the pit. |

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|---|---|---|---|---|---|---|---|
| 13-Sep | 23.55.24 | -15.37568 | -174.00238 | 1244 | 1 | 302 | Large pulse of sulfurous smoke. |
| 13-Sep | 23.57.57 | -15.37567 | -174.00238 | 1244 | 1 | 302 | Exchanging pilots in the van. Will take temperature after. |
| 14-Sep | 00.03.26 | -15.37569 | -174.00234 | 1244 | 1 | 302 | Smoke appears to be going east to west so if work ways down the east end the visibility may be better. |
| 14-Sep | 00.04.13 | -15.37565 | -174.00237 | 1244 | 2 | 302 | Retrieving the temperature probe from the basket. |
| 14-Sep | 00.05.33 | -15.37564 | -174.00237 | 1244 | 2 | 302 | Temperature probe is out. ROV is in the same location: Crater Rim. |
| 14-Sep | 00.06.29 | -15.37566 | -174.00236 | 1244 | 1 | 302 | Placing probe as close as possible to where the 2 samples were taken (fluid and gas). |
| 14-Sep | 00.07.17 | -15.37573 | -174.00234 | 1244 | 1 | 302 | Another cloud of smoke is coming over the top in the other cameras (some in the HD camera). |
| 14-Sep | 00.08.19 | -15.37565 | -174.00237 | 1245 | 2 | 302 | Probe near where the samples taken. 62…70…78…84..88..93…96…98..slowing down at 104. |
| 14-Sep | 00.08.37 | -15.37566 | -174.00234 | 1244 | 1 | 302 | Temperature probe high so far 104.9. High of 105.9. |
| 14-Sep | 00.09.00 | -15.37569 | -174.00237 | 1244 | 1 | 302 | Pulling out and repositioning. |
| 14-Sep | 00.10.05 | -15.37566 | -174.00236 | | | | Position above the sediment approximately at the height of the water sample. 19.5…**22°C**. (Approximate temperature of major & GTB samples). |
| 14-Sep | 00.10.52 | -15.37568 | -174.00230 | 1244 | 2 | 302 | Putting probe tip at the base of the rock where the high flow is. |
| 14-Sep | 00.14.17 | -15.37570 | -174.00236 | 1244 | 1 | 302 | Stowing the temperature probe without the temp taken from the base of the rock. |
| 14-Sep | 00.17.57 | -15.37567 | -174.00234 | 1244 | 1 | 301 | Ambient temperature in the holster is 5.3°C but probe is not all the way in the holster. |
| 14-Sep | 00.19.51 | -15.37567 | -174.00234 | 1244 | 2 | 302 | Another pulse of smoke while waiting for sampling. |
| 14-Sep | 00.22.12 | -15.37570 | -174.00234 | 1244 | 1 | 302 | Significant amount of smoke while trying to place temperature probe in the holster. |
| 14-Sep | 00.23.32 | -15.37568 | -174.00236 | 1244 | 1 | 302 | Sulfur oxidizing microbes are probably producing the filamentous material waving on the rocks. Going to try to collect some of the microbes with the suction sampler. |
| 14-Sep | 00.29.27 | -15.37569 | -174.00237 | 1244 | 1 | 302 | More smoke again after awhile of clearer water. |
| 14-Sep | 00.31.20 | -15.37570 | -174.00233 | 1244 | 2 | 303 | Visibility much decreased. |
| 14-Sep | 00.33.52 | -15.37568 | -174.00234 | 1244 | 2 | 301 | Still trying to get the temperature probe back into the basket. |
| 14-Sep | 00.51.26 | -15.37568 | -174.00233 | 1245 | 2 | 306 | The temperature probe is finally stowed after more than a half hour effort. Still at "Crater Rim site". |
| 14-Sep | 00.55.04 | -15.37563 | -174.00233 | 1244 | 1 | 307 | Next we'll remove the suction hose and take a sample with that. |
| 14-Sep | 00.56.10 | -15.37565 | -174.00233 | 1245 | 1 | 307 | Suction will most likely be composed of: combination of sulfur and ash particles; crust; possibly microbial mats we're hoping end up in this suction |
| 14-Sep | 00.56.43 | -15.37566 | -174.00237 | 1245 | 1 | 306 | Temperature was 22°C at seds. Temp under surface is 105°C. The warm water is seeping up everywhere from the seafloor. |
| 14-Sep | 00.56.58 | -15.37570 | -174.00236 | 1245 | 1 | 307 | Sulfur cloud coming at us probably due to change in currents near the seafloor. |
| 14-Sep | 00.59.55 | -15.37566 | -174.00236 | 1245 | 1 | 329 | This environment is the equivalent of living in constant acid rain. |
| 14-Sep | 01.01.34 | -15.37566 | -174.00238 | 1245 | 1 | 339 | Suctioning the seafloor here. |
| 14-Sep | 01.03.04 | -15.37566 | -174.00236 | 1244 | 1 | 339 | Cleaning out the suction hose. |
| 14-Sep | 01.06.01 | -15.37566 | -174.00237 | 1245 | 1 | 339 | Clean hose ready for the sample. |
| 14-Sep | 01.04.46 | -15.37567 | -174.00237 | 1245 | 1 | 339 | **Bio Sample: Q234-bio-geo-04**. Suctioning the seafloor surface coating. Sample probably includes sulfur and ash particles; crust; microbial mats. Looks like they are getting lots of the white material. Into suction bin 1. **Crater Rim site.** |
| 14-Sep | 01.09.12 | -15.37565 | -174.00237 | 1244 | 1 | 339 | Ram on the major and gastights may be bent a bit. Will have to be straightened out a bit. Quest is working on that. |
| 14-Sep | 01.11.03 | -15.37566 | -174.00236 | 1245 | 1 | 339 | Doing some housekeeping; putting the hose into the submersible. |
| 14-Sep | 01.11.29 | -15.37568 | -174.00235 | 1245 | 1 | 339 | Bob is excited about the technology that allows us to sit on the top of this volcano and observe and sample. Things have improved over time. |
| 14-Sep | 01.13.26 | -15.37565 | -174.00233 | 1245 | 1 | 338 | The plume is looking more yellow now. More sulfur coming out? The intensity of activity can change in the course of minutes to hours in these volcanic systems. |
| 14-Sep | 01.14.34 | -15.37564 | -174.00236 | 1245 | 1 | 339 | The prospects of having a molten sulfur pit at the bottom of this crater is a high possibility. It's a matter of getting down there safely. Plus we have more exploring to do to the east. |
| 14-Sep | 01.16.20 | -15.37565 | -174.00234 | 1245 | 1 | 339 | The temperatures are high enough to get liquid sulfur. |
| 14-Sep | 01.17.43 | -15.37566 | -174.00234 | 1245 | 1 | 339 | Earlier we probably saw a sulfur flow earlier. |
| 14-Sep | 01.18.00 | -15.37564 | -174.00234 | 1245 | 1 | 339 | Lots of sulfur coming out of this pit. Pumping sulfur particulates. |
| 14-Sep | 01.20.34 | -15.37568 | -174.00236 | 1245 | 1 | 339 | Going to reposition a couple meters to get water samples. Then will have to do some tether management. Will be here a little bit. |

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|---|---|---|---|---|---|---|---|
| 14-Sep | 01.21.23 | -15.37565 | -174.00235 | 1245 | 2 | 347 | Can see the rim of the crater with particulate sulfur rising out of it. It's warm and rising like a fog. Looks like its rising out of the seds right in front of us. |
| 14-Sep | 01.22.14 | -15.37564 | -174.00236 | 1245 | 2 | 340 | Looking on the right looks like an example of a hollow drained out sulfur flow. |
| 14-Sep | 01.23.46 | -15.37564 | -174.00230 | | | | The sulfur here has black rock fragments on it. |
| 14-Sep | 01.24.35 | -15.37564 | -174.00234 | 1247 | 1 | 340 | We're going to get our water samples here about 2 meters from the last sampling spot. We're right on the crater rim with good flow pouring out of the porous seafloor. |
| 14-Sep | 01.25.56 | -15.37565 | -174.00233 | 1246 | 1 | 338 | Dave wants to look in the vent more sticking the HD camera over the rim. |
| 14-Sep | 01.27.27 | -15.37562 | -174.00230 | 1247 | 1 | 337 | Going to attempt a major sample. |
| 14-Sep | 01.29.22 | -15.37565 | -174.00235 | 1247 | 1 | 337 | Grabbing the red major sampler. |
| 14-Sep | 01.31.14 | -15.37564 | -174.00233 | 1246 | 1 | 337 | Still trying to grab the major. It's looking like they have it now. |
| 14-Sep | 01.33.29 | -15.37567 | -174.00233 | 1247 | 1 | 337 | Looking the major over in one of the cameras making sure they have it. Why all the circling around with the arm? Rumor has it there is a rotation problem with the arm. |
| 14-Sep | 00.00.00 | -15.37567 | -174.00233 | 1244 | 1 | 302 | |
| 14-Sep | 01.39.35 | -15.37565 | -174.00233 | 1247 | 1 | 337 | Attempting to line up the bottle with the hydraulic ram on the Quest arm. |
| 14-Sep | 01.41.20 | -15.37566 | -174.00234 | 1247 | 1 | 337 | Looks like it might work now? Maybe not. |
| 14-Sep | 01.43.23 | -15.37567 | -174.00234 | 1247 | 1 | 337 | Dave is explaining how to line this up. |
| 14-Sep | 01.44.22 | -15.37566 | -174.00231 | 1247 | 1 | 337 | The nozzle is now in an orifice on the outside of the crater rim. |
| 14-Sep | 01.45.37 | -15.37565 | -174.00233 | 1247 | 1 | 337 | **Fluid Sample: Q324-major-05**. Crater Rim site. Sampling for fluids. Right on the edge of the crater. This sample is about 2 meters away from sample 4. The sampler is positioned over an outflow near the pit in intense flow. The major was triggered. But the spring on the bottle does not appear to be moving. **That sample was unsuccessful. Will not use this for sample 5.** |
| 14-Sep | 01.48.12 | -15.37567 | -174.00233 | 1247 | 1 | 337 | Dave wants to move back from the edge of the pit before stowing the major. |
| 14-Sep | 01.49.26 | -15.37568 | -174.00231 | | | | We're going to try a gastight if they can bend the ram back to a better position? |
| 14-Sep | 01.50.37 | -15.37567 | -174.00234 | | | | Stowing the major. |
| 14-Sep | 01.52.25 | -15.37564 | -174.00234 | 1247 | 1 | 337 | The ram on the arm was probably bent somehow during the dive. |
| 14-Sep | 01.54.36 | -15.37566 | -174.00233 | 1247 | 1 | 337 | Now we will attempt a gastight; even though the ram on the arm is bent. Will use sample number 5 for this sample (because we know that the major sample did not work). |
| 14-Sep | 01.56.25 | -15.37565 | -174.00234 | 1247 | 1 | 337 | Going for the gastight now. |
| 14-Sep | 01.59.34 | -15.37568 | -174.00230 | 1247 | 1 | 337 | Removing the black gastight sample. |
| 14-Sep | 02.00.08 | -15.37567 | -174.00230 | | | | Preparing to take the gastight sample now. |
| 14-Sep | 02.02.49 | -15.37568 | -174.00231 | 1247 | 1 | 337 | **Gas Sample: Q324-gtb-05.** Sampling for gas in this fracture near the edge of the pit where water is pouring out. Black gastight. |
| 14-Sep | 02.04.35 | -15.37568 | -174.00236 | 1247 | 1 | 337 | Fired the gtb. Looks like it fired! Looks good. |
| 14-Sep | 02.06.15 | -15.37571 | -174.00233 | 1247 | 1 | 337 | Stowing the black gastight now. |
| 14-Sep | 02.07.44 | -15.37567 | -174.00234 | 1247 | 1 | 337 | Changing watches in the van. Bob is coming out. Richard and Tim are going in. |
| 14-Sep | 02.12.37 | -15.37565 | -174.00230 | 1246 | 1 | 337 | Doing maintenance on the tether?? Not sure what's going on. We're sitting here in one spot. |
| 14-Sep | 02.15.11 | -15.37569 | -174.00236 | 1246 | 1 | 337 | We will have to move the ship and do some tether maintenance. |
| 14-Sep | 02.15.39 | -15.37569 | -174.00231 | 1247 | 1 | 337 | We have been located on the SE rim of the pit crater here. Sulfur smoke is leaking out; wafting heavily out of the pit. |
| 14-Sep | 02.16.32 | -15.37570 | -174.00229 | 1247 | 1 | 337 | Smoke is moving from NE to SW so if we want to see into the base of the rim we need to be in the NE side of the pit because that's where the current is coming from. |
| 14-Sep | 02.19.16 | -15.37568 | -174.00231 | 1246 | 2 | 337 | Lifting the ROV off the seafloor and so back to the south side of the pit. |
| 14-Sep | 02.19.46 | -15.37569 | -174.00234 | 0 | 0 | 0 | Dense; gray-black rock. Higher silica content than basalt. Here the rock is covered with this sulfurous coating. We see no sign of bacterial mat or larger life forms up here near the pit (like we saw lower down). It's probably too acidic for life forms here. |
| 14-Sep | 02.21.31 | -15.37569 | -174.00236 | 1246 | 2 | 335 | White sulfurous cloudy smoke coming out of the pit. |
| 14-Sep | 02.23.53 | -15.37562 | -174.00232 | 1245 | 10 | 239 | Will move the ship eastwards now and then we will go around the eastern side of the pit to see what we see on the seafloor. |
| 14-Sep | 02.27.06 | -15.37568 | -174.00226 | 1244 | 8 | 307 | We're on the eastern edge of the pit crater now. We want to look into the bottom of this pit if possible. |
| 14-Sep | 02.28.26 | -15.37560 | -174.00228 | 1242 | 9 | 309 | ~1250m at the top of the cone. |
| 14-Sep | 02.30.38 | -15.37572 | -174.00234 | 1245 | 5 | 316 | The ROV is mainly stationary as the ship moves. Probably 10 more minutes till we continue to explore. |

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|---|---|---|---|---|---|---|---|
| 14-Sep | 02.31.30 | -15.37572 | -174.00232 | 1245 | 3 | 314 | This is the first time that a ROV has been here; although we've known about the shape of this caldera for 10 - 15 years with multibeam. |
| 14-Sep | 02.40.00 | -15.37572 | -174.00234 | 1246 | 2 | 300 | We're still creeping along very slowly around the edge of this pit. |
| 14-Sep | 02.40.31 | -15.37572 | -174.00234 | 1246 | 2 | 300 | The ship has moved as far as they need. |
| 14-Sep | 02.40.53 | -15.37572 | -174.00234 | 1246 | 2 | 299 | Quest cameras are checking out the tether and rest of the vehicle. |
| 14-Sep | 02.41.23 | -15.37572 | -174.00234 | 1246 | 2 | 299 | We have camtow'd this cone on several expeditions. We know there are larger life forms on this cone from those tows. |
| 14-Sep | 02.46.03 | -15.37572 | -174.00234 | 1246 | 2 | 300 | The ship has settled in. We are ready to move the ROV toward the east. |
| 14-Sep | 02.47.10 | -15.37572 | -174.00234 | 1246 | 2 | 300 | Volcanic fragments and boulders in front of us. The shimmering water max temp was 105°C. Ambient temp here is 4-5°C. |
| 14-Sep | 02.49.35 | -15.37572 | -174.00234 | 1246 | 2 | 300 | Here we go! |
| 14-Sep | 02.52.20 | -15.37564 | -174.00229 | 1248 | 4 | 276 | Ambient temp is 5.5 C. |
| 14-Sep | 02.52.29 | -15.37566 | -174.00238 | 1248 | 6 | 275 | We're on the east side of the pit looking due west. |
| 14-Sep | 02.53.06 | -15.37565 | -174.00230 | 1247 | 3 | 250 | The interior slope here is blacker without all the sulfur coating. Lots of smoke. Could be pyroclastic volcanic rock. Probably the locus of volcanic activity at Volcano O |
| 14-Sep | 02.54.09 | -15.37564 | -174.00232 | 1248 | 1 | 326 | Secondary rim here within the pit. |
| 14-Sep | 02.54.37 | -15.37567 | -174.00229 | 1247 | 3 | 3 | Backed off a bit. Lots of smoke. Maneuvering to the east. |
| 14-Sep | 02.54.59 | -15.37566 | -174.00229 | | | | Looking east and north. We're about 6m off the bottom. |
| 14-Sep | 02.55.26 | -15.37574 | -174.00233 | 1242 | 6 | 318 | Seeing tocks covered with some sulfurous material. Brown coating could be iron oxides or bacterial mat? |
| 14-Sep | 02.56.29 | -15.37577 | -174.00236 | 1243 | 2 | 320 | HD tape being recorded. |
| 14-Sep | 02.56.45 | -15.37571 | -174.00239 | 1243 | 3 | 316 | Getting our bearings. |
| 14-Sep | 02.57.48 | -15.37574 | -174.00237 | 1244 | 2 | 330 | Lots of smoke now. Is it a source? |
| 14-Sep | 02.58.03 | -15.37573 | -174.00234 | 1244 | 2 | 327 | We think we're on the east side but not sure it's a perfect circle. We're looking NNE right now. Could be ovoid with NE/SW orientation. |
| 14-Sep | 02.59.01 | -15.37575 | -174.00234 | 1243 | 5 | 293 | Huge amount of smoke coming out of this central cone. It's pumping out a considerable amount of smoke. Still pointed NW. |
| 14-Sep | 03.00.18 | -15.37566 | -174.00229 | 1245 | 5 | 298 | This could be a double crater as well - melded together. |
| 14-Sep | 03.00.56 | -15.37566 | -174.00226 | 1247 | 5 | 259 | Dark material on the inside of the pit. |
| 14-Sep | 03.01.40 | -15.37566 | -174.00226 | 1249 | 2 | 332 | The slope is hard to judge but probably 30 degrees or more. |
| 14-Sep | 03.02.00 | -15.37565 | -174.00227 | 1248 | 3 | 271 | Clearer here with a better view into the pit. |
| 14-Sep | 03.02.25 | -15.37563 | -174.00229 | 1249 | 2 | 243 | We have not seen a point source. The rim depth seems to be fairly constant at 1250 meters. Big crack/fissure here. |
| 14-Sep | 03.03.36 | -15.37562 | -174.00230 | 1252 | 1 | 318 | Still the smoke is generally wafting NE to SW. |
| 14-Sep | 03.03.40 | -15.37561 | -174.00226 | 1252 | 1 | 313 | Angular red-stained rocks ahead. |
| 14-Sep | 03.04.16 | -15.37555 | -174.00226 | 1252 | 4 | 238 | Black fresh-looking material behind us. |
| 14-Sep | 03.04.41 | -15.37555 | -174.00226 | 1254 | 2 | 289 | Seem to be inside the rim. |
| 14-Sep | 03.04.59 | -15.37557 | -174.00227 | 1254 | 1 | 287 | We've probably gone down a couple ledges. |
| 14-Sep | 03.05.35 | -15.37555 | -174.00226 | 1254 | 1 | 288 | Iron? Staining on red rocks. |
| 14-Sep | 03.06.08 | -15.37557 | -174.00226 | 1253 | 2 | 297 | HD tape is off. |
| 14-Sep | 03.06.27 | -15.37556 | -174.00226 | 1253 | 1 | 297 | Scale worm (polychaete) in the muck that has been stirred up. |
| 14-Sep | 03.07.12 | -15.37557 | -174.00225 | 1253 | 1 | 308 | Still maneuvering around this it crater. Looks pretty black where a boulder has rolled downhill. Some manganese/iron crust. |
| 14-Sep | 03.08.19 | -15.37564 | -174.00226 | 1249 | 3 | 180 | We're in the pit. Looking back at the south wall. Getting close to one of the ledges or even the original rim. |
| 14-Sep | 03.09.13 | -15.37565 | -174.00230 | 1246 | 4 | 146 | This looks almost like a ridge here. It's very steep inside the crater as well as out of the crater. |
| 14-Sep | 03.09.53 | -15.37568 | -174.00236 | 1245 | 3 | 113 | The slope on inside and outside is close to the angle of repose. |
| 14-Sep | 03.10.32 | -15.37575 | -174.00234 | 1243 | 3 | 246 | Discussing what to do now. |
| 14-Sep | 03.13.25 | -15.37578 | -174.00239 | 1243 | 3 | 320 | We are thinking about using Rick's Tebo scoop (which will be referred to as the Davis scoop from here on since Rick Davis designed it while in Moyer's lab) to get some of the sediments and rocks here inside the crater pit. |
| 14-Sep | 03.14.21 | -15.37586 | -174.00249 | 1244 | 1 | 337 | Looking at the walls of a central cone in a volcano. |
| 14-Sep | 03.15.40 | -15.37588 | -174.00248 | 1244 | 1 | 337 | We're on the outside of the eastern rim of the pit. Facing the N/NW heading 336 degrees. |
| 14-Sep | 03.17.51 | -15.37588 | -174.00248 | 1244 | 1 | 337 | Taking still images. |
| 14-Sep | 03.19.16 | -15.37582 | -174.00244 | 1244 | 1 | 337 | Will scoop up the black material on the seafloor. Volcaniclastic sediments with biological mat as well. Not sure until we get it to the surface. Here at the eastern side of the crater near the rim. |
| 14-Sep | 03.20.25 | -15.37582 | -174.00245 | 1245 | 1 | 338 | Grabbing Davis sampler 9 to scoop up the volcaniclastic sediments. |
| 14-Sep | 03.21.49 | -15.37583 | -174.00248 | 1244 | 1 | 337 | We would love to go to the bottom of this pit and find the source. |

| date | time | latitude | longitude | Z | alt | hdg | Q324 - Motutahi (Cone at Volcano O) Dive Comments |
|---|---|---|---|---|---|---|---|
| 14-Sep | 03.22.13 | -15.37582 | -174.00244 | 1244 | 1 | 336 | We haven't seen evidence for a well defined source but are not sure about that. It's the pilots call. |
| 14-Sep | 03.25.12 | -15.37580 | -174.00248 | 1245 | 1 | 337 | Grabbing the Davis sampler 9 with the stbd arm. |
| 14-Sep | 03.26.25 | -15.37580 | -174.00248 | 1244 | 1 | 336 | Passing the sampler to the port arm. |
| 14-Sep | 03.26.43 | -15.37580 | -174.00248 | 1244 | 1 | 336 | Bob would like to pass over the vent and see the geometry with the sonar. |
| 14-Sep | 03.27.17 | -15.37580 | -174.00248 | 1244 | 1 | 336 | The Quest group does not want to fly through the smoke so that's out. |
| 14-Sep | 03.29.09 | -15.37580 | -174.00248 | 1244 | 1 | 336 | Preparing the scoop. Ken wants more black stuff than yellow stuff. |
| 14-Sep | 03.31.36 | -15.37588 | -174.00252 | 1244 | 1 | 335 | Richard is waxing poetically on. Good job. |
| 14-Sep | 03.32.29 | -15.37585 | -174.00255 | 1244 | 1 | 337 | **Geo Sample: Q324-geo-bio-06**. Scoop of the black material on the seafloor. Probably volcaniclastic sediment and possibly biological material as well. Black gravelly; cindery type of material. Some white coated material in there as well. Tube about 1/3 full. Heading is 337 degrees. Outside the eastern rim of the pit crater. |
| 14-Sep | 03.34.20 | -15.37584 | -174.00255 | 1244 | 1 | 337 | Rick will look for the microbes living on top and within the rock (endolithic microbes) |
| 14-Sep | 03.40.02 | -15.37585 | -174.00256 | 1244 | 1 | 339 | Continuing around the pit to the north? |
| 14-Sep | 03.41.55 | -15.37583 | -174.00251 | 1245 | 1 | 314 | Facing N/NW crabbing around the pit and trying to look down. |
| 14-Sep | 03.41.58 | -15.37583 | -174.00251 | 1245 | 1 | 318 | Would like to see if there is a single source of this sulfurous cloud or a distribution of vents on the floor that are harder to detect. |
| 14-Sep | 03.43.04 | -15.37584 | -174.00249 | 1245 | 2 | 324 | Crabbing along the rim going slightly down facing NW. |
| 14-Sep | 03.43.28 | -15.37582 | -174.00248 | 1246 | 2 | 321 | Sulfur-coated. Moving into the pit. Doesn't look healthy in there. |
| 14-Sep | 03.44.13 | -15.37577 | -174.00245 | 1246 | 3 | 339 | Sulfur-coated volcanic blocks in front of us. Not seeing any macro fauna. |
| 14-Sep | 03.45.52 | -15.37579 | -174.00250 | 1248 | 1 | 314 | Striated-silica rich lavas here. This may be throwing out clasts of different materials during different eruptions. |
| 14-Sep | 03.46.55 | -15.37576 | -174.00249 | 1248 | 1 | 314 | Contemplating going in there. |
| 14-Sep | 03.49.17 | -15.37574 | -174.00249 | 1248 | 1 | 315 | HD turned down. |
| 14-Sep | 03.49.41 | -15.37578 | -174.00254 | 1248 | 1 | 274 | Moving down into the pit. |
| 14-Sep | 03.50.09 | -15.37577 | -174.00247 | 1248 | 3 | 178 | Beautiful view. HD back on. Looking at the eastern wall of the pit. |
| 14-Sep | 03.50.29 | -15.37577 | -174.00244 | 1248 | 2 | 136 | Going in. Boulder-covered. Black is young juvenile fresh volcanic rock. |
| 14-Sep | 03.51.57 | -15.37576 | -174.00249 | 1249 | 2 | 115 | Going into the pit looking back at the wall. Lots of big boulders. |
| 14-Sep | 03.52.31 | -15.37578 | -174.00252 | 1249 | 1 | 95 | Probably explosive volcanism; does not look constructional. |
| 14-Sep | 03.53.03 | -15.37577 | -174.00250 | 1249 | 2 | 89 | Z=1249. Facing the wall (hdg 90 degrees). Still going down. |
| 14-Sep | 03.53.56 | -15.37579 | -174.00253 | 1249 | 1 | 95 | We're back in the smoke. Inside the pit crater at Volcano O. |
| 14-Sep | 03.54.23 | -15.37579 | -174.00253 | 1249 | 2 | 97 | Reversing out way down the SE slope of this pit. |
| 14-Sep | 03.54.50 | -15.37580 | -174.00252 | 1249 | 2 | 110 | Fragmental rock. Probably young; fresh volcanic walk. |
| 14-Sep | 03.55.20 | -15.37579 | -174.00251 | 1249 | 1 | 150 | Enveloped in smoke. |
| 14-Sep | 03.55.49 | -15.37580 | -174.00252 | 1249 | 1 | 207 | Water pouring out of here; but maybe just an optical illusion. |
| 14-Sep | 03.57.13 | -15.37580 | -174.00252 | | | | The downward view is very smoky. |
| 14-Sep | 03.57.41 | -15.37574 | -174.00253 | 1247 | 1 | 187 | Dense vesicular rock. Fragmental at all sizes. Body size to gravel. |
| 14-Sep | 03.58.29 | -15.37581 | -174.00252 | 1248 | 1 | 224 | Panning right to look at the inside wall. |
| 14-Sep | 03.58.57 | -15.37582 | -174.00254 | 1247 | 1 | 235 | Really dense smoke in here. Hard to see anything. |
| 14-Sep | 04.00.44 | -15.37585 | -174.00249 | 1245 | 3 | 254 | We've decided to come back up to the crest of the pit. We probably only made it a f5 meters down into the pit before visibility decreased too much to continue. |
| 14-Sep | 04.02.10 | -15.37586 | -174.00247 | 1243 | 5 | 107 | Coming up again. |
| 14-Sep | 04.03.03 | -15.37582 | -174.00248 | 1248 | 1 | 107 | Planning on going down the east flank. |
| 14-Sep | 04.04.06 | -15.37589 | -174.00252 | 1248 | 1 | 95 | Does look like there are some focused areas of plume coming out of the pit on the brief visit to the bottom of the pit. |
| 14-Sep | 04.05.11 | -15.37587 | -174.00246 | | | | Moving down the flank. Will attempt to head sideways. |
| 14-Sep | 04.05.53 | -15.37584 | -174.00246 | 1248 | 1 | 11 | 30deg slope with rusty red rocks in front of us (iron) with occasional black rocks. |
| 14-Sep | 04.06.22 | -15.37589 | -174.00245 | 1249 | 2 | 11 | Haven't seen any volcanic fall out in this area so no recent volcanic eruption more likely mass wasting. |
| 14-Sep | 04.06.47 | -15.37585 | -174.00250 | 1251 | 1 | 11 | Heading of due north but crabbing down the east flank. |
| 14-Sep | 04.07.17 | -15.37588 | -174.00248 | 1252 | 1 | 11 | Appears the eastern rim has a higher rim than the other side. |
| 14-Sep | 04.07.34 | -15.37592 | -174.00240 | 1252 | 2 | 11 | More rust colored material on this flank than the other side. |
| 14-Sep | 04.07.58 | -15.37590 | -174.00236 | 1255 | 2 | 20 | Blobs in water could be from the ROV thrusters. |
| 14-Sep | 04.08.33 | -15.37598 | -174.00236 | 1256 | 2 | 11 | Since there is a lot of material in the water in the distant view this is not all from the ROV. |
| 14-Sep | 04.08.56 | -15.37596 | -174.00231 | 1257 | 1 | 11 | Particles are very large like a sulfur-snow storm. |
| 14-Sep | 04.09.10 | -15.37595 | -174.00235 | 1260 | 0 | 12 | Some of the particles could be floc and not sulfur. |
| 14-Sep | 04.09.53 | -15.37603 | -174.00230 | 1260 | 4 | 335 | Came down to 1259 m. Rotating vehicle to look at the slope. |
| 14-Sep | 04.10.13 | -15.37599 | -174.00236 | 1259 | 5 | 285 | Looks like it could be a crack in the rim and hydrothermally altered. |

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| 14-Sep | 04.10.35 | -15.37598 | -174.00235 | 1261 | 6 | 279 | Could be a fracture or crack from the rim. |
| 14-Sep | 04.11.02 | -15.37601 | -174.00229 | 1261 | 5 | 269 | Taking some highlight photos. |
| 14-Sep | 04.11.24 | -15.37600 | -174.00230 | 1262 | 5 | 267 | Turning on the HD tape. |
| 14-Sep | 04.11.48 | -15.37601 | -174.00229 | 1261 | 5 | 265 | Looks like some E-W fractures. |
| 14-Sep | 04.11.59 | -15.37601 | -174.00230 | 1261 | 5 | 265 | Folds of the lava when the magma flowed out. Foliated lava. |
| 14-Sep | 04.13.18 | -15.37601 | -174.00235 | 1260 | 6 | 252 | Deeper orange material under the orange coating and even deep it is black. |
| 14-Sep | 04.14.03 | -15.37602 | -174.00236 | 1260 | 5 | 247 | Flows are sticky when erupting. |
| 14-Sep | 04.14.39 | -15.37601 | -174.00231 | 1259 | 6 | 265 | Looks like a tube with a little bit of collapse as it came down and fractured off. |
| 14-Sep | 04.15.02 | -15.37602 | -174.00231 | 1258 | 5 | 266 | Giant flow tubes coming down the slope of the volcano. |
| 14-Sep | 04.16.33 | -15.37599 | -174.00233 | 1257 | 5 | 270 | Lasers are on and the rock was about 20cm wide. |
| 14-Sep | 04.17.44 | -15.37600 | -174.00241 | 1257 | 3 | 274 | Attempting to get a rock sample from the eastern flank of the cone. |
| 14-Sep | 04.19.39 | -15.37599 | -174.00241 | 1258 | 2 | 329 | ROV bumped the tube and it quickly fell away (very fragile). |
| 14-Sep | 04.19.56 | -15.37600 | -174.00241 | 1257 | 2 | 331 | Ken would like a rock that is black as possible. |
| 14-Sep | 04.20.46 | -15.37597 | -174.00238 | 1258 | 2 | 330 | Arm is in place to find a sample. Depth is 1258 on the eastern flank at the sampling location. |
| 14-Sep | 04.22.57 | -15.37600 | -174.00235 | 1258 | 2 | 329 | Piece of altered looking rock. |
| 14-Sep | 04.23.23 | -15.37601 | -174.00231 | 1258 | 2 | 330 | **Geo Sample: Q324-rock-07.** From eastern flank of the cone. Small and coated piece for the microbial scientists. Getting close-up view of rock. Sample taken on south side of pit. |
| 14-Sep | 04.24.37 | -15.37596 | -174.00238 | 1257 | 2 | 330 | Q324-rock-07 placed in drawer 8. The coating fell off as it fell in the drawer and the rock now appears to be black. |
| 14-Sep | 04.27.29 | -15.37596 | -174.00238 | 1258 | 2 | 330 | **Geo Sample: Q324-rock-08.** From eastern flank of the cone same spot as #07. Looks like a mass piece of dacite and can see vesicles in it. Sample taken on south side of pit. |
| 14-Sep | 04.28.47 | -15.37602 | -174.00241 | 1258 | 2 | 330 | Q324-rock-8 put in drawer #10. This rock was black when it was sampled-no coating. |
| 14-Sep | 04.30.50 | -15.37598 | -174.00237 | | | | **Target Rock 7/8** 15° 22.554'S 174° 0.142'W |
| 14-Sep | 04.36.48 | -15.37601 | -174.00235 | 1256 | 5 | 273 | Want to contour around to the east looking for some biology. |
| 14-Sep | 04.37.28 | -15.37602 | -174.00239 | 1252 | 7 | 259 | White patch straight ahead. Could be mat and sulfur. (the orange stuff is probably mat). |
| 14-Sep | 04.38.04 | -15.37604 | -174.00245 | 1250 | 5 | 274 | Saw bubbles rising out of the seafloor. Lots of shimmering water up here approaching the rim edge. |
| 14-Sep | 04.39.08 | -15.37600 | -174.00256 | 1245 | 3 | 333 | We've been here again. |
| 14-Sep | 04.42.20 | -15.37608 | -174.00246 | 1258 | 4 | 312 | Eelpout? Just came out of from behind a rock. |
| 14-Sep | 04.42.44 | -15.37604 | -174.00245 | 1259 | 2 | 311 | Floc on here. Dead shrimp on the seafloor. Too much sulfite? |
| 14-Sep | 04.44.14 | -15.37605 | -174.00245 | 1258 | 2 | 315 | Two eelpouts in the HD a minute ago. |
| 14-Sep | 04.44.35 | -15.37604 | -174.00245 | 1259 | 2 | 318 | Stirring up lots of sulfur and seds off the bottom now. |
| 14-Sep | 04.45.40 | -15.37601 | -174.00235 | 1258 | 4 | 316 | We seem to be back where we were earlier. |
| 14-Sep | 04.46.04 | -15.37596 | -174.00237 | 1259 | 4 | 271 | Pillow tube ahead of us. |
| 14-Sep | 04.46.30 | -15.37595 | -174.00235 | 1260 | 4 | 277 | Lateralling along the slope at 1260m toward the west. |
| 14-Sep | 04.47.44 | -15.37587 | -174.00238 | 1259 | 3 | 292 | Working our way to the east? Facing the slope (west). |
| 14-Sep | 04.49.08 | -15.37583 | -174.00238 | 1259 | 3 | 290 | We are seeing bacterial mat and some floc here. |
| 14-Sep | 04.49.49 | -15.37581 | -174.00237 | 1258 | 3 | 340 | Lots of floc (?) in the water column. |
| 14-Sep | 04.50.36 | -15.37578 | -174.00233 | 1259 | 3 | 306 | It's barren of animals up here. Lots of boulders. |
| 14-Sep | 04.52.24 | -15.37571 | -174.00238 | 1259 | 2 | 270 | Maybe it's too toxic up here with all the sulfite. |
| 14-Sep | 04.53.09 | -15.37570 | -174.00238 | 1259 | 6 | 269 | Eelpout about a minute ago. |
| 14-Sep | 04.53.36 | -15.37567 | -174.00238 | 1258 | 5 | 269 | Light coating of bacterial mat. |
| 14-Sep | 04.54.53 | -15.37572 | -174.00240 | 1255 | 4 | 268 | Amazing boulder overhang. Possibly a lava flow that just cooled and it hanging over the ledge. |
| 14-Sep | 04.55.52 | -15.37575 | -174.00241 | 1255 | 4 | 266 | Just going to head down the slope to try to find some biology. |
| 14-Sep | 04.56.13 | -15.37578 | -174.00240 | 1254 | 5 | 267 | Turning on the highlight tape at 0457. |
| 14-Sep | 04.57.56 | -15.37589 | -174.00229 | 1264 | 5 | 267 | Heading downslope looking for animals. |
| 14-Sep | 04.58.27 | -15.37590 | -174.00227 | 1264 | 6 | 238 | Transition the seabed is now coated mostly with orangish mat (less acidic and are precipitating iron); not as much white (warmer more acidic) |
| 14-Sep | 04.59.51 | -15.37598 | -174.00219 | 1265 | 9 | 277 | Lots of stringy mat and some diffuse venting here. Looking for fauna. |
| 14-Sep | 05.00.24 | -15.37599 | -174.00224 | 1265 | 7 | 288 | Still all rocks; mats; and fluids. |
| 14-Sep | 05.00.45 | -15.37599 | -174.00224 | 1265 | 8 | 288 | Jumble of rocks. Once probably emplaced pillow lavas. |
| 14-Sep | 05.01.16 | -15.37605 | -174.00224 | 1269 | 8 | 289 | Still moving downslope. Seafloor is more uneven mat. Mat is thinner. In place pillow tubes. Blueish-white tinge to the mat rather than bright white. Lots of floc pieces in the water. |
| 14-Sep | 05.02.36 | -15.37610 | -174.00225 | 1270 | 3 | 288 | Eelpout fish. |
| 14-Sep | 05.03.00 | -15.37610 | -174.00225 | 1272 | 3 | 289 | Polychaetes and possibly shrimp in the water column. Eelpout. |

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|---|---|---|---|---|---|---|---|
| 14-Sep | 05.06.23 | -15.37610 | -174.00225 | 1273 | 2 | 288 | Polychaetes everywhere on this yellowish mat. Wow wee. |
| 14-Sep | 05.07.05 | -15.37610 | -174.00225 | 1272 | 2 | 288 | Continuing down. Polychaetes in the water like butterflies. Shrimp? |
| 14-Sep | 05.08.03 | -15.37613 | -174.00216 | 1276 | 4 | 288 | HD turned off. |
| 14-Sep | 05.09.02 | -15.37614 | -174.00212 | 1278 | 5 | 290 | Shrimp on a tock. |
| 14-Sep | 05.10.15 | -15.37615 | -174.00212 | 1284 | 4 | 294 | Continuing downslope. The animals are not at the summit but are farther down. Perhaps too acidic and too much sulfur dioxide near the summit of the cone. |
| 14-Sep | 05.11.47 | -15.37629 | -174.00201 | 1294 | 5 | 295 | Less brown mat now. More disaggregated white mat. |
| 14-Sep | 05.13.10 | -15.37631 | -174.00200 | 1297 | 4 | 300 | Want to get a suction sample of shrimp. |
| 14-Sep | 05.14.17 | -15.37630 | -174.00198 | 1296 | 7 | 301 | Plan of attack to try to get some shrimp; try to get a water sample; grab a rock as we're about to leave. |
| 14-Sep | 05.18.46 | -15.37638 | -174.00193 | 1293 | 15 | 299 | Looking at the water column while getting the water column intake in order. |
| 14-Sep | 05.19.29 | -15.37635 | -174.00196 | 1300 | 6 | 297 | Suction 5 handle secured. Looking at the seafloor. We see several shrimp in the HD image. |
| 14-Sep | 05.20.15 | -15.37639 | -174.00196 | 1301 | 5 | 298 | Quite a few shrimp here into the water column and on the rocks. |
| 14-Sep | 05.21.30 | -15.37638 | -174.00197 | 1302 | 4 | 295 | If we catch the shrimp Tim will do some genetics research on them. |
| 14-Sep | 05.21.51 | -15.37635 | -174.00196 | 1302 | 3 | 297 | Suction hose out and hoping to get a shrimp. These shrimp live only at vent site. Dominant in the western Pacific. Have identified at least 30 species. |
| 14-Sep | 05.22.56 | -15.37639 | -174.00197 | 1302 | 2 | 294 | Polychaetes and shrimp here in the water column. Attempting to suction them. |
| 14-Sep | 05.24.07 | -15.37635 | -174.00200 | 1301 | 2 | 330 | **Bio Sample: Q324-biomacro-09**. Got the shrimp!! Wow good slurp. |
| 14-Sep | 05.25.46 | -15.37637 | -174.00195 | 1302 | 2 | 312 | Continuing to search for more shrimp. |
| 14-Sep | 05.25.48 | -15.37637 | -174.00195 | 1303 | 2 | 312 | HD camera turned on about 2 minutes ago. |
| 14-Sep | 05.27.59 | -15.37635 | -174.00194 | 1300 | 2 | 305 | Retention of larvae on these seamounts causes populations to evolve and diversify. The species tend to stay around a seamount so they have to diversity evolutionarily. |
| 14-Sep | 05.28.02 | -15.37632 | -174.00196 | 1300 | 2 | 305 | These shrimp are typically blind in the deep sea. The functional eyes have migrated to their back. They can see black body radiation (the dim light coming out of the vents). |
| 14-Sep | 05.30.24 | -15.37632 | -174.00197 | 1300 | 2 | 280 | May have lost the shrimp from the suction tube. |
| 14-Sep | 05.35.52 | -15.37630 | -174.00193 | 1296 | 3 | 305 | Ended suction sampling. Hdg 285 |
| 14-Sep | 05.39.57 | -15.37629 | -174.00196 | 1292 | 5 | 286 | Lava tube in the HD. Coming down the slope. Richard would like a piece of that one. |
| 14-Sep | 05.40.32 | -15.37630 | -174.00196 | 1291 | 6 | 286 | Suction tube sampled. |
| 14-Sep | 05.41.26 | -15.37629 | -174.00201 | 1290 | 8 | 286 | Will take a major and a gastight probably right in the holster. |
| 14-Sep | 05.41.49 | -15.37632 | -174.00197 | 1292 | 5 | 290 | Will remove the gastight now and fire that quickly. Will just fire it near the seafloor. Just want to get an idea of the water chemistry in this area. |
| 14-Sep | 05.44.42 | -15.37637 | -174.00199 | 1295 | 2 | 305 | **Fluid Sample: Q323-major-10**. Just going to leave it in the holster on the vehicle. Pushing the plunger to fire green major. Nozzle is very close to the seafloor. Want to get an idea of the ambient water in the area of all these shrimp and polychaetes. Fired successfully. 306 deg heading. |
| 14-Sep | 05.50.57 | -15.37633 | -174.00200 | 1295 | 2 | 305 | Bungee'ing the major in. |
| 14-Sep | 05.48.22 | -15.37633 | -174.00200 | 1295 | 2 | 305 | Will use the same method to fire a gastight. |
| 14-Sep | 05.52.17 | -15.37633 | -174.00200 | 1295 | 2 | 305 | Going to push the yellow gastight right in the holder on the vehicle just like they did the major. Triggering now. Looks like it was successful. Both were triggered near the bottom in the area of shrimp and polychaetes. **Gas Sample: Q323-GTB-11.** |
| 14-Sep | 05.53.12 | -15.37633 | -174.00200 | 1295 | 2 | 305 | Going in for a rock. |
| 14-Sep | 05.57.18 | -15.37633 | -174.00200 | 1295 | 2 | 305 | **Geo Sample: Q323-rock-12**. Got a rock from the seafloor. It has some crust on it yet. Some bacterial mat or sulfur coating on this black small tube exterior rock. Rock went into box 11. |
| 14-Sep | 00.00.00 | -15.37567 | -174.00233 | 1244 | 1 | 302 | Target 14 dive shrimp? |
| 14-Sep | 05.59.00 | -15.37633 | -174.00200 | 1295 | 2 | 305 | Off the bottom? |
| 14-Sep | 06.03.14 | | | | | | Dave tried to fire the major in the plume but it didn't work. |
| 14-Sep | 06.07.23 | | | | | | See the plume out in front of us yet. |
| 14-Sep | 07.11.00 | | | | | | ROV on deck |

## 7.4 Q325 Mata Ua Dive Log

| date | time | latitude | longitude | Z | alt | hdg | Q325 - North Mata Ua Dive Comments |
|---|---|---|---|---|---|---|---|
| **Main Goals:** Explore and sample Mata Ua for hydrothermal systems and rock samples. | | | | | | | |
| **Launch target:** 15°1.421' S 173°47.222' W Z=2347m SW of summit | | | | | | | |
| **Setup:** 3 gastights; 3 majors; temp probe, 1 Davis sampler; large biobox; suction sampler; T-handle | | | | | | | |
| **Nav Notes:** bottom time 9/14/2012 22:05 – 9/15 05:14. Nav smoothed (tolerance=10). Nav shifted: -11m (W) +68m (N). Nav gaps: 22:51:44 - 23:51:45, 03:33:38 - 04:27:00. | | | | | | | |
| **DIVE LOG POSITION INFORMATION: latitude; longitude; Z; alt; hdg values are derived from finalized Quest nav. Any lat/long values in the dive comments column were recorded at sea and are preliminary.** | | | | | | | |
| 14-Sep | 19.18.37 | | | | | | ROV off the deck. |
| 14-Sep | 19.22.07 | | | | | | **ROV in the water.** |
| 14-Sep | 19.29.26 | | | | | | ROV being brought back on deck. |
| 14-Sep | 19.57.46 | | | | | | Problem is with the Pelagic pump which will be removed for this dive (had been added to the ROV for the first time). |
| 14-Sep | 20.19.40 | | | | | | ROV off the deck. |
| 14-Sep | 20.22.56 | | | | | | **ROV in the water.** |
| 14-Sep | 20.25.06 | | | | | | Attaching flotation to wire. HD broadcast view switched to water view. |
| 14-Sep | 20.26.06 | | | | | | Dive bottom target: 15°1.4207S \| 173° 47.222'W z=2347 |
| 14-Sep | 20.29.11 | | | | | | ROV at 25m depth while attaching final flotation. |
| 14-Sep | 20.32.21 | | | | | | ROV is diving; all flotation attached. |
| 14-Sep | 20.34.45 | | | | | | ROV is descending faster today @25-30m/min. |
| 14-Sep | 20.39.19 | | | | | | Ship has a hdg of 320° with winds of 9-10 kts and is located south of the dive targets. |
| 14-Sep | 20.45.58 | | | | | | Descent still faster than previous dives @27m/min. |
| 14-Sep | 20.50.51 | | | | | | CTD screen is now working in hydro lab. |
| 14-Sep | 20.56.36 | | | | | | Descent on winch wire is 24m/min. |
| 14-Sep | 21.13.29 | | | | | | Passing 1100m water depth (just about half way to the bottom). |
| 14-Sep | 21.16.13 | | | | | | Passing about the half-way to the bottom depth. |
| 14-Sep | 21.23.20 | | | | | | Passing 1330m water depth with about 1000m to go to the bottom. |
| 14-Sep | 21.30.31 | | | | | | Passing 1500m depth. |
| 14-Sep | 21.46.42 | | | | | | About 500m more to the bottom. |
| 14-Sep | 21.52.57 | | | | | | Passing 2000m water depth. |
| 14-Sep | 21.58.25 | | | | | | CTD plumes were seen around 2200m depth last night. |
| 14-Sep | 22.01.09 | | | | | | Control van now on headset: Bob Embley joined by Ken Rubin. |
| 14-Sep | 22.01.22 | | | | | | 2200m. |
| 14-Sep | 22.02.42 | | | | | | About 100m off the bottom. |
| 14-Sep | 22.03.02 | | | | | | Some particulates in the water (not much). |
| 14-Sep | 22.04.10 | | | | | | Interesting biology floated by (pelagic) probably jellyfish. |
| 14-Sep | 22.05.10 | | | | | | 40m off bottom. |
| 14-Sep | 22.05.46 | -15.02288 | -173.78715 | 2305 | 20 | 5 | Altimeter kicked in at 23m off bottom. |
| 14-Sep | 22.06.07 | -15.02292 | -173.78711 | 2314 | 11 | 5 | **See bottom with sediment and boulders.** |
| 14-Sep | 22.06.59 | -15.02291 | -173.78712 | 2320 | 5 | 4 | Heavily sedimented on flank of volcano (older part). |
| 14-Sep | 22.07.26 | -15.02290 | -173.78718 | 2320 | 5 | 4 | Older area with boulders probably that have tumbled down in a sedimented area. |
| 14-Sep | 22.08.07 | -15.02288 | -173.78719 | 2320 | 5 | 5 | ROV making adjustments at bottom site. |
| 14-Sep | 22.10.21 | -15.02289 | -173.78703 | 2317 | 4 | 34 | ROV is moving at 033 along flank. Fine-grained sand with ripple marks from currents. |
| 14-Sep | 22.11.27 | -15.02279 | -173.78685 | 2314 | 3 | 30 | Currents move the sediments to create ripple marks. Pillows ahead. |
| 14-Sep | 22.11.51 | -15.02279 | -173.78690 | 2314 | 2 | 31 | Moving into area with pillow flows reaching down flank with a fine coating of sediment (coming from north). |
| 14-Sep | 22.12.57 | -15.02275 | -173.78679 | 2314 | 4 | 343 | HD cam tape is on. |
| 14-Sep | 22.13.41 | -15.02280 | -173.78688 | 2313 | 4 | 345 | We will be attempting to sample some of these pillows. Flows coming from north down the slope of volcano. |
| 14-Sep | 22.13.58 | -15.02280 | -173.78688 | 2313 | 4 | 346 | Whip coral on the top of the lava tube. |
| 14-Sep | 22.14.21 | -15.02281 | -173.78690 | 2314 | 2 | 356 | Split apart lava tube as it came down slope. |
| 14-Sep | 22.14.48 | -15.02276 | -173.78684 | 2314 | 1 | 15 | Elephant texture on the lava pillows where the pillow split open while extruding molten material. |
| 14-Sep | 22.15.04 | -15.02278 | -173.78687 | 2314 | 1 | 15 | Looking for a good place to sample. Need an easy piece protruding for the ROV. |
| 14-Sep | 22.16.13 | -15.02277 | -173.78683 | 2314 | 2 | 14 | Very light coating of sediment on the pillows compared to the heavier sediments in the landing site. |
| 14-Sep | 22.17.12 | -15.02275 | -173.78689 | 0 | 0 | 0 | Arm attempting to pick up a piece from a pillow with some looser appearing pieces broken open. |
| 14-Sep | 22.18.23 | -15.02279 | -173.78687 | 0 | 0 | 0 | Arm broke off a piece of the pillow. |

| date | time | latitude | longitude | Z | alt | hdg | Q325 - North Mata Ua Dive Comments |
|---|---|---|---|---|---|---|---|
| 14-Sep | 22.19.09 | -15.02274 | -173.78687 | 2314 | 2 | 29 | Tubes are .5m or less in diameter across. Probably more fluid lava (high temperature) flow. |
| 14-Sep | 22.22.07 | -15.02276 | -173.78678 | 2315 | 1 | 11 | Long pillow tubes with tan surface and dusting of sediment. Not very old since sediment not completely covering. Guessing 100s of years old. |
| 14-Sep | 22.26.31 | -15.02275 | -173.78679 | 2315 | 1 | 14 | **Geo Sample: Q325-rock-01.** From south flank of pillows flowing down from the north with light sedimentation. Loose piece in pocket between tubes. Presuming pieces just fell off the flow. HD tape turned on/off. |
| 14-Sep | 22.28.46 | -15.02278 | -173.78685 | 2315 | 1 | 13 | Placing rock in box #7 Q325-rock-01. Still photos were taken. |
| 14-Sep | 22.31.32 | -15.02276 | -173.78684 | 2313 | 4 | 1 | Tubes are 25cm across. USBL positions are good. Position for sample: 15°1.41'S 173°47.206W **(check target after dive)** |
| 14-Sep | 22.32.50 | -15.02274 | -173.78687 | 2311 | 6 | 44 | Heading 010 as make way up lightly sedimented slope with pillow tubes (long tubes). |
| 14-Sep | 22.33.16 | -15.02278 | -173.78676 | 2312 | 3 | 44 | Tube have been replaced with angular rocks and sediment. May have been a local flow. |
| 14-Sep | 22.33.44 | -15.02280 | -173.78679 | 2314 | 2 | 46 | Much more sediment and a scattering of angular rocks. |
| 14-Sep | 22.34.01 | -15.02276 | -173.78668 | 2313 | 3 | 46 | Ripples in sediment. |
| 14-Sep | 22.34.34 | -15.02276 | -173.78663 | 2313 | 2 | 8 | Sea star on the rock. HD tape on. Deposit feeder. |
| 14-Sep | 22.35.28 | -15.02276 | -173.78661 | 2313 | 4 | 25 | More pillows in the lava. HD off-only on for a minute. |
| 14-Sep | 22.35.50 | -15.02273 | -173.78653 | 2310 | 4 | 27 | Angular rocks once again and thicker sediment. |
| 14-Sep | 22.36.14 | -15.02268 | -173.78644 | 2310 | 4 | 44 | Slope to left (north) at hdg of 045. |
| 14-Sep | 22.36.39 | -15.02269 | -173.78639 | 2308 | 6 | 44 | Rocks on surface (out of place) formed by avalanche down slope with heavy sediments. |
| 14-Sep | 22.37.10 | -15.02271 | -173.78634 | 2305 | 8 | 44 | More angular rocks than sediment now but there is sediment on the rocks. |
| 14-Sep | 22.37.34 | -15.02271 | -173.78634 | 2304 | 9 | 43 | Slope is ahead of us now at 044. |
| 14-Sep | 22.38.03 | -15.02271 | -173.78632 | 2301 | 11 | 46 | Need to reposition the ship as there is too much strain on the cable. |
| 14-Sep | 22.38.53 | -15.02273 | -173.78622 | 2301 | 10 | 44 | Very angular boulders that are coming down the slope. |
| 14-Sep | 22.39.57 | -15.02272 | -173.78605 | 2297 | 7 | 47 | Volcanic rubble that have moved downslope via avalanching. |
| 14-Sep | 22.42.06 | -15.02272 | -173.78593 | 2284 | 6 | 51 | Going to fill in the time while the ship moves by finding a rock sample. |
| 14-Sep | 22.42.55 | -15.02263 | -173.78584 | 2279 | 8 | 52 | We haven't seen any animals on this rubble area here so may indicate that the lavas haven't been around here for very long. |
| 14-Sep | 22.43.40 | -15.02260 | -173.78580 | 2276 | 5 | 49 | Richard thinks these rocks are a bit more massive. Big blocks that can't have moved far and appear jammed together. |
| 14-Sep | 22.45.01 | -15.02269 | -173.78568 | 2268 | 5 | 49 | The ship is moving now. Crabbing to the NE. We are continuing very slowly upslope. |
| 14-Sep | 22.45.42 | -15.02257 | -173.78558 | 2260 | 4 | 24 | Now seeing an animal (white little elongated something) on a rock; but that's the first one. |
| 14-Sep | 22.46.43 | -15.02252 | -173.78554 | 2255 | 6 | 32 | We're looking at sedimented slope here after passing over a rubble field below (avalanche debris). Rocks interspersed in the sediments. |
| 14-Sep | 22.47.21 | -15.02242 | -173.78536 | 2248 | 5 | 40 | We're hesitating for the ship. |
| 14-Sep | 22.48.51 | -15.02235 | -173.78545 | 2245 | 5 | 340 | Shadow ahead in the sonar may indicate some outcropping rock that would be good for sampling. |
| 14-Sep | 22.49.54 | -15.02234 | -173.78546 | 2245 | 6 | 339 | We're looking for rocky outcrop in place. Right now we are not really moving. |
| 14-Sep | 22.51.44 | -15.02227 | -173.78541 | 2246 | 3 | 359 | There is a film on the HD lens that is visible on the monitors. It almost give the appearance of diffuse flow so it's a bit deceiving. |
| 14-Sep | 22.52.31 | -15.02227 | -173.78541 | 2245 | 4 | 45 | We're moving again. Slowly.. |
| 14-Sep | 22.53.11 | -15.02227 | -173.78541 | 0 | 0 | 0 | Passing over more large rock rubble. |
| 14-Sep | 22.53.43 | -15.02227 | -173.78541 | 2236 | 3 | 46 | Hairy snail on a rock. |
| 14-Sep | 22.53.55 | -15.02227 | -173.78541 | 2234 | 3 | 45 | Seeing a few animals - they appear to be hairy snails. Sparse to little biology here. |
| 14-Sep | 22.54.34 | -15.02227 | -173.78541 | 2229 | 4 | 46 | Outcrop ahead. Headwall to the slide. |
| 14-Sep | 22.55.06 | -15.02227 | -173.78541 | 2226 | 5 | 45 | Seeing more intact rock here. We want the sequence of formation of the lavas over what period of time. |
| 14-Sep | 22.55.37 | -15.02227 | -173.78541 | 2221 | 6 | 45 | This is a small volcano and we don't know how long it took to form. We'll be looking for clues. |
| 14-Sep | 22.56.26 | -15.02227 | -173.78541 | 2221 | 7 | 52 | See some large rocks; some with striations. Some of these rocks appear to be intact (in their place of formation). |
| 14-Sep | 22.57.24 | -15.02227 | -173.78541 | 2219 | 8 | 56 | Zooming in on the rocks a bit. These are unusual looking lavas. Some have striations; some do not. |
| 14-Sep | 22.58.15 | -15.02227 | -173.78541 | 2220 | 4 | 78 | Flatter lava with folded surface. This piece seems to be in place. We'd like a sample of it. |
| 14-Sep | 23.00.51 | -15.02227 | -173.78541 | 2220 | 3 | 75 | Laminar-flow texture on the surface. Blocky lava. Quite a large rock. Possibly vesicular. |

| date | time | latitude | longitude | Z | alt | hdg | Q325 - North Mata Ua Dive Comments |
|---|---|---|---|---|---|---|---|
| 14-Sep | 23.01.48 | -15.02227 | -173.78541 | 2221 | 3 | 75 | **Geo Sample: Q325-rock-02**. Going in for the grab. This sample is rather flat. It appears to have fractured off of the flow top - essential in place. Lobate lava crust. Pyramidal in shape. About 40 cm long. It appears hollow? Into box 8. |
| 14-Sep | 23.09.49 | -15.02227 | -173.78541 | 2220 | 3 | 75 | Preliminary osition for sample: 15°1.36840S 173°47.10920W |
| 14-Sep | 23.11.44 | -15.02227 | -173.78541 | 2220 | 4 | 74 | ROV moving. |
| 14-Sep | 23.12.10 | -15.02227 | -173.78541 | 2218 | 4 | 70 | Moving up to top of this knoll and no evidence of hydrothermal activity. |
| 14-Sep | 23.12.32 | -15.02227 | -173.78541 | 2218 | 8 | 50 | Light sediment coating and rubble flow. |
| 14-Sep | 23.13.00 | -15.02227 | -173.78541 | 0 | 0 | 0 | Some broken lava tubes. Green organisms. |
| 14-Sep | 23.13.24 | -15.02227 | -173.78541 | 0 | 0 | 0 | Intact pillow and broken pieces. |
| 14-Sep | 23.13.38 | -15.02227 | -173.78541 | 2211 | 4 | 66 | Knoll is constructional built by series of lava flows. |
| 14-Sep | 23.14.05 | -15.02227 | -173.78541 | 2210 | 6 | 60 | Moving upslope at 060. |
| 14-Sep | 23.14.26 | -15.02227 | -173.78541 | 2212 | 3 | 59 | Low-lying lavas flowing downhill. |
| 14-Sep | 23.15.03 | -15.02227 | -173.78541 | 2211 | 3 | 63 | Flakey looking edges on the lavas where broken. |
| 14-Sep | 23.15.52 | -15.02227 | -173.78541 | 2209 | 3 | 69 | Heading up flank of volcano with broken and intact lava. Approximately 50m from the top of the cone. |
| 14-Sep | 23.16.11 | -15.02227 | -173.78541 | 2208 | 4 | 78 | Broken pieces look gassy. Some sediment covering lavas. |
| 14-Sep | 23.16.30 | -15.02227 | -173.78541 | 0 | 0 | 0 | Only few animals living amongst the pillows. |
| 14-Sep | 23.17.10 | -15.02227 | -173.78541 | 2204 | 3 | 99 | Crackle texture and green animals (urchins) occasionally seen. |
| 14-Sep | 23.17.30 | -15.02227 | -173.78541 | 2202 | 3 | 114 | Can see some vesicles where the gas released in the lava. Fish. |
| 14-Sep | 23.17.40 | -15.02227 | -173.78541 | 0 | 0 | 0 | Rat tail fish. |
| 14-Sep | 23.18.20 | -15.02227 | -173.78541 | 2199 | 2 | 121 | Rougher surfaces of lavas from gas expulsion. |
| 14-Sep | 23.18.42 | -15.02227 | -173.78541 | 2197 | 2 | 116 | Green animals look like urchins (hard to determine). Shrimp. |
| 14-Sep | 23.19.28 | -15.02227 | -173.78541 | 2196 | 2 | 99 | Slope decreasing however still a lot of rubble. |
| 14-Sep | 23.19.41 | -15.02227 | -173.78541 | 2195 | 2 | 100 | Drop-off to the left as we go along a ridge. |
| 14-Sep | 23.20.11 | -15.02227 | -173.78541 | 2194 | 2 | 97 | Passed over sea star. |
| 14-Sep | 23.20.55 | -15.02227 | -173.78541 | 2193 | 1 | 94 | Getting close to top of knoll with rubble. |
| 14-Sep | 23.21.15 | -15.02227 | -173.78541 | 2194 | 1 | 95 | At top with no sonar contacts ahead of us. |
| 14-Sep | 23.21.37 | -15.02227 | -173.78541 | 2194 | 1 | 95 | Somewhat more intact flow at top of the knoll. Lobate flow. |
| 14-Sep | 23.22.15 | -15.02227 | -173.78541 | 2194 | 1 | 95 | Preparing to take a sample from the top of the knoll. |
| 14-Sep | 23.23.04 | -15.02227 | -173.78541 | 2194 | 1 | 95 | See some urchins at the top between the rocks. |
| 14-Sep | 23.24.16 | -15.02227 | -173.78541 | 2194 | 1 | 95 | Setting down on surface to take a sample on the top of the knoll. |
| 14-Sep | 23.25.17 | -15.02227 | -173.78541 | 2194 | 1 | 95 | Mata means 'eye' in Tongan. Shape of these features resemble eyes. |
| 14-Sep | 23.26.08 | -15.02227 | -173.78541 | 2194 | 1 | 95 | We are on the knoll south of the top of the volcano Mata Ua. |
| 14-Sep | 23.27.02 | -15.02227 | -173.78541 | 2194 | 1 | 95 | Close-up of the urchin in HD. |
| 14-Sep | 23.27.35 | -15.02227 | -173.78541 | 2194 | 1 | 95 | Also see vesicles in the lava tube where the gas was exploded. |
| 14-Sep | 23.28.53 | -15.02227 | -173.78541 | 2194 | 1 | 95 | USBL navigation is not good here for the sample but know we are on top of the knoll. |
| 14-Sep | 23.31.01 | -15.02227 | -173.78541 | 2194 | 1 | 95 | Fairly good level of sediment covering rocks (not too heavy). |
| 14-Sep | 23.31.14 | -15.02227 | -173.78541 | 2194 | 1 | 95 | Preparing arm to take sample. No USBL. |
| 14-Sep | 23.32.58 | -15.02227 | -173.78541 | 2194 | 1 | 95 | Lots of vesicles in the rocks. Gas holes clearly visible in the rocks. |
| 14-Sep | 23.36.33 | -15.02227 | -173.78541 | 2194 | 1 | 95 | Small animals swimming (shrimp?). |
| 14-Sep | 23.40.26 | -15.02227 | -173.78541 | 2194 | 1 | 95 | Searching around for a good place to sample a rock on top of the knoll. No USBL. |
| 14-Sep | 23.41.56 | -15.02227 | -173.78541 | 2194 | 1 | 95 | Settling down on the bottom again to take a sample. |
| 14-Sep | 23.43.56 | -15.02227 | -173.78541 | 2194 | 1 | 95 | Moving around a bit looking for a small enough piece to grab. |
| 14-Sep | 23.44.53 | -15.02227 | -173.78541 | 2194 | 1 | 95 | White animal almost glowing in view. |
| 14-Sep | 23.45.57 | -15.02227 | -173.78541 | 2194 | 1 | 95 | In an area with smaller pieces. Looks like an outer crust of material that would be good to sample with interior of glass. |
| 14-Sep | 23.46.00 | -15.02227 | -173.78541 | 2194 | 1 | 95 | **Geo Sample: Q325-rock-03.** From top of knoll on south flank of volcano summit. |
| 14-Sep | 23.47.54 | -15.02227 | -173.78541 | 2194 | 1 | 95 | Taking stills. Bubbly interior with exterior less fluid where gas couldn't extrude. |
| 14-Sep | 23.49.24 | -15.02227 | -173.78541 | 2194 | 1 | 95 | Placing sample in compartment #13. |
| 14-Sep | 23.50.36 | -15.02227 | -173.78541 | 2194 | 1 | 95 | Moving on to the next target; will not get any USBL positions here but we are at the top of the knoll. |
| 14-Sep | 23.51.35 | -15.02227 | -173.78541 | 2194 | 1 | 95 | Knoll comprised of volcanic rubble. |
| 14-Sep | 23.52.26 | -15.02233 | -173.78479 | 2193 | 3 | 16 | White animal visible again. |
| 14-Sep | 23.52.52 | -15.02233 | -173.78479 | 2193 | 3 | 16 | USBL came back but has us on the flank due south of the top on our bathymetry map. |
| 14-Sep | 23.54.17 | -15.02230 | -173.78480 | 2192 | 5 | 21 | USBL positions have us further east and South than we had thought. |
| 14-Sep | 23.55.28 | -15.02230 | -173.78480 | 2192 | 5 | 1 | Depth has us about at the top of the knoll at target B. Trying to resolve navigation at the moment. Hdg is 002 |

| date | time | latitude | longitude | Z | alt | hdg | Q325 - North Mata Ua Dive Comments |
|---|---|---|---|---|---|---|---|
| 14-Sep | 23.56.04 | -15.02225 | -173.78484 | 2195 | 1 | 0 | Going north to determine if we are on the flank or top of the knoll. |
| 14-Sep | 23.57.16 | -15.02212 | -173.78478 | 2199 | 4 | 1 | Driving at 000 at 2198z. |
| 14-Sep | 23.57.37 | -15.02207 | -173.78476 | 2203 | 2 | 360 | Getting deeper as we drive north so must be on the top of the knoll (target B). |
| 14-Sep | 23.58.17 | -15.02195 | -173.78480 | 2208 | 2 | 0 | Doppler reset. |
| 14-Sep | 23.59.05 | -15.02198 | -173.78482 | 2206 | 2 | 1 | Discrepancy between map and USBL of about 50m. |
| 14-Sep | 23.59.38 | -15.02200 | -173.78480 | 2205 | 1 | 359 | Moving to target E from here. Position on bottom was reading 50m south of the knoll on the map. |
| 15-Sep | 00.00.16 | -15.02197 | -173.78481 | 2205 | 1 | 269 | Turning to west to go at Target E. Actually going to drive due west to compensate for the navigation discrepancy instead of directly to target E. |
| 15-Sep | 00.04.32 | -15.02192 | -173.78502 | 2216 | 4 | 271 | Navigation may be up more toward 100m off to the south to account for the slope going to the right. |
| 15-Sep | 00.04.52 | -15.02192 | -173.78502 | 2216 | 3 | 279 | Cloudy plume ahead could be first evidence of hydrothermal activity. |
| 15-Sep | 00.05.05 | -15.02192 | -173.78502 | 2216 | 3 | 279 | Poor visibility at 2215m with 4m off bottom. |
| 15-Sep | 00.05.41 | -15.02193 | -173.78509 | 2216 | 3 | 283 | Definite clouds of plume at hdg 282. |
| 15-Sep | 00.06.38 | -15.02192 | -173.78524 | 2227 | 3 | 284 | Bottom is rubbly but obscured by cloudy water at 3m off bottom. |
| 15-Sep | 00.07.25 | -15.02192 | -173.78524 | 2227 | 3 | 284 | Moving west looking for a geothermal system as we are moving downslope so can't see bottom on HD. |
| 15-Sep | 00.07.54 | -15.02193 | -173.78527 | 2238 | 3 | 323 | Getting good USBL 15°1.352'S 173° 47.109'W. |
| 15-Sep | 00.08.29 | -15.02195 | -173.78533 | 2243 | 3 | 321 | Slope is changing from right to left has changed from the start of the transect west. |
| 15-Sep | 00.09.28 | -15.02198 | -173.78548 | 2253 | 3 | 320 | Angular rubble. |
| 15-Sep | 00.10.32 | -15.02203 | -173.78560 | 2264 | 3 | 321 | Sediment coating the angular rubble. Slope is still right to left. |
| 15-Sep | 00.11.31 | -15.02203 | -173.78560 | 2264 | 3 | 321 | Volcanic talus with sediment that is getting thicker. |
| 15-Sep | 00.12.11 | -15.02200 | -173.78580 | 2277 | 3 | 321 | Fish. Close-up in HD. |
| 15-Sep | 00.12.55 | -15.02200 | -173.78580 | 2278 | 3 | 317 | Heavier sediment and fine-grained. |
| 15-Sep | 00.14.29 | -15.02207 | -173.78609 | 2281 | 4 | 319 | Moving 0318 along sedimented rubble on slope of the volcano. |
| 15-Sep | 00.15.25 | -15.02211 | -173.78621 | 2280 | 4 | 320 | Shrimp. |
| 15-Sep | 00.15.47 | -15.02214 | -173.78624 | 2280 | 4 | 319 | White animals seen previously were sea cucumbers. |
| 15-Sep | 00.16.24 | -15.02219 | -173.78632 | 2280 | 4 | 320 | Heavy sediment as driving 320 along slope. Pieces of lava and pelagic shrimp. |
| 15-Sep | 00.18.14 | -15.02221 | -173.78642 | 2280 | 4 | 320 | Navigation appears to be good as we move west at 319. |
| 15-Sep | 00.18.22 | -15.02222 | -173.78645 | 2280 | 4 | 319 | Fish. |
| 15-Sep | 00.19.56 | -15.02221 | -173.78657 | 2279 | 4 | 319 | Approximately 150m east of the target as we continue to move west. |
| 15-Sep | 00.20.25 | -15.02225 | -173.78657 | 2280 | 4 | 321 | Going to change heading to a bit more south but still at 320. |
| 15-Sep | 00.21.56 | -15.02232 | -173.78662 | 2285 | 3 | 317 | Can see vesicles in these rocks. |
| 15-Sep | 00.23.11 | -15.02236 | -173.78672 | 2288 | 5 | 321 | Small shrimp. |
| 15-Sep | 00.24.33 | -15.02236 | -173.78672 | 2288 | 5 | 321 | Pieces of lava that appear to have fallen down from upslope with heavy sediment. |
| 15-Sep | 00.25.02 | -15.02236 | -173.78672 | 2288 | 5 | 321 | Searching for a hydrothermal vent site that was inferred from CTD signals. |
| 15-Sep | 00.25.46 | -15.02242 | -173.78685 | 2297 | 4 | 320 | Much heavier sediment. |
| 15-Sep | 00.26.10 | -15.02243 | -173.78690 | 2298 | 4 | 319 | About 100m more to drive to the target due west. |
| 15-Sep | 00.26.56 | -15.02253 | -173.78697 | 2299 | 4 | 319 | Few pieces of rock above the sediment. |
| 15-Sep | 00.28.15 | -15.02251 | -173.78719 | 2303 | 3 | 320 | CTD plumes were seen between 2200-2300m. Current depth is 2300m. |
| 15-Sep | 00.29.57 | -15.02252 | -173.78732 | 2303 | 3 | 319 | Probably another 30 minutes of traversing west before we travel upslope in search of vents. Whip coral. |
| 15-Sep | 00.30.38 | -15.02254 | -173.78738 | 2304 | 4 | 319 | Can see current direction from where animal was facing its feeding direction SW-NE. |
| 15-Sep | 00.31.36 | -15.02253 | -173.78740 | 2303 | 4 | 319 | White reflective thing on seafloor (not identified). |
| 15-Sep | 00.32.13 | -15.02249 | -173.78750 | 2303 | 3 | 320 | US |
| 15-Sep | 00.34.09 | -15.02246 | -173.78765 | 2305 | 3 | 319 | Broken pillow lobes. Good USBL. |
| 15-Sep | 00.35.21 | -15.02249 | -173.78770 | 2312 | 4 | 320 | Ship is moving west as well. ROV heading 320. |
| 15-Sep | 00.36.57 | -15.02253 | -173.78781 | 2312 | 5 | 315 | Looks like these pillow pieces have broken off and fallen downslope. |
| 15-Sep | 00.37.25 | -15.02252 | -173.78787 | 2313 | 5 | 314 | Doppler reset. |
| 15-Sep | 00.38.01 | -15.02252 | -173.78785 | 2312 | 5 | 314 | Larger pieces of pillow pieces with heavy sediment. |
| 15-Sep | 00.38.21 | -15.02252 | -173.78785 | 2312 | 5 | 314 | Approximately 50m west of the target. |
| 15-Sep | 00.39.16 | -15.02252 | -173.78793 | 2312 | 5 | 313 | Round pillow shapes with some tubes in sediment. |
| 15-Sep | 00.40.24 | -15.02247 | -173.78805 | 2313 | 5 | 315 | All sediment here with a steep slope. |
| 15-Sep | 00.41.03 | -15.02246 | -173.78806 | 2312 | 5 | 313 | Coming up to a chute along the slope with rubble over slight ridge. |
| 15-Sep | 00.41.23 | -15.02245 | -173.78816 | 2312 | 5 | 314 | Getting to the edge of the ridge as we near the target. |
| 15-Sep | 00.41.59 | -15.02244 | -173.78816 | 2314 | 4 | 313 | Mostly rubble now instead of sediment at the beginning of the target ridge we would like to traverse upslope. |

| date | time | latitude | longitude | Z | alt | hdg | Q325 - North Mata Ua Dive Comments |
|---|---|---|---|---|---|---|---|
| 15-Sep | 00.43.47 | -15.02249 | -173.78816 | 2320 | 5 | 341 | Rubble with some rounder pillow pieces and angular rocks amongst some sediment. |
| 15-Sep | 00.44.11 | -15.02245 | -173.78816 | 2323 | 5 | 357 | Changing heading to due north to move along the ridge upslope. |
| 15-Sep | 00.44.30 | -15.02242 | -173.78816 | 2321 | 4 | 360 | Ridge is on the SW side of Mata Ua. |
| 15-Sep | 00.45.41 | -15.02247 | -173.78817 | 2317 | 5 | 360 | Moving upslope at 000 (fish) with sediment on angular lava rubble. |
| 15-Sep | 00.47.20 | -15.02237 | -173.78814 | 2314 | 4 | 360 | Bottom is getting rocker as move upslope with some in place lavas. |
| 15-Sep | 00.48.07 | -15.02236 | -173.78814 | 2310 | 7 | 1 | Shrimp in water. |
| 15-Sep | 00.49.58 | -15.02224 | -173.78812 | 2306 | 4 | 1 | Continuing to move upslope at 000 depth is 2306m. |
| 15-Sep | 00.50.57 | -15.02212 | -173.78813 | 2303 | 2 | 360 | Lots of rubble. Think water is getting cloudier. |
| 15-Sep | 00.53.50 | -15.02199 | -173.78816 | 2296 | 4 | 0 | Moving upslope at 000. |
| 15-Sep | 00.55.17 | -15.02185 | -173.78816 | 0 | 0 | 0 | Water appears to be cloudier than when we started. |
| 15-Sep | 00.55.55 | -15.02180 | -173.78816 | 2289 | 6 | 0 | Anemone. |
| 15-Sep | 00.59.09 | -15.02164 | -173.78815 | 2282 | 4 | 360 | We should be about 100m north of the original target E position. |
| 15-Sep | 00.59.52 | -15.02163 | -173.78815 | 2279 | 8 | 1 | Slope is less steep and there is more sediment. |
| 15-Sep | 01.00.15 | -15.02161 | -173.78813 | 2278 | 10 | 0 | Much more sediment as slope flattens out a bit. |
| 15-Sep | 01.01.41 | -15.02156 | -173.78810 | 2279 | 5 | 1 | Plan is to do a search pattern between 2200-2250 meters based on the CTD plume evidence. |
| 15-Sep | 01.02.19 | -15.02156 | -173.78810 | 2278 | 3 | 1 | Will start on the western shoulder of the ridge within the depth range. Looking for hydrothermal activity. Water is cloudier than below this depth. |
| 15-Sep | 01.04.19 | -15.02142 | -173.78806 | 2274 | 2 | 1 | Heading 000 over sediment and rock. |
| 15-Sep | 01.04.45 | -15.02141 | -173.78806 | 2274 | 2 | 0 | Sediment has brown staining. |
| 15-Sep | 01.05.32 | -15.02137 | -173.78813 | 2271 | 4 | 1 | Slope is from right to left. Just passing large sediment area into primarily rubble. |
| 15-Sep | 01.05.46 | -15.02136 | -173.78813 | 2271 | 5 | 0 | Angular talus slope. |
| 15-Sep | 01.06.49 | -15.02135 | -173.78813 | 2270 | 6 | 0 | Plan is to go 50m north then turn NE along the crest of the ridge toward target D. |
| 15-Sep | 01.07.53 | -15.02115 | -173.78820 | 2269 | 5 | 360 | Doppler reset was done as we moved north up the slope. |
| 15-Sep | 01.07.55 | -15.02115 | -173.78820 | 2269 | 5 | 1 | Just did another Doppler reset. |
| 15-Sep | 01.08.43 | -15.02116 | -173.78820 | 2268 | 4 | 0 | Light sediment coating the angular talus with a shrimp swimming by. |
| 15-Sep | 01.10.30 | -15.02102 | -173.78822 | 2265 | 5 | 1 | Lots of rubble. |
| 15-Sep | 01.10.45 | -15.02099 | -173.78822 | 2266 | 4 | 0 | Pieces of rubble a bit larger. |
| 15-Sep | 01.11.56 | -15.02090 | -173.78821 | 2263 | 4 | 0 | Visibility is cloudier so could be in plume but no other evidence of venting. |
| 15-Sep | 01.14.05 | -15.02085 | -173.78818 | 2261 | 5 | 1 | Going to drive 100m more north before turning. |
| 15-Sep | 01.15.47 | -15.02072 | -173.78819 | 2258 | 4 | 1 | Seeing vesicles in lavas with some sediment coating. |
| 15-Sep | 01.18.49 | -15.02048 | -173.78821 | 2254 | 5 | 360 | Water is still somewhat cloudy with sediment coating talus of round and angular lavas. |
| 15-Sep | 01.20.03 | -15.02041 | -173.78816 | 2252 | 4 | 1 | Seeing white staining up ahead. |
| 15-Sep | 01.20.24 | -15.02035 | -173.78811 | 2253 | 3 | 5 | Abrupt change as we come into white slope of staining. |
| 15-Sep | 01.20.51 | -15.02035 | -173.78811 | 2252 | 2 | 5 | Not much staining but looks like it came down the hill. |
| 15-Sep | 01.21.08 | -15.02035 | -173.78811 | 2252 | 2 | 5 | Steep wall with white staining. |
| 15-Sep | 01.21.28 | -15.02025 | -173.78804 | 2251 | 5 | 8 | Turning into slope to examine the white staining. |
| 15-Sep | 01.21.47 | -15.02024 | -173.78805 | 2251 | 6 | 3 | Heavily stained. |
| 15-Sep | 01.22.22 | -15.02023 | -173.78805 | 2250 | 4 | 3 | Heading is 007. |
| 15-Sep | 01.22.44 | -15.02023 | -173.78805 | 2250 | 4 | 7 | Very steep slope here almost a vertical wall. |
| 15-Sep | 01.23.08 | -15.02023 | -173.78805 | 2248 | 4 | 7 | Looks like landslide wall where things have fallen downslope. |
| 15-Sep | 01.23.28 | -15.02025 | -173.78805 | 2248 | 4 | 6 | Orange brown color from iron oxide which is evidence of warm water flowing. |
| 15-Sep | 01.23.38 | -15.02025 | -173.78805 | 2248 | 4 | 7 | Hydroid on rock. |
| 15-Sep | 01.23.46 | -15.02025 | -173.78805 | 2246 | 4 | 19 | No sign of warm water here. |
| 15-Sep | 01.24.31 | -15.02023 | -173.78805 | 2244 | 6 | 40 | Green deposits on the wall. |
| 15-Sep | 01.24.54 | -15.02021 | -173.78804 | 2245 | 6 | 36 | Heading is 038 at 2244m. |
| 15-Sep | 01.25.08 | -15.02021 | -173.78800 | 2245 | 6 | 37 | Getting close-up view of the wall and staining. |
| 15-Sep | 01.26.05 | -15.02019 | -173.78802 | 2245 | 5 | 31 | Taking some digital stills of cliff face. |
| 15-Sep | 01.27.34 | -15.02026 | -173.78806 | 2245 | 8 | 79 | Moving away from the cliff face and turning to the white staining. |
| 15-Sep | 01.27.43 | -15.02023 | -173.78801 | 2245 | 7 | 80 | Vertical cliff as we turn east. |
| 15-Sep | 01.28.01 | -15.02024 | -173.78803 | 2244 | 8 | 81 | Turning to east to drive up. |
| 15-Sep | 01.28.36 | -15.02022 | -173.78804 | 2242 | 8 | 81 | Area of collapse with altered green rocks. |
| 15-Sep | 01.29.25 | -15.02021 | -173.78796 | 2238 | 6 | 80 | Water is cloudy with lots of staining on rocks. |
| 15-Sep | 01.30.49 | -15.02022 | -173.78798 | 2236 | 5 | 81 | Taping HD. Been on 2 minutes. |
| 15-Sep | 01.31.39 | -15.02022 | -173.78801 | 0 | 0 | 0 | Extensively altered sulfides. Not much biology. |
| 15-Sep | 01.32.05 | -15.02021 | -173.78795 | 2230 | 7 | 80 | Steep wall with white staining. |
| 15-Sep | 01.32.39 | -15.02021 | -173.78796 | 2228 | 5 | 81 | Out of most intense alteration on cliff face but back to lavas. |
| 15-Sep | 01.32.52 | -15.02022 | -173.78795 | 0 | 0 | 0 | Seeing biology feather duster worm. |

