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HAWAII DEEP WATER CABLE PROGRAM

PHASE II-D

TASK 2

VISUAL AND PHOTOGRAPHIC SURVEY OF A PREFERRED HAWAII DEEP WATER CABLE ROUTE

Department of Business and Economic Development

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VISUAL AND PHOTOGRAPHIC SURVEY OF A PREFERRED HAWAII DEEP WATER CABLE ROUTE

Prepared by

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for

Parsons Hawaii

Hawaiian Electric Company, Inc.

and the

State of Hawaii

Department of Business and Economic Development

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FOR EACH OF THE FOLLOWING DIVES:

Kohala Slope	Maui Slope
P5-031	P5-061
P5-032	P5-062
P5-058	P5-063
P5-059	P5-064
P5-060	

EXECUTIVE SUMMARY

Submersible studies of the preferred cable route were conducted in order to define the safest cable path for the deep water power cable. Specific study objectives were as follows: (1) Investigate potential problem areas for the cable route due to geological roughness identified in previous geophysical bottom roughness surveys; (2) Determine width characterized by a smooth ocean floor and check for obstacles in the narrow gap regions on the Maui Slope; (3) Provide data packages consisting of the video, still photographic and environmental data taken from the submersible for each dive; (4) Compile a biota summary (survey of living animals) as a precursor for a formal environmental impact study; and (5) Prepare a final report summarizing the data obtained in the form of geologic maps of the areas of interest, and an interpretation of the detrital dynamics of the ocean floor.

Objectives (1) and (2) were met using the Pisces V submersible for a visual inspection of the cable route. The critical areas of the proposed path were examined in detail and identified in consultation with engineers from Makai Ocean Engineering, Inc. The dive tracks were planned to provide full survey coverage of these critical areas. All critical area dive tracks were successfully completed. The critical areas of the proposed cable path were visually examined and mapped with high precision. The resulting geologic Maps A and B are presented in the DATA SOURCES section of this report (as Figures 3 and 4). Path width characterizations and obstacles are discussed in detail in the Cable Path Considerations subsections of the MAUI SLOPE and KOHALA SLOPE sections. Objective (3) was accomplished with the full compilation of Quick Look Reports, dive observer Voice Transcripts, dive Video Logs, Photographic Logs, and CTD Records for each of the dives on the Kohala and Maui Slopes. They are included as appendices in this report. Copies of all dive videos and photographic data were delivered to Parsons

Hawaii. Objective (4) was completed and is included as the BENTHIC MACROFAUNA section of this report. The geologic Maps A and B shown in DATA SOURCES and the text of this report fulfills study objective (5).

Five dives to a water depth of 1600 meters devoted to an area of the Kohala Slope of the Island of Hawaii (P5-031, P5-032, P5-058, P5-059 and P5-060) showed presence of terrain that has no obvious smooth sediment-covered paths for the cable route. Above a water depth of 1050 meters, the Kohala Slope is marked by the presence of an exposed, drowned coral reef, with a jagged surface of reef material that has undergone dissolution. The base of the reef is marked by a field of large boulders, up to 2 meters in diameter, merging downslope into a field of gullies (with terrain 1 to 10 meters in height), formed as a result of downslope mass wasting. The drowned coral reef is overlain by a younger (than the reef) lava flow. Geological investigation of the available data suggests that no large-scale downslope mass wasting is taking place currently along the area surveyed.

Earlier dives by Pisces V along the axis of the Alenuihaha Channel along the proposed cable route path have shown the axis of the channel to be sediment-covered.

The Maui Slope of the channel is also characterized by the presence of drowned, etched coral reefs, located at water depths of 1600 and 1200 meters. Unlike the Kohala Slope, however, the Maui Slope has broad sand or sediment channels, cut through the drowned reef structure. Four Pisces V dives (P5-061, P5-062, P5-063 and P5-064) were used to map the proposed cable route site through the coral reefs. Areas of the Maui Slope studied on these four dives between water depths of 850 and 1650 meters suggest that the slope is stable and a largely sediment-covered bed for the cable may be mapped out. No evidence of extensive erosion by downslope slumping or sliding was found during these studies and careful selection of the cable path will avoid all severe terrain in this area.

Comparisons between the SeaMARC II sidescan data over the dive traverses and visual observations from the submersible suggest that the sidescan reflections do penetrate through the sediments of the ocean floor. The SeaMARC II reflections therefore, may outline terrain that underlies the ocean floor sediments. Both the sidescan data and the submersible observations suggest that if the cable path is carefully selected and surveyed, the cable will not be subjected to catastrophic geological processes. The principal geological hazards that the cable will encounter include possible abrasions on sharp fossil coral reefs and slump debris on the Kohala Slope. The Maui Slope reef structures may be avoided by carefully routing a cable path through the sediment chutes in the reef structures. Very accurate cable laying capacity will be required. There are no obvious paths through the slump debris of the Kohala Slope. Careful submersible-based mapping before laying of the cable at these sites of geological hazard should be undertaken.

INTRODUCTION

The primary purpose of Contract No. 8-SC-6737-1 in support of Phase II-D of the Hawaii Deep Water Cable State-funded Project, was to conduct a visual and photographic survey of the proposed route for the deep sea power cable at selected sites in the Alenuihaha Channel. This was accomplished by conducting a series of electronically-navigated dives, using a Falcon mini-ranger (shore-base control), and a 12 kHz ultra-short baseline ship-to-submersible navigational system. A total of nine dives were conducted during September of 1987 and May of 1988, using the Hawaii Undersea Research Laboratory's submersible, the Pisces V (Table 1).

Table 1. List of Pisces V submersible dives in the Alenuihaha Channel, Hawaii.

	Dive No.	Dive Date	Depth(m) Max - Min
KOHALA SLOPE	P5-031	9 Sep 87	1940-1435
	P5-032	10 Sep 87	1380-1150
	P5-058	12 May 88	1550-1155
	P5-059	14 May 88	1280- 930
	P5-060	16 May 88	1380- 955
MAUI SLOPE	P5-061	18 May 88	998- 865
	P5-062	20 May 88	1300-1140
	P5-063	22 May 88	1315-1000
	P5-064	25 May 88	1655-1340

The first dive, P5-031, was not conducted within the study area, due to excessive drift encountered after the launch of the submersible. The second dive, P5-032, was initially classified as not meeting mission objectives, as the submersible tracking system was not producing reliable navigation posits (See Appendices: Kohala Slope, Quick Look Report, Dive P5-032). However, in post-dive analysis, it was possible to accurately locate the dive track (Figure 4). This was accomplished by comparing the submersible's heading and depth track to the known bathymetry and correlating observed local geologic features (talus chutes) to Deep Tow and

SeaMARC II sidescan data. Although P5-032 did not cross the proposed cable path as intended, it proved valuable in defining the bottom roughness and terrain just east of the proposed cable path on the steep Kohala Slope section. The succeeding seven dives; P5-058, P5-059, P5-060, P5-061, P5-062, P5-063 and P5-064, were carried out successfully and met all study objectives.

DATA SOURCES

Base maps for this survey project were provided by Makai Ocean Engineering. These are three of the maps that were produced for the Second Bottom Roughness Survey, Phase II-B of the HDWC Program. They are in 1:5000 scale with coordinates expressed in U.S. Coast and Geodetic Survey Transverse Mercator grid (for Hawaii State, Zone II, Maui) which express "rocky areas" as determined from sidescan data from the Scripps Institute of Oceanography Deep Tow system. Copies of these maps were used for real-time navigation of the submersible track, and for correlation of sidescan roughness data to visually confirm geological features. Overlays encompassing the base map areas were produced in the same 1:5000 scale and were used in constructing the geologic maps of the Maui Slope and the Kohala Slope. These were photographically reduced to approximately 1:16,700 for inclusion in this report. Figure 1 is an overview of the Alenuihaha Channel, indicating the locations of the geologic maps of the Maui Slope (Map A) and Kohala slope (Map B). Figure 2 is a SeaMARC II data mosaic (Hawaii Institute of Geophysics) of the study area with Deep Water Cable Path and Geologic Map areas superimposed. Figure 3 (Map A) is the geologic map of the Maui Slope cable path area between 800 and 1700 meter depth. Figure 4 (Map B) is the geologic map of the Kohala Slope cable path area between 930 and 1900 meter depth. To conform with previous bottom roughness surveys (Campbell, 1983; Makai Ocean Engineering, Inc. and Scripps Institution of

Figure 1. Bathymetry of Alenuihaha Channel

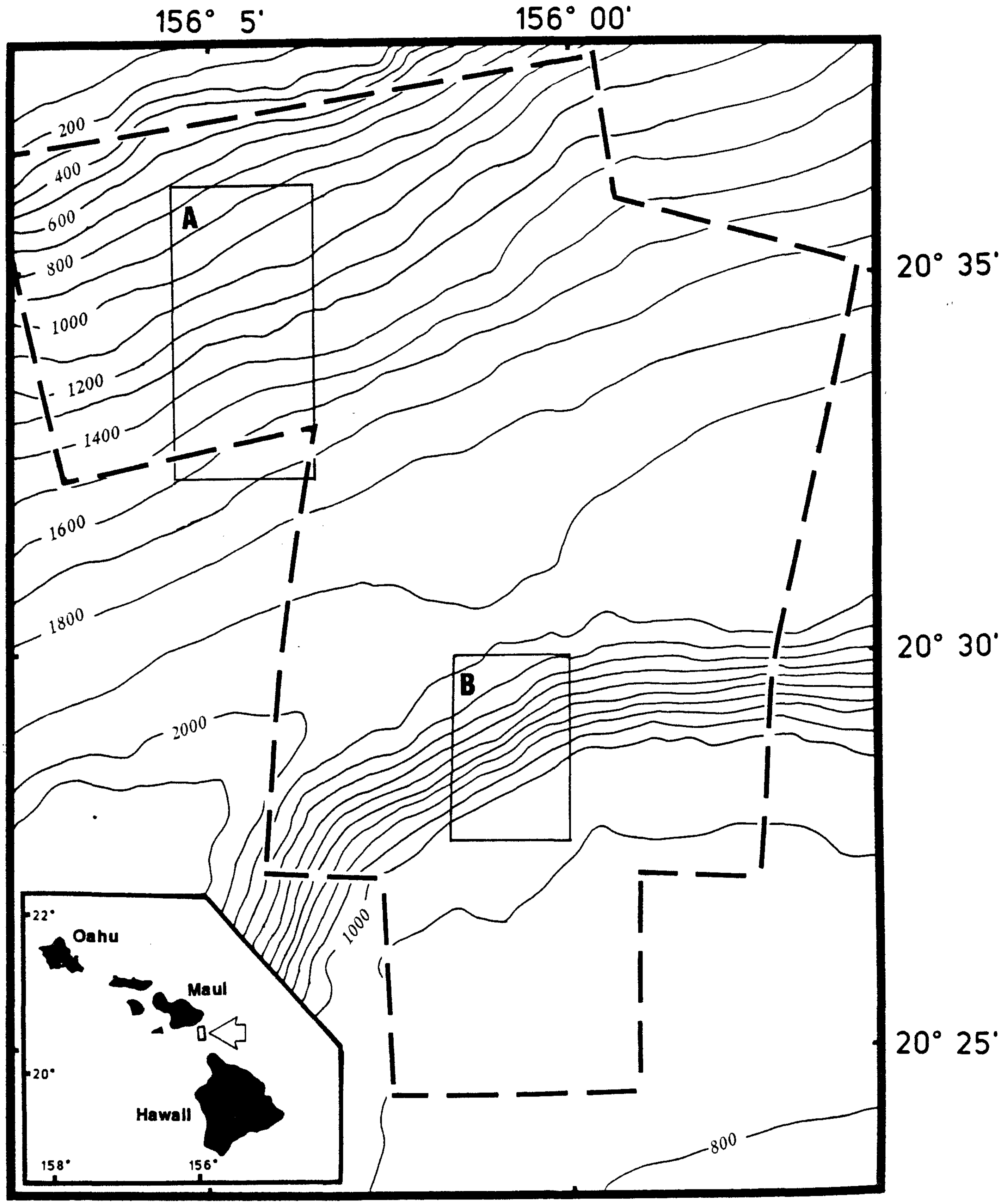
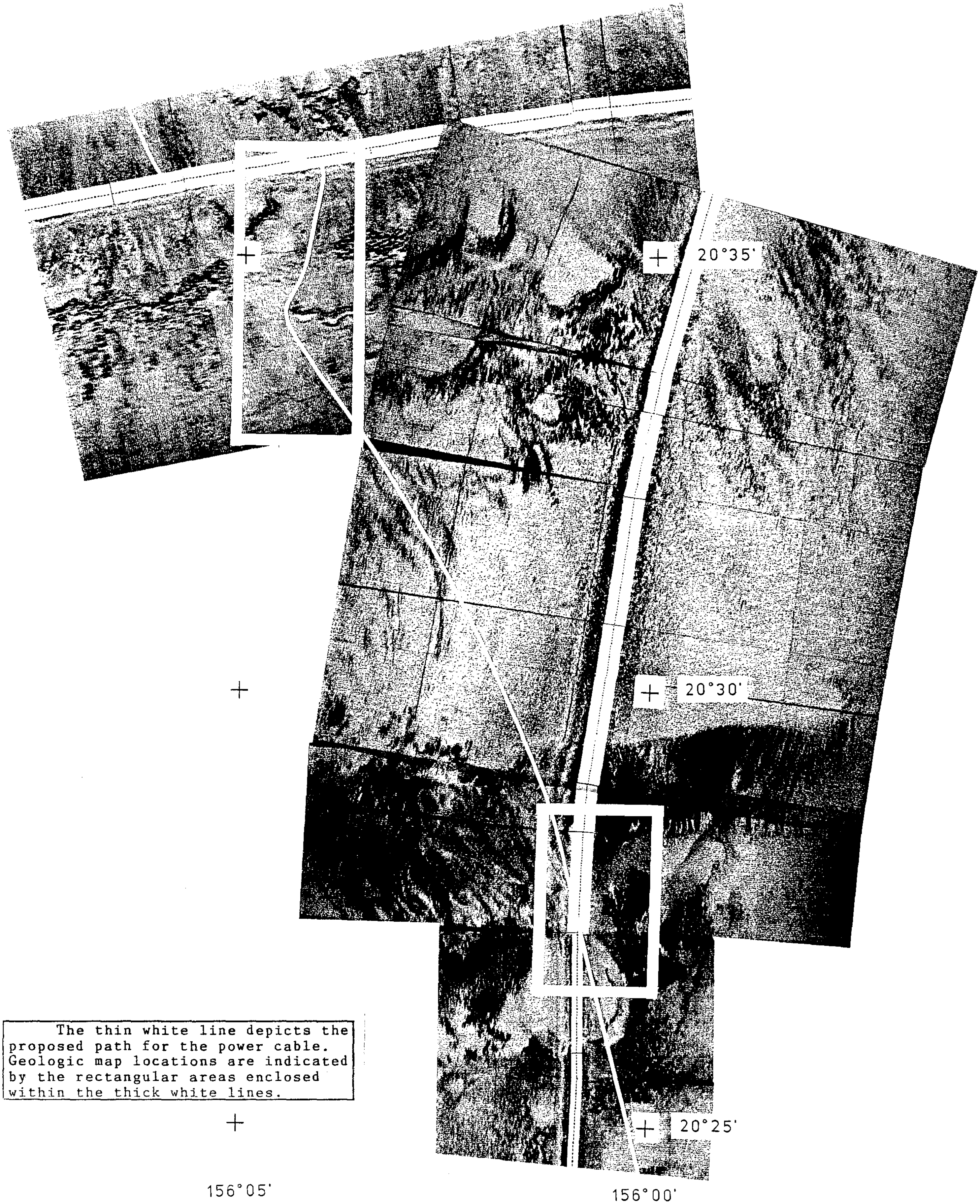
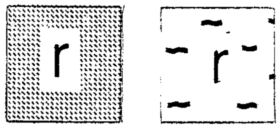


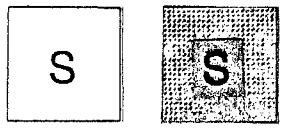
Figure 2. SeaMARC II data mosaic (Hawaii Inst. of Geophysics)

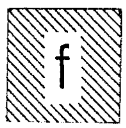


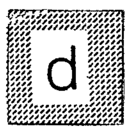
GEOLOGICAL LEGEND FOR FIGURES 3 AND 4.

MACRO SCALE SYMBOLS


Reef Facies

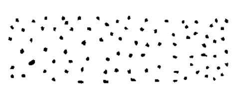

Sand Sediment Facies


Lava Flow


Mass/Debris Flow

MICRO SCALE SYMBOLS


Reef/Reef Material


Sand/Sediment


Talus

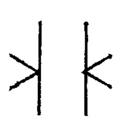

angular, subrounded, blocky


Pillow Lava


Hyaloclastite/Cemented Lava Fragments


Basalt Dike


Slope Break


Talus/Sediment Chute

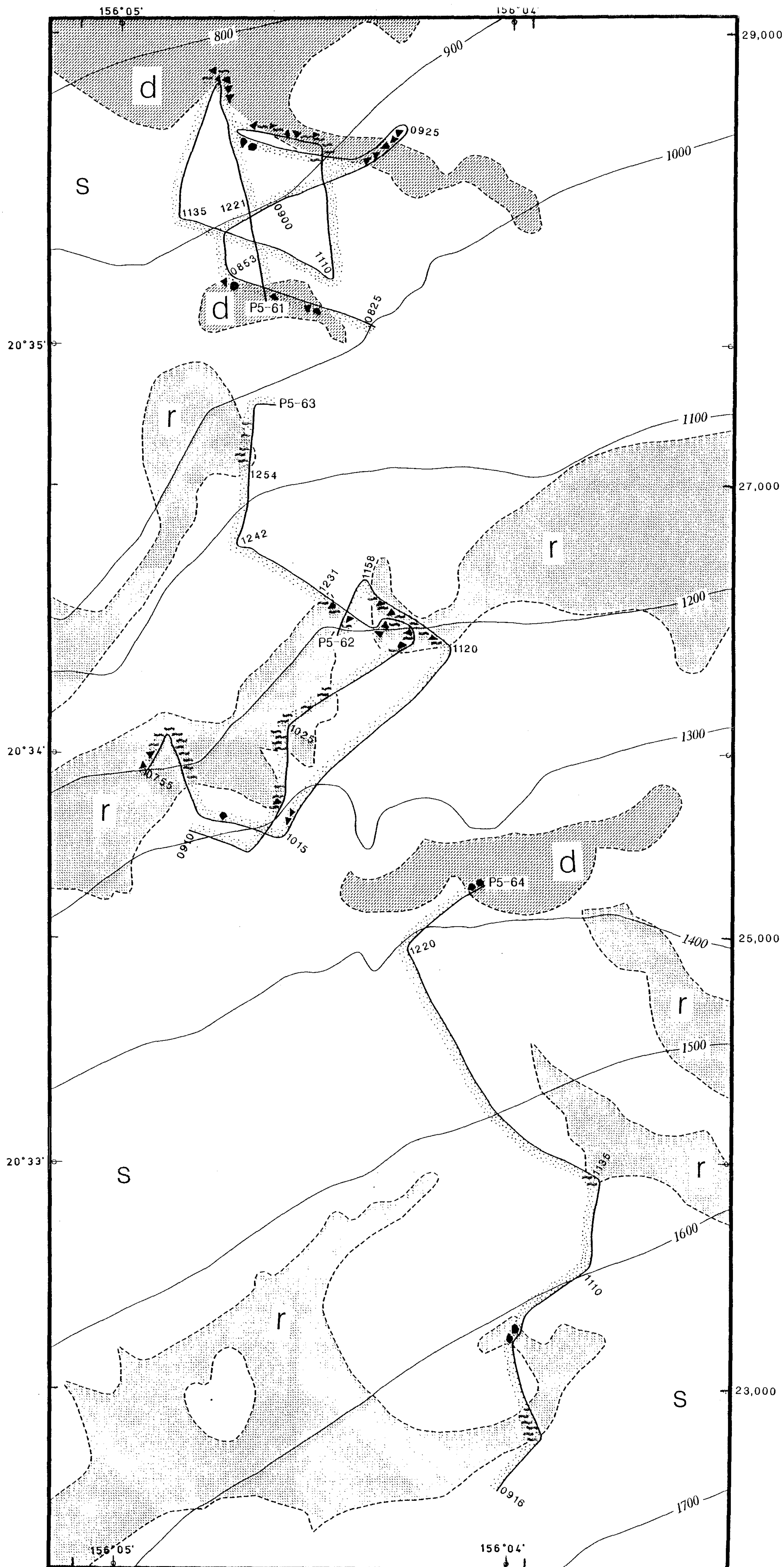
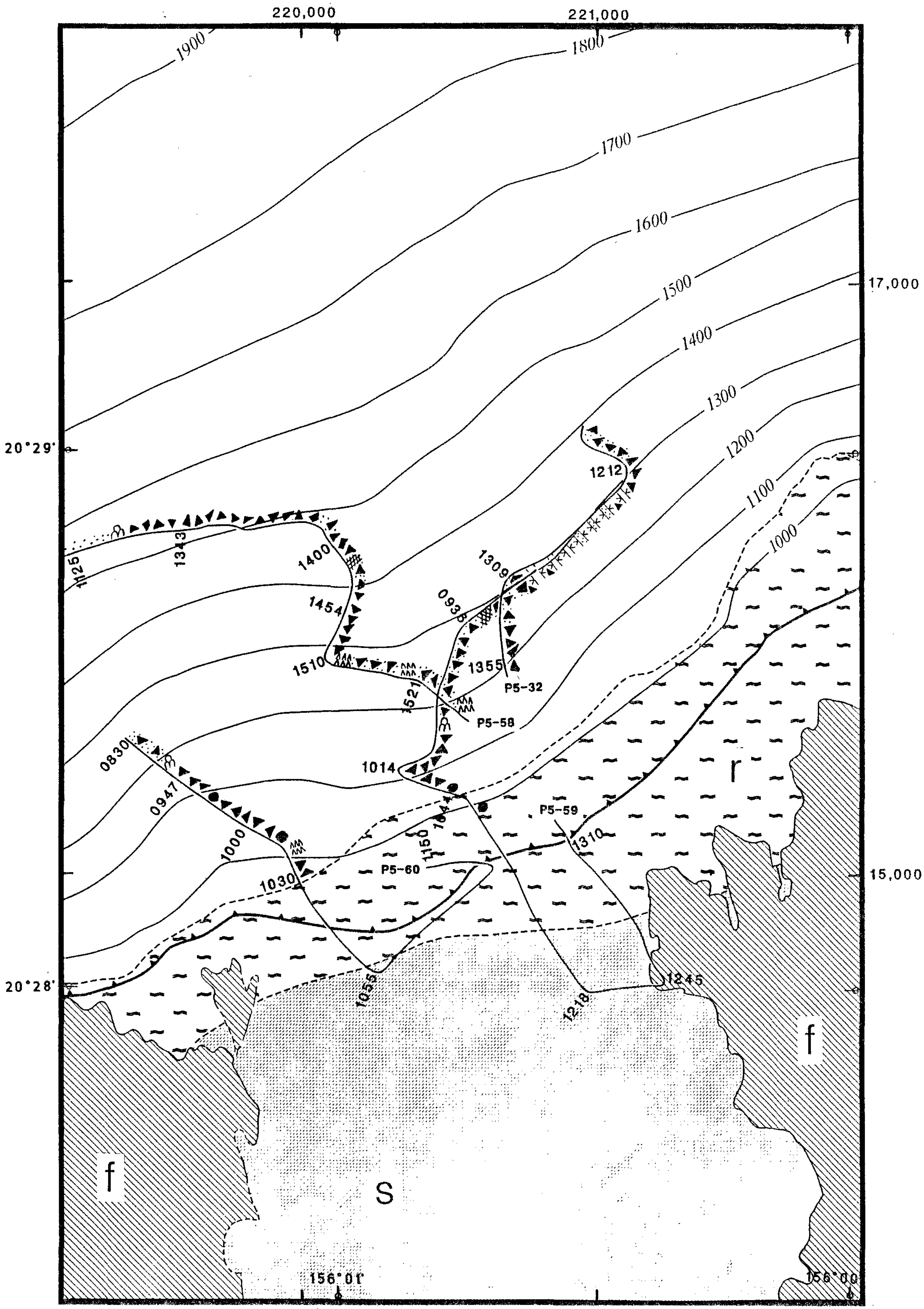


Figure 3. Map A; Geologic Map of Maui Slope Area

Figure 4. Map B; Geologic Map of Kohala Slope Area



Oceanography, 1987), a Motorola mini-ranger system provided by Edward K. Noda and Associates was used for surface navigation. The mini-ranger system is a micro wave line-of-site, range-range positioning system with an overall accuracy of 3 meters. The two shore station sites were located on Maui at the same locations:

Location	X	Y	Z
Kahikinui	190789.6 m	31274.0 m	439 m
Muolea	219737.0 m	39543.7 m	98 m

These coordinates are relative to the U.S. Coast and Geodetic Survey Transverse Mercator grid for Hawaii State, Zone II, Maui. This grid system was used for primary navigation on previous surveys, and for this one. All units are expressed in meters.

For underwater navigation, the Datasonics Aquanav long baseline transponder net system was deployed. Separate acoustic transponder grids of four bottom transponders were established on the Maui Slope and Kohala Slope of the Alenuihaha Channel. This system provided an overall horizontal accuracy of 10 meters. In addition, for redundancy and cross-checking, an EDO Western Micronavtrack ultra-short baseline ship-to-submersible system was used.

Continuous video data was taken during dive bottom traverses with still photography of selected features. Copies of the video tapes and photographic slides have been delivered to Parsons Hawaii. Voice transcripts of the visual observations, video logs, photographic logs, and CTD records for each dive are included as Appendices in this report. All identifications of biological specimens in video and still photographs are tentative, pending collection and taxonomic study of the specimens. Inquiries concerning species and classification should be addressed to Dr. E.H. Chave, Biologist, Hawaii Undersea Research Laboratory. A number of rock and coral reef samples were collected for geological verification of features and scientific study. Inquiries related to these samples may be addressed to Kimo K. Zaiger, Department of Oceanography, University of Hawaii.

