HAWAI'I UNDERSEA RESEARCH LABORATORY
QUICK LOOK REPORT
DIVE: PV-637

MISSION STATUS

Location: Volcano 19, South Tonga (Tofua) Arc

Latitude: ***Begin*** 24° 48.110'S **Longitude:** ***Begin*** 177° 01.173'W

Mission Date: June 14, 2005 **Duration:** 6 hours 20 min (Bottom Time)

Maximum Depth (m): 1012 m

Project Title: SITKAP
(Submersible Investigations of the Tonga-Kermadec arc using PISCES)

Principal Investigator: Prof. Peter Stoffers, Kiel University
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Observer 1: Ulrich Schwarz-Schampera **Observer 2:** None
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Pilot 1: Terry Kerby **Pilot 2:** Colin Wollerman

Scientific Data Acquired: Video, hand-held still photos, CTD, rock samples, bio sample, scoop samples, geological map

Objectives:
Land at the southern crater (SW corner, 1015 m). Transit to the southern elevation within the caldera and further to the tip of the hill (986 m). Following the depression to the base of the southern caldera slope and relocation of the Fe-oxide chimneys. Following their up-slope extension. Sampling water and gas from the chimneys where appropriate. Exploring the southern caldera rim to the ridge crest (725 m) and its highest elevation (698 m). Sampling of the volcaniclastic stratigraphy at the southern caldera rim where appropriate. Moving downwards the caldera rim in a straight northwards direction and locate and sample the source of the mineralized samples sampled during P5-636. Moving to the East and exploring the slope towards the neovolcanic cone and its top (420 m).

Observations, findings, etc: (Also see Appended Dive Log)

Summary: The dive was launched in critical weather conditions but allowed a bottom time of 6.2 hours (total distance traveled = 1.3 km). All objectives besides stratigraphic sampling and the exploration of the neovolcanic cone were achieved. The large area of diffuse low-temperature venting identified during P5-636 was investigated in greater detail and Fe-oxyhydroxide "chimneys" up to 8 m high were located. Bacterial mats on top of these edifices as well as in the volcaniclastic and scoriaceous sediment were identified (maximum 13 deg.C). Elevated to high temperature venting (31 and 113 deg.C) and associated sulfide-sulfate-silica precipitates were discovered and sampled in the area of the Fe-oxyhydroxide "chimneys". A prominent vent fauna was observed and partly sampled. The dike swarm/complex at the crater wall was relocated and followed up-slope towards the southern caldera rim. The dikes are embedded in coarse-grained scoriaceous breccia and form steep, sharp and locally overhanging cliffs. Open faults crosscut thicker dikes. The southern rim is covered by thick deposits of volcanic and compositionally diverse ash and includes boulders of tonalitic intrusive likely representing material from the deep caldera. The blocks of ash identified during P5-636 did not derive from the upper southern caldera rim.

Species List:

As for Dive P5-636 plus a number of vent-related animals near the low and moderate temperature vent field.

Also seen during P5-637 (observer and pilot report):
- small rat tail fish (blue)
- shrimps
- tripod-like fish with long vertical antannae
- Natastoma hertaseps fish
- Actiniaria (anemone)
- Sanaptibranchid fish
- Sledenia fish
- Asteroidea

Near the low and moderate temperature vent fields during P5-637:
- pink crabs (up to 15 cm diameter, including legs), possibly Brachyuran(?) among Fe-oxyhydroxide chimneys
- numerous crabs (15 cm in diameter) at active venting sites, Bythograeidea (2 samples)
- numerous shrimps
- swimming scale worms (Polynoidae?)
- clumps of small (3 cm) contorted worm tubes in fracture in basalt and on rocks near bacterial mat and Fe-oxyhyroxide precipitates (possibly Siboglinidae polycheate worms similar to those normally associated with vents); dead
- clumps of live Seripulidae filter feeders at the base of an Fe-oxyhydroxide chimney (sampled)
- colony of sophonophores that captured a fish

Midwater organisms observed in video (L. Lundsten, MBARI):

Munopsidae (Isopoda)
Calycophorae (Siphonophora)
Bathylagidae (?)
Trachymedusae (Medusae)
Crossota ? (Medusae)
Sergestidae (Decapoda)
Mysida (Decapoda)
Chaetognatha (Arrow Worms)
Appendicularia (Larvaceans)

Benthic organisms observed in video (L. Lundsten, MBARI):
Brisingidae (Asteroidea)
Zoarcidae ? (Eelpout fishes) possibly Ophidiiformes, though difficult to see)
Lepidisis (unbranched Isididae upon rockwall)
Anthomastus (Octocorallia - I think)
Porifera (Possible, though no good closups)

MISSION EVALUATION:

A. Limitations, failures, or operational problems noted:

None.

B. Recommendations for corrective action or improvement:

None.

C. In your opinion, did the mission essentially achieve its purpose?

Yes, for all objectives.

D. Compare actual work accomplished with the work that was expected to be accomplished.

Actual work fully met the expectations.

E. List specimens or samples collected on the mission. (See Sample List Below):

Sample Number	Time (L)	Latitude Min/decM 24degS	Longitude Min/decM 177degW	Depth(m)	Comments Volcano 19:
PV-637-1-Scoop#1	10:41	48.110	01.173	1010	Soft sediment from the caldera floor (lost)
PV-637-2-Scoop#2	12:25	48.297	01.145	985	Sulfide-sulfate-silica precipitates, Fe-oxyhydroxide bacterial mat

PV-637-3-Scoop#4	14:30	48.577	01.065	698	Pumiceous material
PV-637-4-Scoop#3	15:03	48.519	01.107	781	Fe-oxyhydroxide bacterial mat and altered ash from underneath
PV-637-5-R1	11:33	48.230	01.130	985	Spire from a 7 m-high Fe-oxyhydroxide chimney
PV-637-6-R2	12:40	48.297	01.145	969	Sulfide-sulfate-silica precipitates
PV-637-7-MS-blue	12:05	48.297	01.145	985	Water sample (31 deg.C)
PV-637-8-GT-blue	12:10	48.297	01.145	985	Gas sample (31 deg.C)
PV-637-9-A1	12:20	48.297	01.145	985	Crab sample
PV-637-10-MS-white	12:30	48.297	01.145	984	Water sample (113 deg.C)
PV-637-11-GT-yellow	12:35	48.297	01.145	984	Gas sample (113 deg.C)
PV-637-12-R3	14:05	48.501	01.215	725	Boulder of tonalitic rock