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|---|---|---|---|---|---|---|---|
| 15-Sep | 01.33.12 | -15.02021 | -173.78796 | 2228 | 3 | 35 | Will turn to go to the next knoll on the ridge. |
| 15-Sep | 01.33.36 | -15.02021 | -173.78796 | 2227 | 3 | 26 | Sediment is more red-brown than earlier and the water appears to be a bit clearer. |
| 15-Sep | 01.34.35 | -15.02018 | -173.78788 | 2224 | 4 | 20 | Lava talus with sediment. Heading 020. |
| 15-Sep | 01.34.44 | -15.02011 | -173.78783 | 2222 | 4 | 27 | Larger pillows. |
| 15-Sep | 01.35.06 | -15.02012 | -173.78781 | 2220 | 6 | 37 | Big tubes reaching downslope with elephant skin. |
| 15-Sep | 01.36.07 | -15.02011 | -173.78783 | 0 | 0 | 0 | Seeing more biology on these rocks with a dusting yellowish sediment. |
| 15-Sep | 01.36.27 | -15.02007 | -173.78770 | 2213 | 3 | 41 | Heading now is 040. Whip coral. |
| 15-Sep | 01.37.19 | -15.02012 | -173.78781 | 2210 | 3 | 57 | More sediment as we move up this knoll. |
| 15-Sep | 01.37.40 | -15.02009 | -173.78777 | 0 | 0 | 0 | Coming over to a rocky ridge. |
| 15-Sep | 01.37.54 | -15.02008 | -173.78767 | 2207 | 2 | 72 | Whip coral. |
| 15-Sep | 01.38.33 | -15.02008 | -173.78775 | 2203 | 4 | 50 | Large pillows with elephant skin but more rounded and surrounded by rubble. |
| 15-Sep | 01.38.40 | -15.02008 | -173.78775 | 2202 | 4 | 47 | Water is cloudier. |
| 15-Sep | 01.39.07 | -15.02010 | -173.78773 | 2199 | 4 | 48 | Still moving up to the top of the knoll. |
| 15-Sep | 01.39.30 | -15.02007 | -173.78769 | 2197 | 6 | 50 | Urchin. |
| 15-Sep | 01.39.46 | -15.02009 | -173.78765 | 2196 | 5 | 48 | Pillows and definitely cloudier water. |
| 15-Sep | 01.40.19 | -15.02008 | -173.78767 | 2194 | 11 | 49 | Near top of knoll. |
| 15-Sep | 01.43.22 | -15.02010 | -173.78753 | 2193 | 2 | 57 | Cracked pillow heading at 057. |
| 15-Sep | 01.44.12 | -15.02010 | -173.78736 | 2192 | 3 | 57 | Sediment thicker near the top as slope is less. Some rounded pillows with elephant skin. Large pillows. |
| 15-Sep | 01.44.37 | -15.02010 | -173.78736 | 2192 | 3 | 57 | Lots of pillows one on top of another. |
| 15-Sep | 01.45.14 | -15.02013 | -173.78732 | 2190 | 3 | 72 | Swinging around to the east at 070. Looks like a sediment saddle. Sonar shows slope continuing up ahead. |
| 15-Sep | 01.46.03 | -15.02014 | -173.78727 | 2189 | 3 | 71 | Slope more gradual than awhile ago. |
| 15-Sep | 01.47.22 | -15.02014 | -173.78707 | 2186 | 3 | 52 | Lots of sediment. |
| 15-Sep | 01.48.13 | -15.02012 | -173.78703 | 2184 | 1 | 50 | Still going uphill at 051. Primarily sediment with a few lava pillows rising above the sediment. |
| 15-Sep | 01.49.46 | -15.02012 | -173.78695 | 2182 | 2 | 51 | Maybe a few shell fragments or microbial mat. Water has cleared. |
| 15-Sep | 01.50.13 | -15.02012 | -173.78703 | 2181 | 2 | 51 | Could be old hydrothermal sediments. |
| 15-Sep | 01.50.31 | -15.02012 | -173.78697 | 2181 | 2 | 51 | Into an area with more pillows covered in some sediment. |
| 15-Sep | 01.50.49 | -15.02013 | -173.78694 | 2179 | 2 | 51 | Elephantine pillows. |
| 15-Sep | 01.51.24 | -15.02013 | -173.78693 | 2178 | 4 | 50 | Plume depth was 2150 and ROV is at 2177m. |
| 15-Sep | 01.51.59 | -15.02011 | -173.78682 | 2176 | 4 | 51 | Longer pillow tubes and cracked pillows. |
| 15-Sep | 01.58.57 | -15.01989 | -173.78652 | 2171 | 3 | 42 | The dive map on the nav screen is putting the bathy to the south of where we actually are. |
| 15-Sep | 01.59.55 | -15.01981 | -173.78646 | 2172 | 3 | 7 | The depth here is about at target D; a little knoll. The nav trail is south of where we actually are. That puts the map about 30m north of the nav position. |
| 15-Sep | 02.03.30 | -15.01974 | -173.78643 | 2170 | 2 | 6 | It is smoky around here so there must be something going on here. |
| 15-Sep | 02.05.11 | -15.01975 | -173.78646 | 2171 | 2 | 6 | So far we haven't seen a lot of evidence of venting; just this haze in the water column that should be associated with a hydrothermal plume. |
| 15-Sep | 02.08.32 | -15.01979 | -173.78643 | 2172 | 1 | 46 | Going to move to the northeast again. |
| 15-Sep | 02.08.40 | -15.01979 | -173.78643 | 2172 | 1 | 47 | Not many animals. We've seen some anemones; polychaetes; hydroids; fish; shrimp; but nothing in great numbers. |
| 15-Sep | 02.09.53 | -15.01979 | -173.78646 | 2172 | 1 | 47 | We're moving again. Staying along the 2170 depth contour. |
| 15-Sep | 02.10.29 | -15.01979 | -173.78645 | 2173 | 1 | 46 | Large broken up volcanic rock. Saw a crab. |
| 15-Sep | 02.11.16 | -15.01981 | -173.78639 | 2173 | 1 | 47 | See a crab on this rock. Galatheid. |
| 15-Sep | 02.12.09 | -15.01984 | -173.78630 | 2173 | 1 | 47 | Rugged terrain. Driblets on the lava tubes. |
| 15-Sep | 02.12.36 | -15.01986 | -173.78629 | 2173 | 1 | 46 | Some part of the lava tubes are exposed. |
| 15-Sep | 02.13.03 | -15.01984 | -173.78629 | 2173 | 1 | 46 | These are surface features. Some have gas bubbles. |
| 15-Sep | 02.13.52 | -15.01981 | -173.78631 | 2173 | 1 | 46 | Some adjustments were made to the HD so it came; went; and came again. |
| 15-Sep | 02.14.52 | -15.01984 | -173.78628 | 0 | 0 | 0 | This would be challenging to dredge so this is our chance to grab a rock. |
| 15-Sep | 02.15.46 | -15.01991 | -173.78613 | 2174 | 2 | 43 | We're going to keep going. We still keep smoke ahead. Will continue on. |
| 15-Sep | 02.16.51 | -15.01991 | -173.78608 | 2179 | 2 | 43 | Giant lava tubes in the HD. They |
| 15-Sep | 02.19.13 | -15.01994 | -173.78593 | 2181 | 1 | 0 | Interspersed sediment in this area. |
| 15-Sep | 02.19.32 | -15.01985 | -173.78590 | 2180 | 1 | 359 | Heading back up hill. At 2180. |
| 15-Sep | 02.20.05 | -15.01987 | -173.78591 | 2180 | 1 | 0 | The water is clearer here. |
| 15-Sep | 02.20.22 | -15.01986 | -173.78591 | 2180 | 1 | 360 | Some crab? Carcass on the seafloor. |
| 15-Sep | 02.20.39 | -15.01986 | -173.78591 | 2179 | 1 | 360 | White fragments of something on the seafloor. |
| 15-Sep | 02.21.28 | -15.01981 | -173.78583 | 2180 | 1 | 2 | Very clear here. Currents were supposedly going to the north. Here on the south side now we have clear water. |
| 15-Sep | 02.22.18 | -15.01978 | -173.78582 | 2178 | 2 | 357 | Large sandy area with rocks strewn about. |

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|---|---|---|---|---|---|---|---|
| 15-Sep | 02.22.44 | -15.01973 | -173.78584 | 2176 | 3 | 359 | Sandy area with ripples. Pockets in the sand dunes with rubble debris. |
| 15-Sep | 02.23.27 | -15.01964 | -173.78583 | 2176 | 2 | 358 | Sand waves here. |
| 15-Sep | 02.24.10 | -15.01958 | -173.78583 | 2176 | 2 | 359 | Shrimp. |
| 15-Sep | 02.24.15 | -15.01958 | -173.78583 | 2175 | 2 | 359 | We're in a sandy area with some rocks interspersed. |
| 15-Sep | 02.24.51 | -15.01951 | -173.78581 | 2174 | 2 | 16 | Some of these tubes are probably in place. The geologists would like a sample. |
| 15-Sep | 02.25.45 | -15.01953 | -173.78581 | 2175 | 2 | 27 | Boninite rock sample description. Bonin Island name. Unusual rocks. Silica content halfway between basalt and rhyolite. High in magnesium. |
| 15-Sep | 02.27.03 | -15.01952 | -173.78578 | 2176 | 1 | 51 | West Mata was erupting boninite. Hydrothermal source with different chemistry. Much interest in discovering how this rock was made. All these Mata volcanoes have this type of rock type. It's a "Boninite Zoo" up here. |
| 15-Sep | 02.28.37 | -15.01949 | -173.78580 | 2176 | 1 | 75 | Want to know how the composition of the lavas has changed over time. |
| 15-Sep | 02.30.21 | -15.01952 | -173.78581 | 2176 | 1 | 80 | The entire Tonga Arc is rotating clockwise and the basin is opening behind the swinging arc. The ocean floor is mainly basalt. It is the ubiquitous rock type in most of the earth and terrestrial planets. |
| 15-Sep | 02.30.34 | -15.01949 | -173.78578 | 2175 | 1 | 82 | The continental crust is low density (buoyant) and low density due to granitic composition. It's quite unusual as well as terrestrial planets. |
| 15-Sep | 02.31.12 | -15.01951 | -173.78577 | 2176 | 1 | 81 | Collapsed end of a lava tube. This material is coated with sediment. |
| 15-Sep | 02.38.00 | -15.01952 | -173.78578 | 2176 | 1 | 97 | Still searching for the perfect rock. |
| 15-Sep | 02.42.10 | -15.01955 | -173.78575 | 2176 | 1 | 116 | Reaching down to grab a rock in this area of blocky lava rocks - collapsed lava tubes and interspersed sands sediments. |
| 15-Sep | 02.43.39 | -15.01952 | -173.78577 | 2175 | 1 | 115 | **Geo Sample: Q325-rock-04.** Fist-sized somewhat altered with some white coating. Angular fragment of pillow lava. Into bin 10. This is in the saddle area between the top and western knoll. |
| 15-Sep | 02.50.08 | -15.01950 | -173.78574 | 2176 | 1 | 115 | We're going to drive NW along this saddle. We will be driving downslope. |
| 15-Sep | 02.51.53 | -15.01953 | -173.78580 | 2175 | 2 | 29 | We're moving along to the NW now off the crest of this ridge. |
| 15-Sep | 02.55.38 | -15.01950 | -173.78579 | 2175 | 2 | 312 | Patches of sandy sediments with blocks of lava interspersed. |
| 15-Sep | 02.57.08 | -15.01945 | -173.78601 | 2176 | 2 | 312 | Seeing some small white organisms on these rocks. |
| 15-Sep | 02.57.39 | -15.01944 | -173.78602 | 2174 | 2 | 321 | Sponges on the lavas. Saw a lollipop hydroid. |
| 15-Sep | 02.59.07 | -15.01942 | -173.78604 | 2175 | 2 | 320 | Lots of sediment here. Some could be pelagic but more could be hydrothermal or break down of the rock. |
| 15-Sep | 03.00.59 | -15.01942 | -173.78604 | 2175 | 2 | 320 | Zooming in on these blacker patches with orange mounds (?)that we haven't seen before. |
| 15-Sep | 03.02.46 | -15.01917 | -173.78618 | 2172 | 1 | 321 | Some of these blocky lavas are several meters across. |
| 15-Sep | 03.03.17 | -15.01911 | -173.78618 | 2172 | 1 | 320 | We're out of the sand and back into rubble field. |
| 15-Sep | 03.04.01 | -15.01911 | -173.78618 | 2172 | 1 | 320 | Looks like little burrows in the sediments here. It's probably from bioturbation of altered sediments. |
| 15-Sep | 03.05.49 | -15.01913 | -173.78618 | 2172 | 1 | 320 | Seeing long skinny (pencil-like) sponges. Probably siliceous sponges. |
| 15-Sep | 03.06.35 | -15.01915 | -173.78618 | 2172 | 1 | 320 | We're back in the murky water. Lots of rock rubble here. |
| 15-Sep | 03.06.59 | -15.01905 | -173.78619 | 2174 | 1 | 320 | We're continuing to march NW. Gone from mostly sediment to mostly rocky blocks. Galatheid crab. |
| 15-Sep | 03.08.01 | -15.01898 | -173.78624 | 2173 | 2 | 320 | The slope steepened. We're on the edge. Will be going downslope from here. |
| 15-Sep | 03.09.28 | -15.01901 | -173.78629 | 2173 | 2 | 10 | Turning into the slope a bit so we can see it as we go down. The slope is very steep. |
| 15-Sep | 03.10.40 | -15.01898 | -173.78622 | 2173 | 2 | 123 | Facing the slope as we go down. Our heading is 123 degrees. |
| 15-Sep | 03.11.08 | -15.01897 | -173.78623 | 2174 | 2 | 124 | Galatheid crabs (2). They're scavengers that eat dead material. |
| 15-Sep | 03.13.10 | -15.01899 | -173.78627 | 2178 | 1 | 359 | Facing into the slope and going backward was a bit dicey. We're going to move along the slope sideways. |
| 15-Sep | 03.14.22 | -15.01900 | -173.78629 | 2181 | 2 | 3 | Swimming sea cucumber? |
| 15-Sep | 03.15.22 | -15.01896 | -173.78636 | 2187 | 6 | 28 | We're facing north. |
| 15-Sep | 03.15.48 | -15.01886 | -173.78644 | 2195 | 1 | 322 | Slope covered with blocks of the lava flows we saw on the top of the ridge. |
| 15-Sep | 03.16.10 | -15.01892 | -173.78642 | 2196 | 1 | 329 | Rattail in view. |
| 15-Sep | 03.17.21 | -15.01894 | -173.78640 | 2197 | 2 | 321 | Big ridge; steep slope. Drops off ahead of us. We're heading NW facing downslope. |
| 15-Sep | 03.18.21 | -15.01878 | -173.78647 | 2199 | 2 | 355 | Sponges on this side of the slope.  More nutrients; more current? |
| 15-Sep | 03.18.47 | -15.01879 | -173.78646 | 2200 | 4 | 23 | Possible hydrothermal mat? |
| 15-Sep | 03.19.28 | -15.01877 | -173.78649 | 2205 | 1 | 18 | Possible hydrothermal staining? |
| 15-Sep | 03.19.54 | -15.01869 | -173.78659 | 2206 | 2 | 19 | We're in the depth interval that we want to search for the hydrothermal vent. |
| 15-Sep | 03.22.10 | -15.01867 | -173.78663 | 2211 | 1 | 254 | There is some hydrothermal mat (very thin layer) on these rocks. |
| 15-Sep | 03.23.52 | -15.01867 | -173.78663 | 2211 | 1 | 226 | This is squat lobster in front of us. |
| 15-Sep | 03.25.30 | -15.01867 | -173.78662 | 2212 | 1 | 227 | HD tap on for a second. |

| date | time | latitude | longitude | Z | alt | hdg | Q325 - North Mata Ua Dive Comments |
|---|---|---|---|---|---|---|---|
| 15-Sep | 03.26.18 | -15.01870 | -173.78659 | 0 | 0 | 0 | The fish we saw was an eelpout that we see around hydrothermal vents. Eat crabs; polychaetes; etc. They are called zoarcids (family name). |
| 15-Sep | 03.27.31 | -15.01874 | -173.78653 | 2211 | 1 | 226 | HD tape is off. |
| 15-Sep | 03.27.51 | -15.01873 | -173.78652 | 2213 | 1 | 227 | That was the first evidence of hydrothermal activity that we've seen on the dive. |
| 15-Sep | 03.28.56 | -15.01872 | -173.78659 | 2211 | 1 | 180 | More squat lobsters. Murky water. |
| 15-Sep | 03.32.04 | -15.01888 | -173.78665 | 2210 | 1 | 205 | Target of where we are seeing evidence of venting. **Mat target.** (Didn't get the fix from the pilot. Will get it later) |
| 15-Sep | 03.32.07 | -15.01888 | -173.78665 | 2210 | 1 | 205 | The sediments are darker than the ones we saw earlier. The smaller animals appear to be amphipods. |
| 15-Sep | 03.33.41 | -15.01887 | -173.78670 | 2209 | 1 | 214 | Another squat lobster. Saw a pelagic swimming polychaete. Also the amphipods. |
| 15-Sep | 03.34.58 | -15.01887 | -173.78670 | 2209 | 1 | 214 | The water seems to be murkier. More particles in the water. |
| 15-Sep | 03.35.44 | -15.01887 | -173.78670 | 2209 | 1 | 214 | Another polychaete and more mat (very thin veneer). |
| 15-Sep | 03.38.25 | -15.01887 | -173.78670 | 2209 | 1 | 214 | We're going to go down about 20 meters in depth and see what we see. |
| 15-Sep | 03.39.11 | -15.01887 | -173.78670 | 2209 | 1 | 214 | Squat lobster and more mat. |
| 15-Sep | 03.39.55 | -15.01887 | -173.78670 | 2209 | 1 | 214 | The first mats were at 2211. We're going to go a bit deeper and see what we see. |
| 15-Sep | 03.40.58 | -15.01887 | -173.78670 | 2209 | 1 | 214 | Sediment is coming off the vehicle. |
| 15-Sep | 03.41.23 | -15.01887 | -173.78670 | 2209 | 1 | 214 | There is a scarp in front of us. |
| 15-Sep | 03.42.04 | -15.01887 | -173.78670 | 2209 | 1 | 214 | We don't see anything now. The sediment we are seeing in the water is from the vehicle "porch". |
| 15-Sep | 03.43.04 | -15.01887 | -173.78670 | 2209 | 1 | 214 | The ROV is turning into the bottom. Soft sponges are here and know to be in peripheral area of vent areas. |
| 15-Sep | 03.44.14 | -15.01887 | -173.78670 | 2209 | 1 | 214 | Saw Galatheid crabs. |
| 15-Sep | 03.45.35 | -15.01887 | -173.78670 | 2209 | 1 | 214 | We're going to stay at this depth and head to the northeast; then go upslope if we don't find anything. |
| 15-Sep | 03.46.12 | -15.01887 | -173.78670 | 2209 | 1 | 214 | Incredibly steep slope here. We're going to hold this depth and come around. |
| 15-Sep | 03.47.31 | -15.01887 | -173.78670 | 2209 | 1 | 214 | The little squiggly white things are polychaetes. |
| 15-Sep | 03.48.41 | -15.01887 | -173.78670 | 2209 | 1 | 214 | A squat lobster (galatheid). |
| 15-Sep | 03.49.07 | -15.01887 | -173.78670 | 2209 | 1 | 214 | We see mat on this rock. Very steep slope. |
| 15-Sep | 03.51.13 | -15.01887 | -173.78670 | 2209 | 1 | 214 | Incredibly steep outcrop here. We're seeing diking here. |
| 15-Sep | 03.53.20 | -15.01887 | -173.78670 | 2209 | 1 | 214 | We're seeing lots of wispy mat hanging from this diking outcrop. |
| 15-Sep | 03.55.14 | -15.01887 | -173.78670 | 2209 | 1 | 214 | More mat on the top of these rocks. It was a big pillar spire. |
| 15-Sep | 03.57.41 | -15.01887 | -173.78670 | 2209 | 1 | 214 | We're back in the rubble slope. 3 galatheids in 1 view. |
| 15-Sep | 03.57.46 | -15.01887 | -173.78670 | 2209 | 1 | 214 | Steep slope face and altered sediments. |
| 15-Sep | 03.59.22 | -15.01887 | -173.78670 | 2209 | 1 | 214 | Going around a ridge sticking out of the slope. |
| 15-Sep | 04.02.28 | -15.01887 | -173.78670 | 2209 | 1 | 214 | Rock with a chimney shape. |
| 15-Sep | 04.03.22 | -15.01887 | -173.78670 | 2209 | 1 | 214 | Looks like mat along side of the rock on the uphill side. |
| 15-Sep | 04.03.47 | -15.01887 | -173.78670 | 2209 | 1 | 214 | Turning into the slope to see if there is any more of this mat that is on the rock. |
| 15-Sep | 04.04.17 | -15.01887 | -173.78670 | 2209 | 1 | 214 | Looking around this rock spire. Lots of rubble and a squat lobster. |
| 15-Sep | 04.05.03 | -15.01887 | -173.78670 | 2209 | 1 | 214 | More sponges and squat lobsters but not more mat. |
| 15-Sep | 04.06.40 | -15.01887 | -173.78670 | 2209 | 1 | 214 | Slope over here and the water is much clearer. Hdg 159. |
| 15-Sep | 04.07.13 | -15.01887 | -173.78670 | 2209 | 1 | 214 | Eel fish swimming. |
| 15-Sep | 04.09.02 | -15.01887 | -173.78670 | 2209 | 1 | 214 | Plan is to go deeper NW then go down (south) and across east. |
| 15-Sep | 04.10.38 | -15.01887 | -173.78670 | 2209 | 1 | 214 | Will need to move ship in order to make this search pattern. |
| 15-Sep | 04.10.52 | -15.01887 | -173.78670 | 2209 | 1 | 214 | Doesn't appear to be much current. |
| 15-Sep | 04.12.26 | -15.01887 | -173.78670 | 2209 | 1 | 214 | CTD plume was on NW side of this area as well. |
| 15-Sep | 04.13.57 | -15.01887 | -173.78670 | 2209 | 1 | 214 | More angular rubble. |
| 15-Sep | 04.15.47 | -15.01887 | -173.78670 | 2209 | 1 | 214 | Heading downslope 053. |
| 15-Sep | 04.16.52 | -15.01887 | -173.78670 | 2209 | 1 | 214 | Talus slope with sediment. |
| 15-Sep | 04.17.12 | -15.01887 | -173.78670 | 2209 | 1 | 214 | Seeing some galatheid crabs with some murkiness in the water. |
| 15-Sep | 04.17.55 | -15.01887 | -173.78670 | 2209 | 1 | 214 | No USBL. Heading for 2245m depth before turning. |
| 15-Sep | 04.18.35 | -15.01887 | -173.78670 | 2209 | 1 | 214 | Eel fish different kind. |
| 15-Sep | 04.19.03 | -15.01887 | -173.78670 | 2209 | 1 | 214 | 2245m very steep. Going to head west now. |
| 15-Sep | 04.21.27 | -15.01887 | -173.78670 | 2209 | 1 | 214 | Now heading at 210 and going to drive SW at this depth. |
| 15-Sep | 04.23.38 | -15.01887 | -173.78670 | 2209 | 1 | 214 | Driving along at 2242m at 227deg. |
| 15-Sep | 04.23.55 | -15.01887 | -173.78670 | 2209 | 1 | 214 | Coming over lava rock. |
| 15-Sep | 04.24.35 | -15.01887 | -173.78670 | 2209 | 1 | 214 | Maybe up against a lava dike. Doing a pilot exchange in control van. |
| 15-Sep | 04.25.27 | -15.01887 | -173.78670 | 2209 | 1 | 214 | Looks like mat on the rock outcrop. |
| 15-Sep | 04.26.08 | -15.01887 | -173.78670 | 2209 | 1 | 214 | Vertical cliff on the other side of the dike. |

| date | time | latitude | longitude | Z | alt | hdg | Q325 - North Mata Ua Dive Comments |
|---|---|---|---|---|---|---|---|
| 15-Sep | 04.26.26 | -15.01887 | -173.78670 | 2209 | 1 | 214 | Dike is sticking out of the slope. Back on slope of rock & sediment. |
| 15-Sep | 04.27.41 | -15.01816 | -173.78661 | 2243 | 1 | 168 | USBL is back. |
| 15-Sep | 04.28.26 | -15.01815 | -173.78661 | 2243 | 5 | 161 | Rock outcrops of dikes. |
| 15-Sep | 04.29.12 | -15.01815 | -173.78669 | 2243 | 4 | 158 | Looking into the slope and moving right. |
| 15-Sep | 04.30.09 | -15.01821 | -173.78665 | 2241 | 3 | 169 | Ship will be moving north as we continue ROV move to the right. Small patch of mat on rock. |
| 15-Sep | 04.30.44 | -15.01820 | -173.78668 | 2241 | 4 | 172 | No evidence of hydrothermal activity. |
| 15-Sep | 04.31.22 | -15.01819 | -173.78667 | 2240 | 3 | 171 | More biology on this side of ridge than before. |
| 15-Sep | 04.32.04 | -15.01822 | -173.78668 | 2239 | 4 | 156 | Coming over a rock outcrop as laterally moving right. |
| 15-Sep | 04.33.03 | -15.01821 | -173.78668 | 2240 | 2 | 182 | Can see more slide patterns in the sediments downslope. |
| 15-Sep | 04.33.08 | -15.01821 | -173.78668 | 2239 | 2 | 182 | Seeing more worms. |
| 15-Sep | 04.34.22 | -15.01836 | -173.78677 | 2238 | 3 | 226 | More sponges and whip coral. |
| 15-Sep | 04.37.13 | -15.01844 | -173.78687 | 2240 | 2 | 148 | Still moving SW along the north facing wall. Some evidence of life forms of vents but no actual venting seen. |
| 15-Sep | 04.37.51 | -15.01857 | -173.78688 | 2240 | 3 | 194 | Zigzagging on this wall. Some bacterial mat. Brownish stained sediments. |
| 15-Sep | 04.39.13 | -15.01854 | -173.78691 | 2241 | 4 | 181 | Bacterial mat on the rock in front of us - an anemone too. |
| 15-Sep | 04.41.19 | -15.01857 | -173.78697 | 2239 | 5 | 178 | On the NW flank of this ridge will work our way around to the SW flank of this ridge. |
| 15-Sep | 04.41.59 | -15.01867 | -173.78708 | 2240 | 1 | 242 | Geology: a number of dikes on this wall. Have also seen a number of faults and large amounts of breccia. Constructional volcano. The faults may be the feeder channels for hydrothermal fluid. |
| 15-Sep | 04.45.39 | -15.01862 | -173.78717 | 0 | 0 | 0 | Talking strategy in the control van. About a 2 hour descent for the ROV to the ship. |
| 15-Sep | 04.47.28 | -15.01862 | -173.78717 | 2242 | 1 | 247 | Talus blocks in front of us. |
| 15-Sep | 04.48.55 | -15.01862 | -173.78717 | 2242 | 1 | 253 | The water is getting cloudier here. Is the ROV kicking up sediment. |
| 15-Sep | 04.50.26 | -15.01862 | -173.78717 | 2243 | 1 | 239 | A little mat on these rocks. |
| 15-Sep | 04.52.01 | -15.01862 | -173.78717 | 2243 | 1 | 237 | It seems to be a bit murkier now. Some bacterial mat on the rocks. Very thin coat. |
| 15-Sep | 04.54.12 | -15.01862 | -173.78717 | 2234 | 7 | 239 | Tether management. We're 8 meters above the seafloor. Can't see the bottom. |
| 15-Sep | 04.57.13 | -15.01862 | -173.78717 | 2238 | 2 | 218 | We're back on the bottom. |
| 15-Sep | 04.58.26 | -15.01862 | -173.78717 | 2237 | 1 | 234 | The ROV has stirred up the bottom sediments while working on the tether. They feel the tether is clear now. Moving the ship above the ROV now. |
| 15-Sep | 05.01.23 | -15.01862 | -173.78717 | 2237 | 1 | 234 | Back in the water column. Sorting out the tether problems. |
| 15-Sep | 05.04.19 | -15.01865 | -173.78704 | 0 | 0 | 0 | Speculating that the dikes may be conduits of the warm water. |
| 15-Sep | 05.07.07 | -15.01864 | -173.78694 | 2217 | 7 | 257 | We're coming back down to the seafloor. |
| 15-Sep | 05.07.30 | -15.01864 | -173.78692 | 2226 | 5 | 252 | There's the seafloor. |
| 15-Sep | 05.08.46 | -15.01853 | -173.78691 | 2230 | 3 | 270 | Back off the seafloor. Tether management. Want to move the ROV away from the cliff face to get this arrangement straight. |
| 15-Sep | 05.10.11 | -15.01851 | -173.78685 | 2231 | 1 | 255 | On the seafloor again. |
| 15-Sep | 05.10.34 | -15.01854 | -173.78684 | 2231 | 3 | 238 | Talus and sediment slope. Outcrop ahead. |
| 15-Sep | 05.10.56 | -15.01854 | -173.78689 | 2230 | 5 | 230 | More bacterial mat (white filamentous bacterial mat) on the top of this wall. |
| 15-Sep | 05.12.02 | -15.01852 | -173.78691 | 2228 | 5 | 165 | No rock for Ken. We're going to leave the bottom. |
| 15-Sep | 05.12.59 | -15.01871 | -173.78690 | 2218 | 5 | 160 | Seeing crabs and squat lobsters. Lots of particulates in the water. Flat here. |
| 15-Sep | 05.13.49 | -15.01871 | -173.78690 | 2211 | 6 | 111 | **Coming off the bottom.** |
| 15-Sep | 05.14.23 | -15.01875 | | | | | End of our time on the bottom at Mata Ua - at least for this expedition. |
| 15-Sep | 07.20.00 | -15.01875 | | | | | **Quest on deck.** |

## 7.5 Q326 Niua South Dive Log

| date | time | latitude | longitude | Z | alt | hdg | Q326 - Niua South Dive Comments |
|---|---|---|---|---|---|---|---|
| **Main Goals:** Explore and sample Niua southern pit. | | | | | | | |
| **Launch target:** 15°10.0057' S 173°34.549' W Z=1143m Small pit SW of main feature | | | | | | | |
| **Setup:** 3 gastights; 3 majors; temp probe; 1 Davis sampler; large biobox; suction sampler pelagic pump; T-handle | | | | | | | |
| **Nav Notes:** bottom time 9/17/2012 23:23 - 9/18 06:44. Nav smoothed (tolerance=15). Split the nav file into 2 parts. Part 1: small SW pit. 23:22:22 - 01:42:12. Same nav fix 23:27 – 01:42. Gap 01:51 – 02:34. Moved nav file part 1: -14m (W) +24m (N). | | | | | | | |
| **Nav Notes cont:** Part 2: larger pit to north. 02:33:58 - 03:29:32 (last good nav fix). Same nav fix 03:29 – 04:05:32. 04:06:36 end of file. Did not move part 2 nav. | | | | | | | |
| **DIVE LOG POSITION INFORMATION: latitude; longitude; Z; alt; hdg values are derived from finalized Quest nav. Any lat/long values in the dive comments column were recorded at sea and are preliminary.** | | | | | | | |
| 17-Sep | 22.07.13 | | | | | | Preparing for vehicle launch. |
| 17-Sep | 22.07.40 | | | | | | Ship is set-up on Target A. |
| 17-Sep | 22.15.30 | | | | | | Removing final straps off the vehicle. |
| 17-Sep | 22.16.39 | | | | | | ROV coming off the deck. |
| 17-Sep | 22.22.08 | | | | | | **ROV in the water.** |
| 17-Sep | 22.39.11 | | | | | | Ship position: 15°0.0035'S 173°34.6423'W. ROV LBL position: 15°10.002'S 173°34.699'W. |
| 17-Sep | 22.56.59 | | | | | | Still descending. |
| 17-Sep | 23.05.27 | | | | | | Passing 750m. |
| 17-Sep | 23.10.44 | | | | | | Expect to see chimneys in this southern portion of Niua where as the northern part is expected to see more molten sulfur. |
| 17-Sep | 23.13.31 | | | | | | First target is a small pit to the south of the main pit. Could be a younger feature of the larger pit and perhaps a collapse feature. |
| 17-Sep | 23.13.39 | | | | | | Passing 900m. |
| 17-Sep | 23.15.09 | | | | | | Approximately 200m off bottom. |
| 17-Sep | 23.17.34 | | | | | | Passing 1000m. |
| 17-Sep | 23.19.33 | | | | | | 100m off the bottom. **[post-cruise note: start of nav file q326-part1 at 23:22:22]** |
| 17-Sep | 23.23.03 | -15.16662 | -173.57609 | 1128 | 17 | 263 | Altimeter is working in the control van. |
| 17-Sep | 23.23.33 | -15.16660 | -173.57607 | 1143 | 4 | 263 | **There is the bottom.** |
| 17-Sep | 23.24.06 | -15.16660 | -173.57605 | 1146 | 3 | 263 | Could be pumice rocks with sediment in between. |
| 17-Sep | 23.24.23 | -15.16657 | -173.57609 | 1147 | 3 | 273 | See shrimp swimming in water. |
| 17-Sep | 23.24.38 | -15.16657 | -173.57609 | 1148 | 3 | 274 | We are a the southern edge of the pit. |
| 17-Sep | 23.24.47 | -15.16657 | -173.57609 | 1147 | 3 | 273 | Manganese coated pumice. |
| 17-Sep | 23.25.05 | -15.16657 | -173.57606 | 1146 | 4 | 275 | Crab. |
| 17-Sep | 23.25.24 | -15.16656 | -173.57605 | 1147 | 4 | 274 | Seeing signs of hydrothermal activity. |
| 17-Sep | 23.26.17 | -15.16657 | -173.57607 | 1147 | 4 | 274 | ROV is making bottom checks. |
| 17-Sep | 23.26.49 | -15.16656 | -173.57604 | 1148 | 4 | 325 | White material composed of both iron oxidation and biological activity. |
| 17-Sep | 23.27.16 | -15.16651 | -173.57602 | 1148 | 5 | 324 | These shrimp are the type seen at hydrothermal vents. |
| 17-Sep | 23.27.24 | -15.16647 | -173.57601 | 1150 | 4 | 304 | Pumice slab. Altered material. Looks more like tephra sediment. |
| 17-Sep | 23.28.18 | -15.16647 | -173.57601 | 1152 | 5 | 309 | Could be on a bench inside the pit. |
| 17-Sep | 23.28.59 | -15.16641 | -173.57596 | 1150 | 10 | 329 | On the SW wall and is fairly steep. |
| 17-Sep | 23.29.35 | -15.16639 | -173.57594 | 1148 | 10 | 10 | Sonar can see upper wall of pit with some depressions. |
| 17-Sep | 23.29.56 | -15.16637 | -173.57590 | 1150 | 7 | 356 | Black rock with crabs on it-could be a big piece of pumice. |
| 17-Sep | 23.30.14 | -15.16637 | -173.57590 | 1150 | 7 | 353 | Shrimp. Descending down to center of pit. |
| 17-Sep | 23.31.33 | -15.16634 | -173.57587 | 1152 | 4 | 327 | Crabs (galatheids) and some type of snails covering the slabs. Veins of material on the rock. |
| 17-Sep | 23.31.52 | -15.16635 | -173.57582 | 1150 | 8 | 327 | Still descending with about 5m to go. |
| 17-Sep | 23.32.17 | -15.16637 | -173.57590 | 1155 | 7 | 327 | Looks like an area of diffuse venting. |
| 17-Sep | 23.32.44 | -15.16642 | -173.57582 | 1158 | 7 | 325 | Material looks like highly altered and volcaniclastic. |
| 17-Sep | 23.33.11 | -15.16644 | -173.57581 | 1160 | 6 | 327 | Bottom is still 7m below us with a hdg of 327. |
| 17-Sep | 23.33.46 | -15.16647 | -173.57579 | 1163 | 4 | 3 | Looking at NW wall as we descend. |
| 17-Sep | 23.33.58 | -15.16650 | -173.57577 | 1163 | 3 | 2 | Lots of shrimp getting disturbed. |
| 17-Sep | 23.34.12 | -15.16649 | -173.57579 | 1163 | 3 | 1 | Seeing some shimmer in the water. |
| 17-Sep | 23.34.32 | -15.16649 | -173.57576 | 1163 | 2 | 5 | Lots and lots of shrimp. Squat lobsters. |
| 17-Sep | 23.34.46 | -15.16650 | -173.57576 | 0 | 0 | 0 | HD recording on tape. |
| 17-Sep | 23.35.08 | -15.16646 | -173.57577 | 1163 | 2 | 8 | Taking DSC as well. Shimmering water in the ledges. |
| 17-Sep | 23.35.37 | -15.16650 | -173.57578 | 1163 | 3 | 18 | Clear fluids coming from the white stained areas. Zoarcid (eelpout). |
| 17-Sep | 23.35.56 | -15.16652 | -173.57579 | 0 | 0 | 0 | Looks like eelpouts sitting on the floor/mat. |
| 17-Sep | 23.36.44 | -15.16650 | -173.57573 | 1163 | 4 | 35 | Nearing the bottom with 2.8m above and depth 1164m. |
| 17-Sep | 23.36.58 | -15.16654 | -173.57578 | 1165 | 3 | 38 | Pit location is only about 20m off the map. |
| 17-Sep | 23.37.21 | -15.16654 | -173.57581 | 1165 | 3 | 59 | HD off. |

| date | time | latitude | longitude | Z | alt | hdg | Q326 - Niua South Dive Comments |
|---|---|---|---|---|---|---|---|
| 17-Sep | 23.37.55 | -15.16650 | -173.57578 | 1163 | 3 | 302 | **1164m at the bottom of the pit (14m total depth).** |
| 17-Sep | 23.38.42 | -15.16654 | -173.57581 | 1164 | 3 | 264 | Taking a look at the sonar from the bottom of the pit. We are in the middle of the pit. |
| 17-Sep | 23.39.27 | -15.16654 | -173.57577 | 0 | 0 | 0 | Going to move forward to the west wall which is believed to be the steepest wall of the pit. |
| 17-Sep | 23.40.01 | -15.16653 | -173.57573 | 1162 | 2 | 220 | Now looking south. Pit is only 30m in diameter. |
| 17-Sep | 23.40.04 | -15.16655 | -173.57576 | 1162 | 2 | 300 | Swinging around for a look. |
| 17-Sep | 23.41.04 | -15.16651 | -173.57579 | 1163 | 2 | 19 | Clearly the shrimp are different than seeing on the eastern Lau and would like to sample. |
| 17-Sep | 23.41.43 | -15.16653 | -173.57577 | 1164 | 2 | 344 | There are seeing some solid rock and would like a sample of the that. |
| 17-Sep | 23.44.37 | -15.16648 | -173.57581 | 1164 | 1 | 91 | Would like to try to put the slurp gun parallel the surface to avoid getting pumice in the slurp. HD is on. |
| 17-Sep | 23.44.56 | -15.16649 | -173.57577 | 1165 | 1 | 91 | Zoarcid fish in abundance as well. |
| 17-Sep | 23.46.01 | -15.16648 | -173.57576 | 1165 | 1 | 91 | Preparing for suction sample of biology. Seeing white flock in the water coming up from the pumice. |
| 17-Sep | 23.46.45 | -15.16646 | -173.57577 | 1165 | 1 | 91 | Vehicle is at 091hdg and 1165m depth for sampling. |
| 17-Sep | 23.47.55 | -15.16648 | -173.57577 | 1165 | 1 | 91 | Zoarcids do eat shrimp and crabs. They are the top predator. |
| 17-Sep | 23.48.27 | -15.16648 | -173.57576 | 1165 | 1 | 91 | Removing suction from the basket. |
| 17-Sep | 23.48.59 | -15.16648 | -173.57577 | 1165 | 1 | 91 | Current position 15°10.0001'S 173°34.542'W. |
| 17-Sep | 23.49.36 | -15.16648 | -173.57580 | 1164 | 1 | 91 | HD is on. There are 2 different species of shrimp here. The eyes are measily fused on one and more apart on the other species. |
| 17-Sep | 23.50.24 | -15.16650 | -173.57577 | 1164 | 1 | 91 | Amazing to see these rocks full of gas at 1000m depth. Very explosive. |
| 17-Sep | 23.50.44 | -15.16648 | -173.57581 | 1166 | 1 | 91 | Brachyuran crab. |
| 17-Sep | 23.52.04 | -15.16649 | -173.57573 | 1165 | 1 | 91 | Slurping and seeing some shrimp going into the tube. |
| 17-Sep | 23.52.36 | -15.16647 | -173.57577 | 1165 | 1 | 91 | **Bio Sample: Q326-biomacro-01**. Shrimp seen going into the chamber. |
| 17-Sep | 23.53.06 | -15.16649 | -173.57580 | 1165 | 1 | 91 | Appears that shrimp are going back out the tube. |
| 17-Sep | 23.53.18 | -15.16650 | -173.57577 | 1165 | 1 | 91 | No mesh on the tube. Still slurping. |
| 17-Sep | 23.54.06 | -15.16648 | -173.57582 | 1165 | 1 | 91 | Lots of shrimp in chamber. |
| 17-Sep | 23.54.53 | -15.16650 | -173.57577 | 1165 | 1 | 92 | Shrimp are coming back into the chamber. |
| 17-Sep | 23.55.52 | -15.16652 | -173.57573 | 1165 | 1 | 91 | Slurp a little more before rotating the chamber. Slurping but they went out the thruster. Also have a piece of pumice in the sampling tube. |
| 17-Sep | 23.56.49 | -15.16647 | -173.57576 | 1164 | 1 | 91 | Can see some in the chamber. Rotating chamber. |
| 17-Sep | 23.59.59 | -15.16649 | -173.57581 | 1165 | 1 | 91 | Tim is going to control van for shrimp sampling. |
| 18-Sep | 00.00.28 | -15.16649 | -173.57576 | 1165 | 1 | 91 | Temperature on the tool tip is 5.1°C. |
| 18-Sep | 00.01.51 | -15.16649 | -173.57574 | 1165 | 1 | 91 | Taking second suction in the same area. |
| 18-Sep | 00.03.56 | -15.16648 | -173.57579 | 0 | 0 | 0 | Problem with the suction sampler. |
| 18-Sep | 00.05.34 | -15.16648 | -173.57576 | 1165 | 1 | 91 | Shrimp with red back vs. the other type that is more white. |
| 18-Sep | 00.06.03 | -15.16647 | -173.57580 | 1164 | 1 | 91 | CTD temperature is fluctuating by half a degree. Tool tip temperature is also varying. Weeping of hydrothermal fluids. |
| 18-Sep | 00.07.51 | -15.16650 | -173.57573 | 1164 | 1 | 91 | Still resolving slurp problem. The shrimp are scraping microbial material from rocks to feed. |
| 18-Sep | 00.09.30 | -15.16649 | -173.57573 | 1165 | 1 | 91 | Could be red shrimp are predators and the others are scavengers as we saw the red type carrying off the other variety. |
| 18-Sep | 00.12.36 | -15.16648 | -173.57581 | 1165 | 1 | 91 | Shifting pilots in the control van. Still working on suction sampler. |
| 18-Sep | 00.15.11 | -15.16650 | -173.57575 | 1165 | 1 | 91 | 2 species of shrimp; one with well-formed eye stalks and the other without. Larvae feed 100s of meters up in the water column and have usable eyes and loose them when they settle on the bottom. |
| 18-Sep | 00.16.45 | -15.16646 | -173.57581 | 1165 | 1 | 91 | Greater concentration of shrimp on the white patches on the seafloor. Many Zoarcids fish that are small which infer there has been some recent reproductive event. |
| 18-Sep | 00.17.12 | -15.16648 | -173.57579 | 1165 | 1 | 91 | Only seen a few galatheid crabs (scavengers) here. |
| 18-Sep | 00.18.11 | -15.16650 | -173.57573 | 1165 | 1 | 91 | Eye-stalk species could be a new species. |
| 18-Sep | 00.18.40 | -15.16649 | -173.57581 | 1165 | 1 | 91 | Only seeing mobile fauna here (no tubeworms, bivalves or snails). Terrain that changes a lot can't support the more sessile animals. |
| 18-Sep | 00.20.04 | -15.16648 | -173.57581 | 1165 | 1 | 91 | Can see some shrimp with swollen abdomens that probably are females containing 1000s of eggs. |
| 18-Sep | 00.21.33 | -15.16652 | -173.57579 | 1165 | 1 | 94 | Moving the ROV slightly to try the suction again. |
| 18-Sep | 00.25.43 | -15.16650 | -173.57576 | 1165 | 1 | 94 | Suction sampler will not be working for the remainder of the dive. |
| 18-Sep | 00.27.27 | -15.16649 | -173.57579 | 1165 | 1 | 94 | Stowing suction sampler. |
| 18-Sep | 00.28.47 | -15.16648 | -173.57580 | 1165 | 1 | 94 | Will attempt to sample a rock from a solid feature seen on the wall. |
| 18-Sep | 00.30.04 | -15.16649 | -173.57577 | 1164 | 2 | 140 | Would like to move to the outcrop above for a sample. On the move. |
| 18-Sep | 00.31.09 | -15.16659 | -173.57577 | 1161 | 3 | 147 | Fish. Do not want this rock. |
| 18-Sep | 00.31.25 | -15.16659 | -173.57577 | 1161 | 4 | 148 | Lots of shrimp disturbed by the movement of the vehicle. |

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| 18-Sep | 00.31.36 | -15.16659 | -173.57577 | 1159 | 4 | 120 | Looks like breccia with clay. |
| 18-Sep | 00.32.29 | -15.16658 | -173.57577 | 1157 | 5 | 130 | Want a sample of the material on the bench before leaving the pit. |
| 18-Sep | 00.33.14 | -15.16653 | -173.57577 | 1157 | 7 | 89 | See the right stuff in the HD. |
| 18-Sep | 00.34.03 | -15.16651 | -173.57575 | 1156 | 5 | 96 | This rock looks welded and would be good for sampling. Looks like tumbled from above-columnar. Could be a dike as it is jointed. |
| 18-Sep | 00.34.20 | -15.16653 | -173.57577 | 1156 | 5 | 94 | Want some DSC of this. Big fish at top of screen. |
| 18-Sep | 00.35.30 | -15.16654 | -173.57574 | 1157 | 5 | 95 | Trying to get sample from this welded rock. |
| 18-Sep | 00.36.42 | -15.16653 | -173.57576 | 1156 | 5 | 95 | Looks like it is loose from being fractured up with a crab hiding inside. |
| 18-Sep | 00.38.49 | -15.16653 | -173.57576 | 1156 | 5 | 95 | **Geo Sample: Q326-rock-02**. Not the ideal piece as not sure if it came from the welded piece that was broken off. DSC of the sample. |
| 18-Sep | 00.41.16 | -15.16653 | -173.57573 | 1156 | 5 | 95 | Placing rock in STBD tube #1 |
| 18-Sep | 00.41.46 | -15.16653 | -173.57573 | 1157 | 5 | 95 | Not sure that rock was part of the big rock so will try another sample at the same place but from the big rock. |
| 18-Sep | 00.42.28 | -15.16653 | -173.57573 | 1157 | 5 | 95 | Grabbing top of the big rock but trying to keep a piece before it falls apart. Perfect piece of columnar jointing perhaps from cooling. |
| 18-Sep | 00.43.38 | -15.16653 | -173.57573 | 1156 | 6 | 85 | Nice view of fish as well. |
| 18-Sep | 00.44.33 | -15.16653 | -173.57573 | 1156 | 6 | 85 | **Geo Sample: Q326-rock-03**. Most in place material in this area. Columnar looking piece. Got a piece. No DSC just put in box. Did get a DSC. |
| 18-Sep | 00.45.17 | -15.16653 | -173.57573 | 1155 | 6 | 85 | Sample from wall of pit. |
| 18-Sep | 00.47.28 | -15.16653 | -173.57573 | 1156 | 6 | 85 | Put sample in #2. |
| 18-Sep | 00.47.51 | -15.16653 | -173.57573 | 1156 | 6 | 85 | Took another piece of columnar looking pieces. Second piece of Q326-rock-3 in tube #2. Came from same source. |
| 18-Sep | 00.49.07 | -15.16653 | -173.57573 | 1156 | 5 | 85 | Close-up of fish in HD. |
| 18-Sep | 00.51.38 | -15.16653 | -173.57573 | 1154 | 5 | 85 | Rock 3 target. Looking at the east wall and moving over to the west wall. |
| 18-Sep | 00.52.33 | -15.16653 | -173.57573 | 1154 | 7 | 285 | Turning right to the west to look at the steeper wall. |
| 18-Sep | 00.53.24 | -15.16653 | -173.57573 | 1158 | 5 | 314 | Hydrothermal staining as drive to west wall. |
| 18-Sep | 00.53.39 | -15.16653 | -173.57573 | 1158 | 7 | 327 | **Now at the west wall.** |
| 18-Sep | 00.53.59 | -15.16653 | -173.57573 | 1158 | 7 | 321 | White patches on the wall. Warm water streaming out of the pit. |
| 18-Sep | 00.54.37 | -15.16653 | -173.57573 | 1157 | 5 | 346 | Highly altered white slabs. Layered ash perhaps. |
| 18-Sep | 00.55.13 | -15.16653 | -173.57573 | 1156 | 6 | 358 | Seeing some blacker perhaps manganese coated rock. |
| 18-Sep | 00.55.42 | -15.16653 | -173.57573 | 1156 | 2 | 356 | Seeing small snails or something again. Looks like snails. |
| 18-Sep | 00.56.25 | -15.16653 | -173.57573 | 1155 | 4 | 341 | Getting some DSC of the veining and black rock with contacts. |
| 18-Sep | 00.57.02 | -15.16653 | -173.57573 | 1154 | 3 | 331 | We would like to leave the pit and head over to the other area. |
| 18-Sep | 00.57.33 | -15.16653 | -173.57573 | 1155 | 3 | 340 | Looking at altered material and veins of alteration from the hydrothermal fluids flowing pervasively. |
| 18-Sep | 00.58.26 | -15.16653 | -173.57573 | 1153 | 3 | 331 | Almost at the top but are probably on a bench. |
| 18-Sep | 00.58.53 | -15.16653 | -173.57573 | 1151 | 5 | 319 | Steep material above as we move up. |
| 18-Sep | 00.59.15 | -15.16653 | -173.57573 | 1152 | 6 | 343 | Slab of ash material with veins on it. Lots of snails on these white slabs. |
| 18-Sep | 01.00.03 | -15.16653 | -173.57573 | 1152 | 3 | 356 | Would like to get a sample of the white slab to complete the story of how this was formed. |
| 18-Sep | 01.01.28 | -15.16653 | -173.57573 | 1152 | 2 | 356 | Tubes (veining) are on the slab and continue off the slab so something else is making them. |
| 18-Sep | 01.02.17 | -15.16653 | -173.57573 | 1152 | 2 | 355 | Preparing arm for sampling. |
| 18-Sep | 01.03.05 | -15.16653 | -173.57573 | 1152 | 2 | 355 | Housecleaning the rocks off the basket shelf. Galatheid is also on the basket rim. |
| 18-Sep | 01.04.27 | -15.16653 | -173.57573 | 1152 | 2 | 355 | It is possible that the trails are from the snails. |
| 18-Sep | 01.05.49 | -15.16653 | -173.57573 | 1152 | 2 | 355 | Galatheid crab on the basket swam off. |
| 18-Sep | 01.07.10 | -15.16653 | -173.57573 | 1152 | 2 | 355 | Ready to sample the white slab. |
| 18-Sep | 01.08.11 | -15.16653 | -173.57573 | 1152 | 2 | 355 | Will try to grab the edge and snap off a piece. |
| 18-Sep | 01.08.32 | -15.16653 | -173.57573 | 1152 | 1 | 357 | Fairly fragile when it broke off. |
| 18-Sep | 01.11.05 | -15.16653 | -173.57573 | 1152 | 2 | 358 | Picking up the piece that broke off. |
| 18-Sep | 01.11.07 | -15.16653 | -173.57573 | 1152 | 2 | 356 | Tubes on the rocks stay cohesive and didn't break when slab broke off. |
| 18-Sep | 01.12.28 | -15.16653 | -173.57573 | 1152 | 2 | 355 | Got it! Piece of slab but it is very fragile. |
| 18-Sep | 01.13.32 | -15.16653 | -173.57573 | 1152 | 2 | 355 | Some piece when into box #7. |
| 18-Sep | 01.13.34 | -15.16653 | -173.57573 | 1152 | 2 | 355 | **Geo Sample: Q326-rock-04.** Piece of white slab on the way up the west wall of the small pit. |
| 18-Sep | 01.14.59 | -15.16653 | -173.57573 | 1152 | 3 | 355 | Offset in the nav map appears to be 20m south. |
| 18-Sep | 01.15.49 | -15.16653 | -173.57573 | 1149 | 3 | 354 | Continuing up the wall and then over 150m to the next pit. |
| 18-Sep | 01.16.20 | -15.16653 | -173.57573 | 1149 | 4 | 354 | Slabs on top of the rocks which may be cemented ash slabs. |
| 18-Sep | 01.17.37 | -15.16653 | -173.57573 | 1146 | 2 | 354 | Pieces of more angular rocks. |
| 18-Sep | 01.18.02 | -15.16653 | -173.57573 | 1146 | 2 | 354 | White staining in the fine sediments. We are headed to target F. |
| 18-Sep | 01.19.59 | -15.16653 | -173.57573 | 0 | 0 | 0 | The navigation is not working right now. We're flying using the compass. They are staying about 6m off the bottom. |

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| 18-Sep | 01.21.06 | -15.16653 | -173.57573 | 1142 | 2 | 354 | We're over another white patch on the seafloor. Bacterial mat? |
| 18-Sep | 01.22.00 | -15.16653 | -173.57573 | 1142 | 2 | 354 | Small fish on the seafloor. Very skinny. |
| 18-Sep | 01.23.04 | -15.16653 | -173.57573 | 1142 | 2 | 354 | Swapping out pilots. Chris left and Volker has taken over. |
| 18-Sep | 01.23.41 | -15.16653 | -173.57573 | 1143 | 1 | 354 | Zoomed in on bluish-colored fish near the seafloor. See squat lobsters in the video. |
| 18-Sep | 01.24.32 | -15.16653 | -173.57573 | 1143 | 1 | 354 | Squat lobsters have spines on their heads and nose (rostrum). These are little guys. |
| 18-Sep | 01.25.30 | -15.16653 | -173.57573 | 1144 | 0 | 356 | Tubular brown objects on the seafloor. What are they? They are reasonably hard. |
| 18-Sep | 01.26.04 | -15.16653 | -173.57573 | 1143 | 0 | 358 | There is white bacterial mat on the bottom of these rocks. Must be mat in the white patches as well. |
| 18-Sep | 01.26.44 | -15.16653 | -173.57573 | 1143 | 0 | 358 | Little spirals guy is probably a snail. Shrimp on the rocks. |
| 18-Sep | 01.27.26 | -15.16653 | -173.57573 | 1143 | 0 | 358 | Alvinocaris shrimp (have large eyes). They are the predator-type shrimp. |
| 18-Sep | 01.28.00 | -15.16653 | -173.57573 | 1143 | 1 | 358 | Going to leave the seafloor for a few minutes and go up 10 meters to see is we can fix the USBL navigation system. |
| 18-Sep | 01.29.22 | -15.16653 | -173.57573 | 1139 | 5 | 358 | Off the seafloor. An occasional shrimp swims by. |
| 18-Sep | 01.32.48 | -15.16653 | -173.57573 | 0 | 0 | 0 | Still in the water column 10m above the seafloor. |
| 18-Sep | 01.38.44 | -15.16653 | -173.57573 | 1133 | 11 | 358 | The ROV group does not seem to be comfortable diving without their USBL nav. |
| 18-Sep | 01.42.25 | -15.16653 | -173.57573 | 1133 | 11 | 358 | Volker is considering his options. **[post-cruise note: end of nav file q326-part1 at 01:42:12]** |
| 18-Sep | 01.44.05 | | | | | | The seafloor is in sight again. |
| 18-Sep | 01.44.35 | | | | | | Still sorting out the nav issues. |
| 18-Sep | 01.45.09 | | | | | | White bacterial mat patch right below us. Hydrothermal diffuse fluids must be leaking out somewhere. |
| 18-Sep | 01.45.47 | | | | | | Looks like they are trying some tricks with the navigation. |
| 18-Sep | 01.46.14 | | | | | | The little southern pit was really great. The bonus was that it had hydrothermal activity and animals. Lots of life there. |
| 18-Sep | 01.48.25 | | | | | | They are messing with the navigation serial ports now. |
| 18-Sep | 01.49.03 | | | | | | Sand ripples on the seafloor - show the current direction. |
| 18-Sep | 01.49.59 | | | | | | The solid black material is probably ash. Richard thinks the sandy-looking sediments are also volcaniclastic. |
| 18-Sep | 01.51.11 | | | | | | Richard is talking about welded pyroclastic flows - most don't think it can happen underwater; but not sure it can't happen. One would need a colossal eruption. |
| 18-Sep | 01.52.25 | | | | | | These arc volcanoes have a huge amount of pumice. Highly silicic; gas-rich volcanics. (The factory where we make continental crust - highly silicic like much geology on land,) |
| 18-Sep | 01.58.16 | | | | | | They have decided to put the cursor where they believe they were when the nav went out. Then they intend of move the ship and follow with the ROV. Sort of a dead-reckoning thing. |
| 18-Sep | 02.04.45 | | | | | | Well - not sure of the latest plan. They are trying to get the DVL working now. |
| 18-Sep | 02.07.27 | | | | | | Still looking at the same spot…… |
| 18-Sep | 02.09.44 | | | | | | Joe is signing off and Bill is taking over. Still here in the same spot. |
| 18-Sep | 02.12.21 | | | | | | The research technicians on board (John and Brett) have joined the navigation guys in hopes of solving the navigation issue. |
| 18-Sep | 02.13.19 | | | | | | USBL still not working. They've asked the ship to move about 50m north. Hoping that having the ship in a different position may help diagnose the navigation problem. |
| 18-Sep | 02.17.32 | | | | | | We are going to stay in this one place until the ship has moved. |
| 18-Sep | 02.21.56 | | | | | | They are panning around. |
| 18-Sep | 02.22.10 | | | | | | The Doppler is up and running. |
| 18-Sep | 02.22.34 | | | | | | Will move the ROV to the west and the ship to the north. We'll turn the ROV toward the pit and end up at black smokers we hope. |
| 18-Sep | 02.23.46 | | | | | | Well-jointed probably manganese coated that we sampled in the small pit. Still moving the ROV to west. |
| 18-Sep | 02.24.13 | | | | | | Richard feels that what we are seeing it volcanic ash. The white stuff is probably mat. |
| 18-Sep | 02.25.11 | | | | | | All of a sudden it's all ash; very little mat and no rocks. |
| 18-Sep | 02.25.50 | | | | | | Ripple-effect in the sandy surface. |
| 18-Sep | 02.26.27 | | | | | | We're turning now back to the north. |
| 18-Sep | 02.27.17 | | | | | | We're getting closer to the bigger pit |

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| 18-Sep | 02.28.22 | | | | | | We're still going a bit west and waiting for the ship to get ahead of us before we proceed into the larger crater. |
| 18-Sep | 02.30.01 | | | | | | There has been 1 AUV dive here. |
| 18-Sep | 02.31.08 | | | | | | In 2008 there was an ROV here with cameras. Both those dives were performed by Nautilus. |
| 18-Sep | 02.32.32 | | | | | | We're still parked here. |
| 18-Sep | 02.34.49 | -15.16611 | -173.57630 | 1135 | 3 | 12 | It looks like the USBL is up and running again. **[post-cruise note: start of nav file q326-part2 at 02:33:58]** |
| 18-Sep | 02.35.58 | -15.16610 | -173.57626 | 1137 | 1 | 46 | The pilot wants to keep the ship ahead of us. That seems to have done the trick as far as the ability of the ROV to hear the pinger on the ship. |
| 18-Sep | 02.37.36 | -15.16609 | -173.57614 | 1138 | 1 | 46 | The current is coming from the east. |
| 18-Sep | 02.37.50 | -15.16612 | -173.57621 | 1138 | 1 | 46 | USBL is back and a Doppler reset was performed. |
| 18-Sep | 02.38.55 | -15.16611 | -173.57617 | 1138 | 1 | 46 | We have about 100m to go. |
| 18-Sep | 02.39.09 | -15.16609 | -173.57614 | 1138 | 1 | 46 | Squat lobsters on the bottom. |
| 18-Sep | 02.39.49 | -15.16609 | -173.57609 | 1138 | 1 | 46 | The prevailing current is from east to west; determined by the ripples. |
| 18-Sep | 02.40.11 | -15.16609 | -173.57607 | 1139 | 1 | 46 | Lots of the mysterious tubes on the sediments; the which sediments in particular. |
| 18-Sep | 02.40.39 | -15.16608 | -173.57600 | 1139 | 1 | 61 | Larger lava outcrop on the right. Rattail on the right. |
| 18-Sep | 02.41.44 | -15.16608 | -173.57592 | 1140 | 1 | 72 | Barnacles on the rocks. |
| 18-Sep | 02.42.05 | -15.16609 | -173.57587 | 1139 | 1 | 72 | Back into the ash cover. Slowly making our way to the larger crater where the sulfides are. |
| 18-Sep | 02.42.44 | -15.16608 | -173.57579 | 1140 | 1 | 65 | Ripples. Rattail fish. Mostly ash sediments with some white staining. |
| 18-Sep | 02.43.27 | -15.16609 | -173.57564 | 1140 | 1 | 64 | Not much out here in between the pits. It's a pretty quiet neighborhood. |
| 18-Sep | 02.44.07 | -15.16606 | -173.57557 | 1141 | 1 | 64 | We seem to be going right into the current now. Winnowing around the boulders. The currents are in this direction most of the time is what it suggests. |
| 18-Sep | 02.44.50 | -15.16599 | -173.57545 | 1142 | 1 | 64 | Another transition from ash to white seds (mat?) and boulders. |
| 18-Sep | 02.45.25 | -15.16600 | -173.57541 | 1143 | 1 | 64 | Looks like squat lobsters on the rocks. |
| 18-Sep | 02.45.46 | -15.16599 | -173.57531 | 1143 | 1 | 65 | The edge of the pit is coming up in the sonar about 15m in front of us. |
| 18-Sep | 02.46.54 | -15.16595 | -173.57532 | 1144 | 1 | 49 | We're at the edge of the pit. Turning our heading to the north. |
| 18-Sep | 02.47.49 | -15.16592 | -173.57528 | 1145 | 1 | 31 | On the edge. Now only seeing blue water in the HD cam. We're heading for point F. |
| 18-Sep | 02.48.49 | -15.16579 | -173.57526 | 1149 | 1 | 30 | The rock outcrops on the rim may have more permeability - associated with the mats? |
| 18-Sep | 02.49.58 | -15.16568 | -173.57526 | 1150 | 1 | 61 | Bill is explaining the communication between the control van and the hydro van. |
| 18-Sep | 02.50.32 | -15.16568 | -173.57526 | 1153 | 1 | 80 | The ship is about 100m ahead of us to the NE. |
| 18-Sep | 02.51.07 | -15.16562 | -173.57518 | 1155 | 1 | 98 | The Doppler has been reset several times on our transit. |
| 18-Sep | 02.51.45 | -15.16563 | -173.57514 | 0 | 0 | 0 | Now at 1159m. Facing east along the wall of this crater. |
| 18-Sep | 02.52.23 | -15.16555 | -173.57507 | 1165 | 2 | 93 | The slope looks like talus. Possibility pumice rock. |
| 18-Sep | 02.53.09 | -15.16550 | -173.57503 | 1170 | 2 | 93 | Some angular rock and outcrop here. |
| 18-Sep | 02.53.24 | -15.16550 | -173.57502 | 1174 | 3 | 90 | Still continuing downslope. Lots of big blocks. And smaller pumice (?). |
| 18-Sep | 02.54.11 | -15.16534 | -173.57491 | 1175 | 3 | 72 | We're now down in the crater on the floor. We hope to find some hydrothermal vents in here. |
| 18-Sep | 02.55.33 | -15.16525 | -173.57484 | 1179 | 3 | 59 | This looks like an inactive sulfide chimney group ahead. |
| 18-Sep | 02.55.54 | -15.16517 | -173.57482 | 1179 | 3 | 24 | We are continuing north. We want to get to the active chimneys. |
| 18-Sep | 02.56.42 | -15.16500 | -173.57479 | 1178 | 3 | 14 | Snails and a bit of hydrothermal mat on the rocks. |
| 18-Sep | 02.57.15 | -15.16491 | -173.57479 | 1177 | 5 | 16 | Shrimp floating by. Small sulfide chimneys on the right - less than a meter high. |
| 18-Sep | 02.57.57 | -15.16480 | -173.57477 | 1181 | 2 | 15 | More sulfide chimneys on the left. |
| 18-Sep | 02.58.18 | -15.16479 | -173.57477 | 1180 | 3 | 12 | Little inactive sulfide chimneys that have grown out of the seafloor around here. |
| 18-Sep | 02.58.49 | -15.16474 | -173.57471 | 1177 | 5 | 10 | **Some more chimneys in front of us. Inactive chimneys in front of us.** |
| 18-Sep | 02.59.15 | -15.16465 | -173.57472 | 1174 | 9 | 48 | Staining on the chimney to our right. |
| 18-Sep | 02.59.44 | -15.16462 | -173.57473 | 1172 | 9 | 52 | There are chimneys all over the place. Some white staining at the top of many - mostly to the east of us. |
| 18-Sep | 03.00.42 | -15.16454 | -173.57469 | 1180 | 4 | 44 | The navigation is probably 20m off. We were 20m south of where we thought it should be. |
| 18-Sep | 03.01.12 | -15.16449 | -173.57467 | 1180 | 4 | 40 | Broken chimneys to the right. The water is getting murkier. |
| 18-Sep | 03.03.04 | -15.16445 | -173.57468 | 1183 | 4 | 94 | Interesting lighter chimney in front of us. |
| 18-Sep | 03.03.26 | -15.16445 | -173.57468 | 1183 | 4 | 120 | Large acoustic shadow in front of us so we're going to head toward it. |
| 18-Sep | 03.04.21 | -15.16445 | -173.57468 | 1178 | 7 | 113 | Large structure in front of us. |

| date | time | latitude | longitude | Z | alt | hdg | Q326 - Niua South Dive Comments |
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| 18-Sep | 03.04.45 | -15.16447 | -173.57468 | 1177 | 7 | 123 | There's a chimney right in front of us with lots of white staining. This is a large structure that is a mixture of active and inactive spires. Probably 10 chimneys on this structure. |
| 18-Sep | 03.05.54 | -15.16451 | -173.57461 | 1176 | 7 | 118 | **Approaching this large chimney structure.** |
| 18-Sep | 03.06.20 | -15.16451 | -173.57461 | 1175 | 7 | 118 | A few shrimp and maybe snails on the mat at the top of this structure. |
| 18-Sep | 03.07.01 | -15.16456 | -173.57459 | 1175 | 7 | 118 | Shimmering water and shrimp on the structure. Looks like both types of shrimp on this structure. |
| 18-Sep | 03.07.37 | -15.16456 | -173.57459 | 1175 | 7 | 118 | Adding a target here. **LowT Chimney.** |
| 18-Sep | 03.09.56 | -15.16455 | -173.57460 | 1175 | 7 | 115 | Moving on here. Lots of chimneys in all directions. The last group of chimneys was about 7 meters tall. |
| 18-Sep | 03.10.40 | -15.16450 | -173.57460 | 1177 | 6 | 359 | Going a little further north. Something large in front of the vehicle. |
| 18-Sep | 03.11.18 | -15.16441 | -173.57459 | 1181 | 3 | 12 | Turning to face a large structure in front of us. Staining on the base. Several chimneys on top. |
| 18-Sep | 03.12.05 | -15.16437 | -173.57457 | 1179 | 4 | 53 | Climbing up this mound from the west side. Probably going up the big mound. |
| 18-Sep | 03.12.41 | -15.16436 | -173.57455 | 1177 | 6 | 51 | Big chimney in front of us. It looks inactive. |
| 18-Sep | 03.14.10 | -15.16423 | -173.57453 | 1182 | 2 | 6 | We've moved a little farther north. In the sonar most of the targets are to the east. Shrimp in front of us. |
| 18-Sep | 03.14.46 | -15.16423 | -173.57451 | 1181 | 3 | 88 | Looking toward the middle of this sulfide mound at the base. Looks like a piece of dead chimney in front of us. |
| 18-Sep | 03.15.48 | -15.16422 | -173.57453 | 1180 | 4 | 98 | We're going to turn to the SE now and head more or less to Target E. Heading up to the top of this large middle mound. |
| 18-Sep | 03.17.15 | -15.16423 | -173.57453 | 1181 | 4 | 286 | This slope has lots of bacterial mat on it. It's a huge sulfide mound. More broken pieces of chimney at the bottom of this mound. |
| 18-Sep | 03.19.14 | -15.16424 | -173.57452 | 1179 | 4 | 143 | Climbing up the mound. Some mat and shrimp as well of squat lobsters here. These are old sulfides mostly. |
| 18-Sep | 03.20.07 | -15.16436 | -173.57447 | 1177 | 4 | 144 | Continuing up this huge sulfide mound. Dead chimney spires from time to time. |
| 18-Sep | 03.20.56 | -15.16446 | -173.57444 | 1172 | 6 | 139 | Boulders with a little mat coating - whitish; pale blue coating on the rocks. |
| 18-Sep | 03.21.48 | -15.16454 | -173.57441 | 1171 | 6 | 76 | Continuing to climb up here. The top of this mound is about 155 meters. Squat lobsters in front of us on an extinct chimney. |
| 18-Sep | 03.23.01 | -15.16455 | -173.57439 | 1169 | 5 | 87 | Choro-O shrimp and squat lobsters on this extinct chimney. Also looks like Alvinocaris. So at least 2 species of shrimp on the dead sulfide. |
| 18-Sep | 03.24.14 | -15.16456 | -173.57438 | 1166 | 6 | 63 | We see some white staining on the structure ahead of us. Snails on this structure. Shimmering water coming out of the top in the biota. |
| 18-Sep | 03.25.45 | -15.16455 | -173.57433 | 1165 | 5 | 43 | One of the snails is a familiar Lau species. |
| 18-Sep | 03.26.26 | -15.16456 | -173.57430 | 1165 | 3 | 42 | HD cam is on. Going to take some digital stills hopefully. Some diffuse flow. Coming out of this area. The snails in front are really smooth. |
| 18-Sep | 03.27.31 | -15.16454 | -173.57431 | 1164 | 4 | 44 | **Snails** target added. Polychaetes here as well. |
| 18-Sep | 03.29.36 | -15.16455 | -173.57433 | 1164 | 4 | 42 | HD is off. We're being pulled a bit by the tether. Backing up the ship a bit. **[post-cruise note: end of nav file q326-part2 at 03:29:32]** |
| 18-Sep | 03.30.20 | | | | | | Chimney crab (on a chimney - go figure). Tim's ID. |
| 18-Sep | 03.31.28 | | | | | | We've backed out a bit. HD tape back on. Looking at the spot we previously saw. Brachyuran crab. Odd striped? Snail. Polychaetes and shrimp as well. |
| 18-Sep | 03.34.01 | | | | | | Alvinococa some with and some without hair. It's an age thing. |
| 18-Sep | 03.34.16 | | | | | | Nice close-up shots of this biological community. Limpet on a snail. |
| 18-Sep | 03.35.41 | | | | | | These snails have symbiots. |
| 18-Sep | 03.35.58 | | | | | | HD tape is off. Going to drive north toward the next target. |
| 18-Sep | 03.36.54 | | | | | | We're going to continue to climb to the northeast. Looks like a big chimney on the top of this thing. It looks dead. |
| 18-Sep | 03.37.58 | | | | | | Looking behind to make sure there is nothing there. |
| 18-Sep | 03.38.52 | | | | | | This structure looks different. It's a smoker. There is lots of white mat on this structure and smoke coming out the top. |
| 18-Sep | 03.39.41 | | | | | | This is the top structure. Here a black smoker chimney. |
| 18-Sep | 03.40.13 | | | | | | HD camera is on. This is the blackest smoke we've seen this entire trip. |
| 18-Sep | 03.40.45 | | | | | | Pretty amazing that we had to get to the tippy top of this to see a lot of really hot water; black smoke. This is the hottest thing we've seen so far. |
| 18-Sep | 03.41.29 | | | | | | Lots of individual chimneys poking out of this mound. Lots with black smoke coming out. |
| 18-Sep | 03.42.21 | | | | | | 15 to 20 chimneys coming out of this. |
| 18-Sep | 03.43.30 | | | | | | Circling around this huge edifice with active black smokers at the top. |
| 18-Sep | 03.44.15 | | | | | | Black  smoke is full of mineral particles. Lots of sulfide minerals in this fluid judging from the smoke. |
| 18-Sep | 03.45.54 | | | | | | Getting a good look at everything first before we set up to sample. |

| date | time | latitude | longitude | Z | alt | hdg | Q326 - Niua South Dive Comments |
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| 18-Sep | 03.48.47 | | | | | | Haven't had a USBL update in a while. |
| 18-Sep | 03.49.41 | | | | | | We're at the top of the chimney. Lots of black smoke pouring down. |
| 18-Sep | 03.51.15 | | | | | | Big crab and shrimp on the top of the chimney. |
| 18-Sep | 03.51.44 | | | | | | Chimney crab near the top. |
| 18-Sep | 03.52.10 | | | | | | Some tether issues going on in the van. |
| 18-Sep | 03.53.02 | | | | | | An amazing amount of black smoke here. |
| 18-Sep | 03.53.21 | | | | | | Have to back off a little bit. The pilots fear the tether is twisted around something so they are trying to locate it. |
| 18-Sep | 03.54.45 | | | | | | USBL nav is back. Bill's impression is that the USBL position is a bit east of the map. |
| 18-Sep | 03.56.22 | | | | | | **There is a bit of an offset with the map offset to the west of where we are. The acoustic fix is about 20m SE of the top of the mound. Cursor position for this black smoker chimney clump.** |
| 18-Sep | 03.59.29 | | | | | | That was a **DVL position for the chimney clump**. Point E on the dive map. **[postcruise note: This position plots to the east of the central chimney structure on the AUV bathymetry - which was shifted based on the EM122 data…]** |
| 18-Sep | 04.04.24 | | | | | | Preparing for temperature reading prior to sampling. |
| 18-Sep | 04.05.25 | | | | | | Beautiful view of the chimneys (not smoking). |
| 18-Sep | 04.05.54 | | | | | | Top of this large structure has a few black smokers. No USBL. |
| 18-Sep | 04.07.30 | | | | | | Great view of the black smokers in HD. |
| 18-Sep | 04.08.08 | | | | | | Near top of the smoker-rotating around for ideal sampling. |
| 18-Sep | 04.08.37 | | | | | | Up current while looking south at 210. |
| 18-Sep | 04.08.49 | | | | | | Current direction is SW. |
| 18-Sep | 04.09.22 | | | | | | Beautiful from the down-looking cameras into the black smoke. |
| 18-Sep | 04.11.08 | | | | | | Pilot change in control van. |
| 18-Sep | 04.13.09 | | | | | | Altimeter now working on navigation screen. Backed off from chimney during pilot change. We are 15-20m to the SW. |
| 18-Sep | 04.14.57 | | | | | | White staining on the tops of lower features (sulfides) near the smoker. |
| 18-Sep | 04.16.24 | | | | | | We are on a slope at 1160m near base. That makes the chimney about 10m tall. |
| 18-Sep | 04.17.35 | | | | | | Bigger smoker may be behind these. |
| 18-Sep | 04.20.25 | | | | | | Moving closer to the chimneys to prepare for sample. |
| 18-Sep | 04.20.35 | | | | | | Beehive chimneys. |
| 18-Sep | 04.21.03 | | | | | | This is a different cluster of chimney (not the intense black smoker) and think the other is to the left. |
| 18-Sep | 04.21.22 | | | | | | Problem with the current using 30% thrust to stay in place. |
| 18-Sep | 04.21.33 | | | | | | Turning left to the other cluster. |
| 18-Sep | 04.22.43 | | | | | | See snails clustered in the white staining. |
| 18-Sep | 04.22.57 | | | | | | Crawling to the top of the sulfide. |
| 18-Sep | 04.23.29 | | | | | | Lots of shrimp on the spires. |
| 18-Sep | 04.24.06 | | | | | | Nearing top with very skinny spires at top. Vigorous flow. |
| 18-Sep | 04.24.19 | | | | | | 1155 at top with altimeter of 7.5. |
| 18-Sep | 04.24.37 | | | | | | Having some problems staying in place. |
| 18-Sep | 04.25.01 | | | | | | Tooltip temperature has risen over a degree - even more up to over 10 degrees. |
| 18-Sep | 04.25.33 | | | | | | Pilot is trying to figure out how to get the ROV stable. |
| 18-Sep | 04.26.01 | | | | | | Current is a big struggle. |
| 18-Sep | 04.26.49 | | | | | | Smoke is streaming away from vehicle with slight left-right trend. |
| 18-Sep | 04.27.59 | | | | | | Taking DSC. |
| 18-Sep | 04.28.51 | | | | | | Great view of smoker. HD on. |
| 18-Sep | 04.29.27 | | | | | | Perfect setup for sampling. |
| 18-Sep | 04.30.09 | | | | | | Exchanging HD tapes while preparing for temperature. |
| 18-Sep | 04.30.49 | | | | | | Were parked but structure broke away and backed off a little. |
| 18-Sep | 04.31.30 | | | | | | Moving back up to the top. |
| 18-Sep | 04.31.52 | | | | | | HD tape #2 and is recording. |
| 18-Sep | 04.34.11 | | | | | | Setting up to sample at this large black smoker sulfide chimney. |
| 18-Sep | 04.35.00 | | | | | | Out comes the temperature probe. |
| 18-Sep | 04.36.51 | | | | | | Approaching the sulfide structure. Shrimp sitting on the structure. |
| 18-Sep | 04.37.50 | | | | | | Polychaetes and shrimp here. |
| 18-Sep | 04.38.12 | | | | | | Black smoke pouring out of this structure in places. Doesn't really look like the beehives we see at Axial. More just pouring out of holes in the structure. |
| 18-Sep | 04.38.52 | | | | | | Temperature measurement. Got up to 50. The tip came out of the flow. |

| date | time | latitude | longitude | Z | alt | hdg | Q326 - Niua South Dive Comments |
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| 18-Sep | 04.39.42 | | | | | | They're having trouble keeping the temperature nozzle in the flow. Repositioning. |
| 18-Sep | 04.40.55 | | | | | | The top of this structure looks more like beehives than farther down. |
| 18-Sep | 04.41.35 | | | | | | The max temp measured so far is 56. |
| 18-Sep | 04.42.27 | | | | | | Dave expects the temp here is going to be above 300°C. |
| 18-Sep | 04.43.34 | | | | | | Oxidation (rust) on the surface with microbial proportions. |
| 18-Sep | 04.44.04 | | | | | | Got the probe in. 275°C now and going up. |
| 18-Sep | 04.44.40 | | | | | | 315 was the highest temperature so far. |
| 18-Sep | 04.45.34 | | | | | | 315°C was the highest temperature recorded here at 1156 meters depth. That's near the boiling point. |
| 18-Sep | 04.46.32 | | | | | | Very high iron and manganese components to this fluid. We want to get a water sample to know for sure. |
| 18-Sep | 04.48.04 | | | | | | The temperature probe is secured. Wow. |
| 18-Sep | 04.49.52 | | | | | | Will collect a gas tight sample next. |
| 18-Sep | 00.00.00 | | | | | | This black smoker sulfide structure is being named "Adelaide". Peter wanted that because he's from Adelaide and it's his home town in Australia; with lots of churches. The structure looks a bit like a cathedral. |
| 18-Sep | 04.55.59 | | | | | | No LBL. We're at point E on the dive map. |
| 18-Sep | 04.56.38 | | | | | | HD recording on. |
| 18-Sep | 04.55.21 | | | | | | **Gas Sample: Q326-gtb-05.** Gastight sample from **"Adelaide"** chimney. Sample taken in black smoker flow where the temperature was just recorded. Just a meter or so from the top of this massive sulfide structure. |
| 18-Sep | 04.57.30 | | | | | | Start gastight. Green gastight **Q-326-gtb-05**. Use last position given for the cursor which was a DVL position: 15°9.874'S 173°34.440'W is the Doppler position here right now. |
| 18-Sep | 05.00.25 | | | | | | The green gastight is stowed. Grabbing the red gastight now. |
| 18-Sep | 05.02.45 | | | | | | Now have the gtb in hand and heading back to the sulfide structure. |
| 18-Sep | 05.04.58 | | | | | | **Gas Sample: Q326-gtb-06**. The gastight fired and we think it was in the flow when it fired. Same spot on the chimney in the black smoker flow - as far as we could tell. Adelaide chimney structure. Fluids were measure to be 315°C. |
| 18-Sep | 05.09.14 | | | | | | Red gastight stowed. |
| 18-Sep | 05.13.02 | | | | | | Moving in with the yellow gastight. All 3 have been taken out of the same venting orifice. |
| 18-Sep | 00.00.00 | | | | | | **Gas Sample: Q326-gtb-07**. The clear portion of the fluid as it comes out of the chimney is where they want to fire it. This looks like the best of the 3 gastight samples. |
| 18-Sep | 05.14.55 | | | | | | Fired the yellow gastight. |
| 18-Sep | 05.18.38 | | | | | | The yellow gastight has been stored. |
| 18-Sep | 05.19.26 | | | | | | 750ml major samplers next. They measure inorganic compounds; metals and anything in the water that's not a gas. They can leak a little bit on the way to the surface. |
| 18-Sep | 05.21.49 | | | | | | Have the blue major in the claw. Heading for the same part of the chimney for water samples. |
| 18-Sep | 05.23.38 | | | | | | Bumped into the chimney and a little piece of sulfide came loose. |
| 18-Sep | 05.24.18 | | | | | | Moving back in again. |
| 18-Sep | 05.25.20 | | | | | | Knocked another small piece of this sulfide down. |
| 18-Sep | 05.26.36 | | | | | | Moving in to sample water here. The chimney was breaking up a bit. |
| 18-Sep | 05.29.56 | | | | | | Going in for another attempt. |
| 18-Sep | 05.31.34 | | | | | | The top of this structure is really friable. Looks like he may be going for the big one at the top? Changed his mind and heading about a meter down chimney near the last sample sights. |
| 18-Sep | 05.33.19 | | | | | | Trying to get the ROV in a decent position to sample this. |
| 18-Sep | 05.35.09 | | | | | | Trying to collect Q326-major-08. This is the blue major sampler. Near the top of this chimney. The nozzle is in the flow. Took it out. Trying again. |
| 18-Sep | 05.35.25 | | | | | | Moving back in again. The last attempt was unsuccessful. |
| 18-Sep | 05.36.32 | | | | | | Still have the blue major sampler in hand. And looking for another spot to sample. |
| 18-Sep | 05.38.12 | | | | | | This is a very challenging feat for the pilot. |
| 18-Sep | 05.39.51 | | | | | | Trying some of the lower chimneys because the currents aren't as fierce lower down. |
| 18-Sep | 05.40.51 | | | | | | Sulfide is falling. There went the big black beehive. Hoping to get a bigger orifice here to sample. |
| 18-Sep | 05.44.04 | | | | | | There are small animals on the tops of these chimneys very near the blow including crabs and polychaetes. |

| date | time | latitude | longitude | Z | alt | hdg | Q326 - Niua South Dive Comments |
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| 18-Sep | 05.45.19 | | | | | | **Fluid Sample: Q326-major-08**. Got it. Blue major sampler in a lower orifice on this sulfide structure with black smoke pouring out. About 2 meters down from the gastight samples taken previously. Adelaide chimney structure. |
| 18-Sep | 05.51.02 | | | | | | The white major is in the arm. We will repeat this. |
| 18-Sep | 05.51.41 | | | | | | The pilot is suggesting we sample from the nearby chimney spire to the right of the HD camera. It's more convenient for him. It's a little bit higher and a bit closer to the manipulator arm. |
| 18-Sep | 05.55.55 | | | | | | Q326-major-09 white major being lowered into the orifice. The major is down in the flow. Waiting for Dave's approval. They keep taking it out of the flow and rearranging it. |
| 18-Sep | 05.58.59 | | | | | | The nozzle cam out of the flow. Repositioning. |
| 18-Sep | 06.00.28 | | | | | | **Fluid Sample: Q326-major-09.** Triggered the white major. The sample is coming from a chimney spire with white mat and iron oxide coating. The nozzle is in the flow. Light gray smoke is pouring out of the orifice. |
| 18-Sep | 06.02.55 | | | | | | The chimney has some biota near the top of this spire. Polychaete. |
| 18-Sep | 06.03.41 | | | | | | Stowing the major. Securing it with a bungee. |
| 18-Sep | 06.04.32 | | | | | | This large sulfide mound has probably hundreds of chimneys on it most not active. Here at the top there are 20-30 chimneys clustered together with about half of them active. The mound is probably 50 meters across. |
| 18-Sep | 06.08.31 | | | | | | Grabbing the third of the majors. The red major sampler. They would like to sample the top hottest chimney. |
| 18-Sep | 00.00.00 | | | | | | The red major has a bent piston. The bent part is on the major. That's the piston. The ram is on the arm. |
| 18-Sep | 06.13.40 | | | | | | We're not at the vent at the top of the chimney but a one of the ones on the side. There are some shrimp and a big scaleworm on the chimney as well. |
| 18-Sep | 06.12.25 | | | | | | **Fluid Sample: Q326-major-10.** It's in a good position. The ram worked. This sample looks good too. From one of the loser chimneys a few meters from the top. The pilot thinks this chimney is in between the last sampling site and the top. |
| 18-Sep | 06.17.39 | | | | | | This sample is probably done. It's from Adelaide chimney structure. Same structure where the 3 gastights and 2 previous majors were taken. |
| 18-Sep | 06.20.29 | | | | | | The next order of business is to collect a couple chimneys. Preferably one that is active and one that is not. |
| 18-Sep | 06.21.20 | | | | | | HD tape is on. |
| 18-Sep | 06.23.23 | | | | | | Moving in for a chimney grab for Richard (actually for Cornel). That piece fell over. |
| 18-Sep | 06.24.16 | | | | | | Going for an inactive one first then will go for an active one. |
| 18-Sep | 06.27.36 | | | | | | **Geo Sample: Q326-sulfide-11**. Grabbed a piece of inactive chimney from this large sulfide structure. It's going into box 9. Rust colored; friable; forearm to fist sized? Went into box 9. |
| 18-Sep | 06.27.39 | | | | | | HD not recording. Not sure when it went off. |
| 18-Sep | 06.28.43 | | | | | | Going in for a grab of an active chimney. This one has clear smoke pouring out of it. Biota on this chimney. Same outer coating as the last one we collected that was inactive. Lots of flow pouring out. |
| 18-Sep | 06.31.28 | | | | | | Didn't take that one. Looking around. This one has black smoke coming out of it. They are more friable. Moving up the structure looking for the perfect chimney. |
| 18-Sep | 06.34.01 | | | | | | Zooming in a bit to get the hose out of the view. Better now. |
| 18-Sep | 06.34.54 | | | | | | Now they have the port arm because it has a bigger clutch. The top of the chimney came off. The gray smoke it chugging out now. Bob says lots of barite in there. |
| 18-Sep | 06.37.00 | | | | | | Not keeping that one. New HD tape loaded. |
| 18-Sep | 06.38.00 | | | | | | All active sulfide samples are crumbling apart. Going to try for an inactive one. |
| 18-Sep | 06.39.24 | | | | | | HD tape on. Looking at an ice cream cone sulfide. |
| 18-Sep | 06.40.00 | | | | | | Going for top of an inactive chimney. |
| 18-Sep | 06.40.22 | | | | | | Shrimp are jumping off of it and it crumbled away. |
| 18-Sep | 06.40.53 | | | | | | Big fish and snails at base with lots of shrimp. |
| 18-Sep | 06.41.18 | | | | | | Looks like 90% of it looks dead but then find these white stained ones with lots of biology on them. |
| 18-Sep | 06.41.45 | | | | | | Skinny dead spire-got a small piece. |
| 18-Sep | 00.00.00 | | | | | | Only couple inches across with white staining and orange. |

| date | time | latitude | longitude | Z | alt | hdg | Q326 - Niua South Dive Comments |
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| 18-Sep | 06.42.27 | | | | | | **Geo Sample: Q326-sulfide-12. Placed in tube 10. It was dead with white and orange staining. Just below the other attempts above.** |
| 18-Sep | 06.43.43 | | | | | | **Off the bottom.** |
| 18-Sep | 07.46.21 | | | | | | Been holding at 220m from the surface for awhile. |
| 18-Sep | 08.35.21 | | | | | | Problem with the ship's winch. **On board at 0835.** |