The SeaMARC II data was provided by the Hawaii Institute of Geophysics. Data from the R/V Moana Wave cruise of 1985 is depicted in mosaic form in Figure 2. Seabeam data from a 1987 cruise was also obtained, which has slightly higher resolution and greater acoustic penetration of the sediment cover than the 1985 cruise. This recent data was not processed into a format suitable for presentation in this report, but was used in refining the boundaries and spatial distribution of geologic units based on textural data derived from the earlier side scan data. Discrepencies of spatial depictions of geologic units based on recent SeaMARC II data, when compared to the "rocky area" units of the bottom roughness base maps, is most obvious in the deeper (1600 m) reef area on the Maui Slope (Figure 3). However, note that these deviations do not affect the width of the cable path in this area. In addition, the geological boundaries (dashed lines) based upon the SeaMARC II data may not represent the present bottom surface exposure of the units due to seasonal drift of the sand and sediment cover and the acoustic penetration of the sediment cover to basement rock of the portions subjected to shallow burial.

ALENUIHAHA CHANNEL OVERVIEW

The Alenuihaha Channel is located above the coalescence of the submarine flanks of Haleakala Volcano and Kohala Volcano on the Hawaiian Ridge. As depicted in Figure 1, the maximum depth of the channel is 1930 meters (at the top of the saddle) and is located adjacent to the base of the Kohala Slope. The floor of the axis of the channel is mostly sand and sediment covered and is generally quite smooth (devoid of sediment ridges). It is likely that the axis of the Alenuihaha Channel is largely filled with volcanic and coraline debris shed from the Maui Slope (Fornari and Campbell, 1987). Sidescan sonar data from the HDWC Program Second Bottom Roughness Survey and visual observation from the Pisces V submersible determined that the channel floor in the region closest to the Kohala Slope is predominantly covered by well-sorted sediments in the silt to sand size range, with sediment ripples and larger sediment waves present. This region abruptly grades into, and ends at the intersection with the steep talus-covered Kohala Slope described in detail in the KOHALA SLOPE section of this report.

The bottom region of the channel on the Maui side differs in geology from the Kohala side. Coral rubble and rock debris exposed on the sediment surface are more numerous. Sediment ripples are less common and the morphology of the undulations of the sediment surface seem to be controlled by shallow underlying geological structure. Recent high-resolution SeaMARC II sidescan sonar data of the Maui bottom region shows faint acoustic return images of dendritic patterns emanating from survey-confirmed reef terraces. These patterns are interpreted as debris flows which progressed downslope through gullies eroded across the terraces, which are now buried by a shallow sediment layer. The intersection of the channel bottom with the Maui Slope is not geologically distinct, as lower Maui Slope is comprised of eroded coral reef terraces, mantled in sediment, sediment-covered debris flows and ponded sediments.

Observations of this survey confirmed the findings of previous surveys. The smooth bottom of Alenuihaha Channel should not pose any obstacle for cable laying.

MAUI SLOPE

Morphology and Geologic Processes

The geomorphology of the Maui Slope near the bottom of the Alenuihaha Channel is controlled by two discontinuous outcrops of reef terraces. These are denoted by the symbols "r" in Figure 3, and appear as the areas of mottled texture in the sidescan mosaic of Figure 2. The deepest reef structure is the outcrop centered around 1600 meters. Much of this structure is overlain by a sediment cover and its dimensions in Figure 3 are inferred from recent SeaMARC II data. The second line of outcrops is centered around 1200 meters. The reef structure at 1050 meters appears to be connected to this second line, but may be genetically related to a third shallower reef terrace which is located to the west, outside of the survey area. The terraces influence the morphology by controlling the depositional distribution of sediments driven by tidal and current transport and also act as barriers to downslope mass wasting of sediments. Channeling of the gravity-induced debris by the reef structure is evident in the recent SeaMARC II data where faint acoustic returns of a dendritic fabric nature are associated with gaps or gullies through the reef. An example of this is the "three-toed" lobate structure signified by the symbol "d", located at a depth of 1350 meters in Figure 3. This structure appears to be a debris flow which has fanned out after passing through the large gully noched in the 1200-meter reef terrace.

From our field studies, the reef terraces appear to be *in situ*, and are of typical coral reef lithology, consisting of (possibly recrystallized) aragonite coral skeletons in a matrix of cemented calcareous sand, shells and occasional volcanic rock fragments.

The terraces are extensively eroded, probably by dissolution of the carbonate, and wherever exposed, exhibit an irregular, jagged surface. They are crossed by numerous gullies and the outcrops have been severely abraded due to the mechanical effects of the sediment mass transport. The probability of discovering an acceptable cable path directly crossing an exposed reef terrace strucure is low.

Cable Path Considerations

Very accurate cable-laying is required on the Maui Slope in order to navigate the cable along a sandy bottom, through the reef terrace sections. The most critical portion of the cable route is the narrow gap identified in the Second Bottom Roughness Survey (Makai Ocean Engineering, Inc. and Scripps Institution of Oceanography, 1987.) This section of the cable path was extensively investigated during Dives P5-062 and P6-063. This narrow gap, located at a depth of 1200 meters, is a large, deep gully which cuts through the 1200-meter reef formation and is filled with sand and mixed sedmient. There is no evidence of recent mass movement of sediment through this large gully. The "three toed" lobate debris flow structure which projects through the sediment cover downslope of the narrow gap at a depth of 1350 meters, now appears to be well-stabilized. This mass structure, which evidently passed through the gap when it was moving downslope, would tend to inhibit any other major mass movement through the narrow gap. The sediment bottom cover within the narrow gap has surface rubble and small talus boulder erratics with rounded surfaces, which increases in number towards the edges of the gap. These rounded talus fragments do not appear to be cable-endangering. The width of the narrowest portion of the gap was not precisely measurable due to acoustic returns from our submarine navigation tracking system; however, it appears to be at least the 80 meters estimated in the Second Bottom Roughness Survey, confirmed by dead reckoning estimates from the submersible traverses. The eastern gully wall appeared to be sheer; whereas, the western side showed a rough surface consisting of eroded steps and notches in the coral reef formation.

The second area of concern for cable safety, is at the location of the bend in the cable path at 1000 meters water depth. Crisscrossing traverses during Dive P5-061 determined that the width of the clear portion in this area is wider than the 170 meters estimated in the Second Bottom Roughness Survey. The smooth, sandy bottom extends to a width of at least 400 meters. This width for a suitable cable path may allow for a bend of more gentle curvature than proposed. The "rocks just south of the cable path" described in the Roughness Survey were not found, and may be covered by sediment. The geologic unit that was sighted corresponded to the roughness unit further south and were rounded basalt boulders intermittently spaced in an area between 940 and 970 meters. They probably represent the top of a lobate debris flow which is covered by sediment. It is also possible that there is significant seasonal drift in the sediment load in this area, which changed the rock exposure at the bottom surface.

KOHALA SLOPE

Morphology and Geological Processes

The morphology of the Kohala side of the Alenuihaha Channel is dominated by a talus (collection of fallen disintegrated rock fragments) slope rising from the bottom at a depth of 1900 meters, with a slope gradient of 23 degrees, steepening to 30 degrees near the slope-break at a depth of 930 meters. The slope-break culminates in a slight ridge crest swell of 3 to 5 meters and levels out in a near-horizontal bench extending up to 5 kilometers shoreward. The slope continues upwards from this point at a gradient of 3 degrees, which corresponds to the subaerial gradient of the Kohala shield. This 3-degree slope is interrupted at two locations by drowned reef shelves at depths of 400 and 150 meters (Campbell, 1984). The submerged slope-break has been interpreted as the subaerial-subaqueous lava transition zone which marks the end of the rapid shield-type building phase of the Kohala Volcano (Campbell, 1984; Moore, 1987; Mark and Moore, 1987). This correlates to the end of the Pololu Volcanic Series of the Late Pliocene (Sterns and Macdonald, 1946) which is marked by a long period of volcanic inactivity followed by the limited production of the Hawi volcanic series during the Pleistocene.

The area at the slope-break identified as the "significant bottom feature of considerable roughness" in the Second Bottom Roughness Survey (Makai Ocean Engineering, Inc. and Scripps Institution of Oceanography, 1987) has been shown to be a drowned coral reef in this submersible-based study. The reef is depicted in Figure 4 by the unit with the symbol "r". High resolution seismic profiling, as conducted by the Hawaii of Geophysics (Coulbourn et al., 1974), of a number of Hawaiian terraces determined that large sections of submerged terraces which are relatively smooth in bathymetry have been formed from outer drowned oceanic barrier reefs, containing various back reef features, such as reef flats and patch reef clusters infilled with sand. In general, the reef terrace facies (geological unit of similar rock type) develops as a variable wedge which extends laterally shoreward as the island subsides, as long as upward growth rate of the reef can keep pace with the relative change in sea level (Darwin, 1842).

The Kohala 1000-meter reef was traversed on Dives P5-059 and P5-060. It is composed of typical coral reef rock with exposed in situ aragonite coral rubble on the steep barrier outer face with infilling and mantling of reef rock by calcarious sand and sediments shoreward of the ridge crest swell. Outcrops of reef rock were observed protruding through the sediment on the bench up to 300 meters from the ridge crest.

Large, rounded basalt boulders were observed extending in a band below 970 meters, near the bottom of the coral reef face. The band consists of massive, unjointed boulders up to 2 meters in diameter. Some had a carbonate rind exposed on an upper surface indicative of minor downslope movement or rolling, probably as a result of foundation undermining due to some degree of exsolution of the carbonate reef surface layer by undersaturated seawater. The origin of the sorting and distribution of the boulders on the reef face is uncertain. No erratic boulders are found above 970 meters. It is possible that the source of these boulders was located in the surf zone and particular blocks excavated from this source were of a size small enough to be moved, worn round and concentrated downslope of the reef during periods of high energy wave or storm events.

The reef unit is stratigraphically overlain by lava flows which have subaerial or shallow water characteristics. These are located on both sides of the proposed cable path and are denoted by the symbol "f" in Figure 4. Historical subaerial flows that have flowed into the sea have been mapped using a submersible, and are known to have only reached depths of approximately 250 meters (Fornari, 1987). A lava flow rock sample collected on Dive P5-059 had numerous vesicles. The flow itself was relatively thin and sheet-like, with a ropey pahoehoe texture and highly variable surface morphology. It is probably best to avoid these surfaces as a choice for the cable path. Location of source vents for these flows are unknown, but thought to be located along Kohala's principal rift zone.

Dive P5-032 traversed across a number of close-spaced downslope gullies at the depth of 1300 meters in a region east of the proposed cable path. These are thought to be inactive debris chutes and many now have sand and sediment floors. The relief between downslope ridges and chutes has wide variation from 1 to 10 meters and individual talus blocks and boulders within the ridges have dimensions of up to 3 meters with rugged relief. Although the gully floors are generally smooth, the irregular terrain of the downslope ridges decreases the probability of discovering a suitable wide cable path through this region.

Cable Path Considerations

In the study area, the route proposed for the cable path on the Kohala talus slope is based on minimum factor of roughness (Makai Ocean Engineering, Inc. and Scripps Institution of Oceanography, 1987). The particular section of Kohala Slope selected for the cable path was traversed, in part, by Dives P5-058 and P5-059. This section has lower roughness, as it is the area of highest sediment concentration of all regions visually surveyed on the Kohala Slope. The proposed route is not ideal, but seems to be the best available choice. The most significant potential problem may be at the top of the slope, on the reef structure. There is no apparent way to circumvent the zone of rounded boulders at 970 meters. In addition, the reef has some surficial roughness and the ridge crest swell at the slope break appears to be sharp. However, much of the reef roughness is due to aragonite coral skeleton surface rubble. This may be friable enough to excavate a smooth notch and cable path by dragline or other means, prior to laying the cable.

BENTHIC MACROFAUNA

The benthic macrofauna in the Alenuihaha Channel can be divided into fauna associated with the various dominant substrates observed along the dive transects. Within each habitat, sessile and motile invertebrates are differentiated.

Invertebrate Fauna

The invertebrate fauna consists of four major groups, sponges, cnidarians, crustaceans and echinoderms. The Porifera or sponges are represented by 14 taxa, ranging in depth from 920 to 1950 meters. Sponges are sessile organisms with their substrate preferences listed in Table 2. The Cnidaria, mainly anemones, gorgonians, sea pens, and hydroids are also sessile and fairly diverse (37 taxa photographed). Substrates for Cnidaria have been presented in Table 2. All cnidarians are sessile. Other invertebrates represented in the still photographs are motile echinoderms (asteroids, or seastars; ophiuroids, or brittle stars; echinoids, or urchins; and holuthurians, or sea cucumbers), fairly motile crustaceans (crabs and various shrimps), and fairly motile mollusks (one gastropod).

An unusual sighting was a group of animals which were attached to a piece of dead black coral that had drifted downslope and was wedged in a limestone reef on the Haleakala Slope at 1640 meters. These organisms include gooseneck barnacles (<u>Arcoscalpellum</u> sp.), the starfish <u>Freyella</u> sp., crabs (<u>Eumunida</u> sp., unidentified galatheid and white crabs), two species of anemones, a zoanthid, unidentified hydroids, and ophiuroids.

For most of the motile invertebrates, the laying and usage of a deep water power cable will have no serious effect on the benthic community. Although sessile invertebrates in the cable route may be trampled when the power cable is deployed, the low density of these organisms indicates that the number of organisms crushed by the 5-inch diameter cable will be very small. Since many of the sessile organisms prefer hard substrate for attachment, the power cable may also become a site for attachment. In areas of sand and fine sediment not swept by currents, fouling of the cable should be anticipated.

Fish

From a total of 26 still photographs of benthic fishes, six species were identified. Four other major groups of fish were present (Table 2).

The halosaurid, Aldrovandia proboscidea was observed on the Kohala slope at 1360 to 1380 meters (Dive P5-032).

Three small sharks were photographed. One was identified as the squalid Etmopterus villosus on the Kohala Slope at 1800 meters (Dive P5-031). The other sharks were unidentified, with one on the Kohala slope (at 1610 meters on Dive P5-031) and one on the Haleakala Slope (at 1440 meters on Dive P5-064).

Tripod fish of the family Chlorophthalmidae were identified as Bathypterois grallator. The species was observed only on the Haleakala slope on gentle sloping, carbonate sand and fine sediment from 1290 to 1140 meters on two dives (Dive P5-062 and Dive P5-063). At least six specimens were seen along the dive traverse.

A goosefish, Sladenia sp. was photographed at 1200 meters (Dive P5-063) on the Haleakala slope. This fish is similar to the two collected near Loihi at about the same depth.

One synaptobrached eel, a Synaptobranchus affinis, was photographed at 1175 meters (Dive P5-062) on the Haleakala Slope. Congrid (at 1475 meters on Dive P5-064) and other eels (at 1160 meters and 1280 meters on Dive P5-062) were photographed on the Haleakala Slope.

One Lophiodes miacanthus was photographed at 960 meters (on Dive P5-060) on the Haleakala Slope.

Due to the low diversity and the motile nature of the fish witnessed along the submersible transects, it is determined that the laying and usage of a deep water power cable will not hamper the benthic fish community.

ACKNOWLEDGMENTS

We wish to thank the following researchers who were able to help us with some of the material: Dr. W. Neumann and R. Rosenblatt of Scripps Institution of Oceanography; Dr. D. Pawson, T. Bayer and S. Cairns of the National Museum of Natural History; Dr. D. Fautin and T. Iwamoto of the California Academy of Sciences; Dr. K. Sulak of the Atlantic Reference Centre, Canada; and Mr. R. Moffitt of the National Marine Fisheries, Pacific Division.

ALENUIHAHA CABLE SURVEY - Species identification, depth ranges and dominant substrate determined from photos

NAME	DEPTH	RANGE (M)	SUBSTRATE	TOTAL # PHOTOS
PHYLUM PORIFERA				
sponge	1290	1550	hard	3
trunk	920	1325	limestone	5
CLASS DEMOSPONGIAE				
tan	1475	1475	basalt	2
CLASS HECACTINELLIDA				
Chonelasma sp.	1325	1550	basalt talus	10
Euplectella sp.	1940	1940	limestone	1
Hyalonema sp.2	1325	1640	basalt	3
Hyalonema sp.3	1350	1950	limestone	7
Semprella cucumis	975	1925	hard	23
Semprella spicifera	920	1675	basalt	8
euretid	1015	1550	basalt talus	9
hexactanellid	1050	1610	hard	4
rossellid stalked	1325	1680	basalt talus	8
rossellid white	1610	1740	basalt talus	15
scoop	927	1210	limestone	6
PHYLUM CNIDARIA				
cnidarian	1600	1640	hard	3
ORDER ACTINIARIA				
anemone brown	1110	1110	hard	1
Actinernus sp.1	1260	1475	basalt	2
actinoscyphiid sp.3	1260	1350	dead stalk	2
anemone	1370	1370	hard	1
actinostolid tan	1370	1925	hard	7
anemone white	1260	1800	basalt talus	12
hormathiid sp.2	1640	1760	basalt	10
hormathiid sp.3	1260	1260	basalt	2
hormathiid sp.4	1640	1640	limestone	9
ORDER ALCYONACEA				
Anthomastus sp.	1440	1440	basalt	1
neptheid purple	920	920	basalt	4
ORDER ANTIPATHARIA				
Bathypathes crassa	1610	1610	basalt talus	1
ORDER GORGONACEA				
Elisella sp.	920	1445	basalt	13
Candidella helminthopora	1325	1380	basalt	6
gorgonian	927	1930	hard	26
gorgonian spider	1290	1370	basalt talus	2
gorgonian white	920	1325	basalt	16
Chrysogorgia sp.1	1015	1640	limestone	14
Chrysogorgia sp.2	975	1380	basalt	3
Chrysogorgis sp.3	1360	1360	basalt	1
Irridogorgia bella	1610	1610	hard	1
Irridogorgia superba	940	1640	hard	7
Lepidisis olapa	920	1640	limestone	35

Narella sp.3	920	1625	basalt talus	35
Narella bowersi	960	1380	basalt	9
Calyptrophora sp.1 (fan)	1380	1380	basalt talus	3
primnoid harp	1600	1600	basalt talus	1
primnoid	975	1625	hard	11
paramuricid blue	1370	1370	basalt talus	1
ORDER HYDROIDEA				
hydroid	1640	1720	dead stalk	2
ORDER PENNATULACEA				
Calibelemnon symmetricum	1600	1650	limestone	2
funiculinid	1200	1200	sand	1
sea pen	1900	1900	sand	1
ORDER SCLERACTINEA				
scleractinean	1325	1445	hard	9
ORDER ZOANTHINARIA				
Parazoanthus sp.2	1440	1440	dead stalk	1
PHYLUM ANNELIDA				
tubeworm	1015	1380	hard	12
PHYLUM ARTHROPODA				
ORDER THORACICA				
Arcoscalpellum alcockianum	1640	1640	dead stalk	11
ORDER DECAPODA				
crab white	1640	1925	dead stalk	11
Lithodes longispinna	1260	1260	basalt talus	3
Eumunida sp. (pink)	1640	1640	dead stalk	10
galatheid	920	1760	basalt talus	3
Munida brucei	1370	1925	basalt talus	3
pagurid	1620	1620	basalt talus	1
Nematocarcinus tenuirostris	1380	1425	hard	2
Plesionika sp. (banded)	940	1015	basalt talus	5
shrimp	920	1475	all	7
shrimp red	927	1940	all	36
PHYLUM ECHINODERMATA				
CLASS ASTEROIDEA				
brisingid white	1130	1130	sand	1
Freyella sp.3	1640	1640	limestone	1
Henricia pauperrima	1060	1060	sand	1
Mediaster ornatus	1160	1160	limestone	1
Sphaerodiscus ammophilus	1925	1925	hard	2
seastar	975	1600	all	5
ORDER CRINOIDEA				
comatulid banded	920	920	dead stalk	4
comatulid brown	930	940	basalt	2
comatulid narrow	1370	1370	basalt talus	1
Ptilocrinus sp.	1940	1940	basalt talus	3
CLASS ECHINOIDEA				
Aspidodiadema arcticum	1760	1760	sand	2
cidarid	1360	1775	basalt	2
Sperosoma obscurum	1475	1935	sand	2
urchin	1380	1800	all	3
CLASS HOLOTHURIA				
cucumber	1260	1260	sand	1
Paleopatides retifer	1060	1300	sand	3
CLASS OPHIUROIDEA				
Asteroschema sp.	1000	1260	gorgonian	2

ophiuroid	940	1940	all	55
PHYLUM MOLLUSCA				
CLASS GASTROPODA				
gastropod	1930	1930	gorgonian	1
PHYLUM CHORDATA				
CLASS CHONDRICHTHYES				
shark	1440	1610	sand	2
Etmopterus villosus	1800	1800	sand	1
CLASS OSTEICHTHYES				
Aldrovandia proboscidea	1360	1380	sand	6
Bathypterois grallator	1140	1290	sand	5
congrid	1475	1475	sand	1
eel	1160	1475	sand	3
fish	920	1590	all	4
Synaptobranchus affinis	1175	1175	sand	1
Sladenia sp.	1200	1200	hard	2
Lophiodes miacanthus	960	960	basalt talus	1

BIBLIOGRAPHY

Campbell, J.F. 1983. Hawaii Deep Water Cable Program, Phase II: At-Sea Route Surveys. Hawaii Institute of Geophysics Report, HIG-83-4, 50 pp.

Campbell, J.F. 1984. Rapid subsidence of Kohala Volcano and its effect on coral self-growth. Geo-Marine Letters 4:31-36.

Coulburn, W.T., J.F. Campbell and R. Moberly. 1974. Hawaiian submarine terraces, canyons, and quaternary history evaluated by seismic-reflection profiling. Marine Geology 17:215-234.

Darwin, Charles. 1842. The Structure and Distribution of Coral Reefs. D. Appleton and Co., New York (3rd ed., 1987).

Fornari, D.J. 1987. The geomorphic and structural development of Hawaiian submarine rift zones. U.S. Geol. Survey, Professional Paper 1350:125-132.

Fornari, D.J. and J.F. Campbell. 1987. Submarine topography around the Hawaiian Islands. U.S. Geol. Survey, Professional Paper 1350:109-124.

Makai Ocean Engineering, Inc. and Scripps Institution of Oceanography. 1987. Hawaii Deep Water Cable Program, Second Bottom Roughness Survey of the Alenuihaha Channel. Report prepared for Hawaiian Dredging and Construction Company, Honolulu.

Mark, R.K. and J.G. Moore. 1987. Slopes of the Hawaiian Ridge. U.S. Geol. Survey, Professional Paper 1350:101-107.

Moore, J.G. 1987. Subsidence of the Hawaiian Ridge. U.S. Geol. Survey, Professional Paper 1350:85-100.

Sterns, H.T. and G.A. Macdonald. 1946. Geology and ground-water resources of the Island of Hawaii. Hawaii Division of Hydrography, Bulletin 9:170-180.

HAWAII UNDERSEA RESEARCH LABORATORY

QUICK LOOK REPORT MISSION NO. P5-031

MISSION STATUS

Location: Alenuihaha Channel

Mission Date: 9/9/87

Maximum Depth: 6363 ft.

Project Title: Cable Route Contract

Project Leader: Parsons Hawaii (George Krasnick)

Address: 567 S. King St.
Honolulu, HI 96813

Phone: 523-5464

Observer: T. Jones, K. Zaiger

Address: University of Hawaii
1000 Pope Rd. MSB 318
Honolulu, HI 96822

Scientific Data Acquired : Prepare an abstract outlining your objectives, techniques, findings, etc.

Dive objective was to survey designated cable pathway from 1500 m to 1200 m on the Kohala slope in the Alenuihaha Channel. Visual and photographic techniques were used to observe roughness of base and lower slope of Kohala slope. Submersible descent to base of Kohala slope at maximum depth of 6363 feet. Sub proceeded along slope toward study site, then headed up slope. Study site was never reached.

MISSION EVALUATION:

Limitations, failures, or operational problems noted:

Submersible was launched east of study site. Duration of dive was spent trying to get to start of survey. This was not successfully accomplished in the deep current regions of the Alenuihaha Channel.

Recommendations for corrective action or improvement:

Launch of submersible directly over survey site would reduce travel time to beginning of site.

In your opinion, did the mission essentially achieve its purpose? Compare actual work accomplished with the work that was expected to be accomplished.

This dive did not reach survey site due to strong currents and launch of submersible east of survey site.

List specimens or samples collected on the mission.

One rock specimen.

DATA RELEASE

Data may be retained by the project leader for up to 2 years after the mission date with the following exception. NOAA may request to use photos for publication or publicity purposes at any time.

Fill in the appropriate statement below and sign this form.

I hereby release the data archived by HURL for public consumption following mission ___Cable Route Contract___ (project title) held on ___9/9/87___ (date) in the following way:

a. CTD data by ___(N/A)___ (date)

b. voice transcripts, video, and still camera film by ___May 1989___ (date)

c. other ___May 1989___ (date)

d. I will give my written consent to individuals wishing to use these data prior to the above dates depending on the nature of the request(s).

A. Malahoff

Project Leader

HAWAII UNDERSEA RESEARCH LABORATORY

QUICK LOOK REPORT MISSION NO. P5-032

MISSION STATUS

Location: Alenuihaha Channel

Mission Date: 9/10/87

Maximum Depth: 4590 ft.

Project Title: Cable Route Contract

Project Leader: Parsons Hawaii (George Krasnick)

Address: 567 S. King St.
Honolulu, HI 96813

Phone: 523-5464

Observer: T. Jones, J. Van Ryzin

Address: University of Hawaii 1000 Pope Rd. MSB 318 Honolulu, HI 96822	Makai Ocean Engineering Makapuu Point

Scientific Data Acquired : Prepare an abstract outlining your objectives, techniques, findings, etc.