## 7.6 Q327 West Mata Dive Log

| date | time | latitude | longitude | Z | alt | hdg | Q327 - West Mata Dive Comments |
|---|---|---|---|---|---|---|---|
| **Main Goals:** Explore and sample West Mata volcano! | | | | | | | |
| **Launch target:** 15°5.760' S 173°45.031' W Z=1280m SW of summit | | | | | | | |
| **Setup:** 2 hydrophones; 3 gastights; 3 majors; temp probe; 1 Davis sampler; 1 McPhail sampler; 1 marker; large biobox; suction sampler T-handle; small net | | | | | | | |
| **Nav Notes:** bottom time 9/18 21:22 - 9/19 07. Nav smoothed (tolerance=10). Nav shifted: -20m (W) +8m (N). Same nav point 22:51:26 - 23:12:22 then jumps 80m NE. Nav gaps: 00:11 – 00:28, 03:37 – 05:23, 07:01 - 07:18. Off bottom transiting 04:59 – 05:35. | | | | | | | |
| **DIVE LOG POSITION INFORMATION: latitude; longitude; Z; alt; hdg values are derived from finalized Quest nav. Any lat/long values in the dive comments column were recorded at sea and are preliminary.** | | | | | | | |
| 18-Sep | 19.29.44 | | | | | | Preparing for diving at West Mata. |
| 18-Sep | 19.39.25 | | | | | | Unstrapping ROV from the deck. |
| 18-Sep | 19.41.08 | | | | | | ROV off the deck. |
| 18-Sep | 19.45.17 | | | | | | **ROV in the water.** |
| 18-Sep | 20.23.09 | | | | | | ROV holding at 642m. Checking ROV issue. |
| 18-Sep | 20.45.52 | | | | | | ROV is diving but no USBL. |
| 18-Sep | 20.46.37 | | | | | | Passing 800m. |
| 18-Sep | 20.56.55 | | | | | | Passing 1000m. |
| 18-Sep | 20.57.19 | | | | | | No USBL and nav screen is not updating with any navigation. |
| 18-Sep | 21.06.48 | | | | | | Bringing the ROV up to depth that the navigation signal disappeared (500-600m). |
| 18-Sep | 21.09.35 | | | | | | USBL has returned by changing the ship orientation. |
| 18-Sep | 21.11.33 | | | | | | Diving on West Mata! |
| 18-Sep | 21.13.13 | | | | | | Can go into the control van in 5 minutes. |
| 18-Sep | 21.13.59 | | | | | | Navigation has ROV about 50m NW of the dive target. |
| 18-Sep | 21.17.52 | | | | | | 100m off the bottom according to our bathymetry. |
| 18-Sep | 21.19.42 | | | | | | Seeing some white particles in the water. |
| 18-Sep | 21.22.14 | -15.09597 | -173.75075 | 1278 | 17 | 353 | Altimeter reading. |
| 18-Sep | 21.22.42 | -15.09596 | -173.75073 | 1288 | 5 | 354 | Bottom seen. |
| 18-Sep | 21.23.30 | -15.09598 | -173.75070 | 1286 | 6 | 359 | **On the bottom. Sediment and lava fragments.** |
| 18-Sep | 21.23.46 | -15.09597 | -173.75071 | 1285 | 6 | 358 | Navigation has us just south of the old Mat Meadow location. |
| 18-Sep | 21.24.31 | -15.09597 | -173.75071 | 1286 | 6 | 358 | ROV doing bottom checks. Looking north. |
| 18-Sep | 21.26.55 | -15.09592 | -173.75062 | 1284 | 3 | 25 | Upper SW rift zone of W. Mata. Volcanic sand (dark) with lighter material presumably microbial mat. |
| 18-Sep | 21.27.14 | -15.09592 | -173.75064 | 1282 | 2 | 37 | Seeing orange sediments as we move closer to the bottom. |
| 18-Sep | 21.27.43 | -15.09589 | -173.75057 | 1280 | 3 | 40 | Seeing altered or orange coated rocky outcrops. |
| 18-Sep | 21.28.19 | -15.09590 | -173.75049 | 1280 | 2 | 31 | Orange coloring lead to another location being named Red Rock Ridge. (not Red Rock; sm) |
| 18-Sep | 21.28.30 | -15.09590 | -173.75049 | 1281 | 2 | 14 | Looks like the old Mat Meadow site from 2009. Shrimp swimming. |
| 18-Sep | 21.29.20 | -15.09586 | -173.75050 | 1280 | 1 | 354 | Looking for a good site to deploy the hydrophones and marker. |
| 18-Sep | 21.29.47 | -15.09585 | -173.75049 | 1280 | 1 | 350 | Seeing small outcrop with smoking water (diffuse flow). |
| 18-Sep | 21.30.51 | -15.09576 | -173.75035 | 1280 | 1 | 18 | Coarser seabed. Past samples here were fresh pyroclastic elements. |
| 18-Sep | 21.31.18 | -15.09575 | -173.75042 | 1280 | 1 | 20 | Another rocky outcrop to the left. |
| 18-Sep | 21.31.42 | -15.09572 | -173.75039 | 1280 | 1 | 99 | Orange microbial mat with no macrofauna except a few swimming shrimp. |
| 18-Sep | 21.32.11 | -15.09570 | -173.75044 | 1280 | 1 | 343 | Microbial stained volcanic blocks that look not in place. |
| 18-Sep | 21.32.31 | -15.09573 | -173.75038 | 1280 | 1 | 343 | Some lava could be in place. Some rippling in the sediments. |
| 18-Sep | 21.33.04 | -15.09569 | -173.75042 | 1280 | 1 | 341 | Scoping the landscape for a hydrophone deployment. Fish in the rock outcrops and polychaetes. |
| 18-Sep | 21.33.33 | -15.09568 | -173.75039 | 1279 | 1 | 342 | Scaleworms also seen on the rocks. |
| 18-Sep | 21.33.51 | -15.09568 | -173.75039 | 1280 | 1 | 342 | Small pit behind the rocky outcrop that may be new since 2009. |
| 18-Sep | 21.34.17 | -15.09566 | -173.75046 | 1279 | 1 | 342 | Nav has us nearer the Luo site. See shrimp. |
| 18-Sep | 21.35.04 | -15.09568 | -173.75034 | 1279 | 1 | 342 | USBL is working. Nav screen is back. |
| 18-Sep | 21.35.28 | -15.09568 | -173.75036 | 1279 | 1 | 342 | Site looks similar to 2009. |
| 18-Sep | 21.35.50 | -15.09570 | -173.75032 | 1279 | 1 | 342 | **Preparing to deploy the hydrophone.** |
| 18-Sep | 21.36.00 | -15.09569 | -173.75037 | 1279 | 1 | 342 | Hydrophone lifted from basket. |
| 18-Sep | 21.36.49 | -15.09568 | -173.75045 | 1280 | 1 | 342 | Some smoke appears to be coming out of the pit behind this rock. |
| 18-Sep | 21.37.03 | -15.09568 | -173.75045 | 1279 | 1 | 342 | Luo was smoking in 2009. |
| 18-Sep | 21.38.25 | -15.09568 | -173.75045 | 1279 | 1 | 342 | Moving hydrophone package into position with listening end pointed to the vents. Ribbon worm swimming past. Galatheid crab. |
| 18-Sep | 21.40.24 | -15.09568 | -173.75045 | 1280 | 1 | 342 | Ribbon worms swimming in the background while orienting the hydrophone. Can see marker #135 attached to package (to be removed). |
| 18-Sep | 21.42.31 | -15.09568 | -173.75045 | 1278 | 1 | 342 | Still orienting the hydrophone. |
| 18-Sep | 21.42.59 | -15.09568 | -173.75045 | 1280 | 1 | 342 | Looks like we are between targets A & B (Mat Meadow & Luo). |

| date | time | latitude | longitude | Z | alt | hdg | Q327 - West Mata Dive Comments |
|---|---|---|---|---|---|---|---|
| 18-Sep | 21.43.53 | -15.09568 | -173.75045 | 1279 | 1 | 342 | Preparing to remove marker from the hydrophone package. |
| 18-Sep | 21.46.17 | -15.09568 | -173.75045 | 1279 | 1 | 342 | Estimated heading 090 of the hydrophone. (Check looks more like 045). |
| 18-Sep | 21.48.35 | -15.09568 | -173.75045 | 1279 | 1 | 342 | Marker appears to be too securely attached to the hydrophone so will leave the marker on the package. |
| 18-Sep | 21.49.19 | -15.09568 | -173.75045 | 1279 | 1 | 342 | Going to lift up and check the HOMER signal. |
| 18-Sep | 21.50.59 | -15.09568 | -173.75045 | 1280 | 1 | 342 | 15 5.745 173 45.011 z=1279. **Location of the hydrophone**. |
| 18-Sep | 21.51.31 | -15.09568 | -173.75045 | 1279 | 1 | 342 | Would like to go to Luo to confirm the bathymetry and navigation. |
| 18-Sep | 21.52.45 | -15.09568 | -173.75045 | 1279 | 1 | 342 | Taking DSC of the site. Working on USBL which cut out during hydrophone deployment. Will zoom with HD. |
| 18-Sep | 21.53.27 | -15.09568 | -173.75045 | 1279 | 1 | 342 | Zooming with HD but hydrophone is in the way. |
| 18-Sep | 21.53.46 | -15.09568 | -173.75045 | 1279 | 0 | 114 | Repositioning the ROV to get a better image of the rocks with HD and trying to reestablish USBL. |
| 18-Sep | 21.54.33 | -15.09568 | -173.75045 | 1280 | 0 | 111 | Out of place pillow fragments and microbial mat as we turn the vehicle around to the right. See worms swimming. |
| 18-Sep | 21.55.26 | -15.09568 | -173.75045 | 1280 | 0 | 111 | Zooming in on the rock with fresh black rock with vesicles with white material on type (mucous-like) with orange iron oxide microbial colony (mat). |
| 18-Sep | 21.56.01 | -15.09568 | -173.75045 | 1279 | 0 | 111 | Trying to reacquire the USBL navigation. |
| 18-Sep | 21.58.33 | -15.09568 | -173.75045 | 1280 | 0 | 111 | Zooming around with the HD. White scaleworm and shrimp. |
| 18-Sep | 21.59.10 | -15.09568 | -173.75045 | 1280 | 0 | 111 | Not getting any navigation at this time. |
| 18-Sep | 21.59.48 | -15.09568 | -173.75045 | 1280 | 1 | 316 | Moving the ROV and turning left. |
| 18-Sep | 22.00.01 | -15.09568 | -173.75045 | 1279 | 1 | 333 | Saw hydrophone in the spin. |
| 18-Sep | 22.00.58 | -15.09568 | -173.75045 | 1279 | 3 | 82 | Seeing some diffuse smoke/flow behind the rock the hydrophone is located. |
| 18-Sep | 22.01.22 | -15.09568 | -173.75045 | 1281 | 0 | 107 | On the other side of the rock with volcanic sands deposited with some collapse. Recording HD tape. |
| 18-Sep | 22.01.45 | -15.09568 | -173.75045 | 1280 | 0 | 108 | See bag creatures in the crack. See shimmer. |
| 18-Sep | 22.02.18 | -15.09568 | -173.75045 | 1281 | 1 | 106 | Lots of mat disturbed by ROV. Fissures and collapse to the left. |
| 18-Sep | 22.02.30 | -15.09568 | -173.75045 | 1281 | 0 | 107 | Lava that was erupted looks like it was fluid. |
| 18-Sep | 22.03.13 | -15.09568 | -173.75045 | 1281 | 2 | 95 | Split open rock formation with fish and hydrophone is the background. HD off 22:01-22:03. Small fissure. |
| 18-Sep | 22.06.16 | -15.09568 | -173.75045 | 1281 | 2 | 95 | Zooming in on fish in HD and fissure. |
| 18-Sep | 22.06.45 | -15.09568 | -173.75045 | 1280 | 2 | 96 | Fish; scaleworm; bags. |
| 18-Sep | 22.08.11 | -15.09568 | -173.75045 | 1281 | 2 | 96 | Taking DSC and see shrimp swimming. |
| 18-Sep | 22.09.24 | -15.09568 | -173.75045 | 1281 | 2 | 96 | Joe coming into the control van. |
| 18-Sep | 22.10.08 | -15.09568 | -173.75045 | | | | Still working on the navigation while taking HD close-ups of the biology on the rock. |
| 18-Sep | 22.12.07 | -15.09568 | -173.75045 | 1281 | 2 | 87 | Great close-up of the scaleworms in HD. |
| 18-Sep | 22.13.23 | -15.09568 | -173.75045 | 1280 | 2 | 87 | Seeing 2 scaleworms in the HD view. |
| 18-Sep | 22.14.24 | -15.09568 | -173.75045 | 1281 | 2 | 87 | Watching the scaleworm move with its feet and bristles. Some small snails. Podia (feet). |
| 18-Sep | 22.15.17 | -15.09568 | -173.75045 | 1280 | 2 | 87 | Scaleworms in vent fields all over the world but not seen here in 2009. Saw 1000s in the water column upon today's approach. Looks like 2 species. |
| 18-Sep | 22.15.37 | -15.09568 | -173.75045 | 1281 | 2 | 87 | Life-cycle of the scaleworms are unknown-there are males & females. |
| 18-Sep | 22.17.30 | -15.09568 | -173.75045 | 1280 | 2 | 86 | Working on the navigation still. |
| 18-Sep | 22.18.14 | -15.09568 | -173.75045 | 1281 | 2 | 87 | Seeing shrimp and galatheid crab (shrimp from yesterday appear to be here). Many more zoarcids (eelpouts) than 2009. |
| 18-Sep | 22.18.42 | -15.09568 | -173.75045 | 1280 | 2 | 87 | Galatheid crab in lower left of HD which were not seen in 2009. |
| 18-Sep | 22.19.12 | -15.09568 | -173.75045 | 1280 | 2 | 88 | Moving the vehicle slightly to the left to get a different view. |
| 18-Sep | 22.19.38 | -15.09568 | -173.75042 | 1280 | 2 | 102 | Slight shimmer in the water. |
| 18-Sep | 22.20.18 | -15.09568 | -173.75042 | 1280 | 2 | 44 | Looking at interior of the outcrop which has black interior and orange coating. DSC. |
| 18-Sep | 22.21.57 | -15.09568 | -173.75042 | 1280 | 2 | 62 | Great view into the crack of the rock. Looks like Luo but inactive. |
| 18-Sep | 22.22.42 | -15.09568 | -173.75042 | 1282 | 2 | 62 | Seeing lots of scaleworms and a few shrimp on the rock. |
| 18-Sep | 22.23.03 | -15.09568 | -173.75042 | 1282 | 2 | 62 | Big crab in the bottom right. |
| 18-Sep | 22.23.35 | -15.09568 | -173.75042 | 1281 | 2 | 67 | Seeing multiple crabs and more shrimp inside the crack on the rock face. Also seeing the shimmer. |
| 18-Sep | 22.23.56 | -15.09568 | -173.75042 | 1281 | 0 | 67 | Diffuse flow with shrimp down in the hole. No snails. |
| 18-Sep | 22.25.03 | -15.09568 | -173.75042 | 1281 | 0 | 68 | Crab at bottom of the crack below the shrimp. Taking DSC. |
| 18-Sep | 22.27.13 | -15.09568 | -173.75042 | 1282 | 0 | 66 | Turned on the HD video now. |
| 18-Sep | 22.27.26 | -15.09568 | -173.75042 | 1282 | 0 | 66 | Diffuse flow; scaleworms; shrimp; bag creatures; etc in the HD video. |
| 18-Sep | 22.28.05 | -15.09568 | -173.75042 | | | | A shrimp just swam by. |
| 18-Sep | 22.28.33 | -15.09568 | -173.75042 | | | | The lasers are currently on. They are in the HD view. They are 20cm apart. |
| 18-Sep | 22.29.01 | -15.09568 | -173.75042 | | | | The crab is less than 20cm across leg to leg. |

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|---|---|---|---|---|---|---|---|
| 18-Sep | 22.29.28 | -15.09568 | -173.75042 | | | | Tim says the red shrimp is a different species than the 2 we saw in 2009. |
| 18-Sep | 22.30.06 | -15.09568 | -173.75042 | | | | Zooming out a bit. Nice shot of the Luo pit. |
| 18-Sep | 22.30.36 | -15.09568 | -173.75042 | | | | Panning around a bit. Looking at the general area. We're seeing some light/dark ripple effect. |
| 18-Sep | 22.32.54 | -15.09568 | -173.75042 | 1276 | 0 | 56 | We're at the Luo diffuse vent site. |
| 18-Sep | 22.32.56 | -15.09568 | -173.75042 | 1275 | 0 | 54 | Small fish and ribbon worms here. |
| 18-Sep | 22.33.15 | -15.09568 | -173.75042 | 1276 | 0 | 67 | The rough surfaces are fractures; zones of weakness. Looking at the rocks which have angular fractures. They've been here a while. Microbial mat in the cracks between the rocks. |
| 18-Sep | 22.34.16 | -15.09568 | -173.75042 | 1274 | 0 | 31 | Luo is right behind us. Volcaniclastic sands are coated with a combination of orange and white microbial sands |
| 18-Sep | 22.34.46 | -15.09568 | -173.75042 | 1274 | 0 | 17 | Zooming in on the volcaniclastic sediments. Lots of scaleworms in the sediments. Larger scaleworms on the rocks. |
| 18-Sep | 22.35.40 | -15.09568 | -173.75042 | 1275 | 0 | 111 | Dave's impressions: The Luo vent was recognizable. There is much less venting going on right now. Way fewer animals on the vent sites. Shrimp were covering the rocks on the previous visit. Certainly fewer shrimp. |
| 18-Sep | 22.36.48 | -15.09568 | -173.75042 | 1278 | 0 | 168 | It looks like we are moving upslope now. Actually we just moved a bit to the east. Our depth has actually increased (we are a bit deeper). |
| 18-Sep | 22.37.57 | -15.09568 | -173.75042 | 1278 | 0 | 26 | Thick yellow microbial mat (iron coating). The top of some of these tocks is very black. |
| 18-Sep | 22.38.46 | -15.09568 | -173.75042 | 1280 | 0 | 275 | Now we have turned and are heading to the west. In 2009 we saw more bright white mat where there was active venting. |
| 18-Sep | 22.39.45 | -15.09592 | -173.75031 | 1280 | 0 | 302 | Seeing some pitting in the sediments. Particles in the water column are picking up. |
| 18-Sep | 22.40.21 | -15.09594 | -173.75029 | 1279 | 0 | 280 | Another small pit depression ahead. In the center of that depression is a little bit of the bright white deposits Dave was talking about. Probably some active flow going on there. |
| 18-Sep | 22.41.17 | -15.09593 | -173.75037 | 1276 | 0 | 307 | Moving the ship north of the ROV to try to get a navigation fix. |
| 18-Sep | 22.42.43 | -15.09581 | -173.75043 | 1277 | 3 | 306 | Just got the navigation back since the ship moved to the north of the ROV. Go figure…… |
| 18-Sep | 22.43.08 | -15.09575 | -173.75045 | 1278 | 3 | 315 | We're heading upslope now. |
| 18-Sep | 22.45.38 | -15.09567 | -173.75043 | 1275 | 4 | 48 | At the hydrophone again. |
| 18-Sep | 22.47.01 | -15.09567 | -173.75043 | 1276 | 5 | 47 | Hydrophone on the rocky outcrop to the east of Luo. |
| 18-Sep | 22.48.29 | -15.09567 | -173.75043 | 1275 | 5 | 47 | From here would like to head NE to Hades. Vehicle is moving at 047. |
| 18-Sep | 22.49.43 | -15.09567 | -173.75043 | 1276 | 5 | 48 | On the SW rift zone of W Mata. At intersection of this rift zone and the summit there was venting at Hades in 2009. |
| 18-Sep | 22.50.22 | -15.09567 | -173.75043 | 1275 | 5 | 47 | Lost USBL as need to move the ship to get the signal back. |
| 18-Sep | 22.54.13 | -15.09563 | -173.75031 | 1272 | 7 | 48 | Rising up a bit with an overview of the lavas interspersed with orange sediment. |
| 18-Sep | 22.55.27 | -15.09563 | -173.75031 | 1268 | 6 | 46 | Hovering close to the Luo site to acquire navigation. |
| 18-Sep | 22.56.40 | -15.09563 | -173.75031 | 1259 | 7 | 36 | Brachyuran crabs. |
| 18-Sep | 22.57.01 | -15.09563 | -173.75031 | 1255 | 8 | 40 | Ship has moved north. No USBL yet. |
| 18-Sep | 22.57.21 | -15.09563 | -173.75031 | 1252 | 8 | 38 | Contact of sediment and more rocky area as heading 040. |
| 18-Sep | 22.57.39 | -15.09563 | -173.75031 | 1250 | 9 | 39 | Seeing white mat on rock. |
| 18-Sep | 22.58.07 | -15.09563 | -173.75031 | 1242 | 14 | 38 | Rocks look more in place as rise to the summit. Tubes. |
| 18-Sep | 22.58.43 | -15.09563 | -173.75031 | 1238 | 13 | 42 | Seeing more constructional lavas. |
| 18-Sep | 22.58.55 | -15.09563 | -173.75031 | 1238 | 10 | 42 | Seeing some smoke as we near the summit. |
| 18-Sep | 22.59.11 | -15.09563 | -173.75031 | 1237 | 10 | 42 | At top of an outcrop. |
| 18-Sep | 22.59.21 | -15.09563 | -173.75031 | 1237 | 10 | 45 | More polychaetes in water column. |
| 18-Sep | 22.59.46 | -15.09563 | -173.75031 | 1236 | 8 | 50 | Hades should be to the right and left a drop-off. |
| 18-Sep | 23.00.28 | -15.09563 | -173.75031 | 1227 | 18 | 62 | Constructional lavas with polychaetes increasing; indicating nearing hydrothermal activity. |
| 18-Sep | 23.00.47 | -15.09563 | -173.75031 | 1226 | 21 | 61 | Volcaniclastic sediment on the summit. |
| 18-Sep | 23.01.25 | -15.09563 | -173.75031 | 1227 | 21 | 65 | Sonar suggests we are at the summit. |
| 18-Sep | 23.02.52 | -15.09563 | -173.75031 | 1227 | 18 | 64 | Hovering around the summit. |
| 18-Sep | 23.03.18 | -15.09563 | -173.75031 | 1227 | 19 | 76 | No navigation yet. Ship is to the NW. |
| 18-Sep | 23.03.56 | -15.09563 | -173.75031 | 1227 | 19 | 75 | No magmatic activity at the summit. Looking at the summit but hovering off to the side. Altitude 19.3m. |
| 18-Sep | 23.04.54 | -15.09563 | -173.75031 | 1228 | 18 | 76 | Swimming shrimp. |
| 18-Sep | 23.06.46 | -15.09563 | -173.75031 | 1227 | 11 | 76 | Still hovering. Nice view of summit from pilot cam. |
| 18-Sep | 23.09.03 | -15.09563 | -173.75031 | 1230 | 5 | 57 | Summit in 2008/09 was 1175m. Many changes as it is much deeper. |
| 18-Sep | 23.09.43 | -15.09563 | -173.75031 | 1229 | 17 | 87 | Sonar seeing uphill topography beyond this location. |
| 18-Sep | 23.13.22 | -15.09521 | -173.74960 | 1223 | 25 | 88 | **Got nav back!** |

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|---|---|---|---|---|---|---|---|
| 18-Sep | 23.14.25 | -15.09514 | -173.74953 | | | | Nav has ROV on the STBD side of the ship which is 100m to the north. |
| 18-Sep | 23.15.21 | -15.09514 | -173.74942 | 1227 | 21 | 41 | Navigation is putting us about 50m south of Hades target. Maybe less than 5m west of Hades as well. |
| 18-Sep | 23.16.32 | -15.09511 | -173.74928 | 1226 | 19 | 92 | ROV is driving north. |
| 18-Sep | 23.18.14 | -15.09515 | -173.74913 | | | | Moving along constructional ridge at 050. |
| 18-Sep | 23.18.43 | -15.09514 | -173.74905 | 1222 | 5 | 38 | Passing along the edge of the construction ridge. |
| 18-Sep | 23.20.29 | -15.09491 | -173.74895 | 1233 | 16 | 19 | Sonar has ROV in a valley between 2 walls as we head 016. Coincides well with the map. |
| 18-Sep | 23.20.53 | -15.09489 | -173.74895 | 1232 | 15 | 17 | Large cliff to the left. Going over the wall at 016. |
| 18-Sep | 23.21.16 | -15.09484 | -173.74895 | 1230 | 19 | 17 | Could be part of the failed wall. |
| 18-Sep | 23.21.42 | -15.09485 | -173.74895 | 1224 | 22 | 15 | Seeing white material between the rocks-probably sulfur. |
| 18-Sep | 23.22.30 | -15.09482 | -173.74894 | 1214 | 29 | 17 | Still climbing the wall-looks like dike. |
| 18-Sep | 23.22.48 | -15.09482 | -173.74894 | 1210 | 31 | 17 | White raining down on the vehicle. |
| 18-Sep | 23.23.20 | -15.09479 | -173.74894 | 1205 | 24 | 26 | Dikes and columnar joints. |
| 18-Sep | 23.23.47 | -15.09479 | -173.74897 | 1201 | 24 | 56 | Depth of old Hades was 1205m in 2009. |
| 18-Sep | 23.24.06 | -15.09477 | -173.74896 | 1201 | 24 | 58 | Believe we are at where Hades was. |
| 18-Sep | 23.24.16 | -15.09477 | -173.74896 | 1199 | 24 | 49 | Beautiful dikes. |
| 18-Sep | 23.24.37 | -15.09478 | -173.74896 | 1195 | 24 | 53 | HD tape on. DSC. |
| 18-Sep | 23.25.18 | -15.09476 | -173.74896 | 1193 | 8 | 40 | Top of dike. |
| 18-Sep | 23.25.53 | -15.09476 | -173.74896 | 1189 | 9 | 42 | Seeing rounded pillow and some breccia. |
| 18-Sep | 23.26.45 | -15.09476 | -173.74896 | 1188 | 9 | 78 | Exposed rock and dikes. White material with lots of shrimp. |
| 18-Sep | 23.27.33 | -15.09476 | -173.74896 | 1189 | 9 | 77 | White does not look like biology but rather sulfur. |
| 18-Sep | 23.28.57 | -15.09476 | -173.74895 | 1187 | 7 | 11 | ROV is stud of the ship. Good USBL. |
| 18-Sep | 23.32.21 | -15.09459 | -173.74893 | 1187 | 17 | 101 | Sonar shows the far walls of the pit from here. |
| 18-Sep | 23.32.51 | -15.09453 | -173.74899 | 1188 | 17 | 101 | We are moving east to get down to the bottom of the pit (trying to get away from the wall). |
| 18-Sep | 23.35.10 | -15.09429 | -173.74918 | 1203 | 17 | 95 | Moving down into the pit. |
| 18-Sep | 23.35.27 | -15.09432 | -173.74918 | 1205 | 17 | 94 | Sonar showing wall to the east. |
| 18-Sep | 23.37.24 | -15.09435 | -173.74922 | 1234 | 30 | 97 | Altimeter wasn't working on the overlay not changing as we were too high for it to read. |
| 18-Sep | 23.37.59 | -15.09435 | -173.74925 | 1246 | 20 | 94 | Altimeter is now working. |
| 18-Sep | 23.39.42 | -15.09434 | -173.74929 | 1266 | 1 | 95 | Bottom of pit. 80m deeper than at top (agrees with bathy). |
| 18-Sep | 23.40.24 | -15.09434 | -173.74935 | | | | Water is murky at the bottom. |
| 18-Sep | 23.41.42 | -15.09438 | -173.74934 | 1273 | 1 | 146 | Worms swimming in water. Also some shrimp with cloudy water. |
| 18-Sep | 23.42.55 | -15.09439 | -173.74933 | 1274 | 4 | 333 | View of the bottom with lava fragments and volcanic sands. |
| 18-Sep | 23.43.18 | -15.09440 | -173.74924 | 1276 | 5 | 124 | Panning around to look at the bottom. |
| 18-Sep | 23.44.24 | -15.09443 | -173.74926 | 1276 | 5 | 143 | Swung around and saw an opening in the pit on the sonar in front of us at 140. Opening more to the south. |
| 18-Sep | 23.45.45 | -15.09444 | -173.74927 | 1276 | 6 | 142 | Constrained by wall at 20m around the ROV with only a slight opening to the south. |
| 18-Sep | 23.47.46 | -15.09443 | -173.74928 | 1275 | 4 | 52 | Getting bearings at the bottom of the pit. |
| 18-Sep | 23.48.05 | -15.09443 | -173.74928 | 1274 | 5 | 48 | Seeing wall in HD. Hdg is 052. |
| 18-Sep | 23.48.59 | -15.09443 | -173.74928 | 1276 | 3 | 9 | Slowly descending into the pit while watching the sonar view. |
| 18-Sep | 23.49.14 | -15.09443 | -173.74928 | 1276 | 2 | 358 | Nearly symmetrical structure from sonar image. Broken pillow fragments. |
| 18-Sep | 23.50.04 | -15.09443 | -173.74928 | 1274 | 3 | 323 | Broken faces of lava with rubble and sands (volcaniclastic). Looks unstable. Pillow have some white staining either from deposits or alteration. |
| 18-Sep | 23.50.24 | -15.09443 | -173.74928 | 1274 | 3 | 289 | Debris looks fresh and unstable. |
| 18-Sep | 23.50.39 | -15.09443 | -173.74928 | 1273 | 4 | 353 | See some shrimp and polychaetes. |
| 18-Sep | 23.51.15 | -15.09443 | -173.74928 | 1275 | 4 | 104 | Pit seems to be only 20m wide and narrows like a funnel. |
| 18-Sep | 23.51.47 | -15.09443 | -173.74928 | 1276 | 6 | 161 | No signs of actively erupting. |
| 18-Sep | 23.52.50 | -15.09443 | -173.74928 | | | | Temperature at bottom is only slightly above ambient. |
| 18-Sep | 23.54.14 | -15.09443 | -173.74928 | 1277 | 17 | 161 | At 1276m with altimeter at 18m. |
| 18-Sep | 23.56.02 | -15.09463 | -173.74927 | 1279 | 19 | 93 | HD tape is on to document ascent along wall as we come out of the pit. |
| 18-Sep | 23.57.39 | -15.09467 | -173.74924 | 1274 | 19 | 84 | Ship has wire float near the ship. Wire management needed. |
| 18-Sep | 23.57.48 | -15.09465 | -173.74920 | 1270 | 20 | 87 | Seeing the wall upon ascent. Seeing angular fragments of rock and pillows with radial fracturing. Few shrimp on the wall. |
| 18-Sep | 23.59.00 | -15.09462 | -173.74919 | 1258 | 26 | 86 | Yellow material on rocks. Could be sulfur or microbial. |
| 18-Sep | 23.59.50 | -15.09466 | -173.74914 | | | | Looks like lava flow flowing into pit from the sonar (snake like hard return). |
| 19-Sep | 00.00.09 | -15.09461 | -173.74913 | 1248 | 30 | 119 | ROV passed through warmer water when came through that cloudy water. |
| 19-Sep | 00.00.53 | -15.09461 | -173.74913 | 1247 | 30 | 120 | Seeing combination of volcanic rubble and small dike. |
| 19-Sep | 00.00.54 | | | | | | Dike. |
| 19-Sep | 00.01.13 | | | | | | Looks like pillow in front of us (in place). |
| 19-Sep | 00.02.24 | | | | | | Seeing some pillow lava and faces of pillow tubes. Also some sulfur deposit. |

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| 19-Sep | 00.03.00 | | | | | | Not much sign of hydrothermal alteration in the pit walls. |
| 19-Sep | 00.03.49 | | | | | | Dikes and pillows as move up the wall of the pit. |
| 19-Sep | 00.04.46 | | | | | | Some volcanic sediments in the pillow/lava cracks with shrimp. |
| 19-Sep | 00.05.16 | | | | | | Seeing more animals on the wall (polychaetes/scaleworms). |
| 19-Sep | 00.05.40 | -15.09455 | -173.74905 | 1213 | 21 | 95 | More volcaniclastic sediments. Shrimp more extensive on top. |
| 19-Sep | 00.07.34 | -15.09451 | -173.74898 | 1211 | 5 | 114 | Almost at the top of the volcano at 1210m. |
| 19-Sep | 00.07.54 | -15.09451 | -173.74897 | 1210 | 7 | 114 | Seeing a little diffuse flow and microbial patches with shrimp. DSC. |
| 19-Sep | 00.08.54 | -15.09452 | -173.74895 | 1207 | 6 | 104 | Seeing shrimp and scale worms in the volcaniclastic sediments. |
| 19-Sep | 00.10.05 | -15.09452 | -173.74895 | 1202 | 7 | 119 | Pillow remnants with more shrimp. |
| 19-Sep | 00.11.05 | -15.09452 | -173.74895 | 1201 | 8 | 117 | **0011 - 0028 no USBL Nav** |
| 19-Sep | 00.11.44 | -15.09457 | -173.74890 | 1200 | 6 | 114 | Looks like some alteration or microbial mounds on the pillow rock with many more shrimp. |
| 19-Sep | 00.13.17 | -15.09460 | -173.74889 | 1199 | 6 | 116 | More shrimp with areas of diffuse flow on the mat material. |
| 19-Sep | 00.14.53 | | | | | | This would be an opportune area for sampling shrimp but maybe not water. |
| 19-Sep | 00.15.48 | | | | | | Highly concentrated area of shrimp. Not seeing much shimmer if at all. |
| 19-Sep | 00.16.57 | | | | | | HD tape on and DSC. |
| 19-Sep | 00.20.03 | | | | | | Shrimp being disturbed by ROV while positioning the vehicle. |
| 19-Sep | 00.24.11 | | | | | | Preparing for suction sample of the shrimp. |
| 19-Sep | 00.30.18 | -15.09463 | -173.74886 | 1198 | 2 | 176 | ROV has suction ready for sampling. |
| 19-Sep | 00.30.44 | -15.09463 | -173.74887 | 1198 | 2 | 176 | Temperature has decreased since leaving the pit. |
| 19-Sep | 00.32.29 | -15.09463 | -173.74889 | 1197 | 2 | 176 | Suction is on. Not seeing them go into the chamber. Maybe one in chamber. |
| 19-Sep | 00.36.45 | -15.09465 | -173.74883 | 1198 | 1 | 154 | Slightly repositioning the ROV. Looks like shrimp came out of the chamber. Sample not successful-no sample. |
| 19-Sep | 00.39.57 | -15.09463 | -173.74887 | 1198 | 1 | 152 | Haven't seen as many shrimp carrying eggs at this location-only a few. |
| 19-Sep | 00.40.13 | -15.09463 | -173.74886 | 1199 | 1 | 152 | Pilot change. |
| 19-Sep | 00.42.57 | -15.09463 | -173.74889 | 1198 | 2 | 152 | ROV is gong to attempt shrimp collection with net from stbd box. |
| 19-Sep | 00.43.43 | -15.09461 | -173.74892 | 1198 | 2 | 152 | ROV has net. |
| 19-Sep | 00.44.31 | -15.09465 | -173.74887 | 1198 | 2 | 152 | Trying to scoop shrimp from same area. |
| 19-Sep | 00.45.13 | -15.09462 | -173.74889 | 1199 | 2 | 150 | Moving ROV to denser concentration of shrimp. |
| 19-Sep | 00.47.38 | -15.09464 | -173.74886 | 1196 | 5 | 150 | Looking for a dense shrimp pocket. |
| 19-Sep | 00.48.22 | -15.09464 | -173.74886 | 1197 | 4 | 131 | Huge mats of shrimp. Should be a good spot. |
| 19-Sep | 00.49.26 | -15.09466 | -173.74888 | | | | HD tape done. Loading new tape. |
| 19-Sep | 00.50.17 | -15.09464 | -173.74885 | 1197 | 3 | 120 | Taping to HD tape #2. Not seeing any other crabs here. |
| 19-Sep | 00.51.13 | -15.09462 | -173.74885 | 1197 | 2 | 130 | Intense concentration of shrimp. |
| 19-Sep | 00.51.15 | -15.09462 | -173.74885 | 1197 | 2 | 130 | Now taping. Seeing yellow variety of shrimp. |
| 19-Sep | 00.53.14 | -15.09464 | -173.74883 | 1196 | 2 | 129 | Some of the shrimp have swollen bellies - they have eggs in them. |
| 19-Sep | 00.54.02 | -15.09465 | -173.74885 | 1196 | 2 | 129 | The consensus is to point the bag down because shrimp tend to swim up when they are spooked. |
| 19-Sep | 00.57.00 | -15.09465 | -173.74883 | 1196 | 2 | 139 | There are a plethora of shrimp covering these rocks. |
| 19-Sep | 00.58.48 | -15.09465 | -173.74885 | 1197 | 2 | 141 | **Bio Sample: Q327-biomacro-01**. Net scoop of shrimp from dense mats of shrimp on top of wall above pit. Tim thinks we have at least a dozen or more shrimp in there. The net has been looped to keep them inside. Tim thinks there could be more than 30. **Target Shrimp Catch.** |
| 19-Sep | 00.59.49 | -15.09465 | -173.74885 | 1196 | 4 | 142 | There are small pieces of elemental sulfur sprinkled around this area as well as white bacterial mat. |
| 19-Sep | 01.02.26 | -15.09467 | -173.74890 | 1194 | 5 | 141 | Tim says that we have seen at least 8 more species here this trip than in 2009. |
| 19-Sep | 01.04.35 | -15.09463 | -173.74887 | 1195 | 5 | 142 | Tim has never seen this abundance of shrimp in a diffuse flow area. This is a LBL fix. |
| 19-Sep | 01.05.21 | -15.09464 | -173.74890 | 1193 | 5 | 141 | After this we will head for Prometheus; less than 100m to the NE. Prometheus vent was at 1179 meters in 2009. |
| 19-Sep | 01.08.45 | -15.09463 | -173.74887 | 1194 | 7 | 150 | We're starting to move now. |
| 19-Sep | 01.10.29 | -15.09462 | -173.74887 | 1188 | 12 | 78 | Looks like a plume ahead of us. We're heading N/NE (076). There is a plume up ahead. We're seeing evidence of intense venting here. |
| 19-Sep | 01.12.13 | -15.09455 | -173.74877 | 1188 | 14 | 47 | There is some sulfur in this plume. The color is more yellow than earlier. |
| 19-Sep | 01.12.40 | -15.09452 | -173.74875 | 1191 | 13 | 47 | Lots of particles in the plume. |
| 19-Sep | 01.12.59 | -15.09452 | -173.74875 | | | | We're seeing blue water now. |
| 19-Sep | 01.14.01 | -15.09447 | -173.74877 | 1193 | 12 | 93 | We're going to look at the bottom again and see if we can figure out where this venting is coming from. |
| 19-Sep | 01.15.09 | -15.09449 | -173.74876 | 1189 | 19 | 90 | We're seeing billowing smoke. Looks like the source is a little below us. |
| 19-Sep | 01.16.12 | -15.09449 | -173.74870 | 1191 | 12 | 91 | We see the wall ahead of us. White staining. Looking due east. |
| 19-Sep | 01.16.47 | -15.09450 | -173.74866 | 1188 | 10 | 90 | We're within about 30 meters of where Prometheus used to be. |
| 19-Sep | 01.17.32 | -15.09448 | -173.74860 | 1189 | 11 | 76 | Lots of staining on the summit slope. We're not at the top yet. |

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| 19-Sep | 01.18.07 | -15.09445 | -173.74856 | 1183 | 9 | 61 | Lots of bacterial mat or sulfur on the wall here. |
| 19-Sep | 01.19.05 | -15.09444 | -173.74850 | 1178 | 7 | 60 | Amazing outcrop. Precarious leaning structure. |
| 19-Sep | 01.21.15 | -15.09444 | -173.74844 | 1172 | 10 | 50 | Looking at a very steep wall ahead of us. Lots of white staining. Facing to the northeast. |
| 19-Sep | 01.22.10 | -15.09446 | -173.74844 | 1168 | 15 | 15 | More plumage in the background here. Looks like a considerable plume. |
| 19-Sep | 01.23.00 | -15.09446 | -173.74840 | 1168 | 10 | 348 | Terrain is very precarious. Remnant rocks are probably what's left of the summit. Trying to be careful of the tether. |
| 19-Sep | 01.24.10 | -15.09446 | -173.74836 | 1167 | 11 | 305 | Smoke running up from down below. Smoke coming up. |
| 19-Sep | 01.24.50 | -15.09445 | -173.74830 | | | | The summit is now is a bunch of lava remnants. Pillar-like structures that are irregular and impressive. |
| 19-Sep | 01.26.22 | -15.09438 | -173.74835 | 1167 | 8 | 1 | The summit is a precarious blocky patch of rocks. Trying to protect the tether. Don't want to harm the tether. |
| 19-Sep | 01.28.08 | -15.09423 | -173.74844 | | | | It's possible there is still something erupting here. We want to see. We're facing east on the volcano. The summit is just on our east. |
| 19-Sep | 01.28.43 | -15.09425 | -173.74840 | 1170 | 16 | 95 | We're trying to descend to discover the source of the plume. |
| 19-Sep | 01.29.25 | -15.09424 | -173.74835 | 1171 | 16 | 95 | Dave is on the horn now. Talking about eruptions and plumes. |
| 19-Sep | 01.30.47 | -15.09425 | -173.74834 | 1170 | 17 | 96 | It looks like there is more magmatic degassing going on here at Prometheus. |
| 19-Sep | 01.31.31 | -15.09421 | -173.74832 | 1171 | 17 | 73 | Visibility is really bad here. |
| 19-Sep | 01.34.47 | -15.09419 | -173.74819 | 1172 | 10 | 73 | Moving away from the summit a bit so that we can make our way up and see where the source of venting is from. |
| 19-Sep | 01.35.36 | -15.09419 | -173.74821 | 1171 | 19 | 105 | The temperature was up to 5.2 near the summit. |
| 19-Sep | 01.37.49 | -15.09420 | -173.74812 | 1165 | 21 | 105 | Looking to the east at the summit wall. |
| 19-Sep | 01.38.35 | -15.09421 | -173.74809 | 1162 | 15 | 105 | Odd-looking summit rocks. Ken says they are lava pinnacles. Bob thinks it may be a possible sulfide chimney. |
| 19-Sep | 01.40.18 | -15.09417 | -173.74805 | 1161 | 19 | 105 | There is some really beautifully banded lava on this pinnacle. |
| 19-Sep | 01.42.41 | -15.09416 | -173.74805 | 1160 | 23 | 109 | This could be the last little pinnacle summit of what used to be the summit says Ken. |
| 19-Sep | 01.45.43 | -15.09416 | -173.74804 | 1163 | 18 | 118 | Richard is calling it "flow-banded" boninite. This is remnant topography here. Looks like clastic deformation. |
| 19-Sep | 01.46.49 | -15.09415 | -173.74805 | 1161 | 17 | 121 | 15° 5.654'S 173° 45.083'W Z=1162m. Alt=17.6. LBL fix. Seems to be a good one. Summit pinnacle area. |
| 19-Sep | 01.48.02 | -15.09417 | -173.74803 | 1162 | 16 | 110 | Taking some DSCs of this pinnacle. |
| 19-Sep | 01.48.36 | -15.09417 | -173.74803 | 1163 | 16 | 111 | Shrimp living on this structure. Taking some DSCs. |
| 19-Sep | 01.49.59 | -15.09417 | -173.74805 | 1162 | 17 | 115 | Will try to get a sample of the banded texture rock. |
| 19-Sep | 01.51.23 | -15.09417 | -173.74801 | 1162 | 11 | 105 | There are a couple of sharp angles in the banding. |
| 19-Sep | 01.52.07 | -15.09418 | -173.74800 | 1163 | 11 | 116 | Could be some sulfur splatter on this pinnacle. Zooming in touched the chimney and the shrimp are swimming around. |
| 19-Sep | 01.52.56 | -15.09419 | -173.74803 | 1163 | 9 | 121 | Close-up shows that the bands have a structure and relief to them. |
| 19-Sep | 01.55.20 | -15.09418 | -173.74801 | 1162 | 10 | 121 | The stbd arm is coming out to grab a piece of this pinnacle. |
| 19-Sep | 01.56.54 | -15.09419 | -173.74801 | 1162 | 10 | 121 | He got a little tiny piece rock. It's probably half dollar size. It appears black and may have a band on it. It is from t he striped area but doesn't have a stripe on it. |
| 19-Sep | 01.59.25 | -15.09420 | -173.74805 | 1161 | 19 | 112 | **Geo Sample: Q327-rock-02**. It's a walnut-sized sample. Fragment; probably boninite. Near the banded area of the pinnacle. Going into basket 7. |
| 19-Sep | 02.04.33 | -15.09413 | -173.74805 | 1163 | 21 | 95 | Pilot change. |
| 19-Sep | 02.10.04 | -15.09413 | -173.74805 | 1162 | 10 | 71 | We're going to go a little deeper and see if we can locate the source of this plume. |
| 19-Sep | 02.11.02 | -15.09413 | -173.74805 | 1161 | 22 | 55 | Going downslope on the north face of the volcano. See some wispy smoke rising from the seafloor. Not the large plume we saw earlier. |
| 19-Sep | 02.12.45 | -15.09413 | -173.74805 | 1173 | 7 | 80 | Red long skinny fish just swam by. Tim thinks it was probably a squid. |
| 19-Sep | 02.17.38 | -15.09413 | -173.74805 | 1175 | 7 | 87 | Looking at the sonar. We're seeing wall ahead of us and to the right We're probably in the old Prometheus area because there was a ridge between the two vents in the past. |
| 19-Sep | 02.20.51 | -15.09408 | -173.74791 | | | | Discussing where we are; where we've been and where we want to go. |
| 19-Sep | 02.23.42 | -15.09406 | -173.74791 | 1176 | 6 | 134 | Seems like the new plan may be to give up searching for the plume? Not sure what's happening. |
| 19-Sep | 02.24.07 | -15.09407 | -173.74787 | 1177 | 5 | 134 | White mat and shrimp are abundant here. |
| 19-Sep | 02.25.03 | -15.09406 | -173.74791 | 1178 | 5 | 172 | Near-vent volcanic debris. Area we had previously called Prometheus. Lots of change. Obviously mass wasting events. Discoloration. Microbial mat. Tons of shrimp. |
| 19-Sep | 02.26.10 | -15.09409 | -173.74788 | 1179 | 2 | 176 | Angular texture to these rocks. Fragmentation. |
| 19-Sep | 02.27.29 | -15.09410 | -173.74791 | 1175 | 6 | 167 | Red rock ahead of us. |
| 19-Sep | 02.31.03 | -15.09407 | -173.74792 | 1172 | 9 | 153 | There is lots of stuff in the water. Partly from the vehicle and partly from some unknown source. |

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| 19-Sep | 02.32.26 | -15.09408 | -173.74790 | 1174 | 7 | 176 | Still a plethora of shrimp on these larger rock structures. |
| 19-Sep | 02.35.17 | -15.09413 | -173.74797 | 1173 | 3 | 175 | This spot seems to be venting here. Diffuse flow here on the base of the wall. |
| 19-Sep | 02.37.16 | -15.09415 | -173.74796 | 1173 | 2 | 176 | We bumped the rocks here and the shrimp are going crazy filling the video screen. There are thousands + of them. Way beyond any kind of counting. They are covering the rocks. All through the water. |
| 19-Sep | 02.40.01 | -15.09416 | -173.74797 | 1173 | 2 | 175 | We are in close proximity to where Shrimp City used to be. This is the new Shrimp City here. |
| 19-Sep | 02.43.42 | -15.09415 | -173.74802 | 1174 | 2 | 191 | Our goal is to take the temperature here; get some water samples. A boninite pillow right ahead of us. |
| 19-Sep | 02.47.51 | -15.09415 | -173.74801 | 1173 | 3 | 110 | Settling in here at this altered rock surface; angular; orange and gray staining. Altered by hot water interaction with volcanic rock. |
| 19-Sep | 02.51.38 | -15.09415 | -173.74801 | 1174 | 3 | 110 | The pilots are grabbing the temperature sensor. |
| 19-Sep | 02.54.05 | -15.09415 | -173.74801 | 1173 | 4 | 115 | This is not the 2009 Shrimp City target; but it is close in proximity. Shrimp City was at 1182m. We're at 1172 m here. The depth at the bottom is 1176 m. So it's about 5 meters shallower. |
| 19-Sep | 02.56.43 | -15.09415 | -173.74801 | 1173 | 3 | 107 | Rick says that he saw a black shrimp in the group. |
| 19-Sep | 02.57.40 | -15.09415 | -173.74801 | 1174 | 4 | 107 | No sessile fauna here so far. No crab; snails; etc. |
| 19-Sep | 03.01.39 | -15.09415 | -173.74801 | 1174 | 2 | 195 | We're trying to find another place to take a temperature measurement. |
| 19-Sep | 03.03.49 | -15.09415 | -173.74801 | 1173 | 4 | 126 | Probably widespread diffuse venting. Almost all of these shrimp have eggs. |
| 19-Sep | 03.04.58 | -15.09415 | -173.74801 | 1174 | 3 | 118 | With a lot of these species they can change sex to determine a good ratio of male to female in the community. |
| 19-Sep | 03.06.11 | -15.09415 | -173.74801 | 1174 | 3 | 116 | We (Tim) would like a position for this **plethora of shrimp**. This is a **good fix** for **"Shrimp Plethora".** |
| 19-Sep | 03.16.25 | -15.09424 | -173.74813 | 1173 | 6 | 113 | We're looking around for more flow. Here in this area. Doesn't seem to be improving. |
| 19-Sep | 03.17.22 | -15.09428 | -173.74816 | 1173 | 3 | 73 | There are lots of shrimp here but not as intense as earlier. There is a squat lobster here too. |
| 19-Sep | 03.19.00 | -15.09424 | -173.74814 | 1173 | 6 | 91 | Different species of shrimp seen here. Big red one. |
| 19-Sep | 03.19.21 | -15.09425 | -173.74815 | 1173 | 5 | 91 | Eelpouts here as well. |
| 19-Sep | 03.21.01 | -15.09425 | -173.74815 | 1173 | 3 | 92 | The temperature probe is extended out in front of the HD camera. |
| 19-Sep | 03.21.40 | -15.09426 | -173.74815 | 1173 | 3 | 93 | See some milky fluid here so will use the temperature probe to see if there is really any warm water coming out of there. |
| 19-Sep | 03.24.01 | -15.09424 | -173.74814 | 1172 | 4 | 95 | The ROV is situated and the temperature probe is extended here at the rock pile with lots of shrimp. |
| 19-Sep | 03.27.29 | -15.09429 | -173.74815 | 1172 | 4 | 96 | This is too cool to sample. |
| 19-Sep | 03.28.23 | -15.09428 | -173.74815 | 1172 | 4 | 96 | Not looking too promising here. Going to keep looking for another site in another area. |
| 19-Sep | 03.29.50 | -15.09425 | -173.74813 | 1172 | 4 | 94 | We're moving more southerly along the slope. See several species of shrimp; eelpout. |
| 19-Sep | 03.31.45 | -15.09430 | -173.74815 | 1173 | 2 | 97 | The plan is to move upslope a bit. |
| 19-Sep | 03.32.33 | -15.09426 | -173.74815 | 1173 | 2 | 98 | Milky fluid and shrimp on this shrimp. |
| 19-Sep | 03.34.04 | -15.09428 | -173.74816 | 1172 | 4 | 82 | HD is on. Lots of shrimp here and milky water. |
| 19-Sep | 03.35.10 | -15.09431 | -173.74815 | 1172 | 5 | 126 | Looks like lots of diffuse flow here. Tons of shrimp on these rocks. Milky water coming out of a hole. Eelpout. |
| 19-Sep | 03.36.36 | -15.09428 | -173.74814 | 1173 | 2 | 131 | Positioning to reach the low point between the rocks where milky fluid is rising. Ambient temperature is about 5.5°C on the temp probe. 4.0 on the temp probe. |
| 19-Sep | 03.37.00 | -15.09431 | -173.74815 | 1174 | 2 | 130 | **GAP IN USBL NAVIGATION FROM 0337 TO 0523. USING SAME USBL POSITION FROM 0337 TO 0459. 0459 TO 0535 TRANSIT IN THE WATER COLUMN (NO NAV).** |
| 19-Sep | 03.38.00 | -15.09428 | -173.74813 | 1173 | 2 | 130 | The temperature probe is out and down by a rock here. The temp is already up 5 degrees now. |
| 19-Sep | 03.39.15 | | | | | | Temperature got to 10.9°C. Repositioning. |
| 19-Sep | 03.40.39 | | | | | | The ROV moved a bit so we are just going to try to find a good spot again. |
| 19-Sep | 03.41.20 | | | | | | Not lots of mat on the rock. Rick says it's because the shrimp are eating it all. If they weren't here these rocks would be "covered in mat". |
| 19-Sep | 03.42.22 | | | | | | This looks good. We are going to stow the temp probe and will now take a major. |
| 19-Sep | 03.43.00 | | | | | | We got readings of 10.9°C and 10.1°C respectively. |
| 19-Sep | 03.45.02 | | | | | | Murky water; shrimp; scaleworm. Probably lots of sulfur in these fluids. |
| 19-Sep | 03.46.01 | | | | | | HD went off; not sure when. It went off at 0341 is the word from the pilot. |
| 19-Sep | 03.47.22 | | | | | | Crab in the lower left. |

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| 19-Sep | 03.49.00 | | | | | | A big shrimp just went by with a little shrimp it was carrying. The smaller species is opaepele (Choro-O). Time prefers we call it the red shrimp (the big one). |
| 19-Sep | 03.51.27 | | | | | | The blue major is poised over the flow. |
| 19-Sep | 03.54.08 | | | | | | Lots of eelpouts here this visit. In 2009 we only saw 1. |
| 19-Sep | 03.54.39 | | | | | | There are about 6 species of eelpouts that are known. 3 of those in the Pacific. |
| 19-Sep | 03.55.14 | | | | | | There are probably 2 species of shrimp here. Could be up to 4 species here. |
| 19-Sep | 03.56.05 | | | | | | We've seen maybe 4 of these black-colored shrimp. |
| 19-Sep | 04.02.02 | | | | | | Placing tip low-almost touching the ground. |
| 19-Sep | 04.02.54 | | | | | | **Fluid sample: Q327-major-03**. Blue major. In this milky 10+ degree flow in the area with lots of shrimp. **Shrimp Plethora site.** |
| 19-Sep | 04.04.14 | | | | | | Filling up. Stowing. |
| 19-Sep | 04.05.13 | | | | | | Near Prometheus vent at Shrimp Plethora. |
| 19-Sep | 04.07.17 | | | | | | Stowing blue major and securing with bungee. |
| 19-Sep | 04.07.47 | | | | | | Next will take GTB at same site. |
| 19-Sep | 04.09.34 | | | | | | Reaching for the black GTB (stbd of the three). |
| 19-Sep | 04.15.03 | | | | | | GTB in ROV claw-problems with the bungee getting stuck. |
| 19-Sep | 04.15.20 | | | | | | Same location as major-03. Positioning instrument. |
| 19-Sep | 04.17.41 | | | | | | Smokier view-increase in flow. |
| 19-Sep | 04.19.18 | | | | | | **Gas sample: Q327-GTB-04**. Black gastight. Not touching the bottom. **Shrimp Plethora site.** |
| 19-Sep | 04.21.34 | | | | | | Chadwick replacing Butterfield in van. Shank in van. |
| 19-Sep | 04.22.02 | | | | | | After stowing GTB want to do a Huber sample with pelagic pump who's intake is attached to the suction sampler. |
| 19-Sep | 04.24.03 | | | | | | GTB not sliding down holster easily so tapping gently. |
| 19-Sep | 04.26.07 | | | | | | Preparing to remove suction hose. |
| 19-Sep | 04.30.59 | | | | | | First have to get the temperature probe cable disentangled. |
| 19-Sep | 04.32.42 | | | | | | Half inch hose attached to the suction sampler. Turn on a pump that is pulling water through a filter. Run it 10-15 liters of water will be collected on the filter. Will produce a DNA/RNA filter sample. |
| 19-Sep | 04.35.03 | | | | | | Pilot swapped out. |
| 19-Sep | 04.36.57 | | | | | | This will be a somewhat larger DNA/RNA sample than what we get from Dave's "Beast". |
| 19-Sep | 04.44.03 | | | | | | **Fluid sample: Q327-fluid-DNA-05**. Filter sample for Julie Huber. DNA and RNA analysis will be performed on the filter. |
| 19-Sep | 04.47.08 | | | | | | Troubleshooting the pump here. |
| 19-Sep | 04.50.13 | | | | | | The DNA pump isn't working. Aborting the sample. Will head off toward the hydrophone now. |
| 19-Sep | 04.56.03 | | | | | | NO SAMPLE 05. The pump didn't work. (Keeping sample-will check on deck). |
| 19-Sep | 04.58.23 | | | | | | Pulling out of this site and will now head in the direction of the hydrophone. |
| 19-Sep | 04.59.36 | | | | | | We're off the bottom. Heading to the N/NE |
| 19-Sep | 05.24.01 | | | | | | **The USBL is back on. We're out ahead of the ship.** |
| 19-Sep | 05.31.48 | | | | | | We're heading back toward the bottom now. |
| 19-Sep | 05.35.28 | | | | | | The bottom is now in sight. |
| 19-Sep | 05.37.58 | -15.09586 | -173.75022 | 1275 | 4 | 310 | Angular chunks of oxidized rocks. |
| 19-Sep | 05.38.15 | -15.09586 | -173.75022 | 1273 | 7 | 310 | Homer says we are 25m from the hydrophone. |
| 19-Sep | 05.38.49 | -15.09591 | -173.75023 | 1274 | 6 | 312 | We are shallower than the hydrophone location but should get deeper by driving this course. |
| 19-Sep | 05.40.01 | -15.09593 | -173.75028 | 1278 | 5 | 302 | Looking for the hydrophone. Looks like Mat Meadow. |
| 19-Sep | 05.41.18 | -15.09580 | -173.75043 | 1277 | 4 | 358 | Homer says 15m away. |
| 19-Sep | 05.41.25 | -15.09578 | -173.75043 | 1277 | 4 | 12 | There it is! |
| 19-Sep | 05.42.08 | -15.09578 | -173.75038 | 1277 | 4 | 11 | First will take a Davis sampler before recovering the hydrophone. |
| 19-Sep | 05.42.33 | -15.09577 | -173.75036 | 1277 | 4 | 11 | This sampler is equipped to take samples for RNA & DNA. |
| 19-Sep | 05.42.36 | -15.09577 | -173.75036 | 1277 | 4 | 10 | Pilot change. |
| 19-Sep | 05.46.00 | -15.09566 | -173.75045 | 1279 | 2 | 347 | Looking for a sample site for the Davis sampler near the hydrophone location in Mat Meadow. |
| 19-Sep | 05.49.18 | -15.09577 | -173.75035 | 1279 | 2 | 358 | Looking at the orange-coated rocks as a potential sample site. The coating would be the sample. |
| 19-Sep | 05.51.37 | -15.09569 | -173.75038 | 1278 | 2 | 358 | The large rock in front of HD has been selected as the sample site for the mat on the lower right side of the rock. Maybe try to scoop from the top of the rock as well. Lighter color around the edges of the mat indicate fresher mat deposits. |

| date | time | latitude | longitude | Z | alt | hdg | Q327 - West Mata Dive Comments |
|---|---|---|---|---|---|---|---|
| 19-Sep | 05.52.31 | -15.09575 | -173.75036 | 1279 | 2 | 359 | Sampler has been removed from basket (Davis #9). |
| 19-Sep | 05.53.19 | -15.09575 | -173.75036 | 1279 | 2 | 360 | Aiming for the lighter colored mat which would indicate more active in the flow. More active=more cells. |
| 19-Sep | 05.54.00 | -15.09578 | -173.75035 | 1279 | 2 | 359 | Passing sampler to other arm then use the stbd arm to open the valve prior scooping. |
| 19-Sep | 05.54.50 | -15.09576 | -173.75036 | 1278 | 2 | 359 | Port arm holding sampler. |
| 19-Sep | 05.56.49 | -15.09575 | -173.75034 | 1278 | 2 | 359 | Valve is open. Switching the sampler to the stbd arm. |
| 19-Sep | 05.59.44 | -15.09575 | -173.75032 | 1279 | 2 | 3 | Moving in toward the rock for a sample. |
| 19-Sep | 05.59.54 | | | | | | In position. |
| 19-Sep | 06.01.31 | | | | | | Trying for light colored sediment without any scaleworms. |
| 19-Sep | 06.02.22 | | | | | | Trying to get all the angles correct to get the proper sample. |
| 19-Sep | 06.07.20 | | | | | | Got a scoop of light yellow sediment but surface is very crusty. Need more and can't really see any in tube. |
| 19-Sep | 06.09.47 | | | | | | Under orange coating there is glassy black visible. |
| 19-Sep | 06.10.15 | | | | | | Going for orange mat where it meets the sediment at the base of the rock. |
| 19-Sep | 06.11.19 | | | | | | Big scoop and can see some in the sampler. Going to try second scoop in the same place. |
| 19-Sep | 06.12.19 | | | | | | **Bio-Sample: Q327-biosed-06**. Davis sampler #9 for RNA & DNA. Near hydrophone location at **Mat Meadow area.** |
| 19-Sep | 06.15.10 | | | | | | Moving the sampler to port arm then will close/open valves. |
| 19-Sep | 06.16.14 | | | | | | In the port arm and closing the top valve. |
| 19-Sep | 06.16.45 | | | | | | Valve is closed. |
| 19-Sep | 06.17.25 | | | | | | Trying to open the bottom valve. |
| 19-Sep | 06.18.23 | | | | | | Had to reposition the sampler in the port arm. |
| 19-Sep | 06.18.49 | | | | | | Opened the bottom valve. Saw sampler move into the chamber with the fixer. |
| 19-Sep | 06.19.36 | | | | | | Passing the sampler back to stbd arm to be placed in the drawer. |
| 19-Sep | 06.21.58 | | | | | | Placing sampler in #13 on top of the net sample (biomacro-01). |
| 19-Sep | 06.23.13 | | | | | | Stowing arm and drawer. |
| 19-Sep | 06.24.52 | | | | | | Deciding on whether to make additional samples at cost of dive time tomorrow. |
| 19-Sep | 06.27.30 | | | | | | Will sample for one more hour. |
| 19-Sep | 06.30.34 | | | | | | There is the hydrophone and moving back over to the Luo vent for fluid/gas/bio sampling. |
| 19-Sep | 06.32.05 | -15.09565 | -173.75042 | 1279 | 2 | 158 | Black hydrophone is rented and the silver one is rated for full-ocean depth. |
| 19-Sep | 06.32.24 | -15.09570 | -173.75032 | | | | Hole may be too small for sampling to reach into. |
| 19-Sep | 06.35.13 | -15.09565 | -173.75042 | 1278 | 2 | 123 | Not at the right depth nor heading. Need to back up. |
| 19-Sep | 06.37.27 | -15.09571 | -173.75030 | 1279 | 1 | 130 | Backing up and now seeing the crack. |
| 19-Sep | 06.40.33 | -15.09568 | -173.75035 | 1281 | 0 | 138 | Moving back more and seeing water. |
| 19-Sep | 06.43.44 | | | | | | Moving slightly to see if we can find more flow. |
| 19-Sep | 06.44.26 | | | | | | Probably can't reach inside the crack. |
| 19-Sep | 06.45.21 | | | | | | Very deep crack. |
| 19-Sep | 06.47.36 | -15.09566 | -173.75044 | 1282 | 0 | 71 | Can see scaleworms and shrimp but not as much |
| 19-Sep | 06.48.16 | -15.09564 | -173.75048 | 1282 | 0 | 78 | Trying to decide if this can be sampled and looking around a little bit more. |
| 19-Sep | 06.49.26 | -15.09564 | -173.75047 | 1282 | 1 | 77 | Going to concentrate on the suction sample as water and gas may not be possible. |
| 19-Sep | 06.51.37 | -15.09567 | -173.75047 | 1282 | 2 | 62 | Moving in on edge of crack which has many scaleworms. |
| 19-Sep | 06.52.41 | -15.09568 | -173.75045 | 1281 | 2 | 73 | Preparing arm to retrieve the suction sampler. |
| 19-Sep | 06.54.46 | -15.09563 | -173.75041 | 1281 | 2 | 74 | Sampler has been removed and preparing suction. USBL looks good. |
| 19-Sep | 06.55.18 | -15.09563 | -173.75044 | 1281 | 2 | 73 | Ready to suction. |
| 19-Sep | 06.55.42 | -15.09563 | -173.75044 | 1281 | 2 | 74 | Got one and into the box. Got a second on side of canister. |
| 19-Sep | 00.00.00 | -15.09461 | -173.74913 | 1249 | 21 | 116 | Short burst. Big suction |
| 19-Sep | 06.55.42 | -15.09563 | -173.75044 | 1281 | 2 | 74 | **Bio Sample: Q327-biomacro-07**. Suction of scaleworm and sediment from Luo vent. |
| 19-Sep | 06.58.53 | -15.09563 | -173.75041 | 1281 | 2 | 73 | **Bio Sample: Q327-biosed-08.** Rotated chamber for additional suction of scaleworms. Also sediment in the chamber for Ed. Lots of sediment in the second suction chamber and maybe worms as well. |
| 19-Sep | 07.01.47 | -15.09566 | -173.75043 | 1281 | 2 | 74 | Saw worm enter the chamber but is now swimming around. |
| 19-Sep | 07.05.21 | | | | | | Stowing the suction wand. Polychaete swimming in chamber. |
| 19-Sep | 07.07.26 | | | | | | Seeing the bag forms in the crack. |
| 19-Sep | 07.08.07 | | | | | | Will try to get a major sample which can be sub-sampled for gas. |
| 19-Sep | 07.08.41 | | | | | | Removing white major sampler. |
| 19-Sep | 07.12.21 | | | | | | Positioning major in crack. Getting wand deep. |

| date | time | latitude | longitude | Z | alt | hdg | Q327 - West Mata Dive Comments |
|---|---|---|---|---|---|---|---|
| 19-Sep | 07.12.30 | | | | | | **Fluid sample: Q327-major-09**. Sample from diffuse flow in **Luo** crack where last 2 samples taken. Fired and coming up. WC-1 indicates West Coast NURP office sampler. Slightly different place than worms in the crack. |
| 19-Sep | 07.16.48 | | | | | | Rotated the suction sampler so open to #3 of the suction. Potential other sample. |
| 19-Sep | 07.16.50 | | | | | | Great image of crab in the crack. Zooming in with HD. Can also see more shimmer to the water. |
| 19-Sep | 07.18.46 | | | | | | Smaller crabs in the background with larger crab (Lau-like). Hairy crab. |
| 19-Sep | 07.18.54 | -15.09562 | -173.75044 | 1281 | 1 | 89 | **Bio sample: Q327-biomacro-10**. Another scaleworm into the chamber #3. |
| 19-Sep | 07.19.16 | -15.09562 | -173.75043 | | | | Taking stills of the hairy crab at the Luo crack. |
| 19-Sep | 07.20.25 | -15.09562 | -173.75043 | 1280 | 1 | 89 | Off to pickup the hydrophone. |
| 19-Sep | 07.20.51 | -15.09563 | -173.75045 | 1279 | 3 | 80 | Nice view of crack and hydrophone. |
| 19-Sep | 07.21.40 | -15.09569 | -173.75043 | 1279 | 1 | 30 | Need to put the hydrophone on the porch and end the dive. |
| 19-Sep | 07.22.26 | -15.09565 | -173.75040 | 1279 | 1 | 30 | Arm reaching for hydrophone. |
| 19-Sep | 07.22.59 | -15.09568 | -173.75038 | | | | Lifted on seafloor. |
| 19-Sep | 07.23.33 | -15.09569 | -173.75034 | 1280 | 1 | 28 | Rotating and looking for good landing spot on the porch. |
| 19-Sep | 07.25.24 | -15.09563 | -173.75043 | 1280 | 1 | 29 | Rotating hydrophone 180deg which looks better for the tip of the hydrophone. |
| 19-Sep | 07.26.13 | -15.09563 | -173.75043 | 1279 | 1 | 3 | **ROV lifting off bottom with the hydrophone in the arm.** |
| 19-Sep | 07.26.32 | | | | | | Off bottom. |
| 19-Sep | 08.08.34 | | | | | | Passing 540m. Ascending at 20m/min. |
| 19-Sep | 08.22.46 | | | | | | Passing 230m. |
| 19-Sep | 08.41.46 | | | | | | **On the deck.** |

## 7.7 Q328 Mata Ua Dive Log

| date | time | latitude | longitude | Z | alt | hdg | Q328 - North Mata Ua Dive Comments |
|---|---|---|---|---|---|---|---|
| **Main Goals:** Explore and sample the source of hydrothermal venting at North Mata Ua. | | | | | | | |
| **Launch target:** 15°1.008' S 173°47.312 ' W Z=2400m Downslope; NW of summit | | | | | | | |
| **Setup:** 3 gastights; 3 majors; temp probe 1 Davis sampler; 1 McPhail sampler; large biobox; suction sampler; pelagic pump; T-handle and mesh net. | | | | | | | |
| **Nav Notes:** Bottom time: 9/19/2012 23:41 – 9/20 05:59. Nav smoothed (tolerance=10). Did NOT shift nav. 5-10 m discrepancy between log and nav depths on steep slope. | | | | | | | |
| **DIVE LOG POSITION INFORMATION: latitude; longitude; Z; alt; hdg values are derived from finalized Quest nav. Any lat/long values in the dive comments column were recorded at sea and are preliminary.** | | | | | | | |
| 19-Sep | 20.32.12 | | | | | | Ship is at Mata Ua preparing for the dive. |
| 19-Sep | 20.55.07 | | | | | | Unstrapping ROV from the deck. |
| 19-Sep | 20.56.56 | | | | | | ROV off the deck. |
| 19-Sep | 21.02.33 | | | | | | ROV coming back to the ship. |
| 19-Sep | 21.02.49 | | | | | | ROV on deck. |
| 19-Sep | 21.49.17 | | | | | | ROV off deck once again. |
| 19-Sep | 21.52.37 | | | | | | ROV in water. |
| 19-Sep | 21.54.50 | | | | | | Attaching flotation to wire. |
| 19-Sep | 21.57.49 | | | | | | ROV is diving. |
| 19-Sep | 22.10.19 | | | | | | Passing 250m depth. |
| 19-Sep | 22.21.09 | | | | | | Passing 500m and descending at ~20m/min. |
| 19-Sep | 22.52.50 | | | | | | Passing 1300m on our way to a target depth of 2400m. |
| 19-Sep | 23.13.01 | | | | | | Passing 1800m to our revised target depth of 2430m. |
| 19-Sep | 23.20.42 | | | | | | 2000m. |
| 19-Sep | 23.29.37 | | | | | | 2200m. |
| 19-Sep | 23.35.03 | | | | | | 2340m. With 100m to go to the bottom. |
| 19-Sep | 23.37.44 | | | | | | Altimeter is seeing the bottom at 2402.7 |
| 19-Sep | 23.39.36 | | | | | | Bottom at 2432m altitude 8m. |
| 19-Sep | 23.41.08 | -15.01602 | -173.78904 | 2436 | 3 | 184 | Seeing sedimented bottom. Some rocks with rippled sediments. |
| 19-Sep | 23.41.52 | -15.01603 | -173.78900 | 2436 | 3 | 183 | Depth matches map very well. |
| 19-Sep | 23.42.40 | -15.01602 | -173.78905 | 2437 | 3 | 135 | Panning left to hdg 133. |
| 19-Sep | 23.43.17 | -15.01600 | -173.78900 | 2436 | 3 | 135 | Some white staining with heavy sediment and a few protruding rocks. |
| 19-Sep | 23.43.48 | -15.01603 | -173.78900 | 2435 | 3 | 135 | Looking along sediment ripples with a heading of 135. |
| 19-Sep | 23.45.02 | -15.01611 | -173.78895 | 2434 | 2 | 135 | SW to NE is the current direction according to the ripple patterns. |
| 19-Sep | 23.46.01 | -15.01618 | -173.78883 | 2433 | 3 | 136 | Crinoid on rock with heavy sediment. |
| 19-Sep | 23.46.26 | -15.01617 | -173.78885 | 2432 | 3 | 135 | Volcanic rock with mobile crinoid. |
| 19-Sep | 23.47.09 | -15.01618 | -173.78883 | 2432 | 3 | 136 | Moving toward the slope with angular rocks probably from past landslides. |
| 19-Sep | 23.47.32 | -15.01622 | -173.78883 | 2431 | 3 | 135 | Looked like columnar piece. |
| 19-Sep | 23.47.54 | -15.01623 | -173.78884 | 2431 | 3 | 134 | White staining on rocks which could be due to hydrothermal alteration. |
| 19-Sep | 23.50.44 | -15.01635 | -173.78870 | 2428 | 3 | 132 | Coarser sandy sediment with some angular rocks some with hexagonal joints. |
| 19-Sep | 23.51.31 | -15.01636 | -173.78870 | 2426 | 3 | 132 | Breccia with the angular pieces. Soft coral. |
| 19-Sep | 23.52.00 | -15.01639 | -173.78868 | 2424 | 4 | 132 | Seeing highly altered volcanic rocks. |
| 19-Sep | 23.52.21 | -15.01639 | -173.78867 | 2424 | 3 | 132 | Some white tinge to the rocks. |
| 19-Sep | 23.53.19 | -15.01645 | -173.78865 | 2423 | 3 | 132 | More rocks with some larger pieces. |
| 19-Sep | 23.53.40 | -15.01648 | -173.78863 | 0 | 0 | 0 | Anemones and red shrimp. |
| 19-Sep | 23.53.57 | -15.01649 | -173.78862 | 2420 | 4 | 132 | Galatheid crabs. |
| 19-Sep | 23.55.02 | -15.01653 | -173.78859 | 2419 | 4 | 150 | A few white-stained rocks among the other angular pieces. |
| 19-Sep | 23.55.38 | -15.01658 | -173.78858 | 2418 | 4 | 150 | Larger pieces of rocks and less sediment. |
| 19-Sep | 23.56.04 | -15.01657 | -173.78858 | 2418 | 3 | 150 | Talus and slope is increasing. |
| 19-Sep | 23.56.39 | -15.01663 | -173.78862 | 2418 | 3 | 150 | Lighter colored rocks are altered. |
| 19-Sep | 23.57.13 | -15.01664 | -173.78863 | 2416 | 3 | 149 | More talus with fewer larger rocks. |
| 19-Sep | 23.57.35 | -15.01668 | -173.78862 | 2416 | 3 | 150 | Pieces look a bit rounded. |
| 19-Sep | 23.58.14 | -15.01674 | -173.78861 | 2413 | 3 | 150 | More sediment. |
| 19-Sep | 23.58.53 | -15.01677 | -173.78862 | 2412 | 3 | 150 | Small slide scar. |
| 19-Sep | 23.59.37 | -15.01681 | -173.78862 | 2410 | 3 | 150 | Taking DSCs of ascent. |
| 20-Sep | 00.00.19 | -15.01687 | -173.78858 | 2407 | 3 | 150 | More white on the rocks and shell debris. |
| 20-Sep | 00.01.13 | -15.01689 | -173.78858 | 2408 | 3 | 150 | Sediment looks brown. Zooming in. |
| 20-Sep | 00.01.29 | -15.01687 | -173.78861 | 2407 | 3 | 150 | Snail shells (dead) which have fallen down. |
| 20-Sep | 00.03.00 | -15.01690 | -173.78858 | 2405 | 3 | 150 | Continuing up slope. |
| 20-Sep | 00.03.50 | -15.01693 | -173.78857 | 2404 | 3 | 150 | White gastropod snail. |
| 20-Sep | 00.04.32 | -15.01696 | -173.78858 | 2402 | 3 | 150 | Anemone as we continue up slope. |
| 20-Sep | 00.04.49 | -15.01697 | -173.78858 | 2400 | 3 | 150 | Brachyuran crab. |
| 20-Sep | 00.05.24 | -15.01702 | -173.78855 | 2399 | 3 | 150 | Very altered sediments. |

| date | time | latitude | longitude | Z | alt | hdg | Q328 - North Mata Ua Dive Comments |
|---|---|---|---|---|---|---|---|
| 20-Sep | 00.05.48 | -15.01703 | -173.78855 | 2398 | 3 | 151 | Altered pillow lump. More altered as go upslope. |
| 20-Sep | 00.06.25 | -15.01706 | -173.78851 | 2396 | 3 | 150 | More brachyuran crabs. |
| 20-Sep | 00.06.41 | -15.01707 | -173.78850 | 2395 | 3 | 150 | Much more white sediment and shimmer at the base of outcrop. |
| 20-Sep | 00.07.38 | -15.01710 | -173.78849 | 2392 | 2 | 140 | Fish; shrimp; squat lobster; snails; anemone; barnacles (live). |
| 20-Sep | 00.07.52 | -15.01710 | -173.78851 | 2390 | 3 | 140 | Lots of barnacles. Taking DSC. Gorgeous! |
| 20-Sep | 00.08.28 | -15.01713 | -173.78847 | 2392 | 3 | 141 | Shows current. HD tape on. Stalked barnacles. |
| 20-Sep | 00.08.49 | -15.01714 | -173.78852 | 2392 | 2 | 140 | Brachyuran crab. Lots of shimmer. |
| 20-Sep | 00.09.10 | -15.01714 | -173.78850 | 2391 | 3 | 140 | Great close-up with HD. |
| 20-Sep | 00.09.53 | -15.01712 | -173.78848 | 2392 | 3 | 140 | Shrimp amongst the barnacles. |
| 20-Sep | 00.10.26 | -15.01711 | -173.78852 | 2391 | 3 | 140 | Suggested to sample a rock with barnacles. |
| 20-Sep | 00.10.57 | -15.01711 | -173.78852 | 2392 | 3 | 141 | Lots of biology! |
| 20-Sep | 00.11.34 | -15.01712 | -173.78851 | 2391 | 3 | 140 | Looking for a small rock that has barnacles. |
| 20-Sep | 00.12.26 | -15.01710 | -173.78850 | 2392 | 2 | 139 | Most of the outcrops look massive-no looser small pieces. |
| 20-Sep | 00.12.54 | -15.01712 | -173.78847 | 2392 | 2 | 141 | Squat lobster. |
| 20-Sep | 00.13.26 | -15.01713 | -173.78848 | 2391 | 3 | 140 | HD tape off. |
| 20-Sep | 00.13.58 | -15.01712 | -173.78847 | 2390 | 2 | 140 | Close-up of the barnacles feeding. |
| 20-Sep | 00.14.06 | -15.01712 | -173.78847 | 2391 | 2 | 140 | HD on again. Barnacles bathing in the shimmer. Cirri are the feeding parts of the barnacle. DSCs. |
| 20-Sep | 00.15.06 | -15.01712 | -173.78847 | 2391 | 2 | 140 | Amazing imagery. |
| 20-Sep | 00.15.21 | -15.01713 | -173.78850 | 2391 | 2 | 140 | Amphipods attached to the barnacles-they are polychaetes. |
| 20-Sep | 00.17.09 | -15.01710 | -173.78851 | 2391 | 2 | 140 | Limpets also visible on the barnacles. |
| 20-Sep | 00.17.53 | -15.01712 | -173.78846 | 2390 | 2 | 140 | DSCs of this site. Will sample after some imagery. |
| 20-Sep | 00.19.37 | -15.01712 | -173.78845 | 2391 | 2 | 140 | Limpets; red were worms; additionally amphipods. |
| 20-Sep | 00.20.01 | -15.01712 | -173.78847 | 2392 | 1 | 140 | Particles in front of the barnacles could be amphipods swimming around. |
| 20-Sep | 00.20.30 | -15.01713 | -173.78848 | 2391 | 2 | 140 | HD tape is off. |
| 20-Sep | 00.21.10 | -15.01713 | -173.78849 | 2390 | 1 | 53 | Moving to find an appropriate sample. |
| 20-Sep | 00.21.29 | -15.01712 | -173.78846 | 2390 | 2 | 73 | Orientation of the cirri indicate the current (SE). |
| 20-Sep | 00.22.13 | -15.01713 | -173.78848 | 2391 | 2 | 87 | Barnacles are new to this expedition. |
| 20-Sep | 00.25.08 | -15.01714 | -173.78849 | 2390 | 2 | 87 | Moving the arm to prepare for sampling. |
| 20-Sep | 00.25.52 | -15.01713 | -173.78849 | 2391 | 2 | 88 | This barnacle is a vent species. Opening the biobox. |
| 20-Sep | 00.26.26 | -15.01713 | -173.78846 | 2389 | 1 | 88 | Biobox is open and arm is reaching. |
| 20-Sep | 00.30.41 | -15.01716 | -173.78849 | 2390 | 1 | 87 | **Biogeo sample: Q328-biogeo-01**. In box #15. Rock with many barnacles attached. **Barnacle Field site.** |
| 20-Sep | 00.32.37 | -15.01716 | -173.78847 | 2391 | 1 | 87 | Next will attempt a syringe sample (microbio) with the McPhail sampler. |
| 20-Sep | 00.34.39 | -15.01714 | -173.78846 | 2390 | 2 | 87 | Arm reaching for McPhail sampler. At the same location |
| 20-Sep | 00.36.20 | -15.01714 | -173.78847 | 2390 | 1 | 87 | Arm has sampler. |
| 20-Sep | 00.37.18 | -15.01712 | -173.78851 | 2391 | 2 | 87 | Putting the sampler down to get a different grip on it. |
| 20-Sep | 00.39.07 | -15.01714 | -173.78850 | 2390 | 1 | 87 | Trying to sample sediment with microbial mat with this sampler. |
| 20-Sep | 00.40.55 | -15.01713 | -173.78847 | 2390 | 1 | 86 | Want to position the nozzle to get microbes living in the hydrothermal sediments. |
| 20-Sep | 00.42.17 | -15.01714 | -173.78848 | 2390 | 1 | 86 | Trying to straighten the kink in the hose at the nozzle. |
| 20-Sep | 00.42.31 | -15.01713 | -173.78850 | 2390 | 1 | 86 | Looks a little better. |
| 20-Sep | 00.43.03 | -15.01714 | -173.78848 | 2390 | 1 | 87 | Hose in shimmering water above the sediments. Then putting nozzle into the sediment. |
| 20-Sep | 00.43.14 | -15.01714 | -173.78844 | 2390 | 1 | 87 | Pushing ram. Spring is slowly extending while keeping the intake in the sediment. Some coming in but not much. |
| 20-Sep | 00.44.15 | -15.01714 | -173.78848 | 2390 | 1 | 87 | Now seeing a lot of sediment. |
| 20-Sep | 00.44.20 | -15.01714 | -173.78848 | 2390 | 1 | 87 | **Bio sample: Q328-biosed-02**. In same location as biogeo-01. McPhail sampler. **Barnacle Field site.** |
| 20-Sep | 00.46.28 | -15.01715 | -173.78847 | 2390 | 2 | 87 | Finished sampling at this location. |
| 20-Sep | 00.47.09 | -15.01714 | -173.78842 | 2390 | 1 | 88 | Placing in back of biobox space #13. |
| 20-Sep | 00.48.29 | -15.01712 | -173.78845 | 2390 | 2 | 87 | Securing the biobox and retracting the drawer. Arm put back. |
| 20-Sep | 00.49.29 | -15.01715 | -173.78851 | 0 | 0 | 0 | Barnacle Field site. DSC. Fair amount of shimmer around the crab we would like to zoom in on. |
| 20-Sep | 00.51.10 | -15.01714 | -173.78847 | 2390 | 2 | 101 | Zooming in. See crab holding on to something (shrimp?). |
| 20-Sep | 00.51.56 | -15.01715 | -173.78847 | 2390 | 2 | 107 | Two crabs have different claws colored darkly. HD tape on. |
| 20-Sep | 00.52.49 | -15.01713 | -173.78846 | 2391 | 2 | 107 | **Putting target in the nav (Barnacle).** |
| 20-Sep | 00.53.21 | -15.01713 | -173.78845 | 2387 | 5 | 104 | Fish cruising by and can now see how extensive the field of barnacles. |
| 20-Sep | 00.53.32 | -15.01713 | -173.78852 | 2387 | 5 | 104 | Chimney just upslope from the barnacles. |
| 20-Sep | 00.54.15 | -15.01712 | -173.78848 | 2387 | 5 | 104 | Going to examine the flow on these chimneys. |
| 20-Sep | 00.54.57 | -15.01714 | -173.78844 | 2388 | 5 | 104 | Seeing hydrothermal staining around the chimney/barnacle site. |
| 20-Sep | 00.56.09 | -15.01714 | -173.78842 | 2386 | 5 | 123 | Carpet of barnacles and smoke coming out of one chimney in the center. |
| 20-Sep | 00.56.36 | -15.01714 | -173.78849 | 2386 | 5 | 137 | Another chimney is behind this one. |

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|---|---|---|---|---|---|---|---|
| 20-Sep | 00.56.47 | -15.01714 | -173.78848 | 2386 | 5 | 138 | DSCs on the way in. |
| 20-Sep | 00.57.15 | -15.01716 | -173.78843 | 2386 | 5 | 145 | Lots of squat lobsters. Barnacles on the highest part of this sulfide. |
| 20-Sep | 00.58.13 | -15.01715 | -173.78840 | 2385 | 5 | 154 | Vigorous skinny chimney in center that would be very hard to sample. |
| 20-Sep | 00.58.35 | -15.01714 | -173.78842 | 2385 | 5 | 153 | Great view of flow. |
| 20-Sep | 00.58.53 | -15.01715 | -173.78842 | 2385 | 5 | 151 | Polychaete. |
| 20-Sep | 00.59.27 | -15.01715 | -173.78842 | 2386 | 5 | 146 | No snails on the sulfide. Good USBL of this chimney. |
| 20-Sep | 01.02.06 | -15.01715 | -173.78839 | 0 | 0 | 0 | We're going to proceed upslope zigzagging to get an idea of scale. |
| 20-Sep | 01.02.48 | -15.01713 | -173.78839 | 2382 | 6 | 110 | Barnacles are thinning out a bit. Not as much substrate. HD on 0059:20-0102:29 |
| 20-Sep | 01.03.37 | -15.01711 | -173.78831 | 2379 | 5 | 133 | More barnacles on the rocks. |
| 20-Sep | 01.04.14 | -15.01715 | -173.78824 | 2377 | 4 | 134 | The slope is steepening. Want more still camera images. Still more barnacles wherever there are rocks. White staining on the sediments. |
| 20-Sep | 01.05.27 | -15.01719 | -173.78823 | 2374 | 5 | 134 | Probably elemental sulfur on the sediments. |
| 20-Sep | 01.05.55 | -15.01718 | -173.78826 | 2372 | 8 | 134 | Pulling back a bit to get a better image. Something big ahead of us. There is a pedestal in the view. |
| 20-Sep | 01.06.35 | -15.01715 | -173.78825 | 2372 | 9 | 136 | Small anhydrite on the pedestal ahead. Ken wants to look at the rock the pedestal is sitting on. |
| 20-Sep | 01.07.46 | -15.01718 | -173.78823 | 2371 | 9 | 133 | Shift change in the van. |
| 20-Sep | 01.07.57 | -15.01722 | -173.78820 | 2371 | 11 | 134 | Very bizarre looking landscape. Flat rock with bulbous structures behind. Chimneys? |
| 20-Sep | 01.08.44 | -15.01717 | -173.78822 | 2372 | 7 | 135 | More mat covering the rocks in addition to the barnacles. Lots of squat lobsters. We are also seeing shrimp on the rocks; polychaetes; anemones and barnacles. |
| 20-Sep | 01.10.09 | -15.01717 | -173.78822 | 2375 | 3 | 118 | Zoomed in on the seafloor biota and geology. |
| 20-Sep | 01.10.42 | -15.01719 | -173.78821 | 2374 | 2 | 118 | Long stalks on the barnacles. They are really beautiful. |
| 20-Sep | 01.11.52 | -15.01718 | -173.78821 | 2375 | 2 | 117 | Setting up to get a rock samples. Lasers are on. 20cm apart. Good USBL fix for the upcoming sample. |
| 20-Sep | 01.14.10 | -15.01721 | -173.78822 | 2374 | 2 | 117 | Pillow fragment with barnacles. |
| 20-Sep | 01.14.26 | -15.01722 | -173.78821 | 2375 | 2 | 117 | The stbd claw is reaching for a rock. |
| 20-Sep | 01.16.10 | -15.01719 | -173.78826 | 2374 | 2 | 139 | Have the rock in the claw. It's rather large. Setting it down. Will go for a smaller one. |
| 20-Sep | 01.16.59 | -15.01718 | -173.78821 | 2374 | 2 | 140 | **Geo sample: Q327-rock-03**. Have a good grip on that rock. It is angular. Looks weathered. Probably fist sized. Mildly-altered volcanic rock fragment. |
| 20-Sep | 01.20.21 | -15.01718 | -173.78820 | 2372 | 5 | 140 | Going to look at that odd ledge. It looks like a flange. There is a small chimney. Very robust looking barnacle communities on the bulbous rocks surrounding it. Getting DSCs |
| 20-Sep | 01.21.34 | -15.01720 | -173.78818 | 2367 | 5 | 136 | A small little chimney with hot water coming out. Another small little spire in the background. Lots of rattail fish and what look like Barnacle trees. |
| 20-Sep | 01.22.31 | -15.01720 | -173.78819 | 2369 | 6 | 114 | Flat pedestal here. The consensus is that it is a sulfide platform. This could be a possible sulfide and water sample. Looks like there are Alvenellid polychaete worms here as well. |
| 20-Sep | 01.24.32 | -15.01720 | -173.78826 | 2368 | 6 | 126 | Sulfide worms; shrimp; etc. on the chimney. 15°1.032'S 173°47.292'W. **Pedestal Spire** location - target named. |
| 20-Sep | 01.28.45 | -15.01721 | -173.78817 | 2369 | 5 | 119 | Going in for the grab of this small sulfide chimney covered in biota: sulfide worms, polychaetes on pedestal; mussels in the background; barnacles. |
| 20-Sep | 01.29.52 | -15.01721 | -173.78823 | 2368 | 8 | 104 | The sulfide top fell off but looks like the top is intact. |
| 20-Sep | 01.30.21 | -15.01723 | -173.78818 | 2369 | 6 | 106 | Brachyuran crab on the pedestal and possibly another type of barnacle here. White shrimp here too. Black smoke poured out of the chimney when the top fell off (was grabbed). This is probably reasonably hot. Greater than 250C degrees. |
| 20-Sep | 01.32.20 | -15.01720 | -173.78821 | 2368 | 5 | 112 | Ifremieria snail is also here. This small chimney is sitting on an overhung flange. No way to stabilize the vehicle here. |
| 20-Sep | 01.33.52 | -15.01721 | -173.78818 | 2369 | 6 | 107 | Paralomis crab behind the flange. |
| 20-Sep | 01.36.01 | -15.01720 | -173.78819 | 2370 | 2 | 158 | Not having much success getting a sample. We don't want to destroy this to get a sample. |
| 20-Sep | 01.37.35 | -15.01725 | -173.78819 | 2370 | 5 | 128 | Crab is hiding under the remains of the chimney. |
| 20-Sep | 01.38.21 | -15.01720 | -173.78819 | 2368 | 7 | 125 | Pulling back from the slope. The decision has been made to move on from this site. |
| 20-Sep | 01.39.28 | -15.01719 | -173.78820 | 2369 | 8 | 123 | They have abandoned trying to sample this site. HD video is now off. HD was on for 18 minutes. |
| 20-Sep | 01.41.03 | -15.01727 | -173.78819 | 2366 | 3 | 56 | Sulfide blocks? There has to be diffuse venting here because of all the biota. Looks like could be active structures in the background. |
| 20-Sep | 01.41.58 | -15.01729 | -173.78822 | 0 | 0 | 0 | Vigorous black smoker chimney in the HD cam. Multiple smokers in this area. Request for photos. That's a real chugger there. |

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|---|---|---|---|---|---|---|---|
| 20-Sep | 01.42.49 | -15.01731 | -173.78823 | 2366 | 3 | 117 | This wall is incredibly steep. It's amazing the sulfides can grow there. The chimneys are small; maybe a meter tall. |
| 20-Sep | 01.44.14 | -15.01731 | -173.78821 | 2365 | 5 | 81 | Lots of chimney rubble at the base of these chimneys. Looks like a NE/SW line of chimneys. They are sitting on a steep slope. |
| 20-Sep | 01.44.58 | -15.01733 | -173.78821 | 2365 | 3 | 56 | Chimney has fallen over and it still spewing out black smoke. |
| 20-Sep | 01.45.49 | -15.01733 | -173.78823 | 2363 | 6 | 89 | Most of the slope is loose unconsolidated altered volcanic sand. Lots of chimney material. Really spewing out black smoke. |
| 20-Sep | 01.46.41 | -15.01731 | -173.78819 | 2363 | 7 | 90 | Group of larger chimneys in the background. Some didn't look active. |
| 20-Sep | 01.47.02 | -15.01732 | -173.78824 | 2361 | 8 | 164 | Facing SE now see a much larger chimney. Very tall chimney in front of us. |
| 20-Sep | 01.47.32 | -15.01731 | -173.78818 | 2364 | 3 | 178 | The smoke from the smaller chimneys is in front of us. |
| 20-Sep | 01.48.28 | -15.01732 | -173.78816 | 2365 | 2 | 178 | These chimneys could be really hot. Could be 350 - 360 deg C easily because of the depth and boiling point at this depth. |
| 20-Sep | 01.49.26 | -15.01730 | -173.78813 | 2365 | 1 | 176 | Can see some shrimp sitting on these chimneys. |
| 20-Sep | 01.50.12 | -15.01733 | -173.78821 | 2365 | 1 | 182 | We may be setting up to sample. We see some barnacle encrusted rocks close by and shrimp on the rocks. Squat lobsters as well. |
| 20-Sep | 01.52.00 | -15.01733 | -173.78821 | 2365 | 1 | 182 | It looks like the root of a tree. Peter would like to call this site "Black Stump"; another Australian legend. |
| 20-Sep | 01.53.20 | -15.01732 | -173.78819 | 2365 | 1 | 164 | The claw is coming out. Shift change in the van of the scientists. |
| 20-Sep | 01.54.31 | -15.01733 | -173.78820 | 2365 | 1 | 165 | The water sampler is out. Looks like the blue major sampler. |
| 20-Sep | 01.57.23 | -15.01729 | -173.78817 | 2365 | 1 | 178 | This is the blue major sampler. Looks like the sampler is in the vent and out again. |
| 20-Sep | 01.58.11 | -15.01731 | -173.78821 | 2365 | 1 | 189 | **Fluid Sample: Q328-major-04**. Blue major sample in the chimney orifice. Looks like the sampler is getting water. Small very black sulfide smoker chimney on this steep slope vigorously pouring out black smoke. **"Black Stump" location - later renamed "Flashing Chimney".** |
| 20-Sep | 02.03.07 | -15.01732 | -173.78820 | 2365 | 2 | 151 | The sulfide is intact. Not crumbly like the last attempted sample. |
| 20-Sep | 02.04.03 | -15.01729 | -173.78822 | 2365 | 3 | 136 | This small chimney has barnacles; shrimp on it. |
| 20-Sep | 02.04.26 | -15.01728 | -173.78820 | 2366 | 3 | 134 | Pilot change in the control van. |
| 20-Sep | 02.07.06 | -15.01728 | -173.78817 | 2364 | 5 | 136 | This slope is 45 to 50 degrees. Amazing that everything doesn't slide straight down hill. |
| 20-Sep | 02.08.53 | -15.01730 | -173.78822 | 2364 | 7 | 136 | Quest is reaching for the red gastight. |
| 20-Sep | 02.09.20 | -15.01726 | -173.78821 | 2363 | 7 | 136 | Incredible footage on the HD video. |
| 20-Sep | 02.10.47 | -15.01728 | -173.78828 | 2364 | 7 | 135 | Rattail fish just swam by. |
| 20-Sep | 02.11.00 | -15.01729 | -173.78822 | 2364 | 7 | 136 | Quest has the red gastight in hand. Going for a gastight sample in the same chimney as the previous major sample. |
| 20-Sep | 02.13.39 | -15.01730 | -173.78827 | 2366 | 1 | 138 | Setting up for the gastight. We see some evidence of boiling fluid. Could be at the maximum temperature (critical fluid). The white flashing color at the base of the smoke. |
| 20-Sep | 02.15.13 | -15.01730 | -173.78819 | 2366 | 1 | 138 | We're at 240 times the atmospheric temperature at sea level. Dave says the temps can be 380°C. |
| 20-Sep | 02.17.01 | -15.01729 | -173.78818 | 2366 | 2 | 137 | **Gas sample: Q328-gtb-05.** Red gastight in the same black smoker chimney as the previous major. Black smoke is billowing out of the orifice. Possibly super-critical fluid - phase separation. USBL fix. |
| 20-Sep | 02.22.41 | -15.01731 | -173.78823 | 2366 | 2 | 141 | Grabbed the flue gastight and heading for the "flashing" black smoker orifice - probably a couple inches in diameter. |
| 20-Sep | 02.24.40 | -15.01730 | -173.78822 | 2365 | 1 | 149 | **Gas sample: Q328-gtb-06**. Blue gastight in same black smoker orifice. Renaming this site **"Flashing".** LBL fix. |
| 20-Sep | 02.28.14 | -15.01733 | -173.78824 | 2366 | 2 | 148 | We will get a more accurate fix on this amazing little black smoker chimney that has been renamed from the lackluster "Black Stump" to "Flashing"!! Phase separation probably going on. |
| 20-Sep | 02.32.13 | -15.01728 | -173.78817 | 2366 | 1 | 149 | Many of our metallic ores are formed this way. It's an ancient process. |
| 20-Sep | 02.33.23 | -15.01731 | -173.78818 | 2366 | 2 | 147 | They have the white major in hand and are zeroing in for another major sample. |
| 20-Sep | 02.35.22 | -15.01730 | -173.78819 | 2366 | 1 | 149 | Aside: As one gets shallower the boiling point gets closer to what we see at the sea surface. The shallowest smoker system we have seen is about 1000 feet (at East Diamante). |
| 20-Sep | 02.36.22 | -15.01730 | -173.78827 | 2366 | 1 | 148 | **Fluid sample: Q328-major-07**. White major sampler inserted into the same orifice as the last 3 samples here at "Flashing Chimney". There is actually precipitate on the nozzle it's so hot. The shimmer can be seen up the nozzle. "Flashing" chimney. |
| 20-Sep | 02.39.10 | -15.01729 | -173.78819 | 2366 | 1 | 149 | Brown staining on the sampler tube. 380 - 390 degrees possibly. That's Dave's guess. |
| 20-Sep | 02.41.35 | -15.01732 | -173.78821 | 2365 | 1 | 148 | The major is stored and now they are going for a temperature reading. Official location for this site dubbed **"Flashing Chimney"**. |

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|---|---|---|---|---|---|---|---|
| 20-Sep | 02.46.23 | -15.01728 | -173.78826 | 2365 | 1 | 152 | Going for the temperature reading. Ambient temperature on the CTD is 2 degrees C. |
| 20-Sep | 02.48.41 | -15.01732 | -173.78822 | 2366 | 1 | 154 | Highest temp so far is 307deg C. |
| 20-Sep | 02.49.24 | -15.01728 | -173.78821 | 2366 | 1 | 157 | Temp of 352deg C that time. |
| 20-Sep | 02.49.41 | -15.01729 | -173.78820 | 2366 | 1 | 154 | Looks like 359 was the highest reading that time. |
| 20-Sep | 02.52.28 | -15.01731 | -173.78817 | 2366 | 1 | 153 | **Temp reading got up to 360°C**. |
| 20-Sep | 02.53.23 | -15.01732 | -173.78825 | 2366 | 1 | 153 | Want to zoom in with the HD video to examine this chimney and see if we actually are seeing phase separation. |
| 20-Sep | 02.54.38 | -15.01733 | -173.78820 | 2366 | 1 | 153 | Rattail fish just swam off. |
| 20-Sep | 02.54.59 | -15.01733 | -173.78818 | 2366 | 1 | 153 | Flange-like features on the seafloor. With biota on top; mostly stalked barnacles. |
| 20-Sep | 02.56.36 | -15.01731 | -173.78821 | 2366 | 1 | 153 | Changing the HD tape. |
| 20-Sep | 02.57.53 | -15.01735 | -173.78823 | 2365 | 2 | 159 | HD cam is now on. |
| 20-Sep | 03.00.28 | -15.01731 | -173.78822 | 2365 | 1 | 186 | Beautiful zoomed in image of the vent orifice now. We see chalcopyrite; anhydrite; orange oxidized. |
| 20-Sep | 03.02.03 | -15.01731 | -173.78823 | 2365 | 1 | 186 | Emulsion of liquid and vapor states here. That's why the liquid is not clear. Adding salt and pressure increases the boiling pressure as well. That can extend the boiling point to a critical point. |
| 20-Sep | 00.00.00 | -15.01685 | -173.78860 | 2409 | 3 | 150 | The vapor phase is a 20-30 percent of the density of the liquid phase. You get a mixture of low and high density fluids that makes it look opaque and can have a flashing appearance. |
| 20-Sep | 03.03.50 | -15.01731 | -173.78823 | 0 | 0 | 0 | Dave says this is definitely a boiling vent and the temp here must be about 380. He thinks the 360deg reading was a calibration issue with the probe. He's convinced it's boiling. |
| 20-Sep | 03.05.50 | -15.01731 | -173.78820 | 2365 | 1 | 184 | HD is now off. |
| 20-Sep | 03.06.33 | -15.01731 | -173.78823 | 2365 | 1 | 187 | Setting this as **Target 10 Flashing Chimney**. |
| 20-Sep | 03.10.13 | -15.01729 | -173.78824 | 2365 | 1 | 186 | Setting up to suction sample shrimp on the chimney; then want a piece of this little sulfide. |
| 20-Sep | 03.14.29 | -15.01731 | -173.78822 | 2365 | 1 | 186 | Want to suction on the chimney itself. Looking to the south we see a second black smoker in the background. |
| 20-Sep | 03.15.42 | -15.01733 | -173.78823 | 0 | 0 | 0 | We have shrimp; barnacles; snails here. |
| 20-Sep | 03.16.08 | -15.01730 | -173.78821 | 2365 | 1 | 186 | Alvinellid worms were seen earlier but not on this chimney |
| 20-Sep | 03.17.22 | -15.01732 | -173.78822 | 2366 | 1 | 179 | Tim is explaining the biology. |
| 20-Sep | 03.17.41 | -15.01735 | -173.78817 | 2366 | 1 | 181 | The shrimp feed on the microbes on these hot chimneys. How do they find these sites? Their antennae are very sensitive to sulfide. A sort of "chemical detection device". |
| 20-Sep | 03.19.51 | -15.01729 | -173.78822 | 2366 | 1 | 161 | **Bio Sample: Q328-biomacro-08**. Shrimp in the hose. Going in for another suck. Just off to the north of Flashing Chimney. Not sure of the suction contents but believe it may be 1 shrimp and possibly barnacles and a squat lobster. |
| 20-Sep | 03.21.56 | -15.01727 | -173.78826 | 2366 | 2 | 162 | One shrimp just cam through the outlet hose. It came back up through the tube and went out through the exit (exhaust). |
| 20-Sep | 03.23.08 | -15.01732 | -173.78819 | 2364 | 3 | 162 | Tim suggests they just slurp among the barnacles. They did get another one. |
| 20-Sep | 03.25.09 | -15.01727 | -173.78819 | 2365 | 3 | 161 | Moving a little to a more diffuse venting area hoping to find more there. There is a shrimp on the top of the rock. The shrimp are the first colonizers here so they are very important to collect. |
| 20-Sep | 03.27.03 | -15.01726 | -173.78823 | 2365 | 1 | 162 | Suctioned a group of barnacles. |
| 20-Sep | 03.28.59 | -15.01732 | -173.78821 | 2365 | 1 | 162 | **Bio Sample: Q328-biomacro-09**. Got one shrimp. He just got out. The squat lobster is trying to get out. Suctioning in the barnacles. This sample contains at least 1 squat lobster. |
| 20-Sep | 03.33.49 | -15.01731 | -173.78825 | 2365 | 3 | 162 | Moving in to grab a small spire off this little "Flashing Chimney" that had a 360deg C temperature reading. |
| 20-Sep | 03.35.01 | -15.01729 | -173.78824 | 2365 | 2 | 162 | The black top of the chimney crumbled. It's very friable. Smoke is pouring out. Nice view of the flashing. |
| 20-Sep | 03.38.21 | -15.01728 | -173.78821 | 2366 | 1 | 164 | The top of the chimney is not sample-able. It's too friable. They are going for a spire at the base of the chimney. They are crumbling in the claw. |
| 20-Sep | 03.38.38 | -15.01730 | -173.78821 | 2366 | 1 | 164 | The gray-black dusting around the chimneys is sulfidic and sulfate remains of the fallen chimneys. |
| 20-Sep | 03.43.41 | -15.01730 | -173.78822 | 2366 | 1 | 165 | **Geo sample: Q328-sulfide-10**. Have a small piece of the top that just fell down. Walnut-sized piece of the top of the sulfide that originally fell off. Dark black piece going into box 8. "**Flashing Chimney position.** |
| 20-Sep | 03.43.44 | -15.01730 | -173.78822 | 2366 | 1 | 164 | HD on. Zooming in with the HD to get footage of the chimney. |
| 20-Sep | 03.44.56 | -15.01729 | -173.78824 | 2365 | 3 | 160 | HD off now. We're done now and will continue upslope. |
| 20-Sep | 03.45.29 | -15.01729 | -173.78823 | 2365 | 4 | 161 | From this view we see 2 black smokers. We'll see what is upslope. |

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| 20-Sep | 03.46.16 | -15.01727 | -173.78823 | 2366 | 3 | 161 | We see more chimneys upslope. Heading 161 to the southeast at the slope. Spectacular view of these 2 chimneys chugging away. The one we were at is on the left. |
| 20-Sep | 03.47.09 | -15.01728 | -173.78825 | 2365 | 3 | 161 | The chimneys are on ledges; indicating lateral flow. |
| 20-Sep | 03.47.31 | -15.01730 | -173.78820 | 2365 | 4 | 122 | Permeable lateral layers channeling the flow? |
| 20-Sep | 03.48.25 | -15.01731 | -173.78821 | 2362 | 3 | 121 | The HD was on for about a minute (0346 -0347) |
| 20-Sep | 03.49.06 | -15.01729 | -173.78820 | 2359 | 6 | 141 | Forest of chimneys here. Very smoky. Some are covered in barnacles. Amazing sight (what we can see). |
| 20-Sep | 03.49.52 | -15.01727 | -173.78819 | 2360 | 4 | 114 | Continue to see sulfide structures; some with black smoke and lots of white reflective material. This is an incredible density of venting here. |
| 20-Sep | 03.50.58 | -15.01728 | -173.78816 | 2357 | 5 | 152 | Really chugger on the lower right that appears to be flashing too. |
| 20-Sep | 03.51.22 | -15.01731 | -173.78819 | 2356 | 5 | 110 | These chimneys are larger than the ones we saw downslope. |
| 20-Sep | 03.52.05 | -15.01734 | -173.78818 | 2355 | 7 | 33 | The chimneys on the steep slope probably end up failing. |
| 20-Sep | 03.52.25 | -15.01734 | -173.78817 | 2357 | 4 | 32 | Really active site. 2 orifices smoking there. It's "flashing". |
| 20-Sep | 03.52.49 | -15.01732 | -173.78817 | 2357 | 3 | 25 | HD came on at 0349. Viewing this smoker at 2357 meters depth. |
| 20-Sep | 03.53.20 | -15.01736 | -173.78818 | 2357 | 3 | 24 | Slight encounter with a chimney. |
| 20-Sep | 03.53.40 | -15.01732 | -173.78813 | 2358 | 2 | 16 | Polychaetes on the side of this chimney ahead. |
| 20-Sep | 03.55.10 | -15.01734 | -173.78817 | 2358 | 1 | 19 | Incredible flashing on the chimney just ahead of us. Shrimp at the base of the chimney. |
| 20-Sep | 03.55.44 | -15.01732 | -173.78801 | 2358 | 1 | 21 | We're going to set up to try to get a couple more samples. We're about 7 meters upslope from "Flashing Chimney". |
| 20-Sep | 03.58.45 | -15.01735 | -173.78814 | 2359 | 1 | 45 | The first chimney was seen at about 2386m We are now 30 meters upslope from there and are seeing some spectacular larger chimneys here as well. |
| 20-Sep | 04.00.27 | -15.01732 | -173.78814 | 2357 | 6 | 175 | Bethydid (sp?) fish. A vent species. |
| 20-Sep | 04.01.46 | -15.01730 | -173.78809 | 2355 | 6 | 173 | Moving away from really hot smoker field there. Too hard to sample. |
| 20-Sep | 04.02.17 | -15.01729 | -173.78816 | 2354 | 4 | 166 | Still moving up the slope. More smoke in the water column because of the chimneys below. |
| 20-Sep | 04.03.31 | -15.01730 | -173.78802 | 2354 | 7 | 126 | HD on again. Now looking at white bacterial mat on rocks on the seafloor. Perhaps some sulfide coating or manganese on the rock. The sediments are redder/orangish here. |
| 20-Sep | 04.06.20 | -15.01730 | -173.78806 | 2356 | 1 | 125 | Would like rock with maximum amount of mat. HD on. Scaleworm on mat. |
| 20-Sep | 04.06.46 | -15.01732 | -173.78801 | 2356 | 1 | 125 | Can see gas holes in rocks. |
| 20-Sep | 04.07.14 | -15.01732 | -173.78801 | 0 | 0 | 0 | Great close-up of the mat hairs. Loose rocks that fell from above. |
| 20-Sep | 04.08.32 | -15.01729 | -173.78805 | 2356 | 1 | 127 | Biobox is open and positioning for rock sample. |
| 20-Sep | 04.11.28 | -15.01732 | -173.78802 | 2356 | 1 | 126 | First rock was too big for the sample box. Gastropod in HD. |
| 20-Sep | 04.12.46 | -15.01729 | -173.78806 | 2356 | 1 | 127 | Second rock has a lot of mat on it and looks good sized. Nice HD. Angular with mat on one side. Square-ish. |
| 20-Sep | 04.13.10 | -15.01732 | -173.78805 | 2357 | 1 | 126 | **GeoBio Sample: Q328-geobio-11**. From slope above the chimneys. Fuzzy rock. In compartment #14. |
| 20-Sep | 04.14.04 | -15.01730 | -173.78803 | 2356 | 1 | 126 | Just fit into the compartment. |
| 20-Sep | 04.16.36 | -15.01733 | -173.78804 | 2356 | 1 | 128 | Resetting the cameras. |
| 20-Sep | 04.17.02 | -15.01729 | -173.78805 | 2352 | 6 | 142 | Extensive view as we turn of the talus slope of fuzzy-round rocks (turning left). |
| 20-Sep | 04.17.54 | -15.01732 | -173.78803 | 2354 | 1 | 140 | Warm water seeping out of this area. |
| 20-Sep | 04.19.12 | -15.01732 | -173.78803 | 2354 | 2 | 133 | Seeing squat lobsters in abundance. Also some snails. |
| 20-Sep | 04.20.22 | -15.01732 | -173.78803 | 2353 | 3 | 128 | Not all the rocks have mat on them. Large area of mat. |
| 20-Sep | 04.21.14 | -15.01732 | -173.78803 | 2349 | 4 | 175 | Looking right for chimneys but just see a large area of diffuse flow and extensive mat. Looks like snow. |
| 20-Sep | 04.21.50 | -15.01732 | -173.78803 | 2349 | 5 | 137 | Driving 175 degrees and seeing just mat and talus. |
| 20-Sep | 04.22.12 | -15.01732 | -173.78803 | 0 | 0 | 0 | Small outcrop or ridge but not very high. |
| 20-Sep | 04.23.02 | -15.01732 | -173.78803 | 2350 | 2 | 155 | Looking at the small ridge. Can see barnacles here on the ridge. |
| 20-Sep | 04.25.14 | -15.01732 | -173.78803 | 0 | 0 | 0 | Rubin replacing Embley in van. |
| 20-Sep | 04.28.33 | -15.01749 | -173.78807 | 2351 | 1 | 143 | Getting some close-up of the mat and barnacles on the slope near the small ridge. |
| 20-Sep | 04.32.05 | -15.01751 | -173.78813 | 2350 | 2 | 143 | Going to pick up a small piece of this ridge. Abandoning this sample. |
| 20-Sep | 04.34.39 | -15.01751 | -173.78809 | 2350 | 3 | 76 | Going to head uphill from here as we are directly downslope from the center of the CTD target. |
| 20-Sep | 04.35.15 | -15.01742 | -173.78807 | 2349 | 4 | 84 | Turning left and going upslope. Looking at an extensive crust on the surface with microbial mats. Mainly crabs for macrofauna. |
| 20-Sep | 04.35.58 | -15.01741 | -173.78798 | 2348 | 3 | 94 | Heading 098. |
| 20-Sep | 04.36.19 | -15.01739 | -173.78795 | 2347 | 3 | 102 | Mat looks slightly thicker. |
| 20-Sep | 04.36.49 | -15.01735 | -173.78784 | 2346 | 2 | 156 | Now loose unconsolidated angular and rounded rocks (talus). |
| 20-Sep | 04.37.01 | -15.01735 | -173.78784 | 2346 | 2 | 182 | Turning to the right as at end of the tether. |

| date | time | latitude | longitude | Z | alt | hdg | Q328 - North Mata Ua Dive Comments |
|---|---|---|---|---|---|---|---|
| 20-Sep | 04.37.17 | -15.01737 | -173.78784 | 2345 | 1 | 192 | Bright shrimp. |
| 20-Sep | 04.37.42 | -15.01741 | -173.78788 | 2344 | 1 | 198 | Seeing the consolidated surface once gain at 192. |
| 20-Sep | 04.38.01 | -15.01746 | -173.78791 | 2343 | 1 | 200 | Moving upslope. Encountering area of coarser rubble. |
| 20-Sep | 04.38.34 | -15.01750 | -173.78797 | 2342 | 3 | 190 | Looks like chutes of debris coated with mat. |
| 20-Sep | 04.38.56 | -15.01756 | -173.78800 | 2341 | 2 | 184 | Relatively narrow rock chute into loosely consolidated material. |
| 20-Sep | 04.39.17 | -15.01756 | -173.78800 | 2341 | 4 | 180 | More high standing hard rock here. |
| 20-Sep | 04.39.55 | -15.01760 | -173.78805 | 2340 | 6 | 197 | Seeing some barnacles and squat lobsters. Larger rock pieces. |
| 20-Sep | 04.42.18 | -15.01764 | -173.78808 | 2340 | 3 | 145 | Rocky outcrop in front of us is not in a good position for sampling. |
| 20-Sep | 04.42.59 | -15.01766 | -173.78807 | 2340 | 3 | 142 | Squat lobster swam by. |
| 20-Sep | 04.44.09 | -15.01768 | -173.78808 | 2341 | 2 | 169 | Out with the claw. I guess they are going to try to sample this rock with white mat. |
| 20-Sep | 04.44.51 | -15.01765 | -173.78813 | 2340 | 2 | 168 | Attempting to take a volcanic rock. It fell downslope. |
| 20-Sep | 04.47.27 | -15.01767 | -173.78807 | 2341 | 2 | 168 | **Geo sample: Q328-rock-12**. Grabbed a volcanic rock. Fragment from a relatively large piece of pillow fragment sitting beneath a dike. It may have some bacterial mat coating. Into container 1. Facing the south on this steep slope. |
| 20-Sep | 04.51.44 | -15.01767 | -173.78807 | 2340 | 2 | 168 | Zooming in on the cotton-looking microbial mat on the cobbles and pebbles on this slope. There is smaller pea-gravel (?)-size orangish fragments between the fuzzy rocks. |
| 20-Sep | 04.52.59 | -15.01768 | -173.78809 | 2340 | 2 | 168 | Barnacles (laying down) in the sediments. |
| 20-Sep | 04.53.50 | -15.01764 | -173.78811 | 2340 | 2 | 117 | Continuing up the slope. Squat lobster ahead. |
| 20-Sep | 04.55.15 | -15.01768 | -173.78800 | 2335 | 3 | 125 | Seeing a couple species of crab on the slope now. |
| 20-Sep | 04.56.06 | -15.01770 | -173.78797 | 2330 | 5 | 112 | Coral whip. |
| 20-Sep | 04.56.49 | -15.01774 | -173.78795 | 2328 | 4 | 126 | Looking at talus structure and now some in place structure. |
| 20-Sep | 04.57.31 | -15.01781 | -173.78800 | 2325 | 6 | 147 | Another dike in front of us. The cooling joints are perpendicular to the screen here. |
| 20-Sep | 04.58.30 | -15.01782 | -173.78797 | 2327 | 2 | 136 | Strike of dike is ~050. Going in for a rock grab here. |
| 20-Sep | 04.59.18 | -15.01782 | -173.78799 | 2327 | 2 | 143 | **Geo sample: Q328-rock-13**. In-place rock from this volcanic dike. Angular; black appearance; fish-sized. Broken off from the dike. Doesn't look as altered as earlier rocks. Into container 4. Extrusive properties? |
| 20-Sep | 05:02:00 | -15.01782 | -173.78799 | 2327 | 2 | 143 | The strike of the dike will tell us something about the stress direction. |
| 20-Sep | 05.06.01 | -15.01782 | -173.78797 | 2325 | 4 | 145 | **Geo sample: Q328-rock-14.** Rock from dike-proper. Into container 5. Both rocks were very close together. |
| 20-Sep | 05.06.05 | -15.01782 | -173.78797 | 2325 | 4 | 147 | Cooling joints are perpendicular. The strike of the dike was 185 to 190. |
| 20-Sep | 05.07.11 | -15.01786 | -173.78798 | 2320 | 3 | 152 | Bathysaurus fish. Not a vent creature. They can get very large. Unusual to see them swimming. They are usually lying on flat seafloor. |
| 20-Sep | 05.08.08 | -15.01789 | -173.78791 | 2318 | 3 | 160 | Snails; crabs; The mat is decreasing. More oxidation. Attached "miserable looking" creature. |
| 20-Sep | 05.09.08 | -15.01793 | -173.78782 | 2315 | 3 | 167 | We're at the contour where the CTD passed. Another snail. |
| 20-Sep | 05.09.36 | -15.01794 | -173.78778 | 2314 | 2 | 179 | Snail on rock. |
| 20-Sep | 05.09.57 | -15.01792 | -173.78783 | 2313 | 2 | 187 | We're in the zone we were at the other day. Serpulid worms like the ones we saw on our previous dive here. |
| 20-Sep | 05.11.31 | -15.01794 | -173.78784 | 2315 | 2 | 174 | Serpulidae worms here. |
| 20-Sep | 05.12.51 | -15.01799 | -173.78799 | 2315 | 3 | 120 | We're getting out of the active zone. Volcanic talus on the slopes here. We have moved over to C. |
| 20-Sep | 05.14.24 | -15.01798 | -173.78798 | 2315 | 4 | 151 | Seeing something on the sonar. Maybe another little ridge or a dike. |
| 20-Sep | 05.15.46 | -15.01807 | -173.78805 | 2315 | 3 | 164 | Talus shoot wall. Probably a landslide? |
| 20-Sep | 05.16.25 | -15.01811 | -173.78809 | 2314 | 6 | 164 | This slope has had a long history of altering and degrading. |
| 20-Sep | 05.16.51 | -15.01808 | -173.78809 | 0 | 0 | 0 | We're going to come downslope about 20 or 30 meters and then lateral to the west. |
| 20-Sep | 05.19.52 | -15.01782 | -173.78821 | 2337 | 3 | 153 | When get down a bit lower will lateral to the northeast. |
| 20-Sep | 05.21.15 | -15.01776 | -173.78827 | 2342 | 3 | 144 | Will come down to 2350 and then head to the northeast. |
| 20-Sep | 05.21.58 | -15.01772 | -173.78829 | 2344 | 3 | 130 | Snails and whip corals. More wispy mat on the rocks. |
| 20-Sep | 05.23.08 | -15.01768 | -173.78837 | 2349 | 4 | 119 | Seeing more animals; whip corals; squat lobsters. Polychaete just swam by. |
| 20-Sep | 05.23.44 | -15.01767 | -173.78837 | 2351 | 14 | 102 | Will start Lateralling to the northeast now. |
| 20-Sep | 05.24.08 | -15.01764 | -173.78837 | 2352 | 16 | 92 | Dike in front of us. |
| 20-Sep | 05.25.00 | -15.01761 | -173.78844 | 2357 | 10 | 125 | Extensive dike complex. |
| 20-Sep | 05.26.04 | -15.01757 | -173.78839 | 2360 | 3 | 122 | Zooming in on the animals here on this steep cliff face. Dike-buttressed cliff face. |
| 20-Sep | 05.27.26 | -15.01757 | -173.78840 | 2358 | 7 | 106 | Barnacles and crabs.2 types of crabs here. Squat lobsters; stalked barnacles; polychaetes; snails; Paralomis crab is the big one. |
| 20-Sep | 05.30.06 | -15.01755 | -173.78834 | 2356 | 4 | 10 | Beautiful chimneys look like Christmas trees. Lots of floc in the water. |
| 20-Sep | 05.31.10 | -15.01759 | -173.78833 | 2355 | 5 | 354 | Flange putting out hot water as well. Polychaete on the chimney. |

| date | time | latitude | longitude | Z | alt | hdg | Q328 - North Mata Ua Dive Comments |
|---|---|---|---|---|---|---|---|
| 20-Sep | 05.31.57 | -15.01759 | -173.78831 | 2356 | 5 | 352 | Chimney surfaces are coated with barnacles. Making them look white. Large chimney in the background. |
| 20-Sep | 05.32.37 | -15.01759 | -173.78832 | 2356 | 4 | 323 | We're facing downslope at the moment. The row of chimneys seem to be facing 270 degrees. |
| 20-Sep | 05.34.31 | -15.01758 | -173.78831 | 2355 | 7 | 66 | Some of these chimneys have anhydrite chimlets. Christmas-tree looking. |
| 20-Sep | 05.34.48 | -15.01757 | -173.78839 | 2356 | 8 | 65 | HD off at 0522. |
| 20-Sep | 05.36.11 | -15.01759 | -173.78835 | 2352 | 17 | 110 | Preparing to sample. |
| 20-Sep | 05.36.32 | -15.01755 | -173.78835 | 2349 | 19 | 112 | Ken is saying the dike and chimneys are both on an E/W trend. |
| 20-Sep | 05.39.07 | -15.01748 | -173.78835 | 2356 | 10 | 175 | Last opportunity for samples here but at end of dive time. |
| 20-Sep | 05.39.24 | -15.01749 | -173.78834 | 0 | 0 | 0 | Skinny one has fluid but may be hard to get here. |
| 20-Sep | 05.40.19 | -15.01749 | -173.78833 | 2355 | 10 | 172 | Haven't see any easy sampling places. |
| 20-Sep | 05.41.32 | -15.01752 | -173.78849 | 0 | 0 | 0 | Looking at sonar to the right at targets. |
| 20-Sep | 05.42.08 | -15.01754 | -173.78852 | 2353 | 21 | 88 | Water very gloomy (smoky). |
| 20-Sep | 05.42.35 | -15.01753 | -173.78852 | 2357 | 19 | 81 | Coming back down into chimney field. |
| 20-Sep | 05.42.54 | -15.01753 | -173.78851 | 0 | 0 | 0 | Looking for an approachable vent but at end of time. |
| 20-Sep | 05.43.26 | -15.01749 | -173.78849 | 2359 | 17 | 107 | In the thick of it here. |
| 20-Sep | 05.43.50 | -15.01746 | -173.78846 | 2358 | 17 | 105 | Barnacles on sulfides. |
| 20-Sep | 05.44.13 | -15.01738 | -173.78842 | 2357 | 19 | 164 | Looking at top and altimeter is 20m. |
| 20-Sep | 05.44.23 | -15.01738 | -173.78840 | 2356 | 19 | 130 | EW line ??? |
| 20-Sep | 05.45.17 | -15.01737 | -173.78842 | 2357 | 16 | 106 | ROV is trying to move around the chimneys. |
| 20-Sep | 05.45.26 | -15.01739 | -173.78840 | 2359 | 13 | 106 | Sonar look slice string of smokers. EW trend. |
| 20-Sep | 05.45.48 | -15.01741 | -173.78840 | 2357 | 12 | 105 | Seeing a lot of smoke. |
| 20-Sep | 05.46.11 | -15.01745 | -173.78836 | 2357 | 13 | 106 | Moving in on the chimneys at hdg 107. |
| 20-Sep | 05.46.32 | -15.01745 | -173.78831 | 2357 | 9 | 105 | Huge hydrothermal area. |
| 20-Sep | 05.46.55 | -15.01745 | -173.78831 | 2357 | 9 | 104 | Hottest vent fields that we've seen so far. |
| 20-Sep | 05.47.17 | -15.01740 | -173.78828 | 2358 | 9 | 76 | Pilot cam and HD good views. |
| 20-Sep | 05.48.12 | -15.01738 | -173.78829 | 2355 | 16 | 89 | Looking down line at 108deg with heading. (Or 105) |
| 20-Sep | 05.48.24 | -15.01739 | -173.78830 | 2353 | 16 | 97 | Chimneys are very linearly oriented. |
| 20-Sep | 05.48.50 | -15.01736 | -173.78836 | 2354 | 15 | 93 | Lots of smoke and on top of original sampling site. |
| 20-Sep | 05.49.37 | -15.01737 | -173.78832 | 2354 | 16 | 91 | We are out of time. |
| 20-Sep | 05.49.54 | -15.01735 | -173.78830 | 0 | 0 | 0 | Turning left into the smoke. |
| 20-Sep | 05.50.35 | -15.01733 | -173.78828 | 2356 | 18 | 104 | These are much taller than we originally saw at this site. |
| 20-Sep | 05.52.25 | -15.01738 | -173.78830 | 2357 | 14 | 90 | Ran out of time. We are at the Flashing Chimney (or Forest?) Site. |
| 20-Sep | 05.52.28 | -15.01738 | -173.78830 | 2357 | 14 | 90 | Line of smokers at 090. |
| 20-Sep | 05.52.41 | -15.01738 | -173.78830 | 2357 | 14 | 90 | HD is on. 10-15m tall chimneys. |
| 20-Sep | 05.54.06 | -15.01734 | -173.78831 | 2361 | 11 | 108 | Lots of smoke as we leave. |
| 20-Sep | 05.54.37 | -15.01729 | -173.78826 | 2364 | 7 | 119 | Major smoker from earlier site. That is the original site. |
| 20-Sep | 05.54.55 | -15.01731 | -173.78825 | 2364 | 7 | 91 | Shorter chimneys but lots of black smoke. |
| 20-Sep | 05.55.19 | -15.01729 | -173.78832 | 2364 | 7 | 99 | Great navigation today. |
| 20-Sep | 05.55.31 | -15.01730 | -173.78824 | 2365 | 6 | 114 | Beautiful view of the black smokers. |
| 20-Sep | 05.56.05 | -15.01730 | -173.78825 | 2364 | 7 | 120 | Panning around as we leave. |
| 20-Sep | 05.57.23 | -15.01728 | -173.78828 | 2357 | 18 | 118 | Parting view of the chimneys. |
| 20-Sep | 05.59.00 | -15.01728 | -173.78828 | 2357 | 18 | 118 | Off bottom. |
| 20-Sep | 06.12.10 | | | | | | Fiery Eyes. Forest Fire. Flashing Forest. Just some ideas. |
| 20-Sep | 07.48.50 | | | | | | Taking off floats; near the surface. |
| 20-Sep | 07.49.47 | | | | | | At the surface. |
| 20-Sep | 07.55.03 | | | | | | On deck. All done. |

## 7.8 Q329 Mata Fitu Dive Log

| date | time | latitude | longitude | Z | alt | hdg | Q329 - North Mata Fitu Dive Comments |
|---|---|---|---|---|---|---|---|
| **Main Goals:** Explore and sample the source of hydrothermal venting at North Mata Fitu. | | | | | | | |
| **Launch target:** 14°54.880' S 173°46.803' W Z=2649m Downslope SE of summit | | | | | | | |
| **Setup:** 3 gastights; 3 majors; temp probe 1 Davis sampler; 1 McPhail sampler; large biobox; suction sampler; pelagic pump; T-handle and mesh net; shrimp-catcher jar | | | | | | | |
| **Nav Notes:** Bottom time: 9/20/2012 21:38 – 9/21 06:04. Nav smoothed (tolerance=15). Did NOT shift nav. Bathy depths match up pretty well with the log, even on this steep slope. | | | | | | | |
| **DIVE LOG POSITION INFORMATION: latitude; longitude; Z; alt; hdg values are derived from finalized Quest nav. Any lat/long values in the dive comments column were recorded at sea and are preliminary.** | | | | | | | |
| 20-Sep | 19.09.59 | | | | | | ROV off the deck. |
| 20-Sep | 19.24.21 | | | | | | Been hanging for quite some time but the video screens are just coming to life. |
| 20-Sep | 19.28.33 | | | | | | All screens now on. |
| 20-Sep | 19.29.46 | | | | | | ROV in the water. |
| 20-Sep | 19.32.46 | | | | | | At the surface. |
| 20-Sep | 19.41.33 | | | | | | Holding at 40m depth. No nav screen yet. |
| 20-Sep | 19.46.48 | | | | | | We are diving. |
| 20-Sep | 19.49.57 | | | | | | Passing 200m depth. |
| 20-Sep | 20.17.29 | | | | | | Descending at 25m/min. |
| 20-Sep | 20.23.27 | | | | | | Passing 900m. |
| 20-Sep | 21.02.38 | | | | | | A long way to the bottom. Just passing 1830m. |
| 20-Sep | 21.10.23 | | | | | | Passing 2000m depth. |
| 20-Sep | 21.27.10 | | | | | | Passing 2400m depth. |
| 20-Sep | 21.34.19 | | | | | | 100m to go. |
| 20-Sep | 21.36.28 | | | | | | 2600m. Maybe some more particles in the water. |
| 20-Sep | 21.37.15 | -14.91476 | -173.77999 | 2628 | 26 | 3 | Seeing bottom on altimeter. |
| 20-Sep | 21.38.04 | -14.91482 | -173.77998 | 2655 | 4 | 4 | See bottom. |
| 20-Sep | 21.38.44 | -14.91481 | -173.77998 | 2654 | 3 | 5 | Heavy sedimented bottom. Some rubble. Big fish. |
| 20-Sep | 21.39.28 | -14.91482 | -173.77997 | 2655 | 3 | 4 | Some angular rocks and sandy plain. Bathysaurus fish. |
| 20-Sep | 21.39.44 | -14.91478 | -173.77998 | 2655 | 3 | 3 | Fish is a sit and wait predator. |
| 20-Sep | 21.41.58 | -14.91483 | -173.77998 | 2656 | 2 | 325 | First will get a rock from this deepest part of the dive. |
| 20-Sep | 21.42.19 | -14.91484 | -173.77996 | 2656 | 0 | 326 | Would like a piece of the ledge which looks more in place. |
| 20-Sep | 21.43.07 | -14.91483 | -173.77997 | 2657 | 1 | 325 | HD cam tape is on. |
| 20-Sep | 21.43.55 | -14.91482 | -173.77998 | 2656 | 1 | 324 | Preparing for rock sample. Looking at a sponge. |
| 20-Sep | 21.44.46 | -14.91479 | -173.77999 | 2656 | 1 | 324 | Whip corals. |
| 20-Sep | 21.45.13 | -14.91484 | -173.77996 | 2657 | 1 | 324 | Arm ready to pick up sample. Easy grab. |
| 20-Sep | 21.47.00 | -14.91481 | -173.77998 | 2656 | 1 | 324 | **Geo Sample: Q329-rock-01.** From landing site and small ledge with sessile biology nearby. Ken believes it is a pillow fragment. In box #2. |
| 20-Sep | 21.48.00 | -14.91480 | -173.77996 | 2655 | 1 | 324 | Light brown sandy mud covering. |
| 20-Sep | 21.48.48 | -14.91473 | -173.78000 | 2651 | 2 | 331 | More talus slope with angular blocks. |
| 20-Sep | 21.49.18 | -14.91467 | -173.77999 | 2649 | 2 | 348 | Going to zigzag up the slope. Poorly sorted blocks. |
| 20-Sep | 21.49.30 | -14.91465 | -173.77999 | 2649 | 3 | 7 | Belt of sand with a rock ledge horizon. (NE-SW ridge orientation). |
| 20-Sep | 21.50.41 | -14.91463 | -173.77996 | 2650 | 1 | 341 | Sand ripples indicate current. NW-SE. |
| 20-Sep | 21.50.53 | -14.91458 | -173.77993 | 2649 | 1 | 341 | Low-relief lava flow. |
| 20-Sep | 21.51.06 | -14.91460 | -173.77996 | 2649 | 2 | 342 | Some big blocks defining the ridge. |
| 20-Sep | 21.51.39 | -14.91462 | -173.77995 | 2649 | 2 | 6 | Need to move ship further north. |
| 20-Sep | 21.51.59 | -14.91457 | -173.77999 | 2648 | 2 | 38 | Panning stbd to look NE. |
| 20-Sep | 21.52.18 | -14.91459 | -173.77998 | 2649 | 2 | 318 | Looks like flank is sliced up. |
| 20-Sep | 21.53.20 | -14.91460 | -173.77995 | 2648 | 1 | 35 | Looking along ridge at 030 |
| 20-Sep | 21.53.57 | -14.91457 | -173.77983 | 2649 | 1 | 73 | Moving upslope in zigzag. |
| 20-Sep | 21.55.06 | -14.91457 | -173.77983 | 2649 | 1 | 269 | Drop off to right along this ridge. |
| 20-Sep | 21.55.20 | -14.91457 | -173.77983 | 2649 | 2 | 274 | Looking down ridge and do not see anything in place. |
| 20-Sep | 21.55.58 | -14.91458 | -173.77992 | 2649 | 2 | 181 | Lobe of debris flow perhaps but due to orientation could be structural. |
| 20-Sep | 21.56.27 | -14.91458 | -173.77998 | 2648 | 1 | 286 | Going to head back up slope. |
| 20-Sep | 21.57.02 | -14.91454 | -173.78000 | 2649 | 1 | 346 | Seeing ridge north . |
| 20-Sep | 21.57.35 | -14.91446 | -173.77997 | 0 | 0 | 0 | See ridge clearly in sonar. |
| 20-Sep | 21.57.58 | -14.91445 | -173.77997 | 2652 | 1 | 112 | Sharply defined edges between rocks and sediment. |
| 20-Sep | 21.58.58 | -14.91444 | -173.77995 | 2654 | 0 | 65 | Going upslope now. Very red pelagic shrimp. Coral. |
| 20-Sep | 21.59.52 | -14.91446 | -173.77997 | 2653 | 1 | 2 | Now going upslope after shrimp spotting. |
| 20-Sep | 22.00.14 | -14.91443 | -173.77994 | 2653 | 1 | 1 | Big pillow lobes here. Look like they rolled over or in place. Ribbed skins. |
| 20-Sep | 22.00.51 | -14.91440 | -173.77992 | 2653 | 1 | 0 | HD tape on. |
| 20-Sep | 22.01.28 | -14.91441 | -173.77993 | 2654 | 1 | 348 | Elephantine and some tubes. HD off. |

| date | time | latitude | longitude | Z | alt | hdg | Q329 - North Mata Fitu Dive Comments |
|---|---|---|---|---|---|---|---|
| 20-Sep | 22.02.54 | -14.91440 | -173.77992 | 2654 | 0 | 20 | Thinking of sampling a piece of pillow surface. |
| 20-Sep | 22.03.38 | -14.91439 | -173.77988 | 2653 | 1 | 4 | Only moved about 40m since landing on the bottom. |
| 20-Sep | 22.03.54 | -14.91439 | -173.77988 | 2653 | 1 | 350 | Some larger tube shapes. |
| 20-Sep | 22.04.39 | -14.91435 | -173.77987 | 2653 | 1 | 358 | Pillows have sediment and some corals (small). |
| 20-Sep | 22.05.15 | -14.91435 | -173.77985 | 2653 | 1 | 355 | Settling down to sample. Looks like a crocodile's skin. |
| 20-Sep | 22.08.35 | -14.91437 | -173.77984 | 2653 | 1 | 8 | Loose piece of pillow (rounded) that is hard to grab easily. |
| 20-Sep | 22.10.06 | -14.91432 | -173.77989 | 2653 | 0 | 3 | Looking at a smaller piece just below. |
| 20-Sep | 22.11.23 | -14.91438 | -173.77988 | 2653 | 1 | 4 | Boninite rocks. Back to the original rock-bumped it down the slope a little. |
| 20-Sep | 22.13.34 | -14.91433 | -173.77986 | 2651 | 1 | 21 | Moving over to the left for a smaller piece. Now lifting up. |
| 20-Sep | 22.15.01 | -14.91435 | -173.77988 | 2652 | 1 | 289 | Looking over the pillow/tube slope. |
| 20-Sep | 22.16.22 | -14.91431 | -173.77991 | 2652 | 1 | 289 | Very little sediment. Small piece-very glassy from pillow surface. |
| 20-Sep | 22.17.47 | -14.91433 | -173.77990 | 2652 | 1 | 288 | **Geo Sample: Q329-rock-02**. Pillows on slope 40m from landing as heading upslope. Placed in bin #1. Broke in pieces when entered bin. Pillow rind. |
| 20-Sep | 22.19.36 | -14.91436 | -173.77987 | 2651 | 2 | 346 | Put target in the navigation of Rock 2. |
| 20-Sep | 22.20.17 | -14.91426 | -173.77986 | 2651 | 1 | 342 | White straight thing-piece of wood on bottom. Paint on edge. Fairly recent. |
| 20-Sep | 22.20.44 | -14.91428 | -173.77987 | 2650 | 2 | 348 | Seeing some iron staining on the rocks. |
| 20-Sep | 22.21.06 | -14.91426 | -173.77986 | 0 | 0 | 0 | Some white spots in the sands. |
| 20-Sep | 22.21.38 | -14.91424 | -173.77987 | 2648 | 4 | 345 | More sediment on the lavas ahead and white alteration patches but similar broken up pillows. Could also be sulfide debris. |
| 20-Sep | 22.22.20 | -14.91418 | -173.77988 | 2647 | 3 | 354 | Looks like old sulfides also some pillows. |
| 20-Sep | 22.22.46 | -14.91414 | -173.77987 | 2646 | 3 | 351 | Moving upslope and taking DSC. Brown mud sand. |
| 20-Sep | 22.23.44 | -14.91406 | -173.77988 | 2643 | 2 | 351 | Altered material could be coming downslope from hydrothermal activity ahead as we go 351deg. |
| 20-Sep | 22.24.23 | -14.91399 | -173.77988 | 2641 | 4 | 5 | Looks like old chimney with a lot of oxidation and hollow interior (rotting). |
| 20-Sep | 22.25.45 | -14.91395 | -173.77989 | 2639 | 3 | 334 | Fish. |
| 20-Sep | 22.26.05 | -14.91389 | -173.77993 | 2637 | 5 | 329 | Old sulfides-could be old chimney but has lava-like surface features. |
| 20-Sep | 22.26.56 | -14.91384 | -173.77995 | 0 | 0 | 0 | Fish. |
| 20-Sep | 22.27.11 | -14.91382 | -173.77996 | 2633 | 5 | 330 | More sulfide debris. |
| 20-Sep | 22.27.25 | -14.91382 | -173.77997 | 2632 | 6 | 329 | Volcanic debris mixed with sulfides. |
| 20-Sep | 22.28.05 | -14.91377 | -173.77999 | 2629 | 6 | 318 | Coming up to a steeper slope with talus that still has some bigger rocks. |
| 20-Sep | 22.28.42 | -14.91374 | -173.78002 | 2627 | 3 | 323 | Slope is much steeper. Slightly degraded pillow lavas. Swimming shrimp. |
| 20-Sep | 22.29.05 | -14.91366 | -173.78008 | 0 | 0 | 0 | Sulfide next to radial-jointed pillow. |
| 20-Sep | 22.29.19 | -14.91366 | -173.78009 | 2623 | 5 | 328 | Chimney fragments that has fallen over. |
| 20-Sep | 22.29.32 | -14.91364 | -173.78009 | 2622 | 4 | 324 | Water looks murkier. |
| 20-Sep | 22.30.33 | -14.91365 | -173.78010 | 2620 | 4 | 324 | Need to wait for ship to catch up as we move up along the slope. |
| 20-Sep | 22.31.14 | -14.91366 | -173.78009 | 2619 | 5 | 314 | Rotating vehicle while waiting to 302. Ribbing from pillow lavas with more sediment covering. |
| 20-Sep | 22.31.26 | -14.91369 | -173.78012 | 2618 | 5 | 313 | Taking DSC. |
| 20-Sep | 22.32.00 | -14.91369 | -173.78012 | 2618 | 5 | 317 | Looks like old sulfide remnant. |
| 20-Sep | 22.32.18 | -14.91369 | -173.78012 | 2617 | 6 | 328 | Greenish coloration on rock. Copper alteration. |
| 20-Sep | 22.34.34 | -14.91367 | -173.78018 | 2614 | 3 | 334 | Heading up the slope. Curious flakey material here. |
| 20-Sep | 22.35.17 | -14.91365 | -173.78019 | 2614 | 1 | 328 | Curious flakey material. Greenish color. Going to settle down. Orangey brown mud ahead of us. Not sure what this material is. |
| 20-Sep | 22.35.58 | -14.91359 | -173.78027 | 2615 | 1 | 330 | Scaly volcanics. Flakey; platy appearance like a defoliating lava flow. Deeply red in places. |
| 20-Sep | 22.37.13 | -14.91361 | -173.78026 | 2614 | 0 | 319 | Some small white animals on the rocks. Don't know what it is. |
| 20-Sep | 22.37.38 | -14.91363 | -173.78024 | 2614 | 0 | 320 | Maneuvering to take a sample of this odd rock here. |
| 20-Sep | 22.40.27 | -14.91363 | -173.78024 | 2614 | 1 | 280 | **Geo Sample: Q329-rock-03**. Pieces of unusually flakey rock. It's quite fragile. Iron-oxide hydroxide laced crust? Got a nice sample. Red muds underneath. Hydrothermal crust most likely. Stockwork in this stuff. Oozing out of the seds most likely. |
| 20-Sep | 22.42.20 | -14.91359 | -173.78026 | 2614 | 1 | 273 | Going to take some high def video of this crust. |
| 20-Sep | 22.42.54 | -14.91362 | -173.78021 | 2614 | 1 | 270 | High def on. Iron oxy hydroxide material. No evidence of flow here. |
| 20-Sep | 22.44.46 | -14.91361 | -173.78024 | 2615 | 1 | 259 | High definition off. Taking a couple stills. |
| 20-Sep | 22.46.23 | -14.91361 | -173.78024 | 2614 | 1 | 277 | Sulfur streaks of yellow in front of us. |
| 20-Sep | 22.47.41 | -14.91361 | -173.78024 | 2615 | 1 | 296 | More of the flakey rocks and fallen over chimneys. |
| 20-Sep | 22.48.03 | -14.91361 | -173.78024 | 2612 | 4 | 296 | Lots of alteration by hydrothermal fluids here. |
| 20-Sep | 22.48.33 | -14.91361 | -173.78024 | 2608 | 6 | 307 | Lots of fallen chimneys. |
| 20-Sep | 22.49.06 | -14.91361 | -173.78024 | 0 | 0 | 0 | Anemones and fish. |
| 20-Sep | 22.50.56 | -14.91361 | -173.78024 | 2600 | 10 | 324 | Looking at standing chimney with lots of white stained tops. |
| 20-Sep | 22.52.02 | -14.91361 | -173.78024 | 2602 | 9 | 323 | Active chimney? Getting a closer look. |
| 20-Sep | 22.52.46 | -14.91361 | -173.78024 | 0 | 0 | 0 | Massive sulfide feature. No USBL. |
| 20-Sep | 22.54.37 | -14.91343 | -173.78042 | 2603 | 8 | 321 | USBL is back. |

| date | time | latitude | longitude | Z | alt | hdg | Q329 - North Mata Fitu Dive Comments |
|---|---|---|---|---|---|---|---|
| 20-Sep | 22.55.50 | -14.91336 | -173.78042 | 2603 | 8 | 332 | Pilot change complete and new scientists (Resing/Embley). |
| 20-Sep | 22.56.22 | -14.91333 | -173.78048 | 2605 | 7 | 319 | Looking for hydrothermal activity on this sulfide from base to top. |
| 20-Sep | 22.56.46 | -14.91335 | -173.78043 | 2605 | 8 | 311 | Looking along 312 at a string of these chimneys. |
| 20-Sep | 22.57.23 | -14.91331 | -173.78047 | 2604 | 7 | 321 | Chimneys running along 321. |
| 20-Sep | 22.57.46 | -14.91331 | -173.78047 | 2605 | 7 | 322 | Snow-covered peaks. |
| 20-Sep | 22.58.19 | -14.91332 | -173.78046 | 2606 | 5 | 329 | Not seeing any strong hydrothermal activity. |
| 20-Sep | 22.59.09 | -14.91326 | -173.78048 | 2605 | 4 | 339 | DSC and HD on. Polychaetes. and squat lobster |
| 20-Sep | 22.59.22 | -14.91328 | -173.78048 | 2605 | 4 | 348 | Smoke on the top of this chimney. |
| 20-Sep | 22.59.52 | -14.91330 | -173.78048 | 2605 | 3 | 333 | Scaleworms (polychaetes) near the top and some crabs. |
| 20-Sep | 23.01.43 | -14.91328 | -173.78048 | 2605 | 3 | 325 | Close-up of the chimneys with scaleworms and tentacles from polychaetes which like to eat sulfides. |
| 20-Sep | 23.03.24 | -14.91327 | -173.78048 | 2606 | 1 | 28 | Adjacent chimney without shimmer with many polychaetes. Crab. |
| 20-Sep | 23.04.43 | -14.91325 | -173.78052 | 2605 | 2 | 1 | Going to do a quick tour of these chimneys. Not seeing shrimp and barnacles. |
| 20-Sep | 23.04.52 | -14.91323 | -173.78047 | 2605 | 2 | 357 | Now see a shrimp! Fracture on chimney. Seeing different species of polychaetes. |
| 20-Sep | 23.06.01 | -14.91323 | -173.78051 | 2605 | 3 | 330 | Target here: 14°54.798'S 173°46.8326W at chimney site. |
| 20-Sep | 23.07.21 | -14.91326 | -173.78047 | 2605 | 4 | 319 | Line of chimneys along 318 degree heading. |
| 20-Sep | 23.08.11 | -14.91326 | -173.78048 | 2605 | 5 | 311 | Good close-up of shimmer and animals. 2 species of polychaetes grazing on mat. para-Alvinelid polychaetes. Not many shrimp. |
| 20-Sep | 23.10.13 | -14.91325 | -173.78046 | 2605 | 5 | 318 | Seeing tentacles of the Paraalvinelids. Close-ups in the shimmering water of feeding in the microbes. |
| 20-Sep | 23.10.45 | -14.91329 | -173.78048 | 2605 | 7 | 311 | Clear fluids coming out of this structure. Hdg 311 along the line of chimneys. |
| 20-Sep | 23.11.47 | -14.91326 | -173.78049 | 2604 | 3 | 302 | Pretty much clear fluids. |
| 20-Sep | 23.12.27 | -14.91321 | -173.78051 | 2603 | 3 | 301 | Excellent view of the different chimney morphologies and colors. |
| 20-Sep | 23.12.54 | -14.91323 | -173.78050 | 2602 | 4 | 298 | Small smoking chimney ahead. Skinny spigot. |
| 20-Sep | 23.13.55 | -14.91321 | -173.78051 | 2602 | 6 | 297 | White material is microbial. |
| 20-Sep | 23.14.23 | -14.91320 | -173.78052 | 2602 | 7 | 294 | Great close-up of the skinny chimney. Clear fluids. |
| 20-Sep | 23.16.26 | -14.91320 | -173.78048 | 2602 | 5 | 264 | On the white mat tops there are lots of the polychaetes. Taking DSCs. |
| 20-Sep | 23.17.57 | -14.91318 | -173.78049 | 2601 | 5 | 253 | Long tubular features at base of chimney. Could be spaghetti worms or sea cucumbers. |
| 20-Sep | 23.18.17 | -14.91315 | -173.78053 | 0 | 0 | 0 | HD off. White spots could be anemones. |
| 20-Sep | 23.18.56 | -14.91317 | -173.78050 | 2598 | 6 | 261 | Much less active chimneys here. |
| 20-Sep | 23.19.29 | -14.91313 | -173.78050 | 2597 | 8 | 286 | Lots of anemones and squat lobsters. |
| 20-Sep | 23.20.20 | -14.91311 | -173.78050 | 2594 | 7 | 273 | Maybe barnacles near the white rock. |
| 20-Sep | 23.21.05 | -14.91312 | -173.78054 | 2593 | 5 | 273 | Only 20m from the first waypoint. Lots of shimmer and animals. |
| 20-Sep | 23.21.22 | -14.91311 | -173.78053 | 2592 | 6 | 280 | Shorter chimneys here. |
| 20-Sep | 23.22.01 | -14.91308 | -173.78059 | 2591 | 5 | 277 | Following contour at 279. |
| 20-Sep | 23.22.29 | -14.91309 | -173.78056 | 2590 | 4 | 257 | Still seeing barnacles. |
| 20-Sep | 23.22.46 | -14.91306 | -173.78060 | 2589 | 4 | 263 | Seeing snails now. Not hairy ones. Dead crab. |
| 20-Sep | 23.23.20 | -14.91310 | -173.78057 | 2590 | 5 | 274 | Some of the snails are not alive. Can see one that is alive. |
| 20-Sep | 23.23.40 | -14.91310 | -173.78059 | 2590 | 4 | 262 | HD on. See some shrimp. |
| 20-Sep | 23.25.05 | -14.91306 | -173.78063 | 0 | 0 | 0 | White shrimp opaepele. |
| 20-Sep | 23.25.48 | -14.91309 | -173.78055 | 2589 | 4 | 272 | Smaller snails and shrimp in the shimmer. |
| 20-Sep | 23.27.56 | -14.91304 | -173.78060 | 2587 | 7 | 275 | Can see many barnacles on a face of this chimney. |
| 20-Sep | 23.28.25 | -14.91308 | -173.78058 | 2587 | 7 | 274 | Not as many cirri out feeding as the other site. |
| 20-Sep | 23.29.12 | -14.91306 | -173.78057 | 2587 | 7 | 268 | Suspect more iron-rich environment as the cirri are orange colored. |
| 20-Sep | 23.29.51 | -14.91307 | -173.78059 | 2586 | 6 | 262 | Some cirri are white but majority are orangish. Some squat lobsters. |
| 20-Sep | 23.30.21 | -14.91307 | -173.78058 | 2587 | 6 | 260 | Not sure if same species of barnacles. Closed body is black. |
| 20-Sep | 23.31.15 | -14.91305 | -173.78059 | 2587 | 6 | 258 | Not the same species. The plates have a different shape. Tops have a little point. Seeing only one species here. |
| 20-Sep | 23.32.29 | -14.91308 | -173.78057 | 2586 | 6 | 259 | White sea cucumbers which were seen earlier. Believe they can extend themselves very far out. |
| 20-Sep | 23.32.59 | -14.91307 | -173.78057 | 2586 | 6 | 261 | Could be a holothurian. HD off. |
| 20-Sep | 23.34.04 | -14.91308 | -173.78056 | 2584 | 7 | 267 | Continuing up this structure at 268deg. |
| 20-Sep | 23.34.40 | -14.91305 | -173.78059 | 2584 | 7 | 260 | Structure was 7m tall-at the top. Snail at top and cluster at another top. |
| 20-Sep | 23.34.48 | -14.91303 | -173.78062 | 2585 | 7 | 260 | HD on. See some shrimp. |
| 20-Sep | 23.35.45 | -14.91303 | -173.78055 | 2585 | 6 | 249 | Small skinny chimney with an adjacent one smoking. |
| 20-Sep | 23.36.33 | -14.91303 | -173.78061 | 2584 | 6 | 252 | Live snails (not hairy) and occupy less temperature/sulfur range than the hairy type. |
| 20-Sep | 23.36.53 | -14.91304 | -173.78060 | 2584 | 5 | 242 | Shrimp. Changing HD tape. |

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|---|---|---|---|---|---|---|---|
| 20-Sep | 23.37.24 | -14.91306 | -173.78058 | 2585 | 6 | 242 | Close-up of barnacles and snails in background. Sea cucumber within the barnacles. Also polychaetes on the white mat. |
| 20-Sep | 23.38.30 | -14.91299 | -173.78062 | 2585 | 6 | 238 | Line of chimneys in pilot cam. |
| 20-Sep | 23.39.28 | -14.91307 | -173.78060 | 2584 | 5 | 226 | Skinny-needle spire with smoke in HD. |
| 20-Sep | 23.42.04 | -14.91304 | -173.78060 | 2585 | 3 | 214 | Would be more interested in something low would be good. |
| 20-Sep | 23.42.33 | -14.91301 | -173.78060 | 2584 | 3 | 221 | Squat lobsters swimming by. |
| 20-Sep | 23.44.22 | -14.91307 | -173.78063 | 2585 | 3 | 200 | Preparing for a sulfide sample of the active lower chimney. |
| 20-Sep | 23.45.31 | -14.91304 | -173.78064 | 2585 | 3 | 208 | Close-up of snails & crab at base of this chimney. |
| 20-Sep | 23.46.17 | -14.91304 | -173.78060 | 0 | 0 | 0 | Got it. |
| 20-Sep | 23.48.56 | -14.91313 | -173.78050 | 2585 | 3 | 196 | **Geo Sample: Q329-sulfide-04.** Active chimney for GNS de Ronde. In box 13 with rock-03. (Area named Chim-C postcruise. Quest Tmax was 77°C. Actual temp probably higher.) |
| 20-Sep | 23.50.29 | -14.91306 | -173.78060 | 2585 | 3 | 205 | Looking at possibility of fluid sampling from where chimney was broken off. |
| 20-Sep | 23.51.49 | -14.91307 | -173.78059 | 2585 | 3 | 207 | Retrieving major from the basket. (Would also like to break off one of the inactive chimneys to the left of this chimney). |
| 20-Sep | 23.52.15 | -14.91306 | -173.78058 | 2585 | 3 | 205 | Retrieving blue major (port one). |
| 20-Sep | 23.54.13 | -14.91305 | -173.78064 | 2586 | 3 | 201 | Have major and moving back to chimney. |
| 20-Sep | 23.57.32 | -14.91301 | -173.78064 | 2586 | 4 | 201 | See smoke out the hole. Tap slowly and triggered and tip didn't move-spring up. Coming up slow. |
| 20-Sep | 23.58.08 | -14.91304 | -173.78062 | 2586 | 4 | 201 | **Fluid Sample: Q329-major-05**. Fluid from chimney just sampled (sulfide-04). Blue major. (Area named Chim-C postcruise. Quest Tmax was 77°C. Actual temp probably higher.) |
| 21-Sep | 00.00.13 | -14.91301 | -173.78061 | 2585 | 3 | 200 | May be clogged. Looks like it is fully extended. Done. Great sample. |
| 21-Sep | 00.02.54 | -14.91306 | -173.78060 | 2586 | 4 | 201 | Returning major to holster. |
| 21-Sep | 00.05.10 | -14.91300 | -173.78066 | 2586 | 4 | 202 | Arm attempting to reach the adjacent inactive sulfide. |
| 21-Sep | 00.07.29 | -14.91305 | -173.78064 | 0 | 0 | 0 | Got a piece of the top of an inactive chimney. Taking DSC. |
| 21-Sep | 00.09.08 | -14.91299 | -173.78063 | 2585 | 3 | 201 | **Geo Sample: Q329-sulfide-06.** Inactive chimney that was adjacent to the active sulfide (sulfide-04). Fell on edge and disintegrated into pieces. (Area named Chim-C postcruise. Quest Tmax was 77°C. Actual temp probably higher.) |
| 21-Sep | 00.11.04 | -14.91300 | -173.78064 | 2585 | 3 | 201 | Would also like a temperature and gastight which will require backing up and then repositioning. Maybe GTB without repositioning. |
| 21-Sep | 00.14.20 | -14.91298 | -173.78063 | 2585 | 3 | 200 | Going for the black GTB. Got it. |
| 21-Sep | 00.14.46 | -14.91301 | -173.78065 | 2585 | 3 | 201 | Positioning over the active vent and lining up piston trigger. |
| 21-Sep | 00.17.16 | -14.91299 | -173.78062 | 2586 | 3 | 201 | Tip attracting the crabs. Fired. Perfect sample. |
| 21-Sep | 00.17.31 | -14.91307 | -173.78061 | 2585 | 3 | 201 | **Gas Sample: Q329-gtb-07**. GTB of the same active chimney as major-05. (Area named Chim-C postcruise. Quest Tmax was 77°C. Actual temp probably higher.) |
| 21-Sep | 00.19.13 | -14.91308 | -173.78060 | 2585 | 3 | 201 | Securing the GTB back in the basket. |
| 21-Sep | 00.21.01 | -14.91306 | -173.78064 | 2586 | 3 | 201 | Retrieving the temperature wand from basket. |
| 21-Sep | 00.24.25 | -14.91305 | -173.78059 | 2586 | 3 | 201 | Positioning the long wand around the chimney structure by trying not to move the vehicle out of position. |
| 21-Sep | 00.26.24 | -14.91299 | -173.78066 | 2586 | 3 | 201 | Temperature went up to over 12deg when touched the adjacent chimney. |
| 21-Sep | 00.27.29 | -14.91306 | -173.78060 | 2585 | 3 | 201 | Tip in vent came out again. Only came up to 22deg. |
| 21-Sep | 00.28.03 | -14.91304 | -173.78065 | 2585 | 3 | 201 | Tip in again. Went up to 50 and trying a different position. |
| 21-Sep | 00.29.59 | -14.91308 | -173.78060 | 2585 | 3 | 201 | Got up to 53deg. |
| 21-Sep | 00.31.56 | -14.91305 | -173.78064 | 2585 | 3 | 201 | Looks like 77 was the highest. |
| 21-Sep | 00.33.14 | -14.91304 | -173.78065 | 2586 | 3 | 201 | Broke off top of skinny spire by accident. |
| 21-Sep | 00.33.52 | -14.91302 | -173.78066 | 2585 | 3 | 200 | Tip up on top but not directly in hole-was only 8deg. |
| 21-Sep | 00.34.04 | -14.91302 | -173.78066 | 2585 | 2 | 201 | Storing temperature wand. |
| 21-Sep | 00.37.22 | -14.91307 | -173.78060 | 2584 | 5 | 201 | Pulling in the basket. |
| 21-Sep | 00.37.46 | -14.91303 | -173.78060 | 2585 | 4 | 205 | Going to move to the NW and laterally along this line of chimneys. |
| 21-Sep | 00.38.43 | -14.91303 | -173.78057 | 2584 | 6 | 263 | Looking at 235 along line of chimneys. |
| 21-Sep | 00.40.07 | -14.91299 | -173.78058 | 2585 | 5 | 261 | Took picture of sonar screen. Seeing line of structure. |
| 21-Sep | 00.40.32 | -14.91306 | -173.78059 | 2585 | 5 | 261 | NW-SE is the line of chimneys. |
| 21-Sep | 00.41.32 | -14.91303 | -173.78064 | 2584 | 7 | 295 | Lining up the ROV along the trend of the chimneys. Looks like 316 is the heading of the chimneys. |
| 21-Sep | 00.42.39 | -14.91305 | -173.78064 | 2582 | 8 | 303 | Line of chimneys goes upslope. |
| 21-Sep | 00.43.32 | -14.91303 | -173.78059 | 2579 | 12 | 310 | More barnacles on some chimneys as we move upslope. |
| 21-Sep | 00.43.49 | -14.91305 | -173.78059 | 2578 | 9 | 299 | Mixture of dead and alive chimneys. |
| 21-Sep | 00.44.48 | -14.91301 | -173.78065 | 0 | 0 | 0 | Climbing upslope and seeing smoker. |
| 21-Sep | 00.45.16 | -14.91296 | -173.78065 | 2576 | 10 | 302 | More smokers up the hill. |
| 21-Sep | 00.45.46 | -14.91299 | -173.78062 | 2575 | 8 | 310 | Lots of smoke all around here. |