Dive objective was to repeat previous dive plan with launch of sub directly over survey site. Visual survey of designated cable pathway from 1500 m to 1200 m on Kohala slope in the Alenuihaha Channel. Positioning of submersible within cable route was not satisfactory due to problems with ship to sub tracking system.

MISSION EVALUATION:

Limitations, failures, or operational problems noted:

Ship to sub tracking system did not give satisfactory positions to determine whereabouts on slope. System used was Edo Western's Micro Navtrack which was limited in that the automatic depth telemetry function was inoperable. Although depth figures were manually entered into the units CPU, consistent "believable" location data was not generated.

Recommendations for corrective action or improvement:

Either a back up system or overhaul of present navigational tracking system is in order so that precision navigating of sub can be accomplished.

In your opinion, did the mission essentially achieve its purpose? Compare actual work accomplished with the work that was expected to be accomplished.

This dive did not accomplish goals due to the inability to know where the sub was in relation to the cable route pathway.

List specimens or samples collected on the mission.

No specimens were secured.

DATA RELEASE

Data may be retained by the project leader for up to 2 years after the mission date with the following exception. NOAA may request to use photos for publication or publicity purposes at any time.

Fill in the appropriate statement below and sign this form.

I hereby release the data archived by HURL for public consumption following mission Cable Route Contract (project title) held on 9/10/87 (date) in the following way:

a. CTD data by May 1989 (date)

b. voice transcripts, video, and still camera film by May 1989 (date)

c. other May 1989 (date)

d. I will give my written consent to individuals wishing to use these data prior to the above dates depending on the nature of the request(s).

N. Miklos[?]
Project Leader

HAWAII UNDERSEA RESEARCH LABORATORY

QUICK LOOK REPORT MISSION NO. P5-058

MISSION STATUS

Location: Alenuihaha Channel

Mission Date: 12 May 1988

Maximum Depth: 1550 m

Project Title: Hawaii Deep Water Cable Route Survey

Project Leader: Dr. Alexander Malahoff

Address: Hawaii Undersea Research Laboratory
1000 Pope Road MSB 319
Honolulu, HI 96822

Phone: 948-6802

Observers: Kevin Kelly, Tony Jones

Address: Department of Oceanography
1000 Pope Road
Honolulu, HI 96822

Scientific Data Acquired : Prepare an abstract outlining your objectives, techniques, findings, etc.

Survey preferred Hawaii Deep Water Cable (HDWC) Route from 1500 m to 1200 m on Kohala slope. Examine overall roughness of pathway.

MISSION EVALUATION:

Limitations, failures, or operational problems noted:

Datasonics transponder failed during dive. EDO Ultrashort base was used to plot sub position.

Recommendations for corrective action or improvement:

Discussion with Datasonics representative, G. Freitas, led to recommendations of a second transponder unit attached under the sub for down-looking capabilities.

In your opinion, did the mission essentially achieve its purpose? Compare actual work accomplished with the work that was expected to be accomplished.

Yes

List specimens or samples collected on the mission.

2-sponge
1-rock

DATA RELEASE

Data may be retained by the project leader for up to 2 years after the mission date with the following exception. NOAA may request to use photos for publication or publicity purposes at any time.

Fill in the appropriate statement below and sign this form.

I hereby release the data archived by HURL for public consumption following mission "HDWC Route Survey" (project title) held on 12 May 1988 (date) in the following way:

a. CTD data by (unavailable) (date)

b. voice transcripts, video, and still camera film by May 1989 (date)

c. other May 1989 (date)

d. I will give my written consent to individuals wishing to use these data prior to the above dates depending on the nature of the request(s).

A. Malahoff

Project Leader

HAWAII UNDERSEA RESEARCH LABORATORY

QUICK LOOK REPORT MISSION NO. P5-059

MISSION STATUS

Location: Alenuihaha Channel, Kohala Slope

Mission Date: 14 May 1988

Maximum Depth: 1340 m

Project Title: Hawaii Deep Water Cable Route Survey, Phase II-D

Project Leader: Dr. Alexander Malahoff

Address: Hawaii Undersea Research Laboratory
1000 Pope Road MSB 319
Honolulu, HI 96822

Phone: (808) 948-6802

Observers: Kimo Zaiger, Andrew Resnick

Address: Department of Oceanography
1000 Pope Road
Honolulu, HI 96822

Makai Ocean Engineering

Scientific Data Acquired : Prepare an abstract outlining your objectives, techniques, findings, etc.

Object: Survey proposed cable route on Kohala slope from 1300 m - 950 m top of slope break. Investigate surface roughness particularly between "rock structures" inferred from side scan data. Note major obstacles and geologic features of interest for survey purposes.

Techniques used: Relatively precise subsurface navigation with Edo Western micro-nav tracking system and Datasonics bottom transponder long-baseline system.

Findings:

1) "Rock structure" to the east of proposed cable route appear to be a series of incised channels tending down dip perpendicular to slope face.

2) Rough feature below slope break seems to correlate to reef terrace with base at 1015 m extending upwards past slope break at approximately 930 m.

3) Slope break appears to swell and dip at top but not continuous laterally. Not as sharp and regular as depicted in bathymetry chart.

4) Potential problem for cable near base of reef terrace where there appears to be a field of large rounded boulders up to 5 m in diameter. They seem to have been concentrated due to exsolution of calcium carbonate reef material around them. Need to investigae further the lateral extent of this boulder field.

5) Rough feature to east of proposed route south of the slope break was investigated and appears to be a lava flow, probably shallow submarine, as overlies coral rock and sample taken is vesicular.

MISSION EVALUATION:

Limitations, failures, or operational problems noted:

None noted.

Recommendations for corrective action or improvement:

None.

In your opinion, did the mission essentially achieve its purpose? Compare actual work accomplished with the work that was expected to be accomplished.

Yes, mission was successful. Objectives of this particular dive were met.

List specimens or samples collected on the mission.

880514-59001; reef rock 1015 m, base of reef terrace.

DATA RELEASE

Data may be retained by the project leader for up to 2 years after the mission date with the following exception. NOAA may request to use photos for publication or publicity purposes at any time.

Fill in the appropriate statement below and sign this form.

I hereby release the data archived by HURL for public consumption following mission "HDWC ROUTE SURVEY" (project title) held on 14 MAY 1988 (date) in the following way:

a. CTD data by May 1989 (date)

b. voice transcripts, video, and still camera film by MAY 1989 (date)

c. other MAY 1989 (date)

d. I will give my written consent to individuals wishing to use these data prior to the above dates depending on the nature of the request(s).

A. Malahoff

Project Leader

HAWAII UNDERSEA RESEARCH LABORATORY

QUICK LOOK REPORT MISSION NO. P5-060

MISSION STATUS

Location: Alenuihaha Channel-Kohala Slope

Mission Date: 16 May 1988

Maximum Depth: 1380 m

Project Title: Hawaii Deep Water Cable Route Survey

Project Leader: Dr. Alexander Malahoff

Address: Hawaii Undersea Research Laboratory
1000 Pope Road MSB 319
Honolulu, Hawaii 96822

Phone: 948-6802

Observers: Kimo Zaiger, Tony Jones

Address: Department of Oceanography
1000 Pope Road
Honolulu, Hawaii 96822

Scientific Data Acquired : Prepare an abstract outlining your objectives, techniques, findings, etc.

Survey alternative route on Kohala slope for preferred HDWC between 1400 m and 950 m. Determine roughness and investigate lateral extent of slope break.

MISSION EVALUATION:

Limitations, failures, or operational problems noted:

-Manipulator unavailable.
-Datasonics transponder network not operating efficiently.
-Swift current during dive.

Recommendations for corrective action or improvement:

Fix manipulator for upcoming dives.

In your opinion, did the mission essentially achieve its purpose? Compare actual work accomplished with the work that was expected to be accomplished.

Mission was successful, although no rock samples were collected from ancient limestone reef.

List specimens or samples collected on the mission.

None

DATA RELEASE

Data may be retained by the project leader for up to 2 years after the mission date with the following exception. NOAA may request to use photos for publication or publicity purposes at any time.

Fill in the appropriate statement below and sign this form.

I hereby release the data archived by HURL for public consumption following mission "HDWC ROUTE SURVEY" (project title) held on 16 May 1988 (date) in the following way:

a. CTD data by May 1989 (date)

b. voice transcripts, video, and still camera film by May 1989 (date)

c. other May 1989 (date)

d. I will give my written consent to individuals wishing to use these data prior to the above dates depending on the nature of the request(s).

A. Malahoff

Project Leader

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(808) 948-6335

VOICE TRANSCRIPT FOR HAWAII UNDERSEA RESEARCH LABORATORY MISSION

Dive Number: P5-031

Location: Alenuihaha Channel

Date of Dive: Sept. 9, 1987

Project Leader: Parsons Hawaii

Observers: T. Jones, K. Zaiger

Pilot: T. Kerby

TAPE 1, SIDE 1

Jones: Testing, testing. September 9, 9:11. We're off the LRT ready to go down. Terry is pilot. Kimo and Tony are observers.

Jones: We're at 1935 and it's 10:46. Dark bottom. Rippled sand. There's a brittlestar. We're set down. What's the heading here, 174?

Kerby: Yeah. We're heading south.

Jones: There's a little bit of a current pushing away the sediment. We stirred up some large asteroids.

Jones: Video recording starting at...

Zaiger: On the bottom at 1940 m. What kind of coral is this right here in front of us. Looks like a seapen or something.

Jones: I don't see what you're talking about.

Zaiger: It's kind of hidden by the collecting basket. Possibly...

Jones: I still don't see it.

Jones: It's an orange seapen...why don't you see if you can get it...Sediment is about...ripple marks are uneven approximately 3 cm. in wave height. Different coloration on the top and the upcurrent slope side of the ripples.

Kerby: Call to surface. On the bottom at 6360 ft. Over.

Jones: 10:51. The video started. We're talking with the ship trying to get positioning to get over to the survey area. This bottom in here would be no problem for cable.

Kerby: We are on the bottom. Over.

Jones: Depth on that was 1935.

Jones: Sandy area; it's pretty barren of any burrowing inverts although I think I saw a couple of holes a little bit back.

Jones: First photo was of just the bottom sediment. It's relatively flat, no slope at....in this area.

Jones: We're in the process of adjusting our trim. It's now 10:59.

Jones: It's about 1100. Heading about 180.

Jones: See there's a seapen out in front of us. Small one sticking up about 3 inches. Couple of them here and there. There's a good sized shrimp bent back with the....there's just one. Starfish to our left. Elongated arms. We're still in the sand flat area with the ripples. There's a large urchin in front of us with its spines sticking up. It's got small little white, I don't know what they are, little white pebbles underneath it. Real interesting looking. Purple, looks kind of like one of those ones that cruises around in the sand.

Kerby: Call to surface. We're moving south. Over.

Jones: Take a picture of that purple urchin. The pink urchin's got white spines probably keeping it in the sediment and just feeding whatever's going by. Brittlestar in front of us. Still over the sand bottom. Have found some short, fat starfish.

Jones: There's a change in slope of the sediment to my left. Not much of a one but... obvious change in the texture. There's another one of those red shrimp in the sand. Same as the one that was floating by before.

Jones: 11:10. Heading now 186. Back to the rippled pattern again. Another larger shrimp. 9-12 inches in length.

Jones: Couple burrows in the harder...looks like hard packed sand I guess or something like that. There's a seapen bent over in the current. Bottom is hard. There's no ripples in this area. And now we're getting into where there's ripples.

Jones: 1950 m. 11:14. We're still going along a slick sand flat bottom. Small ripples. Still a little bit of a coloration change in the dune...the lower upcurrent is whitish. Seapens every once and a while. Single, stalked orange with small polyps. Camera went off. It's the green one. Don't touch the green button.

Jones: Continuing over basically sand bottom with ripples. The bottom of the waves have a white color, the tops are brownish-greyish. At 11:22; heading about 180. At a depth of 1950 m.

Jones: Every once and while there's small rocks about 8 inches across and 4-5 inches high. They're...it's very patchy and most of it's just sand, rippled sand. The ripples are maybe 20 cm. crest to crest and probably less than 5 cm. depth. Definitely less than 5 cm. So this is basalt, angular basalt coming up.

Jones: Transition into a hardened ground, nonrippled with some rock outcrops, but very small, maybe...3-5 inches in length.

Jones: See a stalked sponge of some type. Mushroom-shaped.

Kerby: There's a crinoid on this rock up ahead of us.

Zaiger: Very large soft sponge...

Kerby: Do you want a photograph of that?

Jones: Sure, if you can get one.

Jones: It's a sponge, right?

Kerby: Yes.

Jones: Stalked sponge, looks like it's attached to a _____. Hard substrate. Basalt. Nice _____.

Jones: Angular basalt. This is rolled downhill.

Jones: Photo... These sponges are attached to small pieces of basalt that are sticking up. Pretty good-sized sponges about...at least 2 and a half feet high. ______.

Jones: Got some stalked crinoids that are yellowish-gold color. Coming our of basalt slab, I guess, rock sticking out.

Jones: Changes slope. Little chunks of lava here and there. Heading uphill. About 1925 m. 11:31 time. 11:32. Hard bottom, still heading uphill. Slope... got a boulder off to the right, huge sponges on it. This boulder would be unacceptable span.

Kerby: I've got to call the surface. I'm going to settle right here.

Jones: We've got a size on this. There's a shrimp inside of that one sponge. Saw some anemones on this basalt.

Jones: Good-sized sponge in front of us. Hardened bottom. Figure the slope maybe 5 degrees. Just under 1925 m. And the time is 11:38. Heading south. Good sized boulder up front. Probably 2 and a half foot high. About 5 foot long. Definitely sticks out of the sediment.

Jones: Saw some large sponges, globular looking ____ and hard substrate. Dots part of the area here. We have gone up into some basalt talus, rubble, some sediment inbetween. Another mushroom sponge. (difficult to understand - machinery running) With small little white things on the...basalt which I'm not sure...they could be coral...look like marbles. Here comes ....here's the ledge. Got a ledge about 3 ft. high. Just jumps up. It's just about 1900 m. Could be a ... looks like a sand chute in here. And some more rock. Basalt boulders.

Jones: More outcrops. It's 11:43. Some anemones. Some rippled sand. 11:44. Depth is ... just under 1900.

Jones: More rock - cobble area. Mushroom sponges, call them glass sponges, big amorphous-shaped ones. Trying to go upslope...trying to find our study site. Got 3 large white sponges off to the left here. Time is 11:46. Depth is just under 1900 m. We're heading south.

Jones: Another photo at...photo number 19. Another photo showing some of the rock here. Heading uphill; it's cobbled, basalt-cobbled... it's just ____ downhill. The sediment on the surface is hard-packed. It's not rippled or _____.

Jones: Depth is 1875 m. Bamboo coral. We are heading up the slope here. Small ledges about a couple inches in height. Platelike lobes. And it's about 1875 m and heading upslope.

Jones: Time is 11:52; water depth is about 1875 and we are heading about 200 degrees. And these lobe ledge structures, look like plates or something with the small little drop, couple inches maybe. But we're still trying to get to the study site, so...we're just taking ____ here and there. The bottom's got small cobble-shaped, cobble-sized basalts, some angular basalt in a group that might go up 5 degree slope. Some sediment but no ripple marks in here. And again, some more of these ledges.

Jones: Going upslope. Got a shark on the photo. Between two sponges. Distribution of sponges is pretty patchy. They're pretty good-sized sponges, at least the amorphous type. A few of the mushroom type, but not a lot of them.

Jones: We're continuing upslope. Couple mushroom sponges in front of us. It's 1800 m. depth. 11:58. Bottom type is angular cobbles. Basalt. 12:01. Heading about 180. Going upslope. It's cobbley rubble. All basalt. ____ seems to be pretty angular. We just crossed over some glass sponges. There's a rock outcrop with about a 5 inch drop on one side.

Jones: Not much biota in this section. There's large amorphous sponges, not much else. Mushroom sponges here and there. Now coming up on a ledge. Cracks. 12:03. Another photograph.

Jones: Take a picture of that? Another photo. Another photo of this mound at 1775 m. Time is 12:05.

Kerby: KILA, this is PISCES V, do you copy?

Jones: 12:10. Course 210. Depth is about 1760 m. Hard bottom with cobbles. Compacted. Doesn't look like they're loose. There's no...sediment but not much. There's a few small shrimp running around. And similar to what we've been getting _____ the last couple of minutes. We're heading into some high grounds again. And the boulder field is to one side. These boulders are bigger than baseballs, but smaller than basketballs. Another ledge. Sort of drop-off, probably 3-4 feet. There's an anemone on it. We should get try to get a picture of that if you can, that ledge.

Jones: Photo 28 of the ledge with the anemone on it. Might not even be in the right area for the path...so. Depth 1740 and we are looking at parts of this ledge - it's about 3 or 4 boulder high. Drop - looks almost like a wall. Slope in this area is probably less than 10 degrees.

Jones: Another photo opportunity presented itself. We are on photo number 30. Not using them too fast, but... Little bit of a current here. 12:22 and depth is just shy of... about 1710 m. Looking out of the window - its again cobbly, some larger boulders size like boxes. Coming up on some hard basalt with sponges and here we go - another photo.

Jones: 31 photo. Coming up on some sponges ready... Photo 32 taken at 12:24 - Photo showing some of the structures and ___ has mushroomed up.

Jones: 12:34. 1680 m. We just ____ off bottom; we are heading southwest trying to negotiate the current and get to the study site, if at all possible. Hard bottom - less organisms than I was expecting for the current regime but that's what happens.

Jones: It's 1680 here. We are on the edge of a break to our right is downslope.

Kerby: If you want to move upslope, you get to 1500.

Jones: It's now 12:42.

Jones: It's 12:45 and the water depth is 1650 m. We are above hard rock area, heading towards ... and trying to go upslope. We were following a south/southwest pass and this area here is basalt, hardened, with sponges here and there. No sediment, real soft sediment, there's probably some hard sediment in some of the cracks. There are some visible fissures or ledges, small ledges probably. Couple of inches in height. We should get a picture of those.

Jones: Strong current. We are trying to make some progress now. It's 12:47.

Jones: Its 12:49. Let's take another picture. It's number 51 and we are at 1645.

Jones: 12:51 - fighting current. It's 1635 deep. There's a rock dropoff right below us about a foot and a half. _____ on the screen. Bingo! That's photo number ... what number is that? 53.

Jones: Time is 13:00 and we are trying to sit down on the bottom to do communications. Depth is 1600 m. and we are taking some photographs. Deep slope - its about 30 to 40 degrees and it's semi-covered with straight ...it's straight down, that's pretty amazing. There's some biota on it and it looks like it's some small pieces of.... Wow - sponges all the way down. There must be tremendous current. The sub is getting spun around.

Kerby: Call to surface.

Jones: Time is 13:01. Depth is 1625 and heading is 190. We are still trying to go back and find the study site. Coming across some lava. Here's another lava ledge. Let's get a quick photo of that. Anyway - no time for a photo - there are these ledges, small. There's some pieces of basalt spread around. ______ pretty restricted to sponges.

Jones: Good current down here. 1:17 and checking the video - everything's OK - Heading is about 210. Depth is exactly 1600 m. and flying off the bottom, trying to find our course. The bottom is fist-sized boulders of lava. A good-sized slope to my right. I'm on the left side of the vessel. Goes down better than 40 degrees and ...

Jones: 13:20 time and depth is 1600 m. We are coming into a little more biota. More or less suspension-feeders. ___ types of rocks. Missed that photo. And we are just kind of traversing the slope. The ___ hardened stable slope. That's a good idea. Small fist-sized boulders here and there. There are some drops on ledges about a foot or so.

Jones: 1600 m. We're starting to see some of these cork-screw corals.

Jones: 1:25 and 1600 m. There's a ledge. I'm going to check the video right now.

Jones: Getting into an area of ______. It's 13:27. Large cork-screw corals, soft gorgonians. At least one per m. sq. close to 2. Gorgonians are oriented parallel to the slope. And it's almost 220 is their tangent to the main growth form.

Jones: 13:31. We are set down in an area with alot of soft gorgonians and basically we're just sitting here ______. The rock looks like a...basalt desert rock with small brownish crust. The soft gorgonians are all planted...seem to be oriented the same way, that is parallel to slope. There's not very many pockets - there's no pockets of sediment or anything like that.

Jones: 1:40 and we are in .... 1575 and there are alot of the soft gorgonians, at least one per m. sq. from where we came from. And some of the...Video tape just went...

Jones: I'm not sure what causes these ledges, but...pretty common in this section at least. 1:42 and the video's up and running again, thanks to Kimo - amazing Kimo.

Jones: We're into like a gravel area. It's 1:43. We are in 1440 m. water depth. Let's get a picture of this. Heading upslope about 145 degrees.

Jones: 1:50. Stopped on the bottom. Depth is about 1425.

Jones: Time is 13:11 and depth is 1435. Big blow-out from the thrusters, so it's sandy bottom. Small largely gravel-size pieces of volcano rock.

Jones: Can we get a piece of that or not?

Zaiger: Look at how white they are.

Jones: Going to attempt to pick up a piece of rock. See what happens.

Jones: 1430 m., picked up a rock. 1420 m.

Jones: 2:39. We need to go. Current on northeast and we just left a beautiful patch of soft gorgonians and bamboo coral. And getting ready to head up. It's ...

END OF TAPE 1, SIDE 1

Zaiger: Time 9:10. Just departed the LRT. About ready to begin the descent.

Zaiger: Dive Number 31 PISCES V. Terry is the pilot. Tony Jones and Kimo Zaiger observers.

Zaiger: Time is 10:04. We are wheeling about the port to head south. We are passing 1100 m. at this time.

Zaiger: 10:32. Passing 1625 m.

Zaiger: Time is 10:46. We have the bottom in sight. The depth is 1935 m. Apparent on the bottom is ripple marks. Ahead I see what looks like a dogfish of some kind - some kind of marine life about 2 ft. long. Ripple marks, asymmetric, seem to show southerly current flow.

Zaiger: Just touched down.

Zaiger: OK. We have a starfish on the bottom. The current...the ripple crests seem to parallel about 165.

Zaiger: Length between current ripple mark crests is about 15-20 cm.

Zaiger: Current is carrying us toward the southeast which seems to correlate with the current rippling pattern. Few seapens and they are also bending in the direction of the current flow.

Kerby: On the bottom.

Zaiger: Time is 10:55. First photo - sand. The topography here is flat. We haven't moved much since we hit bottom. Just trying to get ____. Anyway topography is fairly flat. Not much slope. Sediments are not very well sorted. There's small chunks of - looks like carbonaceous material - pieces of coral or something, a couple of centimeters across here and there.

Zaiger: 11:00. We are progressing on course 180. Benthic life is still kind of sparse. Although there's occasional seapens and we see a shrimp here and there. Some starfish.

Zaiger: Time 11:03. Took picture number 2. Just of the sand bottom.

Zaiger: Time 11:04. Took picture number 3 of a purple sea urchin on the bottom.

Zaiger: Interesting sea urchin - it's got little white spines on the ... white tips on the lower spines. I estimate it to be about 6-9 inches across. Purple in color.

Zaiger: 11:06. Took picture number 4, again of the sea urchin.

Zaiger: No significant change in the ripple pattern. If anything, a little more symmetrical. By symmetrical, I'm not so much talking about in cross section but more on linearity. The ripples are more linear. We just passed a small ___ about 6 inches across of basaltic material. Had a couple of small ____ corals growing out of it. First one I've seen of this kind.

Zaiger: Right now the bottom is starting to change and the ripples are pretty much gone. It's a harder bottom. There's more evidence of little mounds and burrows. The substrate seems to be...Now, we're back in the ripple pattern. I'm not sure if that... harder area was higher or lower.

Zaiger: Trying to stay on 180. Just heading south at this time. We project that we're not even on our chart, our bottom chart, so I'm not keeping accurate nav. plot at this time.

Zaiger: Time is 11:10. My comments about the change of bottom happened a couple of minutes ago about 11:08. We are coming to another patchy spot where there is no ripple patterns. Time 11:12. This bottom is not as flat as the other flat surfaces. Little depressions in it indicating that perhaps the old burrows... We are getting back to the ripple patterns. Time is 11:12. Passing a ratfish about a foot to a foot and a half in length on the starboard side.

Zaiger: It's still staying fairly consistent in depth. It's about 1940 m. Time is 11:15. Still heading about 180. Large red shrimp on the bottom. Ripple patterns are still continuous. More dark mantling of the ripples. Sediments look darker. A little observation - the ripples are not as regular as they used to be. They grade in and out and literally they are not constant.

Zaiger: Area is suitable for laying cable. Time is 11:16. Still predominantly ripples grading down to patchy, flat areas.

Zaiger: Time 11:17. We are re-punching in some data into the camera. The camera accidentally got turned off. Getting ready to take another picture of the bottom showing a slight change in ripples. We do have a little piece of substrate showing or it could be an exotic ...it's a piece of basaltic rock about 9 inches across. Doesn't look... looks like it could be a piece of talus or something.

Zaiger: Time 11:18. Took picture number 5 essentially of the bottom showing perhaps a little bit darker surface layer. Looks darker than it has in the past.

Zaiger: OK. Time 11:19. Just took another shot. A little more panoramic view.

Zaiger: At this time we are also faced directly into the current about 210 degrees.

Zaiger: Seeing more pieces of basalt sticking up from the sand. Cannot tell if it's actual substrate or just erratic. I think it's the latter.

Zaiger: I see more basalt erratics. These definitely look like they have been emplaced later. Little bit larger than the others, about a foot across. Seeing more and more of these rocks.

Zaiger: Time is now 11:24. We are out of the rippled pattern again. We are on a flat harder bottom. It's very flat with occasional outcrop. No evidence of burrows or holes or anything but we do have fairly large soft sponge or coral or something on the port side. We are going to take a photograph of it, along with some crinoids and stuff.

Zaiger: Took photo of the sponge. We're on number 7. The basalt that I'm looking at - a few chunks that are lying around are fairly vesicular and pretty much broken up, angular. Just took a picture of a large red shrimp at 11:26. Seems to be more life forms here on this harder bottom. Could be that they're able to attach to these rocks and whatnot without being covered up by the sand ripples.