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|---|---|---|---|---|---|---|---|
| 21-Sep | 00.45.58 | -14.91299 | -173.78065 | 0 | 0 | 0 | Chimney covered in barnacles. HD on. |
| 21-Sep | 00.47.14 | -14.91301 | -173.78062 | 2576 | 7 | 309 | Pilot cam shows the smoker below and tower of barnacle chimney. |
| 21-Sep | 00.47.45 | -14.91300 | -173.78062 | 2576 | 6 | 312 | WOW. Prop wash flushes the barnacles. |
| 21-Sep | 00.48.15 | -14.91298 | -173.78066 | 2576 | 6 | 314 | Grey smoke coming out of the chimney below. |
| 21-Sep | 00.48.58 | -14.91304 | -173.78063 | 2576 | 6 | 318 | Going to move on to look for black smoker not grey. |
| 21-Sep | 00.49.21 | -14.91303 | -173.78060 | 2576 | 9 | 317 | One side of chimney doesn't have barnacles. |
| 21-Sep | 00.50.19 | -14.91299 | -173.78055 | 2578 | 9 | 202 | Trend NW of the line of chimneys. |
| 21-Sep | 00.50.44 | -14.91301 | -173.78057 | 2580 | 10 | 199 | Maybe some cross-trends. |
| 21-Sep | 00.51.29 | -14.91296 | -173.78049 | 2580 | 11 | 218 | HD is off as vehicle has come around off bottom. |
| 21-Sep | 00.51.44 | -14.91294 | -173.78048 | 2580 | 11 | 223 | Turning to approach again. |
| 21-Sep | 00.52.59 | -14.91291 | -173.78054 | 0 | 0 | 0 | Getting lined up to follow the trend of the activity. |
| 21-Sep | 00.54.05 | -14.91302 | -173.78055 | 2582 | 5 | 248 | Chimney looks like a snow-covered fir tree. |
| 21-Sep | 00.54.44 | -14.91300 | -173.78055 | 2582 | 6 | 248 | Taking DSC. |
| 21-Sep | 00.55.13 | -14.91298 | -173.78058 | 2580 | 7 | 250 | Pagoda structure with flanges and seeing some snails clustered on a chimney. |
| 21-Sep | 00.55.32 | -14.91305 | -173.78054 | 2580 | 8 | 249 | Big cluster of chimneys with different morphologies. |
| 21-Sep | 00.56.00 | -14.91299 | -173.78058 | 2579 | 8 | 249 | Large structure beyond. Dr. Seuss-like forms. |
| 21-Sep | 00.56.50 | -14.91300 | -173.78057 | 2579 | 8 | 249 | Moving closer over the large chimney. |
| 21-Sep | 00.58.10 | -14.91297 | -173.78063 | 2578 | 4 | 249 | Will continuing to move up the slope. |
| 21-Sep | 00.58.35 | -14.91296 | -173.78065 | 2577 | 5 | 249 | Looking at this large chimney with barnacles and snails on it. |
| 21-Sep | 00.59.05 | -14.91299 | -173.78063 | 2576 | 4 | 249 | These chimneys seem to have more flanges than the ones we saw at Mata Ua. |
| 21-Sep | 00.59.27 | -14.91303 | -173.78061 | 2576 | 5 | 249 | Anemone on lower right and lots of barnacles. We are going to look at the top. |
| 21-Sep | 00.59.52 | -14.91299 | -173.78061 | 2576 | 6 | 248 | Largely looking at biology on this chimney. |
| 21-Sep | 01.00.56 | -14.91297 | -173.78065 | 2576 | 5 | 249 | This chimney in front of us is at least 7 meters tall. No discernible flow out opt the top.. |
| 21-Sep | 01.01.44 | -14.91303 | -173.78064 | 2576 | 8 | 249 | Monstrous sulfide in front of us. Leaking fluids out of the bottom. Snail clusters toward the back. |
| 21-Sep | 01.02.23 | -14.91301 | -173.78063 | 2575 | 6 | 248 | Black smoke coming across our field of view. |
| 21-Sep | 01.03.03 | -14.91301 | -173.78063 | 2575 | 7 | 214 | We see some darker smoke but it is not that vigorous. The intent is to keep moving up. |
| 21-Sep | 01.05.23 | -14.91299 | -173.78060 | 2565 | 20 | 278 | Murky up ahead. Black smoke. Want to find the source of the black smoke. |
| 21-Sep | 01.07.13 | -14.91280 | -173.78064 | 2573 | 15 | 299 | Going down a little bit so we can get under the smoke. Richard thinks it may be to the SW of us. |
| 21-Sep | 01.08.59 | -14.91281 | -173.78062 | 2581 | 8 | 300 | Volker thinks we came up over the smoker so we are going to descend a bit and try to locate it that way. |
| 21-Sep | 01.09.59 | -14.91278 | -173.78068 | 2587 | 2 | 299 | Back on the seafloor. Collapsed chimney right ahead of us. It looks like a fallen tree. Sparse biota here. |
| 21-Sep | 01.11.00 | -14.91281 | -173.78062 | 2586 | 3 | 300 | See what appears to be lots of fallen sulfide structures. |
| 21-Sep | 01.11.28 | -14.91279 | -173.78066 | 2587 | 2 | 299 | At the base of the sulfide chimney complex we se broken sulfides scattered about. |
| 21-Sep | 01.12.32 | -14.91278 | -173.78066 | 2587 | 2 | 299 | Coral whips; not too healthy looking away from the flow here. |
| 21-Sep | 01.12.55 | -14.91281 | -173.78065 | 2587 | 2 | 299 | Going to go to the northwest and then perhaps go down and swing over to the active site from a different direction. |
| 21-Sep | 01.14.08 | -14.91278 | -173.78063 | 2586 | 2 | 299 | The plan is head toward the G target (sulfide cliff). |
| 21-Sep | 01.14.45 | -14.91275 | -173.78068 | 2586 | 2 | 300 | Heading toward the northwest to see what is at the top of this approaching mound. |
| 21-Sep | 01.15.15 | -14.91270 | -173.78073 | 2585 | 2 | 300 | Is this really sulfide? Seems like there is too much of it. |
| 21-Sep | 01.15.43 | -14.91277 | -173.78065 | 2584 | 2 | 300 | We're in more of a diffuse zone now. |
| 21-Sep | 01.16.08 | -14.91274 | -173.78070 | 2584 | 2 | 299 | Lava now. A pillow in view with orange staining around the base. We're the outer lower temperature end of this system. |
| 21-Sep | 01.16.48 | -14.91267 | -173.78080 | 2583 | 2 | 300 | Possibly snails on the seafloor. |
| 21-Sep | 01.17.05 | -14.91269 | -173.78078 | 2582 | 2 | 299 | Looks like manganese patches here. |
| 21-Sep | 01.17.30 | -14.91267 | -173.78076 | 2582 | 2 | 290 | There is some dark coating on the rocks. Doesn't look like much. |
| 21-Sep | 01.18.28 | -14.91268 | -173.78075 | 2582 | 2 | 289 | Bob thinks that this is manganese patches. |
| 21-Sep | 01.21.09 | -14.91264 | -173.78081 | 2581 | 3 | 290 | Moving on to the NW. We see piles of talus; some pillow fragments; etc. |
| 21-Sep | 01.22.07 | -14.91267 | -173.78080 | 2581 | 3 | 289 | Want to move to the northwest. Want to see what is at the top of this mound. |
| 21-Sep | 01.23.29 | -14.91261 | -173.78083 | 2575 | 3 | 279 | Moving upslope. |
| 21-Sep | 01.24.15 | -14.91260 | -173.78090 | 2575 | 3 | 279 | Big steep talus pile. We're still going up slope. Giant snail! |
| 21-Sep | 01.24.45 | -14.91259 | -173.78094 | 2572 | 3 | 280 | Continuing to climb. Not seeing any mineralization. We may be past the active venting site. |

| date | time | latitude | longitude | Z | alt | hdg | Q329 - North Mata Fitu Dive Comments |
|---|---|---|---|---|---|---|---|
| 21-Sep | 01.25.45 | -14.91259 | -173.78101 | 2569 | 3 | 279 | This is a really steep slope going up an old fault? |
| 21-Sep | 01.26.51 | -14.91261 | -173.78096 | 2566 | 3 | 279 | Stopping the upward traverse because he doesn't see any mineralization. The slope is covered in talus. |
| 21-Sep | 01.28.22 | -14.91261 | -173.78100 | 2566 | 3 | 270 | We're going to head south down the slope. |
| 21-Sep | 01.34.20 | -14.91278 | -173.78102 | 2571 | 3 | 270 | We're deciding what to do. We're going to head back where we were when we saw all the smoke and then head SE. |
| 21-Sep | 01.35.12 | -14.91279 | -173.78099 | 2571 | 3 | 270 | Going to head a little bit further down the slope and then head east. |
| 21-Sep | 01.35.28 | -14.91274 | -173.78100 | 2571 | 3 | 273 | We're waiting to move the ship. |
| 21-Sep | 01.37.18 | -14.91280 | -173.78098 | 0 | 0 | 0 | Talus slope here. The rocks look volcanic. No evidence of sulfides here. |
| 21-Sep | 01.37.58 | -14.91277 | -173.78100 | 2571 | 3 | 271 | We have about 3 hours of bottom time left and lots of sampling yet to happen. |
| 21-Sep | 01.38.52 | -14.91278 | -173.78099 | 2571 | 3 | 271 | Pillows scattered about this slope. |
| 21-Sep | 01.40.03 | -14.91277 | -173.78098 | 2573 | 3 | 272 | We're moving down the slope. Stirring up a bit of debris. We ran into the bottom. |
| 21-Sep | 01.42.36 | -14.91283 | -173.78092 | 2572 | 6 | 271 | The water has been stirred up. We're not moving much yet. |
| 21-Sep | 01.44.25 | -14.91280 | -173.78094 | 2570 | 5 | 1 | The bottom is visible again. |
| 21-Sep | 01.45.03 | -14.91277 | -173.78100 | 2567 | 5 | 326 | We want to see the bottom as we move downslope. |
| 21-Sep | 01.45.25 | -14.91280 | -173.78100 | 2568 | 5 | 200 | More talus / pillow debris. |
| 21-Sep | 01.46.38 | -14.91283 | -173.78093 | 2571 | 5 | 180 | Beautiful slope of broken up pillow lavas; tubes. Scree / talus slope. |
| 21-Sep | 01.47.11 | -14.91284 | -173.78095 | 2571 | 4 | 179 | Some big pillow lobes several meters across. They haven't moved far if at all. Richard sees some tubes that probably fed them. |
| 21-Sep | 01.48.59 | -14.91294 | -173.78096 | 2570 | 5 | 180 | Still working our way southward down this volcanic ridge. Massive volcanic ridge we're travelling down. |
| 21-Sep | 01.49.45 | -14.91301 | -173.78098 | 2574 | 3 | 180 | We want to find the source of the black smoke. That's the strategy. |
| 21-Sep | 01.50.30 | -14.91303 | -173.78100 | 2578 | 2 | 180 | We want to get beneath the smoke and work out way to the east. Still not seeing much smoke. |
| 21-Sep | 01.51.00 | -14.91313 | -173.78105 | 2584 | 2 | 180 | Platy lavas. |
| 21-Sep | 01.51.11 | -14.91314 | -173.78105 | 2584 | 2 | 180 | Shift change in the van. Bob and Ken now. |
| 21-Sep | 01.51.28 | -14.91316 | -173.78105 | 2585 | 2 | 181 | Waft of smoke? |
| 21-Sep | 01.53.03 | -14.91321 | -173.78106 | 2589 | 3 | 100 | Rattail in video. We're west of the smoky chimney location now. |
| 21-Sep | 01.53.35 | -14.91322 | -173.78105 | 2595 | 2 | 98 | Seeing some sulfide debris now. Old chimney base? |
| 21-Sep | 01.55.00 | -14.91322 | -173.78105 | 0 | 0 | 0 | We see the sulfide piece to the left of what we have in the HD view. |
| 21-Sep | 01.55.36 | -14.91327 | -173.78104 | 2594 | 3 | 99 | Cornel will date the ages of the chimney. He wants active and dead chimneys. |
| 21-Sep | 01.57.19 | -14.91329 | -173.78100 | 2594 | 3 | 102 | These pieces are way too big. Some look like lavas; possibly sulfide-cemented sediments. |
| 21-Sep | 01.58.05 | -14.91325 | -173.78102 | 2593 | 4 | 100 | Laminated material to the left; could be an old sulfide or a rock? |
| 21-Sep | 01.58.55 | -14.91329 | -173.78099 | 2593 | 4 | 83 | Richard thinks this is dead hydrothermal material; on and covered with lava comples(?) We're moving on. |
| 21-Sep | 02.00.07 | -14.91330 | -173.78092 | 2591 | 4 | 91 | Looking at piles of pillow lavas in the HD. |
| 21-Sep | 02.00.25 | -14.91331 | -173.78087 | 2591 | 3 | 90 | More particulate matter in the water. Possibly some bacterial mat in the water. |
| 21-Sep | 02.00.49 | -14.91331 | -173.78087 | 0 | 0 | 0 | Crinoids on a rock. Red one and lighter color. |
| 21-Sep | 02.01.18 | -14.91334 | -173.78079 | 2590 | 4 | 91 | We're about 10m deeper when we encountered the active chimneys. |
| 21-Sep | 02.01.54 | -14.91334 | -173.78079 | 2591 | 4 | 40 | White patch to the right. Coming back into the area of live chimneys. It must be close. |
| 21-Sep | 02.02.47 | -14.91341 | -173.78065 | 2596 | 4 | 61 | See white staining on the rocks. Quite thick. Probably animals on the white patches. See small dots. |
| 21-Sep | 02.03.42 | -14.91342 | -173.78061 | 2597 | 5 | 67 | Sulfur on the rocks? Ken thinks it is probably anhydrite. |
| 21-Sep | 02.05.18 | -14.91348 | -173.78056 | 0 | 0 | 0 | No chimneys ahead. The shrimp like to inhabit these types of area. |
| 21-Sep | 02.06.12 | -14.91342 | -173.78061 | 2600 | 4 | 56 | Hard to tell what we're seeing. We're flying too high. Our altitude is 4meters. |
| 21-Sep | 02.07.05 | -14.91347 | -173.78055 | 2601 | 2 | 57 | See some crabs. |
| 21-Sep | 02.07.50 | -14.91345 | -173.78054 | 2604 | 2 | 56 | We are now closer to the seafloor. We did not head east but southeast so we are too deep. |
| 21-Sep | 02.08.18 | -14.91343 | -173.78051 | 2604 | 1 | 54 | We want the vehicle to head upslope. |
| 21-Sep | 02.08.56 | -14.91340 | -173.78051 | 2604 | 3 | 57 | Swapping out pilots. We got too deep and were too far off the seafloor. |
| 21-Sep | 02.10.24 | -14.91336 | -173.78052 | 2605 | 2 | 57 | We're just sitting here……. |
| 21-Sep | 02.15.56 | -14.91328 | -173.78050 | 2609 | 2 | 25 | We're moving now. We see some old inactive chimneys ahead. |
| 21-Sep | 02.16.28 | -14.91332 | -173.78046 | 2608 | 3 | 4 | The goal is to get back to the action. We need to gain some confidence in where we are. |
| 21-Sep | 02.17.28 | -14.91325 | -173.78053 | 2607 | 4 | 351 | Here we go. Moving up the slope. |

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| 21-Sep | 02.18.03 | -14.91329 | -173.78044 | 2606 | 4 | 342 | Small amount of bacterial mat on these old chimney structures. Some coral whips. |
| 21-Sep | 02.19.03 | -14.91323 | -173.78049 | 2603 | 8 | 317 | We're back in the chimneys. Most are covered with white. |
| 21-Sep | 02.20.36 | -14.91325 | -173.78048 | 2604 | 8 | 262 | Low flow chimneys off to the right. Reorienting ourselves. The navigation is right on. |
| 21-Sep | 02.21.24 | -14.91323 | -173.78047 | 2601 | 7 | 289 | Larger chimneys with clear smoke coming out of beehives. Beautiful structures. |
| 21-Sep | 02.22.25 | -14.91324 | -173.78049 | 2600 | 7 | 281 | Looking at this big chimney structures. Seeing polychaete worms and para-Alvinelid polychaetes The chimneys have lots of polychaetes on the white. |
| 21-Sep | 02.23.44 | -14.91325 | -173.78050 | 2601 | 8 | 283 | Not seeing the abundance of shrimp here that we saw on previous dives. |
| 21-Sep | 02.24.04 | -14.91320 | -173.78052 | 2601 | 7 | 290 | Going to move around this set of chimney spires that were sampled earlier (samples 4 - 7) |
| 21-Sep | 02.24.39 | -14.91323 | -173.78049 | 2601 | 5 | 263 | Chimneys spires are right next to each other, |
| 21-Sep | 02.25.05 | -14.91320 | -173.78049 | 2602 | 5 | 236 | Tim thinks that sea cucumbers are the long thin things we see near the base. |
| 21-Sep | 02.25.34 | -14.91323 | -173.78047 | 2600 | 7 | 232 | We want to make some tracks. |
| 21-Sep | 02.27.13 | -14.91322 | -173.78049 | 2598 | 7 | 217 | Galatheid crab at the base of a structure. We don't see them on the chimneys and are not sure why. Seeing scaleworms on the chimneys but not much else. |
| 21-Sep | 02.28.17 | -14.91315 | -173.78053 | 2600 | 4 | 194 | Seeing anemones; polychaetes; snails; barnacles; and long skinny sea cucumbers. |
| 21-Sep | 02.29.44 | -14.91318 | -173.78052 | 2600 | 3 | 262 | Anemones like iron-rich fluids. This chimney is more orangish than the white ones downslope just a couple meters.. |
| 21-Sep | 02.30.31 | -14.91317 | -173.78049 | 2599 | 6 | 200 | Seeing smoke in the video but it is probably from the chimney complex we just saw. |
| 21-Sep | 02.31.11 | -14.91315 | -173.78049 | 0 | 0 | 0 | Looking due west we see a line of edifices. Upslope and to the north we came out of venting very quickly. |
| 21-Sep | 02.32.13 | -14.91314 | -173.78050 | 2596 | 5 | 286 | We have identified that there are not live smokers here. |
| 21-Sep | 02.33.07 | -14.91312 | -173.78054 | 2594 | 4 | 269 | We are coming upon another complex of chimneys with clear smoke coming out. This group is shorter with polychaetes and stalked barnacles. |
| 21-Sep | 02.34.31 | -14.91312 | -173.78052 | 2592 | 5 | 283 | Tim is not seeing any crabs; shrimp; snails or tubeworms. These chimneys are probably not metal-rich because those organisms like those types of fluids. |
| 21-Sep | 02.35.25 | -14.91302 | -173.78058 | 2590 | 3 | 257 | Starting to see some shrimp. |
| 21-Sep | 02.35.40 | -14.91297 | -173.78061 | 2588 | 3 | 265 | Galatheid crabs; white snails; the black things are barnacles. Bright yellow in the view. Sulfur? Oxidized iron? |
| 21-Sep | 02.36.28 | -14.91296 | -173.78061 | 2587 | 3 | 259 | The white material is anyone's guess. |
| 21-Sep | 02.36.56 | -14.91299 | -173.78060 | 2588 | 2 | 293 | Brachyuran and galatheid crabs with highly altered rock. |
| 21-Sep | 02.37.17 | -14.91296 | -173.78053 | 2586 | 4 | 297 | The activity is patchy. Here are more sulfides ahead. They look dead. |
| 21-Sep | 02.38.04 | -14.91299 | -173.78053 | 2582 | 6 | 284 | This cluster of spires looks less active then the ones we saw previously. |
| 21-Sep | 02.38.34 | -14.91292 | -173.78055 | 2581 | 7 | 269 | We're seeing  more biology. The Alvinochonca snails are the lighter colored smooth ones. |
| 21-Sep | 02.40.09 | -14.91295 | -173.78057 | 2581 | 8 | 269 | HD turned on about a minute ago. |
| 21-Sep | 02.40.47 | -14.91296 | -173.78056 | 2580 | 8 | 266 | Sea cucumbers are intertwined. Pockets of snails all over this chimney. White huge snails as well. The tissue out of the shell is the animal's foot. |
| 21-Sep | 02.42.15 | -14.91294 | -173.78057 | 2578 | 9 | 277 | Several large white snails; squat lobsters; long skinny holothurians. |
| 21-Sep | 02.43.06 | -14.91297 | -173.78054 | 2579 | 8 | 280 | HD is off. |
| 21-Sep | 02.43.27 | -14.91298 | -173.78053 | 2581 | 6 | 279 | Heading over toward target D about 20m to our east. |
| 21-Sep | 02.43.46 | -14.91299 | -173.78053 | 2582 | 7 | 265 | Panning around. See some more of the white material on chimneys with lots of polychaetes. |
| 21-Sep | 02.44.35 | -14.91295 | -173.78052 | 2583 | 7 | 163 | The currents are coming from the SE now. We're about 5m off the bottom. |
| 21-Sep | 02.45.01 | -14.91293 | -173.78049 | 2585 | 3 | 86 | They are going to move the vehicle sideways and yet try to look toward the north so we can see chimneys. Right now not seeing anything in the HD. |
| 21-Sep | 02.48.43 | -14.91302 | -173.78029 | 2590 | 7 | 100 | We're up in the water column. Can't see a thing. |
| 21-Sep | 02.49.55 | -14.91302 | -173.78029 | 2597 | 6 | 94 | We circumnavigated that entire area of chimneys. The plan was to head to the east and look for more activity. |
| 21-Sep | 02.54.10 | -14.91306 | -173.78021 | 2606 | 2 | 115 | Still seeing some of these large snails that usually take advantage of large mussel and clam beds. Where are the clam beds? |
| 21-Sep | 02.56.24 | -14.91315 | -173.78024 | 2607 | 4 | 114 | A chimney ahead. Smaller chimneys with white covering. |
| 21-Sep | 02.57.38 | -14.91318 | -173.78022 | 2611 | 4 | 96 | Just started repositioning from D to E. |
| 21-Sep | 02.58.09 | -14.91318 | -173.78022 | 2611 | 4 | 96 | Panning around we see more of the white-coated chimneys. Also seeing some light brown sediments. |
| 21-Sep | 02.59.35 | -14.91321 | -173.78014 | 2610 | 4 | 94 | The ship is repositioning and waiting for the wire. We will grab a piece of this large old chimney structure. |

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|---|---|---|---|---|---|---|---|
| 21-Sep | 03.00.14 | -14.91319 | -173.78019 | 2609 | 5 | 55 | Looking at some large old spires. They don't look active. Possibly some weak diffuse flow around the base. |
| 21-Sep | 03.01.44 | -14.91317 | -173.78015 | 2609 | 5 | 37 | They are trying to get the sub in a position. |
| 21-Sep | 03.02.17 | -14.91318 | -173.78017 | 2610 | 3 | 52 | They are going to grab this piece of what may be a spire. |
| 21-Sep | 03.04.19 | -14.91318 | -173.78016 | 2611 | 1 | 87 | Seeing some bacterial mat on the old chimney structure in front of us. |
| 21-Sep | 03.07.26 | -14.91321 | -173.78011 | 2611 | 1 | 88 | **Geo Sample: Q329-sulfide-08**. Brownish/reddish-colored sulfide piece from an extinct chimney. Fist-sized? |
| 21-Sep | 03.10.19 | -14.91320 | -173.78014 | 2610 | 1 | 90 | Going in for another chunk of this heavily-oxidized material. It crumbled a bit. There is a greenish tint to some of this sulfide. Richard is satisfied with that. Time to move on. |
| 21-Sep | 03.12.25 | -14.91322 | -173.78013 | 2610 | 1 | 89 | The hope is to move on to the southeast. The ship is not repositioned and we should be good to go. |
| 21-Sep | 03.14.23 | -14.91320 | -173.78016 | 2610 | 4 | 88 | Yellow patch in the HD video. Looks like sulfur? Ken thinks it looks like oxidized iron. |
| 21-Sep | 03.15.37 | -14.91327 | -173.78013 | 2611 | 4 | 97 | Rattail ahead. |
| 21-Sep | 03.16.20 | -14.91331 | -173.78004 | 2609 | 7 | 96 | Blue water on the HD cam. The bottom is out of sight. |
| 21-Sep | 03.17.15 | -14.91335 | -173.78000 | 2601 | 19 | 94 | The slope has dropped down beneath us quickly. |
| 21-Sep | 03.20.03 | -14.91340 | -173.77989 | 2616 | 10 | 92 | Still in blue water. The bottom is out of sight. |
| 21-Sep | 03.23.50 | -14.91343 | -173.77978 | 2634 | 3 | 88 | On the bottom again. We're at the right depth for the chimneys. |
| 21-Sep | 03.24.46 | -14.91344 | -173.77972 | 2634 | 5 | 89 | The pilots are asking the ship to move a little further to the east to enable us to move on a SE heading. |
| 21-Sep | 03.25.31 | -14.91343 | -173.77971 | 2634 | 3 | 88 | Blocks of rock/sulfides on this slope in the down-looking camera. |
| 21-Sep | 03.26.12 | -14.91342 | -173.77961 | 2632 | 9 | 88 | Murkiness in the water; sort of. There is a definite target in the sonar. |
| 21-Sep | 03.27.35 | -14.91341 | -173.77959 | 2635 | 7 | 88 | Big sulfide to our left. It's an inactive chimney top ahead. We're 6.5 meters above the bottom. 2 crinoids on the top of the chimney. |
| 21-Sep | 03.28.59 | -14.91343 | -173.77948 | 2639 | 4 | 93 | Pilot change again. |
| 21-Sep | 03.30.48 | -14.91342 | -173.77950 | 2642 | 2 | 89 | Seeing the bottom. Looks like a structure on the sonar. |
| 21-Sep | 03.31.22 | -14.91341 | -173.77954 | 2639 | 3 | 89 | The bottom looks quite sedimented. No signs of hydrothermal activity. |
| 21-Sep | 03.32.16 | -14.91341 | -173.77951 | 2637 | 6 | 27 | We're traveling along now. The seafloor is in sight. Another inactive chimney with crinoids. This chimney is 9 meters tall. |
| 21-Sep | 03.33.20 | -14.91334 | -173.77934 | 2632 | 10 | 29 | Hopefully the inactive chimneys we are seeing could be an indication that we are near active venting. |
| 21-Sep | 03.34.20 | -14.91325 | -173.77934 | 2631 | 10 | 115 | There's a chimney ahead of us. |
| 21-Sep | 03.34.54 | -14.91333 | -173.77927 | 2633 | 9 | 97 | Nice-looking ahead of us. It's active. More barnacles and active spires. Seeing some biology. |
| 21-Sep | 03.35.45 | -14.91336 | -173.77924 | 2635 | 7 | 130 | There are several chimneys in the field of view. More of the white staining on the seafloor and these structures. |
| 21-Sep | 03.36.22 | -14.91339 | -173.77924 | 2637 | 5 | 132 | There is some smoking beneath us. Looking ahead there is a larger chimney. |
| 21-Sep | 03.37.11 | -14.91346 | -173.77922 | 2635 | 6 | 124 | There is smoke coming out of this guy. |
| 21-Sep | 03.37.44 | -14.91350 | -173.77921 | 2636 | 6 | 123 | Barnacles; anemones; gastropods; on this large chimney. |
| 21-Sep | 03.38.21 | -14.91351 | -173.77920 | 2633 | 9 | 136 | HD is on. Tall slender spire with smoking near the top. |
| 21-Sep | 03.38.59 | -14.91350 | -173.77923 | 2635 | 6 | 127 | Looking around this big sulfide structure with lots of small black beehives and gray smoke. |
| 21-Sep | 03.39.58 | -14.91353 | -173.77918 | 2634 | 7 | 108 | Ifremieria snails. See more sulfides in the distance with white staining. This chimney in the foreground |
| 21-Sep | 03.41.18 | -14.91355 | -173.77919 | 2635 | 7 | 100 | Chimney crab; holothurian; barnacles; brachyuran crab. |
| 21-Sep | 03.42.30 | -14.91356 | -173.77920 | 2636 | 7 | 109 | A shrimp!! Not exactly what Tim is hoping for barnacles off a piece of chimney and shrimp of course. |
| 21-Sep | 03.44.51 | -14.91351 | -173.77923 | 2634 | 8 | 145 | HD off a few minutes ago. |
| 21-Sep | 00.00.00 | -14.91306 | -173.78059 | 2586 | 4 | 201 | Different chimney now. Very large. We're 9 meters above the bottom. |
| 21-Sep | 03.46.57 | -14.91365 | -173.77918 | 2631 | 10 | 190 | We're still climbing up over 13 meters now. Shrimp on this chimney also. |
| 21-Sep | 03.48.28 | -14.91361 | -173.77915 | 2626 | 16 | 196 | This chimney is about 17+ meters tall. Black smoke it pumping out of it. There's some hot water for you. Black hot smoke pouring out. About 50+ feet tall. |
| 21-Sep | 03.49.48 | -14.91362 | -173.77914 | 2625 | 16 | 220 | Dave wants to sample that water. It will be difficult. The depth at the seafloor here is more than 2640m. |
| 21-Sep | 03.51.03 | -14.91364 | -173.77917 | 2626 | 16 | 220 | This ought to be called Chimney E; Bob's target from the camtow. We're less than 20m south of Target E. |
| 21-Sep | 03.52.47 | -14.91363 | -173.77915 | 2626 | 16 | 223 | HD off. White spots could be anemones. |
| 21-Sep | 03.53.00 | -14.91362 | -173.77917 | 2626 | 17 | 223 | Richard thinks it is flashing. It's some very black smoke pouring out the top of this structure dubbed **"Chimney E - Chim-E"**. |
| 21-Sep | 03.55.20 | -14.91366 | -173.77910 | 2626 | 16 | 237 | The pilots think they can sample this one. Good for them. |

| date | time | latitude | longitude | Z | alt | hdg | Q329 - North Mata Fitu Dive Comments |
|---|---|---|---|---|---|---|---|
| 21-Sep | 03.57.31 | -14.91365 | -173.77914 | 0 | 0 | 0 | Fuzzy brachyuran crab on the top of this chimney. Polychaetes. Possible anhydrite spire in the distance. |
| 21-Sep | 03.58.52 | -14.91365 | -173.77907 | 2627 | 15 | 223 | The top of the chimney came off. The chimney in front looks like it is flashing |
| 21-Sep | 04.02.41 | -14.91364 | -173.77917 | 2627 | 16 | 222 | White major is being readied for sampling. Tip is in the black. |
| 21-Sep | 04.03.10 | -14.91367 | -173.77908 | 2626 | 16 | 222 | Checking everything before firing. |
| 21-Sep | 04.03.37 | -14.91365 | -173.77911 | 2627 | 16 | 222 | **Fluid Sample: Q329-major-09**. Chim- E water sample in the black smoke. |
| 21-Sep | 04.04.15 | -14.91365 | -173.77909 | 2627 | 16 | 222 | Sample complete. |
| 21-Sep | 04.06.26 | -14.91366 | -173.77908 | 2626 | 15 | 227 | Having to back away to put the sampler away. 50' high! (16m) |
| 21-Sep | 04.08.31 | -14.91365 | -173.77919 | 2626 | 17 | 229 | Good close-up of the black smoke. Vigorous smoke. |
| 21-Sep | 04.09.02 | -14.91364 | -173.77915 | 2627 | 15 | 229 | Getting the red major out of the basket. |
| 21-Sep | 04.10.48 | -14.91365 | -173.77916 | 2627 | 15 | 230 | Crab scaling to the top of the chimney and now is going back down. |
| 21-Sep | 04.12.09 | -14.91366 | -173.77914 | 2627 | 16 | 230 | Preparing the sampler and approaching the vent to sample again at Chim-E. |
| 21-Sep | 04.12.50 | -14.91367 | -173.77913 | 2626 | 16 | 232 | Want to get an additional sample in the black smoke. |
| 21-Sep | 04.14.20 | -14.91364 | -173.77910 | 2626 | 16 | 235 | Putting intake into the center of the black smoke. |
| 21-Sep | 04.16.05 | -14.91367 | -173.77912 | 2626 | 16 | 235 | Slightly different angle at the vent. |
| 21-Sep | 04.16.41 | -14.91366 | -173.77916 | 2626 | 16 | 235 | Pulled off and realigning again. Looks good. |
| 21-Sep | 04.17.13 | -14.91365 | -173.77913 | 2626 | 16 | 235 | Fired. Pulled out at first but put back into the main flow. |
| 21-Sep | 04.17.44 | -14.91367 | -173.77915 | 2626 | 16 | 236 | Pulled out again during sampling. |
| 21-Sep | 04.17.51 | -14.91367 | -173.77915 | 2626 | 16 | 235 | Excavated with the major intake. Large orifice now. Still putting the intake within the smoke. |
| 21-Sep | 04.19.39 | -14.91366 | -173.77912 | 2626 | 16 | 235 | Fully extended. |
| 21-Sep | 04.19.42 | -14.91366 | -173.77912 | 2626 | 16 | 235 | **Fluid Sample: Q329-major-10.** Second black smoke fluid sample at Chim-E. Maybe compromised. |
| 21-Sep | 04.22.05 | -14.91366 | -173.77911 | 2627 | 15 | 239 | Placing red major back into holster. Next will take 2 GTBs. |
| 21-Sep | 04.23.37 | -14.91369 | -173.77910 | 2625 | 17 | 239 | Tim is replacing Ken in the van. |
| 21-Sep | 04.27.25 | -14.91364 | -173.77914 | 2625 | 17 | 207 | Taking bets on the temperature. Richard says 371deg. |
| 21-Sep | 04.28.15 | -14.91359 | -173.77920 | 2626 | 17 | 208 | Trying to retrieve the yellow GTB. |
| 21-Sep | 04.31.02 | -14.91363 | -173.77916 | 2626 | 17 | 207 | Retrieved yellow GTB. Approaching the vent. |
| 21-Sep | 04.32.29 | -14.91364 | -173.77915 | 2626 | 17 | 207 | HD is already on. |
| 21-Sep | 04.35.15 | -14.91367 | -173.77914 | 2627 | 16 | 261 | Moving in for a gastight sample. Having trouble getting the sampler in the orifice or this tall chimney. |
| 21-Sep | 04.36.45 | -14.91368 | -173.77914 | 2627 | 16 | 197 | Flashing going on at the top of this chimney. This is probably super critical fluid coming out of the top of this edifice. |
| 21-Sep | 04.38.31 | -14.91363 | -173.77920 | 2626 | 16 | 198 | Still repositioning at this chimney that is probably 3 meters wide lower down and 16 meters high at the top. |
| 21-Sep | 04.39.57 | -14.91357 | -173.77914 | 2626 | 16 | 197 | The wand is near the top of the structure again. |
| 21-Sep | 04.42.40 | -14.91366 | -173.77920 | 2627 | 16 | 198 | He just turned the HD off. |
| 21-Sep | 04.44.03 | -14.91359 | -173.77920 | 2627 | 15 | 197 | **Gas Sample: Q329-gtb-11**. Looks like they got a successful sample there. Nozzle was right in the black smoker that looked like it was boiling. It has been confirmed that it is boiling. Dave and Tim saw bubbles coming out. Depth of seafloor is 2643m. This chimney is ~16m high. ChimE location. |
| 21-Sep | 04.50.06 | -14.91365 | -173.77916 | 2628 | 15 | 198 | Securing the yellow gtb in the holder. |
| 21-Sep | 04.51.38 | -14.91362 | -173.77920 | 2625 | 18 | 205 | Going for the green gastight now. |
| 21-Sep | 04.53.59 | -14.91361 | -173.77914 | 2630 | 13 | 236 | Have the gastight in the stbd claw and heading for ChimE. |
| 21-Sep | 04.54.46 | -14.91363 | -173.77922 | 2627 | 15 | 241 | HD video is on again. |
| 21-Sep | 04.55.09 | -14.91367 | -173.77917 | 2627 | 15 | 242 | Looking at scaleworms; crabs; snails and bacterial mat on this large chimney that is probably at super-critical temperature. |
| 21-Sep | 04.56.44 | -14.91362 | -173.77914 | 2626 | 16 | 241 | Moving in with the ROV. |
| 21-Sep | 04.56.59 | -14.91363 | -173.77922 | 2627 | 15 | 241 | HD off. |
| 21-Sep | 04.57.56 | -14.91366 | -173.77919 | 2627 | 16 | 241 | Inserting the major probe; moving around in and out. They broke a part of the top of the sulfide off. Much larger orifice now. |
| 21-Sep | 04.59.45 | -14.91363 | -173.77922 | 2627 | 15 | 241 | One can see the flashing in a couple of spickets at the top. Impressive stuff. |
| 21-Sep | 05.01.16 | -14.91366 | -173.77915 | 2627 | 15 | 240 | The ROV backed off again. |
| 21-Sep | 05.03.29 | -14.91366 | -173.77915 | 2625 | 17 | 234 | Looking at black smoke billowing out of the top of this chimney now. |
| 21-Sep | 05.05.51 | -14.91372 | -173.77919 | 2627 | 15 | 338 | **Gas Sample: Q329-gtb-12.** Fired in the black smoker orifice at the top of ChimE. Probably at the super-critical state of phase separation. |
| 21-Sep | 05.06.59 | -14.91375 | -173.77921 | 2627 | 15 | 338 | The gastight has been stored. The next task is to take a temperature reading. |
| 21-Sep | 05.10.42 | -14.91380 | -173.77924 | 2632 | 11 | 14 | Another pilot change. |
| 21-Sep | 05.12.06 | -14.91375 | -173.77920 | 2628 | 15 | 348 | Approaching the chimney again to get a temperature reading at the top of this 16m high chimney. |
| 21-Sep | 05.13.30 | -14.91372 | -173.77919 | 0 | 0 | 0 | Trying to get the temperature probe….. Still perched over it. |

| date | time | latitude | longitude | Z | alt | hdg | Q329 - North Mata Fitu Dive Comments |
|---|---|---|---|---|---|---|---|
| 21-Sep | 05.15.39 | -14.91369 | -173.77916 | 2626 | 17 | 351 | Finally the temperature probe is out and we are approaching the orifice at the chimney top. |
| 21-Sep | 05.16.20 | -14.91367 | -173.77916 | 2627 | 16 | 350 | Tooltip temp was 3.1 before approaching the chimney. |
| 21-Sep | 05.17.46 | -14.91367 | -173.77916 | 2626 | 16 | 17 | The temperature gradient is extreme here. Now at 222 258. 285 was the highest reading so far. |
| 21-Sep | 05.20.30 | -14.91365 | -173.77919 | 2626 | 16 | 20 | Maneuvering the probe again. They are coming in for another try. Raising up the arm so they can push it in lower. |
| 21-Sep | 05.23.04 | -14.91361 | -173.77919 | 2627 | 15 | 22 | Still taking the temp Rising to 233. That was the highest reading so far. |
| 21-Sep | 05.24.30 | -14.91366 | -173.77916 | 2627 | 16 | 270 | Moving around the chimney to try to get a better position for this temperature reading. |
| 21-Sep | 05.25.32 | -14.91366 | -173.77913 | 2627 | 15 | 273 | They are not having much luck with the temperature reading. |
| 21-Sep | 05.28.06 | -14.91365 | -173.77916 | 2627 | 16 | 275 | The temperature reading got up to 50. Repositioning. 78; got up to 115C that time. The highest reading we got was 285C. It was never totally in the vent fluid. That is a way-low reading. |
| 21-Sep | 05.30.07 | -14.91369 | -173.77913 | 2627 | 16 | 335 | The last hurrah here. Only got up to 34 degrees. Incredible flow now that the whole top has been taken off. Got up to 150C there. Give it up guys….. |
| 21-Sep | 05.33.50 | -14.91369 | -173.77913 | 2627 | 16 | 80 | 31 320  323 325; 330; 331!!!!  We got up to 331 degrees. ChimE is hot! |
| 21-Sep | 05.36.32 | -14.91369 | -173.77913 | 2627 | 17 | 68 | Going to the base of this chimney now. It's 2627m at the top. We'll get the base depth next. |
| 21-Sep | 05.37.39 | -14.91369 | -173.77913 | 2627 | 16 | 53 | Going to try to get anything for Tim. |
| 21-Sep | 05.39.49 | -14.91369 | -173.77913 | 2634 | 8 | 34 | Going down and down. |
| 21-Sep | 05.40.30 | -14.91369 | -173.77913 | 2640 | 4 | 29 | Still descending down the chimney. |
| 21-Sep | 05.41.04 | -14.91369 | -173.77913 | 2643 | 2 | 22 | At the bottom. 2644 at the base. |
| 21-Sep | 05.42.48 | -14.91369 | -173.77913 | 2642 | 2 | 8 | Opening the bio bucket to try the shrimp catcher. |
| 21-Sep | 05.43.46 | -14.91369 | -173.77913 | 2643 | 2 | 8 | Fresh chimney at the base (we probably knocked it down). |
| 21-Sep | 05.44.41 | -14.91369 | -173.77913 | 2643 | 1 | 12 | Retrieving the suction sampler to test out new sampling technique. |
| 21-Sep | 05.46.35 | -14.91369 | -173.77913 | 2644 | 1 | 10 | Testing the reach of the suction to the bucket. |
| 21-Sep | 05.48.17 | -14.91369 | -173.77913 | 2643 | 2 | 15 | Now looking for an animal to try the sampling. |
| 21-Sep | 05.51.03 | -14.91369 | -173.77913 | 2642 | 1 | 357 | Aiming at the fish and got it. |
| 21-Sep | 05.51.25 | -14.91369 | -173.77913 | 2642 | 0 | 9 | No trying to flush it out into the bucket.  See it in the tube. |
| 21-Sep | 05.51.52 | -14.91369 | -173.77913 | 2644 | 1 | 9 | Here it comes to the bucket. |
| 21-Sep | 05.52.58 | -14.91369 | -173.77913 | 2643 | 2 | 10 | **Biology Sample: Q329-biomacro-13**. It is in the bucket swimming in a circle. From base of large chimney. Slurped and stowed in bucket. |
| 21-Sep | 05.56.59 | -14.91369 | -173.77913 | 2643 | 1 | 58 | **Biology Sample: Q329-biomacro-14**.  Gastropod from near the fish sample. Taken with slurp and stowed in bucket. |
| 21-Sep | 05.58.21 | -14.91369 | -173.77913 | 2642 | 2 | 24 | Made it in the bucket but can't close lid with slurp handle. |
| 21-Sep | 05.58.51 | -14.91369 | -173.77913 | 0 | 0 | 0 | Stowing the slurp sampler. Bungee on top of the t-handle.  All the way on the handle. |
| 21-Sep | 06.01.10 | -14.91369 | -173.77913 | 2644 | 1 | 55 | Now will try to close the bucket lid. Fish is still in the bucket. |
| 21-Sep | 06.01.39 | -14.91369 | -173.77913 | 2643 | 1 | 55 | Coming off the bottom while closing. |
| 21-Sep | 06.02.28 | -14.91369 | -173.77913 | 2640 | 3 | 56 | Retracting the drawer and coming off the bottom.  Looks like a volunteer sulfide on the front porch.  Can be a sample if it is still there on deck. |
| 21-Sep | 06.03.13 | -14.91369 | -173.77913 | 2641 | 4 | 56 | Last view of the chimneys. |
| 21-Sep | 06.04.05 | -14.91369 | -173.77913 | 2631 | 13 | 28 | Looking at Chim-E as we come off the bottom. |
| 21-Sep | 06.04.28 | -14.91369 | -173.77913 | 2623 | 21 | 28 | Top of the chimney at 2627m. |
| 21-Sep | 06.04.45 | -14.91369 | -173.77913 | 2619 | 23 | 29 | Off bottom. |
| 21-Sep | 08.06.25 | | | | | | Taking floats off the wire. |
| 21-Sep | 08.11.48 | | | | | | ROV out of the water. |
| 21-Sep | 08.13.01 | | | | | | ROV on deck. |

## 7.9 Q330 Niua North Dive Log

| date | time | latitude | longitude | Z | alt | hdg | Q330 - Niua North Dive Comments |
|---|---|---|---|---|---|---|---|
| **Main Goals:** Explore and sample the source of hydrothermal venting at Niua North. | | | | | | | |
| **Launch target:** 15°4.879' S 173°33.287 'W Z=765m Sulfur area NW Niua | | | | | | | |
| **Setup:** 2 gastights; 3 majors; temp probe 2 Davis samplers; 1 McPhail sampler; large biobox; suction sampler; pelagic pump; T-handle and mesh net; shrimp-catcher jar | | | | | | | |
| Nav Notes: Bottom time: 9/21/2012 20:36 – 9/22 06:06. Nav smoothed (tolerance=11). Split the nav file into 2 parts. Part 1 nav: 9/21 20:36 – 9/22 05:02; moved +30m (E), +14m (N). Part 2 nav: 05:22:32 – 06:07; moved +27m (E). +14m (N). | | | | | | | |
| **DIVE LOG POSITION INFORMATION: latitude; longitude; Z; alt; hdg values are derived from finalized Quest nav. Any lat/long values in the dive comments column were recorded at sea and are preliminary.** | | | | | | | |
| 21-Sep | 19.03.53 | | | | | | Preparing for dive. |
| 21-Sep | 19.10.41 | | | | | | Off the deck. |
| 21-Sep | 19.16.01 | | | | | | ROV in the water. |
| 21-Sep | 19.24.35 | | | | | | ROV out of water. |
| 21-Sep | 19.25.55 | | | | | | ROV on deck. |
| 21-Sep | 19.41.42 | | | | | | Unstrapping ROV again. |
| 21-Sep | 19.47.34 | | | | | | Off the deck. |
| 21-Sep | 19.50.46 | | | | | | In the water. |
| 21-Sep | 19.52.25 | | | | | | Putting flotation on wire. |
| 21-Sep | 19.55.30 | | | | | | ROV is diving. |
| 21-Sep | 20.00.59 | | | | | | Passing 100m. |
| 21-Sep | 20.06.56 | | | | | | Passing 200m on the way to bottom target depth of 765m. |
| 21-Sep | 20.15.19 | | | | | | About halfway to the bottom. 375m. |
| 21-Sep | 20.16.34 | | | | | | 400m depth. |
| 21-Sep | 20.17.21 | | | | | | ROV appears to be further west of the target bottom position (~100m west and deeper). |
| 21-Sep | 20.22.52 | | | | | | ROV is moving toward bottom target. |
| 21-Sep | 20.26.17 | | | | | | 200m off bottom. |
| 21-Sep | 20.30.38 | | | | | | 100m off bottom. |
| 21-Sep | 20.31.21 | | | | | | ROV heading is 222 but slope should be at 045. |
| 21-Sep | 20.31.33 | | | | | | Turning ROV into slope. |
| 21-Sep | 20.32.13 | | | | | | Passing 700m. |
| 21-Sep | 20.33.07 | | | | | | Altimeter picked up bottom. |
| 21-Sep | 20.33.35 | | | | | | Lots of smoke in pilot cam. |
| 21-Sep | 20.33.56 | | | | | | Lots of smoke in all cams. |
| 21-Sep | 20.34.40 | | | | | | All white. |
| 21-Sep | 20.35.10 | | | | | | Will be challenging to find the source of the plume in these conditions with dense plumes so may have to go lower down the slope. |
| 21-Sep | 20.35.37 | -15.08113 | -173.55475 | 759 | 6 | 110 | Bottom. |
| 21-Sep | 20.36.02 | -15.08113 | -173.55475 | 759 | 6 | 110 | Looks like sediment and scattered rock - maybe in the pit. |
| 21-Sep | 20.36.41 | -15.08110 | -173.55477 | 761 | 5 | 107 | Looks like sulfur flows with maybe shrimp on slabs. |
| 21-Sep | 20.36.42 | -15.08110 | -173.55477 | 761 | 4 | 107 | Shrimp all over. |
| 21-Sep | 20.37.39 | -15.08109 | -173.55478 | 761 | 5 | 111 | Sulfur flows in layer with block that has fallen down. Shrimp everywhere. |
| 21-Sep | 20.38.08 | -15.08110 | -173.55480 | 763 | 4 | 104 | Sonar looks like we may be inside the pit. |
| 21-Sep | 20.38.39 | -15.08109 | -173.55479 | 763 | 4 | 101 | HD zoom in on shrimp. |
| 21-Sep | 20.38.53 | -15.08111 | -173.55480 | 763 | 4 | 103 | Looks like a different shrimp than W. Mata. |
| 21-Sep | 20.39.28 | -15.08110 | -173.55480 | 763 | 4 | 102 | See gas holes in the sulfur. |
| 21-Sep | 20.40.19 | -15.08109 | -173.55479 | 763 | 4 | 102 | Will try to get some of these shrimp in the shrimp jar. |
| 21-Sep | 20.40.20 | -15.08109 | -173.55480 | 763 | 4 | 102 | Lip has sulfur teeth. Looks like what was dredged last year. |
| 21-Sep | 20.41.09 | -15.08109 | -173.55478 | 762 | 4 | 103 | Seeing shelving on the left rock so pieces of a former sulfur lake or pond. |
| 21-Sep | 20.42.12 | -15.08110 | -173.55478 | 762 | 4 | 102 | Preparing for a shrimp sample. Crab with shrimp moving out of its way. |
| 21-Sep | 20.42.54 | -15.08111 | -173.55480 | 763 | 3 | 107 | HD tape on.22:42-22:43. |
| 21-Sep | 20.43.06 | -15.08110 | -173.55479 | 763 | 3 | 108 | Nice view of crab. Would like to try to get it as well but priority is the shrimp. |
| 21-Sep | 20.43.59 | -15.08110 | -173.55480 | 765 | 2 | 97 | Lots of shrimp being displaced by ROV landing. Eelfish. |
| 21-Sep | 20.46.42 | -15.08109 | -173.55480 | 765 | 1 | 97 | Mussels here as well in HD. Eelfish with tiger markings. |
| 21-Sep | 20.47.00 | -15.08109 | -173.55479 | 766 | 1 | 97 | Want the sample to go into the bucket with the lid. |
| 21-Sep | 20.48.13 | -15.08109 | -173.55480 | 766 | 1 | 97 | Opening the bucket. |
| 21-Sep | 20.48.50 | -15.08109 | -173.55480 | 766 | 1 | 98 | Iris is down. Lasers on. Size of mussels is about 8cm. |
| 21-Sep | 20.50.13 | -15.08110 | -173.55479 | 765 | 1 | 97 | Arm reaching for the slurper. |
| 21-Sep | 20.50.39 | -15.08110 | -173.55480 | 765 | 1 | 98 | Slurper in HD view. |
| 21-Sep | 20.51.40 | -15.08109 | -173.55479 | 765 | 1 | 98 | Slurping. Not going in yet. |
| 21-Sep | 20.52.55 | -15.08109 | -173.55478 | 766 | 1 | 97 | Slurper not sucking. |

| date | time | latitude | longitude | Z | alt | hdg | Q330 - Niua North Dive Comments |
|---|---|---|---|---|---|---|---|
| 21-Sep | 20.53.17 | -15.08110 | -173.55480 | 765 | 1 | 98 | Working - saw it go in. Went out again. |
| 21-Sep | 20.54.25 | -15.08109 | -173.55478 | 765 | 1 | 96 | Seen a few go in. |
| 21-Sep | 20.54.50 | -15.08110 | -173.55479 | 766 | 1 | 97 | Moving slightly for a better patch of shrimp. |
| 21-Sep | 20.55.49 | -15.08110 | -173.55477 | 765 | 1 | 98 | **Bio Sample: Q330-biomacro-01.** Placed suction hose in shrimp. Got the crab and a shrimp. Crab in slurp chamber #1. At landing site in a former sulfur pond/lake. |
| 21-Sep | 20.59.26 | -15.08110 | -173.55479 | 765 | 1 | 97 | Slurp rotation having difficulty. |
| 21-Sep | 21.03.28 | -15.08110 | -173.55478 | 765 | 1 | 98 | Continue to suction and saw a few more go in the tube. |
| 21-Sep | 21.04.26 | -15.08110 | -173.55478 | 765 | 1 | 98 | Jar has not been rotated. Trying to slurp the mussel. |
| 21-Sep | 21.04.47 | -15.08110 | -173.55478 | 765 | 1 | 97 | Dead mussel - don't want it. |
| 21-Sep | 21.06.20 | -15.08110 | -173.55478 | 765 | 1 | 93 | Still working on the slurp chambers and rotation. |
| 21-Sep | 21.08.18 | -15.08110 | -173.55478 | 765 | 1 | 74 | Maybe something went into the jar. |
| 21-Sep | 21.08.19 | -15.08110 | -173.55478 | 765 | 1 | 74 | Tiger striped fish again. |
| 21-Sep | 21.10.53 | -15.08110 | -173.55479 | 0 | 0 | 0 | Crab moved across the HD view. |
| 21-Sep | 21.11.53 | -15.08110 | -173.55478 | 765 | 1 | 74 | Rotator is not working so use the same chamber or the lidded bucket for this sample. |
| 21-Sep | 21.13.08 | -15.08110 | -173.55480 | 765 | 1 | 73 | Going to try to slurp one at a time and put into the lidded bucket. |
| 21-Sep | 21.14.09 | -15.08110 | -173.55478 | 764 | 2 | 44 | Looking for more shrimp so moving around a bit. |
| 21-Sep | 21.15.20 | -15.08109 | -173.55477 | 765 | 1 | 85 | Lots of crab on the finer sediment. |
| 21-Sep | 21.15.49 | -15.08108 | -173.55476 | 765 | 1 | 85 | Slurping more. |
| 21-Sep | 21.16.12 | -15.08108 | -173.55476 | 764 | 1 | 86 | Attempting to put in the lidded bucket. |
| 21-Sep | 21.16.57 | -15.08108 | -173.55475 | 765 | 1 | 86 | **Bio Sample: Q330-biomacro-02**. Seeing shrimp in the bucket. Looks like some pieces of sulfur with the shrimp. |
| 21-Sep | 21.19.18 | -15.08108 | -173.55477 | 764 | 1 | 85 | Still slurping. Going to try to put some more in the bio bucket. |
| 21-Sep | 21.20.55 | -15.08108 | -173.55475 | 764 | 1 | 85 | Something went into the bucket and could see at least 4 inside. |
| 21-Sep | 21.21.38 | -15.08108 | -173.55476 | 765 | 1 | 85 | Slurping again. Going to reposition the ROV again for more shrimp abundance. |
| 21-Sep | 21.23.44 | -15.08109 | -173.55477 | 764 | 1 | 86 | Looks like a piece of pumice in the HD view within the sampling area next to the sulfur. |
| 21-Sep | 21.24.34 | -15.08109 | -173.55476 | 765 | 1 | 86 | Moving over to the bucket. |
| 21-Sep | 21.25.30 | -15.08109 | -173.55476 | 765 | 1 | 85 | More went into the bucket. |
| 21-Sep | 21.26.15 | -15.08108 | -173.55477 | 0 | 0 | 0 | Will try one more slurp and repositioning. |
| 21-Sep | 21.26.44 | -15.08110 | -173.55477 | 764 | 2 | 78 | Seeing sulfur formations in layers and many gas vesicles with lineations from the lake draining. |
| 21-Sep | 21.28.26 | -15.08110 | -173.55477 | 764 | 2 | 92 | Driving with suction pointed down. Slurping. |
| 21-Sep | 21.34.24 | -15.08109 | -173.55475 | 763 | 1 | 96 | Moving over to the bucket to reverse flow. |
| 21-Sep | 21.35.04 | -15.08110 | -173.55474 | 763 | 1 | 96 | More shrimp went into the bucket. |
| 21-Sep | 21.36.04 | -15.08109 | -173.55474 | 763 | 1 | 97 | Can see many shrimp in the bucket. Going to try one more time. |
| 21-Sep | 21.36.42 | -15.08110 | -173.55475 | 763 | 1 | 96 | Looks like they sucked an eel or fish. Moving over to the bucket. |
| 21-Sep | 21.37.09 | -15.08110 | -173.55476 | 764 | 1 | 96 | See the fish in the hose. |
| 21-Sep | 21.37.33 | -15.08110 | -173.55475 | 764 | 1 | 96 | Got the fish in the bucket. Bummer-fish swam out. |
| 21-Sep | 21.38.43 | -15.08110 | -173.55474 | 763 | 1 | 96 | Been on the bottom for about an hour. |
| 21-Sep | 21.39.27 | -15.08110 | -173.55474 | 763 | 1 | 96 | Trying for a few more shrimp with slurper. |
| 21-Sep | 21.41.21 | -15.08110 | -173.55475 | 764 | 1 | 96 | Reversing into the bucket again. |
| 21-Sep | 21.41.42 | -15.08109 | -173.55475 | 764 | 1 | 96 | Slurping a little bit more. |
| 21-Sep | 21.43.06 | -15.08109 | -173.55474 | 763 | 1 | 97 | See bright yellow sulfur where scraped with the slurper. Haven't seen any venting. |
| 21-Sep | 21.43.39 | -15.08109 | -173.55475 | 764 | 1 | 97 | Moving back over to the bucket. Looks like a few more went in. |
| 21-Sep | 21.46.03 | -15.08109 | -173.55475 | 763 | 1 | 96 | Slurped a fish. |
| 21-Sep | 21.46.26 | -15.08109 | -173.55476 | 764 | 1 | 95 | Trying to put the fish in the bucket. |
| 21-Sep | 21.46.58 | -15.08108 | -173.55474 | 764 | 1 | 96 | Swam out. Done sampling. May be some crabs and sulfur. |
| 21-Sep | 21.47.37 | -15.08109 | -173.55475 | 763 | 1 | 96 | Stowing the slurp hose |
| 21-Sep | 21.49.35 | -15.08109 | -173.55474 | 0 | 0 | 0 | Slurp hose is secured. |
| 21-Sep | 21.50.03 | -15.08109 | -173.55475 | 764 | 1 | 96 | Going to close the lid. Still see some shrimp in the bucket. |
| 21-Sep | 21.50.42 | -15.08109 | -173.55475 | 764 | 1 | 96 | Lid is closed. |
| 21-Sep | 21.51.51 | -15.08109 | -173.55474 | 762 | 3 | 96 | Going to get some HD of the area. Layered sulfur. |
| 21-Sep | 21.52.05 | -15.08112 | -173.55475 | 762 | 2 | 96 | HD tape on. |
| 21-Sep | 21.52.23 | -15.08113 | -173.55476 | 762 | 2 | 97 | DSCs |
| 21-Sep | 21.53.04 | -15.08112 | -173.55474 | 0 | 0 | 0 | Zooming in on shrimp. Two species of shrimp (red & white). |
| 21-Sep | 21.53.25 | -15.08112 | -173.55475 | 762 | 1 | 96 | Paralomis (?) crab. |
| 21-Sep | 21.54.04 | -15.08112 | -173.55474 | 762 | 3 | 101 | Crab captured another crab or mating/eating. |
| 21-Sep | 21.54.59 | -15.08110 | -173.55479 | 761 | 3 | 107 | Mussel nearby as well. |
| 21-Sep | 21.55.24 | -15.08112 | -173.55474 | 0 | 0 | 0 | Moving along. |

| date | time | latitude | longitude | Z | alt | hdg | Q330 - Niua North Dive Comments |
|---|---|---|---|---|---|---|---|
| 21-Sep | 21.55.59 | -15.08112 | -173.55474 | 759 | 4 | 107 | Drift structures on the sulfurs. |
| 21-Sep | 21.56.37 | -15.08112 | -173.55474 | 760 | 3 | 107 | Well-developed eye stalks and upturned rostrum on shrimp. |
| 21-Sep | 21.57.00 | -15.08113 | -173.55471 | 760 | 2 | 114 | Close-up of Paralomis (?) crab. |
| 21-Sep | 21.57.14 | -15.08112 | -173.55472 | 760 | 2 | 114 | There is a crab in the tube of the slurper. |
| 21-Sep | 21.58.36 | -15.08112 | -173.55470 | 760 | 2 | 114 | Turned the slurper on and the crab looked like it went into the chamber with hopefully **biomacro-01**. |
| 21-Sep | 21.59.33 | -15.08112 | -173.55470 | 760 | 2 | 122 | Can see microbes growing on shrimp carapace-farming microbes. |
| 21-Sep | 22.00.31 | -15.08112 | -173.55471 | 760 | 3 | 130 | White coating on rocks looks like microbial mat on top of the sulfur. |
| 21-Sep | 22.01.16 | -15.08112 | -173.55470 | 759 | 3 | 132 | Mussel looks alive. |
| 21-Sep | 22.01.49 | -15.08112 | -173.55471 | 759 | 3 | 138 | HD off. |
| 21-Sep | 22.02.30 | -15.08110 | -173.55469 | 758 | 3 | 152 | Darker rock is probably rhyolite within the sulfur. |
| 21-Sep | 22.02.42 | -15.08111 | -173.55469 | 758 | 3 | 181 | Turning south to get a good sonar image of the site. |
| 21-Sep | 22.03.13 | -15.08110 | -173.55469 | 758 | 3 | 100 | 3 tubeworms with plumes. |
| 21-Sep | 22.03.47 | -15.08109 | -173.55468 | 759 | 3 | 32 | Looking at the tubeworms. |
| 21-Sep | 22.04.54 | -15.08109 | -173.55468 | 758 | 3 | 104 | Going to get HD before sampling of the tubeworms. |
| 21-Sep | 22.05.37 | -15.08110 | -173.55468 | 759 | 3 | 107 | Awesome image. HD on. |
| 21-Sep | 22.06.02 | -15.08110 | -173.55468 | 758 | 3 | 109 | Great HD of the tops of the tubeworms. Look different than Lau Basin. Plume structure morphology can help identify the species. |
| 21-Sep | 22.07.15 | -15.08110 | -173.55469 | 758 | 4 | 112 | Shrimp on top of the tubeworm imagery. |
| 21-Sep | 22.07.27 | -15.08109 | -173.55469 | 758 | 4 | 112 | Opening up a little more. When see the tendrils it is almost all the ways extended. HD off. |
| 21-Sep | 22.08.19 | -15.08109 | -173.55470 | 759 | 4 | 113 | Looking around at the best method to sample these tubeworms and then place them in the biobox. Maybe they are on a rock that could be more easily picked up. |
| 21-Sep | 22.09.30 | -15.08110 | -173.55467 | 758 | 2 | 141 | Gray part on the top is a cap to close them. |
| 21-Sep | 22.10.00 | -15.08110 | -173.55466 | 758 | 2 | 141 | Tube and cap are chitonous (sp?). |
| 21-Sep | 22.11.19 | -15.08110 | -173.55466 | 758 | 1 | 142 | Tubes look clean and smooth and straight. |
| 21-Sep | 22.12.01 | -15.08111 | -173.55465 | 759 | 1 | 141 | HD just off (had been on). |
| 21-Sep | 22.12.45 | -15.08111 | -173.55466 | 758 | 2 | 142 | Arm reaching for the tubeworms. |
| 21-Sep | 22.13.56 | -15.08111 | -173.55465 | 759 | 2 | 142 | Excavating a nearby rock to have better access to the tubeworms. Have not seen any shimmer. |
| 21-Sep | 22.14.51 | -15.08110 | -173.55467 | 758 | 2 | 142 | Tubeworms have all closed up during this process. |
| 21-Sep | 22.16.08 | -15.08110 | -173.55467 | 759 | 1 | 141 | May be some old tubes nearby. |
| 21-Sep | 22.16.47 | -15.08111 | -173.55465 | 758 | 1 | 142 | Mobile fauna may be more successful than the sessile ones such as the tubeworms in this environment. |
| 21-Sep | 22.17.20 | -15.08111 | -173.55466 | 758 | 1 | 142 | Grabbing through unconsolidated material. Not seeing any blood. |
| 21-Sep | 22.18.04 | -15.08111 | -173.55466 | 758 | 1 | 141 | These had more roots than expected. Close-up in HD. |
| 21-Sep | 22.18.21 | -15.08111 | -173.55466 | 759 | 1 | 141 | Seeing some blood coming out the far left. Will attract the crabs. |
| 21-Sep | 22.18.55 | -15.08111 | -173.55466 | 758 | 1 | 142 | **Biology Sample: Q330-biomacro-03**. Tubeworms with roots in the sulfur patch. HD is on 22:18. |
| 21-Sep | 22.19.47 | -15.08111 | -173.55467 | 759 | 1 | 141 | Taking HD of the terminus end (root) before putting into the biobox. HD off 22:19. |
| 21-Sep | 22.23.00 | -15.08111 | -173.55465 | 759 | 1 | 141 | Put tubeworms in biobox #13. (Note: Davis #9 is in stbd box). |
| 21-Sep | 22.23.09 | -15.08111 | -173.55465 | 759 | 1 | 142 | Looked like 3 tubeworms. |
| 21-Sep | 22.23.53 | -15.08111 | -173.55466 | 756 | 3 | 136 | Coming off bottom again at 136deg. |
| 21-Sep | 22.24.17 | -15.08112 | -173.55465 | 756 | 4 | 135 | HD on 22:24. Coming upslope looking at ledge. |
| 21-Sep | 22.24.53 | -15.08114 | -173.55464 | 753 | 4 | 135 | Looked like a sulfur blister as came out of the pit. |
| 21-Sep | 22.25.14 | -15.08117 | -173.55463 | 751 | 3 | 108 | Now traversing over sediment with sulfur and country rock (rhyolite). |
| 21-Sep | 22.25.58 | -15.08117 | -173.55460 | 748 | 4 | 72 | DSCs as swing left and over rhyolite. Less sulfur and not much bio on the rocks but one cluster of shrimp and mussels. |
| 21-Sep | 22.26.23 | -15.08117 | -173.55457 | 747 | 4 | 98 | Still downslope and seeing many mussels. |
| 21-Sep | 22.26.31 | -15.08117 | -173.55457 | 746 | 4 | 99 | Smoke in a nearby pit coming out of the side and more than one. |
| 21-Sep | 22.26.53 | -15.08121 | -173.55456 | 748 | 4 | 95 | Looks slow and dense smoke. |
| 21-Sep | 22.27.16 | -15.08123 | -173.55459 | 749 | 3 | 98 | Well-defined where the smoke is coming out. |
| 21-Sep | 22.27.30 | -15.08125 | -173.55461 | 749 | 3 | 103 | Several sources of smoke with sulfur flows. WOW. |
| 21-Sep | 22.27.48 | -15.08127 | -173.55463 | 751 | 3 | 116 | WOW. |
| 21-Sep | 22.28.03 | -15.08128 | -173.55463 | 751 | 4 | 112 | Focused areas of the flow. |
| 21-Sep | 22.29.02 | -15.08132 | -173.55460 | 0 | 0 | 0 | Large smoke area and seeing sonar targets ahead. |
| 21-Sep | 22.29.29 | -15.08133 | -173.55460 | 753 | 2 | 106 | Smoke is blowing away from this heading of 106. |
| 21-Sep | 22.29.46 | -15.08132 | -173.55460 | 752 | 3 | 106 | No biology seen here could be low pH. |
| 21-Sep | 22.30.14 | -15.08132 | -173.55460 | 752 | 3 | 106 | Seeing puffs of yellow in center. |
| 21-Sep | 22.30.34 | -15.08133 | -173.55461 | 753 | 2 | 122 | Bright yellow indicates temperature above melting point of sulfur. |
| 21-Sep | 22.31.09 | -15.08132 | -173.55461 | 753 | 2 | 99 | There was some biology away from the smoke. |

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|---|---|---|---|---|---|---|---|
| 21-Sep | 22.31.23 | -15.08133 | -173.55460 | 0 | 0 | 0 | HD on the sulfur. Seeing gas bubbles. Chunks of sulfur. |
| 21-Sep | 22.31.55 | -15.08133 | -173.55460 | 754 | 2 | 89 | Now seeing some shrimp in the diffuse flow. |
| 21-Sep | 22.34.25 | -15.08133 | -173.55462 | 752 | 3 | 83 | Huge amount of gas and sulfur. |
| 21-Sep | 22.35.24 | -15.08136 | -173.55464 | 752 | 4 | 112 | Images of Hades with sulfurous gases coming out. |
| 21-Sep | 22.36.15 | -15.08140 | -173.55463 | 0 | 0 | 0 | Collapse areas within the pit. |
| 21-Sep | 22.38.35 | -15.08136 | -173.55460 | 0 | 0 | 0 | HD video on. |
| 21-Sep | 22.38.51 | -15.08135 | -173.55461 | 754 | 0 | 53 | Venting of sulfur from multiple orifices. Incredible. Looks like an easy place to sample. |
| 21-Sep | 22.39.33 | -15.08135 | -173.55458 | 0 | 0 | 0 | Looks like white bacterial mat here too. We're seeing evidence of life here. |
| 21-Sep | 22.40.23 | -15.08135 | -173.55459 | 754 | 0 | 53 | Something living here would be one of the extremes we see of life on earth. The fact that we see microbes here is amazing. |
| 21-Sep | 22.41.01 | -15.08135 | -173.55459 | 754 | 0 | 53 | Billowing sulfur gas coming out. |
| 21-Sep | 22.41.39 | -15.08135 | -173.55459 | 754 | 0 | 53 | See some bubbles coming out. |
| 21-Sep | 22.41.56 | -15.08135 | -173.55459 | 754 | 0 | 53 | Don't see any macrofauna right on the sulfur. |
| 21-Sep | 22.43.51 | -15.08135 | -173.55459 | 754 | 0 | 53 | Preparing to water sample here. |
| 21-Sep | 22.45.07 | -15.08135 | -173.55459 | 754 | 0 | 53 | SO2 coming out and reacts with the water; it disproportionates and makes sulfuric acid and elemental sulfur. |
| 21-Sep | 22.46.27 | -15.08135 | -173.55455 | 754 | 0 | 54 | Dave is on the horn now. |
| 21-Sep | 22.47.07 | -15.08134 | -173.55461 | 754 | 0 | 54 | The white appearance is defined by the native sulfur in this fluid. All the particles in this type of fluid is sulfur. The melting point of sulfur is about 150C. When the sulfur comes out in liquid form above 150C it will appear bright yellow. |
| 21-Sep | 22.49.05 | -15.08135 | -173.55458 | 0 | 0 | 0 | Have the temperature probe and preparing to stick the probe in a smoking orifice. The temperature was 112° C. |
| 21-Sep | 22.51.11 | -15.08134 | -173.55459 | 755 | 0 | 54 | Shrimp on the sulfur. |
| 21-Sep | 22.53.26 | -15.08136 | -173.55458 | 754 | 0 | 53 | Using temperature probe to prospect for sampling as well as temperature. |
| 21-Sep | 22.54.25 | -15.08135 | -173.55458 | 754 | 0 | 53 | Looking at this small orifice that has strong yellow smoke in center. |
| 21-Sep | 22.55.08 | -15.08135 | -173.55458 | 755 | 0 | 53 | See some wafting of white mat near smoke on rock. |
| 21-Sep | 22.55.55 | -15.08135 | -173.55458 | 755 | 0 | 53 | Only got up to 55°C . |
| 21-Sep | 22.56.39 | -15.08136 | -173.55458 | 754 | 0 | 53 | Saw a 76.8°C. |
| 21-Sep | 22.57.56 | -15.08136 | -173.55458 | 754 | 0 | 53 | Probing in another orifice. Got up to 54 at that one. Trying again same hole. |
| 21-Sep | 22.59.01 | -15.08135 | -173.55458 | 755 | 0 | 53 | Crab in suction hole again. Sucking down into chamber with **biomarco-01**. |
| 21-Sep | 23.00.16 | -15.08135 | -173.55458 | 754 | 0 | 53 | Stowing the temperature probe. |
| 21-Sep | 23.01.26 | -15.08135 | -173.55458 | 754 | 0 | 53 | Crab is trying to get out of the suction chamber. |
| 21-Sep | 23.02.42 | -15.08136 | -173.55459 | 754 | 0 | 53 | Temperature probe secured. |
| 21-Sep | 23.04.55 | -15.08135 | -173.55459 | 754 | 0 | 53 | Pilot change. |
| 21-Sep | 23.06.34 | -15.08135 | -173.55459 | 0 | 0 | 0 | Going to try to get a GTB from the basket. |
| 21-Sep | 23.06.53 | -15.08135 | -173.55461 | 754 | 0 | 53 | Sulfur balls in front of the smoke in HD close-up. |
| 21-Sep | 23.07.05 | -15.08136 | -173.55459 | 754 | 0 | 53 | Getting the blue GTB. |
| 21-Sep | 23.08.11 | -15.08136 | -173.55460 | 754 | 0 | 53 | Close-up in HD. Smoke is coming out of sulfur coated rock and not the sediments. |
| 21-Sep | 23.09.31 | -15.08135 | -173.55458 | 754 | 0 | 53 | Blue GTB removed from the basket. Put back down for a better grip. |
| 21-Sep | 23.13.00 | -15.08134 | -173.55459 | 754 | 0 | 53 | Nature of smoke is changing and current is wafting. |
| 21-Sep | 23.13.47 | -15.08135 | -173.55460 | 754 | 0 | 53 | Shrimp in tube. Sucked down. |
| 21-Sep | 23.13.58 | -15.08135 | -173.55459 | 754 | 0 | 53 | Still trying to grip the blue GTB. |
| 21-Sep | 23.14.23 | -15.08135 | -173.55460 | 755 | 0 | 53 | Excellent view of sampling orifice and waving mat. HD on. |
| 21-Sep | 23.15.12 | -15.08135 | -173.55459 | 754 | 0 | 53 | GTB out of the basket. |
| 21-Sep | 23.16.08 | -15.08135 | -173.55458 | 754 | 0 | 53 | Sulfur balls from the orifice as a liquid and then solidified to form balls.. HD off. |
| 21-Sep | 23.16.51 | -15.08135 | -173.55458 | 754 | 0 | 53 | Moving GTB into position. Current is moving slightly. |
| 21-Sep | 23.17.56 | -15.08135 | -173.55460 | 754 | 0 | 53 | Intake into the hole. Zooming in. |
| 21-Sep | 23.19.19 | -15.08135 | -173.55458 | 755 | 0 | 53 | Fired and slightly dislodged the rock. |
| 21-Sep | 23.20.33 | -15.08134 | -173.55459 | 754 | 0 | 53 | **Gas Sample: Q330-GTB-04**. From the hole with a high temp of 112°C. Yellow and white smoke with sulfur balls in front of hole on sediment. Blue GTB. |
| 21-Sep | 23.21.11 | -15.08135 | -173.55460 | 754 | 0 | 53 | Storing GTB in basket. |
| 21-Sep | 23.21.37 | -15.08135 | -173.55459 | 754 | 0 | 53 | Smoke is wafting back toward ROV. |
| 21-Sep | 23.22.23 | -15.08133 | -173.55460 | 754 | 1 | 53 | Covered in smoke. Calling this site is **Hellow.** (Hell+Yellow) |
| 21-Sep | 23.24.43 | -15.08134 | -173.55460 | 754 | 1 | 53 | Retrieving the white major from the basket. |
| 21-Sep | 23.25.14 | -15.08134 | -173.55459 | 0 | 0 | 0 | Still in the same place but covered in smoke to the front. |
| 21-Sep | 23.26.39 | -15.08134 | -173.55459 | 754 | 1 | 53 | Preparing the major in the arm for firing. |
| 21-Sep | 23.27.51 | -15.08134 | -173.55459 | 754 | 1 | 49 | Trying to relocate the same vent. |
| 21-Sep | 23.29.49 | -15.08135 | -173.55461 | 754 | 1 | 43 | Smoke direction is improving. |

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|---|---|---|---|---|---|---|---|
| 21-Sep | 23.30.48 | -15.08134 | -173.55460 | 754 | 0 | 48 | There it is again. Slightly different heading but same place. |
| 21-Sep | 23.31.36 | -15.08134 | -173.55461 | 754 | 0 | 48 | Moving major into position. Dislodging the rock. |
| 21-Sep | 23.33.13 | -15.08134 | -173.55461 | 755 | 0 | 47 | Position is good. Firing and seeing the sample filling up. |
| 21-Sep | 23.33.30 | -15.08135 | -173.55459 | 754 | 0 | 47 | **Fluid sample: Q330-major-05**. White major at same place as GTB-04. |
| 21-Sep | 23.33.44 | -15.08134 | -173.55460 | 754 | 0 | 47 | HD on and iris down. |
| 21-Sep | 23.35.03 | -15.08135 | -173.55462 | 755 | 0 | 47 | HD tape off. |
| 21-Sep | 23.36.05 | -15.08134 | -173.55461 | 755 | 0 | 47 | Will stow this major and would like to take another. |
| 21-Sep | 23.37.30 | -15.08134 | -173.55461 | 755 | 0 | 47 | Seen some bubbles in the pilot cam upper left. Must be some CO2. |
| 21-Sep | 23.38.25 | -15.08134 | -173.55462 | 755 | 0 | 47 | Can't stow the major because too much smoke in front of the ROV. |
| 21-Sep | 23.39.22 | -15.08133 | -173.55462 | 755 | 0 | 47 | Current shifted so we can see what we're doing. Looks like the tray is over the top of another vent. |
| 21-Sep | 23.40.47 | -15.08134 | -173.55463 | 754 | 1 | 48 | Pulling vehicle back a little to get out of the cloud. |
| 21-Sep | 23.41.06 | -15.08134 | -173.55461 | 754 | 1 | 47 | Major is back in the holster. |
| 21-Sep | 23.42.06 | -15.08134 | -173.55461 | 754 | 1 | 47 | Joe has picture of sonar. Hdg is 047. |
| 21-Sep | 23.43.37 | -15.08134 | -173.55462 | 754 | 1 | 48 | Retrieving the blue major. |
| 21-Sep | 23.45.05 | -15.08134 | -173.55461 | 0 | 0 | 0 | Have the blue major in the arm and rotating to get the trigger into position. |
| 21-Sep | 23.46.34 | -15.08134 | -173.55462 | 754 | 1 | 48 | Heavy billows of sulfur in HD view of center of plume (very vigorous). |
| 21-Sep | 23.48.33 | -15.08134 | -173.55460 | 754 | 0 | 47 | Current change and in smoke again. |
| 21-Sep | 23.49.58 | -15.08134 | -173.55460 | 754 | 0 | 48 | Smoke has cleared and the same vent ahead. |
| 21-Sep | 23.53.33 | -15.08133 | -173.55461 | 754 | 0 | 47 | Rock displaced and changing the flow out of it. |
| 21-Sep | 23.54.53 | -15.08134 | -173.55461 | 754 | 0 | 47 | Rock looks like a cork to the main hole. |
| 21-Sep | 23.55.54 | -15.08134 | -173.55461 | 754 | 0 | 48 | Nozzle in and pushing ram. Not seeing spring move. |
| 21-Sep | 23.56.27 | -15.08134 | -173.55461 | 754 | 0 | 47 | Moving rock around again. Seeing more flow under rock. |
| 21-Sep | 23.57.06 | -15.08134 | -173.55461 | 754 | 0 | 47 | Spring has come up but not fully. Keeping pushing on ram to get full extension. Pushing again looks like it worked. |
| 21-Sep | 23.57.38 | -15.08134 | -173.55461 | 754 | 0 | 47 | **Fluid Sample: Q330-major-06**. Blue major taken at same orifice at Hellow with some excavating of the rock. |
| 22-Sep | 00.01.42 | -15.08134 | -173.55461 | 754 | 0 | 47 | Storing the major. |
| 22-Sep | 00.03.47 | -15.08135 | -173.55461 | 754 | 1 | 47 | Came off bottom to get out of smoke. |
| 22-Sep | 00.04.40 | -15.08135 | -173.55462 | 753 | 1 | 47 | Can see in pilot cam the other sulfur vents. Storing the blue major. |
| 22-Sep | 00.05.43 | -15.08135 | -173.55462 | 753 | 1 | 47 | **Note Bob says the first landing location was not a pit but a ledge with sulfur pond/lake features. |
| 22-Sep | 00.06.22 | -15.08135 | -173.55460 | 754 | 1 | 47 | Seeing vigorous yellow smoke in center of this billowing pit. |
| 22-Sep | 00.07.03 | -15.08135 | -173.55460 | 754 | 0 | 47 | Intending to pick up the rock where sampling and put it in the biobox. |
| 22-Sep | 00.07.17 | -15.08135 | -173.55460 | 754 | 0 | 48 | Arm reaching for the rock which is covered in bacterial mat. |
| 22-Sep | 00.07.54 | -15.08135 | -173.55461 | 754 | 0 | 47 | Smoke has obscured the view once again. |
| 22-Sep | 00.09.36 | -15.08135 | -173.55462 | 754 | 0 | 48 | Waiting for current shift. Puff on rock was when the other rock was pushed. |
| 22-Sep | 00.13.41 | -15.08135 | -173.55462 | 754 | 0 | 47 | More smoke with particles wafting by. |
| 22-Sep | 00.15.46 | -15.08134 | -173.55460 | 754 | 0 | 48 | Might be too big for the claw. Lost visibility again. |
| 22-Sep | 00.17.19 | -15.08134 | -173.55460 | 753 | 1 | 47 | Backing out. |
| 22-Sep | 00.18.22 | -15.08135 | -173.55462 | 754 | 1 | 48 | Moved back and can see bottom but still too smoky. |
| 22-Sep | 00.20.24 | -15.08136 | -173.55469 | 752 | 3 | 49 | Can't see a thing. |
| 22-Sep | 00.20.45 | -15.08135 | -173.55470 | 753 | 3 | 45 | Can see now. |
| 22-Sep | 00.21.36 | -15.08135 | -173.55471 | 754 | 3 | 47 | Seeing large slabs of sulfur but still very smoky. |
| 22-Sep | 00.22.17 | -15.08134 | -173.55472 | 754 | 3 | 49 | Backing up and going downslope so having let more wire out. |
| 22-Sep | 00.24.01 | -15.08130 | -173.55473 | 756 | 5 | 88 | Cleared up a little but then more smoke. |
| 22-Sep | 00.25.26 | -15.08131 | -173.55473 | 753 | 8 | 93 | Current is l-r or N-S as we are facing 092. |
| 22-Sep | 00.26.14 | -15.08125 | -173.55475 | 754 | 8 | 91 | When we see the bottom is it sulfur crusts? |
| 22-Sep | 00.27.21 | -15.08122 | -173.55477 | 759 | 5 | 92 | Sonar showing a wall or slope in front of us. Backing up and moving north. |
| 22-Sep | 00.28.16 | -15.08119 | -173.55493 | 768 | 4 | 91 | Lots of shrimp here on sulfur crust. |
| 22-Sep | 00.28.59 | -15.08119 | -173.55496 | 769 | 6 | 93 | Sonar shows some mounds ahead of us. |
| 22-Sep | 00.29.17 | -15.08118 | -173.55498 | 770 | 6 | 91 | As we backup the visibility has improved and looks like area where we landed. |
| 22-Sep | 00.32.53 | -15.08118 | -173.55500 | 774 | 5 | 82 | Currents have abated currently. |
| 22-Sep | 00.34.03 | -15.08116 | -173.55499 | 771 | 6 | 62 | Going to drive NE to see if can get out of the plume. |
| 22-Sep | 00.34.41 | -15.08115 | -173.55496 | 769 | 7 | 57 | Moving 057 upslope. Still in a haze. |
| 22-Sep | 00.36.09 | -15.08111 | -173.55494 | 769 | 3 | 58 | Looked like we passed over a sulfur chimney. |
| 22-Sep | 00.36.31 | -15.08108 | -173.55489 | 768 | 3 | 56 | Pumice and less sulfur (out of the pit). |
| 22-Sep | 00.37.06 | -15.08107 | -173.55486 | 765 | 3 | 58 | Sulfur here may have rolled down from something up ahead. |
| 22-Sep | 00.37.24 | -15.08104 | -173.55479 | 764 | 3 | 57 | Lots of pumice and is getting to be larger pieces. Lots of shrimp and maybe a tubeworm. |
| 22-Sep | 00.37.55 | -15.08101 | -173.55474 | 758 | 4 | 57 | Shell fragments of mussels from upslope presumably. |
| 22-Sep | 00.38.21 | -15.08099 | -173.55471 | 755 | 4 | 57 | Lava rock-not pumice. |