Zaiger: Time 11:29. Just took a picture of a stalked crinoid.

Zaiger: Time 11:30. Moving upslope. We're on an area of soft, dark sand, ripples fading in and out.

Zaiger: Seems like it's a linear ___ going upslope. It's this linear feature of dark sand with ripples and bounded by flat areas of the lighter, harder sand without any ripples.

Zaiger: 11:34. We are on course about 190. Depth 1925 m. We are back onto fairly flat hard _____ sand. Making tracks for our observation site.

Zaiger: 11:35. We're stopping to contact the surface. Large boulder on the order of a couple of feet in diameter. It's sitting on top of a mound, a localized mound. It's possible that it could be a ____ outcrop or substrate.

Zaiger: This mound upslope is about 180, 190. We are looking at a view of this picture we just took looking at 240. As you can see, there's a bit of a slope here, about 15 degrees just up to this mound where it levels off with a higher elevation than the sand we were on lower.

Jones: This a localized ledge and this outcrop could possibly be an actual substrate coming through the sand.

Kerby: Are we close to the study area? Over.

Zaiger: We are heading south. Presently passing two of the four. Slopes is starting.... The gradient slope rate is starting to get a little bit more than we had seen in the past going upslope. Again the ripples are gone. Patchy basalt showing through...

Zaiger: (Machinery noise - hard to understand) Time 11:40. Still moving upslope. The topography hasn't changed too much. Seeing more talus or erratics of basalt. Moving upslope. Depth is 1910 m. on a course of 180. Just passing over a three foot high lava ledge. Now we are definitely looking at the top of a lava outcrop.

Zaiger: Time is 11:42. We are now, having passed the ledge, I'd say on the order some tens of meters of very continuous rocky outcrops, _____ sand. No evidence of ripples here.

Zaiger: Sand is starting to ____ back on the ripples. Looks like slope is going down, as if... On top of a rise. The slope seems to be descending as you look off to about 270. We're still on a course of 180.

Zaiger: Time is 11:44; sand ripples are more prominant again as before. Very much looks like the area where we first started our dive. Rocky outcrops are all gone. We're crossing another rock shelf. This one's on the order of just a few inches though. A little terrace. Lot of rock outcrops; this is fairly flat. If this continues in series, it's a pattern of a little rocky outcrop or ledge with the flat, harder sand on it unless you progress past them, there's a gradation of slope a little bit and you get back to the sand ripples.

Zaiger: 11:47; just took another photo which shows typical slabby outcrops of basalt where you can see. 7:48; just took another photo. I think I've lost track of the photos, so I'm not going to continue recording them. On my notepad. OK, that was number 20.

Zaiger: 11:50; we're still moving upslope; depth of 1870 m. Course 180. Pretty much looking at a lot of lava surfaces with a mantling of silt on top of it.

Zaiger: 11:52. Pretty much looking at a very layered, vesicular type of lava. Can see fractures here and there. Joints. (Cannot understand - machinery).

Zaiger: Bamboo coral for the first time. Big starfishes.

Zaiger: The nature of the topography is more and more of a general appearance. Not rounded, per say. They're cobble-sized but more angular, fist-like. They're not spheroidal, but rounded in some sense.

Zaiger: Passing over a local little mound which breaks off the ledge on one side. Almost looks like breccia. Consolidated talus. Large boulders are not evident here; the largest ones I'm seeing are on the order of a foot. Most of the material is fist-sized or smaller.

Kerby: Little sharks ahead of us on the bottom there.

Zaiger: Just took a picture of a shark. Time is 11:55. Strata is staying consistant; here we have a very platy-looking _____ with joints, but for the most part we're seeing...more talus-looking stuff on the surface.

Zaiger: Another picture, number 24 or 25 of this talus mound. Observation while on the bottom: Substrate is hard, we set down (cannot understand).

Zaiger: Just realized that my dictaphone stopped. I'm not sure how much I've been recording and how much is missing. It's now 12:20 and the depth is approximately 1720 m. Still proceeding south. Topography has not changed significantly; it's still pretty much rocky substrate, possible talus or talus-like looking flow features. Local boulders as large as a foot in diameter and the majority of them being fist-sized on down to small pebbles of relatively rounded material. Seems to be consolidated to some extent. Also mantled and silt - sand. Terry just made the observation that steeper slope gradient appears to be in the direction of 220. So that's the direction we're going to start to proceed. Slope is on the order of maybe 7 or 8 degrees.

Zaiger: Time 12:23. We're getting into a little bit more massive basalt. We're past more massive unit, blocky, on the order of a foot to two feet. Now we're back into some more looks like talus, consolidated talus, in ridges and little ledges. Slope gradient still about the same. We just went over an area of locally steeper slope, but now it's back down to about 7 or 8 degrees. Time is 12:24.

Zaiger: Time 12:24. We're just at 1700 m. depth. 12:28; still progressing upslope. Seems there's a heavier mantling of sand and particulate material on top of the rock unit. At this time, we're setting down to try to call KILA to get a position report again.

Zaiger: Experiencing fairly strong current on the order of a knot, knot and a half. Taking us back downslope. Our heading is...right now 226 and we're basically just being pushed backwards. 12:30; changing tactics. Instead of being pushed around on the bottom, we're going to raise altitude to a safe location.

Zaiger: 12:35. Lifting off the bottom. Got instructions from the KILA to continue heading to the southwest. Noticed as we were scraping along the bottom that we were scraping off the upper layer of the talus; appeared to be more of the same underneath. A few pieces on the order of a few inches to half a foot across.

Zaiger: 12:40. We kind of went over a dropoff. Just a local depression though, it's going back up. Slope is still very indurant, it's very _____, as we notice as we're bouncing along it.

Zaiger: Time is 13:00. Try and contact the KILA again. 1610 m. We're looking at a fairly steep slope here. However, the slope is very indurant. Very strong current. Having trouble making headway. Current is spinning us around. Getting into the bathology of the rocks here, very dark basalt, some of it's glassy. I've seen some very glassy surfaces.

Zaiger: Time 13:02. We're passing a ledge here. About 3 feet, fairly massive. On the bathology, almost seems there's a lot of talus that's cemented onto the more massive...like a'a type flow, but different, it's almost as if they're cemented to the matrix of sorts. Tephra or talus about the size of a fist on down. The ledges or fractures are pretty much running cross-slope with a strike of just roughly 230. We're on a course of about 206, heading upslope. Slightly transverse. Very strong dropoff to the right. 30 to 40 degrees. Again, down dip would be approximately 260-270, about 30 to 40 degrees downdip.

Zaiger: Depth about 1610 m. but navigationally, KILA hasn't had a fix in over an hour, and they could just tell us in very general terms to head to the southwest.

Zaiger: 13:22; progressing course 230 to 190. Essentially trying to head to the northwest. Very steep shelf. Picture 84 of a fairly large fish taken just for time perspective. Slope does not have an apron of any sort, of talus really. Although there are some particles which appear free...some units ...pieces that may be 6-8 inches that appear free. Most of it seems to be consolidated and it's not an unstable slope at all. It's very indurant. Its mantle of silt and biota which is indicative of the stable slope. As far as roughness, it undulates with local mounds and depressions and here and there an erratic boulder. But by and large it's on the scale of feet. As we transit this course and not knowing where we are. We are noticing strong current and lots of biota. Some very interesting biota. We have... Terry's going wild with the pictures. We have bamboo coral good twenty feet long. Very neat looking soft corals. See more fishes also - rat-tail fishes.

Zaiger: 13:44. Bathology has changed somewhat dramatically. We're no longer on the talus slope. Now we're...we have fully sorted, gravelly mix where the ground mass is mostly gravel. A mix of looks like carbonate sand. ______-type rock. Here and there we have local pockets of larger size. The slope gradient is also a lot less steep. Only about 10 degrees slope. Strike and dip of the slope plain is approximately 175 strike with a dip of about 10 degrees. Depth is 1440 m. Closer, it almost looks like cinders. (Nephritic?) -type cinders from a cinder cone mixed with silt. It's no longer talus. This rock looks very much like (nepila?), something that's been ______ ______. We're scraping at the surface of this unit now. Seems to be fairly mixed with sand. Can't tell how deep this goes or not. Here and there we have an angular piece of talus, but mostly it's just cinderlike material. Now we're grading into more and more talus material.

Zaiger: Time 13:47. Back to the old fully consolidated talus. That last geologic area is interesting in that it's relatively well-sorted. It could possibly have run downslope.

Zaiger: As we're scraping along the bottom of this terrace, we do not see the sand mixing that was apparent in the earlier unit. All we are stirring up is a little bit of silt.

Zaiger: 13:48. Continuing my comments: We're set down on the bottom trying to contact KILA. Current at this location is almost nil. Also, biota mass, actual species is smaller. Morphologically they're smaller.

Zaiger: Time is 14:10. We got our position from KILA, which puts us about a mile due east of where we wanted to start. We'll be going downslope just a little bit if we go due west, neglecting drift of any currents.

Zaiger: At present, I'm inspecting a blast from a thruster. This is back in the area that had the more gravelly stuff. The cinder. At 1400 m. They appear to be cinders. They blew out of a thruster blast, leaving nothing but sand underneath. Seems to be an armored layer of cinders. Fairly light, low-density cinders, nephratic-type that have been injected out from some kind of cone. These cinders are fairly uniform, about a centimeter across. We just took picture number 117.

Zaiger: 14:30. We just picked up a rock in the vicinity of the cinder area. I'm not sure if this is the same genesis of the cinder. Looks very light. We'll have to have a look at it when we get on the surface. In the same exact same location...1425.

Zaiger: Dropped the dropweight and rolled down the hill. Slope is about 30 degrees. Heading for the surface. Time 14:39. Current seem to have switched 180 degrees. Now coming from the northeast. After ...while we were retrieving a rock on the bottom. Could very well be tidal.

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VOICE TRANSCRIPT FOR HAWAII UNDERSEA RESEARCH LABORATORY MISSION

Dive Number: P5-032

Location: Alenuihaha Channel

Date of Dive: Sept. 10, 1987

Project Leader: Parsons Hawaii

Observers: T. Jones, J. Van Ryzin

Pilot: D. Foster

TAPE 1; SIDE 2

Jones: September 10; it's 9:31. This is dive 32 with Joe Van Ryzin and our pilot Dave Foster.

Jones: We're 9:47 and we're headed down on the LRT. Everything's go.

Jones: 10:12. Powering south. We're at about 550 m. We're heading about 200 degrees and trying to get over to the path site. We're off about a kilometer.

Jones: It's 11:04 and we just hit bottom. There's a nice looking rock outcrop. About 5 feet by 4 feet. The pebbley texture on the sediment. We're just going to probably sit down here and... just dragged the front end. Very soft...soft sediment that's for sure. It's like a sand I guess.

Jones: Depth is 1380 m. And I just gave Joe his present. We're dragging the basket along in front. You can see that there's like a silt component to the sediment and as soon as we stir it up it's getting washed downhill. The slope here is about 20 degrees, maybe a little less than that. 10 to 20, somewhere in there. It's 11:08 time.

Jones: Texture is kind of gravelly. There's a silt component to it. And there's a few rock outcrops there sticking out.

Foster: KILA, this is PISCES V, do you copy?

Jones: 11:17, we're going to head south along this contour and try and look for a large rock outcropping. Slope here is about 30 degrees. There are basalt outcrops with gorgonian and ... between the rock outcrops there is like a sand... Here's a... coming up on a boulder field. There's some glass sponges. Bamboo coral out in front. Here's a good-sized bamboo coral. Comes up... Picture of that. Depth is about 1360.

Jones: And then there's these mushroom things that I believe are sponges too. They're pretty interesting looking.

Jones: Heading about 190. 11:19 time. Looks like boulder field. Angular basalt with a dusting of probably some sort of silt. Sedimentation. There's a few soft gorgonians. Quite a few of these sponges.

Jones: END OF TAPE - SIDE 2

TAPE 1, SIDE 1

Jones: Test 1,2,3,4,5. Try that again. September 10, 11:23. This is dive 32 and we're down with Joe Van Ryzin and pilot Dave Foster. We're proceeding along slope. Depth is just under 1400, about 1380 and it's 11:23.

Foster: Pink coral...chalky white.

Jones: Pink coral at this depth...

Van Ryzin: Some coral...pink coral, a tree, but...

Jones: Photo number 1. 11:24. Bottom here is still pebbley. There's some fish. Don't know what it was. One of these small flat starfish. Fat starfish. On the slope here. Photo number 2; the bottom. Take another one here. Good. There were these solitary corals down here, little individual polyps. Not too many of them, maybe a cluster...a couple here...and then a couple of them, maybe, 10-15 m. away. Usually 1 or 2.

Jones: More diversity here than it is down below on the deeper dive yesterday. There's about at least three different types of sponges. There's a vase sponge, and then there's a amorphous white sponge, and then there's a third mushroom-shaped sponge. On this one vase sponge that we just passed over there was a small gastropod, and the shrimp are here and there, maybe one per every 10 meters or so.

Jones: Rubble, small little boulders... Slope looks fairly stable.

Jones: Some of these soft gorgonians are...the...11:30; the depth is about 1380 still. There's a large...

Foster: Settle down here and give a call...

Jones: Ophiuroids here. Small, nice-shaped gorgonian in front of us. Soft coral.

Nothing on rest of tape 1; side 1.

TAPE 2; SIDE 1

Jones: Test, 1,2,3 test. Seem to be having problems with this machine. This is September 10, 11:41. We're down on the dive and second dive of the deep water cable program. There's a nice....Here comes a nice rock with a bunch of...anemones, gorgonians. And then these rocks, boulders every now and then. One of these long, black fish, small, maybe about a foot long.

Jones: Just took two more photos as we stopped to scan the bottom. We just stopped to get a radar fix and kicked up some of the sediment. It's definitely not compacted, but there's a silt component to it. There's a fish in front of us here, but I don't know if we're going to see it on the video or... two dorsal fins, small, black. There's a fish on our left. It's got two white markings on the dorsal; the pectorals are up high on the body. Snout is elongated. Anal fin is extremely long. It's about maybe 2 - 2 1/2 feet long. Looks like a brownish color on top. Eyes are near the top of the head, but not connected. Extremely long anal fin. That's at 1380 m. Second fish up ahead on the right but... I'm not sure if we will be able to get that in there.

Jones: Time is 11:49 and we're at about 1370. Here comes a ledge. Got a photo of that for Joe, and maybe we'll get another one here.

Jones: I wonder if this is one of those points that you had.

Van Ryzin: I bet this is point A.

Jones: Took another photo as we head upslope on a course of about 120-130. These are fairly large boulders, probably 2 1/2 - 3 feet across and 4-5 feet long. They're in a pile. Stopped right here. Take another photo. Another one of those fish.

Jones: Another one of those fish with the long anal fin. Light coloration on top; dark on the bottom. Small eyes.

Jones: Upslope about 100 degrees and coming up to a boulder with another outcrop. Soft gorgonian and gold coral; look at that shrimp. Shrimp on top of that. Here comes another ledge. It's all basalt. Just a sheer ledge. Probably about 5 feet high maybe. Large clumps of these basalt - rounded, fairly rounded basalt. Some mushroom sponges on top of it. And some of those small, solitary corals. Here comes another fish.

Foster: I've got to check the focal length.

Jones: Just took a picture of a fish with the silver head, black marking right behind its...before it's...right after its gills. Extremely long anal fin. Just sitting on the substrate.

Jones: Here's comes some more...pile of boulders. Time is 11:54. Depth is about 1360 m.

Jones: Some of these large vase sponges down here. This area here looks like a cobble road, but the cobbles are a little bit bigger than cobbles, maybe two-fist size. Some of them are a little larger, irregular. There's no real pattern to them. They come up... And we're heading upslope a little bit.

Jones: What was that?

Van Ryzin: That was a big...

Jones: There's the first sea cucumber of the day. Right next to a soft gorgonian with a asteroid sitting on it. Starfish. Oh, there's one of them...we are just coming across an area again now that's cobbled, and more into like a gravel slope and there's just a... maybe that's ... _____ the sub. Now we're up to more of the cobble area.

Jones: In the process of settling down for a fix. It's 12:01. Our depth is 1340. Bottom is cobbley with a light dust of sediment. And we're trying to find a flat place to set down. In front of us is a boulder, outcropping that's 6 feet plus across. On the downslope side, there's a drop of maybe 3 feet. Here we go. Settle down.

Jones: Got a fish off to my left, but it just went away. Time is 12:12. Depth is about 1325 m. We're heading about 180. Trying to get to the study site. The terrain here is basically a ______-sized to cobble sized pieces of basalt that have been dusted with some sort of sediment. And then every once and awhile there are boulders that are about a foot by a foot. And attached to some of these are inverts. Comes up on some say a flow structure. Definitely ______. These are more boulder-size.

Jones: Large multi-arm starfish. Eight arms. Nine arms.

Foster: I'd say we lucked out with the current today.

Jones: Or else we're up higher than the currents usually.

Jones: Top gorgonians are oriented pretty much parallel to the slope.

Jones: 12:19. We have turned. We are heading...trying to get to the study site. And we're at 1300 m. About a 30-40 degree slope here along the contour. Looks like orange sea pen with some sort of invert. wrapped around its...among its tentacles...in the stalk.

Jones: I'm not sure if they're crinoids or some kind of echinoderm that's wrapped up...that's in the stalk area of these soft gorgonians. Kind of getting up off the bottom. Coming up on a rocky area. Sandy. Between... here's a huge ______ coral. Maybe 7-8 feet high. Easily.

Jones: Here comes a big boulder field. Probably 12 feet high. And there's a house rock.

Jones: There's a big house rock. Easily. And we're at 1290. Past it are some good sized boulders, at least 3 feet - 2-3 feet I guess. Rounded. And next to that's a sand chute. Probably... 30-40 m. across. Coming up on another larger rock. This is a sponge.

Jones: Just hit bottom. Just dragging a little bit over there. There's one of these fish with the long anal fins in among the rocks.

Jones: There's a buried crinoid with his arms sticking up. Another rock on our left here at least cabin-sized. Coming off this area with the rocks is a nice sand area, and then there's some of these rocks that are just sticking up through it.

Jones: Coming up to a ledge, changing slope and going from maybe...definitely drops. Looks like a ledge actually. Drops probably about 5 feet there and then goes out another couple feet. Then it just drops like crazy. That's...I don't know if this is one of those terraces or not. This is pretty...that's a good 20 foot drop. This must be one of your edges Joe. This is a drop of....15 feet. Now where are we going?

Van Ryzin: Ledge seems to be going up and down the hill.

Jones: Now we're...after that ledge area, there's a, back to a basically sand with very mixed pieces of basalt and also now we're getting into more of a pebbley area. Smaller pieces. Black rock fragments and things.

Jones: Came up on a second ledge. Time is 12:24. Could have been continuous with that other ledge. They're parallel to each other, but don't know.

Jones: We've set down, looking out the window, it's 1300 m. and there are small white solitary anemones that are attached to the rock. ____ on the sides, not on the top. They're probably about an inch long, almost conical to a base. There's one of these little anal-finned fish off to the left. Some sort of _____ structures on its snout.

Foster: We're at 1300 m. Can you give us a fix over?

Jones: There's sediment in between the rock spaces. Quite a few ophiuroids attached on the sides of these rocks. An anemone. Web-like structure between some of the rock at the crevices. I don't know who's making that, but they're essentially a feeding net. Trying to get a fix right now.

Jones: One of those long anal-finned fish coming up to our lights and it's oriented head-down with its top of the head towards the light, and the base of it away from the light source.

Jones: Actually, its head is away from the light source. His three....those are high pecs... I guess real high pectoral fins. One dorsal fin next to the long anal fin.

Jones: It's 1300 m. and we're coming up to another ledge; it's about 3 feet. Just...well it may be more than that. Maybe 6 or so boulders high.

Jones: Very little current. One of these spirally ______ corals - gorgonians. Here comes a mound, kind of a rise up and then drop-off. Rises up above 45 degrees angle. And drops off at probably 70. It rises about, maybe 5 feet high.

Jones: We're heading in 230. There's another one of these drop-offs. This is the third one in the series. This one...Just kind of builds up and then drops off and then there's another one. Kind of stepped almost. This one drops off about only 10 plus feet, and then we come up to another set of boulders, builds up... Another ledge built up and drops off. Probably at least 10 feet. Probably more like 12 - 15. Now we're up a little higher. It's kind of hard to figure out if there's some downhill erosion or not, but there's these channels and then there's lips. Here comes another rise. This is all basalt. There's another lip coming up to this one.

Jones: One of those drop-offs coming up again. And one of those spirally... Oh there's a fish.

Jones: Coming to some more of these...they're smaller drops - ledges - with channel. Small little-like viper fish, black. There's a... well, I guess it's solid rock, about...

Foster: Looks like the skeleton of one of those sponges.

Jones: Yeah, it does; it was. Almost looks like an intrusion basalt right back there. On top of that is some sand with these pebbles... kind of washed out.

Jones: Maybe is this it? One of these... what he's talking about ...on the... Joe do you think this is one of your structures or not?

Van Ryzin: I don't know. I have to look and see.

Jones: It's about... it's 15 feet high.

Jones: Basalt structures. Looks more like flows coming down. Some chunks have been broken off or have settled nearby. Sponges, shrimps. Looks like a conglomerate of basalt formed on this linear structure. A crinoid sitting on a rock, arms extended. We're coming up to one of these ledges - small fish, white body, oscillating back and forth, elongate. Here comes a drop-off. This might be one of your structures. Maybe not.

Van Ryzin: It does look huge, ______ with the edge.

Jones: Stills out. It's 12:53. Total opportunity... comes up on another one of these long anal-finned fish. We're looking at a bottom that's basically bouldery, and we are heading about 250. Depth is 1300 m. Large bamboo coral off to my side here, probably at least 10 feet high. Coming up to these drops that are 3-5 feet on this one. This is...two of them. Most are like swamped features, but can't hardly tell. Here's another one, 3-5 feet. Sand chute. Wow, look at the size of that huge one - bamboo coral. Some sort of...

Jones: And another ledge. Dike-like structure, sitting up maybe 2 feet. Big ______. Large starfish sitting on the base of one of these soft gorgonians.

Jones: Saw a rounded...looks like a holothurian, asymmetrical, football-shaped I guess. More rounded on the points. Eel off to our left.

Jones: We are stopped. It's now 1:01 - 13:01. And 1320. Standing by until we get the fix and looking out the window. Slope is about - at least 30 plus feet. The soft gorgonian in front of me is oriented downslope. It's fanned. It's _____ cross slope. Small little ophiuroid in front of me on a rock. ______ must be small. Solitary coral, earlier described, comes up, and it's got almost a saddle shape from a... It comes up as a cone and then the head structure is saddle-shaped with like a brownish tinge to it. Surface is coated with a light sediment dusting.

Jones: I got our position. We're heading south 200 or 195. Trying to get over to the site. Still in about 1320 m. water depth following the contour as much as we can. Now we're following sand with a sprinkling of pebbles on top of it. Getting into the _____. Looks like we're in a bowl or something here. Coming up to a large rock outcrop loaded with gorgonians - soft, hard corals ...

Jones: Big drop-offs here. 5 feet. It's almost a canyon-like structure on this next drop-off. It drops down and then it comes back up. Drop off down is about as wide as distance between the two...

Van Ryzin: Pretty big lumps out here.

Jones: Yeah. Large humungous outcropping here. Two-door garage size. That's got a ... downslopes deep vertical face. Stalked crinoid coming up and about 200... Time is 1:15. Depth is about 1340. So we're getting a little deeper. And this area is basically just rocky bottom. Every triple meters there's a rock with a gorgonian growing. Usually they're at the side of a rock and they seem to be spanned out into the current. Coming up on some larger boulders with many sponges and gorgonians and hard coral. Recovering a dusting of sediment.

Jones: (Walls?), couple sponges on it. Gorgonian.

Jones: Another urchin. Second one I've seen on this trip. Same as the one yesterday I think. Kind of purplish, light base. Time is 1:22. Depth is just 1300 m. Going across an area that's traversing a slope that's got a lot of.... basalt rubble. Fairly stable. Theres' a covering of soft sediment. There are a few inverts attached. Mainly soft gorgonians, some bamboo coral, there's one of those long anal finned fish. Some hard corals, some of these soft gorgonians with symbionic either an asteroid or crinoid. And every once and awhile we see that red shrimp on the bottom.

Jones: Little shark, got a dorsal on the back. I don't think it will be on the video though. There's a couple of bamboo corals that have been knocked over. They're on small rocks, gotten too big, and got blown out. Starfish on top of one of these stalked seapens I believe. Just munching it away with it's ______. Rock in front of me has some of those solitary corals on it. We've reached an area where there's a lot of look like sticks, but they're probably pieces of broken, stalked animals that have been... These are all... these long sponges, big curly sponges...

Jones: We're coming up to an area where there's really small hard corals, but there's giant sponges and (new?) coral nearby. There's a sponge on my left that's a lot bigger than a breadbox. It's probably 3 feet and it's spherical shaped.

Jones: We're stopping for a fix; in front of me is one of these eels and a shrimp that's just sticking around with long antennae. I'm watching the fishes ______. Shrimp is standing on its toes, its legs, whatever. It's bright red. Large antennae. Different than the other ones; they're smaller antennae.

BALANCE OF TAPE 2; SIDE 1 EMPTY.

TAPE 2; SIDE 2

Jones: Test 1,2,3. Let's try this one more time. September 10. It's 1:42. We've just gotten a fix and we're heading uphill, upslope. There are some large depressions here. There goes a fish with some massive teeth in front of it. There are like ledges that drop at least three feet. Looks like they are in base rock. Stalked crinoid in front of me. Continuing upslope. Time is 1:45. Depth is about 1250 m. Heading 143. Bottom here is cobbley; there's some rocks. Some rock outcrop with a fairly large sea anemone. Here's some more of those red shrimp that are off the bottom.

Van Ryzin: Indentation in it, looks like a rock was in there until we picked it up.