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| 22-Sep | 00.38.30 | -15.08098 | -173.55469 | 753 | 4 | 57 | Great visibility here. |
| 22-Sep | 00.39.44 | -15.08096 | -173.55464 | 751 | 5 | 93 | Now going to turn to the SSE. |
| 22-Sep | 00.40.13 | -15.08098 | -173.55461 | 750 | 5 | 94 | Some plume ahead. |
| 22-Sep | 00.40.27 | -15.08098 | -173.55459 | 749 | 4 | 103 | Coming up on the plume edge didn't get too far. |
| 22-Sep | 00.40.57 | -15.08099 | -173.55458 | 749 | 4 | 102 | Dead mussel shells. |
| 22-Sep | 00.41.16 | -15.08102 | -173.55455 | 746 | 4 | 133 | To stay out of the plume will drive along its edge. |
| 22-Sep | 00.42.14 | -15.08106 | -173.55453 | 738 | 10 | 133 | Visibility not good. |
| 22-Sep | 00.42.18 | -15.08106 | -173.55453 | 739 | 10 | 131 | Above the plume now and will try to go south while riding above. |
| 22-Sep | 00.43.12 | -15.08110 | -173.55459 | 740 | 14 | 132 | Driving over the sulfur plume presumably from a pit. |
| 22-Sep | 00.44.33 | -15.08115 | -173.55464 | 738 | 18 | 134 | Still driving above the clouds (plume). |
| 22-Sep | 00.44.57 | -15.08119 | -173.55464 | 737 | 19 | 134 | Current now going S-N. |
| 22-Sep | 00.45.23 | -15.08120 | -173.55463 | 737 | 18 | 135 | Going to try to follow edge of plume up-current. |
| 22-Sep | 00.46.14 | -15.08128 | -173.55459 | 736 | 18 | 121 | Plume is not rising up too high as we are 18m off bottom above the clouds. |
| 22-Sep | 00.46.42 | -15.08135 | -173.55455 | 740 | 13 | 115 | Looks like we are at edge of the sulfur venting area. |
| 22-Sep | 00.47.13 | -15.08136 | -173.55454 | 740 | 10 | 128 | Moving to upcurrent side. Lava tube. |
| 22-Sep | 00.49.00 | -15.08143 | -173.55469 | 741 | 17 | 54 | Still looking for a good up-current edge. |
| 22-Sep | 00.49.43 | -15.08145 | -173.55469 | 742 | 16 | 40 | Billowing plume. Very steep slope as we drive 110. |
| 22-Sep | 00.50.04 | -15.08149 | -173.55468 | 743 | 8 | 137 | Altered rock. Mussel shells. |
| 22-Sep | 00.50.32 | -15.08155 | -173.55465 | 742 | 9 | 278 | Turning 360deg. |
| 22-Sep | 00.51.16 | -15.08152 | -173.55474 | 750 | 6 | 359 | Sulfur crusts and shrimp (plates of sulfur). Quite a plume. |
| 22-Sep | 00.51.57 | -15.08150 | -173.55467 | 750 | 2 | 10 | Pumice and sulfur. Shrimp. |
| 22-Sep | 00.52.38 | -15.08146 | -173.55462 | 750 | 2 | 15 | Not a lot of room to land in here and the plume is billowing. |
| 22-Sep | 00.52.48 | -15.08146 | -173.55461 | 750 | 3 | 23 | In place rock to the right. |
| 22-Sep | 00.53.42 | -15.08143 | -173.55458 | 747 | 6 | 60 | Altered rock on the edge. Steep slope to right with in-place rock. |
| 22-Sep | 00.54.39 | -15.08138 | -173.55452 | 746 | 7 | 114 | Vent in side. CO2 bubbles. |
| 22-Sep | 00.55.22 | -15.08139 | -173.55448 | 746 | 5 | 154 | Plume not coming out of the big hole but above it. Shimmer to the left on the sulfur outcrop. |
| 22-Sep | 00.55.56 | -15.08139 | -173.55447 | 746 | 3 | 151 | Bubbles coming out of this one. |
| 22-Sep | 00.56.40 | -15.08139 | -173.55448 | 747 | 3 | 160 | Bullfrog sulfur with bubbles coming. |
| 22-Sep | 00.57.07 | -15.08140 | -173.55449 | 747 | 3 | 162 | HD on. |
| 22-Sep | 00.59.12 | -15.08139 | -173.55447 | 748 | 2 | 164 | HD off. |
| 22-Sep | 00.59.30 | -15.08140 | -173.55447 | 748 | 2 | 173 | There is a little crab settling in. |
| 22-Sep | 00.59.44 | -15.08140 | -173.55447 | 747 | 2 | 173 | HD on. |
| 22-Sep | 01.00.00 | -15.08140 | -173.55447 | 747 | 2 | 177 | There are bubbles visible in the background. |
| 22-Sep | 01.00.38 | -15.08139 | -173.55447 | 745 | 5 | 133 | HD off. |
| 22-Sep | 01.00.50 | -15.08139 | -173.55448 | 745 | 7 | 130 | Trying to find a place to set down and gather a microbial mat sample for Rick. |
| 22-Sep | 01.01.46 | -15.08142 | -173.55452 | 745 | 5 | 42 | We must be on the SE side of the pit here. It's quite steep upslope. |
| 22-Sep | 01.02.20 | -15.08142 | -173.55452 | 748 | 3 | 39 | This looks like a more feasible place to sample. |
| 22-Sep | 01.02.38 | -15.08142 | -173.55450 | 747 | 2 | 38 | Bubbles coming out of the lower part of this vent. |
| 22-Sep | 01.04.12 | -15.08141 | -173.55449 | 748 | 2 | 37 | Trying to get some of the mat and perhaps a piece of sulfur. |
| 22-Sep | 01.04.57 | -15.08141 | -173.55450 | 748 | 2 | 37 | Going to take one of the Davis samplers and scrape up some of the material in front of us. |
| 22-Sep | 01.05.32 | -15.08140 | -173.55449 | 748 | 2 | 35 | CO2 bubbles coming out of the vent. Sulfur plume wafting out of the holes in the solid sulfur. |
| 22-Sep | 01.07.28 | -15.08140 | -173.55449 | 748 | 2 | 42 | The debate is whether the CO2 bubbles are liquid or gas. Liquid CO2 bubbles are "sticky" - like the ones that stuck to the ROPOS arm at Eifuku. |
| 22-Sep | 01.09.07 | -15.08141 | -173.55450 | 748 | 2 | 44 | Repositioning again. |
| 22-Sep | 01.10.29 | -15.08141 | -173.55449 | 748 | 1 | 36 | HD on. |
| 22-Sep | 01.10.51 | -15.08142 | -173.55450 | 0 | 0 | 0 | The blue Davis sampler is coming out. |
| 22-Sep | 01.11.15 | -15.08140 | -173.55449 | 748 | 2 | 36 | Lupton believes the bubbles are liquid CO2 at this depth. |
| 22-Sep | 01.11.59 | -15.08141 | -173.55449 | 748 | 1 | 36 | HD off. |
| 22-Sep | 01.13.05 | -15.08141 | -173.55450 | 748 | 2 | 36 | The smaller Davis sampler is out. Sampler #9 (blue). |
| 22-Sep | 01.19.42 | -15.08140 | -173.55450 | 748 | 2 | 37 | Sulfur cloud obscured our vision. |
| 22-Sep | 01.25.53 | -15.08140 | -173.55450 | 748 | 2 | 37 | **Biology sample: Q330-biogeo-07**. Going for biological mat on the sulfur sediments just to the right of the solid sulfur with smoke pouring out. The dark sediments are sulfur dissolved in the water that precipitates. There are also yellow sulfur particles. The white is microbial mat. (SW? side to Hellow). Hellow area. |

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| 22-Sep | 01.20.47 | -15.08140 | -173.55450 | 748 | 1 | 37 | Looking at the sonar image of the pit it **would put us ~30m to the SW of the AUV map.** Our depth agrees well with the AUV map (and EM122 map - if the ROV put us in the proper place). Our position is about 30m to the SW on the nav screen of where we actually are (and the contours to the SW put us deeper). |
| 22-Sep | 01.26.54 | -15.08140 | -173.55449 | 748 | 2 | 37 | HD off 1 minute ago. |
| 22-Sep | 01.31.25 | -15.08141 | -173.55449 | 748 | 2 | 37 | *THE MAP SHOULD BE MOVED 30M TO THE SW TO AGREE WITH THE ROV NAV AND DEPTHS. OR THE ROV POSITION SHOULD BE MOVED 30M NE TO AGREE WITH THE MAP.* |
| 22-Sep | 01.37.08 | -15.08140 | -173.55450 | 748 | 1 | 37 | Stowing the Davis sampler 9 in container 13. Looks like the tubeworms that were there earlier are no longer in the container. |
| 22-Sep | 01.39.04 | -15.08140 | -173.55450 | 747 | 3 | 37 | Going to head to the south to look at a mound visible in the AUV data. |
| 22-Sep | 01.40.18 | -15.08141 | -173.55451 | 729 | 20 | 36 | No visibility. |
| 22-Sep | 01.42.08 | -15.08143 | -173.55452 | 716 | 29 | 153 | The occasional shrimp showing up in the HD cam. |
| 22-Sep | 01.42.39 | -15.08146 | -173.55454 | 725 | 23 | 184 | Also seeing lots of particles in the plume. |
| 22-Sep | 01.43.28 | -15.08157 | -173.55467 | 735 | 19 | 188 | Crazy sulfur balls in the HD cam. Is it sulfur particles or bubbles. We're 13m above the seafloor. |
| 22-Sep | 01.50.29 | -15.08160 | -173.55484 | 747 | 19 | 86 | We're down on the seafloor again. |
| 22-Sep | 01.51.03 | -15.08158 | -173.55471 | 747 | 9 | 91 | Looks like rock on the seafloor; not pumice. |
| 22-Sep | 01.51.30 | -15.08158 | -173.55468 | 743 | 12 | 91 | The rock on this big knob may be what is forming this seamount. |
| 22-Sep | 01.53.12 | -15.08158 | -173.55463 | 747 | 4 | 109 | Lots of shrimp on the rocks. They are fleeing. |
| 22-Sep | 01.53.56 | -15.08159 | -173.55463 | 749 | 2 | 120 | **Geology Sample: Q330-rock-08**. Angular fragment of rock. It's crumbly. Probably dacite. Manganese coated. (Discrepancy whether in tube #2 or #4). |
| 22-Sep | 01.57.46 | -15.08159 | -173.55463 | 748 | 2 | 116 | HD on. Zoom of shrimp on the rocks. Seeing 2 species here at least. Big red species here. Big snail we saw yesterday is also there. |
| 22-Sep | 02.01.07 | -15.08158 | -173.55464 | 748 | 2 | 115 | See small sulfur balls on the rocks. The shrimp are grazing on the rocks. The big red shrimp looks like the Alvinocaris shrimp. The smaller ones are unidentifiable in the HD. |
| 22-Sep | 02.02.37 | -15.08158 | -173.55465 | 748 | 2 | 115 | A bit of smoke coming through. |
| 22-Sep | 02.02.54 | -15.08158 | -173.55465 | 749 | 2 | 115 | HD off. |
| 22-Sep | 02.03.36 | -15.08158 | -173.55463 | 748 | 2 | 115 | The slurper is on. The lid has been removed from the shrimp bucket. The shrimp seem to be staying in the bucket. The lid of the bucket is broken. |
| 22-Sep | 02.05.40 | -15.08158 | -173.55464 | 748 | 2 | 115 | This will be a mixed sample because these shrimp will go into the same bucket as the previous sample (biomacro-02). |
| 22-Sep | 02.06.57 | -15.08158 | -173.55463 | 748 | 2 | 115 | "Conger" eel. Like one at least. They are very aggressive. |
| 22-Sep | 02.08.46 | -15.08158 | -173.55463 | 0 | 0 | 0 | The problem is that the ROV can only do big manipulations with the stbd arm. Still messing with the suction hose…… |
| 22-Sep | 02.10.08 | -15.08159 | -173.55463 | 749 | 2 | 115 | The yellow thing is possibly a mussel. |
| 22-Sep | 02.11.27 | -15.08158 | -173.55464 | 749 | 2 | 115 | The slurp gun is out and on. |
| 22-Sep | 02.11.32 | -15.08158 | -173.55464 | 748 | 2 | 115 | **Biology sample: Q330-biomacro-09**. Slurped up at least 1 shrimp. Putting it in the shrimp bucket with the other shrimp. This is a mixed sample in the bucket with sample 2. |
| 22-Sep | 02.14.37 | -15.08159 | -173.55464 | 0 | 0 | 0 | The other shrimp are starting to get out. This is not ideal; to say the least. |
| 22-Sep | 02.17.20 | -15.08158 | -173.55463 | 748 | 2 | 116 | Beautiful shot of the shrimp. |
| 22-Sep | 02.19.10 | -15.08158 | -173.55463 | 748 | 2 | 117 | They are closing the lid on the bucket. There were still shrimp in the bucket when the lid went down. |
| 22-Sep | 02.22.46 | -15.08158 | -173.55463 | 0 | 0 | 0 | HD on. Backing out a bit to see the aggregation of shrimp. |
| 22-Sep | 02.28.31 | -15.08157 | -173.55467 | 747 | 6 | 117 | Moving on up the hill now. |
| 22-Sep | 02.29.15 | -15.08160 | -173.55466 | 743 | 5 | 127 | Beautiful columnar jointing. Big cooling joints. Still lots of life and some bacterial mat. Paralomis crab and mussels. |
| 22-Sep | 02.31.21 | -15.08173 | -173.55460 | 731 | 3 | 92 | Lots of shrimp here; Paralomis crabs. Bacterial mat here or sulfur. |
| 22-Sep | 02.32.06 | -15.08174 | -173.55453 | 0 | 0 | 0 | Talus (black stuff) with some pumice in there. Tim sees mussels on that rock. |
| 22-Sep | 02.33.37 | -15.08174 | -173.55432 | 723 | 3 | 108 | Still seeing shrimp and sulfur sediments. |
| 22-Sep | 02.34.17 | -15.08175 | -173.55425 | 720 | 2 | 87 | See a clump of mussels and bacterial mat. |
| 22-Sep | 02.34.42 | -15.08176 | -173.55420 | 720 | 2 | 92 | HD on and zooming in. |
| 22-Sep | 02.34.58 | -15.08175 | -173.55421 | 720 | 2 | 103 | Tim thinks the whole group is alive. There is a big white snail; a red crab; some shrimp; and live mussels. Actually lots of shrimp on these rocks. Conger eels in the area. |
| 22-Sep | 02.37.26 | -15.08176 | -173.55420 | 721 | 1 | 110 | Great image of the biology and geology in this area. |
| 22-Sep | 02.38.19 | -15.08176 | -173.55419 | 720 | 1 | 110 | We'll put the net back of the biobox where the tubeworms used to be. |
| 22-Sep | 02.40.13 | -15.08176 | -173.55420 | 721 | 1 | 110 | Probably some sulfurous gas leaking up here providing nourishment for the biological community here. |

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| 22-Sep | 02.40.54 | -15.08177 | -173.55419 | 721 | 1 | 110 | **Q330-biomacro-10**. Using the net to scoop up the mussels. May be one in there. Moving upslope on rock/sediment slope. Area or a variety of macrofauna. This sample includes mussels (and rocks as a subsample). |
| 22-Sep | 02.50.38 | -15.08169 | -173.55408 | 717 | 1 | 58 | Lots of mussels and shrimp in the view. |
| 22-Sep | 02.51.20 | -15.08160 | -173.55394 | 716 | 1 | 44 | Want to go north a bit. We're just south of position H new at the top of this hill. |
| 22-Sep | 02.53.42 | -15.08152 | -173.55389 | 716 | 0 | 64 | The open valves are live. Can see tissue in the gape. Lots of dead open shells as well. There's a nice view of a paralomis crab. Shrimp also in the view. Conger eels here as well. Great zoom on this paralomis crab. |
| 22-Sep | 02.55.44 | -15.08152 | -173.55389 | 716 | 0 | 62 | Going to lift off and head to the north. |
| 22-Sep | 02.56.45 | -15.08144 | -173.55379 | 0 | 0 | 0 | The dead mussels are due to various causes: "all things die; lack of flow; predation by crabs and octopus…..". |
| 22-Sep | 02.57.38 | -15.08130 | -173.55363 | 715 | 3 | 42 | The ship is making tracks and so are we. |
| 22-Sep | 02.58.17 | -15.08120 | -173.55361 | 718 | 1 | 35 | White patchy material here; probably lined up along a buried fracture. |
| 22-Sep | 02.59.04 | -15.08111 | -173.55356 | 0 | 0 | 0 | Bob thinks the white patch is sulfur. Mussel shells sticking up. Leopard eels (see the spots). They could be juveniles of the larger conger eels but time doesn't know that. |
| 22-Sep | 03.00.10 | -15.08108 | -173.55354 | 720 | 1 | 38 | Tubeworms ahead in the dark rock. Tim wants them to be alive. Tim thinks the tubeworms are dead. Saw another eel-like thing (blue in color). |
| 22-Sep | 03.01.44 | -15.08103 | -173.55350 | 722 | 0 | 49 | Zooming in on the red shrimp. See a leopard eel in the front view. See the spots on the eel. Barnacles on the tubeworm. The blue guy could be a conger eel. Anemone on a tubeworm. Probably on pumice here. |
| 22-Sep | 03.03.58 | -15.08102 | -173.55344 | 721 | 2 | 71 | The tubeworms look dead. Maybe 1 was alive. Going to have a look. |
| 22-Sep | 03.05.07 | -15.08100 | -173.55341 | 722 | 1 | 85 | Shrimp are taking off in front of us. |
| 22-Sep | 03.06.41 | -15.08099 | -173.55337 | 723 | 1 | 143 | HD cam on. The shrimp seen previously had eggs. The tubeworm with the anemone on it is alive. If it is a melobracchia they don't need any heat. Live off the wafting plumes. |
| 22-Sep | 03.08.38 | -15.08099 | -173.55335 | 723 | 1 | 194 | Tim wants the tubeworm pulled out low on the tube. It looks like it has had a hard existence. Not sure what the black thing near the worm plume is. The tube has bacterial mat coating it. |
| 22-Sep | 03.09.58 | -15.08100 | -173.55336 | 722 | 1 | 202 | The white area on the end of the plume tube is the seal, It closes it up. |
| 22-Sep | 03.14.20 | -15.08100 | -173.55332 | 723 | 1 | 211 | Moved a large rock to get at the base of the tube. Going in for the grab. |
| 22-Sep | 03.19.34 | -15.08100 | -173.55332 | 723 | 0 | 209 | **Biology Sample: Q330-biomacro-11.** Brownish-tan skinny tubeworm with a red plume. Also attached is something blackish looking near the end and an anemone also attached. The black part is probably part of the tubeworm (?). Stowed in the back of the biobox with samples 3?; 7; and 10. (Tim notes that there has never been a temp anomaly where these guys live). |
| 22-Sep | 03.21.55 | -15.08095 | -173.55321 | 723 | 2 | 68 | Moving to target I now where dense cluster of live bivalves were seen on the camera tow.. |
| 22-Sep | 03.24.24 | -15.08074 | -173.55307 | 720 | 5 | 19 | Shifting the ship. |
| 22-Sep | 03.27.15 | -15.08053 | -173.55318 | 724 | 0 | 23 | Venus fly trap anemone; tubeworm, live ones; more anemones. |
| 22-Sep | 03.28.01 | -15.08049 | -173.55319 | 723 | 1 | 350 | Heading north. |
| 22-Sep | 03.28.47 | -15.08035 | -173.55326 | 721 | 3 | 337 | Lots of dead mussel shells. They die because the source turns off and then predators come in to get them. There are some live shells. |
| 22-Sep | 03.29.55 | -15.08028 | -173.55331 | 724 | 0 | 324 | We are seeing abyssal threads where mussels have been attached before. Leopard eel and shrimp. |
| 22-Sep | 03.30.59 | -15.08028 | -173.55332 | 724 | 0 | 324 | There's an eel showing up in the video. A big huge eels was hogging the camera. |
| 22-Sep | 03.31.46 | -15.08028 | -173.55332 | 723 | 1 | 308 | Moving on. See more microbial mat. Really dense area here of mussels. |
| 22-Sep | 03.32.41 | -15.08028 | -173.55343 | 722 | 1 | 291 | Galatheid crab; shrimp; tons of live mussels. |
| 22-Sep | 03.33.00 | -15.08025 | -173.55346 | 722 | 1 | 291 | HD on. |
| 22-Sep | 03.33.11 | -15.08025 | -173.55346 | 0 | 0 | 0 | Great zoom in image of live mussels and the little "leopard eels". Abyssal threads and paralomis crab. The tan colored fragments are places where mussels were attached in the past (like spider man moves on the thread it shoots out - then cut the thread). |
| 22-Sep | 03.35.08 | -15.08025 | -173.55346 | 722 | 0 | 290 | Vast field with microbial mat on the mussels; some squat lobsters; eels; shrimp; crabs. Lots of fauna. |
| 22-Sep | 03.36.00 | -15.08023 | -173.55349 | 722 | 0 | 141 | Shimmering water in the lower part of the screen. |
| 22-Sep | 03.36.15 | -15.08023 | -173.55348 | 722 | 0 | 140 | HD back on. |
| 22-Sep | 03.36.46 | -15.08023 | -173.55348 | 721 | 0 | 140 | See the big snail among the mussels; shrimp; and the paralomis red crab here as well. Mussels dominate this ecosystem. |
| 22-Sep | 03.37.51 | -15.08022 | -173.55348 | 722 | 0 | 140 | Request for a McPhail sample stuck down right between the mussels. |
| 22-Sep | 03.38.29 | -15.08023 | -173.55347 | 722 | 0 | 138 | Scaleworm of some type on the mussel shell. |

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| 22-Sep | 03.46.30 | -15.08023 | -173.55348 | 722 | 0 | 138 | Preparing to take a McPhail sample in the sediments between these healthy mussels covered with white bacterial mat. There is a bit of shimmering water in front. |
| 22-Sep | 03.48.22 | -15.08023 | -173.55347 | 722 | 0 | 138 | Eel pout poking out in front of us. Here comes the sampler. |
| 22-Sep | 03.49.49 | -15.08023 | -173.55347 | 722 | 0 | 138 | Dubbed this vast expanse of mussels **"Mussel Mania"**. Mussels everywhere plus lots of paralomis crabs; some eel pouts; big snails; brachyuran crabs; some shrimp. |
| 22-Sep | 03.54.13 | -15.08021 | -173.55347 | 722 | 0 | 167 | **Biology Sample: Q320-biosed-12**. McPhail sample in the sediments beneath these healthy mussels covered with microbial mat and diverse biota. In an area of shimmering water here at "Mussel Mania". |
| 22-Sep | 03.54.19 | -15.08022 | -173.55346 | 0 | 0 | 0 | There is some haze coming in there. Ed says that its probably a decent sample. Storing it back in the box where it came from. |
| 22-Sep | 03.59.57 | -15.08022 | -173.55346 | 0 | 0 | 0 | Clear shimmering water with mussels. |
| 22-Sep | 04.00.32 | -15.08022 | -173.55346 | 722 | 0 | 171 | Temperature measurement of the shimmering water. |
| 22-Sep | 04.01.57 | -15.08022 | -173.55345 | 722 | 0 | 171 | Crab trying to call out of the suction sampler again. Sucked back down. |
| 22-Sep | 04.03.24 | -15.08023 | -173.55349 | 722 | 0 | 171 | 2 crabs in HD going after each other. Larger & smaller. |
| 22-Sep | 04.04.34 | -15.08022 | -173.55350 | 722 | 0 | 171 | Getting temperature probe from basket. |
| 22-Sep | 04.05.22 | -15.08022 | -173.55350 | 722 | 0 | 171 | Temp. before is 6.2. Crab attempts escape from slurp chamber. |
| 22-Sep | 04.07.32 | -15.08023 | -173.55348 | 722 | 0 | 171 | Temperature in the shimmer is 8.3 was the highest. |
| 22-Sep | 04.07.57 | -15.08023 | -173.55348 | 723 | 0 | 171 | Moving it around again. Shoving it into the sediment. |
| 22-Sep | 04.08.50 | -15.08022 | -173.55349 | 722 | 0 | 171 | Highest was **8.9°C**. |
| 22-Sep | 04.10.04 | -15.08023 | -173.55348 | 723 | 0 | 171 | Would like a water sample with the major. |
| 22-Sep | 04.10.39 | -15.08023 | -173.55349 | 722 | 0 | 171 | Returning the temperature probe to the basket. |
| 22-Sep | 04.13.01 | -15.08023 | -173.55349 | 722 | 0 | 171 | Will be removing the red major for a water sample. |
| 22-Sep | 04.16.38 | -15.08023 | -173.55349 | 722 | 0 | 171 | Two crabs going after each other again in the HD view. |
| 22-Sep | 04.17.14 | -15.08023 | -173.55349 | 722 | 0 | 171 | Red major in arm. |
| 22-Sep | 04.19.49 | -15.08022 | -173.55349 | 723 | 0 | 171 | Placing tip in the shimmer where temperature taken. |
| 22-Sep | 04.20.57 | -15.08023 | -173.55349 | 0 | 0 | 0 | Fired. Spring is coming up. |
| 22-Sep | 04.21.25 | -15.08023 | -173.55349 | 722 | 0 | 171 | **Q330-major-13**. Water sample in diffuse flow down in the mussel beds of Mussel Mania from the red major. Highest temperature was 8.9°C. |
| 22-Sep | 04.22.14 | -15.08022 | -173.55349 | 722 | 0 | 172 | Done. |
| 22-Sep | 04.23.39 | -15.08022 | -173.55349 | 722 | 0 | 171 | Putting the major back in the basket. |
| 22-Sep | 04.24.08 | -15.08022 | -173.55350 | 722 | 0 | 171 | Crabs at each other once again in front of HD. |
| 22-Sep | 04.29.10 | -15.08022 | -173.55347 | 722 | 0 | 171 | Stowing the major sampler. |
| 22-Sep | 04.31.46 | -15.08019 | -173.55352 | 719 | 2 | 344 | Taking off here and trying to get a feel for the size of the mussel bed. |
| 22-Sep | 04.32.50 | -15.08006 | -173.55354 | 720 | 2 | 34 | To the east it is thick. Diffuse fluids are probably escaping the seabed here. Nice white sediments. |
| 22-Sep | 04.33.36 | -15.07993 | -173.55347 | 723 | 2 | 80 | We're on the NE edge of the mussel bed. Taking some still of this boundary with lots of mussels on the right and lesser on the right where there are no white seds. |
| 22-Sep | 04.35.00 | -15.07990 | -173.55341 | 724 | 1 | 93 | HD is going on. |
| 22-Sep | 04.36.30 | -15.08001 | -173.55331 | 723 | 2 | 176 | Now passing over lots of dead shells. A mixture of dead and live beds. Seeing a bit more on our left as well. |
| 22-Sep | 04.37.32 | -15.08025 | -173.55339 | 719 | 4 | 196 | HD off. |
| 22-Sep | 04.38.06 | -15.08031 | -173.55346 | 719 | 4 | 5 | This area "Mussel Mania" has got to be at least 50m x 30m. |
| 22-Sep | 04.39.04 | -15.08027 | -173.55359 | 714 | 7 | 328 | Discussing how long it's going to take to get back to the sulfur flow. It's only 100 meters away to the SW. |
| 22-Sep | 04.41.45 | -15.08029 | -173.55363 | 714 | 7 | 243 | The decision has been made to go back to the sulfur area again. |
| 22-Sep | 04.43.12 | -15.08029 | -173.55366 | 718 | 3 | 214 | We're at the edge of the slope. We see a bit of a sulfur overhang on it. |
| 22-Sep | 04.44.08 | -15.08039 | -173.55381 | 718 | 6 | 185 | The sulfur smoke is billowing here. We haven't gone down the slope. |
| 22-Sep | 04.45.46 | -15.08050 | -173.55408 | 720 | 5 | 257 | We want to find the source. **We're still on the top of the high spot here**. On the sonar we see a great big pit. Look at all the crabs. |
| 22-Sep | 04.47.23 | -15.08036 | -173.55391 | 720 | 2 | 354 | Billowing smoke again. |
| 22-Sep | 04.48.22 | -15.08034 | -173.55388 | 718 | 3 | 83 | There is the pit on the right of the screen. |
| 22-Sep | 04.48.45 | -15.08033 | -173.55386 | 716 | 4 | 95 | The pit is about 20 meters across. We're looking down into it. The smoke is just hanging over the top of it. |
| 22-Sep | 04.49.59 | -15.08041 | -173.55394 | 718 | 3 | 133 | **"Sulfur pit"** at top of north mound. North of target H ~100m. 15deg 4.835'S 173deg 33.255'W. |
| 22-Sep | 04.54.16 | -15.08085 | -173.55452 | 741 | 6 | 160 | Starting downslope. We're just north of the dive target. |
| 22-Sep | 04.55.12 | -15.08099 | -173.55459 | 748 | 4 | 162 | We're back into the sulfur fog. |
| 22-Sep | 04.56.39 | | | | | | Break in the plume. Hdg 230. Looking to the SW at this huge sulfur plume. Bill remarked that the plume is not that buoyant like a black smoker one is. It just seems to hang in the water not moving much. |

| date | time | latitude | longitude | Z | alt | hdg | Q330 - Niua North Dive Comments |
|---|---|---|---|---|---|---|---|
| 22-Sep | 05.01.38 | | | | | | Swapping out pilots again. **[postcruise: Split the nav file here due to weird offset. Nav jumps 60m in 2 seconds. Start of nav part2 here].** |
| 22-Sep | 05.03.42 | | | | | | The steep thermal gradients may make it more difficult for the fluids/plume to rise. |
| 22-Sep | 05.04.17 | | | | | | Elemental sulfur on the seafloor. |
| 22-Sep | 05.05.06 | | | | | | Looking at the edge of the pit/cliff here. Sulfur platy crusts here. |
| 22-Sep | 05.05.49 | | | | | | Looking to the east on the talus slope and elemental sulfur. |
| 22-Sep | 05.07.14 | | | | | | HD on. |
| 22-Sep | 05.07.31 | | | | | | Sulfur vent. Sulfur smoke pouring out of the vent. This is sitting on the edge of this steepish slope. Liquid CO2 bubbles coming out again. |
| 22-Sep | 05.08.35 | | | | | | The plume is moving down instead of up. The currents are pushing it? Bill sees liquid CO2 droplets. They are very corrosive. |
| 22-Sep | 05.10.01 | | | | | | **Volker says it's the exact same vent we were at before.** |
| 22-Sep | 05.12.08 | -15.08099 | -173.55459 | 747 | 6 | 253 | This is where we did the Davis sampler (sample 07). Hellow area. |
| 22-Sep | 05.23.17 | -15.08134 | -173.55453 | 747 | 2 | 40 | Samples 4; 5; 6; 7 and 14 are all taken very close together. |
| 22-Sep | 05.23.28 | -15.08134 | -173.55454 | 748 | 2 | 39 | Just saw some liquid CO2 bubbles rising (large and odd shaped and sort of wobbly. |
| 22-Sep | 05.23.41 | -15.08134 | -173.55453 | 747 | 2 | 39 | Huge liquid CO2 bubbles floating by. |
| 22-Sep | 05.24.20 | -15.08134 | -173.55453 | 748 | 2 | 40 | **Gas sample: Q330-gtb-14.** In sulfur vent pouring out smoke and CO2 bubbles. (probably liquid CO2) The smoke is white with an occasional yellow tinge. **Hellow area.** |
| 22-Sep | 05.25.43 | -15.08134 | -173.55453 | 748 | 2 | 41 | HD off. |
| 22-Sep | 05.28.08 | -15.08134 | -173.55453 | 748 | 2 | 40 | Stowing the red gastight. |
| 22-Sep | 05.30.49 | -15.08133 | -173.55452 | 748 | 2 | 40 | The smoke has more of a yellow tinge to it now although the video is very washed out. |
| 22-Sep | 05.31.14 | -15.08134 | -173.55453 | 747 | 2 | 41 | They have toned the video down now. |
| 22-Sep | 05.32.52 | -15.08134 | -173.55453 | 744 | 5 | 316 | We're pulling up away from the bottom and plan to head to the south. |
| 22-Sep | 05.33.40 | -15.08134 | -173.55458 | 740 | 13 | 64 | We can still see the bottom |
| 22-Sep | 05.36.10 | -15.08136 | -173.55463 | 741 | 11 | 157 | Going through the plume. Slope on our left. |
| 22-Sep | 05.36.42 | -15.08144 | -173.55467 | 742 | 10 | 171 | Looking at the outcrop of rock (knoll). |
| 22-Sep | 05.37.12 | -15.08153 | -173.55474 | 745 | 10 | 192 | Want to get to the south side of this knoll/outcrop. |
| 22-Sep | 05.37.55 | -15.08157 | -173.55486 | 752 | 14 | 159 | Going to turn-into/look-at slope a bit. |
| 22-Sep | 05.38.51 | -15.08161 | -173.55485 | 750 | 11 | 168 | Hanging plume fog. |
| 22-Sep | 05.39.20 | -15.08164 | -173.55482 | 0 | 0 | 0 | Looks like more plume coming from below. Sulfur on the rocks. |
| 22-Sep | 05.40.10 | -15.08168 | -173.55479 | 754 | 4 | 172 | Rock ridge. |
| 22-Sep | 05.40.36 | -15.08168 | -173.55478 | 754 | 3 | 171 | At the end of the tether here. Lots of shrimp on the rock. |
| 22-Sep | 05.41.03 | -15.08170 | -173.55478 | 751 | 4 | 171 | May want to get one of these rocks. |
| 22-Sep | 05.41.35 | -15.08172 | -173.55476 | 749 | 7 | 126 | Fish feeding on something in water. |
| 22-Sep | 05.41.50 | -15.08172 | -173.55475 | 748 | 6 | 106 | Massive outcrop. Columnar jointing and tilted. |
| 22-Sep | **05.42.50** | -15.08166 | -173.55476 | 742 | 15 | 66 | **Could be on the nose of this outcrop as we are looking east.** |
| 22-Sep | 05.43.45 | -15.08166 | -173.55476 | 744 | 13 | 79 | DSCs of this outcrop. Lots of shrimp. (No view in lab-may not be functioning). |
| 22-Sep | 05.44.30 | -15.08164 | -173.55473 | 744 | 11 | 86 | Outcrop is tilted to the left (hdg 086). |
| 22-Sep | 05.45.12 | -15.08164 | -173.55472 | 745 | 12 | 89 | Many eel here with the shrimp and a crab. |
| 22-Sep | 05.45.36 | -15.08164 | -173.55472 | 745 | 12 | 91 | Setting up to sample a rock here. |
| 22-Sep | 05.45.47 | -15.08164 | -173.55472 | 745 | 12 | 91 | Probably a dome. |
| 22-Sep | 05.47.17 | -15.08164 | -173.55473 | 0 | 0 | 0 | Used arm to dislodge a piece of the in-place rock/dome. |
| 22-Sep | 05.49.40 | -15.08164 | -173.55472 | 744 | 12 | 124 | Got a piece that was dislodged. Good picture in HD-angular. |
| 22-Sep | 05.51.15 | -15.08164 | -173.55473 | 745 | 2 | 110 | **Geology Sample: Q330-rock-15**. Rock from the dome outcrop south of the sulfur pit. Going in tube #1. |
| 22-Sep | 05.52.36 | -15.08159 | -173.55482 | 742 | 19 | 108 | Going to transit up this dome. |
| 22-Sep | 05.54.25 | -15.08165 | -173.55470 | 730 | 8 | 99 | Heading 101 and taking DSC of the slope going up the dome. |
| 22-Sep | 05.55.27 | -15.08167 | -173.55461 | 0 | 0 | 0 | Top of the slope and broad rocky outcrop covered in the summit of the dome. |
| 22-Sep | 05.55.39 | -15.08167 | -173.55461 | 723 | 10 | 98 | Sediment and debris on the top. |
| 22-Sep | 05.56.27 | -15.08170 | -173.55458 | 727 | 6 | 97 | Coming on to the top of the dome while near the bottom. |
| 22-Sep | 05.57.55 | -15.08177 | -173.55442 | 722 | 4 | 99 | Shrimp everywhere. Mussels. |
| 22-Sep | 05.58.33 | -15.08178 | -173.55434 | 0 | 0 | 0 | Mussels in clumps on the rocks surrounded by sediment. |
| 22-Sep | 05.58.56 | -15.08180 | -173.55429 | 718 | 2 | 98 | Big patch of mussels. |
| 22-Sep | 05.59.28 | -15.08181 | -173.55425 | 718 | 2 | 97 | HD tape on. |
| 22-Sep | 05.59.44 | -15.08182 | -173.55425 | 719 | 2 | 96 | Tape is full. No more HD on this dive. |
| 22-Sep | 06.00.12 | -15.08182 | -173.55425 | 719 | 1 | 96 | Going to spin 360deg. Taking DSCs if it is working. |
| 22-Sep | 06.01.24 | -15.08182 | -173.55426 | 719 | 2 | 106 | Getting some current at the top of the dome. |

| date | time | latitude | longitude | Z | alt | hdg | Q330 - Niua North Dive Comments |
|---|---|---|---|---|---|---|---|
| 22-Sep | 06.02.02 | -15.08181 | -173.55427 | 0 | 0 | 0 | Spinning left at the top. Mussel Beach?? |
| 22-Sep | 06.02.27 | -15.08180 | -173.55428 | 718 | 4 | 32 | Light staining. Now spinning - there was a line of dead mussels. |
| 22-Sep | 06.02.54 | -15.08180 | -173.55428 | 717 | 4 | 98 | Swinging to the right. |
| 22-Sep | 06.03.14 | -15.08182 | -173.55428 | 718 | 3 | 140 | Patchy mussels at 125hdg. |
| 22-Sep | 06.03.44 | -15.08183 | -173.55428 | 718 | 3 | 193 | Looking south and mussels are patchy. |
| 22-Sep | 06.04.01 | -15.08183 | -173.55429 | 719 | 3 | 216 | Mussels died off at 202hdg. |
| 22-Sep | 06.04.20 | -15.08183 | -173.55429 | 718 | 3 | 175 | End of our time for this dive. |
| 22-Sep | 06.04.54 | -15.08182 | -173.55428 | 719 | 3 | 81 | Just looking around as we prepare to leave the bottom. |
| 22-Sep | 06.05.25 | -15.08183 | -173.55429 | 719 | 3 | 236 | Fast spin in midwater at 719m. |
| 22-Sep | 06.06.24 | -15.08175 | -173.55448 | 724 | 6 | 284 | Off bottom. |
| 22-Sep | 06.06.51 | -15.08174 | -173.55455 | 722 | 12 | 289 | Keeping eye on suction sampler to try to keep the crab. |
| 22-Sep | 06.07.31 | -15.08172 | -173.55466 | 0 | 0 | 0 | In the plume again. |
| 22-Sep | 06.08.28 | | | | | | Big plume. |
| 22-Sep | 06.10.20 | | | | | | Plume ended at 652m during ascent. |
| 22-Sep | 06.46.20 | | | | | | ROV on deck. |

## 7.10 Q331 Mata Tolu Dive Log

| date | time | latitude | longitude | Z | alt | hdg | Q331 - North Mata Tolu Dive Comments |
|---|---|---|---|---|---|---|---|
| **Main Goals:** Explore and sample Mata Tolu for hydrothermal systems and rock samples. | | | | | | | |
| **Launch target:** 15°0.338' S 173°47.610' W Z=1866m Downslope S of summit | | | | | | | |
| **Setup:** 3 gastights; 3 majors; temp probe 2 Davis samplers; 1 McPhail sampler; large biobox; suction sampler; pelagic pump; T-handle and mesh net; shrimp-catcher jar | | | | | | | |
| Nav Notes: Bottom time: 9/22/2012 21:15 – 9/23 06:01. Nav smoothed (tolerance=13). Did NOT shift nav. Several small nav gaps. Eliminated some points to remove wander. | | | | | | | |
| **DIVE LOG POSITION INFORMATION: latitude; longitude; Z; alt; hdg values are derived from finalized Quest nav. Any lat/long values in the dive comments column were recorded at sea and are preliminary.** | | | | | | | |
| 22-Sep | 19.07.10 | | | | | | Preparing for launch. Ship position is currently over the bottom target. |
| 22-Sep | 19.44.58 | | | | | | Target depth is 1866m. |
| 22-Sep | 19.45.20 | | | | | | ROV off the deck. |
| 22-Sep | 19.49.21 | | | | | | ROV in the water. |
| 22-Sep | 19.50.45 | | | | | | Putting flotation on the wire. |
| 22-Sep | 19.53.30 | | | | | | ROV is diving. |
| 22-Sep | 20.10.49 | | | | | | At 320m. |
| 22-Sep | 20.14.00 | | | | | | At 400m. |
| 22-Sep | 20.18.10 | | | | | | At 500m. |
| 22-Sep | 20.26.33 | | | | | | At 700m. |
| 22-Sep | 20.33.32 | | | | | | 866m about 1000m more to the bottom. |
| 22-Sep | 20.39.04 | | | | | | At 1000m. |
| 22-Sep | 20.47.20 | | | | | | 1200m. |
| 22-Sep | 20.51.40 | | | | | | 1300m. |
| 22-Sep | 20.54.15 | | | | | | About 500m off bottom. |
| 22-Sep | 20.59.59 | | | | | | 1500m. |
| 22-Sep | 21.04.19 | | | | | | 1600m. |
| 22-Sep | 21.07.23 | | | | | | 200m off bottom. |
| 22-Sep | 21.08.52 | | | | | | 1700m. |
| 22-Sep | 21.11.48 | | | | | | 100m off bottom. |
| 22-Sep | 21.14.41 | | | | | | Altimeter reading bottom. |
| 22-Sep | 21.15.07 | -15.00566 | -173.79364 | 1852 | 20 | 349 | Can see returns on sonar that look like lava flow fronts. |
| 22-Sep | 21.15.24 | -15.00564 | -173.79365 | 1860 | 14 | 348 | Bottom. |
| 22-Sep | 21.15.53 | -15.00571 | -173.79359 | 1863 | 9 | 347 | Looks like lavas with sediment. |
| 22-Sep | 21.16.50 | -15.00565 | -173.79359 | 1862 | 5 | 348 | Talus of angular blocks of lava with some sediment pockets between. |
| 22-Sep | 21.17.55 | -15.00566 | -173.79364 | 1864 | 4 | 347 | Some pieces of the lava have cooling joints. Some broken pillow fragments. |
| 22-Sep | 21.18.56 | -15.00564 | -173.79357 | 1863 | 4 | 348 | Some outcrop to the right. |
| 22-Sep | 21.19.16 | -15.00560 | -173.79359 | 1862 | 4 | 335 | Zooming in on a snail on the rock. Known species that have been seen near vents. |
| 22-Sep | 21.20.28 | -15.00562 | -173.79360 | 1862 | 6 | 329 | Going to look at the outcrop and try to take a sample of it (lava tubes). |
| 22-Sep | 21.21.03 | -15.00564 | -173.79357 | 1859 | 6 | 330 | Lobate flows coming down from the slope. |
| 22-Sep | 21.21.11 | -15.00561 | -173.79358 | 1859 | 5 | 329 | Another snail. Sponge (lollipop). |
| 22-Sep | 21.22.21 | -15.00560 | -173.79359 | 1857 | 7 | 320 | Good pilot view of the outcrop of lava tubes. |
| 22-Sep | 21.22.49 | -15.00561 | -173.79363 | 1856 | 6 | 329 | Galatheid crab and a few more of those snails. |
| 22-Sep | 21.23.43 | -15.00557 | -173.79364 | 0 | 0 | 0 | Some bacterial mat in patches. |
| 22-Sep | 21.24.12 | -15.00557 | -173.79361 | 1856 | 3 | 339 | Moving arm in for a sample. |
| 22-Sep | 21.25.45 | -15.00556 | -173.79365 | 1856 | 4 | 338 | First piece didn't stick in claw. |
| 22-Sep | 21.26.55 | -15.00559 | -173.79361 | 1856 | 3 | 336 | Trying again and little swimming polychaetes. |
| 22-Sep | 21.28.22 | -15.00559 | -173.79360 | 1856 | 3 | 336 | Got a small piece from the tube. Getting pictures. |
| 22-Sep | 21.28.44 | -15.00557 | -173.79362 | 1856 | 3 | 337 | In tube #1. |
| 22-Sep | 21.29.02 | -15.00556 | -173.79365 | 1856 | 3 | 337 | **Geo Sample: Q331-rock-01**. From outcrop of lava tubes at the landing site. Some sessile animals at the site and light sediment coating and patch of mat. |
| 22-Sep | 21.30.49 | -15.00559 | -173.79362 | 1856 | 5 | 327 | Got a second piece from same place. Q331-rock-01 in HD. |
| 22-Sep | 21.32.51 | -15.00559 | -173.79362 | 1855 | 7 | 338 | On our way heading 339. |
| 22-Sep | 21.33.24 | -15.00559 | -173.79362 | 1852 | 7 | 338 | Dikes and cooling fractures perpendicular from the flow. DSCs. |
| 22-Sep | 21.34.18 | -15.00559 | -173.79362 | 1847 | 9 | 338 | Swimming shrimp. Great views of the dike as we move up. |
| 22-Sep | 21.34.31 | -15.00559 | -173.79362 | 1846 | 9 | 338 | Seeing some mat on the surface of the dike. |
| 22-Sep | 21.34.52 | -15.00559 | -173.79362 | 1844 | 12 | 331 | HD tape on. |
| 22-Sep | 21.35.20 | -15.00559 | -173.79362 | 1843 | 13 | 324 | Top of dike. |
| 22-Sep | 21.36.14 | -15.00559 | -173.79362 | 1841 | 7 | 357 | Snails and a fuzzier snail. |
| 22-Sep | 21.36.54 | -15.00559 | -173.79362 | 1841 | 6 | 359 | Lava mound with a feeder system underneath. |
| 22-Sep | 21.37.34 | -15.00559 | -173.79362 | 1842 | 6 | 5 | Amphipods here and zooming in on the bicolored snail. |

| date | time | latitude | longitude | Z | alt | hdg | Q331 - North Mata Tolu Dive Comments |
|---|---|---|---|---|---|---|---|
| 22-Sep | 21.38.05 | -15.00559 | -173.79362 | 1841 | 6 | 3 | Stopping to get another rock. |
| 22-Sep | 21.38.46 | -15.00559 | -173.79362 | 1841 | 6 | 3 | Arm moving in for a rock. |
| 22-Sep | 21.39.26 | -15.00559 | -173.79362 | 1841 | 6 | 3 | Got it. HD view. Dropped it and going for another piece with a piece with surface texture of glass and interior. |
| 22-Sep | 21.42.51 | -15.00559 | -173.79362 | 1842 | 6 | 9 | Got a second piece and will take a closer look of it for surface. Looks good in HD. |
| 22-Sep | 21.45.30 | -15.00559 | -173.79362 | 1841 | 6 | 9 | **Geo Sample: Q331-rock-02**. From the lava mound just on top of the dike we ascended on. Has exterior and interior surfaces. |
| 22-Sep | 21.45.50 | -15.00540 | -173.79366 | 1841 | 6 | 344 | Looking at bicolored snail in HD. |
| 22-Sep | 21.46.22 | -15.00546 | -173.79364 | 1841 | 7 | 350 | Moving on. |
| 22-Sep | 21.46.46 | -15.00546 | -173.79364 | 1842 | 4 | 352 | Putting target Rock 02 in the target list. |
| 22-Sep | 21.47.32 | -15.00544 | -173.79363 | 1839 | 3 | 351 | Moving upslope. **USBL went out before this so check the sample site.** |
| 22-Sep | 21.47.52 | -15.00541 | -173.79366 | 1837 | 3 | 348 | More thin white mat and increase in snails. |
| 22-Sep | 21.48.11 | -15.00542 | -173.79365 | 1836 | 3 | 336 | Closer to diffuse venting evidence. |
| 22-Sep | 21.48.33 | -15.00540 | -173.79366 | 1835 | 5 | 329 | Hydrothermal zone. |
| 22-Sep | 21.49.24 | -15.00537 | -173.79366 | 1831 | 18 | 331 | Needing the ship to move. |
| 22-Sep | 21.49.36 | -15.00537 | -173.79366 | 1831 | 18 | 331 | Talus/scree slope. |
| 22-Sep | 21.50.08 | -15.00531 | -173.79367 | 0 | 0 | 0 | Volcanic spatter on this big block. |
| 22-Sep | 21.50.22 | -15.00533 | -173.79366 | 1828 | 5 | 331 | More outcrop ahead. Maybe small faults going EW. |
| 22-Sep | 21.51.11 | -15.00525 | -173.79370 | 1824 | 1 | 354 | Galatheid crabs and seastar. HD on. Crinoid on the rock. |
| 22-Sep | 21.51.45 | -15.00520 | -173.79368 | 1822 | 3 | 358 | Shrimp in water. |
| 22-Sep | 21.52.05 | -15.00517 | -173.79366 | 1822 | 3 | 3 | Looks like floc in the water. |
| 22-Sep | 21.52.15 | -15.00517 | -173.79366 | 1822 | 3 | 4 | Sulfide chimney. |
| 22-Sep | 21.52.46 | -15.00510 | -173.79366 | 1821 | 3 | 33 | Old chimney. Would like a piece of it. |
| 22-Sep | 21.53.28 | -15.00513 | -173.79366 | 1819 | 4 | 3 | Smoke in the water behind this chimney. |
| 22-Sep | 21.53.54 | -15.00511 | -173.79366 | 1820 | 4 | 9 | Galatheid crabs on the chimney. |
| 22-Sep | 21.54.21 | -15.00509 | -173.79364 | 1819 | 3 | 57 | Turning around the chimney. Facing 057 now. Few meters high. |
| 22-Sep | 21.55.31 | -15.00508 | -173.79362 | 1820 | 2 | 57 | Other views show other older chimneys behind this at 060. |
| 22-Sep | 21.55.54 | -15.00506 | -173.79366 | 1820 | 2 | 59 | Shrimp and crabs on chimney. Film of mat on chimney as well. |
| 22-Sep | 21.57.03 | -15.00506 | -173.79366 | 1820 | 2 | 51 | Reaching with arm for piece of sulfide. |
| 22-Sep | 21.57.50 | -15.00507 | -173.79364 | 1820 | 2 | 47 | Toppled off when touched. |
| 22-Sep | 21.58.18 | -15.00504 | -173.79366 | 1821 | 2 | 61 | Can see minerals. |
| 22-Sep | 22.01.28 | -15.00505 | -173.79366 | 1820 | 2 | 60 | Got a piece of the top of a little spire - fell. Trying to pick it up again. |
| 22-Sep | 22.03.01 | -15.00507 | -173.79363 | 1820 | 2 | 59 | Very brittle. On the top but fell. On the edge of the porch and trying to pick it up. |
| 22-Sep | 22.04.43 | -15.00504 | -173.79366 | 1820 | 3 | 59 | Big piece trying to put in the drawer. |
| 22-Sep | 22.06.05 | -15.00506 | -173.79363 | 1820 | 2 | 59 | **Geo Sample: Q331-sulfide-03**. Old sulfide on the way upslope from the lava flows. Covered with mat film and has shrimp and crabs. In the biobox #13. Carefully placed in the drawer. **Target: sulfite 3 in nav.** |
| 22-Sep | 22.09.16 | -15.00508 | -173.79362 | 1820 | 2 | 59 | HD on. Taking tape of the top of the chimney and shrimp. |
| 22-Sep | 22.10.46 | -15.00508 | -173.79362 | 1820 | 2 | 60 | DSCs. |
| 22-Sep | 22.11.42 | -15.00508 | -173.79362 | 1820 | 2 | 59 | Can see scars from where the chimney was taken off. |
| 22-Sep | 22.12.12 | -15.00508 | -173.79363 | 1820 | 3 | 62 | Moving. Different shrimp than seen before. |
| 22-Sep | 22.13.11 | -15.00504 | -173.79366 | 1818 | 4 | 351 | Big crab. |
| 22-Sep | 22.13.14 | -15.00504 | -173.79366 | 1817 | 4 | 348 | Active chimney with snails at the base. More mat on this one. Seeing some shimmer at the top. |
| 22-Sep | 22.14.12 | -15.00496 | -173.79364 | 1816 | 6 | 332 | Shrimp and crabs (brachyuran) and polychaetes and worm.. Smoking. |
| 22-Sep | 22.14.47 | -15.00500 | -173.79360 | 1817 | 5 | 331 | Lots of biology all over the chimney. Chimney field of different ages. |
| 22-Sep | 22.15.57 | -15.00501 | -173.79362 | 1816 | 6 | 333 | Putting in target in nav. **Snail Chimney**. |
| 22-Sep | 22.16.53 | -15.00500 | -173.79362 | 1816 | 5 | 328 | Looks difficult to sample but taking a look. |
| 22-Sep | 22.17.33 | -15.00498 | -173.79363 | 1816 | 7 | 305 | Camera is darker today. See hairy gastropods. |
| 22-Sep | 22.18.36 | -15.00494 | -173.79361 | 1818 | 7 | 231 | Enormous cluster of hairy gastropods at base. |
| 22-Sep | 22.19.39 | -15.00491 | -173.79361 | 1820 | 5 | 233 | Also lots of brachyuran crabs and amazing distribution of the biology. White snails show where most of the hydrothermal activity is. |
| 22-Sep | 22.19.42 | -15.00495 | -173.79360 | 1819 | 6 | 234 | This is the largest clustering of these snails seen on this expedition. |
| 22-Sep | 22.19.58 | -15.00492 | -173.79364 | 1818 | 5 | 236 | Panning is great and zooming to see animals closer. |
| 22-Sep | 22.20.44 | -15.00492 | -173.79360 | 1820 | 6 | 239 | Getting overall community structure. Zoom in to see the shrimp and snails. See a chunk of pyrite as well. |
| 22-Sep | 22.21.17 | -15.00495 | -173.79357 | 1819 | 5 | 249 | See shimmer in the white snails. |
| 22-Sep | 22.21.31 | -15.00496 | -173.79358 | 1820 | 4 | 249 | Amazing panning of the biology. |
| 22-Sep | 22.22.21 | -15.00494 | -173.79360 | 1819 | 5 | 245 | Quite a few shrimp. Good place to try the net to get biology. |
| 22-Sep | 22.22.34 | -15.00495 | -173.79359 | 1819 | 5 | 250 | Need to pan back out to get overall view of the setting. |
| 22-Sep | 22.22.45 | -15.00498 | -173.79357 | 1819 | 6 | 253 | Zoomed out. Crabs/snails on one side of the chimney (north side). |

| date | time | latitude | longitude | Z | alt | hdg | Q331 - North Mata Tolu Dive Comments |
|---|---|---|---|---|---|---|---|
| 22-Sep | 22.23.58 | -15.00493 | -173.79362 | 1819 | 4 | 236 | Continually panning to view the structure. Eel and pagoda structures on chimney. Hot water coming out but less than the other. |
| 22-Sep | 22.24.12 | -15.00491 | -173.79362 | 1820 | 3 | 224 | Biomass of snails is tremendous. Polynoid worms. |
| 22-Sep | 22.24.34 | -15.00489 | -173.79364 | 0 | 0 | 0 | Panning around the chimney structure. |
| 22-Sep | 22.25.19 | -15.00487 | -173.79366 | 1822 | 5 | 158 | Moving around left and panning. Wow. 7m down. |
| 22-Sep | 22.25.21 | -15.00487 | -173.79366 | 1822 | 5 | 159 | 8-9m high. Also seeing barnacles. |
| 22-Sep | 22.25.28 | -15.00487 | -173.79366 | 1822 | 5 | 158 | Shrimp on the edges. |
| 22-Sep | 22.25.57 | -15.00489 | -173.79364 | 1823 | 4 | 157 | Have traveled down this chimney. |
| 22-Sep | 22.26.12 | -15.00487 | -173.79366 | 1822 | 4 | 147 | Barnacles seen as we came down the chimney. |
| 22-Sep | 22.26.39 | -15.00490 | -173.79360 | 1822 | 5 | 151 | Zooming back out. |
| 22-Sep | 22.26.59 | -15.00489 | -173.79366 | 1821 | 6 | 136 | White mat is higher up the chimney and now continuing to go around. |
| 22-Sep | 22.27.27 | -15.00491 | -173.79369 | 1820 | 6 | 121 | Large flanges. Other side less active. Maybe sloughed off. |
| 22-Sep | 22.28.41 | -15.00492 | -173.79371 | 1816 | 7 | 205 | Continuing to come around the structure. |
| 22-Sep | 22.29.23 | -15.00499 | -173.79366 | 1818 | 4 | 354 | We're looking toward the north so we're on the south(?) side. |
| 22-Sep | 22.30.04 | -15.00496 | -173.79366 | 1816 | 6 | 354 | Chimney is covered in snails toward the top. There is active venting coming out the top. Not vigorous black smoke but look like beehives. |
| 22-Sep | 22.31.04 | -15.00498 | -173.79361 | 1817 | 6 | 335 | We're seeing non-stalked barnacles; snails; shrimp; brachyuran crabs. |
| 22-Sep | 22.32.05 | -15.00501 | -173.79357 | 1818 | 7 | 280 | We may be on the SE side of the pit (which is down below)?. Speculating because we haven't been there yet. |
| 22-Sep | 22.33.00 | -15.00499 | -173.79357 | 1818 | 6 | 271 | We'd like to focus on the biology first. Sample biology first. Use the net to get some of these snails. |
| 22-Sep | 22.33.39 | -15.00496 | -173.79357 | 1818 | 6 | 229 | Ifremieria snails (darker) and hairy snails (lighter). Hairy snails are where its hotter. Seeing shrimp and crabs as well. There is microbial mat on these sulfide structures as well and diffuse flow coming out from under the flanges. |
| 22-Sep | 22.35.28 | -15.00490 | -173.79362 | 1821 | 6 | 184 | We're getting DSCs of this large sulfide structure. |
| 22-Sep | 22.36.58 | -15.00490 | -173.79362 | 1818 | 9 | 204 | Still circling around and getting a nice looks at this large sulfide structure. |
| 22-Sep | 22.37.19 | -15.00493 | -173.79359 | 1817 | 10 | 206 | Tim is in the van setting up for sampling. |
| 22-Sep | 22.37.41 | -15.00493 | -173.79357 | 1817 | 9 | 208 | The chimney is draped with snails - 2 types. |
| 22-Sep | 22.38.56 | -15.00493 | -173.79359 | 1819 | 7 | 223 | After snail connecting will move to another nearby chimney |
| 22-Sep | 22.39.50 | -15.00491 | -173.79360 | 1820 | 5 | 252 | The net is coming out. |
| 22-Sep | 22.40.33 | -15.00495 | -173.79360 | 1819 | 6 | 254 | HD is on at 2240. |
| 22-Sep | 22.40.45 | -15.00496 | -173.79358 | 1820 | 5 | 253 | On the left on the rocks we can see non-stalked barnacles. They are the gold small round things on the sulfide. |
| 22-Sep | 22.41.38 | -15.00493 | -173.79362 | 1818 | 6 | 251 | These shrimp are very pale. |
| 22-Sep | 22.41.59 | -15.00494 | -173.79361 | 1818 | 7 | 252 | HD off at 2242. |
| 22-Sep | 22.42.16 | -15.00495 | -173.79356 | 0 | 0 | 0 | The shrimp are grey or translucent. They may be a different species than we have seen. There are some golden colored shrimp up higher on the chimney. |
| 22-Sep | 22.43.30 | -15.00496 | -173.79358 | 1817 | 7 | 252 | 2 types of crab: brachyuran and paralomis. An eel in the background. Lots of shimmering water. |
| 22-Sep | 22.44.58 | -15.00494 | -173.79363 | 1819 | 5 | 251 | Net out and perched over the 2 types of snails; translucent shrimp; brachyuran crabs; yellow shrimp in the area as well. |
| 22-Sep | 22.47.01 | -15.00498 | -173.79358 | 1819 | 4 | 238 | Looks like some large crab in the background (galatheid?) |
| 22-Sep | 22.47.33 | -15.00497 | -173.79359 | 1819 | 5 | 236 | Great scoop of the Alvinochonca snails and probably at least 1 hairy snails as well as a brachyuran crab. |
| 22-Sep | 22.50.05 | -15.00501 | -173.79359 | 1819 | 5 | 215 | Second scoop got the lots of hairy snails and several crabs. |
| 22-Sep | 22.52.25 | -15.00501 | -173.79358 | 1817 | 8 | 243 | **Bio Sample: Q331-biomacro-04.** Large net sample of Alvinochonca and hairy snails as well as several Brachyuran crabs. Into container 13. |
| 22-Sep | 22.54.37 | -15.00501 | -173.79356 | 1816 | 8 | 244 | Getting ready to stow the sample in the biobox. First passing the sampler from one arm to another. |
| 22-Sep | 22.54.55 | -15.00498 | -173.79358 | 0 | 0 | 0 | Biobox out. Close to 30 snails and 5 brachyuran crabs. Box open. |
| 22-Sep | 22.56.48 | -15.00501 | -173.79356 | 1817 | 8 | 244 | Trying to pass the sampler between arms. Success. |
| 22-Sep | 22.57.40 | -15.00501 | -173.79357 | 1816 | 8 | 245 | Rotating the bag to close it. |
| 22-Sep | 22.59.10 | -15.00497 | -173.79361 | 1816 | 9 | 245 | Moving over to the biobox. Placing sample in #14-16. |
| 22-Sep | 23.01.07 | -15.00500 | -173.79358 | 1816 | 9 | 245 | Closing biobox. |
| 22-Sep | 23.01.46 | -15.00500 | -173.79359 | 1816 | 8 | 244 | Pilot change. Looking at top of venting chimney. |
| 22-Sep | 23.05.47 | -15.00499 | -173.79360 | 1819 | 5 | 258 | Looking closer down the chimney at snail colonies. |
| 22-Sep | 23.07.01 | -15.00498 | -173.79360 | 1820 | 5 | 262 | Alvinochonca and shrimp amongst mussels. |
| 22-Sep | 23.07.35 | -15.00496 | -173.79362 | 1820 | 4 | 277 | Trying to decide how best to sample the shrimp. White structure they are calling the flange is the potential target. |
| 22-Sep | 23.08.28 | -15.00496 | -173.79362 | 1821 | 5 | 261 | Moving to the white flange area. Looking for best area to sample shrimp. Saw a scaleworm. |
| 22-Sep | 23.09.53 | -15.00495 | -173.79363 | 1820 | 3 | 273 | Diffuse flow in the white mat. |

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|---|---|---|---|---|---|---|---|
| 22-Sep | 23.10.35 | -15.00496 | -173.79364 | 1821 | 2 | 252 | This active chimney is within 10m of the dead chimney first sampled. |
| 22-Sep | 23.10.45 | -15.00497 | -173.79365 | 1821 | 2 | 253 | HD on. Shrimp; squat lobsters; alvinochonca; snails. |
| 22-Sep | 23.11.52 | -15.00497 | -173.79363 | 1819 | 4 | 253 | Retrieving the slurp hose. |
| 22-Sep | 23.12.54 | -15.00494 | -173.79364 | 1819 | 5 | 254 | At the lower right of this place pit between two chimney structures (Tim's description). |
| 22-Sep | 23.14.09 | -15.00494 | -173.79365 | 1819 | 3 | 258 | Have suction hose and will try to put them in the suction jars. Eel. |
| 22-Sep | 23.14.45 | -15.00493 | -173.79367 | 1820 | 2 | 251 | Lots of crabs in the center of the snail pit. |
| 22-Sep | 23.15.00 | -15.00493 | -173.79367 | 1820 | 2 | 241 | Brown snails and alvinochonca. |
| 22-Sep | 23.15.29 | -15.00492 | -173.79369 | 1821 | 1 | 241 | Rattail Fish. |
| 22-Sep | 23.16.23 | -15.00492 | -173.79371 | 1821 | 2 | 243 | Positioning over shrimp cluster. Bigger fish swam by and was pregnant. |
| 22-Sep | 23.18.50 | -15.00495 | -173.79368 | 1821 | 1 | 245 | Sucking but not dropping down. |
| 22-Sep | 23.20.47 | -15.00494 | -173.79367 | 0 | 0 | 0 | **Bio Sample: Q331-biomacro-05.** Saw 2 drop so rotated the jar. Shrimp collected next to brown snail cluster. Chamber #1. |
| 22-Sep | 23.23.52 | -15.00495 | -173.79367 | 1821 | 1 | 244 | Adding a snail to flush the shrimp down into the chamber. |
| 22-Sep | 23.24.39 | -15.00492 | -173.79370 | 1821 | 1 | 245 | **Bio Sample: Q331-biomacro-06.** Snail worked and rotated. Shrimp with a snail chaser. Chamber #2. |
| 22-Sep | 23.25.12 | -15.00495 | -173.79367 | 1821 | 1 | 244 | Paralomis crab. |
| 22-Sep | 23.27.20 | -15.00494 | -173.79366 | 1821 | 1 | 243 | Large and small shrimp here and looks like the smaller ones are escaping from the mesh in sampler. Small could be opaepele but big ones are definitely not. |
| 22-Sep | 23.27.40 | -15.00493 | -173.79367 | 1821 | 1 | 245 | Still slurping with a slight repositioning of the ROV. |
| 22-Sep | 23.30.33 | -15.00492 | -173.79368 | 1822 | 1 | 244 | Got a few shrimp and now trying for the chaser before rotating. |
| 22-Sep | 23.31.59 | -15.00494 | -173.79366 | 1822 | 1 | 245 | Looking for a snail of the right size. |
| 22-Sep | 23.33.18 | -15.00493 | -173.79367 | 1821 | 1 | 245 | Squat lobster not big enough to flush the shrimp. |
| 22-Sep | 23.33.57 | -15.00492 | -173.79368 | 1822 | 1 | 245 | Going for a snail. Rotating after a crab came through and flushed it down. **Bio Sample: Q331-biomacro-07.** Few shrimp and a crab. Chamber #3. |
| 22-Sep | 23.37.28 | -15.00491 | -173.79368 | 1822 | 1 | 245 | Going to try for one more suction of shrimp in this location. |
| 22-Sep | 23.40.53 | -15.00494 | -173.79365 | 1821 | 1 | 245 | Got a snail to push things down the tube. Been slurping. |
| 22-Sep | 23.42.55 | -15.00496 | -173.79364 | 1822 | 1 | 245 | Reversing flow and then went back and saw a lot of animals did come through. **Rotating Bio Sample: Q331-biomacro-08.** Looks like some of the crabs were blocking and then a few shrimp dropped. Jar #4. |
| 22-Sep | 23.43.31 | -15.00496 | -173.79365 | 1822 | 1 | 245 | Reverse flow is blowing out the biology (shrimp/crab/snail). Got the shrimp again. |
| 22-Sep | 23.46.17 | -15.00493 | -173.79366 | 1822 | 1 | 245 | **Bio Sample: Q331-biomacro-09**. Slurped more and got crab and shrimp. Reverse flow and a snail/crab hanging on in the tube. Snail caught in kink in hose. Jar #5. |
| 22-Sep | 23.48.24 | -15.00493 | -173.79367 | 1822 | 1 | 245 | **Bio Sample: Q331-biomacro-10**. Saw another shrimp. Put in jar #6. |
| 22-Sep | 23.48.50 | -15.00491 | -173.79369 | 1822 | 1 | 245 | Reversing flow to clear out the hose. All critters out. |
| 22-Sep | 23.49.34 | -15.00492 | -173.79369 | 1822 | 1 | 245 | Storing suction hose. Nav has wandered a bit. |
| 22-Sep | 23.52.23 | -15.00498 | -173.79366 | 1822 | 1 | 245 | Sampling a rock from the shrimp slurping area before moving. |
| 22-Sep | 23.53.09 | -15.00496 | -173.79366 | 1822 | 1 | 245 | Reaching for a rock which is probably sulfide. Same location. |
| 22-Sep | 23.53.47 | -15.00494 | -173.79369 | 1822 | 1 | 245 | Lost nav screen display. Restarting network. |
| 22-Sep | 23.54.47 | -15.00492 | -173.79366 | 1822 | 1 | 245 | **Geo Sample: Q331-rock-11.** Taking images of the sample. From base of chimney where the shrimp were. Place in bin #2. |
| 22-Sep | 23.56.25 | -15.00495 | -173.79366 | 1822 | 1 | 245 | Nav screen is back. |
| 22-Sep | 23.59.40 | -15.00495 | -173.79365 | 1821 | 2 | 222 | Repositioning the vehicle to look at water sampling site. Moving away from the lower chimneys. |
| 23-Sep | 00.00.34 | -15.00491 | -173.79364 | 1820 | 7 | 221 | Looking at taller chimney ahead. |
| 23-Sep | 00.01.38 | -15.00496 | -173.79364 | 1819 | 6 | 219 | Unclear whether sulfide or rock at base of the tall chimney. |
| 23-Sep | 00.02.12 | -15.00499 | -173.79365 | 1816 | 8 | 222 | Moving up the chimney. This was called Snail Chimney earlier and pilots then said would be too hard to sample. |
| 23-Sep | 00.02.51 | -15.00499 | -173.79365 | 1817 | 6 | 223 | Scaleworms near the top and a few shrimp. |
| 23-Sep | 00.03.44 | -15.00497 | -173.79368 | 1817 | 7 | 244 | Would also be interested in a sulfide sample but could be friable. |
| 23-Sep | 00.04.10 | -15.00497 | -173.79368 | 1816 | 7 | 279 | Top looks like 2 spires and water coming out of the side. |
| 23-Sep | 00.05.05 | -15.00498 | -173.79367 | 1817 | 6 | 282 | DSCs of chimney top. HD tape on. |
| 23-Sep | 00.06.06 | -15.00496 | -173.79367 | 1816 | 6 | 269 | Young chimney in front bathing in the sulfides. |
| 23-Sep | 00.06.41 | -15.00496 | -173.79368 | 1816 | 7 | 263 | Arm reaching out. |
| 23-Sep | 00.07.25 | -15.00495 | -173.79368 | 1816 | 7 | 264 | HD off. Top of the chimney is wide so may not fit in the grip. |
| 23-Sep | 00.08.08 | -15.00498 | -173.79365 | 1816 | 7 | 264 | Reaching for chimney in the back. |
| 23-Sep | 00.08.43 | -15.00499 | -173.79364 | 1816 | 7 | 264 | Got a piece of the top. Broke off. |
| 23-Sep | 00.09.27 | -15.00497 | -173.79365 | 1816 | 7 | 264 | Trying again. Broke off again. Going to try the front one again. |
| 23-Sep | 00.11.01 | -15.00494 | -173.79369 | 1816 | 7 | 264 | Top of this chimney is too big for the grip. |
| 23-Sep | 00.11.33 | -15.00499 | -173.79365 | 1816 | 6 | 264 | Just crumbling away in the sampler. |

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|---|---|---|---|---|---|---|---|
| 23-Sep | 00.11.43 | -15.00494 | -173.79368 | 1817 | 6 | 264 | Not possible to sample. |
| 23-Sep | 00.13.01 | -15.00498 | -173.79367 | 1816 | 7 | 264 | Will try to sample fluids here before getting a sulfide sample. |
| 23-Sep | 00.16.17 | -15.00494 | -173.79369 | 1816 | 6 | 264 | Tried one more time for a piece sitting on the top but fell out again. |
| 23-Sep | 00.18.54 | -15.00499 | -173.79367 | 1816 | 7 | 264 | Trying to reach for the bungee on the white major for fluid sampling. |
| 23-Sep | 00.20.47 | -15.00499 | -173.79364 | 1817 | 7 | 262 | Looks like trying to get the red major now out of the bungee. |
| 23-Sep | 00.21.40 | -15.00497 | -173.79364 | 1815 | 9 | 199 | ROV had to move a bit while grabbing the major but will move back for the sample. |
| 23-Sep | 00.22.06 | -15.00495 | -173.79362 | 1816 | 9 | 198 | Looking at the **Snail Chimney** from 200deg. |
| 23-Sep | 00.23.19 | -15.00493 | -173.79364 | 1817 | 8 | 208 | Have the red major. Rotating to fire and approaching the vent. |
| 23-Sep | 00.24.45 | -15.00499 | -173.79363 | 1816 | 7 | 208 | Positioning back at the chimney to get a parking spot for fluid sampling. |
| 23-Sep | 00.25.59 | -15.00494 | -173.79366 | 1817 | 7 | 209 | Smoking vent ready to be sampled with ROV nudged against it. |
| 23-Sep | 00.27.50 | -15.00494 | -173.79368 | 1816 | 7 | 209 | Tip in flow at top and down into orifice. Can't get view of trigger or exhaust so moving sampler a bit. |
| 23-Sep | 00.36.31 | -15.00494 | -173.79368 | 1816 | 7 | 216 | Firing the major. |
| 23-Sep | 00.39.22 | -15.00502 | -173.79363 | 1816 | 6 | 221 | **Fluid sample: Q331-major-12**. Red major at Snail Chimney top where snails and shrimp samples were taken. |
| 23-Sep | 00.39.52 | -15.00493 | -173.79366 | 1816 | 7 | 223 | Couldn't see the spring during sampling so held in place and now viewing spring-it fired and filled. |
| 23-Sep | 00.40.12 | -15.00496 | -173.79365 | 1816 | 7 | 222 | Next will be a GTB. Returning red major to basket. |
| 23-Sep | 00.44.01 | -15.00502 | -173.79363 | 1816 | 7 | 214 | Red major secured. Still in the same location. |
| 23-Sep | 00.45.32 | -15.00498 | -173.79364 | 1816 | 7 | 214 | Unsecuring the yellow GTB. Did not have to move the ROV. |
| 23-Sep | 00.46.11 | -15.00493 | -173.79367 | 1816 | 7 | 211 | HD shows biobox resting against the vent. |
| 23-Sep | 00.48.26 | -15.00497 | -173.79362 | 1816 | 8 | 209 | Removing the GTB from the basket. |
| 23-Sep | 00.48.59 | -15.00498 | -173.79365 | 1816 | 8 | 208 | Rotating GTB for the trigger. |
| 23-Sep | 00.50.51 | -15.00500 | -173.79365 | 1817 | 7 | 211 | Placing tip in the heart of the flow. |
| 23-Sep | 00.52.47 | -15.00499 | -173.79362 | 1816 | 8 | 207 | **Gas Sample: Q331-GTB-13**. Yellow GTB from the same vent as major-12. Same ROV position and heading. |
| 23-Sep | 00.55.46 | -15.00498 | -173.79365 | 1816 | 7 | 209 | Gastight stowed in the holster. |
| 23-Sep | 01.01.26 | -15.00494 | -173.79365 | 1816 | 8 | 208 | Attempting to grab the temperature probe to get an idea of hot this shimmering water is. |
| 23-Sep | 01.02.18 | -15.00496 | -173.79364 | 1816 | 7 | 211 | Lots of flow coming out of the top of this sulfide chimney. The fluid is clear with a bit of milky color as well. Taking bets on the temperature. |
| 23-Sep | 01.03.30 | -15.00495 | -173.79367 | 1816 | 8 | 207 | There's a small barnacle near the right center of this chimney hanging on for dear life. |
| 23-Sep | 01.06.23 | -15.00502 | -173.79364 | 1816 | 7 | 210 | The temperature probe is positioned over the chimney. |
| 23-Sep | 01.07.36 | -15.00496 | -173.79368 | 1816 | 7 | 209 | Trying to get the right angle with the ROV arm and probe. |
| 23-Sep | 01.08.21 | -15.00496 | -173.79368 | 1816 | 7 | 208 | The ambient temp was ~3+C. |
| 23-Sep | 01.09.52 | -15.00496 | -173.79368 | 0 | 0 | 0 | The temp is rising now. Got up to 120°C. Falling… A shrimp swimming by in the background. It's up to 192 then fell again. |
| 23-Sep | 01.10.58 | -15.00496 | -173.79368 | 1816 | 7 | 199 | The chimney broke off. About a foot of chimney crumbled down. Lots of gray smoke right now as the chimney top. |
| 23-Sep | 01.12.56 | -15.00496 | -173.79368 | 1817 | 6 | 262 | Part of the chimney ended up on the porch. Richard wants that piece of course. Going to go in for a temperature again. |
| 23-Sep | 01.13.33 | -15.00496 | -173.79368 | 1817 | 6 | 256 | The smoke coming out of the top of the now-larger orifice looks grayer now. |
| 23-Sep | 01.14.44 | -15.00496 | -173.79368 | 1816 | 6 | 251 | Translucent shrimp perched near the chimney top. Scrambling down away from the temp probe now. |
| 23-Sep | 01.15.31 | -15.00496 | -173.79368 | 0 | 0 | 0 | Back in the orifice with the probe now. 244°C; 264°; 270°; 271.4° C. |
| 23-Sep | 01.17.17 | -15.00496 | -173.79368 | 1816 | 6 | 243 | The highest temperature recorded was 271.4°C in one of the two orifices. |
| 23-Sep | 01.17.49 | -15.00496 | -173.79368 | 1817 | 6 | 221 | Moving over to sample another orifice up here. Small brachyuran crab on top the chimney. Looks like he's going to get out of the way of the temperature probe. He's now hiding being the chimney. |
| 23-Sep | 01.19.20 | -15.00496 | -173.79368 | 1817 | 6 | 221 | The temperature in the second orifice only got up to 40ish. Probably not in the hole. |
| 23-Sep | 01.20.03 | -15.00496 | -173.79368 | 1817 | 7 | 218 | Next moving down the chimney to get the temperature in the area of earlier sampling. Lowering the sub down the chimney. |
| 23-Sep | 01.21.28 | -15.00496 | -173.79368 | 1817 | 6 | 198 | This chimney - on this side- is covered in snails and tons of biota. |
| 23-Sep | 01.22.15 | -15.00496 | -173.79368 | 1819 | 4 | 191 | Tiny little spickets of water poking out all over this chimney. See lots of shrimp now. Of course snails. **[Postcruise: Nav jump 55m to NE. Cut nav from 01:22:50 thru 01:25:10 when nav wandered back.]** |
| 23-Sep | 01.24.05 | -15.00496 | -173.79368 | 1819 | 4 | 191 | Tunnel through the arch. Big eel just swam by the view. |
| 23-Sep | 01.24.54 | -15.00496 | -173.79368 | 1819 | 4 | 191 | The shrimp are hanging out on the reddish/yellowish area of the chimney. |
| 23-Sep | 01.25.46 | -15.00494 | -173.79364 | 1817 | 7 | 148 | This chimney is about 7 meters tall. **Called Snail Chimney.** |
| 23-Sep | 01.26.47 | -15.00496 | -173.79363 | 1820 | 2 | 166 | Crabs covering the rocks. Yellow-stained squat lobster swam by. |

| date | time | latitude | longitude | Z | alt | hdg | Q331 - North Mata Tolu Dive Comments |
|---|---|---|---|---|---|---|---|
| 23-Sep | 01.27.44 | -15.00495 | -173.79363 | 1820 | 2 | 180 | Want to put a target here. Lots of the hairy snails here that are covered with brachyurans. Enormous brachyuran spectacle. |
| 23-Sep | 01.30.13 | -15.00498 | -173.79364 | 1821 | 2 | 179 | Just saw a crab eating a squat lobster here. |
| 23-Sep | 01.30.29 | -15.00496 | -173.79364 | 0 | 0 | 0 | Temperature measurement in the environment where the hairy snails and brachyuran crabs are congregating in the shimmering water. 24°C temperature here in the shimmering water. |
| 23-Sep | 01.33.29 | -15.00491 | -173.79365 | 1820 | 2 | 181 | HD on. They are going to take some stills here as well. Saw a yellow shrimp. |
| 23-Sep | 01.34.40 | -15.00494 | -173.79366 | 1821 | 1 | 180 | Looks like old and young shrimp; possibly the same species. Yellow squat lobster in front. Snails of course everywhere. |
| 23-Sep | 01.35.38 | -15.00497 | -173.79366 | 1821 | 1 | 180 | One water sampler is slowly leaking and filling up with sea water. We're going to see if we can use it here in this diffuse flow. |
| 23-Sep | 01.36.07 | -15.00492 | -173.79366 | 1821 | 1 | 179 | Temperature probe is stowed. |
| 23-Sep | 01.36.24 | -15.00499 | -173.79365 | 1821 | 1 | 181 | Eel tail in the camera. |
| 23-Sep | 01.36.44 | -15.00498 | -173.79364 | 1821 | 1 | 181 | HD stopped. |
| 23-Sep | 01.37.09 | -15.00496 | -173.79366 | 1821 | 1 | 178 | The next task is to try to get the sulfide in the view; grab it and get it as a sample. |
| 23-Sep | 01.40.57 | -15.00498 | -173.79365 | 1821 | 1 | 176 | Had a small piece of sulfide in hand but did not get it into a container. It fell out of the claw. |
| 23-Sep | 01.42.04 | -15.00495 | -173.79363 | 1821 | 2 | 177 | Going in for another grab of the sulfide chunks that fell on the porch. It's a nice piece. It is a fist-sized angular piece of black chimney top. |
| 23-Sep | 01.43.42 | -15.00498 | -173.79363 | 1820 | 2 | 170 | Dropped this second piece too! Have not successfully gotten a piece yet. |
| 23-Sep | 01.45.11 | -15.00490 | -173.79365 | 1820 | 6 | 217 | We've backed away from the chimney. |
| 23-Sep | 01.39.06 | -15.00499 | -173.79363 | 1821 | 1 | 181 | **Geo sample: Q331-sulfide-14**. Piece of active sulfide from the top of the chimney where we got the 270°C fluid. It's a small black piece. There was another piece that fell by the temperature probe that may contribute to the sample. Went into container 5. Snail Chimney. |
| 23-Sep | 01.51.57 | -15.00495 | -173.79364 | 1821 | 2 | 206 | The HD camera has been raised so that the porch is finally out of view. |
| 23-Sep | 01.52.32 | -15.00493 | -173.79365 | 1820 | 2 | 205 | HD on at 0157. |
| 23-Sep | 01.52.58 | -15.00493 | -173.79366 | 1820 | 2 | 205 | Zooming in with the HD camera. Crab and hairy snail spa here. They are staked out in this area of diffuse flow. The snail in the lower left is moving. |
| 23-Sep | 01.54.16 | -15.00494 | -173.79365 | 1820 | 2 | 206 | The blue major sampler is in the ROV hand. Going in for the area of diffuse venting here at the hairy snail spa. |
| 23-Sep | 01.55.11 | -15.00499 | -173.79360 | 0 | 0 | 0 | HD off a minute ago. |
| 23-Sep | 01.55.35 | -15.00496 | -173.79363 | 1820 | 2 | 205 | **Q331-major-15.** Blue major in this area of diffuse flow above the hairy snails and brachyuran crabs at the base of Snail Chimney. |
| 23-Sep | 02.00.53 | -15.00499 | -173.79362 | 1819 | 2 | 201 | We are going to continue to move up the slope now. Going to leave this Snail Chimney and are now ready to move along and do some more exploring. |
| 23-Sep | 02.02.53 | -15.00493 | -173.79364 | 1818 | 4 | 199 | The big guys on the top of the chimney are paralomis crabs (even though they are not red). |
| 23-Sep | 02.03.28 | -15.00496 | -173.79364 | 1819 | 3 | 199 | Lots of biota on this chimney. It is a biologists paradise. But it's time to see what else this lovely volcano has to show us. |
| 23-Sep | 02.05.39 | -15.00496 | -173.79362 | 1821 | 2 | 220 | **The next plan is to investigate the pit (~1845m) seen on the AUV bathymetry.** |
| 23-Sep | 02.08.22 | -15.00486 | -173.79363 | 1825 | 6 | 300 | We're moving along the seafloor. With another chimney in the background. |
| 23-Sep | 02.11.24 | -15.00471 | -173.79359 | 1833 | 4 | 347 | It looks like we are at some pit edge. |
| 23-Sep | 02.13.50 | -15.00468 | -173.79356 | 0 | 0 | 0 | Bob wants to confirm that this is the chimney ridge on the top of the volcano. Older sulfide chimneys here are probably at the top of the ridge?? Hard to say. There is some white thin microbial mat on these dead sulfides. |
| 23-Sep | 02.15.55 | -15.00469 | -173.79360 | 1834 | 4 | 250 | Lots of crabs covering these boulders. |
| 23-Sep | 02.16.26 | -15.00467 | -173.79359 | 1834 | 4 | 261 | Repositioning the ship and managing the tether. |
| 23-Sep | 02.17.38 | -15.00472 | -173.79366 | 1825 | 7 | 234 | **Simon and Susan believe we are probably at the SW side of the pit. [postcruise: not sure about that]** |
| 23-Sep | 02.19.01 | -15.00482 | -173.79368 | 1824 | 4 | 216 | Bob sees what he believes is the edge of the pit. |
| 23-Sep | 02.19.34 | -15.00482 | -173.79375 | 1822 | 5 | 251 | We're heading down this hill a bit. We've possibly crossed over the ridge and are probably looking down the SW slope of this area. |
| 23-Sep | 02.22.27 | -15.00473 | -173.79377 | 1822 | 4 | 147 | DSC's here at this large chimney that does have black smoke coming out of one of the spickets. Put in a target: **target 14 called "smoker chimney".** Seafloor depth is 1829. |
| 23-Sep | 02.25.08 | -15.00475 | -173.79373 | 1824 | 4 | 146 | Black smoker chimney with lots of biota. Both snails; live shrimp; brachyurans; paralomis crab. |
| 23-Sep | 02.27.16 | -15.00461 | -173.79366 | 1821 | 18 | 261 | Heading downslope to the west.[postcruise: looks7 like we're still in the pit on the nav] |
| 23-Sep | 02.29.10 | -15.00459 | -173.79367 | 1829 | 12 | 268 | The bottom of the pit is at 1840. |

| date | time | latitude | longitude | Z | alt | hdg | Q331 - North Mata Tolu Dive Comments |
|---|---|---|---|---|---|---|---|
| 23-Sep | 02.31.14 | -15.00460 | -173.79364 | 1833 | 8 | 213 | This is a massive face of the slope here. Not sure where we are. This looks like mostly sulfide debris. Some sulfides and some rocks. |
| 23-Sep | 02.32.12 | -15.00458 | -173.79362 | 1839 | 4 | 216 | **There is a pit here.** The depth here is 1838m. It is consistent with the nav offset we have seen in the past. We're probably at the crosshairs now. That position is 173 47.6292 15 0.2866 in the crosshairs. 15deg 0.276'S 173 47.618'W LBL fix here. Susan is calling this **the Pit target. They put in a target called Pit Chimney target 15.** |
| 23-Sep | 02.35.45 | -15.00459 | -173.79365 | 1839 | 2 | 277 | Heading 270 looking at a sulfide with lots of biota; etc. Barnacles on the sulfide (orange things); Alvinochonca snails; galatheid crabs. |
| 23-Sep | 02.39.39 | -15.00458 | -173.79363 | 1835 | 6 | 275 | We're several meters from the top of the pit. |
| 23-Sep | 02.39.56 | -15.00460 | -173.79362 | 1836 | 6 | 275 | HD off Will spin around now. |
| 23-Sep | 02.40.17 | -15.00460 | -173.79363 | 1835 | 7 | 217 | Looking the SW wall now. Zooming on HD. Lots of crabs. Ken thinks they are volcanic rocks with a dusting of hydrothermal mat. Occasional shrimp. |
| 23-Sep | 02.41.50 | -15.00460 | -173.79363 | 1835 | 7 | 217 | Ralph thinks we are at the DVL nav cluster and he wants to head SW. |
| 23-Sep | 02.42.45 | -15.00462 | -173.79359 | 1832 | 8 | 237 | Heading to the SW. Big sulfide chimney in the view. |
| 23-Sep | 02.43.07 | -15.00461 | -173.79364 | 1830 | 5 | 230 | Looking at blue water but we see more structure up ahead. |
| 23-Sep | 02.43.49 | -15.00456 | -173.79373 | 1827 | 10 | 230 | The seabed is 1836m here. Coming upon another structure. We're just going to continue to the SW a bit. |
| 23-Sep | 02.44.49 | -15.00459 | -173.79374 | 1828 | 8 | 259 | Smoke up ahead in the water. |
| 23-Sep | 02.45.42 | -15.00455 | -173.79387 | 1826 | 14 | 248 | Blue water here. |
| 23-Sep | 02.46.59 | -15.00454 | -173.79385 | 1830 | 10 | 249 | We're sitting over 1840 meters. |
| 23-Sep | 02.49.05 | -15.00455 | -173.79385 | 1839 | 4 | 271 | Seeing hard returns around us. We're at 1843 meters. There is lots of bacterial mat on the rocks here. |
| 23-Sep | 02.51.59 | -15.00443 | -173.79387 | 1846 | 2 | 334 | There is a chimney in front of us. Lots of bacterial mat on the rocks here. |
| 23-Sep | 02.53.16 | -15.00446 | -173.79376 | 1848 | 1 | 315 | Lots of bac mat on the rocks visible in the downward-looking camera. |
| 23-Sep | 02.54.24 | -15.00447 | -173.79379 | 1846 | 3 | 266 | We've identified a feature in the sonar map to the west of us and will use that feature as a way of pinpointing our location. |
| 23-Sep | 02.56.04 | -15.00444 | -173.79385 | 1847 | 7 | 266 | Lots of flock in the water. |
| 23-Sep | 02.56.31 | -15.00447 | -173.79385 | 1852 | 1 | 266 | Squat lobsters and shrimp swimming in front of the video cam. Lots of particulates in the water. |
| 23-Sep | 02.57.27 | -15.00446 | -173.79385 | 1852 | 1 | 270 | We're at 1852 meters seeing lots of volcanic features. |
| 23-Sep | 02.58.52 | -15.00443 | -173.79397 | 1848 | 4 | 269 | The area of hydrothermal activity is much more extensive than what Bob and Ken had anticipated from the camera tows. |
| 23-Sep | 02.59.57 | -15.00439 | -173.79406 | 1850 | 3 | 269 | The bottom is in sight again. Some sediments; angular volcanic rocks and a crinoid. Brachyuran. Talus in this area. Large rock ahead of us. In place or not? |
| 23-Sep | 03.02.46 | -15.00436 | -173.79408 | 1848 | 5 | 166 | Beautiful crinoid on a rock in front of us. An occasional shrimp swimming by. |
| 23-Sep | 03.04.14 | -15.00438 | -173.79408 | 1847 | 4 | 165 | The big rock in front of us was a sulfide toppled on its side. |
| 23-Sep | 03.05.08 | -15.00440 | -173.79405 | 1842 | 9 | 168 | We're looking to the south. Large extinct chimney in the view. |
| 23-Sep | 03.05.30 | -15.00438 | -173.79406 | 1840 | 15 | 159 | On this SW side of the summit we are seeing lots of chimneys. |
| 23-Sep | 03.05.59 | -15.00447 | -173.79404 | 1839 | 9 | 159 | See some white staining on the seabed. Loose sediment with smaller rubble fragments. Orange/yellow/rust staining. Seeing volcanic rocks in front of us on the slope. |
| 23-Sep | 03.06.58 | -15.00451 | -173.79404 | 1843 | 5 | 160 | Sulfide deposit here. |
| 23-Sep | 03.07.35 | -15.00451 | -173.79400 | 1842 | 6 | 180 | We're at 1850m here. We see a long skinny white thing. |
| 23-Sep | 03.08.45 | -15.00452 | -173.79399 | 1845 | 4 | 180 | Patch of microbial mat with biology (a few snails; squat lobsters and crabs).. |
| 23-Sep | 03.10.35 | -15.00450 | -173.79402 | 1844 | 5 | 180 | Steep slope in front of us. Large sulfide mound? |
| 23-Sep | 03.10.59 | -15.00449 | -173.79402 | 1844 | 5 | 180 | Eel in the background slithering about. White color. |
| 23-Sep | 03.11.24 | -15.00450 | -173.79398 | 0 | 0 | 0 | Rick is talking about manganese oxidizers. They want to find that oxidizer. He would like to find some of the black manganese mats for that purpose. |
| 23-Sep | 03.12.27 | -15.00447 | -173.79400 | 1843 | 5 | 91 | We are feeling that we are probably NW of the pit. Will execute a due east transit heading for the summit. |
| 23-Sep | 03.15.32 | -15.00458 | -173.79383 | 1833 | 6 | 46 | Heading upslope. We've changed our mind about determining where the pit is. We're just going to head up slope to target D and then on to target H. |
| 23-Sep | 03.16.30 | -15.00457 | -173.79378 | 1835 | 4 | 52 | **Doing an eastern traverse upslope.** |
| 23-Sep | 03.17.03 | -15.00456 | -173.79375 | 0 | 0 | 0 | We've seen this chimney before Susan thinks. |
| 23-Sep | 03.17.57 | -15.00456 | -173.79373 | 1831 | 8 | 60 | If we have seen this before we will end up very close to the pit again. We'll see. |
| 23-Sep | 03.18.43 | -15.00456 | -173.79371 | 1831 | 5 | 90 | Either way we are heading due east. |
| 23-Sep | 03.19.12 | -15.00458 | -173.79364 | 1831 | 6 | 90 | White staining in the distance. Large slope ahead of us. |
| 23-Sep | 03.20.20 | -15.00460 | -173.79349 | 1829 | 10 | 89 | We're seeing a mixture of small and large chimneys ahead of us. |
| 23-Sep | 03.21.06 | -15.00458 | -173.79348 | 1830 | 9 | 90 | We're now feeling confident that we are on the northern part of the summit platform. [postcruise: at least we are north of the pit. Not sure if north of the summit] |

| date | time | latitude | longitude | Z | alt | hdg | Q331 - North Mata Tolu Dive Comments |
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| 23-Sep | 03.21.39 | -15.00462 | -173.79342 | 1830 | 8 | 90 | Smoke in the water. |
| 23-Sep | 03.21.50 | -15.00462 | -173.79341 | 1830 | 10 | 90 | There is a beautiful chimney right in front of us. |
| 23-Sep | 03.22.50 | -15.00462 | -173.79340 | 1830 | 9 | 113 | Black smoke coming out of this chimney. Dr. Seuss-looking chimney. |
| 23-Sep | 03.23.25 | -15.00460 | -173.79342 | 1829 | 9 | 148 | Barnacles on the chimney. Black smoke. Saw some snails as well. |
| 23-Sep | 03.24.04 | -15.00460 | -173.79342 | 1827 | 13 | 156 | **Gray smoke Chimney Target 16.** |
| 23-Sep | 03.25.59 | -15.00460 | -173.79342 | 1837 | 3 | 91 | Bunches of smaller chimneys in the view. Some white microbial mat on the chimneys. |
| 23-Sep | 03.27.05 | -15.00460 | -173.79342 | 1836 | 5 | 102 | We do see some microbial mat on these chimneys. They don't look very active. |
| 23-Sep | 03.28.12 | -15.00460 | -173.79342 | 1837 | 2 | 125 | Looks like a large cluster of inactive chimneys. White crabs but no sign of shrimp. |
| 23-Sep | 03.29.07 | -15.00471 | -173.79330 | 1838 | 4 | 155 | Iron and manganese oxide on this chimney. |
| 23-Sep | 03.29.25 | -15.00471 | -173.79329 | 1839 | 2 | 157 | Lots of volcanic talus behind this chimney (the black rock behind the chimney). |
| 23-Sep | 03.29.57 | -15.00468 | -173.79325 | 1838 | 3 | 163 | **Our depth here is 1842m. The depth on the map is 1815. Just found out that the USBL has not given us any fixes for a while.** |
| 23-Sep | 03.31.33 | -15.00463 | -173.79319 | 1840 | 5 | 58 | This all looks familiar to Rick…… |
| 23-Sep | 03.32.32 | -15.00461 | -173.79316 | 1845 | 1 | 60 | **We're seeing volcanic rock here. We're probably on the eastern part of the volcanic summit now.** |
| 23-Sep | 03.33.43 | -15.00456 | -173.79310 | 1849 | 4 | 61 | We think we're about 20m from the end of the traverse. We're moving to the NE to finished that and then will pick up a volcanic rock. |
| 23-Sep | 03.34.55 | -15.00451 | -173.79305 | 1850 | 6 | 65 | **We do have some LBL fixes again.** |
| 23-Sep | 03.38.48 | -15.00445 | -173.79293 | 1862 | 3 | 65 | The vehicle is on the bottom again - then up in the water column. |
| 23-Sep | 03.41.00 | -15.00439 | -173.79296 | 1868 | 2 | 65 | On the bottom again. Looking at what appears to be pumice and talus? |
| 23-Sep | 03.42.42 | -15.00439 | -173.79296 | 1866 | 6 | 158 | In place pillow lava on the slope. Debris-strewn slope. |
| 23-Sep | 03.43.33 | -15.00439 | -173.79293 | 1866 | 4 | 179 | Zooming in on this in-place pillow. |
| 23-Sep | 03.45.39 | -15.00443 | -173.79291 | 1866 | 3 | 190 | This pillow lava appears to be in place. Large bulbous top and tubes of lava extending it down slope. Right orientation for an in-place lava. |
| 23-Sep | 03.47.35 | -15.00445 | -173.79293 | 0 | 0 | 0 | Will head to the SW after this and go to the active area for water sampling within 15 to 20 minutes. |
| 23-Sep | 03.47.03 | -15.00445 | -173.79291 | 1866 | 3 | 184 | There's also talus and rubble on this slope in the vicinity. |
| 23-Sep | 03.44.06 | -15.00444 | -173.79289 | 1866 | 5 | 176 | **Geo Sample: Q331-rock-16**. Piece of the outer rind on this large pillow lava. Put into container 4. Fist sized? Drain out surface in foreground. Rock looks very rough from elephant-skin type lava when cooling and cracking. Looks quite crystal-rich. Boninite pillow. East of summit. |
| 23-Sep | 03.56.39 | -15.00443 | -173.79293 | 1865 | 3 | 184 | Working a bit higher up on this pillow - they want to position to get a rock. |
| 23-Sep | 03.54.15 | -15.00439 | -173.79294 | 1866 | 2 | 154 | **Geo Sample: Q331-rock-17**. Going for another piece of the rind just a bit higher up on the pillow. This one will be for microbial analysis of the rind. They want to know what microbes live in the rind. This is a boninite pillow. East of summit. |
| 23-Sep | 04.03.13 | -15.00445 | -173.79293 | 1865 | 4 | 225 | **Starting a traverse to the SW.** |
| 23-Sep | 04.05.14 | -15.00445 | -173.79293 | 1860 | 5 | 226 | **USBL out.** |
| 23-Sep | 04.06.22 | -15.00439 | -173.79295 | 1862 | 3 | 226 | USBL coming to life. |
| 23-Sep | 04.07.04 | -15.00444 | -173.79301 | 1858 | 6 | 225 | Moving 225. |
| 23-Sep | 04.07.32 | -15.00447 | -173.79311 | 1858 | 3 | 224 | Pillows and tubes coming down the slope. |
| 23-Sep | 04.08.17 | -15.00446 | -173.79310 | 1854 | 6 | 225 | Starting to see some crabs and shells with orange sediment. Fault face or land sliding. |
| 23-Sep | 04.08.40 | -15.00447 | -173.79318 | 1849 | 7 | 226 | Whip coral on a dike buttress face. Orientation almost 220. |
| 23-Sep | 04.09.23 | -15.00447 | -173.79320 | 1849 | 3 | 225 | Parallel to a fault seeing in the bathymetry. |
| 23-Sep | 04.09.43 | -15.00447 | -173.79320 | 1848 | 3 | 225 | Another view of the dike. Vertical feeder for surface eruptions. |
| 23-Sep | 04.09.51 | | | 1847 | 4 | 226 | Lots of crabs. |
| 23-Sep | 04.10.09 | | | 1845 | 5 | 225 | Hydrothermal muds. |
| 23-Sep | 04.10.40 | | | 1842 | 6 | 227 | Look like more altered rock and an old chimney. Sulfides built on side of northern face. |
| 23-Sep | 04.10.51 | | | 1842 | 6 | 225 | Lost USBL again. |
| 23-Sep | 04.11.22 | | | 1842 | 7 | 194 | Some microbial mat on the formations and seeing more white staining beyond these features. |
| 23-Sep | 04.11.53 | | | 1842 | 4 | 195 | Sonar seeing lots of features which could be chimney deposits. |
| 23-Sep | 04.12.01 | | | 1842 | 5 | 193 | HD tape on. |
| 23-Sep | 04.12.38 | | | 1841 | 5 | 199 | Shrimp and squat lobsters on these fuzzy rocks. |
| 23-Sep | 04.12.53 | | | 1841 | 5 | 198 | Gollum chimney - see a bit of shimmer. |
| 23-Sep | 04.13.33 | | | 1840 | 5 | 194 | Seeing some of that green deposit on the rock within the mat. |
| 23-Sep | 04.13.48 | | | 1840 | 5 | 193 | **Think we may on waypoint E????** |

| date | time | latitude | longitude | Z | alt | hdg | Q331 - North Mata Tolu Dive Comments |
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| 23-Sep | 04.14.44 | | | 1840 | 6 | 189 | HD off. |
| 23-Sep | 04.14.56 | | | 1840 | 6 | 189 | Mat was waving. |
| 23-Sep | 04.15.25 | | | 1840 | 5 | 233 | Seeing different chimney forms but no smoke. |
| 23-Sep | 04.16.23 | | | 1839 | 6 | 132 | Trying to reestablish navigation while panning around these inactive sulfides. |
| 23-Sep | 04.16.44 | | | 0 | 0 | 0 | Black smoke coming from the ones in front. |
| 23-Sep | 04.17.15 | | | 1840 | 4 | 140 | Shrimp swimming and squat lobsters. |
| 23-Sep | 04.17.27 | | | 1841 | 3 | 140 | No USBL. |
| 23-Sep | 04.18.14 | | | 1838 | 6 | 164 | Panning around the field. |
| 23-Sep | 04.19.11 | | | 1837 | 7 | 199 | White staining at the base of the taller feature. |
| 23-Sep | 04.19.33 | | | 1838 | 3 | 227 | So far only one smoker and seeing shimmer in the white mat with snails in it. |
| 23-Sep | 04.20.36 | | | 1839 | 2 | 244 | White area has more heat with lots of biology living on it. Smoker is just in front of us now. |
| 23-Sep | 04.21.08 | | | 1839 | 2 | 244 | A few snails near the top with 2 outlets. |
| 23-Sep | 04.21.38 | | | 1840 | 1 | 243 | Not very vigorous smoker. Shrimp below the snails. |
| 23-Sep | 04.22.53 | | | 1840 | 1 | 243 | Looks like black smoke at the top. Scaleworms; crabs; worms; shrimp. |
| 23-Sep | 04.23.01 | | | 1840 | 1 | 243 | Good sampling site. Know that there isn't much hydrothermal activity in this area from CTD work. |
| 23-Sep | 04.24.04 | | | 1840 | 1 | 243 | Crab climbing to the top. Turned the HD off. Taking some DSCs. |
| 23-Sep | 04.24.48 | | | 1840 | 1 | 243 | Larger crab at base of a different variety. |
| 23-Sep | 04.25.55 | -15.00447 | -173.79320 | 1840 | 1 | 243 | We're on the N-S fault which also adds to the value of this sample. |
| 23-Sep | 04.27.52 | -15.00462 | -173.79343 | 1839 | 1 | 253 | Would like to get fluid-gas-sulfide samples here. |
| 23-Sep | 04.29.28 | -15.00462 | -173.79344 | 1840 | 1 | 252 | Might try the sulfide sampling first to create a bigger orifice for water sampling. |
| 23-Sep | 04.30.30 | -15.00464 | -173.79345 | 1839 | 1 | 254 | **USBL is back.** |
| 23-Sep | 04.31.12 | -15.00464 | -173.79344 | 1840 | 1 | 254 | Arm is reaching for the sulfide and it is very fragile. |
| 23-Sep | 04.31.40 | -15.00466 | -173.79344 | 1839 | 1 | 254 | The top crumbled away when grabbed. Nav is bouncing around a bit. |
| 23-Sep | 04.33.03 | -15.00462 | -173.79347 | 1840 | 1 | 255 | Not having luck getting a piece of this sulfide. |
| 23-Sep | 04.33.52 | -15.00462 | -173.79347 | 1840 | 1 | 254 | Going to move the vehicle for a different sampling angle. |
| 23-Sep | 04.34.22 | -15.00462 | -173.79347 | 1840 | 1 | 253 | Looks like better flow. |
| 23-Sep | 04.35.02 | -15.00457 | -173.79347 | 1841 | 1 | 250 | Ralph-Daniel-Dave-Joe. |
| 23-Sep | 04.35.21 | -15.00455 | -173.79349 | 1840 | 1 | 251 | Larger piece broken off and good flow. |
| 23-Sep | 04.37.20 | -15.00456 | -173.79348 | 1839 | 1 | 253 | Trying to pick up a large piece of sulfide chimney. It's a solid piece. Active piece of sulfide. Was delicate at the top but appears to be stronger at the base. |
| 23-Sep | 04.38.33 | -15.00461 | -173.79345 | 1840 | 1 | 254 | Repositioning. |
| 23-Sep | 04.40.02 | -15.00455 | -173.79347 | 1840 | 1 | 245 | We would prefer to get this chimney piece from the same place we want to sample fluids. That way the chemistry from both can be compared. |
| 23-Sep | 04.42.51 | -15.00454 | -173.79346 | 1840 | 1 | 247 | The active sulfide top fell to the ground earlier and Quest has been trying to pick it up for at least 10 minutes. |
| 23-Sep | 04.43.46 | -15.00455 | -173.79347 | 0 | 0 | 0 | Shrimp on the sulfide rocks in front of us. |
| 23-Sep | 04.48.01 | -15.00457 | -173.79346 | 1840 | 1 | 245 | Beautiful shot of the biological community here. Shrimp grazers on the microbial mat. Snails and crabs. |
| 23-Sep | 04.49.08 | -15.00454 | -173.79346 | 1839 | 1 | 245 | Zooming in on the biology. |
| 23-Sep | 04.51.19 | -15.00459 | -173.79345 | 1840 | 1 | 245 | We're going to collect 2 gastights and a major sample here. Will back out. |
| 23-Sep | 04.55.02 | -15.00459 | -173.79346 | 1840 | 1 | 245 | Grabbing the green gastight to take a sample in this sulfide chimney with lots of flow (mainly clear with a tinge of black to it). |
| 23-Sep | 04.57.15 | -15.00454 | -173.79345 | 1840 | 1 | 245 | **Gas Sample: Q331-gtb-18**. Fired gastight over the top of the flow from this broken off small sulfide chimney. The chimney has a thick rind of chalcopyrite with intense flow. Chimney south of summit area. |
| 23-Sep | 05.02.50 | -15.00454 | -173.79345 | 1841 | 1 | 245 | Brought out the white gastight bottle |
| 23-Sep | 05.05.25 | -15.00454 | -173.79345 | 1840 | 1 | 244 | **Gas Sample: Q331-gtb-19**. Black gastight fired far in the chimney flow. Great sample. The nozzle was far down in the flow. Chimney south of summit area. |
| 23-Sep | 05.06.28 | -15.00456 | -173.79344 | 1840 | 1 | 245 | The ROV is going for the last major sampler. |
| 23-Sep | 05.08.50 | -15.00459 | -173.79343 | 1840 | 1 | 245 | Have the major sampler in the grasp of the ROV. |
| 23-Sep | 05.10.04 | -15.00458 | -173.79344 | 1840 | 1 | 245 | Looking in the rock at shrimp grazing the microbial mat in the lower left part of the screen. |
| 23-Sep | 05.10.49 | -15.00458 | -173.79344 | 1840 | 1 | 245 | HD on. |
| 23-Sep | 05.11.09 | -15.00459 | -173.79343 | 1839 | 1 | 245 | That looks like a good position with the white major sampler. |
| 23-Sep | 05.13.31 | -15.00458 | -173.79345 | 1840 | 1 | 244 | **Fluid Sample: Q331-major-20**. Sample is down in the chimney quite a way. This looks like a great sample also. Chimney south of summit area. |

| date | time | latitude | longitude | Z | alt | hdg | Q331 - North Mata Tolu Dive Comments |
|---|---|---|---|---|---|---|---|
| 23-Sep | 05.14.47 | -15.00458 | -173.79344 | 1841 | 1 | 244 | 0423-17 HD off. |
| 23-Sep | 05.15.25 | -15.00453 | -173.79347 | 1840 | 1 | 244 | The shrimp are climbing up to the ledge for the good microbes and then they get too hot and head back down. |
| 23-Sep | 05.17.24 | -15.00455 | -173.79344 | 1840 | 1 | 244 | Going for the temperature probe. Want a temperature reading in the place where we took the last 3 samples. |
| 23-Sep | 05.18.55 | -15.00457 | -173.79346 | 1840 | 1 | 245 | A shrimp grabbed a polychaete on the left hand side of the chimney. The shrimp keep climbing on up to the top and then getting too warm and heading down again. Quite an interesting shot. |
| 23-Sep | 05.20.01 | -15.00460 | -173.79344 | 1840 | 1 | 244 | Have the temperature probe in hand and going toward the vent. |
| 23-Sep | 05.21.20 | -15.00458 | -173.79343 | 1840 | 1 | 244 | The temperature probe is in the venting sulfide orifice. Temp readings 77; 96; 109°C. He's only on the edge right now. |
| 23-Sep | 05.22.52 | -15.00461 | -173.79345 | 1840 | 1 | 242 | Repositioned: 113; 156; 187; 202; 222; 240; 242. That looks like the limit: **242°C**. It matches our heading. |
| 23-Sep | 05.25.40 | -15.00456 | -173.79345 | 1840 | 1 | 244 | The temperature probe is being stored. |
| 23-Sep | 05.27.56 | -15.00460 | -173.79343 | 1840 | 1 | 243 | The next task is to get a pump filter sample for DNA and RNA for Julie Huber. |
| 23-Sep | 05.31.27 | -15.00462 | -173.79343 | 1839 | 1 | 243 | **Fluid sample: Q331-DNA-RNA-21**. One final slurp of water with the pelagic pump (hose from pump is attached to the suction sample hose). The hose is positioned over the bacterial mat in more diffuse flow just to the left of the hot chimney we have been sampling. The pump runs for 10 minutes and the filter is the actual sample. Sample for Julie Huber. (Chimney south of summit area) |
| 23-Sep | 05.35.29 | -15.00458 | -173.79343 | 1840 | 1 | 244 | HD tape has been swapped out. HD on. |
| 23-Sep | 05.37.21 | -15.00458 | -173.79344 | 1840 | 1 | 243 | We see a rostrum on one of the shrimp. |
| 23-Sep | 05.39.54 | -15.00461 | -173.79346 | 1840 | 1 | 244 | The pump is off. |
| 23-Sep | 05.40.45 | -15.00459 | -173.79345 | 0 | 0 | 0 | HD is turned off. |
| 23-Sep | 05.41.00 | -15.00461 | -173.79342 | 1840 | 1 | 244 | HD back on. |
| 23-Sep | 05.41.36 | -15.00461 | -173.79342 | 1840 | 1 | 243 | **Bio Sample: Q331-biomacro-22**. Sucking up the shrimp with the suction sampler hose. They have collected lots of shrimp here. Not sure how many of them have stayed in the chamber. (Chimney south of summit area) |
| 23-Sep | 05.45.45 | -15.00461 | -173.79342 | 1840 | 1 | 243 | **Bio Sample: Q331-biomacro-23**. Sucking up more the shrimp with the suction sampler hose. They have collected lots of shrimp here. Seems like most of them stayed in the chamber. (Chimney south of summit area) |
| 23-Sep | 05.46.25 | -15.00459 | -173.79344 | 1840 | 1 | 243 | Storing the suction sampler hose now. Going for the sulfide chimney that we've been sampling. |
| 23-Sep | 05.47.38 | -15.00462 | -173.79342 | 1840 | 1 | 243 | **Bio Sample: Q331-sulfide-24.** We want the hot smoker chimney. Got it. Beautiful piece with chalcopyrite ring inside. Beautiful chimney piece. Black with beautiful chalcopyrite. Fist-sized. |
| 23-Sep | 05.51.38 | -15.00460 | -173.79344 | 1840 | 1 | 243 | Wrapping up this successful dive here at Mata Tolu. We will do a little fly-over of this area next. |
| 23-Sep | 05.52.44 | -15.00462 | -173.79343 | 1840 | 1 | 243 | That's a beautiful shot. That's an artistic shot. |
| 23-Sep | 05.53.29 | -15.00460 | -173.79344 | 1840 | 1 | 243 | HD on. Amazing shot of this area. Yellow-covered pagoda chimney in the forefront. Less active chimneys in the background. Amazing view. |
| 23-Sep | 05.56.01 | -15.00461 | -173.79342 | 1840 | 1 | 242 | Surreal scenery. In the background we see crabs covering the rocks. |
| 23-Sep | 05.58.29 | -15.00460 | -173.79347 | 1839 | 1 | 292 | Looking around now looking at extinct sulfide chimney with some biota. Moving up the chimney. |
| 23-Sep | 05.59.44 | -15.00458 | -173.79349 | 1837 | 3 | 286 | That's it. We're off the bottom. |
| 23-Sep | 07.26.52 | | | | | | ROV out of water. |
| 23-Sep | 07.28.06 | | | | | | ROV on deck. |

## 7.11 Q332 West Mata Dive Log

| date | time | latitude | longitude | Z | alt | hdg | Q332 - West Mata Dive Comments |
|---|---|---|---|---|---|---|---|
| **Main Goals:** Complete sampling and exploration goals at West Mata. | | | | | | | |
| **Launch target:** 15°5.630' S 173°45.057' W Z=1360m Downslope on north side of summit | | | | | | | |
| **Setup:** 3 gastights; 3 majors; temp probe 2 Davis samplers; 1 McPhail sampler; large biobox; suction sampler; pelagic pump; T-handle and mesh net; shrimp-catcher jar | | | | | | | |
| **Nav Notes:** Bottom time: 9/23 20:14 - 9/24 05:15. Nav smoothed (tolerance=10). Nav NOT shifted. No log entries 03:56:26 - 04:02:44. Nav takes a big loop (wander?) with sparse data points. That is probably not real. | | | | | | | |
| **DIVE LOG POSITION INFORMATION: latitude; longitude; Z; alt; hdg values are derived from finalized Quest nav. Any lat/long values in the dive comments column were recorded at sea and are preliminary.** | | | | | | | |
| 23-Sep | 19.24.12 | | | | | | Passing 200m. |
| 23-Sep | 19.29.03 | | | | | | Passing 300m. |
| 23-Sep | 19.34.12 | | | | | | 400m. |
| 23-Sep | 19.47.52 | | | | | | 700m. |
| 23-Sep | 19.52.20 | | | | | | 800m. |
| 23-Sep | 19.55.28 | | | | | | 500m off the bottom. |
| 23-Sep | 20.07.51 | | | | | | 200m off the bottom. |
| 23-Sep | 20.11.44 | | | | | | About 100m off bottom. |
| 23-Sep | 20.13.58 | | | | | | Altimeter reading bottom. |
| 23-Sep | 20.14.55 | -15.09393 | -173.75096 | 1343 | 7 | 302 | See bottom on cameras. |
| 23-Sep | 20.15.21 | -15.09396 | -173.75096 | 1348 | 1 | 302 | Bottom with lava talus and not so much sediment. |
| 23-Sep | 20.17.02 | -15.09395 | -173.75097 | 1349 | 1 | 345 | Angular blocks. Swimming worms (?). |
| 23-Sep | 20.18.28 | -15.09398 | -173.75094 | 1348 | 2 | 103 | Expected to see sediments and not these angular rocks. |
| 23-Sep | 20.19.23 | -15.09400 | -173.75094 | 1347 | 2 | 103 | Taking DSCs. |
| 23-Sep | 20.19.57 | -15.09401 | -173.75094 | 1345 | 4 | 103 | Seeing rocks with vesicles and look fairly fresh. Some altered rocks. |
| 23-Sep | 20.20.23 | -15.09402 | -173.75093 | 1344 | 2 | 154 | Debris slope with swimming scaleworms. |
| 23-Sep | 20.20.40 | -15.09403 | -173.75090 | 1342 | 3 | 106 | No sessile biology. |
| 23-Sep | 20.21.18 | -15.09405 | -173.75088 | 1341 | 2 | 102 | Moving upslope over angular talus slope. Lasers on. |
| 23-Sep | 20.22.23 | -15.09409 | -173.75083 | 1337 | 3 | 110 | Larger piece of lava that looks older with some sand on top. |
| 23-Sep | 20.22.45 | -15.09411 | -173.75080 | 1336 | 3 | 109 | Seeing more sand deposits on the other side of the boulder. |
| 23-Sep | 20.23.00 | -15.09413 | -173.75079 | 1336 | 3 | 98 | Talus are smaller pieces. |
| 23-Sep | 20.23.31 | -15.09415 | -173.75078 | 1332 | 5 | 74 | Moving upslope with one very large piece of lava. |
| 23-Sep | 20.23.55 | -15.09417 | -173.75076 | 1331 | 4 | 109 | Steeper here probably a slide slope. |
| 23-Sep | 20.24.32 | -15.09420 | -173.75072 | 1328 | 4 | 154 | 5-20cm with occasional larger blocks. |
| 23-Sep | 20.24.51 | -15.09421 | -173.75072 | 1328 | 2 | 150 | More altered rock Pillow truncated. |
| 23-Sep | 20.25.09 | -15.09423 | -173.75071 | 1328 | 3 | 125 | Rusty brown sediment. |
| 23-Sep | 20.25.39 | -15.09424 | -173.75068 | 1327 | 2 | 126 | Coming up to larger pieces of talus. |
| 23-Sep | 20.25.44 | -15.09424 | -173.75068 | 1326 | 2 | 126 | More angular pieces with larger pieces and vesicles in rocks. |
| 23-Sep | 20.26.25 | -15.09426 | -173.75066 | 1326 | 2 | 118 | Large vesicles. |
| 23-Sep | 20.26.54 | -15.09426 | -173.75066 | 1324 | 3 | 118 | 10-60 cm blocks. Holes are 5cm. |
| 23-Sep | 20.27.12 | -15.09426 | -173.75067 | 1323 | 4 | 118 | Piece of darker material with elephantine skin. |
| 23-Sep | 20.28.06 | -15.09429 | -173.75063 | 1321 | 4 | 118 | Looks like debris. Shrimp non-vent. |
| 23-Sep | 20.28.31 | -15.09429 | -173.75062 | 1318 | 4 | 117 | Angular talus with some broken pillows. |
| 23-Sep | 20.28.50 | -15.09430 | -173.75060 | 1317 | 5 | 98 | Moving upslope turning on HD. |
| 23-Sep | 20.29.16 | -15.09430 | -173.75060 | 1316 | 3 | 98 | Swimming shrimp. |
| 23-Sep | 20.29.31 | -15.09432 | -173.75056 | 1315 | 3 | 98 | Some rock fragments have iron staining. |
| 23-Sep | 20.29.46 | -15.09432 | -173.75056 | 1314 | 3 | 98 | Seeing glass skins on some debris-maybe fresher. |
| 23-Sep | 20.30.17 | -15.09435 | -173.75052 | 1309 | 4 | 100 | Look like these are pillow parts. |
| 23-Sep | 20.31.01 | -15.09437 | -173.75044 | 1306 | 4 | 101 | Sonar still showing climbing up slope. |
| 23-Sep | 20.31.16 | -15.09437 | -173.75044 | 1305 | 4 | 100 | HD off. |
| 23-Sep | 20.31.38 | -15.09440 | -173.75041 | 1300 | 4 | 100 | Glassy skins on the pillow talus. |
| 23-Sep | 20.32.01 | -15.09442 | -173.75040 | 1298 | 5 | 110 | This could be in place pillows with truncation. DSCs. |
| 23-Sep | 20.32.28 | -15.09442 | -173.75040 | 1296 | 7 | 118 | Beautiful truncated pillows in place. HD on. |
| 23-Sep | 20.33.22 | -15.09439 | -173.75041 | 1298 | 8 | 142 | Similar sample taken here about 3 years ago. Stacked pillows. |
| 23-Sep | 20.33.36 | -15.09441 | -173.75042 | 1298 | 7 | 140 | Very larger pillows-some over 1m across. |
| 23-Sep | 20.34.11 | -15.09441 | -173.75042 | 1296 | 9 | 118 | Seeing some sediment. |
| 23-Sep | 20.34.44 | -15.09445 | -173.75038 | 1292 | 15 | 119 | Some biology on the edges. |
| 23-Sep | 20.35.01 | -15.09444 | -173.75040 | 1290 | 17 | 119 | Sonar looks like topping out. |
| 23-Sep | 20.35.48 | -15.09444 | -173.75041 | 1291 | 13 | 138 | Near top of the pillow with some non-truncated pillows. Cross section of radial pillow. |
| 23-Sep | 20.36.30 | -15.09444 | -173.75039 | 1292 | 15 | 134 | Don't need a sample since it looks near the same as 3 years ago. |
| 23-Sep | 20.37.38 | -15.09445 | -173.75038 | 1291 | 7 | 145 | Getting close-ups of the pillow with the lasers on. Seeing layer of vesicles in a lava flow. |

| date | time | latitude | longitude | Z | alt | hdg | Q332 - West Mata Dive Comments |
|---|---|---|---|---|---|---|---|
| 23-Sep | 20.38.28 | -15.09446 | -173.75035 | 1288 | 4 | 100 | HD on. |
| 23-Sep | 20.39.00 | -15.09447 | -173.75030 | 1286 | 5 | 119 | Going to head east. |
| 23-Sep | 20.39.48 | -15.09447 | -173.75027 | 1285 | 6 | 120 | Cliff of in place pillow that have been truncated (right) to the left looks like rubble that has fallen from above. |
| 23-Sep | 20.40.19 | -15.09448 | -173.75022 | 1283 | 3 | 80 | Broken pillows of talus. |
| 23-Sep | 20.40.32 | -15.09449 | -173.75015 | 1281 | 4 | 95 | White staining here. |
| 23-Sep | 20.40.59 | -15.09452 | -173.75010 | 1277 | 3 | 70 | Heading upslope. 20cm to .5m across lava pieces. |
| 23-Sep | 20.41.21 | -15.09452 | -173.75005 | 1275 | 3 | 77 | Chute of rubble of lava fragments. Getting close to rim depth. |
| 23-Sep | 20.41.34 | -15.09452 | -173.75001 | 1273 | 5 | 83 | Transitioning into smaller fragments and sand. |
| 23-Sep | 20.41.49 | -15.09452 | -173.74998 | 1272 | 4 | 88 | Some in place pillows and tubes. |
| 23-Sep | 20.42.17 | -15.09452 | -173.74998 | 1267 | 7 | 88 | Large tubes coming down the slope. Some truncated. |
| 23-Sep | 20.42.51 | -15.09455 | -173.74990 | 1263 | 4 | 68 | In place pillows are covered by some debris that has slid down. |
| 23-Sep | 20.43.07 | -15.09455 | -173.74989 | 1261 | 4 | 62 | Sonar showing slope still in front. Some yellow/orange sediment. |
| 23-Sep | 20.43.31 | -15.09455 | -173.74983 | 1259 | 4 | 64 | Looks like a rim coming up. Big pillows. |
| 23-Sep | 20.43.45 | -15.09455 | -173.74983 | 1258 | 4 | 64 | Tubes here looks like they are on top of any debris. |
| 23-Sep | 20.44.12 | -15.09455 | -173.74978 | 1257 | 3 | 124 | At the top of the rim. |
| 23-Sep | 20.45.05 | -15.09456 | -173.74976 | 1256 | 3 | 51 | On the rim facing NE. |
| 23-Sep | 20.45.41 | -15.09457 | -173.74978 | 1256 | 3 | 76 | Seeing some shrimp on the pillows. |
| 23-Sep | 20.46.41 | -15.09455 | -173.74976 | 1256 | 2 | 116 | Setting up to sample a piece of pillow at the top which could have been erupted in the last few years. |
| 23-Sep | 20.47.31 | -15.09455 | -173.74976 | 1257 | 2 | 116 | Trying for a piece of crust of the lava pillow. |
| 23-Sep | 20.49.29 | -15.09456 | -173.74976 | 1257 | 2 | 114 | Will try to get 2 pieces (one for Rubin other for Tebo). Tebo's will always go into the biobox. |
| 23-Sep | 20.51.34 | -15.09455 | -173.74976 | 1256 | 2 | 115 | Crust did break off. Small piece in claw. Placing this piece in the biobox. Image in HD of sample. |
| 23-Sep | 20.52.36 | -15.09455 | -173.74977 | 1257 | 2 | 115 | Gently placed in the biobox. |
| 23-Sep | 20.53.41 | -15.09455 | -173.74976 | 1257 | 2 | 115 | **Geo Sample: Q332-rock-01**. Piece of pillow crust from the edge of a pit at 1257m. Fresh eruption from within the past few years. |
| 23-Sep | 20.54.05 | -15.09455 | -173.74977 | 0 | 0 | 0 | Sample was fairly friable so probably fresh. Going for second piece. |
| 23-Sep | 20.54.47 | -15.09455 | -173.74979 | 1257 | 2 | 115 | Got another piece but need more. That piece may have disintegrated too much so moved vehicle slightly to get a bigger piece. |
| 23-Sep | 20.57.25 | -15.09457 | -173.74978 | 1257 | 2 | 76 | Broke off an entire piece of pillow but has a piece of it in claw. Same pillow just a different angle. Putting in bin #1 again. |
| 23-Sep | 20.58.16 | -15.09456 | -173.74976 | 1256 | 2 | 76 | **Geo Sample: Q332-rock-02**. Pieces of same pillow crust for Rubin. Pillow from edge of a rim of fresh lavas. Placed in tube #1. Larger piece with crumbled first piece. |
| 23-Sep | 20.59.31 | -15.09457 | -173.74978 | 1256 | 2 | 92 | Going to look at this tube teetering on the edge of the rim. |
| 23-Sep | 21.00.34 | -15.09460 | -173.74977 | 1255 | 5 | 266 | Facing west to look at the chopped pillow. |
| 23-Sep | 21.00.52 | -15.09460 | -173.74976 | 1257 | 4 | 261 | There is the pillow from this side. Lots of truncated pillow. HD on. |
| 23-Sep | 21.01.38 | -15.09457 | -173.74974 | 1256 | 5 | 349 | Look at that edge-like a knife at 348deg. |
| 23-Sep | 21.02.01 | -15.09457 | -173.74974 | 1256 | 3 | 348 | Pillow on the knife edge. |
| 23-Sep | 21.02.48 | -15.09452 | -173.74970 | 1256 | 4 | 347 | Tubes oriented downslope then truncated on the pit side. |
| 23-Sep | 21.02.56 | -15.09451 | -173.74970 | 1256 | 4 | 332 | Not much debris on top. Outer slope to left and pit to right where truncated. |
| 23-Sep | 21.03.38 | -15.09446 | -173.74968 | 1255 | 3 | 6 | Stack of pillow tubes formed on slope of volcano and the pit has truncated them all. |
| 23-Sep | 21.03.59 | -15.09445 | -173.74966 | 1255 | 3 | 10 | Massive truncated tube with little hollow center. |
| 23-Sep | 21.04.21 | -15.09445 | -173.74966 | 1254 | 5 | 319 | Scaleworms swimming. |
| 23-Sep | 21.04.41 | -15.09444 | -173.74964 | 1254 | 5 | 320 | View in tube with lasers on. Cavity is 30cm wide. |
| 23-Sep | 21.05.06 | -15.09442 | -173.74961 | 1254 | 5 | 309 | Pillows flowing downslope. Not much debris on the top from any explosive event. |
| 23-Sep | 21.05.51 | -15.09437 | -173.74961 | 1255 | 4 | 319 | Sharp knife edge with lava drips inside the pillow. |
| 23-Sep | 21.06.40 | -15.09430 | -173.74961 | 1255 | 3 | 5 | More sediment in here. |
| 23-Sep | 21.07.29 | -15.09424 | -173.74958 | 1253 | 5 | 319 | Rim here is unconsolidated flow - fragmental. |
| 23-Sep | 21.08.04 | -15.09424 | -173.74958 | 1253 | 4 | 332 | Polychaetes feeding in the water. |
| 23-Sep | 21.08.32 | -15.09424 | -173.74958 | 1251 | 4 | 347 | Scaleworm swimming in HD close-up. |
| 23-Sep | 21.09.03 | -15.09424 | -173.74959 | 1252 | 3 | 18 | There is the rim again. What a knife. |
| 23-Sep | 21.09.45 | -15.09425 | -173.74958 | 1253 | 1 | 21 | Sediment and fragments right on the edge. |
| 23-Sep | 21.10.31 | -15.09421 | -173.74957 | 1253 | 1 | 29 | Both sides of the rim covered in sediment up to a knife edge. |
| 23-Sep | 21.11.08 | -15.09419 | -173.74954 | 1252 | 2 | 35 | Coming up to some bigger blocks with sediment. |
| 23-Sep | 21.12.35 | -15.09414 | -173.74948 | 1249 | 1 | 35 | Would like to go down to the pit but would like to be where the in place pillows are instead of this unconsolidated material. |
| 23-Sep | 21.13.09 | -15.09414 | -173.74940 | 1250 | 3 | 52 | More polychaetes in the water over the pit. |
| 23-Sep | 21.14.21 | -15.09417 | -173.74941 | 1251 | 4 | 308 | Going to turn back and follow the rim to the tubes. |

| date | time | latitude | longitude | Z | alt | hdg | Q332 - West Mata Dive Comments |
|---|---|---|---|---|---|---|---|
| 23-Sep | 21.14.37 | -15.09417 | -173.74941 | 1253 | 2 | 308 | Looks like smoke on the outside of the pit?? Nope-just us. |
| 23-Sep | 21.15.18 | -15.09419 | -173.74944 | 1251 | 3 | 263 | Now following the rim back. |
| 23-Sep | 21.15.49 | -15.09425 | -173.74954 | 1254 | 5 | 211 | Back to the tubes and pillows. |
| 23-Sep | 21.16.24 | -15.09437 | -173.74958 | 1257 | 4 | 246 | Inside of pit is very clean here which supports the collapse hypothesis. |
| 23-Sep | 21.16.52 | -15.09437 | -173.74954 | 1260 | 5 | 247 | Pillows look like just on the rim as we descended got into fragmented debris material. Very steep. |
| 23-Sep | 21.17.30 | -15.09437 | -173.74954 | 1263 | 3 | 212 | Very unstable slope with some intact pillow and tubes. Very large tube. HD on. |
| 23-Sep | 21.17.57 | -15.09437 | -173.74955 | 1263 | 2 | 202 | Pillow sticking out of the slope like a giant finger. |
| 23-Sep | 21.18.36 | -15.09436 | -173.74952 | 1264 | 4 | 217 | Some of the pillows were strong enough to withstand the collapse. |
| 23-Sep | 21.19.11 | -15.09436 | -173.74951 | 1267 | 2 | 216 | Came about 10m down from the pit rim. |
| 23-Sep | 21.19.40 | -15.09436 | -173.74951 | 1265 | 4 | 295 | Going to look around to find the bottom. Sonar shows ROV in a hole. |
| 23-Sep | 21.19.52 | -15.09435 | -173.74949 | 1266 | 3 | 25 | Looking 010 so there is the other side. |
| 23-Sep | 21.20.28 | -15.09435 | -173.74949 | 1266 | 4 | 32 | Could be in side pit since the depths don't match the multibeam. |
| 23-Sep | 21.21.00 | -15.09435 | -173.74943 | 1268 | 5 | 67 | Just found another edge-little saddle. In a side pit. |
| 23-Sep | 21.21.14 | -15.09435 | -173.74937 | 1270 | 2 | 77 | Going down again. Wall in front of us 20m. |
| 23-Sep | 21.21.39 | -15.09437 | -173.74934 | 1272 | 4 | 82 | Bigger and deeper pit. |
| 23-Sep | 21.22.32 | -15.09443 | -173.74931 | 1279 | 6 | 81 | Looking around and sonar shows a defined pit. |
| 23-Sep | 21.23.18 | -15.09447 | -173.74927 | 1285 | 10 | 82 | Beautiful wall of in place wall. 10m above bottom at 1285 with truncated pillows. |
| 23-Sep | 21.23.50 | -15.09447 | -173.74927 | 1288 | 3 | 81 | Looking for anything that looks like it erupted after truncation. Not seeing any of that. |
| 23-Sep | 21.25.01 | -15.09448 | -173.74924 | 1290 | 5 | 87 | Not going any further down due to tether issues. (**Deepest 1297**). |
| 23-Sep | 21.25.14 | -15.09447 | -173.74923 | 1290 | 6 | 87 | Viewing wall as come up at 087. |
| 23-Sep | 21.25.41 | -15.09447 | -173.74924 | 1286 | 7 | 83 | Some volcanic sediment in the ledges of the truncated pillows. |
| 23-Sep | 21.26.29 | -15.09447 | -173.74923 | 1281 | 8 | 84 | Gradually coming back up to the rim. DSCs. |
| 23-Sep | 21.26.49 | -15.09447 | -173.74920 | 1279 | 5 | 84 | Going to come up to the rim and then head to target C. |
| 23-Sep | 21.27.30 | -15.09446 | -173.74923 | 1274 | 7 | 84 | Viewing lavas of the inside pit wall. Will be moving the ship north. |
| 23-Sep | 21.28.11 | -15.09447 | -173.74920 | 1273 | 7 | 84 | White particles in sediment-zooming in. |
| 23-Sep | 21.28.22 | -15.09447 | -173.74919 | 1272 | 7 | 84 | Looks like sulfur balls. |
| 23-Sep | 21.30.08 | -15.09447 | -173.74919 | 1273 | 5 | 89 | Rocks very crystal rich. |
| 23-Sep | 21.30.47 | -15.09447 | -173.74918 | 1270 | 6 | 90 | Close-ups of the pillows and sediment as we climb out of the pit. |
| 23-Sep | 21.31.13 | -15.09446 | -173.74918 | 1271 | 5 | 90 | Some alteration or mat here. |
| 23-Sep | 21.31.46 | -15.09447 | -173.74918 | 1270 | 5 | 90 | See some shrimp grazing on the mat maybe a little shimmer. More permeable since some breccia here. |
| 23-Sep | 21.32.26 | -15.09448 | -173.74916 | 1269 | 3 | 94 | Some tubes of something. Close-ups of the shrimp. |
| 23-Sep | 21.33.17 | -15.09448 | -173.74916 | 1268 | 7 | 94 | Rocks highly degassed so see the vesicles. |
| 23-Sep | 21.33.58 | -15.09447 | -173.74919 | 1266 | 10 | 67 | Probably 10m below the rim. |
| 23-Sep | 21.35.06 | -15.09444 | -173.74916 | 1265 | 8 | 89 | Worms. Cliff here looks a little more stained. Barnacles. |
| 23-Sep | 21.36.25 | -15.09442 | -173.74911 | 1261 | 8 | 58 | Tube with hole. |
| 23-Sep | 21.37.12 | -15.09436 | -173.74906 | 1260 | 4 | 23 | Older generation flow here. |
| 23-Sep | 21.37.56 | -15.09430 | -173.74904 | 1258 | 3 | 26 | Maybe plotting 15m north and a little west than actually are. |
| 23-Sep | 21.38.15 | -15.09429 | -173.74904 | 1257 | 5 | 26 | Need to wait for ship to get the wire situated before moving to target C. |
| 23-Sep | 21.38.51 | -15.09424 | -173.74905 | 1256 | 4 | 346 | More intact pillows (very large). |
| 23-Sep | 21.38.58 | -15.09424 | -173.74905 | 1256 | 4 | 344 | HD on. Looking north 344deg. |
| 23-Sep | 21.39.29 | -15.09422 | -173.74907 | 1254 | 4 | 346 | Upper pillows contoured around the lower ones-stacked up. |
| 23-Sep | 21.39.38 | -15.09419 | -173.74910 | 1253 | 5 | 347 | Textbook. Lasers on. |
| 23-Sep | 21.40.09 | -15.09420 | -173.74907 | 1252 | 5 | 346 | Radial fractures from cooling. |
| 23-Sep | 21.40.27 | -15.09419 | -173.74911 | 1250 | 6 | 345 | HD off. |
| 23-Sep | 21.40.54 | -15.09420 | -173.74907 | 1248 | 4 | 327 | Pillows are extending downslope from ROV. |
| 23-Sep | 21.41.34 | -15.09419 | -173.74911 | 1244 | 8 | 337 | Rubbly texture may be splatter clasts. |
| 23-Sep | 21.41.54 | -15.09418 | -173.74911 | 1243 | 13 | 12 | At the rim looking north. |
| 23-Sep | 21.42.11 | -15.09419 | -173.74911 | 1241 | 15 | 13 | Along the rim of the pit. |
| 23-Sep | 21.42.43 | -15.09415 | -173.74910 | 1240 | 4 | 1 | Pit to right as we head north. |
| 23-Sep | 21.43.03 | -15.09414 | -173.74910 | 1240 | 3 | 347 | Large pillow under the sediment and debris. |
| 23-Sep | 21.43.31 | -15.09411 | -173.74911 | 1238 | 2 | 333 | Just outside of the pit. |
| 23-Sep | 21.44.04 | -15.09406 | -173.74915 | 1237 | 5 | 334 | Looking at large pillows. Slightly truncated and transitional. More fluid cross-section. |
| 23-Sep | 21.45.13 | -15.09403 | -173.74920 | 1239 | 2 | 40 | Pillows trending downslope on outer rim of the pit. |
| 23-Sep | 21.45.24 | -15.09400 | -173.74923 | 1239 | 1 | 58 | Some sediments. Pillows on outer slope. 100% pillows. |
| 23-Sep | 21.46.21 | -15.09396 | -173.74921 | 1241 | 2 | 58 | These pillows could indicate the eruption was further north than we had originally thought. |
| 23-Sep | 21.46.54 | -15.09396 | -173.74921 | 1238 | 5 | 63 | We are at target C. |

| date | time | latitude | longitude | Z | alt | hdg | Q332 - West Mata Dive Comments |
|---|---|---|---|---|---|---|---|
| 23-Sep | 21.47.31 | -15.09396 | -173.74922 | 1239 | 3 | 124 | Seen scaleworms as long as we've been driving around the pit. Some shrimp scattered around. Not seen in 2009. |
| 23-Sep | 21.47.51 | -15.09396 | -173.74918 | 1240 | 4 | 152 | Toothpaste tubes and constructional/undisturbed. Ideal for sampling. |
| 23-Sep | 21.48.42 | -15.09397 | -173.74919 | 1239 | 4 | 167 | Drainout that formed the lobates. |
| 23-Sep | 21.49.00 | -15.09397 | -173.74918 | 1239 | 3 | 174 | Going to try for the piece above the hole. |
| 23-Sep | 21.49.27 | -15.09396 | -173.74921 | 1239 | 3 | 185 | Look like some vent shrimp. HD on. |
| 23-Sep | 21.49.57 | -15.09396 | -173.74918 | 1240 | 3 | 169 | HD off. |
| 23-Sep | 21.50.45 | -15.09397 | -173.74919 | 1239 | 3 | 199 | Lavas are only a few years old are a unique opportunity to sample from the seafloor. |
| 23-Sep | 21.51.03 | -15.09398 | -173.74918 | 1239 | 2 | 197 | Preparing to grab a piece. |
| 23-Sep | 21.52.02 | -15.09398 | -173.74918 | 1240 | 2 | 197 | Got it and need to look on HD for glass. DSC an now HD. Maybe some mat. Looks good. |
| 23-Sep | 21.53.18 | -15.09397 | -173.74918 | 1240 | 2 | 197 | In bin #4. |
| 23-Sep | 21.54.35 | -15.09398 | -173.74917 | 1240 | 2 | 197 | **Q332-rock-03**. Piece of 2-yr old lava on rim of pit. Need piece of glass on it. Looking in HD. In bin #4. Near target C. |
| 23-Sep | 21.55.01 | -15.09399 | -173.74917 | 1239 | 3 | 193 | After sample will head toward Prometheus (highest point). |
| 23-Sep | 21.55.23 | -15.09398 | -173.74917 | 1236 | 4 | 132 | Off bottom and seeing intact pillows where lava flowing downslope before pit was formed. |
| 23-Sep | 21.56.04 | -15.09401 | -173.74908 | 1234 | 2 | 82 | Up at ragged edge of the large pit following the rim. Pillows hanging off in space where bottom fell away. |
| 23-Sep | 21.56.20 | -15.09400 | -173.74904 | 1233 | 3 | 82 | Little bit of microbial mat. |
| 23-Sep | 21.56.33 | -15.09400 | -173.74904 | 1234 | 2 | 76 | Slope to pit is almost vertical. |
| 23-Sep | 21.57.00 | -15.09399 | -173.74902 | 1232 | 4 | 60 | Surface of these pillows are not as glass but coated with some sediment. |
| 23-Sep | 21.57.47 | -15.09398 | -173.74896 | 1228 | 4 | 48 | HD on. |
| 23-Sep | 21.58.27 | -15.09398 | -173.74889 | 0 | 0 | 0 | Following pit rim instead of going directly to target D. Amazingly narrow. Starting to circle around. |
| 23-Sep | 21.58.57 | -15.09398 | -173.74881 | 1223 | 5 | 102 | HD off. Pillows here getting covered with debris. |
| 23-Sep | 21.59.05 | -15.09400 | -173.74879 | 1223 | 5 | 86 | Crossing pit rim. |
| 23-Sep | 21.59.20 | -15.09406 | -173.74872 | 1223 | 1 | 106 | Lots of orange material as we head to D. |
| 23-Sep | 21.59.27 | -15.09406 | -173.74872 | 1221 | 2 | 109 | Lots of shrimp here. More hydrothermal flow. HD on. |
| 23-Sep | 22.00.10 | -15.09412 | -173.74867 | 1219 | 3 | 125 | Iron staining with shrimp or is it mat? |
| 23-Sep | 22.01.07 | -15.09412 | -173.74866 | 1217 | 4 | 126 | Pilot cam shows the steepness. |
| 23-Sep | 22.01.22 | -15.09414 | -173.74866 | 1216 | 5 | 116 | Outer surface with brown coating on the pillows. |
| 23-Sep | 22.01.47 | -15.09415 | -173.74865 | 1214 | 6 | 99 | We may be on the tongue south of us on the map. |
| 23-Sep | 22.02.24 | -15.09415 | -173.74864 | 1211 | 6 | 115 | Could be on the north-facing side of the chute from Prometheus. |
| 23-Sep | 22.02.32 | -15.09415 | -173.74864 | 1212 | 5 | 139 | More mat on the outer slope. Heading to target D. |
| 23-Sep | 22.02.55 | -15.09416 | -173.74859 | 1210 | 3 | 151 | Lots of shrimp here. |
| 23-Sep | 22.03.08 | -15.09416 | -173.74858 | 1209 | 3 | 124 | Out of staining. |
| 23-Sep | 22.03.42 | -15.09418 | -173.74852 | 1206 | 5 | 115 | Up against vertical wall of intact wall. Headwall of upper part of collapse. |
| 23-Sep | 22.03.56 | -15.09418 | -173.74852 | 1206 | 5 | 115 | Looks like older rock that is hydrothermally altered. |
| 23-Sep | 22.04.15 | -15.09418 | -173.74853 | 1200 | 7 | 133 | Now in place pillows that overflowed the older lavas. |
| 23-Sep | 22.04.22 | -15.09418 | -173.74853 | 1199 | 6 | 145 | Young-old contact. |
| 23-Sep | 22.05.10 | -15.09420 | -173.74849 | 1196 | 7 | 166 | Want a piece of the new lava up higher. |
| 23-Sep | 22.05.12 | -15.09420 | -173.74849 | 1196 | 6 | 166 | Following contact. |
| 23-Sep | 22.05.29 | -15.09420 | -173.74849 | 1194 | 6 | 169 | More and more shrimp as we ascend. |
| 23-Sep | 22.05.52 | -15.09422 | -173.74848 | 1193 | 6 | 170 | Lots of mat and shrimp. Scaleworms. |
| 23-Sep | 22.06.28 | -15.09422 | -173.74848 | 1192 | 6 | 176 | Pilot cam shows getting near the top of this cliff. Want to follow the young lava for sampling. |
| 23-Sep | 22.06.59 | -15.09422 | -173.74848 | 1192 | 6 | 176 | Not quite at the top. |
| 23-Sep | 22.07.21 | -15.09422 | -173.74848 | 1186 | 15 | 141 | Lost the young flows. May be mat-coated and further away. |
| 23-Sep | 22.07.39 | -15.09425 | -173.74846 | 1182 | 11 | 168 | Stacked pillows. At top-actually just a bench. |
| 23-Sep | 22.08.09 | -15.09427 | -173.74846 | 1179 | 13 | 152 | Cloudy water as well. Still going up. |
| 23-Sep | 22.08.39 | -15.09431 | -173.74846 | 1174 | 6 | 150 | Mixture of sheets and pillows. Shrimp heaven and smoke. Shimmer. |
| 23-Sep | 22.09.05 | -15.09433 | -173.74842 | 1174 | 7 | 198 | Looking around here near the top if not on it. Possible sample site in the crack with the diffuse flow. |
| 23-Sep | 22.10.22 | -15.09436 | -173.74843 | 1176 | 3 | 220 | Maybe sample later the shrimp. |
| 23-Sep | 22.10.37 | -15.09437 | -173.74843 | 1175 | 3 | 220 | Can see different types of shrimp. |
| 23-Sep | 22.10.59 | -15.09436 | -173.74843 | 1175 | 3 | 220 | Putting in **target in nav** for the shrimp and diffuse flow. HD on. **Shrimp Cliff Target.** |
| 23-Sep | 22.11.37 | -15.09436 | -173.74846 | 1176 | 3 | 220 | Want to continue up to the top. |
| 23-Sep | 22.12.02 | -15.09437 | -173.74844 | 1176 | 3 | 220 | Close-up of the shrimp in HD. |
| 23-Sep | 22.12.52 | -15.09436 | -173.74840 | 1175 | 5 | 219 | Want to get up and look at the top and follow the trend. |
| 23-Sep | 22.13.09 | -15.09438 | -173.74844 | 1175 | 5 | 193 | HD off. Looking at wall at 222deg. |

| date | time | latitude | longitude | Z | alt | hdg | Q332 - West Mata Dive Comments |
|---|---|---|---|---|---|---|---|
| 23-Sep | 22.13.53 | -15.09437 | -173.74840 | 1171 | 6 | 214 | Coming up to get an overview of the rim. |
| 23-Sep | 22.14.11 | -15.09437 | -173.74841 | 1171 | 7 | 199 | Seeing plume beyond here. |
| 23-Sep | 22.14.34 | -15.09435 | -173.74844 | 0 | 0 | 0 | Want to see the structure of the pinnacles on the top. |
| 23-Sep | 22.14.48 | -15.09437 | -173.74848 | 1171 | 8 | 130 | Sonar shows we are higher with only something higher to the SE. |
| 23-Sep | 22.15.23 | -15.09439 | -173.74848 | 1170 | 9 | 102 | Pillows were flowing away to the south-under the vehicle. |
| 23-Sep | 22.16.08 | -15.09438 | -173.74846 | 1169 | 6 | 207 | Intact pillow going downslope below the ROV |
| 23-Sep | 22.16.41 | -15.09441 | -173.74844 | 1169 | 5 | 283 | North side of pinnacle clear water and plume to other side. |
| 23-Sep | 22.16.53 | -15.09441 | -173.74844 | 1169 | 6 | 285 | Pinnacle below as we are looking west. |
| 23-Sep | 22.17.09 | -15.09441 | -173.74844 | 1169 | 6 | 285 | Lots of shrimp. Top of pinnacle is rubbly. |
| 23-Sep | 22.17.36 | -15.09441 | -173.74844 | 1169 | 6 | 285 | Earlier were the youngest intact flows. |
| 23-Sep | 22.18.21 | -15.09433 | -173.74845 | 1169 | 12 | 189 | Turning east the long way to get wrap out of the tether. |
| 23-Sep | 22.18.42 | -15.09433 | -173.74843 | 1169 | 11 | 95 | Looking east right now. |
| 23-Sep | 22.19.44 | -15.09438 | -173.74829 | 1170 | 4 | 78 | Looking at spires maybe seen for the other side from the other dive. |
| 23-Sep | 22.20.18 | -15.09437 | -173.74826 | 1170 | 5 | 121 | Getting some smoke wafting over. |
| 23-Sep | 22.20.38 | -15.09437 | -173.74824 | 1171 | 3 | 142 | These look different than the other day. |
| 23-Sep | 22.21.05 | -15.09436 | -173.74819 | 1170 | 3 | 157 | Remnant pillow on the rim-flowing away from ROV. |
| 23-Sep | 22.21.36 | -15.09435 | -173.74819 | 1171 | 15 | 232 | Circling. Looks like spatter with sulfur balls. |
| 23-Sep | 22.22.06 | -15.09435 | -173.74819 | 1170 | 18 | 261 | Vent must have been near here and then it collapsed as well. Lots of shrimp. |
| 23-Sep | 22.22.27 | -15.09439 | -173.74819 | 1171 | 21 | 297 | Excellent place to sample. |
| 23-Sep | 22.22.46 | -15.09439 | -173.74820 | 1171 | 21 | 295 | Settling down to sample the rock believed to be the newest. |
| 23-Sep | 22.22.53 | -15.09440 | -173.74819 | 1171 | 21 | 296 | HD tape on. |
| 23-Sep | 22.23.14 | -15.09439 | -173.74818 | 1171 | 21 | 295 | HD off. |
| 23-Sep | 22.24.18 | -15.09440 | -173.74820 | 1171 | 3 | 295 | Got it. Placing in bin #2. |
| 23-Sep | 22.30.50 | -15.09438 | -173.74818 | 1171 | 3 | 295 | **Q332-rock-04**. Top of rim (near summit) very new lava. Piece of crust. DSCs and HD. |
| 23-Sep | 22.31.35 | -15.09438 | -173.74818 | 1171 | 3 | 295 | Moving the ship to the NE next to get through the targets first; then will sample afterward. |
| 23-Sep | 22.33.11 | -15.09438 | -173.74819 | 1171 | 3 | 295 | When we come back to the pinnacle if we approach it from the south facing north it may be easier to sample. |
| 23-Sep | 22.35.40 | -15.09436 | -173.74819 | 1169 | 2 | 355 | We've stirred up the bottom a bit. Moving the ship. |
| 23-Sep | 22.36.05 | -15.09436 | -173.74819 | 1169 | 2 | 343 | We're facing north. We see a few returns on the sonar. |
| 23-Sep | 22.36.35 | -15.09435 | -173.74820 | 1170 | 3 | 343 | We see some in place pillows, We're moving north along the summit ridge. |
| 23-Sep | 22.37.19 | -15.09433 | -173.74820 | 1172 | 2 | 344 | HD on. Shrimp everywhere. A dark shrimp in view. |
| 23-Sep | 22.37.54 | -15.09433 | -173.74820 | 1172 | 1 | 340 | Noting this navigation position. **It's raining shrimp!!** |
| 23-Sep | 22.39.18 | -15.09428 | -173.74820 | 1171 | 2 | 334 | Ken will be relieving Bob or Bill in the van. We want to continue along this summit crest looking at the summit features. |
| 23-Sep | 22.43.01 | -15.09411 | -173.74813 | 1177 | 4 | 44 | Large pinnacle in front of us. |
| 23-Sep | 22.43.42 | -15.09410 | -173.74808 | 1177 | 5 | 50 | We're gradually getting a bit deeper. On this ridge. No visibility. |
| 23-Sep | 22.44.37 | -15.09405 | -173.74805 | 1182 | 3 | 302 | We're seeing some smoky water. Not sure if it is something we stirred up. |
| 23-Sep | 22.45.34 | -15.09397 | -173.74811 | 1185 | 7 | 301 | Bob has been relieved by Ken. Richard is relieving Bill. Susan on for Andra. |
| 23-Sep | 22.46.14 | -15.09397 | -173.74810 | 1193 | 1 | 304 | Looking at rubble here with some in place lavas as well. |
| 23-Sep | 22.46.37 | -15.09397 | -173.74811 | 1193 | 2 | 188 | Sulfur particles on the rocks? Yellow staining on the rocks to the left. |
| 23-Sep | 22.47.04 | -15.09397 | -173.74812 | 1191 | 3 | 130 | We're ;looking to the SW. We're not at the summit now. |
| 23-Sep | 22.50.41 | -15.09389 | -173.74817 | 1191 | 9 | 131 | Driving 130 along the major summit ridge. Collapse SSE. |
| 23-Sep | 22.53.09 | -15.09387 | -173.74817 | 1197 | 7 | 131 | Pillows below as we are about 10m above the rim. |
| 23-Sep | 22.53.50 | -15.09381 | -173.74815 | 1196 | 14 | 96 | Shrimp are in the slurp bucket-must have crawled up the hose. |
| 23-Sep | 22.54.57 | -15.09382 | -173.74818 | 1202 | 4 | 117 | Pilot change. Then driving to target F but need the ship to move a bit. |
| 23-Sep | 22.55.42 | -15.09385 | -173.74816 | 1201 | 3 | 116 | Pillow tubes flowing down the slope with shrimp on top. |
| 23-Sep | 22.56.09 | -15.09391 | -173.74814 | 1195 | 4 | 116 | Smokey water as we head 117 |
| 23-Sep | 22.57.12 | -15.09398 | -173.74812 | 1191 | 3 | 118 | Shrimp blizzard seen before the eruption and are still here. |
| 23-Sep | 22.57.53 | -15.09395 | -173.74808 | 1190 | 5 | 124 | Intact pillows with some collapse rubble downslope to the right. |
| 23-Sep | 22.59.14 | -15.09392 | -173.74796 | 1188 | 4 | 126 | Lots of shrimp especially in the white line of staining. |
| 23-Sep | 22.59.42 | -15.09392 | -173.74796 | 1187 | 5 | 126 | Massive pillows above the shrimp white staining area. |
| 23-Sep | 23.00.00 | -15.09390 | -173.74795 | 1187 | 5 | 123 | White on the inside and not so much staining on the outside. |
| 23-Sep | 23.00.18 | -15.09390 | -173.74793 | 1186 | 6 | 125 | Looking on the outside slope. |
| 23-Sep | 23.00.57 | -15.09390 | -173.74790 | 1186 | 4 | 125 | Less shrimp here with less staining. |
| 23-Sep | 23.01.16 | -15.09389 | -173.74785 | 1185 | 6 | 126 | Gorgeous hollow pillow. |
| 23-Sep | 23.01.51 | -15.09387 | -173.74782 | 1185 | 9 | 125 | Steep pillow tubes reaching downslope on the left as we are looking 128deg. |
| 23-Sep | 23.03.17 | -15.09383 | -173.74776 | 1189 | 5 | 125 | Spectacular steepness of this lava . |
| 23-Sep | 23.04.22 | -15.09385 | -173.74774 | 1188 | 5 | 174 | Wall of lava. |
| 23-Sep | 23.05.07 | -15.09390 | -173.74767 | 1185 | 5 | 173 | Doppler reset. |
| 23-Sep | 23.05.22 | -15.09392 | -173.74768 | 1185 | 6 | 173 | Looking south along this lava wall. |
| 23-Sep | 23.06.02 | -15.09398 | -173.74769 | 1182 | 8 | 174 | Sonar shows big contact ahead. Still moving along the summit. |

| date | time | latitude | longitude | Z | alt | hdg | Q332 - West Mata Dive Comments |
|---|---|---|---|---|---|---|---|
| 23-Sep | 23.06.51 | -15.09398 | -173.74772 | 1179 | 9 | 201 | White stained pinnacles of craggy lava. |
| 23-Sep | 23.07.17 | -15.09397 | -173.74774 | 1179 | 9 | 194 | Folds of lava on top of each other. |
| 23-Sep | 23.07.54 | -15.09396 | -173.74773 | 1181 | 5 | 188 | Fresh pillows on the right. Contact between young pillows next to breccia. |
| 23-Sep | 23.08.25 | -15.09397 | -173.74777 | 1182 | 5 | 188 | Still moving not going to sample. |
| 23-Sep | 23.10.38 | -15.09395 | -173.74778 | 1180 | 7 | 188 | Stopped trying to move to F and thought we were coming around to look at the headwall. |
| 23-Sep | 23.11.37 | -15.09395 | -173.74778 | 1178 | 7 | 188 | Believe to be on the south side looking south. Ken does want a sample of the young pillows overlying the brecciated material. |
| 23-Sep | 23.11.59 | -15.09395 | -173.74778 | 1178 | 7 | 187 | DSCs. |
| 23-Sep | 23.12.25 | -15.09395 | -173.74778 | 1178 | 7 | 188 | HD on. Positioning for a sample of the young lava. |
| 23-Sep | 23.12.53 | -15.09395 | -173.74778 | 1178 | 7 | 188 | Spectacular view of the young-old contact. |
| 23-Sep | 23.14.12 | -15.09395 | -173.74778 | 1180 | 5 | 188 | Heading the ROV into the wall. HD of the shrimp. |
| 23-Sep | 23.16.50 | -15.09395 | -173.74778 | 1179 | 4 | 188 | Positioning arm for sample. Want piece of black dome (glass). |
| 23-Sep | 23.18.25 | -15.09397 | -173.74778 | 1180 | 5 | 188 | Very crumbly surface with white interior. |
| 23-Sep | 23.19.08 | -15.09398 | -173.74777 | 0 | 0 | 0 | Breaking up the rock to get a good piece to grab. |
| 23-Sep | 23.19.43 | -15.09397 | -173.74778 | 1179 | 5 | 188 | Got a piece and examining it in HD. Good. |
| 23-Sep | 23.21.36 | -15.09397 | -173.74775 | 1178 | 6 | 188 | Putting it in bin #6. |
| 23-Sep | 23.22.14 | -15.09396 | -173.74778 | 1179 | 5 | 188 | **Q332-rock-05**. Piece of new lava from contact of new pillow lavas over brecciated flow at summit rim. In bin #6 |
| 23-Sep | 23.24.01 | -15.09395 | -173.74774 | 0 | 0 | 0 | Looking 196 at rim and contact where just sampled. |
| 23-Sep | 23.24.14 | -15.09394 | -173.74775 | 1181 | 10 | 199 | Almost vertical wall. |
| 23-Sep | 23.26.44 | -15.09393 | -173.74768 | 1181 | 10 | 184 | Looking at 180 at headwall of collapse. |
| 23-Sep | 23.27.31 | -15.09393 | -173.74769 | 1185 | 10 | 178 | Plan is to back away from headwall then move slightly south to get a good view of headwall. |
| 23-Sep | 23.29.20 | -15.09426 | -173.74773 | 1178 | 10 | 178 | Hanging midwater before ship's fire drill. |
| 23-Sep | 23.29.43 | -15.09429 | -173.74774 | 1185 | 10 | 179 | Fire drill. |
| 23-Sep | 23.31.09 | -15.09412 | -173.74769 | 1210 | 10 | 177 | Sonar contact of the wall. Traversing to target G. |
| 23-Sep | 23.32.51 | -15.09407 | -173.74768 | 1205 | 10 | 178 | Almost at target G. |
| 23-Sep | 23.33.55 | -15.09415 | -173.74760 | 1200 | 10 | 139 | Doppler reset. |
| 23-Sep | 23.34.47 | -15.09423 | -173.74757 | 1201 | 10 | 158 | Driving midwater to target then will head into the headwall. |
| 23-Sep | 23.36.00 | -15.09411 | -173.74754 | 1223 | 10 | 161 | Ship has moved south. |
| 23-Sep | 23.36.52 | -15.09405 | -173.74753 | 1230 | 27 | 159 | Seeing slope to stbd with the ROV hdg of 161. |
| 23-Sep | 23.37.30 | -15.09404 | -173.74753 | 1245 | 20 | 163 | Altimeter is back. |
| 23-Sep | 23.38.34 | -15.09406 | -173.74757 | 0 | 0 | 0 | Can see bottom. |
| 23-Sep | 23.39.17 | -15.09430 | -173.74766 | 1250 | 4 | 175 | Slowly approaching the wall & bottom. |
| 23-Sep | 23.39.41 | -15.09432 | -173.74770 | 1249 | 5 | 236 | Bottom looking at pillows that have been truncated and talus. |
| 23-Sep | 23.40.29 | -15.09430 | -173.74776 | 1247 | 3 | 258 | Some in place pillow with debris surrounding it and pieces of sulfur. |
| 23-Sep | 23.40.54 | -15.09430 | -173.74776 | 1248 | 2 | 260 | Shrimp here. Piece of bright yellow. |
| 23-Sep | 23.41.27 | -15.09430 | -173.74775 | 1248 | 2 | 259 | Looking at large debris slope. |
| 23-Sep | 23.41.44 | -15.09429 | -173.74774 | 1248 | 2 | 259 | About 80m downslope of the summit. |
| 23-Sep | 23.42.16 | -15.09429 | -173.74774 | 0 | 0 | 0 | Probably warm water leaking out of loose debris here for the shrimp to feed on. Have had some shrimp that swam into suction tube. |
| 23-Sep | 23.42.35 | -15.09429 | -173.74774 | 1248 | 3 | 260 | Taking DSCs. |
| 23-Sep | 23.43.03 | -15.09428 | -173.74775 | 1248 | 2 | 259 | Yellow material looks soft so maybe microbial. |
| 23-Sep | 23.43.33 | -15.09430 | -173.74776 | 1246 | 3 | 260 | Moving upslope and seeing larger rock fragments. |
| 23-Sep | 23.43.57 | -15.09429 | -173.74778 | 1245 | 3 | 259 | White stained rock. |
| 23-Sep | 23.44.19 | -15.09429 | -173.74781 | 1244 | 2 | 259 | Seeing some larger pieces within the matrix of smaller debris. |
| 23-Sep | 23.44.50 | -15.09427 | -173.74783 | 1240 | 2 | 259 | Moving upslope looking at 259deg. |
| 23-Sep | 23.46.05 | -15.09424 | -173.74790 | 1240 | 2 | 272 | More shrimp in the water. |
| 23-Sep | 23.46.29 | -15.09426 | -173.74783 | 1237 | 2 | 272 | Finer sediment that looks colonized with mat. |
| 23-Sep | 23.46.45 | -15.09425 | -173.74788 | 1237 | 4 | 269 | Sediment touching an outcrop of wall. |
| 23-Sep | 23.47.13 | -15.09422 | -173.74792 | 1236 | 3 | 270 | Rock spire that is nearly vertical. Headwall that failed in a nearly vertical sense. |
| 23-Sep | 23.47.51 | -15.09424 | -173.74789 | 1234 | 6 | 271 | Seeing white mat on the headwall face with shrimp. |
| 23-Sep | 23.47.56 | -15.09425 | -173.74788 | 1233 | 6 | 272 | HD on. |
| 23-Sep | 23.48.30 | -15.09425 | -173.74789 | 1230 | 10 | 322 | Headwall that is vertical. |
| 23-Sep | 23.49.15 | -15.09423 | -173.74791 | 1223 | 9 | 23 | Come up 10m of this that almost looks like a dike on this thin spine. |
| 23-Sep | 23.49.31 | -15.09423 | -173.74792 | 1221 | 14 | 31 | Maybe not a dike but a lava fragment that is vertical. |
| 23-Sep | 23.50.00 | -15.09421 | -173.74792 | 1221 | 15 | 16 | Near vertical feature. Pinnacle with angular margins. |
| 23-Sep | 23.50.16 | -15.09419 | -173.74791 | 1221 | 15 | 17 | Behind looks like a dike. |
| 23-Sep | 23.50.42 | -15.09418 | -173.74789 | 1221 | 14 | 15 | Pillows in the background and it does look like a dike pinnacle. |
| 23-Sep | 23.51.19 | -15.09420 | -173.74790 | 1222 | 15 | 12 | Skeleton after the collapse (aorta of the flow). |
| 23-Sep | 23.51.42 | -15.09423 | -173.74792 | 1221 | 15 | 10 | Changing HD tape. |

| date | time | latitude | longitude | Z | alt | hdg | Q332 - West Mata Dive Comments |
|---|---|---|---|---|---|---|---|
| 23-Sep | 23.52.12 | -15.09422 | -173.74790 | 1222 | 14 | 13 | Looks like 10m vertical with everything else around it sloughing off. |
| 23-Sep | 23.52.58 | -15.09421 | -173.74791 | 0 | 0 | 0 | Best looking dike that Embley has ever seen on a volcano. |
| 23-Sep | 23.53.25 | -15.09421 | -173.74789 | 1222 | 16 | 352 | Failure on sides . |
| 23-Sep | 23.53.36 | -15.09419 | -173.74782 | 1220 | 22 | 352 | Another dike in wall. |
| 23-Sep | 23.54.16 | -15.09419 | -173.74780 | 1222 | 28 | 284 | HD tape on. |
| 23-Sep | 23.54.33 | -15.09419 | -173.74781 | 1221 | 28 | 284 | Close-up of dike on wall. |
| 23-Sep | 23.55.41 | -15.09419 | -173.74781 | 1221 | 23 | 283 | Looks like some sulfur on the rock face. |
| 23-Sep | 23.55.58 | -15.09419 | -173.74781 | 1221 | 21 | 281 | Going to follow the dike up to see if it is eruptive. |
| 23-Sep | 23.56.46 | -15.09421 | -173.74776 | 1220 | 24 | 280 | Waiting for wire and ship positioning. |
| 23-Sep | 23.59.49 | -15.09413 | -173.74775 | 1220 | 25 | 291 | Unclear if we are viewing the same dike or not. |
| 24-Sep | 00.00.16 | -15.09410 | -173.74770 | 1218 | 6 | 291 | Approached the wall again after ship repositioning. |
| 24-Sep | 00.00.40 | -15.09411 | -173.74776 | 1216 | 6 | 290 | Looking at headwall face at 290deg. |
| 24-Sep | 00.00.56 | -15.09409 | -173.74776 | 0 | 0 | 0 | Looks like breccia. |
| 24-Sep | 00.01.14 | -15.09410 | -173.74775 | 1214 | 6 | 291 | Ascending up headwall along breccia. |
| 24-Sep | 00.02.09 | -15.09410 | -173.74774 | 1213 | 7 | 290 | Unusual as it looks like a breccia pipe. Exposed on either side in the pilot view. |
| 24-Sep | 00.02.51 | -15.09410 | -173.74777 | 1212 | 7 | 291 | There is the top of this breccia. |
| 24-Sep | 00.03.55 | -15.09409 | -173.74777 | 1212 | 7 | 292 | Good view of the breccia in HD and decided not to sample. |
| 24-Sep | 00.04.56 | -15.09410 | -173.74775 | 1212 | 7 | 291 | DSCs. |
| 24-Sep | 00.06.01 | -15.09409 | -173.74778 | 1210 | 7 | 291 | More coherent lava at the core in pilot cam. |
| 24-Sep | 00.06.41 | -15.09410 | -173.74775 | 1210 | 7 | 291 | Hollowed out core of pillow. |
| 24-Sep | 00.07.05 | -15.09410 | -173.74778 | 1209 | 7 | 291 | Broken rock face that aren't so fresh. |
| 24-Sep | 00.07.26 | -15.09410 | -173.74776 | 1208 | 7 | 292 | Vertical orientation changed to fanned out. |
| 24-Sep | 00.07.40 | -15.09410 | -173.74777 | 1208 | 7 | 292 | Seeing some white matting and maybe some diffuse venting. |
| 24-Sep | 00.08.03 | -15.09410 | -173.74777 | 1207 | 7 | 292 | Fossilized volcanic conduit could have been the breccia pipe. |
| 24-Sep | 00.08.34 | -15.09409 | -173.74777 | 1205 | 7 | 292 | More of this breccia conduit. |
| 24-Sep | 00.09.01 | -15.09408 | -173.74778 | 1204 | 7 | 291 | Stunning view of the inside of a volcanic vent. |
| 24-Sep | 00.09.42 | -15.09409 | -173.74778 | 1203 | 7 | 292 | Now transitioning into coherent flow. Core cooled more slowly. |
| 24-Sep | 00.10.03 | -15.09410 | -173.74780 | 1201 | 7 | 292 | Looks like the top where it flowed out and fanned. |
| 24-Sep | 00.10.36 | -15.09409 | -173.74779 | 1199 | 7 | 292 | Come up about 50m of vertical. Continuing to take DSCs. |
| 24-Sep | 00.11.19 | -15.09408 | -173.74777 | 1197 | 7 | 293 | Pillow tubes that have been truncated. |
| 24-Sep | 00.11.42 | -15.09408 | -173.74777 | 1197 | 7 | 293 | Need to continue straight up due to the wire and ship position. |
| 24-Sep | 00.12.04 | -15.09410 | -173.74778 | 1198 | 7 | 293 | Pilot cams are being panned out for a wider view. |
| 24-Sep | 00.12.13 | -15.09410 | -173.74777 | 1197 | 7 | 295 | Intact dark pillow in HD. |
| 24-Sep | 00.12.49 | -15.09409 | -173.74779 | 0 | 0 | 0 | Pilot cam view of below (steep-deep-hole). |
| 24-Sep | 00.13.29 | -15.09409 | -173.74778 | 1196 | 7 | 293 | All pillows now. |
| 24-Sep | 00.14.02 | -15.09409 | -173.74780 | 1196 | 7 | 297 | Zooming in on sulfur and pillows. Crystallized previously molten sulfur. |
| 24-Sep | 00.14.26 | -15.09409 | -173.74779 | 1196 | 7 | 296 | Some mat and shrimp and some intact pillows and truncated. |
| 24-Sep | 00.14.48 | -15.09409 | -173.74778 | 1195 | 6 | 295 | Vesicles in pillows. Young-fresh pillows. |
| 24-Sep | 00.15.44 | -15.09410 | -173.74778 | 1196 | 6 | 296 | Going to continue upslope. |
| 24-Sep | 00.16.39 | -15.09410 | -173.74780 | 1194 | 6 | 296 | Rock fall from above as it is very steep. Don't think we touched it. |
| 24-Sep | 00.16.46 | -15.09408 | -173.74778 | 1194 | 6 | 296 | Backed up. Very unstable. |
| 24-Sep | 00.18.38 | -15.09409 | -173.74779 | 0 | 0 | 0 | Coming back up the headwall. |
| 24-Sep | 00.19.00 | -15.09408 | -173.74778 | 1185 | 6 | 308 | Glass coated blocks. |
| 24-Sep | 00.19.44 | -15.09407 | -173.74779 | 1182 | 6 | 307 | Pilot cam pillow. |
| 24-Sep | 00.20.03 | -15.09407 | -173.74777 | 1181 | 6 | 308 | Large pillow logs that have been truncated. |
| 24-Sep | 00.22.08 | -15.09407 | -173.74779 | 0 | 0 | 0 | Transitioning to more pillows and the top. At the crest. |
| 24-Sep | 00.22.58 | -15.09406 | -173.74778 | 1176 | 8 | 308 | HD has been on since 23:54. Great pillow interior view. |
| 24-Sep | 00.23.42 | -15.09406 | -173.74780 | 1177 | 8 | 308 | Pillow is about 60-70cm across. |
| 24-Sep | 00.24.08 | -15.09406 | -173.74779 | 1176 | 8 | 307 | Large amount of shrimp. |
| 24-Sep | 00.25.43 | -15.09407 | -173.74779 | 1175 | 9 | 308 | Lateralling along the rim while deciding on next sampling. |
| 24-Sep | 00.26.07 | -15.09408 | -173.74779 | 1175 | 9 | 309 | Looking at the rim lined with pillows. |
| 24-Sep | 00.26.55 | -15.09406 | -173.74777 | 1175 | 11 | 340 | HD shows pillow lavas that are very young in the vicinity of Prometheus and some sulfur crystals. |
| 24-Sep | 00.27.27 | -15.09407 | -173.74775 | 1176 | 11 | 232 | Close to what had been the active vent in May 2009. |
| 24-Sep | 00.27.49 | -15.09408 | -173.74777 | 1175 | 11 | 215 | New target from this dive. |
| 24-Sep | 00.28.41 | -15.09406 | -173.74779 | 1175 | 11 | 223 | Want to drive west to the Shrimp Cliff. |
| 24-Sep | 00.29.09 | -15.09406 | -173.74775 | 0 | 0 | 0 | HD off. |
| 24-Sep | 00.30.57 | -15.09408 | -173.74776 | 1171 | 11 | 225 | Some smoke in the water. |
| 24-Sep | 00.32.03 | -15.09412 | -173.74781 | 1163 | 16 | 233 | Looking 233 at inside of the volcano. |
| 24-Sep | 00.33.19 | -15.09418 | -173.74789 | 1161 | 12 | 233 | Midwater. |
| 24-Sep | 00.35.30 | -15.09424 | -173.74803 | 1167 | 8 | 233 | View of rim again at 233. |
| 24-Sep | 00.35.52 | -15.09424 | -173.74803 | 1167 | 22 | 239 | Pinnacle left at the summit ridge after landslide. |