Jones: Some rock outcrop with a fairly large sea anemone. There's some more of those red shrimp that are off the bottom. Look at the size of this guy. Large bamboo coral. Continuing upslope. Still basically rubble, rounded basalt rocks, about a foot in diameter. And then there's pieces of outcrop that are a lot larger dusted with a sand material. And there are these ____-like structures, but you can't figure out what they are if they are leftovers or something - something's come from upslope coming down. We're just still about 1250. Coming up on a ledge running parallel with us. I see two of them drop-offs... there's a big white sponge.

Jones: There's a cave-like structure. To the left, there's a ... cliff.... could have been ___ from a lava tube. There's an urchin with long, white spines - short and small. Test... What else?

Jones: There's an overhang with maybe a foot of sand underneath it. The basalt is on top of it. These are fairly rounded pieces, not terribly angular, although some of them have flat sides.

Jones: Continuing upslope. 1225 m. Time is 1:50 and course heading is 170. Heading upslope and just came across one of the antennaed shrimp. Long antennaes and we're in an area in here that's got a fairly perilous drop and large boulder here. Ledge maybe four foot plus. Drops to an area with sand and pebbles and cobble-sized basalt. And that is... almost like a channel that goes down next to this next ledge, this basalt ledge. There's one of the white-stalked sponges with a shrimp on its side. Now we've into a pea-gravel type and there's another ledge that's got an undercut.

Jones: We are heading up 160. Heading upslope. And now we're in an area with pea-gravel on top of probably sand.

Jones: We're up to a rock wall with some sediment upon it.

Jones: Set down for communications. Time is 1:55. Standing by for a fix. The bottom here is cobbly with some big boulders and there's sediment inbetween. We've kicked up a little bit of the sediment and it's going downslope a little bit. Sand size.

Jones: Going uphill to enjoy the view. Time is 2:07. Depth is just under 1200 m., probably like 1180. And we are getting up off the bottom. Navigation is not doing too well with trying to locate this line. So we're going to just _____. Some of these corals attached to the rocks get bigger than the base, becomes unstabilized and they rock over. Coming up on... There are a few of these ledges that are undercut and there's sand underneath it. So we are going to be heading up on a course of about 200. Bottom is cobbled basalt.

Jones: 12:14 (sic) continuing upslope. Depth is about 1150. Course is 193. We're in an area of basically basalt rubble. There's hard corals on the sides - attached to the sides of some of these - maybe less than 10% of them. Bamboo coral with a decapod crustacean on it. And a stalked anemone and that's about it. The dive lights are getting low as we propel forward so Captain Dave says that we should head up. This is one of two tapes, both sides have something on it because of some problems with the tape. We are getting ready to head up.

Jones: 12:18. We are off the bottom, heading up. 4:00 pm. On surface. Waiting for pick-up. This is the end of Tape for second dive of Hawaii deep-water cable, Parsons.

END OF TAPE 2, SIDE 2.

TAPE 3 EMPTY.

TAPE 4; SIDE 1

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VOICE TRANSCRIPT FOR HAWAII UNDERSEA RESEARCH LABORATORY MISSION

Dive Number: P5-058

Location: Alenuihaha Channel

Date of Dive: May 12, 1988

Project Leader: A. Malahoff

Address: Department of Oceanography
University of Hawaii
1000 Pope Road, MSB 319
Honolulu, Hawaii 96822

Phone: (808) 948-6802

Observers: T. Jones, K. Kelly

Pilot: T. Kerby

VIDEOTAPE 1 (Audio Tape 1 broken)

Kelly: On the bottom at 11:25, 1550 meters. Cinders on top of sand. (Waiting for a fix)

Kelly: Hardly any current at all.

Kerby: Understand, travel NE, 060.

Kelly: Time is 11:35. Moving upslope. Slight current to the South. Photo 1 of sponge. Photo 2

Kelly: Time 11:43, depth 1540 meters. Collecting sample of mushroom sponge. Substrate here has turned to a coarser texture of rocks on sand. Still nothing big, but coarser gravels.

Kelly: I think there is exposed limestone underneath there. Look at this, there is a wall in front of us here.

Kelly: Depth is 1540, 11:54. We've come across a lot of sponges sitting on very blocky pahoehoe flows. Moderate dusting of sediment on most of the flows. ...moderate relief.

Kerby: Continuing on coarse 060 (12:00 call to surface).

Kelly: Lunch while we wait for fixes for the sub. The slope outside is about 25 degrees. .....flows covered with medium sized gravels and sediments.

Kelly: It is 12:32, we are heading east ...600 meters.

Kelly: It's 12:35 we're still heading east. Crossed over an area of ...gravels to small talus sized rocks on a sediment slope. Our depth is 1540 meters.

Kelly: It's 12:47 we're about 1500 meters. Slope is containing bigger talus now, nothing over 2 feet in diameter, most is less than 10 inches.

Kerby: We're getting into some real rocky rubbly areas, some higher relief, ...basalt.

Kelly: We're on a large basalt outcrop about 10 to 12 meters across. Moderate relief.

Kerby: We've been moving along to the east and just passed over a large outcrop and we're waiting here to see if you have a position on us. 1:00 call to the surface.

Kerby: Heading 090.

Kelly: Time is 1:47 and we're 1515 meters heading due East for 300 meters.

Kelly: (1356 on video, reporting undecipherable.) Slight current.

Kerby: We have moved aproximately 300 meters. Can you get a position on us here?

Kelly: 2:00, we're at 1500 meters. We've moved 300 meters to the East. The slope here is a gentler grade, sandy silt covered with larger gravels and small rocks 6 inches or less in diameter. They are interspersed with thin flows of lovely? basalts and some isolated sand patches. Every now and then there is a boulder less than 2 feet across.

Kelly: Right where they launched us, in the middle of the track. So now we just have to go on this compass heading up slope.....150... What is our depth, 1500 meters?

Kelly: The time is 2:10 PM. Just discovered tape 1 in the voice transcript has been broken, don't know how long it has been broken. We've just come from the East.

Kelly: We'll be moving up slope at a heading of 150 in the middle of the 200 meter swath at 1500 meters depth. The slope here is mostly coarse gravels on sediment there are interspersed boulders, most less than 2 feet in diameter. And every once in a while there are thinly bedded lavas or cemented gravels forming thin layers, and light sediment everywhere.

Kelly: Collecting a rock from 1500 meters before we go up to the 150 heading.

Kelly: We're at 1470 meters; it's 2:17 PM. Steady slope, it grades from fine gravels into small talus averaging about 8-10 inches across. There have been a few boulders, none any greater than 2.5 feet across.

Kelly: We're at 1470 meters, just passed a large boulder about 3 feet high, pretty prominent feature on the slope.

Kelly: At 1460 meters there is a large boulder off to the right of the submarine; the face is about 8 feet high.

Kelly: At 1400 meters we've come across 2 boulders about 4 feet high. The rest of the slope is gravel slope with talus and gravels over sediment. Every once in a while there are thin layers of basalt; they get ...8 to 10 inch blocks of basalt on those layers.

Kelly: At 1380 meters we've come upon a rock approximately 8 feet high, maybe higher, it forms a wall, right in front of us (multiple voices) running parallel to the slope. Looks like part of the same structure. Looks like a dike, just an isolated dike outcropping on the slope at 1380 meters. ____ is covering the wall.

Kelly: Off to the west is more of this type of terrain.

Kelly: Looking at the map, seems like we've drifted to the west, is it, into that cross hatch area.

Kelly: 2:32 PM, we're talking to the surface.

Kerby: Ok, we are at 1365 meters, moving upslope, coarse 150, do you want to get a fix on us here, over.

Kelly: We're heading to the East to see if this outcrop area isn't the hatched area on the map, then we'll continue course 160 upslope.

Kelly: The KILA people say we're in the middle of the thing, but, ...Perhaps the placement of the stuff on the map is a little off, to the east.

Kerby: Yeah. We wanted to work our way up to 1200 meters, is that our goal?

Kelly: Soon as we come to the east it looks like its back to the regular easy grade slope. We're now at 1360 meters. Up the slope, talus and mostly gravel and sediment. Now and then there is a rock, a foot or four in diameter. Here is a big block, 4 feet high. And there is a cemented pedestal with gravel around the base of it.

Kelly: Big drop off to the west here, at 1340 meters, 1335 meters. Probably about 25 feet on the edge. A lot of larger rubble down the slope, boulders in excess of 2-3 feet. Back to the east the slope is steading and average size talus and gravels and sediment. Large boulders, at least a foot at the most.

Kelly: It's 2:56 PM, we're going up from 1300 meters. Coming across a small ridge, about 2.5 feet, 1 meter. The slope is still moderate, talus with sediment. I see a wall running straight up and down slope on the left side of sub. On the right we have another some kind of terrace that runs parallel to the sub. We're on a terrace on a ledge about 3 feet high runs for about 15 feet, drops off another 3 feet. We're stepping down the slope here, I can count 3 steps. Curves to the west becoming very steep.

Kelly: So, we're right in that rough zone off to the west, right where we thought we were.

Kelly: So, it looks like the flat slope that they are after is actually the surface of this ash flow.

Kelly: Now we'll head upslope, at 150. The relief has become more subdued, mostly small talus and sediment. Depth now is 1235 meters. The time is 3:21 PM. This is an outcrop of basalt. 1215 meters the slope steepens, larger blocks of angular talus, still not over 1 foot in diameter. It's very steep at around 1200 meters. It's really rocky...

Kelly: There are big outcrops, but the relief isn't that great. Low profile. Blocks sticking out of the ash and moderate sized talus. Every now and then you have a few foot drop.

Kerby: We'll call, let them know we're at target depth. Get another fix. It's real solid.

Kelly: Just a light dusting of sediment over it. The piece of talus may not even be talus, just differentially weathered blocks.

Kerby: Middle of the track.

Kelly: Middle of the track at 13....

Kerby: 1155 meters...

Kelly: ..Ash, cindery stuff..

END OF TAPE TRANSCRIPT

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VOICE TRANSCRIPT FOR HAWAII UNDERSEA RESEARCH LABORATORY MISSION

Dive Number: P5-059

Location: Alenuihaha Channel

Date of Dive: May 14, 1988

Project Leader: A. Malahoff

Department of Oceanography
University of Hawaii
1000 Pope Road, MSB 319
Honolulu, Hawaii 96822

Phone: (808) 948-6802

Observer: K. Zaiger, A. Resnick

Pilot: D. Foster

TAPE 1, SIDE 1

Resnick: This is Pisces Dive 59, pilot~~t~~ed by Dave Foster with Kimo Zaiger and Andrew Resnick as observers. We are diving on the Kohala slope of the Alenuihaha Channel. We deployed over 1200 m. to pick up where Dive 58 left off. We closed the hatch at 7:45 approximately and we are submerged and dropping at 8 o'clock.

Resnick: On the way down, it appeared we were getting into too deep water so we flew to the southeast at 150 heading to try and get into slightly shallower water for our landing.

Resnick: We have the bottom in sight at 9:06 at 1280-1290 m.

Resnick: It is sediment with rocks. We are landing adjacent to a delineation between boulders of one to two feet in diameter and sediment covering what would appear to be a basalt rubble.

Resnick: We are on the bottom at 1300 m. and calling the surface. At 9:20, 1330 m. we are seeing a chute going down the slope that drops off about 25 m.

Resnick: The sand chute was approximately 30 m. wide, photo number 2 is of the southwest edge of the chute and we are continuing on. We are traversing across the slope at just below 1300 m. Please mark this with a time delineation of 9:35. We have run across several series of ridges and channels including some sand channels that were quite smooth and in almost all the cases the ridges ran up and down slope. We only saw some fairly shallow ridges approximately one meter or less that ran across the slope paralleling the contours.

Resnick: Picture 4 showed a talus movement in the chute showing block~~ing~~y stuff ... with a ridge on one side.

Resnick: 9:36. We are proceeding across the slope slightly up passing 1300 m.

Resnick: And now the ridge systems are probably the side scan targets that are seen to be east of the cable path.

Resnick: 9:38. We are coming across another channel - a big channel on the right hand side. We are at 1290 m. The channel is approximately 5 m. deep.

Resnick: 9:38. We are crossing a hummocky area. The relief is not very much, maybe half a meter.

Resnick: The sand looks like it had recent movement, nothing growing in it.

Resnick: We are at 1270 m.

Resnick: At the west end of the sand channel we crossed another ridge that moved directly below us has petered out to nothing but can see off to our left upslope is approximately a meter to two meters high running up/down channel. There are various sized boulders here all the way up to perhaps one meter.

Resnick: The relief may be up to half to three quarters of a meter. Past the ledge the bottom becomes cemented talus that has been scoured as exampled by the undercutting of the ledges.

Resnick: 9:43. We are at 1265 m. Calling the surface. We are on a cemented talus slope with sand deposited over it.

Resnick: Picture 5 is of this talus slope.

Resnick: 9:46 at 1265 m. We are heading up the slope staying informed that we are on the track.

Resnick: Bottom primarily talus. The relief looks less than a meter.

Resnick: Photograph 6 is of a boulder at 1260 m. on the cable track taken at 9:50.

Resnick: The rock looks like an anomaly on an otherwise smooth slope. Approximately ...

Foster: 7.

Resnick: 9. Photographs up to 9 and including 9 are of this rock, sponge and ___. The rock is well over a meter in height.

Resnick: The top of the boulder is oxidized such that it appears to have been the bottom at a previous time.

Resnick: It's 9:54. We are 1255 m. The talus appears to be made up of pieces cemented together. Chunks of conglomerate.

Resnick: 9:55 at 1250 m., we've got a sand chute running along the right hand side.

Resnick: Gentle ridge on the west end of the sand chute, less than a meter high.

Resnick: Off to the right hand side. Oh, excuse me. 9:57, 1248 m. about a meter boulder off the right hand side.

Resnick: At 10 o'clock, 1240 m. we are on the east side of the track headed upslope.

Resnick: Heading to the west, we ran across a few large boulders associated with a ridge system. The boulders are approximately a meter and a half in diameter.

Resnick: Crossing over the ridge, we find more evidence of scouring in the channel beyond.

Resnick: Sand channel and the boulders seem more rounded, softer in the sediment.

Resnick: 10:07. We have crabbed towards the west to an area of bigger talus on the far side of what had been a fairly smooth channel.

Resnick: Half a meter in diameter.

Resnick: 10:11. 1140 m. we have come across a zone of pillow lava that has been fractured. It has bigger pieces on the order of one to two meters as well as the smaller tailings, but the relief appears to stay on the order of a meter.

Resnick: Its 10:21. We are at 1100 m. proceeding upslope. We are about thirty meters west of the track according to surface nav.

Resnick: It is 10:27. We are at 1040 m. As Kimo was just saying, over some cemented material which has been corroded by high currents exposing rocks and capturing sand in the pockets between the eroded bits of rocks.

Resnick: 10:34. 1045 m. We are about 100 m. west of the track and going to head due east. The bottom here is a bit rough. We haven't seen any signs of the side scan targets that were seen over here, a bit further west.

Resnick: It's 10:38. We are at 1030 m. proceeding east. We have come across a number of rocks from three meters up to house-size.

Resnick: In a local area. We are back onto smooth bottom. Just after the width of that was probably about 15 m. wide. Just past the boulders, we ran into a reef with some more boulders of two to three meters size scattered around it.

Resnick: Its 10:41. We are 1015 m. and have come across an extensive reef formation. We are sampling the reef.

Resnick: Photograph 11 is of the reef formations that we are sampling.

Resnick: Photograph 11 and the previous one (actually it is 10) of the reef material that was sampled in which it was 1015 m.

Resnick: Picture 12 is a close up of the coral slope. In it the black ...

Resnick: Turns out that this dictaphone has been paused throughout most of my dictation, unfortunately. We are now at photograph 36, which I will try and describe backwards. 36 is of the top of the coral slope looking east at 940 m. 34 and 35 are of the top of the pinnacle on the coral rubble of Kohala slope. Photographs back through 29 are of this coral rubble deposit. Photographs back through 25 to 28 are of large boulders deposited in the coral slope.

Resnick: Picture 37 is taken at 11:31 at a depth of 930 m. of the rock coral piece that we are collecting from this depth.

Resnick: We are 11:40. We are at 930 m. We're headed at 160 and we've run out of the coral and are into the sand.

Resnick: We have occasional coral heads poking up above the bottom.

Resnick: The sand has turned back to coral. Its 11:45. Depth is 925 m. The water got very murky for a ways and there was no life forms. Now we are getting into slightly cleaner water and life forms are seen once again.

Resnick: We are now up to shot 38 at 11:46, 925 m.

Resnick: Its 12:11. We are at 925 m. having just gotten a fix placing us on the east edge of the track at 500 m. above the 950 foot contour. We inspected our landing mark and it would appear that the bottom is a fine silt covering a coral reef or other hard material as we did not leave deep scratch tracks though the landing felt soft.

Resnick: It is 11, excuse me, 12:18. We are cruising east at 925 m. depth. We continue to be on a barren sediment covered plain. Very low abundance of life or diversity. No sponges or other types of creatures ___. As we saw below, then there are occasional fish and ____ life.

Resnick: It's 12:30. We are at 925 m. at the eastern edge of the lava flow. The lava flow appears to be a ___ a a'a type, slightly jumbled. It is not a pillow lava flow.

Resnick: Its 12:40. We are at 920 m. just departing the edge of the lava flow where they got a good fix. We are going to head... heading of 270 back the slope break and from there head along the slope to cross the track.

Resnick: The next picture and I have lost count is at the lava flow at the top of the slope.

Resnick: Its 12:47. We took the basalt sample at 920 ft. and we are proceeding ...

Resnick: The edge of the flow, if it is indeed the edge, appears to have a drop of about 2 m. Several photographs were taken of a sponge on the lava flow before we proceeded.

Resnick: At 12:52 and 922 m. the next picture after the sponge is of some basalt sticking out in the middle of the sand structure. The lava has been observed to be on top of the reef structure. Quite clearly, the flow came over the reef. At the edge of the flow, it looks like pillow lava which has flowed over the coral reef.

DIVE P5-059
TAPE 1; SIDE 1
PAGE 6

Resnick: We are proceeding from the lava flow on a heading of about 300 degrees looking for the slope edge. We are again crossing the plain of sediment over coral. It is quite boring to say the least.

Resnick: One o'clock at a depth of 927. We've crossed back into the rougher coral reef.

Resnick: Next photograph is of the shallow edge of the rough area at the top of the slope just to the west of the track. There will be a series of photographs taken along this rough area.

Resnick: 1314 hrs at 930 m. We have hit the edge of the slope, a fairly clear delineation in the coral reef that is not as rough as we had seen it on earlier crossings but still rougher than the sediment covered reef up above.

Resnick: The remainder of the photographs are taken on the roll-off edge of the slope in the rough area turns out to be coral.

END OF TAPE 1, SIDE 1

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VOICE TRANSCRIPT FOR HAWAII UNDERSEA RESEARCH LABORATORY MISSION

Dive Number: P5-060

Location: Alenuihaha Channel

Date of Dive: May 16, 1988

Project Leader: A. Malahoff

Department of Oceanography
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Phone: (808) 948-6335

Observer: T. Jones, K. Zaiger

Pilot: T. Kerby

TAPE 1, SIDE 1

Zaiger: Pisces V, Dive 60. 16 May 1988. Pilot - Terry Kerby, observers Kimo Zaiger and Tony Jones. We have just left the LRT. Time 8:43 in the morning on the way down.

Zaiger: Correction - 7:30. The purpose of this dive is actually, this was original Dive 2 on the Alenuihaha, Kohala side looking at alternate gaps. The objective is to see if the rough boulder field at the bottom of the reef terrace we found at about 1,015 meters, extends laterally over a great deal of the terrace or if it ends close enough to the proposed gap that we can use it as a course and miss those boulders. We'll see.

Zaiger: Time 8:22. Bottom in sight. Very rugged bottom. Talus, sponges, ______. Just about 1370 m.

Kerby: We have a real rugged bottom. We'll be standing by for a fix. Over.

Zaiger: Time 8:40. The fix placed us right about where we want to be. We are headed up in the water to obtain some neutral buoancy. We are about to head upslope. The geology consists of a talus slope. We intend to head upslope. This course of 150 should take us across all the features inferred from the seamarc data. As I was saying the geology appears to be talus, relatively well cemented locally in ridges but very loose in between the ridges. Ridges are a ______ and have a relief of about 1m.

Zaiger: Strike and dip of the slope is about - strike is 330 and dip is about 25 degrees.

Jones: There is a relatively high diversity of benthic organisms organisms. At least three species of sponges, maybe five species of sea fans, some gorgonians, eel like fishes. These species seem to indicate some rigor. Current seems to be upslope. Benthic shrimp.

Zaiger: Seem to be heading into the current, heading 222 .

Zaiger: The current seems to be setting us on 042.

Zaiger: Seeing a little bit more soft sediments over on the bottom, silky stuff. Sediment covered talus. This time the last observation was 8:45.

Zaiger: Time is 8:52. We are crabbing at the slope kind of sideways due to the current. Our heading is about 180. We are actually making good about 150 or so. Very rough relief. The terrain is hummocky. Many lineations to the high topographic relief areas. Coming upslope, across slope, everywhere it's very hummocky, at least on the order of up to 2 meters. There is some lineation as we are moving up here. There are some gullies and some linear outcrops. We are making progress into the current travelling up. We are kind of following the line on some of these gullies and linear outcrops that makes a reference here as we're moving upslope.

Zaiger: We're staying at about 190 (multiple voices). Some of this little relief forms look like submarine pillow formations.

Zaiger: Time is 8:57. The relief is a little less rugged, smoothed out a little bit. The relative relief seems to be less than 1/2 m. Still all talus. Strike and depth is unchanged, 300, 25 degrees.

Zaiger: Relatively sandy patch. We're going to put down for a position fix.

Jones: That's amazing, look at the crinoids on the top of that (multiple voices).

Zaiger: Making good about 160 due to crabbing into the current. Passing a series of larger boulders, rougher boulders. Other than that, the terrain is unchanged, very well covered with talus. A series of large.. (multiple voices).. looks like they're all on the downslope. Definately a large pillow flow, pillow cluster. Depth is 1200..1180m.

Zaiger: Time about 9:29, our heading is still 175, climbing upslope. Roughness still moderate ________.

Zaiger: Bathymetry is hummocky. Lots of coral structures, coral tubes.

Zaiger: 1075 m.

As in the last dive there seems to be a lot of rocks, cobble-sized materials encased within the reef. Time is 9:47. Stuff on the reef appears to be hyaloclastite ...the glassy material put out by ....

Zaiger: Now, on the last dive, 59 where we progressed up the reef we went up about 100 m or so, we came to this place with very large boulders. Wonder if we will see the same thing here.

Jones: _____ this reef face _____. Now all of those, a few very large sponges, relatively barren.

Kerby: Pretty clean.

Zaiger: Probably indicative of rapid growth. Time 9:55, negative communication with the surface continuing upslope. Limestone intermixed with a definite area of hyaloclastite looking very friable basalt.

Jones: Very coarse topography.

Zaiger: Ocassional ____ boulders here.

Jones: Looks like splatter ____, a few ____ boulders here and there.

Zaiger: Looks like we are progressing upslope. We're getting a higher and higher percentage of basalt. About 50/50.

Zaiger: Looks like we have passed beyond that swath of white clean limestone.

Zaiger: We are out of it and we are back into talus. ___ area, clean and no big rocks. Good landing place.

Jones: Yeah except that it went from 1015 all the way to south. Never stopped.

Zaiger: We are deep. We're deeper than yesterday. We went to another area.

Zaiger: Tony, how wide do you think that swath was?

Jones: 50 m., maybe a lot more. Can say it is 50 m thick.

Zaiger: Probably a little less.

Zaiger: Time 10 O'clock. We are moving a course of 190. Current is slacking somewhat. We are in a bouldery area. Depth about 1020. A lot of boulders here. Coming up on a ridge.

Zaiger: Steep ridge. Maybe that's that one feature on the one sid, to the East.

Jones: It's more limestone.

Zaiger: Yes. ____

Zaiger: There's a ridge here about 1000 m. Slope about 40 degrees. Strong current in this area.

Zaiger: 20, 150. To our left the ridge has come up this slope and it drops straight off the other side. Facing 20. We're looking south. We seem to be going across the ridge. Drops off steeply on either side of us.

Zaiger: The benthic community here has picked up. Seems to correlate with the increased current we are experiencing across the top of this ridge. The ridge itself has an approximate dip of about 20 degrees, but of course the angle is off of each limb to about 40 degrees.

Kerby: This is PISCES V, do you copy?

Zaiger: Time 10:22. About ready to lift off after getting a fix. We are about a thousand meters. We have got ourselves anchored on a rock formation that looks surprisingly like breccia. Two sides of smaller, angular blocky conglomerate..which is oddly _____ more limestone. Downslope seems to be covered by limestone. It is overlying limestone. I can see limestone underneath it.

Jones: This seems to be a pioneer of the ____. Look at the sponges up here. Amazing.

(multiple voices)

Jones: Depth 975. Time 10:27.

?: An amazing ridge of pahoehoe, pahoehoe like pillars, it's huge.

Zaiger: A lot of boulders coming up. We are starting to get into the limestone _____. Look at that. This took a lot of current action. Huge boulders here, right at the base of limestone. _____ an undercut _____ gold corals. These boulders here are just totally covered with sponges and corals and what not. We are going almost south still. Now we are getting into that limestone reef area. Looks like broken corals.

Zaiger: Just like the last dive. Close to the base of limestone. A lot of big boulders, right close to the base of the reef structure. The reef structure shows a_____ it's kind of platey, shelly looking. What's the depth? The base of this mass seems reef structured. Its at 965? We're supposed to go all the way up to the top. How about 920? Notice the big difference between the reef we saw at depth, that was all smooth and cemented and fine grained. This stuff looks like it's a lot more porous and very much like what we saw on the last dive. It seems that this is shallower than what we encountered in the last dive. Maybe it means that its tipping toward Kohala.

Kerby: Hard to say. (multiple voices)

Kerby: This is PISCES V, we are continuing to move upslope.

Zaiger: Time is 10:44. Our intent is to move upslope to reach slope break, then skirt along to the east. The relief on the coral is talus. It's not ___. Its not that terribly rough. Aproximately 925 meters. See if you've reached slope break; it's flattening out. Topography is still coral. Pretty much unchanged.