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|---|---|---|---|---|---|---|---|
| 24-Sep | 00.37.42 | -15.09414 | -173.74812 | 1167 | 14 | 234 | Traversing across the summit of W. Mata volcano then to the west to Shrimp Cliff. |
| 24-Sep | 00.40.05 | -15.09421 | -173.74827 | 1171 | 11 | 208 | Waiting for ship and heading midwater at 208. |
| 24-Sep | 00.41.50 | -15.09431 | -173.74838 | 1172 | 9 | 176 | Looking at rim again in HD. Very craggy. |
| 24-Sep | 00.43.56 | -15.09439 | -173.74842 | 1172 | 6 | 203 | Coming into ridges and looks like diffuse venting. |
| 24-Sep | 00.45.14 | -15.09436 | -173.74843 | 1172 | 6 | 193 | Seeing shrimp all over the rocks. Doing some tether management. |
| 24-Sep | 00.45.44 | -15.09438 | -173.74846 | 1172 | 6 | 192 | Also some brownish color to the rock. |
| 24-Sep | 00.46.01 | -15.09439 | -173.74843 | 1172 | 6 | 193 | Going to look around for the most vigorous flow. |
| 24-Sep | 00.47.22 | -15.09441 | -173.74844 | 1172 | 7 | 192 | Looks like twice the amount or even 3Xs more shrimp than 2009. |
| 24-Sep | 00.47.35 | -15.09440 | -173.74846 | 1172 | 7 | 192 | Lasers on. |
| 24-Sep | 00.48.19 | -15.09440 | -173.74847 | 1172 | 7 | 192 | Some of the shrimp look yellow. Feeding troughs for the shrimp in the flow. |
| 24-Sep | 00.48.25 | -15.09440 | -173.74844 | 1172 | 7 | 192 | HD tape on. |
| 24-Sep | 00.48.54 | -15.09440 | -173.74844 | 1173 | 7 | 192 | Zoom of the shrimp and mat. |
| 24-Sep | 00.49.22 | -15.09440 | -173.74845 | 1172 | 7 | 192 | Some small snails in the rocks. |
| 24-Sep | 00.49.53 | -15.09440 | -173.74846 | 1172 | 7 | 192 | Shrimp are different colors so could be molting or could be dietary. |
| 24-Sep | 00.50.07 | -15.09441 | -173.74844 | 1173 | 7 | 192 | Lasers in HD. Shrimp only few cm long. Eggs in ones with the pink bellies. |
| 24-Sep | 00.50.51 | -15.09441 | -173.74844 | 1173 | 7 | 192 | Going to get the temperature probe. HD off. Look like oppapalei. May see some other morphologies. |
| 24-Sep | 00.52.54 | -15.09441 | -173.74843 | 1172 | 7 | 192 | Only things in 2009 were the shrimp & zoarcid fish. Now seeing a wider diversity of animals. |
| 24-Sep | 00.53.46 | -15.09440 | -173.74846 | 1173 | 2 | 192 | Retrieving temperature probe. Tooltip reading is 4.7. |
| 24-Sep | 00.54.11 | -15.09441 | -173.74843 | 1173 | 6 | 192 | Moved up to 4.8 just out of the basket. |
| 24-Sep | 00.54.36 | -15.09441 | -173.74846 | 1172 | 4 | 192 | Pointing to the rock face up to 5.2. |
| 24-Sep | 00.55.58 | -15.09440 | -173.74846 | 0 | 0 | 0 | Placing tip in a high concentration of shrimp who have left the crack. |
| 24-Sep | 00.57.28 | -15.09441 | -173.74846 | 1172 | 4 | 192 | Temperature..17.0….was high in this crack. DSCs. |
| 24-Sep | 00.57.52 | -15.09440 | -173.74847 | 1172 | 4 | 192 | Moving probe. |
| 24-Sep | 01.02.08 | -15.09440 | -173.74844 | 1173 | 4 | 192 | Poking the shrimp trough with the probe. |
| 24-Sep | 01.03.03 | -15.09440 | -173.74843 | 1172 | 4 | 192 | Trough temperature was also 17deg. Nope went up to 18.5. |
| 24-Sep | 01.03.45 | -15.09439 | -173.74844 | 1172 | 5 | 192 | Going to back up and down a little ways with the ROV. |
| 24-Sep | 01.04.27 | -15.09438 | -173.74841 | 1173 | 5 | 194 | Backing down and seeing a lot of shrimp. |
| 24-Sep | 01.04.56 | -15.09439 | -173.74842 | 1173 | 6 | 171 | Backing up a bit more. |
| 24-Sep | 01.06.39 | -15.09441 | -173.74843 | 1174 | 5 | 192 | Looking at another feeding hole and seeing a scaleworm. |
| 24-Sep | 01.07.00 | -15.09439 | -173.74841 | 1174 | 6 | 192 | Brachyuran crab as we back up some more for a wider view. |
| 24-Sep | 01.09.56 | -15.09440 | -173.74845 | 1175 | 3 | 193 | Coming back in to look for more flow. |
| 24-Sep | 01.11.07 | -15.09439 | -173.74844 | 1175 | 3 | 193 | Putting the probe into a small hole. |
| 24-Sep | 01.11.24 | -15.09439 | -173.74842 | 1175 | 4 | 193 | Not very vigorous looking. 8.1deg max. |
| 24-Sep | 01.16.57 | -15.09438 | -173.74841 | 1175 | 3 | 222 | There are 30 shrimp species known from vents and seeps in the world; that's about 1 new species per year. |
| 24-Sep | 01.17.35 | -15.09439 | -173.74841 | 1175 | 3 | 223 | Putting the temperature probe in this little hole under a rock that is covered in shrimp. Temp is 16.4deg C at the first probe. |
| 24-Sep | 01.19.13 | -15.09438 | -173.74843 | 1176 | 3 | 223 | Probe in the little notch under the rock. The temp is rising. 18.9; 19.3deg C seems to be the top temperature. Z=1175. Shrimp are everywhere here. There is a little bit of milky flow coming out. |
| 24-Sep | 01.21.54 | -15.09438 | -173.74844 | 1176 | 3 | 222 | We will be sampling water; gas; DNA/RNA filter; and biota as well as sediment with the McPhail sampler. Here at Shrimp Cliff target. |
| 24-Sep | 01.22.58 | -15.09439 | -173.74841 | 1176 | 3 | 223 | Stowing the temperature probe here. |
| 24-Sep | 01.24.08 | -15.09438 | -173.74844 | 1176 | 3 | 222 | The pelagic pump did get a successful sample yesterday so there is a good chance for today. |
| 24-Sep | 01.25.57 | -15.09438 | -173.74845 | 1176 | 3 | 222 | Will sample fluid with the white major sampler next. Have the sample in the stbd claw. |
| 24-Sep | 01.26.48 | -15.09438 | -173.74841 | 1176 | 3 | 223 | Tim says he has looked at the literature and the density of shrimp at diffuse sites and he thinks West Mata at present is the highest density known at a diffuse site. |
| 24-Sep | 01.37.27 | -15.09438 | -173.74843 | 1176 | 3 | 222 | These samples are being acquired in a crack under a notch beneath a pillow lava. |
| 24-Sep | 01.28.59 | -15.09439 | -173.74842 | 1176 | 3 | 222 | **Q332-major-06**. Sampling in this crack under a pillow where the temp reading was 19.3C. This is the white major. The flow is slightly milky. Shrimp Cliff. |
| 24-Sep | 01.32.03 | -15.09439 | -173.74842 | 1176 | 3 | 223 | Grabbed the red major for the next sample. |
| 24-Sep | 01.34.31 | -15.09438 | -173.74841 | 1175 | 3 | 223 | The ROV is holding position and the nozzle in the hole well. |
| 24-Sep | 01.34.52 | -15.09439 | -173.74843 | 1176 | 3 | 222 | **Q332-major-07**. Sampling with the red major in this crack under a pillow where the temp reading was 19.3C. The flow is slightly milky. Shrimp Cliff. |
| 24-Sep | 01.36.02 | -15.09437 | -173.74842 | 1176 | 3 | 222 | Major sample is finished. |

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|---|---|---|---|---|---|---|---|
| 24-Sep | 01.38.03 | -15.09439 | -173.74843 | 1176 | 3 | 222 | Stowing the major. |
| 24-Sep | 01.39.07 | -15.09439 | -173.74842 | 1176 | 3 | 222 | Next are the gastight samples. |
| 24-Sep | 01.39.37 | -15.09439 | -173.74842 | 1176 | 3 | 222 | Brachyurans crabs and shrimp in this area. |
| 24-Sep | 01.39.55 | -15.09438 | -173.74844 | 1176 | 3 | 222 | Grabbing the blue gastight sampler with the claw. |
| 24-Sep | 01.40.17 | -15.09437 | -173.74840 | 1176 | 3 | 223 | We don't see any Paralomis crabs here. |
| 24-Sep | 01.41.09 | -15.09436 | -173.74844 | 1176 | 3 | 222 | The blue gastight is in the claw and heading toward the vent. |
| 24-Sep | 01.42.19 | -15.09437 | -173.74844 | 1176 | 3 | 222 | **Q332-gtb-08**. The blue gastight in the same orifice as the last 2 major samples. The temp here was 19.3C in slightly milky flow coming out from under a pillow lobe. Shrimp Cliff. |
| 24-Sep | 01.47.08 | -15.09437 | -173.74846 | 1176 | 3 | 222 | Have the red gastight in hand. |
| 24-Sep | 01.47.28 | -15.09437 | -173.74843 | 1176 | 3 | 222 | Looking at a few shrimp with eggs - they have a reddish abdomen. |
| 24-Sep | 01.48.20 | -15.09436 | -173.74842 | 1175 | 3 | 222 | **Q332-gtb-09. T**he red gastight in the same orifice as the last 3 samples. The temp here was 19.3C in slightly milky flow coming out from under a pillow lobe. Shrimp Cliff. |
| 24-Sep | 01.49.32 | -15.09438 | -173.74845 | 1176 | 3 | 222 | Stowing the gastight in its holder. |
| 24-Sep | 01.50.46 | -15.09438 | -173.74842 | 1176 | 3 | 223 | The next sample will be a McPhail syringe sample for microbes and sediments. |
| 24-Sep | 01.53.35 | -15.09438 | -173.74844 | 1176 | 3 | 223 | The McPhail sampler is in the ROV claw. Moving in to get a sample of this brown/blackish sediment to the east of the venting hole. |
| 24-Sep | 01.56.37 | -15.09437 | -173.74843 | 1176 | 3 | 222 | **Q332-biosed-10.** The McPhail syringe sampler is in the sediments adjacent to the hole that the fluid samples were collected (19.3deg C in flow). Grey/black/red colored sediments. No obvious heat or microbial mat at the exact sampling site. Shrimp Cliff. |
| 24-Sep | 01.58.21 | -15.09437 | -173.74843 | 1176 | 4 | 222 | Not sure the McPhail sampler worked so may suction some sediments here as well. |
| 24-Sep | 01.59.06 | -15.09438 | -173.74842 | 1175 | 3 | 222 | First; we will get a DNA/RNA filter sample for Julie Huber. The filter will be the sample. |
| 24-Sep | 00.00.00 | -15.09412 | -173.74774 | 1219 | 6 | 291 | |
| 24-Sep | 02.09.56 | -15.09438 | -173.74844 | 1175 | 3 | 221 | The hose is in place. |
| 24-Sep | 02.12.11 | -15.09438 | -173.74843 | 1176 | 3 | 221 | **Q332-biomicro-11.** Start sample at 0212**.** DNA/RNA filter sample for Julie Huber. The pelagic pump attached to the suction sampler will suck up water coming out of the same hole where the majors and gastights were collected (19.3deg C in flow) for 15 minutes. Shrimp Cliff. |
| 24-Sep | 02.17.15 | -15.09439 | -173.74845 | 1176 | 3 | 222 | Repositioning the hose a bit. |
| 24-Sep | 02.22.06 | -15.09438 | -173.74843 | 1175 | 3 | 221 | Samples of this nature were collected in 2009 so this will give us an idea of how the microbial community changes as the eruptive activity wanes. |
| 24-Sep | 02.25.33 | -15.09438 | -173.74843 | 1175 | 3 | 221 | Microbes are the basis of this chemosynthetic community and thus are vital to the ecology of hydrothermal vent systems. |
| 24-Sep | 02.28.12 | -15.09438 | -173.74844 | 1176 | 3 | 221 | Finished the microbial sample with the pelagic pump. |
| 24-Sep | 02.28.42 | -15.09438 | -173.74843 | 1176 | 3 | 222 | **Q332-biosed-12**. Suction sample of sediments into the jar for pharmacological analysis. Sediments are gray; probably volcaniclastic. Shrimp Cliff site. |
| 24-Sep | 02.31.41 | -15.09438 | -173.74845 | 1175 | 3 | 221 | Finished up sampling fluids; gas and sediments here. Will reposition slightly to look for more shrimp. |
| 24-Sep | 02.33.05 | -15.09438 | -173.74843 | 1175 | 4 | 221 | Tim is shrimp hunting. There is a thick population on the rock in the background. Didn't have to go far. There are a mass of shrimp on the rock to the left of the screen. |
| 24-Sep | 02.34.15 | -15.09439 | -173.74843 | 1175 | 3 | 218 | Zooming in for the suction. |
| 24-Sep | 02.35.06 | -15.09439 | -173.74842 | 1175 | 3 | 218 | These shrimp are too small to go into the jar. They are going through the mesh. Going to change tactics and get ready to put shrimp in the biojar. |
| 24-Sep | 02.38.46 | -15.09438 | -173.74844 | 1175 | 3 | 218 | Going to suction them with the hose and put them in the shrimp jar. |
| 24-Sep | 02.42.11 | -15.09440 | -173.74843 | 1174 | 3 | 218 | **Q332-biomacro-13.** They decided to rotate the suction canister after all after observing several shrimp in the chamber. Hopefully there will be some shrimp in the suction sampler jar 2. Shrimp Cliff site. |
| 24-Sep | | | | | | | **Q332-biomacro-14.** Suction of shrimp into canister 3. These shrimp are really small so are hard to keep in the canister chamber or the bio jar. Shrimp Cliff site. |
| 24-Sep | 02.55.02 | -15.09440 | -173.74847 | 1173 | 2 | 209 | Repositioned to another rock that is covered in shrimp. When we get near the shrimp just swim away. |
| 24-Sep | | | | | | | **Q332-biomacro-15.** Suction of shrimp into canister 4. The shrimp are covering the rocks in this area. These shrimp are really small. Looks like there are some in jar 4. Shrimp Cliff site. |

| date | time | latitude | longitude | Z | alt | hdg | Q332 - West Mata Dive Comments |
|---|---|---|---|---|---|---|---|
| 24-Sep | 03.04.05 | -15.09441 | -173.74843 | 1173 | 2 | 201 | **Q332-biomacro-16.** Suction of shrimp into canister 5. The shrimp are covering the rocks in this area. These shrimp are really small. Looks like there are some (3) in jar 5. Shrimp Cliff site. |
| 24-Sep | 03.06.05 | -15.09440 | -173.74844 | 1173 | 2 | 201 | **Q332-biomacro-17.** Suction of shrimp into canister 6 The shrimp are covering the rocks in this area. These shrimp are really small. Looks like there are some (3) in jar 6. Shrimp Cliff site. |
| 24-Sep | 03.07.03 | -15.09440 | -173.74846 | 0 | 0 | 0 | **Q332-biomacro-18.** Suction of shrimp into canister 7. The shrimp are covering the rocks in this area. These shrimp are really small. Looks like there are a few in jar 7. Shrimp Cliff site. |
| 24-Sep | 03.09.55 | -15.09439 | -173.74848 | 1173 | 2 | 201 | Finished with sample 18 into canister 7. There may be a problem with the suction motor. The next idea is to pick up the net. |
| 24-Sep | 03.11.37 | -15.09440 | -173.74844 | 1173 | 2 | 201 | There are problems with the suction pump. They are attending to the suction pump. |
| 24-Sep | 03.16.16 | -15.09440 | -173.74844 | 1173 | 2 | 201 | Looks like the suction sampler is working again. Trying to get more shrimp; this time into canister 8. |
| 24-Sep | 03.18.41 | -15.09441 | -173.74846 | 1173 | 2 | 201 | **Q332-biomacro-19.** Suction of shrimp into cannister8. The shrimp are covering the rocks in this area. These shrimp are really small. Looks like there are a few in jar 8. Shrimp Cliff site. |
| 24-Sep | 03.19.43 | -15.09440 | -173.74845 | 1173 | 2 | 201 | The next plan is to head to the southwest after this. First we will look at the plume rising in the distance. |
| 24-Sep | 03.20.39 | -15.09441 | -173.74844 | 1173 | 2 | 201 | The next plan is to use the net to try to scoop up some of these shrimp. They have opened up the biobox which is where they will stash the net after we snare the shrimp (hopefully). |
| 24-Sep | 03.27.12 | -15.09439 | -173.74847 | 1172 | 4 | 202 | Beautiful pillows in the HD view- truncated with some orange staining. |
| 24-Sep | 03.29.07 | -15.09436 | -173.74848 | 1172 | 5 | 106 | Facing east. Here is come bacterial mat and sulfur on the rocks. We've disturbed the shrimp. A big yellow one just swam by. |
| 24-Sep | 03.30.12 | -15.09439 | -173.74847 | 1173 | 3 | 106 | The net is out and perched but this method does not seem to be very successful. |
| 24-Sep | 03.34.40 | -15.09439 | -173.74846 | 1173 | 3 | 116 | Flailing around with the net. It is not very effective. |
| 24-Sep | 03.37.18 | -15.09439 | -173.74847 | 1173 | 4 | 71 | There are about a dozen shrimp in the net. It's going to go into the biobox. Just keep spinning it until it gets into the biobox. |
| 24-Sep | 03.40.59 | -15.09439 | -173.74847 | 1173 | 3 | 70 | **Q332-biomacro-20** captured in the butterfly net. It's going into the biobox. There are probably at least a dozen shrimp in the net. |
| 24-Sep | 03.44.38 | -15.09439 | -173.74848 | 1172 | 3 | 91 | Looks like squat lobsters and shrimp on the rock in front of us. |
| 24-Sep | 03.48.26 | -15.09437 | -173.74847 | 1175 | 4 | 266 | We're heading toward the vent formerly known as Creamsickle in search of fluids to sample. |
| 24-Sep | 03.50.02 | -15.09429 | -173.74830 | 1174 | 2 | 30 | Bacterial mat on the rocks and lots of shrimp. |
| 24-Sep | 03.50.36 | -15.09426 | -173.74826 | 1174 | 2 | 70 | White fish in view. Lots of shrimp. |
| 24-Sep | 03.51.33 | -15.09424 | -173.74826 | 1173 | 4 | 62 | Fluid-looking lavas here. Complicated interplay between fragmentation and lava flows building up in unconsolidated mounds. |
| 24-Sep | 03.52.10 | -15.09421 | -173.74822 | 1174 | 4 | 96 | Starting to see microbial mat. Whitish staining on the rock. |
| 24-Sep | 03.53.44 | -15.09421 | -173.74816 | 1173 | 2 | 125 | Incredible amount of shrimp here. |
| 24-Sep | 03.56.26 | -15.09416 | -173.74806 | 1173 | 2 | 97 | Still moving to the west. |
| 24-Sep | 04.02.44 | -15.09368 | -173.74838 | 1219 | 3 | 84 | Lava boulders. |
| 24-Sep | 04.03.13 | -15.09367 | -173.74835 | 1218 | 3 | 93 | Finishing traverse and repositioning ship/wire. |
| 24-Sep | 04.03.22 | -15.09368 | -173.74832 | 1217 | 3 | 95 | Due west of target. |
| 24-Sep | 04.03.52 | -15.09369 | -173.74829 | 1211 | 6 | 98 | Large chunks of pillow lava. Significantly less biology than 75m to the south. |
| 24-Sep | 04.05.25 | -15.09375 | -173.74822 | 1201 | 10 | 61 | Vehicle close to tether and waiting for ship to move it a bit further away. No bottom in view-altimeter 11m at 1200m depth. |
| 24-Sep | 04.06.52 | -15.09376 | -173.74823 | 1203 | 7 | 109 | Wall ahead in sonar to the south. (Right on sonar at 108deg hdg.) |
| 24-Sep | 04.07.29 | -15.09382 | -173.74820 | 1201 | 5 | 80 | Pillow tube just hanging in midair. Steep tubes and talus of very large pieces in between the intact lavas. |
| 24-Sep | 04.08.02 | -15.09380 | -173.74812 | 1205 | 5 | 85 | Rubble giving away to microbial mat on sediments. Slight smoke in water as we come near the old Creamsicle vent site. |
| 24-Sep | 04.08.53 | -15.09374 | -173.74804 | 1208 | 5 | 91 | Lots of floc in the water and very hazy. |
| 24-Sep | 04.09.12 | -15.09375 | -173.74799 | 1208 | 5 | 128 | Lot fewer shrimp but they are here. |
| 24-Sep | 04.09.29 | -15.09377 | -173.74798 | 1208 | 3 | 145 | Climbing steep slope. |
| 24-Sep | 04.10.17 | -15.09378 | -173.74798 | 1204 | 6 | 144 | Pillows overtopping with an eel hiding in the crack. |
| 24-Sep | 04.10.32 | -15.09379 | -173.74798 | 1203 | 7 | 139 | White staining to left. Looks like older rock with sediments. |
| 24-Sep | 04.10.54 | -15.09381 | -173.74796 | 1203 | 6 | 152 | Still a fair amount of shrimp. |
| 24-Sep | 04.11.20 | -15.09383 | -173.74794 | 1202 | 4 | 156 | Climbing up the slope. |
| 24-Sep | 04.12.05 | -15.09385 | -173.74791 | 1202 | 3 | 188 | DSCs. |
| 24-Sep | 04.12.17 | -15.09385 | -173.74791 | 1202 | 3 | 187 | Large eel. |
| 24-Sep | 04.12.54 | -15.09386 | -173.74792 | 1198 | 5 | 154 | Shrimp concentrating in a few spots of large mat deposit. |

| date | time | latitude | longitude | Z | alt | hdg | Q332 - West Mata Dive Comments |
|---|---|---|---|---|---|---|---|
| 24-Sep | 04.13.22 | -15.09385 | -173.74793 | 1198 | 8 | 159 | Risen up on to large lava tubes and boulders. Seeing black sediment in the cracks. |
| 24-Sep | 04.14.13 | -15.09385 | -173.74790 | 1192 | 9 | 154 | Large tubes cascading down the steep wall. Some shrimp. |
| 24-Sep | 04.15.26 | -15.09385 | -173.74790 | 1193 | 7 | 55 | Smooth lava surface. Some haze as we pan out to open water. |
| 24-Sep | 04.15.59 | -15.09383 | -173.74786 | 1198 | 6 | 63 | Came up the top of this. |
| 24-Sep | 04.16.18 | -15.09382 | -173.74784 | 1201 | 7 | 82 | Going to head back down the slope to look for a sampling site for fluids. |
| 24-Sep | 04.17.05 | -15.09384 | -173.74774 | 1209 | 4 | 85 | Smoke in the water. |
| 24-Sep | 04.17.57 | -15.09377 | -173.74776 | 1215 | 21 | 63 | Not as smoky here. |
| 24-Sep | 04.18.48 | -15.09373 | -173.74777 | 1216 | 17 | 42 | Need to move the wire away from the cliff face in order to approach the face again. |
| 24-Sep | 04.20.05 | -15.09373 | -173.74776 | 1223 | 15 | 309 | Waiting for the ship. |
| 24-Sep | 04.20.31 | -15.09374 | -173.74777 | 1227 | 15 | 290 | Seeing the bottom again. |
| 24-Sep | 04.21.07 | -15.09373 | -173.74775 | 1238 | 4 | 291 | Intact lava flow with some volcanic dusting. |
| 24-Sep | 04.21.25 | -15.09373 | -173.74776 | 1239 | 6 | 265 | Pillows with bright orange staining. Seeing some more recent exposed black. Orange debris with lots of shrimp and a little shimmer. |
| 24-Sep | 04.22.45 | -15.09372 | -173.74772 | 1242 | 6 | 295 | Looks like a swarm of shrimp in a little stained area. |
| 24-Sep | 04.23.14 | -15.09374 | -173.74772 | 1244 | 4 | 295 | Looks like a good sample place. |
| 24-Sep | 04.23.36 | -15.09374 | -173.74774 | 1243 | 4 | 295 | Amazing vertical streak of staining with shrimp. |
| 24-Sep | 04.24.27 | -15.09375 | -173.74777 | 0 | 0 | 0 | A streak of white in the talus but very linear. Dave is calling this Blue Streak but probably Creamsicle. Warm water coming out. |
| 24-Sep | 04.25.08 | -15.09375 | -173.74772 | 1244 | 2 | 294 | Crack of warm water. |
| 24-Sep | 04.25.54 | -15.09372 | -173.74777 | 1245 | 2 | 281 | Looks like there was more upslope. |
| 24-Sep | 04.27.05 | -15.09371 | -173.74775 | 1244 | 2 | 283 | Found a spot with a lot of fluid and a bunch of shrimp. |
| 24-Sep | 04.27.45 | -15.09371 | -173.74775 | 0 | 0 | 0 | Backing off again. DSCs.. |
| 24-Sep | 04.29.35 | -15.09373 | -173.74772 | 1244 | 1 | 284 | HD tape change going on. |
| 24-Sep | 04.29.53 | -15.09374 | -173.74773 | 0 | 0 | 0 | This site has been dubbed "Blue Streak". |
| 24-Sep | 04.31.24 | -15.09373 | -173.74772 | 1244 | 1 | 284 | We're going to do a temperature. Here first. |
| 24-Sep | 04.32.27 | -15.09373 | -173.74772 | 1244 | 2 | 285 | **This spot (Blue Streak" is very near the old Kohu site**. The white bacterial mat on the dark rocks plus the shimmer in the water give this little area a "blue" color. |
| 24-Sep | 04.33.53 | -15.09373 | -173.74772 | 1244 | 1 | 285 | Pilot change in the van. |
| 24-Sep | 04.34.59 | -15.09373 | -173.74772 | 1244 | 2 | 285 | There is a scaleworm on the rock in front. |
| 24-Sep | 04.35.35 | -15.09373 | -173.74772 | 1244 | 2 | 285 | Lots of shimmer in the water here. The best flow we've seen all day. |
| 24-Sep | 04.36.34 | -15.09373 | -173.74772 | 1244 | 2 | 285 | Going for the temperature probe. |
| 24-Sep | 04.38.47 | -15.09373 | -173.74772 | 1244 | 2 | 284 | The biology we're seeing here includes: Zoarcid fish; 2 types of scaleworms; shrimp. |
| 24-Sep | 04.42.11 | -15.09373 | -173.74772 | 1244 | 2 | 284 | The temperature probe is coming into view. |
| 24-Sep | 04.45.54 | -15.09373 | -173.74772 | 1244 | 2 | 284 | The temp in this spot is 9.9 degrees C. |
| 24-Sep | 04.46.43 | -15.09373 | -173.74772 | 1244 | 2 | 285 | Moving the probe around a bit trying to get another reading - want to find something warmer. |
| 24-Sep | 04.48.03 | -15.09373 | -173.74772 | 1244 | 2 | 284 | We'll say that it is 11deg C here. |
| 24-Sep | 04.48.53 | -15.09373 | -173.74772 | 1244 | 2 | 284 | Moving around a bit to look for warmer water. |
| 24-Sep | 04.52.03 | -15.09373 | -173.74772 | 1243 | 2 | 285 | We've moved up hill a couple meters. |
| 24-Sep | 04.53.09 | -15.09373 | -173.74772 | 1243 | 2 | 284 | Scaleworm just drifted by our view. See quite a lot of shrimp grazing these rocks covered with microbial mat. Surrounding rocks have a brown-ish tint. |
| 24-Sep | 04.54.33 | -15.09373 | -173.74772 | 1243 | 2 | 285 | HD tape on. |
| 24-Sep | 04.57.04 | -15.09373 | -173.74772 | 1243 | 2 | 284 | These rocks in the chute are smaller than the ones to either side. Where the flow is the rocks are smaller. |
| 24-Sep | 04.57.46 | -15.09373 | -173.74772 | 1243 | 2 | 285 | Ken says that we are definitely on the north side of the ridge. |
| 24-Sep | 04.58.21 | -15.09373 | -173.74772 | 1243 | 2 | 285 | The max temp was 10.1deg C. The flow and temperature seems to be quite uniform throughout. |
| 24-Sep | 04.59.58 | -15.09373 | -173.74772 | 1243 | 2 | 283 | Preparing to get a major sample here in this are of diffuse flow throughout these cobble sediments. |
| 24-Sep | 05.03.22 | -15.09373 | -173.74772 | 1243 | 2 | 285 | HD off. Blue Streak diffuse venting site. |
| 24-Sep | 05.04.20 | -15.09373 | -173.74772 | 1243 | 2 | 285 | There are lots of pregnant female shrimp here. |
| 24-Sep | 05.05.04 | -15.09373 | -173.74772 | 0 | 0 | 0 | Looking at the vesicles in the rock here in the diffuse flow. Gray colored; irregular shapes. Looks like pebble cobble size. |
| 24-Sep | 05.06.10 | -15.09373 | -173.74772 | 1243 | 2 | 284 | Have the blue major in hand. Rotating it now. |
| 24-Sep | 05.07.18 | -15.09373 | -173.74772 | 1243 | 2 | 285 | Yellow shrimp in the HD close-up. |
| 24-Sep | 05.07.47 | -15.09373 | -173.74772 | 1243 | 2 | 284 | The nozzle for the major sampler is in the flow. |
| 24-Sep | 05.10.37 | -15.09373 | -173.74772 | 1243 | 2 | 285 | **Q332-major-21.** Sampling this diffuse fluid with a light coating of bacterial mat on these gray rocks in the area of diffuse low. Temperature here was 10.1 deg C. Blue Streak venting site. |

| date | time | latitude | longitude | Z | alt | hdg | Q332 - West Mata Dive Comments |
|---|---|---|---|---|---|---|---|
| 24-Sep | 05.10.43 | -15.09373 | -173.74772 | 1243 | 2 | 285 | Finished with the sample. Bringing the major back to the vehicle. That will be the last sample of the dive. |
| 24-Sep | 05.13.19 | -15.09371 | -173.74775 | 1243 | 2 | 284 | The major sampler is stored. Just need to bungee it in. |
| 24-Sep | 05.14.48 | -15.09374 | -173.74773 | 1243 | 1 | 285 | Will do a bit of HD to document this place called "Blue Streak". |
| 24-Sep | 05.15.19 | -15.09373 | -173.74772 | 1243 | 2 | 284 | HD on. |
| 24-Sep | 05.16.37 | -15.09374 | -173.74771 | | | | Looking at the wall in front of us. Facing west. We must be sort of on the SE side of the narrow summit. |
| 24-Sep | 05.29.13 | | | | | | Off the seafloor at ~0515 UTC. |
| 24-Sep | 06.16.03 | | | | | | Out of the water. |
| 24-Sep | 06.17.11 | | | | | | ROV on deck. |

## 7.12 Q333 Niua South Dive Log

| date | time | latitude | longitude | Z | alt | hdg | Q333 - Niua South Dive Comments |
|---|---|---|---|---|---|---|---|
| **Main Goals:** Sample microbes at small pit to southwest; then travel to larger depression for exploration and sampling. | | | | | | | |
| **Launch target:** 15°10.001' S 173°34.549' W Z=1143m Small pit SW of main Niua S site | | | | | | | |
| **Setup:** 2 gastights; 3 majors; temp probe 2 Davis samplers; 1 McPhail sampler; large biobox; suction sampler; pelagic pump; T-handle and mesh net; shrimp-catcher jar | | | | | | | |
| **Nav Notes**: Bottom time: Bottom time: 9/24/2012 19:07 – 9/25 01:53. Nav smoothed (tolerance=13). Moved nav file +24m (E) +22m (N). Nav ends at 01:09:42 (~45 min before end of dive). Sampling at chimney site (Target E) from 23:38 – 02:49. | | | | | | | |
| **DIVE LOG POSITION INFORMATION: latitude; longitude; Z; alt; hdg values are derived from finalized Quest nav. Any lat/long values in the dive comments column were recorded at sea and are preliminary.** | | | | | | | |
| 24-Sep | 18.08.36 | | | | | | Off the deck. |
| 24-Sep | 18.11.16 | | | | | | ROV in the water. |
| 24-Sep | 18.15.51 | | | | | | Floats on wire. |
| 24-Sep | 18.16.42 | | | | | | ROV diving. |
| 24-Sep | 18.22.42 | | | | | | At 100m. |
| 24-Sep | 18.27.08 | | | | | | 200m. |
| 24-Sep | 18.45.30 | | | | | | 600m. |
| 24-Sep | 19.01.54 | | | | | | Passing 1000m on our way to bottom target depth 1143m. |
| 24-Sep | 19.06.51 | -15.16620 | -173.57584 | 1135 | 15 | 324 | Bottom. **[postcruise note: moved the nav 24m east / 22m north]** |
| 24-Sep | 19.07.46 | -15.16619 | -173.57576 | 1144 | 4 | 322 | Landed in sediments with white staining around large boulders. |
| 24-Sep | 19.08.54 | -15.16620 | -173.57577 | 1144 | 4 | 323 | We are probably west of the pit. ROV doing bottom checks. |
| 24-Sep | 19.09.41 | -15.16619 | -173.57576 | 1142 | 6 | 321 | Large fish next to a rock. |
| 24-Sep | 19.10.08 | -15.16620 | -173.57576 | 1143 | 5 | 323 | Christian and Ralph piloting. Brad and Rick in the van. |
| 24-Sep | 19.10.33 | -15.16619 | -173.57578 | 1143 | 5 | 241 | Heading toward the pit at 231deg. |
| 24-Sep | 19.10.42 | -15.16623 | -173.57578 | 1145 | 4 | 244 | Edge of pit! |
| 24-Sep | 19.11.08 | -15.16628 | -173.57576 | 1147 | 6 | 251 | Looking SW and going down the pit. |
| 24-Sep | 19.11.55 | -15.16636 | -173.57573 | 1159 | 6 | 265 | Wall is to stbd as we head 264deg. |
| 24-Sep | 19.12.35 | -15.16640 | -173.57573 | 1163 | 2 | 281 | Fine sediment and mat coating. |
| 24-Sep | 19.13.35 | -15.16647 | -173.57577 | 1166 | 3 | 260 | Angular pumice. |
| 24-Sep | 19.13.45 | -15.16649 | -173.57578 | 1166 | 3 | 207 | Shrimp and mat. |
| 24-Sep | 19.14.05 | -15.16649 | -173.57577 | 1166 | 3 | 155 | At bottom of pit looking for black pumice (manganese coated pumice). |
| 24-Sep | 19.14.45 | -15.16647 | -173.57576 | 1167 | 1 | 154 | Some good diffuse flow in mat. |
| 24-Sep | 19.15.23 | -15.16647 | -173.57576 | 1168 | 1 | 188 | Bottom of pit looking south. Diffuse flow and lots of orange mat. |
| 24-Sep | 19.17.32 | -15.16645 | -173.57576 | 1165 | 3 | 110 | Red shrimp had a pink shrimp in claws. Swimmer type eating a hydrothermal shrimp. |
| 24-Sep | 19.18.01 | -15.16651 | -173.57575 | 1165 | 3 | 205 | **Offset in the map-we are on the east side but bathy map shows us on the west wall.** |
| 24-Sep | 19.18.57 | -15.16649 | -173.57583 | 1165 | 2 | 348 | Not seeing many black rocks as we head a little to the west. |
| 24-Sep | 19.19.11 | -15.16646 | -173.57583 | 1165 | 2 | 356 | Pit is full of pumice. |
| 24-Sep | 19.19.44 | -15.16640 | -173.57582 | 1164 | 2 | 324 | Squat lobsters on the larger rock as well as shrimp. Saw an eelpout too. |
| 24-Sep | 19.21.02 | -15.16639 | -173.57582 | 1165 | 1 | 334 | Large rock looks like it would be good to scoop/scrape manganese so setting up to park for sampling. |
| 24-Sep | 19.25.42 | -15.16641 | -173.57581 | 1164 | 1 | 334 | Retrieving Davis #9 from basket (double-chamber). |
| 24-Sep | 19.28.44 | -15.16642 | -173.57580 | 1164 | 1 | 334 | Passing sampler from one arm to the other. |
| 24-Sep | 19.30.55 | -15.16640 | -173.57583 | 1164 | 1 | 334 | Scraping rock with sampler and black piece fell off the rock. |
| 24-Sep | 19.31.55 | -15.16641 | -173.57582 | 1164 | 1 | 334 | Interior piece of broken rock shows a white interior. |
| 24-Sep | 19.33.06 | -15.16642 | -173.57581 | 1164 | 1 | 334 | Opening valve on scoop. |
| 24-Sep | 19.34.15 | -15.16643 | -173.57581 | 1164 | 1 | 334 | First going to try to get a small piece of pumice into the 2 inch wide tube. |
| 24-Sep | 19.35.47 | -15.16642 | -173.57583 | 1164 | 1 | 334 | Picked up a piece that had been knocked off the big rock. Already falling apart. |
| 24-Sep | 19.36.45 | -15.16641 | -173.57583 | 1165 | 1 | 334 | Got a piece in claw. Trying to get it over to scooper. HD view of pumice. Too much lighter material on that piece. Want the dark stuff. |
| 24-Sep | 19.38.49 | -15.16642 | -173.57581 | 1164 | 1 | 334 | Got another piece and positioning over sampler. Didn't make it in the sampler. Will try again. |
| 24-Sep | 19.41.15 | -15.16641 | -173.57582 | 1164 | 1 | 334 | Missed again-too big. Back for another piece. |
| 24-Sep | 19.44.32 | -15.16643 | -173.57581 | 0 | 0 | 0 | Got a piece. Trying to scrape the piece on top of the sampler. |
| 24-Sep | 19.44.48 | -15.16643 | -173.57580 | 1164 | 1 | 334 | Good piece went into the sampler. |
| 24-Sep | 19.45.56 | -15.16643 | -173.57580 | 1164 | 1 | 334 | Will try to get another piece before closing the valve. |
| 24-Sep | 19.47.42 | -15.16642 | -173.57580 | 1164 | 1 | 334 | Grabbed a large piece off the rock and bringing it over to the sampler. |
| 24-Sep | 19.48.49 | -15.16641 | -173.57583 | 0 | 0 | 0 | Lining piece over the top of the sampler. Perched on top of the little sampler. |
| 24-Sep | 19.49.54 | -15.16642 | -173.57582 | 1165 | 1 | 334 | Smashing the rock into the tube. Went into the tube and will try to use a finger/thumb to push the remainder down the throat of the sampler. |

| date | time | latitude | longitude | Z | alt | hdg | Q333 - Niua South Dive Comments |
|---|---|---|---|---|---|---|---|
| 24-Sep | 19.53.23 | -15.16642 | -173.57584 | 1165 | 1 | 334 | Transferred the sampler to the stbd arm and going to use the longer fingers of the port arm to get the sampler down the tube. |
| 24-Sep | 19.55.31 | -15.16640 | -173.57582 | 1165 | 1 | 334 | Poked down the tube and the manganese coating was facing down the tube when placed on the sampler. |
| 24-Sep | 19.58.11 | -15.16641 | -173.57583 | 1164 | 1 | 334 | Transferred sampler back to port arm. |
| 24-Sep | 20.03.04 | -15.16641 | -173.57582 | 1164 | 1 | 334 | Closing the top valve. |
| 24-Sep | 20.04.48 | -15.16642 | -173.57583 | 1165 | 1 | 334 | Opening the bottom valve. Seeing some sample moving into the lower chamber. |
| 24-Sep | 20.05.15 | -15.16640 | -173.57583 | 1164 | 1 | 334 | Shrimp has a crab in the HD. |
| 24-Sep | 20.05.20 | -15.16643 | -173.57582 | 0 | 0 | 0 | **Bio Sample: Q333-biorock-01**. Davis sampler scoop of manganese coating on pumice rocks at the bottom of a small pit with hydrothermal venting (diffuse). Used small Davis #9 (double-chamber) sampler. In #13. |
| 24-Sep | 20.07.50 | -15.16643 | -173.57584 | 1165 | 1 | 333 | Putting sampler back into the basket into the back of the drawer in #13. Had to move away from the rock to open the drawer. |
| 24-Sep | 20.09.41 | -15.16644 | -173.57582 | 1165 | 1 | 333 | Next going to use the other Davis sampler at the same location. |
| 24-Sep | 20.12.11 | -15.16644 | -173.57583 | 1165 | 1 | 333 | Retrieving Davis #1 sampler from the basket. |
| 24-Sep | 20.14.19 | -15.16645 | -173.57583 | 1165 | 1 | 333 | Transferred sampler to port arm. |
| 24-Sep | 20.15.20 | -15.16642 | -173.57584 | 1165 | 1 | 333 | Opening the valve. |
| 24-Sep | 20.16.41 | -15.16642 | -173.57584 | 1165 | 1 | 333 | Transferring the sampler to the stbd arm to scrape the sampler on the rock to get the manganese coating. |
| 24-Sep | 20.18.05 | -15.16643 | -173.57582 | 1164 | 1 | 338 | Moving back to the rock. |
| 24-Sep | 20.19.55 | -15.16643 | -173.57583 | 1164 | 1 | 349 | First scrape knocked off a good portion of the rock. |
| 24-Sep | 20.20.29 | -15.16642 | -173.57583 | 1164 | 1 | 349 | Seeing some sample going into the tube. |
| 24-Sep | 20.21.36 | -15.16642 | -173.57583 | 1164 | 1 | 350 | Quite a bit of material in the tube. Going to get a bit more material. |
| 24-Sep | 20.23.17 | -15.16642 | -173.57582 | 1165 | 1 | 347 | Scraping again. Valve is clogged so shaking the tube and then will try to use the port arm to poke it down. |
| 24-Sep | 20.25.08 | -15.16640 | -173.57583 | 1165 | 1 | 344 | Successfully poked down the tube. |
| 24-Sep | 20.26.34 | -15.16643 | -173.57581 | 1164 | 1 | 346 | Continuing to scoop. |
| 24-Sep | 20.27.38 | -15.16642 | -173.57582 | 1165 | 1 | 346 | **Bio Sample: Q333-biorock-02**. Scrape of the big rock's black manganese coating with Davis sampler #1 (large DNA). Quite a large sample. The small pit. |
| 24-Sep | 20.31.13 | -15.16643 | -173.57581 | 0 | 0 | 0 | We are NE of the **navigation** (maybe 20m N 10m E) The nav is plotting SW of where we actually are. It puts us out of the little pit on the SW side. We're actually in the pit on the NE side. **[postcruise note: moved the nav 24m east ; 22m north]** |
| 24-Sep | 20.35.07 | -15.16643 | -173.57582 | 1165 | 2 | 324 | HD on. |
| 24-Sep | 20.36.12 | -15.16643 | -173.57584 | 1163 | 4 | 324 | Coming off the bottom and looking at the site at the bottom of this pit. |
| 24-Sep | 20.36.23 | -15.16645 | -173.57584 | 1163 | 4 | 326 | HD off. Bob in the van with Akapei. |
| 24-Sep | 20.37.15 | -15.16645 | -173.57584 | 1163 | 4 | 326 | Looking at the NW wall of the pit with some white-ash layers covered by manganese coated pumice. Some squat lobsters. |
| 24-Sep | 20.38.44 | -15.16643 | -173.57580 | 1162 | 4 | 23 | Turning NE and looking at the pit rim which we'll drive up. |
| 24-Sep | 20.39.09 | -15.16638 | -173.57574 | 1158 | 5 | 22 | Should be flat between the pits and about 100m away. |
| 24-Sep | 20.39.22 | -15.16637 | -173.57573 | 1157 | 6 | 23 | Pumice embedded in the ash sediment. |
| 24-Sep | 20.40.08 | -15.16636 | -173.57571 | 1150 | 7 | 230 | Need to move the ship for this transit. |
| 24-Sep | 20.40.43 | -15.16631 | -173.57574 | 1148 | 3 | 301 | Coming out over the rim seeing layers of ash plates. |
| 24-Sep | 20.41.08 | -15.16622 | -173.57578 | 1146 | 2 | 310 | Driving west a bit to deal with the wire angle. |
| 24-Sep | 20.41.30 | -15.16612 | -173.57586 | 1143 | 2 | 318 | Black coated pumice rocks (manganese). |
| 24-Sep | 20.42.38 | -15.16594 | -173.57588 | 1139 | 2 | 340 | Larger pit has the black smokers in it. |
| 24-Sep | 20.47.14 | -15.16593 | -173.57583 | 1141 | 2 | 59 | Pilot change while waiting for the ship. |
| 24-Sep | 20.47.32 | -15.16593 | -173.57577 | 1140 | 2 | 59 | ROV is now moving and turning NE at 058. |
| 24-Sep | 20.48.41 | -15.16586 | -173.57562 | 1141 | 2 | 79 | Flat and sandy bottom. |
| 24-Sep | 20.49.27 | -15.16586 | -173.57557 | 1141 | 2 | 79 | Ripple marks in the bottom. |
| 24-Sep | 20.50.16 | -15.16586 | -173.57551 | 1142 | 2 | 79 | Pumice with some white bacterial mat in the sandy plain. |
| 24-Sep | 20.51.34 | -15.16587 | -173.57547 | 1142 | 2 | 77 | Rattail fish. |
| 24-Sep | 20.54.06 | -15.16591 | -173.57540 | 1142 | 2 | 68 | Driving high over sandy flat bottom. |
| 24-Sep | 20.55.24 | -15.16591 | -173.57525 | 1142 | 2 | 62 | Large anemone on rock in sandy sediment. |
| 24-Sep | 20.58.35 | -15.16590 | -173.57521 | 1142 | 2 | 61 | Continuing to drive to the next pit. |
| 24-Sep | 20.59.42 | -15.16588 | -173.57513 | 1143 | 2 | 61 | Less sediment and more rocky outcrop (pumice). |
| 24-Sep | 21.00.26 | -15.16588 | -173.57508 | 1142 | 4 | 62 | Almost at the crater and now seeing some lava boulders. |
| 24-Sep | 21.00.57 | -15.16587 | -173.57506 | 1143 | 2 | 61 | Near the rim of the next pit. |
| 24-Sep | 21.02.30 | -15.16583 | -173.57485 | 1146 | 2 | 61 | **Nav offset has us SW of where we actually are.** |
| 24-Sep | 21.03.38 | -15.16579 | -173.57474 | 1147 | 2 | 61 | Some larger boulders or lava. |
| 24-Sep | 21.04.28 | -15.16578 | -173.57463 | 1145 | 2 | 60 | Heading downslope but laterally not directly. |

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| 24-Sep | 21.04.40 | -15.16577 | -173.57458 | 1145 | 2 | 61 | Edge has some large lava pieces. |
| 24-Sep | 21.05.12 | -15.16579 | -173.57450 | 1141 | 3 | 60 | Mixture of pumice and lava on the wall. |
| 24-Sep | 21.06.21 | -15.16574 | -173.57435 | 1140 | 3 | 48 | Moving along the upper rim. |
| 24-Sep | 21.11.40 | -15.16550 | -173.57426 | 1149 | 4 | 21 | Driving along the rim at 021deg. |
| 24-Sep | 21.12.18 | -15.16549 | -173.57424 | 1151 | 4 | 21 | Doppler reset. |
| 24-Sep | 21.12.51 | -15.16550 | -173.57426 | 1152 | 3 | 21 | Lots of rubble but there is in place lava. |
| 24-Sep | 21.16.14 | -15.16555 | -173.57430 | 1154 | 2 | 111 | Setting up for a sample of in place lava. |
| 24-Sep | 21.20.45 | -15.16561 | -173.57433 | 1149 | 3 | 112 | Little zoarcids. |
| 24-Sep | 21.22.03 | -15.16562 | -173.57432 | 1149 | 3 | 113 | Settled in front of rock with 2 broken pieces that would be good to sample. |
| 24-Sep | 21.24.49 | -15.16561 | -173.57433 | 1149 | 3 | 113 | Had a piece but broke off in claw. Has orange coating. DSC. |
| 24-Sep | 21.27.50 | -15.16563 | -173.57431 | 1149 | 3 | 113 | Placing sample in bin #1. |
| 24-Sep | 21.27.54 | -15.16563 | -173.57431 | 1150 | 3 | 113 | **Geo Sample: Q333-rock-03**. Sample from outcrop near the rim of the large pit that has active hydrothermal systems in the bottom of the pit. |
| 24-Sep | 21.29.27 | -15.16563 | -173.57432 | 1149 | 3 | 22 | Looking at the rim of the depression. Stowing arm. |
| 24-Sep | 21.30.02 | -15.16557 | -173.57427 | 1150 | 3 | 21 | Descending into the pit with about 60m to the target in the depression. |
| 24-Sep | 21.30.26 | -15.16553 | -173.57423 | 1148 | 3 | 21 | Talus slope coated with some sediment. |
| 24-Sep | 21.31.54 | -15.16541 | -173.57413 | 1154 | 3 | 20 | No view as we drive down into the pit. |
| 24-Sep | 21.32.51 | -15.16540 | -173.57407 | 1153 | 3 | 60 | Seeing some of the talus slope. |
| 24-Sep | 21.33.08 | -15.16539 | -173.57403 | 1152 | 3 | 61 | Chimney (old) seeing sonar targets. White staining on the slope. |
| 24-Sep | 21.34.19 | -15.16536 | -173.57402 | 1156 | 3 | 85 | Seeing other white-stained features around the base. |
| 24-Sep | 21.34.54 | -15.16533 | -173.57402 | 1157 | 3 | 93 | Seeing dead chimneys further downslope adjacent to the white one. |
| 24-Sep | 21.35.15 | -15.16534 | -173.57399 | 1155 | 3 | 92 | Lots of orange staining and see some smoke coming out. |
| 24-Sep | 21.35.47 | -15.16536 | -173.57398 | 1155 | 3 | 107 | See a long string of chimneys in a line at 092 with others going off to the side. |
| 24-Sep | 21.35.59 | -15.16536 | -173.57399 | 1155 | 3 | 122 | Two trends intersecting. |
| 24-Sep | 21.36.37 | -15.16534 | -173.57400 | 1156 | 3 | 100 | Fish by a rock. Crabs. |
| 24-Sep | 21.37.56 | -15.16534 | -173.57397 | 1155 | 3 | 102 | Moving around to get a view. |
| 24-Sep | 21.38.38 | -15.16534 | -173.57396 | 1156 | 1 | 83 | Partly coated with orange material then have white patches where more hydrothermal flow. One has some gray smoke out of the top. |
| 24-Sep | 21.39.19 | -15.16536 | -173.57398 | 1155 | 1 | 61 | Snails coated in orange on the vent. Nearby shrimp. |
| 24-Sep | 21.40.27 | -15.16534 | -173.57400 | 1155 | 5 | 114 | Marking as a target in the nav as Southern Chimney. |
| 24-Sep | 21.41.10 | -15.16534 | -173.57396 | 1155 | 1 | 84 | Higher chimneys behind this at 080. |
| 24-Sep | 21.42.30 | -15.16533 | -173.57396 | 1157 | 2 | 93 | HD on. |
| 24-Sep | 21.42.54 | -15.16533 | -173.57396 | 1155 | 4 | 103 | Can see a scaleworm at the top. |
| 24-Sep | 21.44.00 | -15.16533 | -173.57397 | 1157 | 2 | 103 | Pilot change. |
| 24-Sep | 21.46.10 | -15.16533 | -173.57393 | 1155 | 4 | 156 | See a little smoke out of this white chimney but very faint and grey. |
| 24-Sep | 21.47.21 | -15.16533 | -173.57392 | 1157 | 2 | 153 | Snails are heavily coated with orange. |
| 24-Sep | 21.48.30 | -15.16533 | -173.57387 | 1152 | 8 | 142 | Larger old chimneys very craggy. |
| 24-Sep | 21.48.44 | -15.16533 | -173.57386 | 1150 | 9 | 151 | Coming up this massive chimney. |
| 24-Sep | 21.49.09 | -15.16533 | -173.57386 | 1148 | 11 | 178 | An active chimney at the very top. |
| 24-Sep | 21.50.03 | -15.16536 | -173.57386 | 1148 | 11 | 163 | Close-up of the chimney top. Scaleworm-shrimp. |
| 24-Sep | 21.50.29 | -15.16533 | -173.57386 | 1148 | 11 | 127 | Very wide chimney with taller spires. More in the distance at 126deg. |
| 24-Sep | 21.51.13 | -15.16531 | -173.57383 | 1147 | 13 | 163 | Sonar shows many chimney structures as we look at 163deg. |
| 24-Sep | 21.51.30 | -15.16531 | -173.57383 | 1149 | 11 | 175 | Water is smoky here. |
| 24-Sep | 21.51.49 | -15.16533 | -173.57381 | 1148 | 10 | 168 | We're up 11m off bottom looking at chimney tops. |
| 24-Sep | 21.52.04 | -15.16536 | -173.57381 | 1147 | 10 | 161 | Very massive chimneys. Chimneys are on the wall-not the bottom. |
| 24-Sep | 21.52.25 | -15.16536 | -173.57381 | 1147 | 10 | 161 | **A wall of chimneys as we look south (tall skinny ones).** |
| 24-Sep | 21.52.56 | -15.16539 | -173.57384 | 1146 | 12 | 142 | Headed to top (nothing living on the sides). |
| 24-Sep | 21.54.32 | -15.16537 | -173.57396 | 1150 | 5 | 44 | This was unexpected here but are going to drive north. HD off. |
| 24-Sep | 21.55.21 | -15.16535 | -173.57392 | 1150 | 7 | 88 | Still looking at these massive chimneys as we are looking 090. |
| 24-Sep | 21.56.05 | -15.16532 | -173.57389 | 1148 | 12 | 152 | Turning left to head north. |
| 24-Sep | 21.57.09 | -15.16536 | -173.57386 | 1144 | 13 | 129 | At 14m still not quite looking at the top-very tall. |
| 24-Sep | 21.58.47 | -15.16539 | -173.57384 | 1138 | 19 | 158 | Having some wire and ship issues. |
| 24-Sep | 21.59.16 | -15.16541 | -173.57385 | 1136 | 17 | 158 | Saw one with more smoke coming out of it. |
| 24-Sep | 22.00.30 | -15.16546 | -173.57387 | 1132 | 19 | 157 | Seeing a fair amount of smoke in the pilot camera. |
| 24-Sep | 22.02.18 | -15.16535 | -173.57398 | 1132 | 25 | 326 | Way off the bottom and lost navigation. |
| 24-Sep | 22.04.43 | -15.16528 | -173.57425 | 1147 | 21 | 326 | Doppler is now working. |
| 24-Sep | 22.05.32 | -15.16527 | -173.57424 | 1160 | 9 | 23 | Back near the bottom at 8m off. USBL is back. |
| 24-Sep | 22.06.46 | -15.16525 | -173.57424 | 1163 | 6 | 23 | These look shorter and less active covered in fuzz. |
| 24-Sep | 22.07.12 | -15.16519 | -173.57420 | 1162 | 7 | 24 | Seeing some white stained chimneys. |
| 24-Sep | 22.07.59 | -15.16513 | -173.57418 | 1164 | 7 | 25 | Chimneys here are not tall-thin; more short-squat. |
| 24-Sep | 22.08.20 | -15.16509 | -173.57417 | 1162 | 9 | 5 | Large sulfide structure ahead. |
| 24-Sep | 22.09.51 | -15.16509 | -173.57415 | 1161 | 8 | 42 | Looks like massive sulfide mound. |

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|---|---|---|---|---|---|---|---|
| 24-Sep | 22.10.18 | -15.16508 | -173.57416 | 1160 | 10 | 49 | Water is murky here south of our target. |
| 24-Sep | 22.11.10 | -15.16507 | -173.57413 | 1164 | 5 | 44 | Heading at 044 approaching the mound. Some shimmer in the white mat at the bottom of this mound. |
| 24-Sep | 22.13.05 | -15.16507 | -173.57413 | 1163 | 6 | 42 | Small active smoker next to this one. |
| 24-Sep | 22.14.30 | -15.16509 | -173.57417 | 1161 | 9 | 43 | Also there is a current here pulling on the wire. |
| 24-Sep | 22.16.00 | -15.16508 | -173.57416 | 1162 | 8 | 54 | Trying to reposition the ship-wire-vehicle. |
| 24-Sep | 22.16.15 | -15.16509 | -173.57416 | 1163 | 7 | 53 | We are between targets B & C??. **[postcruise: Actually very close to target C]** |
| 24-Sep | 22.17.42 | -15.16509 | -173.57417 | 1161 | 9 | 53 | We are back down on the edge of the mound at 9m off bottom. |
| 24-Sep | 22.22.29 | -15.16501 | -173.57394 | 1163 | 5 | 45 | Looking at the bottom just south of target C. [postcruise: actually east of target C] |
| 24-Sep | 22.22.48 | -15.16501 | -173.57393 | 1161 | 7 | 45 | Looks like we are at the base of the mound. |
| 24-Sep | 22.23.53 | -15.16499 | -173.57385 | 1160 | 6 | 46 | Target C is on the spine of the mounds. |
| 24-Sep | 22.24.46 | -15.16496 | -173.57379 | 0 | 0 | 0 | We are heading at 045 but need to go further west. |
| 24-Sep | 22.25.29 | -15.16493 | -173.57380 | 1158 | 9 | 313 | Turning to the west. |
| 24-Sep | 22.26.13 | -15.16487 | -173.57388 | 1167 | 2 | 321 | Old sulfide to the right. |
| 24-Sep | 22.26.44 | -15.16480 | -173.57395 | 1169 | 3 | 328 | Trying to find the N-S trending sulfide mounds. |
| 24-Sep | 22.27.19 | -15.16481 | -173.57401 | 1169 | 3 | 284 | Fuzz on the rocks on some faces. |
| 24-Sep | 22.27.38 | -15.16480 | -173.57406 | 1168 | 4 | 278 | Heading 284 and seeing some sulfide rubble. Eastern edge of the mound. |
| 24-Sep | 22.29.59 | -15.16478 | -173.57413 | 1166 | 4 | 278 | Climbing up the mound. |
| 24-Sep | 22.30.44 | -15.16476 | -173.57420 | 1163 | 5 | 274 | Climbing the eastern side of the mound. Sulfides on slope. |
| 24-Sep | 22.31.16 | -15.16475 | -173.57423 | 1161 | 4 | 274 | Still climbing up and seeing some shrimp and a crab. |
| 24-Sep | 22.32.33 | -15.16474 | -173.57433 | 1162 | 1 | 221 | To get to target C need to drive about 30m south once on top of the mound. |
| 24-Sep | 22.32.35 | -15.16477 | -173.57434 | 1162 | 1 | 220 | At active chimneys. Snails. |
| 24-Sep | 22.33.17 | -15.16478 | -173.57435 | 1162 | 2 | 224 | Activity between targets c & d. |
| 24-Sep | 22.33.37 | -15.16480 | -173.57435 | 1161 | 4 | 232 | Some smoke coming out of a little chimney. Climbing up a spire. |
| 24-Sep | 22.34.00 | -15.16479 | -173.57435 | 1160 | 5 | 238 | Top of this one is not active. Snail on top. |
| 24-Sep | 22.34.21 | -15.16480 | -173.57435 | 1160 | 5 | 234 | Seeing more activity in the background. |
| 24-Sep | 22.34.58 | -15.16484 | -173.57440 | 1164 | 3 | 257 | Young activity superimposed on older chimney |
| 24-Sep | 22.35.16 | -15.16483 | -173.57443 | 0 | 0 | 0 | Looking 255 at some active smoke. |
| 24-Sep | 22.35.55 | -15.16481 | -173.57443 | 1164 | 2 | 235 | Lots of shrimp and a black beehive structure, |
| 24-Sep | 22.36.09 | -15.16480 | -173.57443 | 1164 | 2 | 232 | HD on. Scaleworm and shrimp with snails further down the bottom of the structures. |
| 24-Sep | 22.38.17 | -15.16483 | -173.57443 | 1166 | 1 | 288 | Fish between the rock with many snails and shrimp on the white staining. Focused flow at the top. |
| 24-Sep | 22.39.09 | -15.16484 | -173.57444 | 1165 | 2 | 284 | Brachyuran crabs and zoarcid fish; polychaete. Big fish (fat). |
| 24-Sep | 22.39.25 | -15.16485 | -173.57444 | 1164 | 2 | 287 | Target in nav called **D Chimneys**. |
| 24-Sep | 22.40.29 | -15.16486 | -173.57446 | 1165 | 2 | 302 | Alvinochonca. |
| 24-Sep | 22.41.39 | -15.16486 | -173.57446 | 1166 | 2 | 304 | HD on. |
| 24-Sep | 22.42.07 | -15.16487 | -173.57445 | 1165 | 2 | 289 | HD off. |
| 24-Sep | 22.42.26 | -15.16486 | -173.57445 | 1164 | 2 | 259 | Want to follow this around to the west a little bit. Row of chimneys. |
| 24-Sep | 22.43.16 | -15.16486 | -173.57447 | 1166 | 2 | 274 | Large chimney line ahead driving 268deg. Smoke in the water. |
| 24-Sep | 22.44.06 | -15.16485 | -173.57452 | 1166 | 2 | 267 | Panning from left to right at the line of chimneys. |
| 24-Sep | 22.44.24 | -15.16485 | -173.57451 | 1166 | 2 | 264 | Very craggy chimneys. |
| 24-Sep | 22.45.05 | -15.16483 | -173.57456 | 1166 | 4 | 235 | Drop-off on all sides and blue water with no more activity. |
| 24-Sep | 22.45.28 | -15.16482 | -173.57456 | 1166 | 4 | 307 | Turning to look north. |
| 24-Sep | 22.46.00 | -15.16481 | -173.57454 | 1165 | 5 | 355 | Looking at a large chimney with snails coated in orange. |
| 24-Sep | 22.46.15 | -15.16481 | -173.57454 | 1164 | 5 | 341 | DSCs of the chimney. |
| 24-Sep | 22.48.16 | -15.16479 | -173.57450 | 1164 | 4 | 351 | Looking at 351 at older sulfide some with diffuse flow. Snail communities and hairy gastropods. |
| 24-Sep | 22.48.51 | -15.16479 | -173.57448 | 1164 | 2 | 356 | Turning right and seeing smoke. |
| 24-Sep | 22.49.50 | -15.16470 | -173.57444 | 1165 | 5 | 354 | We are just south of the area sampled on the last dive so should we sample here or not. |
| 24-Sep | 22.52.10 | -15.16464 | -173.57435 | 1159 | 6 | 73 | Large spires in pilot cams. HD has snail patches but no smoke. |
| 24-Sep | 22.52.33 | -15.16465 | -173.57433 | 1158 | 7 | 57 | Going east a bit. Think we are at target H. |
| 24-Sep | 22.53.30 | -15.16468 | -173.57431 | 1162 | 3 | 89 | Heading 090. |
| 24-Sep | 22.54.36 | -15.16472 | -173.57422 | 1166 | 2 | 90 | Joe replacing Bob in van. |
| 24-Sep | 22.56.39 | -15.16481 | -173.57401 | 1167 | 5 | 80 | Driving east and starting to see some targets in sonar. |
| 24-Sep | 22.57.15 | -15.16484 | -173.57391 | 1165 | 5 | 64 | Just a rock. |
| 24-Sep | 23.01.33 | -15.16490 | -173.57344 | 1155 | 7 | 41 | Small shrimp on the sulfides. |
| 24-Sep | 23.02.47 | -15.16493 | -173.57339 | 1154 | 4 | 84 | We're lost here because of navigation offsets. Bad nav again….. |
| 24-Sep | 23.07.05 | -15.16484 | -173.57326 | 1155 | 3 | 17 | HD 2303 off at 2306. |
| 24-Sep | 23.07.38 | -15.16479 | -173.57324 | 1154 | 5 | 16 | Sulfide debris on the seafloor. We see smoke in the distance. |

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| 24-Sep | 23.08.32 | -15.16471 | -173.57320 | 1152 | 5 | 17 | We're seeing some white staining. |
| 24-Sep | 23.09.08 | -15.16470 | -173.57319 | 1151 | 5 | 21 | We're probably climbing up the mound to our target E. The navigation is putting us ~30m south of the target. It's wrong. **[postcruise: We were climping up the mound to the south of target E]** |
| 24-Sep | 23.10.57 | -15.16465 | -173.57320 | 1152 | 4 | 352 | This is a massive sulfide structure with white staining on parts. Not a lot of smoke from this view. |
| 24-Sep | 23.13.30 | -15.16462 | -173.57322 | 1152 | 4 | 352 | There are some shrimp - not dense - on the smaller chimney in front of us. This is a massive sulfide structure just like Adelaide. |
| 24-Sep | 23.14.37 | -15.16461 | -173.57318 | 1147 | 7 | 354 | Tons of spires up here We're looking at the top of the chimney now. |
| 24-Sep | 23.15.16 | -15.16456 | -173.57315 | 1146 | 8 | 353 | HD on. There are more chimneys in front of us. So far the flow we see is pretty clear. |
| 24-Sep | 23.16.25 | -15.16458 | -173.57315 | 1146 | 9 | 356 | There are lots of chimneys in the background as well. Hot fluid is pouring out all over this area. We haven't seen a black smoker. |
| 24-Sep | 23.18.12 | -15.16457 | -173.57316 | 1146 | 9 | 38 | We're trying to work our way around this chimney where they supposedly saw black smoke. |
| 24-Sep | 23.19.04 | -15.16455 | -173.57316 | 1149 | 6 | 54 | The hairy snails are on this chimney. |
| 24-Sep | 23.19.50 | -15.16455 | -173.57316 | 1148 | 5 | 28 | Odd looking chimneys sort of splayed out in front of us. |
| 24-Sep | 23.20.16 | -15.16455 | -173.57316 | 1148 | 7 | 350 | Kind of funny-looking spires here. |
| 24-Sep | 23.20.37 | -15.16457 | -173.57312 | 1147 | 8 | 335 | Several massive groups of chimneys in the view. |
| 24-Sep | 23.22.19 | -15.16454 | -173.57308 | 1150 | 7 | 335 | Some of them have white mat on them. |
| 24-Sep | 23.25.01 | -15.16454 | -173.57290 | 1150 | 7 | 28 | We're going to look here a little longer. |
| 24-Sep | 23.26.26 | -15.16449 | -173.57290 | 1149 | 6 | 32 | The chimney in front of us could be samplable. |
| 24-Sep | 23.27.19 | -15.16448 | -173.57289 | 1149 | 6 | 33 | We're looking at this chimney in front of us. It has a big beehive on it that is black on the end; white underneath. Lots of shrimp and snails; hairy snails. Brachyuran and polychaete on the chimney. Shrimp congregated. |
| 24-Sep | 23.29.26 | -15.16448 | -173.57290 | 1148 | 6 | 33 | Beautiful beehives for sampling. Clusters of snails; Ifremieria snails. |
| 24-Sep | 23.31.28 | -15.16448 | -173.57288 | 0 | 0 | 0 | Taking some nice DSCs and HD cam is still on. |
| 24-Sep | 23.32.46 | -15.16447 | -173.57288 | 1150 | 5 | 44 | We're trying to figure out the sampling order. We want to sample fluids; biological sampling. |
| 24-Sep | 23.34.37 | -15.16447 | -173.57289 | 1151 | 5 | 45 | Tim says that the scaleworms will eat shrimp; but usually the shrimp are too fast for them. |
| 24-Sep | 23.36.42 | -15.16448 | -173.57289 | 1150 | 5 | 45 | The suction sampler is on the hose. |
| 24-Sep | 23.38.54 | -15.16448 | -173.57288 | 1150 | 4 | 47 | **Bio Sample: Q333-biomacro-04.** Sucking shrimp off the sulfide chimney in the oxidized area. Into chamber 1. Several shrimp when in container 1. (Target D chimney) postcruise: Actually chimney east of Target E. |
| 24-Sep | 23.40.23 | -15.16447 | -173.57290 | 1150 | 4 | 46 | **Bio Sample: Q333-biomacro-05.** Sucking shrimp off the sulfide chimney in the oxidized area. Into chamber 2. Several shrimp. (Target D chimney) postcruise: Actually chimney east of Target E. |
| 24-Sep | 23.43.14 | -15.16447 | -173.57289 | 1151 | 4 | 46 | Repositioning a bit to slurp more shrimp. |
| 24-Sep | 23.43.28 | -15.16447 | -173.57288 | 1150 | 4 | 46 | Moving around a bit to look for more shrimp. |
| 24-Sep | 23.44.12 | -15.16448 | -173.57288 | 1151 | 4 | 46 | We're just a little lower on the chimney and to the right of previous spot. |
| 24-Sep | 23.45.36 | -15.16446 | -173.57289 | 1148 | 6 | 50 | **Bio Sample: Q333-biomacro-06.** Sucking shrimp off the sulfide chimney near white microbial mat area. Into chamber 3. Continuing to pursue - now going for the bunch in the lower center of the screen. Good haul that time; possibly close to a dozen. (Target D chimney) [postcruise: Actually chimney east of Target E]. |
| 24-Sep | 23.52.59 | -15.16447 | -173.57289 | 1150 | 4 | 51 | Setting up for water sampling in this area of dense biota and black beehive chimneys. |
| 24-Sep | 23.55.45 | -15.16446 | -173.57290 | 1150 | 4 | 69 | There are the 2 types of snails here: Ifremieria and hairy snails. We see the shrimp here as well as brachyuran crabs. Patches of microbial mat here and there on this oxidized sulfide structure. |
| 24-Sep | 23.57.49 | -15.16447 | -173.57289 | 1150 | 4 | 77 | This is a sizable beehive maybe 30cm across. These sulfide formations are so bizarre and beautiful. |
| 25-Sep | 00.05.19 | -15.16448 | -173.57289 | 0 | 0 | 0 | The temperature probe is clearing out a hole for sampling fluids and possibly the sulfide. |
| 25-Sep | 00.05.59 | -15.16448 | -173.57290 | 1150 | 3 | 76 | The probe is in the orifice of this sulfide. The water has turned very black with all the sulfide debris - due to poking the chimney. Bad visibility. |
| 25-Sep | 00.08.09 | -15.16449 | -173.57291 | 1151 | 5 | 76 | Waiting for the "smoke" to clear. |
| 25-Sep | 00.09.19 | -15.16447 | -173.57291 | 1149 | 5 | 75 | Looking better now. This chimney site is probably at our "Target E" site on the dive plan map. **[postcruise: actually at the mound east of Target E]** |
| 25-Sep | 00.10.09 | -15.16448 | -173.57289 | 1150 | 3 | 76 | Attempting another temperature measurement. |
| 25-Sep | 00.10.26 | -15.16447 | -173.57291 | 1150 | 3 | 76 | Temps: 264.1°C highest temp on last attempt. |
| 25-Sep | 00.11.27 | -15.16446 | -173.57289 | 1149 | 4 | 76 | Another attempt in same orifice: 203.8°C. The structure just fell apart. |
| 25-Sep | 00.13.10 | -15.16446 | -173.57289 | 1150 | 3 | 76 | Where is the structure now? Seems like the pedestal is gone as well. |

| date | time | latitude | longitude | Z | alt | hdg | Q333 - Niua South Dive Comments |
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| 25-Sep | 00.17.17 | -15.16447 | -173.57289 | 1150 | 4 | 76 | They are now going down to the bottom to get a good look. We see the black smoke but it's not as focused without the beehive. |
| 25-Sep | 00.19.33 | -15.16446 | -173.57289 | 1151 | 1 | 97 | Zooming in to get at the black smoke. |
| 25-Sep | 00.19.54 | -15.16447 | -173.57288 | 1151 | 2 | 98 | As the black smoke orifice opened up lower down the snails are moving away quickly (for a snail). |
| 25-Sep | 00.21.29 | -15.16446 | -173.57290 | 1151 | 2 | 98 | Taking another temperature reading here where the fluid formerly contained by the beehive is now flowing out of the bottom of the chimney. The smoke is black. |
| 25-Sep | 00.22.22 | -15.16447 | -173.57288 | 1151 | 1 | 98 | Temperature reading. 191; 231; 242; 251; 261; 266; 268; 272; **274.0°C** is the highest temperature reading here. |
| 25-Sep | 00.24.05 | -15.16446 | -173.57289 | 1151 | 1 | 98 | Backing out to stow the temp probe. Will grab the major sampler too. |
| 25-Sep | 00.24.49 | -15.16446 | -173.57289 | 1151 | 1 | 98 | What a sad sight. The snails are falling into the super hot water and trying to scramble away. Little shrimp are swooping in to take advantage of the traumatized snails. |
| 25-Sep | 00.26.40 | -15.16446 | -173.57290 | 1151 | 1 | 98 | Watching these snails and crabs move away from the very hot water that wasn't there earlier is quite the sight. |
| 25-Sep | 00.27.17 | -15.16446 | -173.57289 | 1151 | 1 | 97 | HD on. |
| 25-Sep | 00.28.05 | -15.16447 | -173.57288 | 1151 | 1 | 97 | One appears to be try and shake the other one off; or to save the one next to him. |
| 25-Sep | 00.29.04 | -15.16446 | -173.57289 | 1151 | 1 | 98 | We can see the snout outside of the snail. We see a polychaete on the snout of a snail. |
| 25-Sep | 00.31.27 | -15.16447 | -173.57288 | 1151 | 1 | 97 | Ifremieria snails (darker) prefer less heat than Alvinochonca (hairy snails) |
| 25-Sep | 00.32.31 | -15.16447 | -173.57288 | 1151 | 1 | 97 | Have the red major in the black smoke flow. Readjusting a bit. |
| 25-Sep | 00.39.58 | -15.16448 | -173.57290 | 1151 | 1 | 98 | HD off at 00:11:25 |
| 25-Sep | 00.34.55 | -15.16447 | -173.57289 | 1150 | 1 | 98 | **Fluid sample: Q333-major-07.** Red major in the black smoke flow at the base of this chimney among the snails that ended up there after the chimney fell apart. We got 274°C flow. Firing at 1234. (Target D chimney) postcruise: Actually chimney east of Target E. |
| 25-Sep | 00.38.59 | -15.16448 | -173.57289 | 1150 | 2 | 97 | Here comes the white major sampler. Will get another sample in the same place; where the black smoke is rising from the base of the chimney. |
| 25-Sep | 00.40.43 | -15.16447 | -173.57289 | 1150 | 2 | 99 | **Fluid sample: Q333-major-08.** White major in the black smoke flow at the base of this chimney among the snails that ended up there after the chimney fell apart. We got 274°C flow. (Target D chimney) postcruise: Actually chimney east of Target E. |
| 25-Sep | 00.51.12 | -15.16447 | -173.57290 | 1150 | 1 | 97 | Have grabbed the biosediment sampler and are preparing to take the sample. The OSU pharmacology group culture the medium and profile them for microbial activity. They are eventually screened to see if they have anti-cancer activities. |
| 25-Sep | 00.55.46 | -15.16448 | -173.57289 | 1150 | 1 | 98 | **Biology sample: Q333-biosed-09.** Going for the gray sediment to the left of the flow with the McPhail sampler. The sediment is most likely partly beehive material and partly oxidized sulfide. It filled up quite fast but doesn't look like there is any sediment in there. (Target D chimney) postcruise: Actually chimney east of Target E. |
| 25-Sep | 00.58.31 | -15.16449 | -173.57290 | 1150 | 2 | 97 | Stowing the McPhail sampler in compartment 13. |
| 25-Sep | 01.01.51 | -15.16447 | -173.57291 | 1151 | 3 | 98 | Have the green gastight in the ROV hand. Going back to same sampling site as the majors. |
| 25-Sep | 01.04.27 | -15.16448 | -173.57290 | 1151 | 2 | 98 | **Gas sample: Q333-gtb-10.** Green gastight in the black smoke flow at the base of the chimney among the snails that ended up there after the chimney fell apart. The tip is in the vent. Fired at 0103. Looks like a good sample. 274deg C temp earlier. (Target D chimney) postcruise: Actually chimney east of Target E.. |
| 25-Sep | 01.04.31 | -15.16447 | -173.57290 | 1151 | 2 | 102 | The sample worked but there was a hydraulic leak The RAM is not working anymore. |
| 25-Sep | 01.06.45 | -15.16448 | -173.57291 | 1151 | 2 | 97 | Stowed the gastight. |
| 25-Sep | 01.08.17 | -15.16449 | -173.57290 | 1151 | 2 | 99 | Close-up of the hydraulic ram. The oil is coming out the hose above the fitting on the upper side of the arm. **LAST NAVIGATION FIX AT 01:09:42. NO NAV UPDATES AFTER THAT.** |
| 25-Sep | 01.12.16 | -15.16448 | -173.57290 | 1151 | 2 | 101 | Pilot change. |
| 25-Sep | 01.18.15 | -15.16449 | -173.57291 | 1151 | 2 | 103 | Second half of pilot change. |
| 25-Sep | 01.20.28 | -15.16449 | -173.57291 | 1150 | 2 | 84 | Ralph is in the pilot seat. |
| 25-Sep | 01.24.14 | -15.16449 | -173.57291 | 1151 | 1 | 84 | **Bio Sample: Q333-biosed-11**. Sucking up the black sediment (beehive) and possibly some iron oxide/sulfide material at the base of the chimney. That's a nice sample. Sample for McPhail pharmacological studies. |

| date | time | latitude | longitude | Z | alt | hdg | Q333 - Niua South Dive Comments |
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| 25-Sep | 01.25.28 | -15.16449 | -173.57291 | 1151 | 1 | 85 | **Bio Sample: Q333-biomacro-12**. Sucking biology: brachyuran and some shrimp in container 5. |
| 25-Sep | 01.26.14 | -15.16449 | -173.57291 | 1151 | 2 | 82 | **Bio Sample: Q333-biomacro-13**. Sucking biology: Shrimp? Into container 6. |
| 25-Sep | 01.31.13 | -15.16449 | -173.57291 | 1151 | 1 | 91 | **Bio Sample: Q333-biomacro-14**. Sucking biology: Crab and a Shrimp? Into container 7. Possibly some sulfide pieces? |
| 25-Sep | 01.32.07 | -15.16449 | -173.57291 | 1151 | 2 | 92 | **Bio Sample: Q333-biomacro-15**. Sucking biology: Crab and a Shrimp? Into container 8. Possibly some sulfide pieces? |
| 25-Sep | 01.34.27 | -15.16449 | -173.57291 | 1151 | 1 | 93 | Rapid-fire biology samples that filled up the suction sampler containers. Not sure what exactly ended up in the chambers but will find out when we hit the surface. |
| 25-Sep | 01.37.22 | -15.16449 | -173.57291 | 1149 | 4 | 338 | Going in for a spire off the top of this sulfide structure. |
| 25-Sep | 01.37.42 | -15.16449 | -173.57291 | 1150 | 3 | 301 | HD on. Nice images of the top of this sulfide. |
| 25-Sep | 01.39.59 | -15.16449 | -173.57291 | 1150 | 3 | 63 | Going in for the grab on this sulfide spear near the top of the structure. It fell to the ground. |
| 25-Sep | 01.40.56 | -15.16449 | -173.57291 | 1152 | 2 | 321 | HD and hopefully DSCs of this odd complex of skinny sulfide spires. |
| 25-Sep | 01.42.34 | -15.16449 | -173.57291 | 1151 | 3 | 275 | **The navigation and depth information have not updated since we settled down here to sample at Target D [postcruise: Actually chimney east of Target E]** |
| 25-Sep | 01.42.54 | -15.16449 | -173.57291 | 1151 | 3 | 286 | Yellow shrimp on this sulfide structure. Another spire falls. |
| 25-Sep | 01.44.19 | -15.16449 | -173.57291 | 1149 | 2 | 10 | Obviously these sulfide structures are very fragile. Even the non-active parts are hard to collect without breaking them apart.. |
| 25-Sep | 01.45.16 | -15.16449 | -173.57291 | 1150 | 0 | 7 | **Geo Sample: Q333-sulfide-16**. A large piece of sulfide is in the claw. Grabbed from near the top of the sulfide complex. It's orangish brown and inactive. |
| 25-Sep | 01.52.54 | -15.16449 | -173.57291 | 1127 | 24 | 352 | Off the bottom. Last dive of SRoF'12 NE Lau Basin |
| 25-Sep | 02.46.06 | | | | | | On the surface. |
| 25-Sep | 02.49.44 | | | | | | On the deck. |
| 25-Sep | 02.49.47 | | | | | | Head for Samoa!!! |