Zaiger: Seems to be more fish up here. Time 11 O'clock. Stop for a fix. We're at 920 meters. We are heading east along slope break. Still all coral strata.

Zaiger: Time 11:15. We are on a course about 135. Right now we are passing over what looks like a silty sand covering, with coral showing through periodically.

Zaiger: Some evidence of a burly ... that big blue thing? That's a one of them sea slug things. We saw a bunch of them last dive.

Zaiger: We're back in the reef again, we're sort of in a depression (multiple voices) sandy bottom here, with some ripples. Time 11:20, heading of 050, 030 now, depth about 920 meters. See a large starfish on the sandy bottom. Another one of those nudibranchs. A number of large blue nudibranchs,..or slugs. Have a coral outcropping here through the sediment bottom. The reef seems to be mantled with this silty sediment. Time 11:35 ___ puts us back on the original proposed track. We're in the vicinity of the slope break. The plan now, in the remaining time we have available, is to head back down, about 270, 280, and try to identify a rough feature infered from the side scan sonar. Still on the top of coral, no change, very monotonous.

Zaiger: Time 11:40, definitely reached some sort of slope break. ____ to the drop off, about 20 degree dip. (multiple voices) Seems to be a series of swells, kind of like old reef ramparts. It just steps right down, that's pretty much what the reef looks like anyway, though. (multiple voices)

Zaiger: Time 11:50, depth 960 meters, heading on coarse 240 down slope. Oh, hit a big boulder with our tail. Going across a boulder field, fairly massive looking stuff, dense. This may correlate with that rough feature. The boulders seem to be placed on top of coral, and may have been concentrated by coral dissolution. Some of the boulders seem to exhibit pillow features such as the one I'm looking at right now.

Zaiger: Another possibility is that the coral grew up around these boulders interstitially and just because of their high relief they have always been exposed and they were crusted over, or they have been exposed to the solution. You can't tell if the boulders have been placed on top or the corals wrapped around without another study and drilling.

Kerby: Time to leave the bottom.

END OF TAPE TRANSCRIPTION

VIDEOLOG P5-031

P.L.: Parsons HI

Observer: Jones
Zaiger

Pilot: Kerby

Time on Tape Counter	Data Logger	Subject/"Remarks made by Observer"

Original changes from SP to LP at 1:11:11 on counter; 12:00 on databack.

0:00:00	10:49	"1940 m" rippled fine sed.
0:13:46*	11:00	ophiuroids, "shrimp", sea pen, rippled sed. (photos) urchin
0:24:00	11:12	sea pens, rippled fine sed., "1940", ophiuroids (photo)
0:35:00*	11:24	_Hyalonema_ sp., fine sed. (photos) cemented Btalus, ophiuroids, red shrimp (photo), round sponge, _Euplectella_ (photo), urchin
0:39:00*	11:28	_Ptilocrinus_ sp., Btalus, fine sed., sea star, shrimp, gorgonian, sea star, rippled sed., funiculinids
0:45:00*	11:33	cemented Btalus, fine sed., sponge, anemone, ophiuroid "50 degree slope" _Sphaerodiscus_, "1925 m", gorgonian
0:52:49	11:41	cemented Btalus, fine sed., sea pens, cnidarians, gorgonians, "going up a rise"
0:58:29	11:47	cemented Btalus, fine sed., _Semprella_, sea star, _Hyalonema_ sp.
1:01:50*	11:50	club sponge, basalt, fine sed., _Hyalonema_ sp. _Lepidisis_ _olapa_, cemented Btalus, fine sed.
1:07:02*	11:55	shark, _Etmopterus_ _villosus_, sponges, cemented Btalus, shrimp
1:10:20	11:59	"photo 23", cemented Btalus
1:15:23	12:04	"1775 m" cemented Btalus, basalt outcrop

Time on Tape Counter	Data Logger	Subject/"Remarks made by Observer"
P5-031		
1:33:00*	12:22	gorgonian, cemented Btalus, Semprella, Irridogorgia
1:39:30**	12:28	gorgonian? cemented Btalus, Semprella, rossellid, "1675 m", white anemones
1:55:41	12:44	rossellid white, rossellid stalked, cemented Btalus
2:02:55	12:51	pau tape 1 of duplicate tape
Duplicate Tape 2		
0:00:00	12:51	"1635 m", cemented Btalus, rossellid white, Hyalonema sp.
0:07:00*	12:58	asteroid, rossellid white
0:24:49	13:15	Narella sp. 3, Lepidisis olapa, cemented Btalus, Irridogorgia sp., "1610 m", hexanchid shark
0:37:37**	13:28	Chrysogorgia sp., Narella sp. 3, primnoid, L.olapa, cemented Btalus. B/W 1600 m.
0:48:19	13:39	pau original tape 1
0:48:20	13:42	(start original tape 2), same area as above
0:53:00*	13:48	fuzzy gorgonian, Narella sp.3, cemented Btalus, coarse sed. "1445 m"
1:07:00**	14:01	Narella sp.3, cem. Btalus
1:17:00*	14:12	Narella sp.3, Nematocarcinus, cem. Btalus
(14:18) collecting		
1:37:33**	14:34	"leaving the bottom", L.olapa, primnoids
1:45:31	14:40	water column
2:02:49	14:56	(pau duplicate tape 2)

Time on Tape Counter	Data Logger	Subject/"Remarks made by Observer"
P5-031		
Duplicate Tape 3		
0:00:00	14:57	water column "1375 m depth"
0:21:19	not set	water column "1200 m depth"
0:22:52		pau tape 2 (original)

VIDEOLOG P5-032

P.L.: Parsons HI

Observer: Jones
Van Ryzin

Pilot: Foster

Time on Tape Counter	Data Logger	Subject/"Remarks made by Observer"
0:00:00	11:15	(1360 m) cemented basalt talus, fine sed., Lepidisis olapa, primnoid
0:07:00	11:22	asteroid, primnoid, fine sed.
0:21:27	11:36	cemented basalt talus, fine sed., primnoid, (11:39 fish, Irridogorgia)
0:28:00	11:43	Candidella, cidarid, shrimp, coarse sed.
0:32:30**	11:48	Aldrovandia proboscidea, coarse sed., outcrop, gorgonians, anemone
0:38:11*	11:53	A. proboscidea, coarse sed., 1460 m
0:41:17*	11:56	fish, cem. Btalus, coarse sed. (1360 m)
1:07:00	-----	"house rock, 1290 m" basalt outcrop
1:20:34	12:35	cemented Btalus slope (stationary at 1300 m)
2:02:48	13:18	pau duplicate Tape 1

Tape 2

0:00:00	13:18	cem. Btalus (distance)
0:21:32	13:39	"1320" primnoids, L.olapa
0:38:07	-----	cem. Btalus "1200 m, moving slope"
0:53:04	-----	"crinoid, sponges 1170 m", cem. Btalus
0:58:55	-----	"cliff, 1145 m" dark
1:00:00	-----	pau duplicate Tape 2

VIDEOLOG P5-058

P.L.: Malahoff

Observers: Jones
Kelly
Pilot: Kerby

Time on Tape Counter	Data Logger	Subject/"Remarks made by Observers"
0:00:00		Launch
0:04:43	11:27	"1550 m" fine sediment, Btalus
0:08:25	11:30	Narella sp., fine sediment, Btalus
*0:19:31	11:40	cemented Btalus, fine sediment, asteroid, scoop sponge, solasterid, collecting rossellid stalked
0:34:14	11:56	"blocky flows," white anemone, scoop sponges "1540 m," Narella sp., sponge skeletons
1:16:14	12:38	"1540 m," Semprella, Btalus, coarse sediment
*1:29:47	12:52	Narella sp. 3, Lepidisis olapa, Btalus, coarse sediment, 1500 m, cemented Btalus, collecting
1:43:56	----	collecting sponge (Semprella)
1:51:27	----	pau tape 1.
Tape 2		
0:00:00	13:14	cemented Btalus, Btalus, Narella sp. (approximately 1500 m)
*0:18:46	13:36	collecting rock, sponge, cemented Btalus, (Chonelasma sp.)
*1:13:27	14:31	boulders, cemented Btalus, sponges, basalt outcrops "1380 m," gorgonians, shrimp, red anemone (video off)
1:26:36	14:49	(video on), boulders, flow, gravel, fine sediment
1:32:18	14:54	boulders, Btalus, fine sediment, Sladenia sp., drop-off, gorgonians "1340 m"
1:43:14	15:05	Chonelasma sp. cemented Btalus

Time on Tape Counter	Data Logger	Subject/"Remarks made by Observers"
1:53:12	15:15	"wall, ash flows," cemented Btalus, coarse sediment, basalt
2:02:00	----	pau tape 2

<u>Tape 3</u>

Time on Tape Counter	Data Logger	Subject/"Remarks made by Observers"
0:00:00	15:36	fine sediment, Btalus, basalt
0:09:06	15:45	pau tape 3

VIDEOLOG P5-059

P.L.: Malahoff

Observers: Zaiger
Resnick

Pilot: Foster

Time on Tape Counter	Data Logger	Subject/"Remarks made by Observers"
*0:00:00	09:10	congrid, fine sediment, basalt, 1300 m
0:06:47	09:16	boulders, fine sediment "drop off", Narella sp., basalt, cemented Btalus, Hyalonema sp., shrimp, primnoid "chute"
*0:11:48	----	basalt, cemented Btalus, sponges, shrimp, fine sediment
0:18:19	----	"9:28," fine sediment chute, eel, basalt, fishes, Hyalonema sp., crab
0:30:00	09:40	fine sediment, boulders, Btalus, 1270 m
0:34:31	----	cemented Btalus, "9:43, 1265 m," fine sediment
*0:39:30	09:50	boulders, Lithodes longispina, hormathiid sp.3, Btalus, fine sediment
0:58:02	10:08	(sound off) Btalus, fine sediment, congrid, (sound intermittant)
1:06:19	----	(sound on) cemented Btalus
1:19:14	10:29	limestone, cemented Btalus, anemone, shark
1:21:54	----	pau tape 1

Time Counter	on Tape Data Logger	Subject/"Remarks made by Observers"

Tape 2

0:00:00	10:33	limestone, cemented Btalus, boulders
*0:08:00	----	collecting limestone "1015 m"
0:14:38	----	limestone, basalt "1015 m"
0:28:00	11:02	limestone, basalt, shrimp, gorgonian, boulders "vesicular aa blocks"
0:39:07	11:15	"photo 29" limestone reef
*0:42:14	11:18	limestone reef, jagged pieces of coral, sponges "940 m", collecting scoop sponges
0:57:00	----	(sound off) reef, scoop sponges
0:58:59	11:39	fine sediment, macrourid
1:00:00	11:41	"930 m" fine sediment, limestone
*1:09:41	----	trunk sponges, crinoid
*1:35:42	----	fine sediment, pillows 920 m, anemone, sponges *Hyalonema* sp.
1:43:00	----	eel
2:01:57	----	pau tape 2

Tape 3

0:00:00	----	limestone, fine sediment crinoid, sponge
0:04:37	----	limestone, Btalus, fine sediment, shark, sponge
*0:16:17	13:15	scoop sponges, limestone reef "930 m"
0:27:43	----	pau tape 3.

VIDEOLOG P5-060

P.L.: Malahoff

Observers: Jones
Zaiger
Pilot: Kerby

Time on Tape Counter	Data Logger	Subject/"Remarks made by Observers"
0:00:00	7:24	launch
*0:11:46	23:19	cemented Btalus, Narella sp., "1380 m," conger eel
0:29:54	----	cemented Btalus, Narella sp., gorgonians
0:40:09	----	gorgonians, cemented Btalus, sponges
0:59:46	----	cemented Btalus, sponges, gorgonians, basalt
01:07:03	----	gorgonians, shrimp, seastar, actinoscyphiid, 1000 m
*1:27:52	----	Semprella, sponges, cemented Btalus
*1:30:27	----	gorgonian, limestone, basalt, 920 m, soft coral
*1:51:00	----	scoop sponges, gorgonians, cemented Btalus, Lepidisis olapa, hormathiid, crabs, white anemone
2:01:48	----	pau tape 1

Tape 2

*0:00:00	01:18	basalt, fine sediment, gorgonians, scoop sponge, Semprella, gorgonians
0:05:08	01:23	basalt cliff, Narella sp., crab
*0:09:07	01:37	"965 m," coral reef
0:30:00	01:50	limestone reef "925 m"
*0:46:27	02:02	limestone reef, sponge, "top of reef," limestone, fish
0:56:29	02:14	sand, Paleopatides retifer, fish, limestone reef, brissingid

Time on Tape Counter	Data Logger	Subject/"Remarks made by Observers"
1:24:20	02:42	"960," limestone reef, midwater, limestone reef crest
1:29:06	----	basalt and limestone "on top, boulders," fine sediment
1:30:28	02:49	limestone, sponges, basalt, gorgonians, eel
1:45:54		pau tape 2

DIVE	SLIDE	SUBSTRATUM	ALGAE	SPONGES	CORALS	OTHER INVERTS	VERTEBRATES	OTHER	TIME DEPTH
Data Back									
P5-031									
01	01	rippled fine sed.				Sperosom obscurum			11:06 1935 m.
05	02	rippled fine sed.							11:18 1940 m.
06	03	rippled fine sed.							11:19 1940 m.
07	04	fine sed. cem. Btalus		Hyalonema sp.3					11:24 1950 m.
08	05	fine sed. cem. Btalus		Hyalonema sp.3					11:25 1950 m.
09	06	fine sed.							11:26 1950 m.
01	07	fine sed. cem. basalt		Hyalonema sp.3 Euplectella sp.		shrimp red ophiuroid Ptilocrinus sp.			11:28 1940 m.
02	08	fine sed. cem. basalt		Hyalonema sp.3		shrimp red ophiuroid Ptilocrinus sp.			11:29 1940 m.
03	09	fine sed. cem. basalt				shrimp red ophiuroid Ptilocrinus sp.			11:29 1940 m.
04	10	rippled fine sed.			gorgonian	ophiuroid mollusk			11:30 1930 m.
05	11	rippled fine sed. Btalus		Semprella cucumis	actinostolid tan gorgonian	shrimp red ophiuroid Sphaerodiscus ammophilus			11:34 1925 m.
06	12	rippled fine sed. cem. Btalus		S.cucumis	actinostolid tan gorgonian	shrimp red crab white ophiuroid S.ammophilus			11:34 1925 m.
07	13	fine sed. cem. Btalus				galatheid white ophiuroid		dead sponge	11:35 1925 m.

DIVE	SLIDE	SUBSTRATUM	ALGAE	SPONGES	CORALS	OTHER INVERTS	VERTEBRATES	OTHER	TIME DEPTH
P5-031									
Data Back									
08	14	fine sed. cem. Btalus		S.cucumis	gorgonian	shrimp red ophiuroid galatheid white			11:36 1925 m.
19	15	basalt cem. Btalus		S.cucumis		shrimp red			11:47 1900 m.
20	16	basalt cem. Btalus			stylatulid yellow				11:47 1900 m.
21	17	cem. Btalus fine sed. Btalus							11:49 1875 m.
22	18	cem. Btalus fine sed. Btalus		Hyalonema sp.3 S.cucumis	anemone white		Etmopterus villosus		11:55 1800 m.
23	19	cem. Btalus fine sed. Btalus				urchin			11:59 1800 m.
24	20	cem. Btalus basalt Btalus			anemone white	cidarid			12:03 1775 m.
25	21	cem. Btalus basalt Btalus							12:03 1775 m.
26	22	cem. Btalus			actinostolid tan				12:05 1775 m.
01	23	cem. Btalus basalt			hormathiid sp.2 actinostolid tan	galatheid cidarid			12:14 1760 m.
02	24	Btalus basalt			hormathiid sp.2 actinostolid tan	galatheid cidarid			12:15 1760 m.
03	25	cem. Btalus		S.cucumis rossellid white					12:19 1740 m.
04	26	cem. Btalus			anemone white hydroid	ophiuroid			12:21 1720 m.

DIVE	SLIDE	SUBSTRATUM	ALGAE	SPONGES	CORALS	OTHER INVERTS	VERTEBRATES	OTHER	TIME DEPTH
P5-031									
Data Back									
05	27	cem. Btalus		S.cucumis	anemone white	shrimp red			12:23 1710 m.
06	28	cem. Btalus				shrimp red			12:24 1700 m.
07	29	cem. Btalus				ophiuroid shrimp red			12:25 1690 m.
01	30	cem. Btalus		S.cucumis					12:27 1690 m.
02	31	cem. Btalus				ophiuroid			12:27 1685 m.
03	32	cem. Btalus				ophiuroid			12:28 1680 m.
04	33	cem. Btalus		rossellid white	anemone white	shrimp red			12:29 1675 m.
05	34	cem. Btalus		Semprella spicifera					12:31 1675 m.
06	35	cem. Btalus			anemone white				12:34 1680 m.
07	36	cem. Btalus				ophiuroid			12:38 1680 m.
08	37	cem. Btalus		S.cucumis					12:40 1680 m.
09	38	cem. Btalus		rossellid white Hyalonema sp.3 rossellid stalked					12:41 1680 m.
10	39	cem. Btalus		rossellid white rossellid stalked					12:42 1680 m.
11	40	cem. Btalus							12:43 1670 m.
12	41	basalt		rossellid white rossellid stalked		shrimp ophiuroid			12:44 1670 m.

DIVE	SLIDE	SUBSTRATUM	ALGAE	SPONGES	CORALS	OTHER INVERTS	VERTEBRATES	OTHER	TIME DEPTH
P5-031									
Data Back									
13	42	basalt		rossellid white rossellid stalked					12:44 1670 m.
14	43	Btalus		rossellid white rossellid stalked					12:45 1650 m.
15	44	Btalus							12:46 1650 m.
16	45	Btalus		S.cucumis					12:47 1650 m.
17	46	Btalus			Calibelemnon symmetricum anemone white				12:48 1650 m.
18	47	Btalus			anemone white	ophiuroid			12:49 1645 m.
19	48	cem. Btalus		rossellid white					12:50 1645 m.
20	49	cem. Btalus Btalus							12:52 1635 m.
21	50	cem. Btalus		Hyalonema sp.					12:53 1635 m.
22	51	cem. Btalus							12:53 1635 m.
23	52	cem. Btalus		rossellid white					12:54 1630 m.
24	53	cem. Btalus		rossellid white					12:54 1630 m.
25	54	cem. Btalus		S.cucumis					12:55 1625 m.
26	55	cem. Btalus		S.cucumis		ophiuroid			12:55 1625 m.
27	56	cem. Btalus							12:56 1625 m.

DIVE	SLIDE	SUBSTRATUM	ALGAE	SPONGES	CORALS	OTHER INVERTS	VERTEBRATES	OTHER	TIME DEPTH
P5-031									
Data Back									
28	57	cem. Btalus		S.cucumis rossellid white		pagurid (mollusk) shrimp red			12:56 1620 m.
29	58	cem. Btalus		S.spirifera					12:56 1620 m.
30	59	cem. Btalus		rossellid stalked	anemone white	ophiuroid			12:57 1610 m.
31	60	cem. Btalus		S.cucumis					12:57 1610 m.
32	61	cem. Btalus fine sed.		rossellid white Hyalonema sp.3					12:58 1610 m.
33	62	cem. Btalus		hexactinellid	cnidarian C.symmetricum				12:59 1600 m.
01	63	cem. Btalus							13:01 1625 m.
02	64	cem. Btalus			anemone white	ophiuroid			13:01 1625 m.
03	65	cem. Btalus							13:06 1625 m.
04	66	cem. Btalus		S.cucumis	primnoid				13:07 1625 m.
05	67	cem. Btalus fine sed.		rossellid white					13:15 1625 m.
06	68	cem. Btalus fine sed.			Chrysogorgia sp.1				13:15 1625 m.
07	69	cem. Btalus		rossellid white	Lepidisis olapa				13:15 1625 m.
08	70	cem. Btalus		rossellid white	Narella sp.3 L.olapa				13:15 1625 m.
09	71	cem. Btalus fine sed.		Pheronema sp.	Narella sp.3				13:16 1625 m.

DIVE	SLIDE	SUBSTRATUM	ALGAE	SPONGES	CORALS	OTHER INVERTS	VERTEBRATES	OTHER	TIME DEPTH
P5-031									
Data Back									
10	72	Btalus							13:16 1625 m.
11	73	Btalus fine sed.			Irridogorgia bella Bathypathes crassa				13:17 1610 m.
12	74	Btalus		rossellid white	Narella sp.3				13:17 1610 m.
13	75	Btalus							13:17 1610 m.
14	76	Btalus fine sed.		rossellid white	L.olapa Narella sp.3				13:18 1610 m.
15	77	Btalus fine sed.			L.olapa Narella sp.3				13:18 1610 m.
16	78	Btalus		hexactinellid			shark		13:19 1610 m.
17	79	cem. Btalus		rossellid white					13:19 1610 m.
18	80	cem. Btalus		Hyalonema sp.2	Irridogorgia superba Narella sp.3				13:20 1600 m.
19	81	cem. Btalus			I.superba Narella sp.3				13:22 1600 m.
20	82	cem. Btalus			Narella sp.3				13:22 1600 m.
21	83	cem. Btalus			Narella sp.3 L.olapa I.superba				13:24 1600 m.
22	84	cem. Btalus			I.superba Narella sp.3				13:24 1600 m.
23	85	cem. Btalus			Narella sp.3 L.olapa				13:25 1600 m.
24	86	cem. Btalus			Narella sp.3				13:27 1600 m.

DIVE	SLIDE	SUBSTRATUM	ALGAE	SPONGES	CORALS	OTHER INVERTS	VERTEBRATES	OTHER	TIME DEPTH
P5-031									
Data Back									
25	87	cem. Btalus			Narella sp.3				13:28 1600 m.
26	88	cem. Btalus		rossellid stalked	L.olapa Narella sp.3 primnoid harp Chrysogorgia sp.1	cidarid			13:29 1600 m.
27	89	cem. Btalus			L.olapa primnoid 2 harp Narella sp.3 Chrysogorgia sp.1				13:29 1600 m.
28	90	cem. Btalus			Narella sp.3				13:34 1590 m.
29	91	cem. Btalus		hexactinellid	Narella sp.3 L.olapa		fish		13:34 1590 m.
30	92	cem. Btalus			Narella sp.3 L.olapa				13:30 1590 m.
31	93	cem. Btalus			Narella sp.3				13:38 1590 m.
32	94	cem. Btalus			Narella sp.3 L.olapa				13:39 1575 m.
33	95	cem. Btalus							13:43 1440 m.
34	96	cem. Btalus							13:44 1440 m.
35	97	coarse sed.							13:46 1440 m.
36	98	coarse sed.							13:46 1440 m.
37	99	coarse sed.			Narella sp.3 Anthomastus sp.				13:46 1440 m.
38	100	coarse sed. cem. Btalus			gorgonian				13:47 1440 m.

DIVE	SLIDE	SUBSTRATUM	ALGAE	SPONGES	CORALS	OTHER INVERTS	VERTEBRATES	OTHER	TIME DEPTH
P5-031									
39	101	cem. Btalus							13:47 1440 m.
40	102	cem. Btalus			zoanthid brown ~~Parazoanthus sp.2~~ L.olapa Narella sp.3				13:47 1440 m.
41	103	cem. Btalus			Ellisella sp.				13:47 1440 m.
42	104	cem. Btalus				shrimp red			13:48 1445 m.
43	105	cem. Btalus			Narella sp.3				13:48 1445 m.
44	106	cem. Btalus			Ellisella sp.				xx:xx 1445 m.
45	107	cem. Btalus			Narella sp.3	ophiuroid			xx:xx 1445 m.
46	108	cem. Btalus		Chonelasma sp.	Narella sp.3 scleractinean	shrimp red ophiuroid			xx:xx 1445 m.
114	109	cem. Btalus		Chonelasma sp.	L.olapa Narella sp.3	shrimp red			13:58 1425 m.
115	110	cem. Btalus		Chonelasma sp.	scleractinean Narella sp.3 L.olapa				14:01 1425 m.
116	111	cem. Btalus			Narella sp.3				14:01 1425 m.
117	112	cem. Btalus coarse sed.			Narella sp.3	Nematocarcinus cf tenuirostris			14:12 1425 m.
118	113	cem. Btalus coarse sed.			Narella sp.3 L.olapa				14:14 1420 m.

DIVE	SLIDE	SUBSTRATUM	ALGAE	SPONGES	CORALS	OTHER INVERTS	VERTEBRATES	OTHER	TIME DEPTH
P5-032									
	Data Back								
02	02	cem. Btalus fine sed.			Ellisella sp.			?	11:26 1380 m.
03	03	cem. Btalus fine sed.			primnoid	ophiuroid			11:26 1380 m.
04	04	cem. Btalus fine sed.		Semprella cucumis	Chrysogorgia sp.1				11:27 1380 m.
05	05	cem. Btalus fine sed.			scleractinean Lepidisis olapa Candidella helminthopora Chrysogorgia sp.2				11:29 1380 m.
06	06	cem. Btalus fine sed.			primnoid	ophiuroid			11:30 1380 m.
07	07	cem. Btalus fine sed.			N.bowersi C.helminthopora	ophiuroid			11:30 1380 m.
08	08	cem. Btalus fine sed.			Ellisella sp.				11:31 1380 m.
09	09	cem. Btalus fine sed.			Calyptrophora ~~primnoid~~ fan scleractinean L.olapa				11:31 1380 m.
10	10	cem. Btalus fine sed.			" ~~primnoid~~ fan scleractinean L.olapa				11:31 1380 m.
11	11	cem. Btalus fine sed.			" ~~primnoid~~ fan scleractinean L.olapa				11:31 1380 m.
12	12	cem. Btalus			L.olapa				11:39 1380 m.
13	13	basalt coarse sed. cem. Btalus				Nematocarcinus cf. tenuirostris tubeworm			11:42 1380 m.
14	14	basalt			C.helminthopora	tubeworm cidarid urchin			11:43 1380 m.

DIVE	SLIDE	SUBSTRATUM	ALGAE	SPONGES	CORALS	OTHER INVERTS	VERTEBRATES	OTHER	TIME DEPTH
P5-032									
	Data Back								
15	15	basalt			C.helminthopora	shrimp cidarid urchin tubeworm			11:43 1380 m.
16	16	coarse sed. sand cem. Btalus							11:43 1380 m.
17	17	coarse sed. sand cem. Btalus		Chonelasma sp.			Aldrovandia proboscidea		11:47 1380 m.
18	18	coarse sed. cem. Btalus			scleractinean gorgonian				11:47 1370 m.
19	19	cem. Btalus sand					A.proboscidea		11:47 1370 m.
20	20	cem. Btalus sand			anemone paramuricid blue	tubeworm		?	11:47 1370 m.
21	21	coarse sed.					A.proboscidea		11:48 1370 m.
22	22	coarse sed. sand cem.Btalus							11:49 1370 m.
23	23	coarse sed. sand basalt Btalus			gorgonian spider	Munida brucei comatulid narrow Comatulid			11:49 1370 m.
24	24	Btalus sand basalt			actinostolid tan gorgonian primnoid	ophiuroid			11:49 1370 m.
25	25	Btalus sand		Chonelasma sp.	actinostolid tan				11:49 1370 m.
26	26	basalt cem. Btalus				ophiuroid			11:50 1370 m.
27	27	coarse sed. fine sed.							11:51 1370 m.

P5-032

DIVE	SLIDE	SUBSTRATUM	ALGAE	SPONGES	CORALS	OTHER INVERTS	VERTEBRATES	OTHER	TIME DEPTH
	Data Back								
28	28	coarse sed. fine sed. cem. Btalus					A.proboscidea		11:53 1360 m.
29	29	coarse sed. fine sed. cem. Btalus					A.proboscidea		11:53 1360 m.
30	30	winnowed sed. cem. Btalus					A.proboscidea		11:54 1360 m.
31	31	coarse sed. fine sed. cem. Btalus							11:55 1360 m.
32	32	coarse sed. fine sed. cem. Btalus			Chrysogorgia sp.3 scleractinean L.olapa	cidarid shrimp red			11:55 1360 m.
33	33	cem. Btalus fine sed.			L.olapa				11:58 1360 m.
34	34	cem. Btalus basalt			Candidella helminthopora actinoscyph~~id~~ia sp 3				11:59 1350 m.
35	35	coarse sed. Btalus fine sed.							12:07 1350 m.
36	36	coarse sed. Btalus fine sed. cem. Btalus							12:11 1325 m.
01	37	cem. Btalus Btalus		Chonelasma sp.	Narella sp.3 gorgonian white	shrimp red			xx:xx 1325 m.
02	38	cem. Btalus Btalus		Chonelasma sp.					xx:xx 1325 m.
03	39	cem. Btalus Btalus		Chonelasma sp.	L.olapa				xx:xx 1325 m.
04	40	cem. Btalus Btalus			gorgonian white L.olapa				xx:xx 1325 m.

DIVE	SLIDE	SUBSTRATUM	ALGAE	SPONGES	CORALS	OTHER INVERTS	VERTEBRATES	OTHER	TIME DEPTH
P5-032									
Data Back									
05	41	cem. Btalus			C.helminthopora	ophiuroid			xx:xx 1325 m.
06	42	cem. Btalus fine sed.		Hyalonema sp.3 Chonelasma sp. rossellid stalked	L.olapa scleractinean				xx:xx 1325 m.
07	43	cem. Btalus fine sed. Btalus		trunk	Chrysogorgia sp.2 L.olapa				xx:xx 1325 m.
08	44	basalt outcrop cem. Btalus			gorgonian white				xx:xx 1325 m.
09	45	Btalus fine sed basalt						house rock	xx:xx 1290 m.
10	46	basalt			gorgonian spider				xx:xx 1290 m.
11	47	Btalus fine sed.		sponge	L.olapa gorgonian white Ellisella sp.	tubeworm			xx:xx 1290 m.
46	48	Btalus fine sed.			gorgonian white				12:57 1300 m.
47	49	cem. Btalus Btalus			L.olapa				xx:xx 1300 m.
48	50	cem. Btalus basalt Btalus			gorgonian Narella cf. bowersi	ophiuroid			xx:xx 1300 m.
49	51	cem. Btalus							xx:xx 1320 m.
50	52	cem. Btalus basalt fine sed.			gorgonian	ophiuroid			xx:xx 1320 m.
51	53	cem. Btalus basalt fine sed.				ophiuroid			xx:xx 1320 m.
53	54	cem. Btalus							xx:xx

DIVE	SLIDE	SUBSTRATUM	ALGAE	SPONGES	CORALS	OTHER INVERTS	VERTEBRATES	OTHER	TIME DEPTH
P5-032									
Data Back									
54	55	cem. Btalus			Narella sp. 3	shrimp red			13:37 1320 m.
55	56	cem. Btalus			gorgonian white Narella sp.3				xx:xx 1225 m.
56	57	cem. Btalus			Ellisella sp. gorgonian				xx:xx 1225 m.
57	58	cem. Btalus							xx:xx 1200 m.
58	59	cem. Btalus				seastar			xx:xx 1170 m.
59	60	cem. Btalus			Narella sp.3	shrimp			xx:xx 1150 m.

DIVE SLIDE	SUBSTRATUM	ALGAE	SPONGES	CORALS	OTHER INVERTS	VERTEBRATES	OTHER	TIME DEPTH
P5-058 (selected slides kept)								
04	cem. Btalus		rossellid stalked	anemone white	crab			11:45 1540 m.
05	cem. Btalus		rossellid stalked	anemone white	crab			11:45 1540 m.
06	cem. Btalus		rossellid stalked	anemone white	crab			11:48 1540 m.
07	cem. Btalus		rossellid stalked	anemone white				11:49 1540 m.
08	cem. Btalus		rossellid stalked					11:50 1540 m.
09	cem. Btalus		Semprella cucumis					11:57 1540 m.
10	cem. Btalus basalt				shrimp red			11:57 1540 m.
11	cem. Btalus			Lepidisis olapa Narella sp.3				11:59 1540 m.
12	cem. Btalus			L.olapa				11:59 1540 m.
13	cem. Btalus			L.olapa primnoid				12:36 1540 m.

DIVE	SLIDE	SUBSTRATUM	ALGAE	SPONGES	CORALS	OTHER INVERTS	VERTEBRATES	OTHER	TIME DEPTH
P5-059 (selected slides kept)									
	Data Back								
01	06	Btalus fine sed.							09:45 1260 m.
02	07	Btalus fine sed. boulder			anemone white hormathiid sp.3	ophiuroid Lithodes longispinna tubeworm			09:49 1260 m.
03	08	Btalus fine sed. boulder			anemone white hormathiid sp.3	ophiuroid L.longispinna tubeworm			09:49 1260 m.
04	09	Btalus fine sed. boulder				L.longispinna ophiuroid			09:50 1260 m.
06	11	limestone cem. Btalus basalt		Semprella spicifera		shrimp red			10:41 1015 m.
07	12	limestone cem. Btalus basalt							10:45 1015 m.
08	13	limestone cem. Btalus basalt		Eurete sp.		tubeworm			10:52 1015 m.
09	14	limestone cem. Btalus basalt		Eurete sp.		tubeworm Plesionika banded			10:53 1015 m.
10	15	limestone cem. Btalus basalt				tubeworm Plesionika banded			10:54 1015 m.
11	16	limestone cem. Btalus basalt				tubeworm Plesionika banded			10:54 1015 m.
13	18	limestone cem. Btalus basalt		Eurete sp.		tubeworm Plesionika banded			11:00 1015 m.

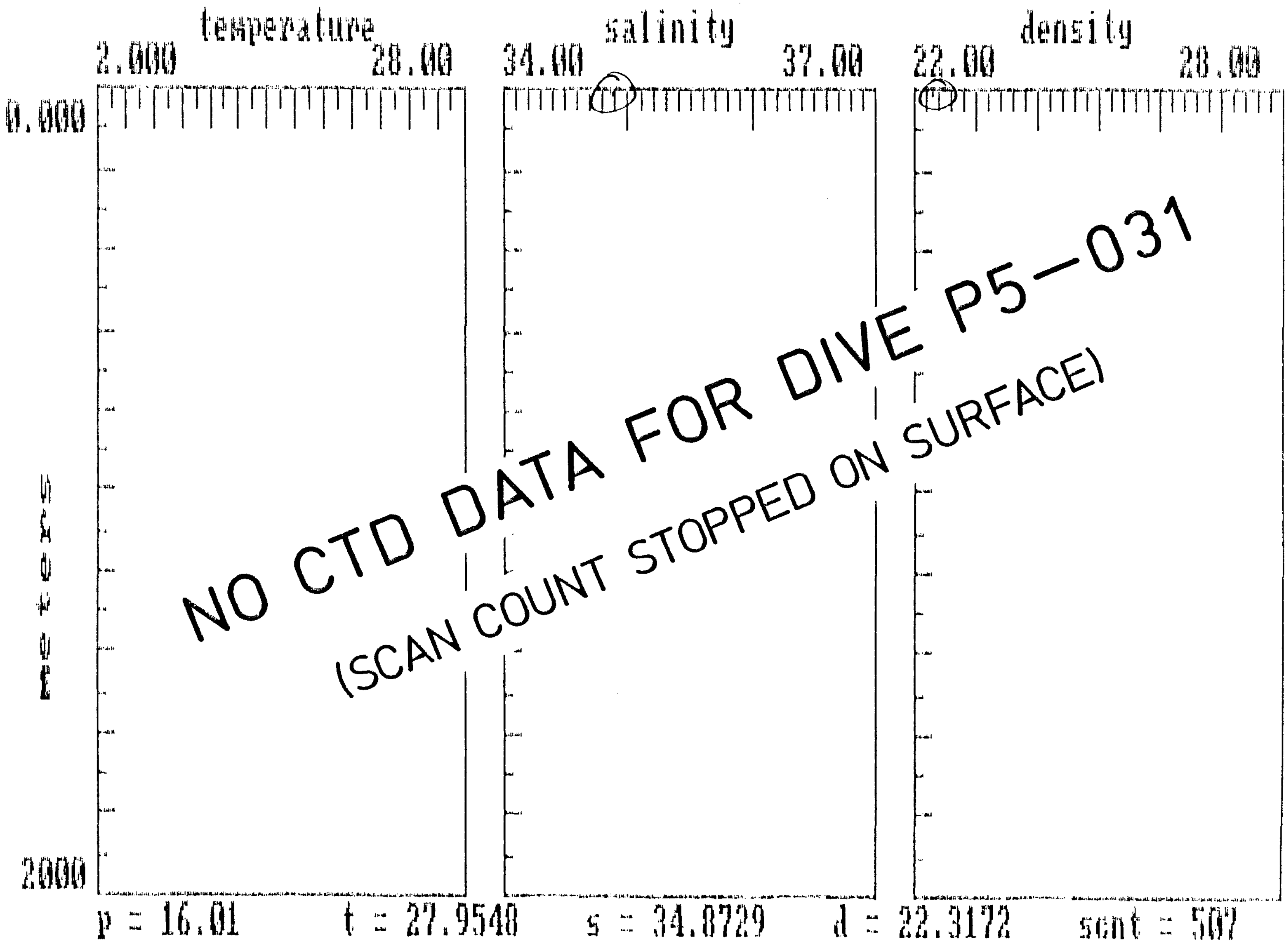
DIVE	SLIDE	SUBSTRATUM	ALGAE	SPONGES	CORALS	OTHER INVERTS	VERTEBRATES	OTHER	TIME DEPTH
P5-059									
14	19	limestone cem. Btalus boulder			Narella cf bowersi Chrysogorgia sp.1	ophiuroid			11:03 1015 m.
15	20	limestone cem. Btalus boulder			Narella cf bowersi Chrysogorgia sp.1	ophiuroid			11:04 1015 m.
16	01	limestone cem. Btalus			Narella cf bowersi	ophiuroid			11:06 1015 m.
17	23	limestone basalt boulder							11:09 1000 m.
18	24	limestone basalt boulder							11:09 1000 m.
19	25	limestone basalt boulder						dead sponge	11:09 1000 m.
20	26	limestone boulders basalt			primnoid Narella cf bowersi	Asteroschema sp.			11:10 1000 m.
21	27	limestone boulders basalt							11:10 1000 m.
22	28	basalt boulders			gorgonian gorgonian white				11:12 1000 m.
23	29	limestone						sponge skeletons	11:14 980 m.
24	30	limestone						sponge skeletons	11:14 980 m.
25	31	limestone						sponge skeletons	11:16 980 m.
27	33	limestone						sponge skeletons	11:18 980 m.

DIVE	SLIDE	SUBSTRATUM	ALGAE	SPONGES	CORALS	OTHER INVERTS	VERTEBRATES	OTHER	TIME DEPTH
P5-059									
28	34	limestone				ophiuroid		sponge skeletons	11:18 940 m.
29	35	limestone			Irridigorgia superba gorgonian	ophiuroid Plesionika banded		sponge skeletons	11:20 940 m.
30	36	limestone				comatulid black		sponge skeletons	11:20 940 m.
31	37	limestone				comatulid black		sponge skeletons	11:20 930 m.
32	38	limestone			gorgonian	shrimp red		sponge skeletons	11:31 930 m.
33	39	limestone		scoop				sponge skeletons	11:35 930 m.
34	01	pahoehoe fine sed.					fish		12:27 920 m.
35	02	pahoehoe fine sed.			Narella sp.3 gorgonian white				12:28 920 m.
36	03	fine sed. blocky basalt		S.spicifera		comatulid banded			12:43 920 m.
37	04	fine sed. blocky basalt		S.spicifera		comatulid banded			12:44 920 m.
38	05	fine sed. blocky basalt		S.spicifera		comatulid banded			12:45 920 m.
40	02	fine sed. blocky basalt		S.spicifera		comatulid banded			12:46 920 m.
41	03	sand basalt							12:52 920 m.
42	04	limestone fine sed.				shrimp red		dead sponge	13:02 927 m.
43	05	limestone fine sed.				shrimp red		dead sponge	13:02 927 m.

DIVE	SLIDE	SUBSTRATUM	ALGAE	SPONGES	CORALS	OTHER INVERTS	VERTEBRATES	OTHER	TIME DEPTH
P5-059									
44	06	limestone fine sed.				shrimp red		dead sponge	13:03 927 m.
45	07	limestone fine sed.							13:04 927 m.
46	08	limestone fine sed.							13:05 927 m.
47	09	limestone fine sed.							13:07 927 m.
48	10	limestone		scoop				sponge skeletons	13:15 927 m.
49	11	limestone		scoop				sponge skeletons	13:17 927 m.
50	12	limestone		scoop					13:17 927 m.
51	13	limestone		scoop					13:19 927 m.
52	14	limestone			gorgonian				13:19 927 m.
53	15	limestone							13:22 927 m.

DIVE	SLIDE	SUBSTRATUM	ALGAE	SPONGES	CORALS	OTHER INVERTS	VERTEBRATES	OTHER	TIME DEPTH
P5-060 (selected slides kept)									
	Data Back								
03	03	cem. Btalus			gorgonian white				10:24 1020 m.
04	04	cem. Btalus			gorgonian white				10:24 1020 m.
05	05	cem. Btalus			gorgonian white				10:24 1020 m.
06	06	indet.			gorgonian white				10:25 1020 m.
08	08	cem. Btalus limestone			gorgonian white				10:26 1000 m.
09	09	cem. Btalus limestone			gorgonian white				10:26 975 m.
10	10	cem. Btalus limestone			gorgonian white primnoid Lepidisis olapa				10:29 975 m.
11	11	cem. Btalus		Semprella cucumis	gorgonian				10:29 975 m.
12	12	cem. Btalus limestone			gorgonian				10:30 975 m.
13	13	cem. Btalus			Parazoanthus sp.2 Ellisella sp. primnoid				10:32 975 m.
14	14	cem. Btalus			gorgonian				10:55 975 m.
15	15	cem. Btalus limestone			primnoid gorgonian white Chrysogorgia sp.2				10:55 975 m.
16	16	cem. Btalus			gorgonian primnoid				10:56 975 m.
17	17	cem. Btalus			Ellisella sp.				10:58 975 m.

DIVE	SLIDE	SUBSTRATUM	ALGAE	SPONGES	CORALS	OTHER INVERTS	VERTEBRATES	OTHER	TIME DEPTH
P5-060									
	Data Back								
18	18	cem. Btalus			primnoid	seastar		sponge skeleton	10:59 975 m.
19	19	cem. Btalus			L.olapa Narella sp.3	galatheid			11:00 920 m.
20	20	cem. Btalus fine sed.			L.olapa gorgonian white Ellisella sp.				11:04 920 m.
22	22	limestone basalt		trunk					11:19 920 m.
23	23	limestone coarse sed.		trunk					11:19 920 m.
24	24	limestone basalt			neptheid purple Ellisella sp.				11:19 920 m.
25	25	limestone basalt			Ellisella sp. neptheid purple	shrimp			11:20 920 m.
26	26	limestone basalt			L.olapa				11:20 920 m.
27	27	limestone basalt			Ellisella sp. neptheid purple				11:20 920 m.
28	28	limestone basalt			Ellisella sp. neptheid purple				11:20 920 m.
29	29	limestone basalt			Narella cf bowersi	Sladenia sp. ~~Lophiodes sp.~~			11:35 960 m.



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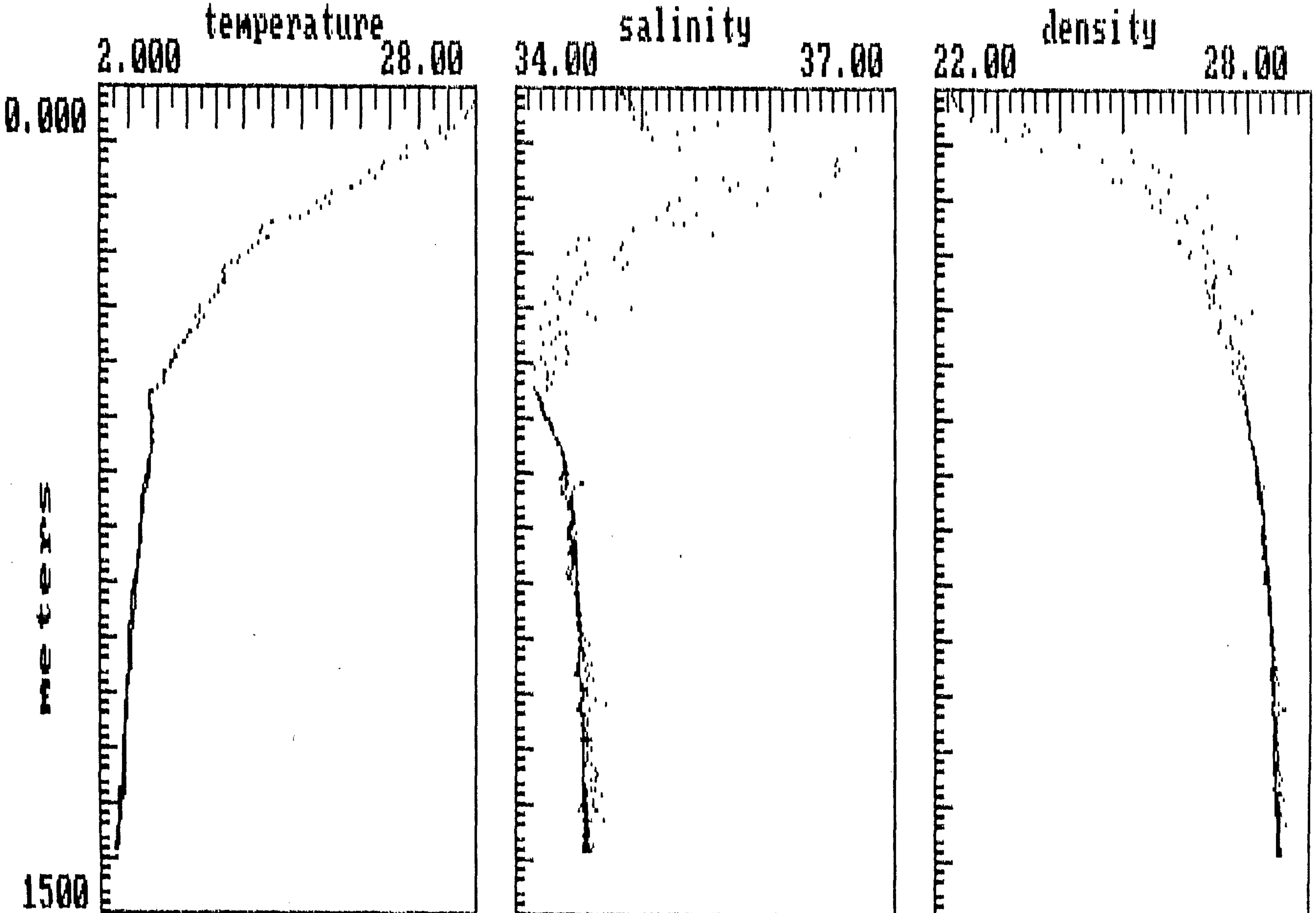

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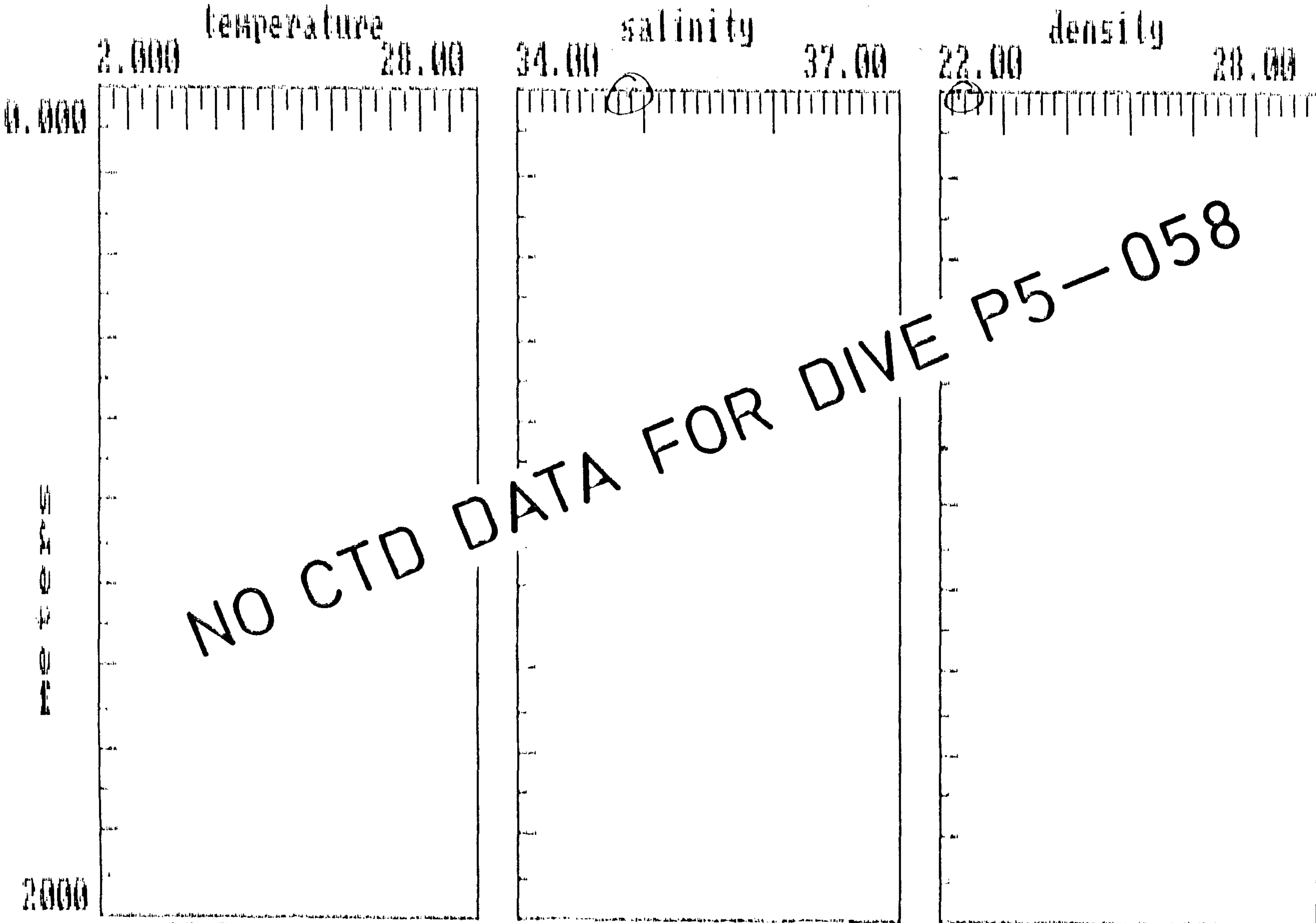
KOHALA SLOPE P5-032



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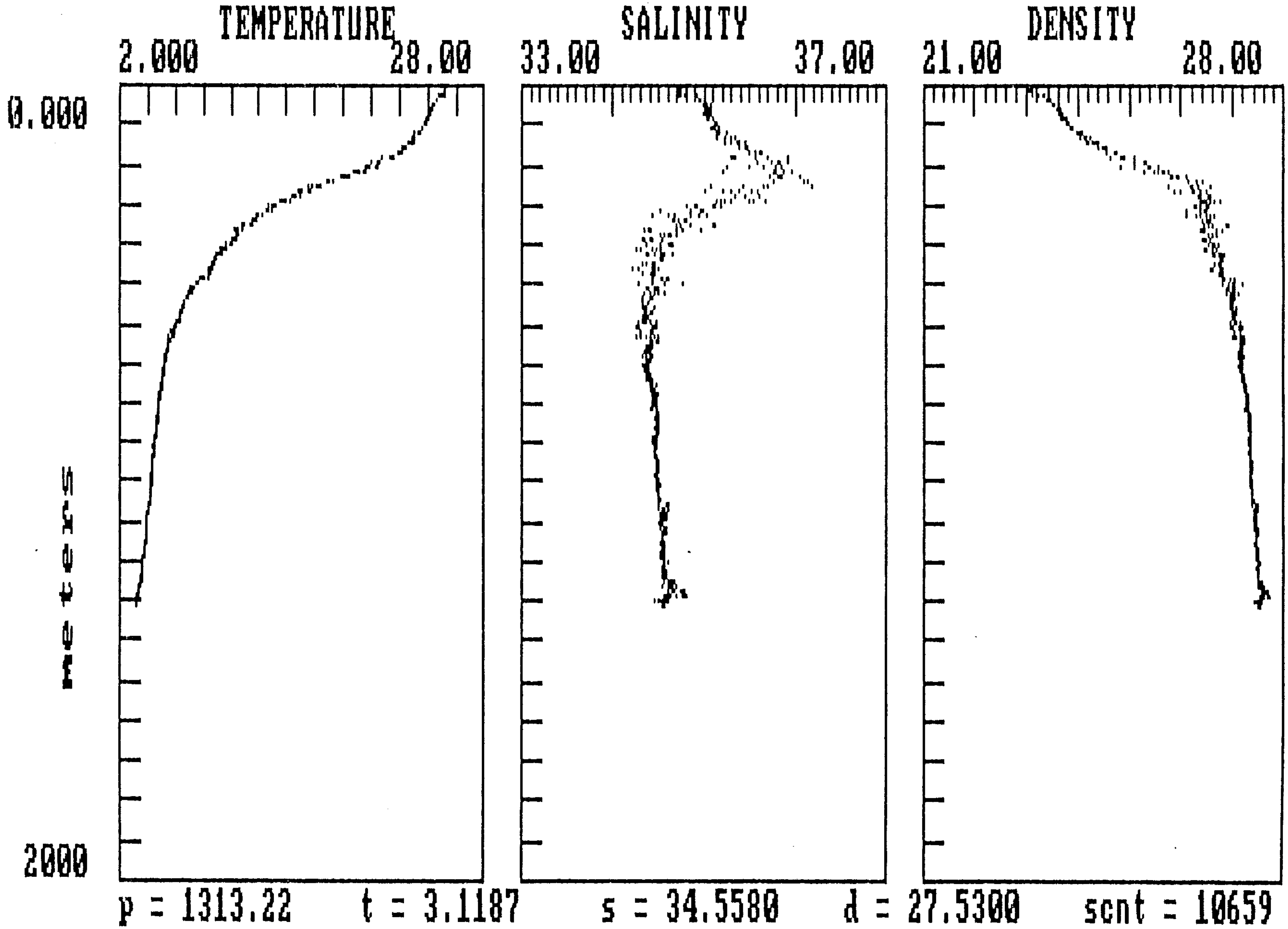
KOHALA SLOPE P5-058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28.00
SALINITY
33.00
37.00
DENSITY
21.00
28.00
0.000
meters
2000
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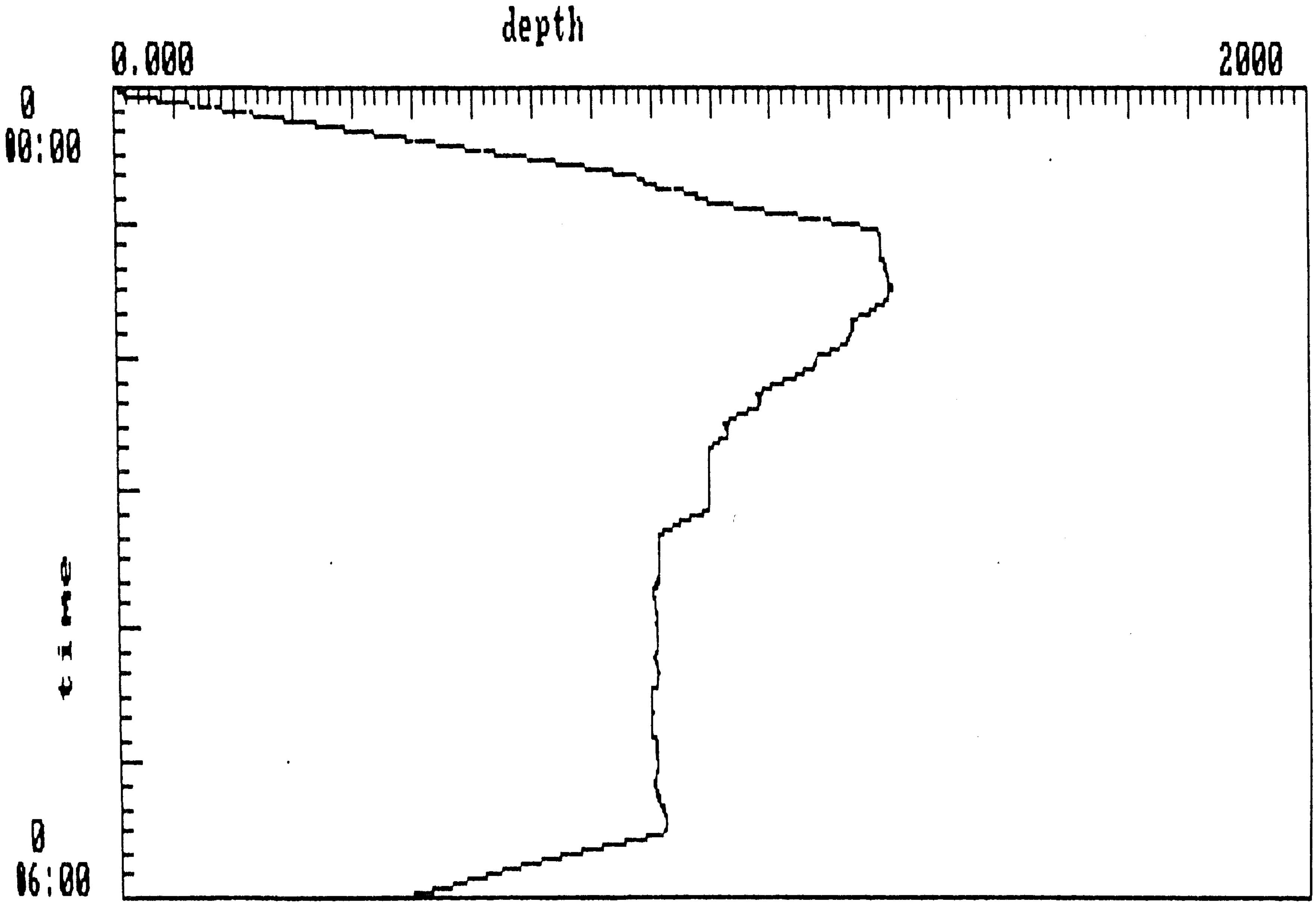
P5-059



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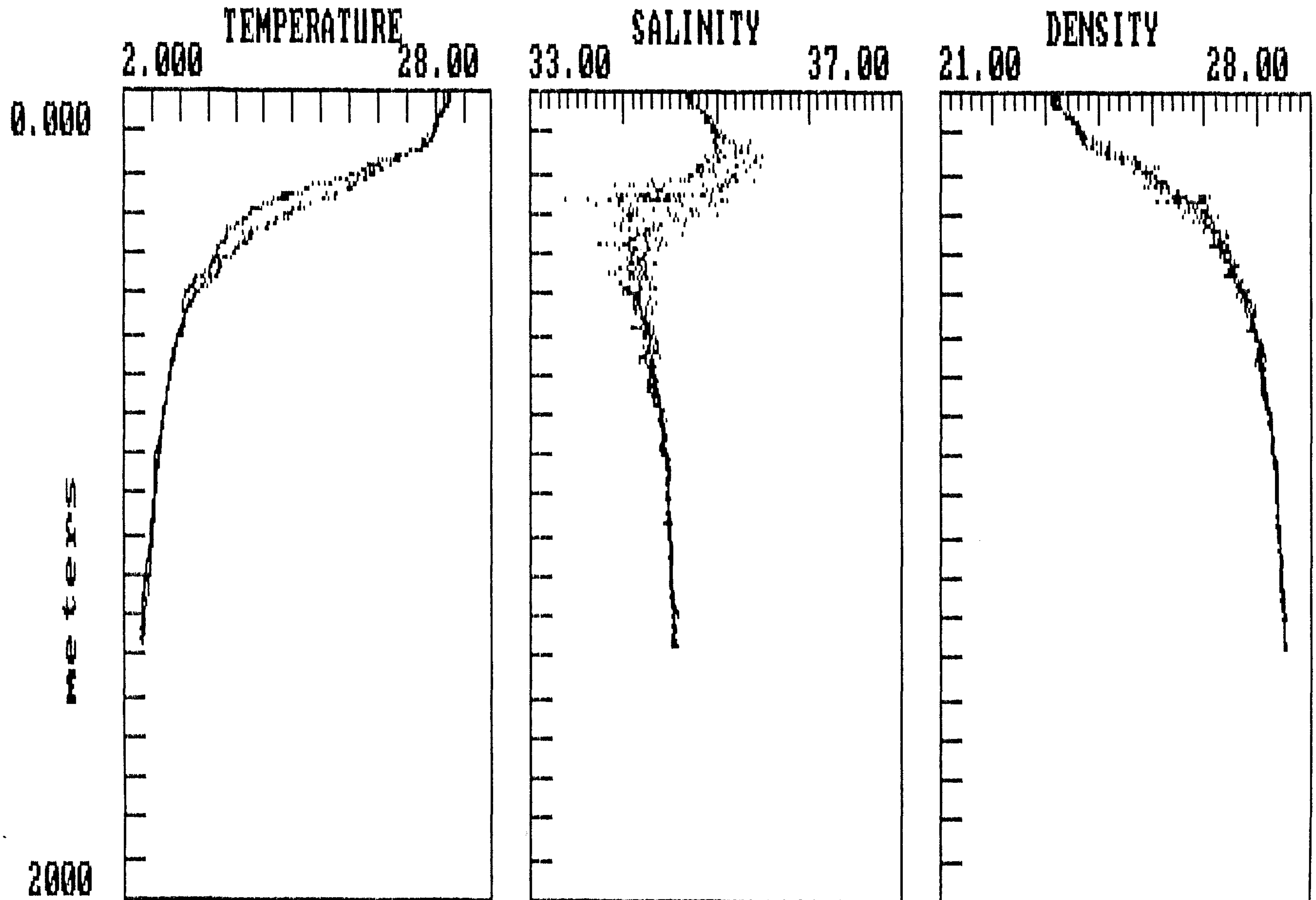
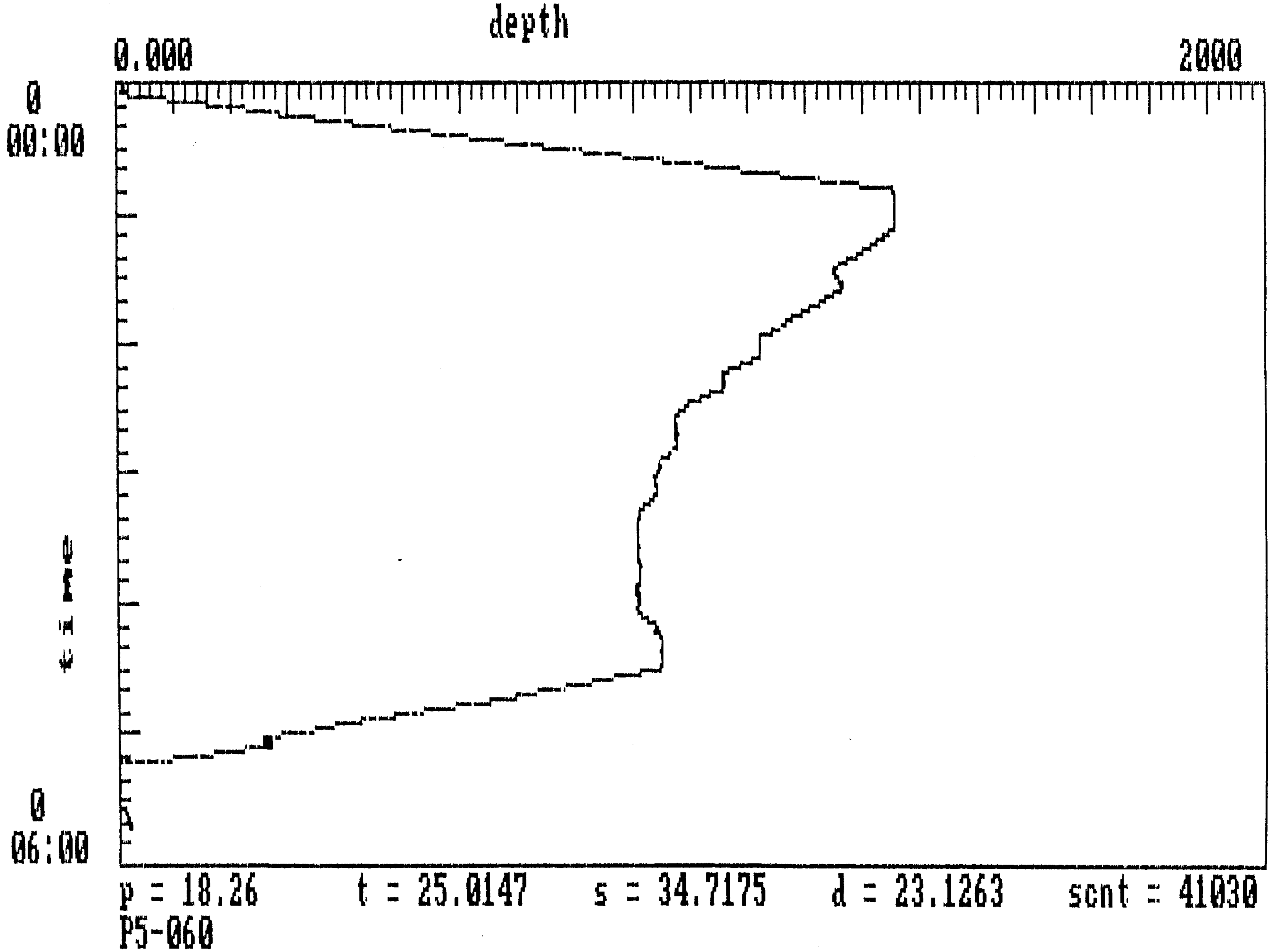
P5-059



p = 18.26 t = 25.0147 s = 34.7175 d = 23.1263 scnt = 41030
P5-060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2000
0
00:00
time
0
06:00
p = 18.26
t = 25.0147
s = 34.7175
d = 23.1263
scnt = 41030
P5-060

HAWAII UNDERSEA RESEARCH LABORATORY

QUICK LOOK REPORT MISSION NO. P5-061

MISSION STATUS

Location: Alenuihaha Channel - Maui slope

Mission Date: 18 May 1988

Maximum Depth: 1015 m

Project Title: Hawaii Deep Water Cable Route Survey

Project Leader: Dr. Alexander Malahoff

Address: University of Hawaii
Dept. of Oceanography
1000 Pope Road, MSB 319
Honolulu, Hawaii 96822

Phone: 948-6802

Observers: Kimo Zaiger, Dr. Ed Noda

Address: University of Hawaii
Department of Oceanography
1000 Pope Road, MSB 318
Honolulu, Hawaii 96822

Scientific Data Acquired : Prepare an abstract outlining your objectives, techniques, findings, etc.

Objective: This dive was to survey the portion of the proposed cable route located between 1050 m and 900 m depth on the Maui slope. This is the area in which the cable route has to make a 90 degree turn to the east in order to avoid rough features inferred from side scan sonar data.

Procedure: The cable route and rough features of engineering interest were verified and plotted by visual observations from the submersible PISCES V. Real time navigational positions were received from a surface support vessel which used Datasonics long baseline and Edo Western short baseline systems to track the submersible, and ranging data from shore-based Falcon mini-ranger transmitters to calculate the submersible's position with relatively high precision.

Findings: The proposed cable route was verified to be suitable with the substrate made up predominantly of sandy sediments with low roughness factor. There seems to be more leeway in the route path than the 200 meters minimum width just upslope from the 90 degree turn which was depicted on the side scan based working charts. In that location, the sandy bottom extends laterally at least another 100 meters in width. The rough features from side scan data were found to be mixtures of reef terraces, reef rock and basalt talus. Limitations, failures, or operational problems noted:

MISSION EVALUATION:

Limitations, failures, or operational problems noted:

None

Recommendations for corrective action or improvement:

None

In your opinion, did the mission essentially achieve its purpose? Compare actual work accomplished with the work that was expected to be accomplished.

Yes. Survey produced usable data and verified that the proposed cable route is practicable in this area.

List specimens or samples collected on the mission.

Cemented sand and shell fragments from Maui slope terrace at approximately 900 meters.

DATA RELEASE

Data may be retained by the project leader for up to 2 years after the mission date with the following exception. NOAA may request to use photos for publication or publicity purposes at any time.

Fill in the appropriate statement below and sign this form.

I hereby release the data archived by HURL for public consumption following mission "HDWC ROUTE SURVEY" (project title) held on MAY 18, 1988 (date) in the following way:

a. CTD data by May, 1989 (date)

b. voice transcripts, video, and still camera film by May, 1989 (date)

c. other May, 1989 (date)

d. I will give my written consent to individuals wishing to use these data prior to the above dates depending on the nature of the request(s).

A. Malahoff

Project Leader

HAWAII UNDERSEA RESEARCH LABORATORY

QUICK LOOK REPORT MISSION NO. P5-062

MISSION STATUS

Location: Maui - Alenuihaha Channel

Mission Date: 20 May 1988

Maximum Depth: 1300 m

Project Title: Hawaii Deep Water Cable Route Survey

Project Leader: Dr. Alexander Malahoff

Address: Hawaii Undersea Research Laboratory
1000 Pope Road MSB 319
Honolulu, Hawaii 96822

Phone: (808) 948-6802

Observers: A. Malahoff, G. Krasnick

Address: Same as above

Parsons Hawaii

Scientific Data Acquired : Prepare an abstract outlining your objectives, techniques, findings, etc.

Surveyed drowned coral reef at 1200 meters, sampled the reef. The reef is well preserved with corals. The face of the reef is etched by dissolution. Alternate lava flows and corals are seen in the cross-section of the reef. The base of the reef is covered by sediments.

MISSION EVALUATION:

Limitations, failures, or operational problems noted:

None, all systems operational.

Recommendations for corrective action or improvement:

None.

In your opinion, did the mission essentially achieve its purpose? Compare actual work accomplished with the work that was expected to be accomplished.

Outstanding dive.

List specimens or samples collected on the mission.

Basalt and fossil reef fragments.

DATA RELEASE

Data may be retained by the project leader for up to 2 years after the mission date with the following exception. NOAA may request to use photos for publication or publicity purposes at any time.

Fill in the appropriate statement below and sign this form.

I hereby release the data archived by HURL for public consumption following mission "Hawaii Deep Water Cable Route Survey" (project title) held on 20 May 1988 (date) in the following way:

a. CTD data by May 1989 (date)

b. voice transcripts, video, and still camera film by May 1989 (date)

c. other May 1989 (date)

d. I will give my written consent to individuals wishing to use these data prior to the above dates depending on the nature of the request(s).

Project Leader

HAWAII UNDERSEA RESEARCH LABORATORY

QUICK LOOK REPORT MISSION NO. P5-063

MISSION STATUS

Location:	Alenuihaha Channel - Maui Slope - cable dive in narrow gate area
Mission Date:	May 23, 1988
Maximum Depth:	1350 m
Project Title:	Hawaii Deep Water Cable Route Survey
Project Leader:	Dr. Alexander Malahoff
Address:	University of Hawaii Dept. of Oceanography 1000 Pope Road, MSB 319 Honolulu, Hawaii 96822
Phone:	948-6802
Observers:	J. Wiltshire, J. Van Ryzin
Address:	Hawaii Undersea Research Laboratory 1000 Pope Road, MSB 324 Honolulu, Hawaii 96822 948-6042

Scientific Data Acquired : Prepare an abstract outlining your objectives, techniques, findings, etc.

The purpose of the dive was to investigate a narrow passage on the Maui slope at a depth of about 1200 m for the possible passage of a power cable. The passage turned out to be a sand chute flanked on both sides by old coral reef outcrops. The reef outcrops were several meters in height. Several adjacent geological structures were investigated. These had been recorded as reflectors on side-scan sonar records. They also turned out to be highly weathered submerged reefs. At various points off the prime cable route the bottom was strewn with rounded basaltic boulders about 1 foot in diameter. Two samples were collected.

MISSION EVALUATION:

Limitations, failures, or operational problems noted:

None

Recommendations for corrective action or improvement:

Add a carbon dioxide meter inside the submarine.

In your opinion, did the mission essentially achieve its purpose? Compare actual work accomplished with the work that was expected to be accomplished.

Mission was fully successful.

List specimens or samples collected on the mission.

2 basaltic rock samples.
-both samples were loose at the bottom of slopes:

Sample 1-round massive basalt
Sample 2-weathered vessicular basalt with coral growth and agglutinated bivalves.

DATA RELEASE

Data may be retained by the project leader for up to 2 years after the mission date with the following exception. NOAA may request to use photos for publication or publicity purposes at any time.

Fill in the appropriate statement below and sign this form.

I hereby release the data archived by HURL for public consumption following mission "Hawaii Deep Water Cable Route Survey" (project title) held on May 23, 1988 (date) in the following way:

a. CTD data by May, 1989 (date)

b. voice transcripts, video, and still camera film by May, 1989 (date)

c. other May, 1989 (date)

d. I will give my written consent to individuals wishing to use these data prior to the above dates depending on the nature of the request(s).

Project Leader

HAWAII UNDERSEA RESEARCH LABORATORY

QUICK LOOK REPORT MISSION NO. P5-064

MISSION STATUS

Location: Alenuihaha Channel

Mission Date: May 25, 1988

Maximum Depth: 5,428 feet

Project Title: Hawaii Deep Water Cable Route Survey

Project Leader: A. Malahoff

Address: University of Hawaii
Department of Oceanography
MSB 319
Honolulu, HI 96822

Phone: 948-6802

Observers: A. Malahoff, T. Jones

Address: University of Hawaii
Department of Oceanography
MSB 319
Honolulu, HI 96822

Scientific Data Acquired : Prepare an abstract outlining your objectives, techniques, findings, etc.

The dive extended from 1650 meters water depth to 1350 meters on the Maui side mapping and sampling exposures of basalt and coral in order to define a smooth path for the deep water cable. Reef was encountered at 1550 meters.

MISSION EVALUATION:

Limitations, failures, or operational problems noted:

None.

Recommendations for corrective action or improvement:

None.

In your opinion, did the mission essentially achieve its purpose? Compare actual work accomplished with the work that was expected to be accomplished.

Yes.

List specimens or samples collected on the mission.

Samples of coral from drowned reef.

DATA RELEASE

Data may be retained by the project leader for up to 2 years after the mission date with the following exception. NOAA may request to use photos for publication or publicity purposes at any time.

Fill in the appropriate statement below and sign this form.

I hereby release the data archived by HURL for public consumption following mission "HDWC Route Survey" (project title) held on May 25, 1988 (date) in the following way:

a. CTD data by May 1989 (date)

b. voice transcripts, video, and still camera film by May 1989 (date)

c. other May 1989 (date)

d. I will give my written consent to individuals wishing to use these data prior to the above dates depending on the nature of the request(s).

Project Leader

HAWAII UNDERSEA RESEARCH LABORATORY
University of Hawaii
1000 Pope Road, MSB 226
Honolulu, Hawaii 96822
(808) 948-6183

VOICE TRANSCRIPT FOR HAWAII UNDERSEA RESEARCH LABORATORY MISSION

Dive Number: P5-061

Location: Alenuihaha Channel

Date of Dive: 18 May 1988

Project Leader: Dr. Alexander Malahoff

Address: University of Hawaii
Department of Oceanography
1000 Pope Road MSB 319
Honolulu, Hawaii 96822

Observers: Kimo Zaiger, Ed Noda

Pilot: David Foster

TAPE 1, SIDE 1

Zaiger: This is PISCES V Dive 61; 18 May 1988. Pilot is Dave Foster, scientific observers are Dr. Edward Noda and Kimo Zaiger. Just left the LRT at 7:35 on the way to the bottom. Diving Maui slope.

Zaiger: Time 8:05 passing 700 meters. From the biological point of view, a lot of species diversification at this point. Large, mesopelagic type of critters. Possibly indicating diurnal extent of vertical migration. Alot of jellyfish. Lots of fish larvae. Most definitely saw a little bit higher up.

Zaiger: Time is 8:10, approaching 900 meters. The bio-diversity I spoke of in my last observation is totally gone. There's very little life at this depth. This is that large band around 700 meters. One question is where's all the myctophids? That Tom Clark says is supposed to be the major consumer "critters" in Hawaii's ecosystem. I didn't see a single one.

Zaiger: Time 8:14, dropped off dropweights; we can see a cloud rising from below. Should be approaching the bottom momentarily. Time 8:15 bottom in sight. We're looking at a sand silt sediment with a few erratic basalts. Some ripple marks evident. Seems to be mostly sand. Higher concentration of sand than silt. Okay we're gonna set down to get a fix. In terms of bio, we have one rat-tail type fish. Depth is about 1000 meters, 998, 999. Temperature

Foster: KILA, do you copy? We are on the bottom at 999 m. Over.

Surface: Understand on the bottom at 999 m. Stand by for a fix. Over.

Foster: Standing by.

Noda: Look at those fish out there. Like an eel.

Zaiger: Other than the eel and those fish there's not much evidence of other fauna. There's some growing... evidence that seems to be fairly vigorous. There's a current going by. The current is flowing approximately south. The fish are drifting by, correction north.

(Multiple voices).

Foster: Want to put a video on now?

Zaiger: That looks like high rigor of environment. Terribly high sediment movement. The linear trend of the ripples are pretty much east-west 270 090. Ripples are basically asymmetric. Wavelike looking ridge crests an area of 27 meters.

Surface: Dave, we have you about the center right of "Golf" G - 24.

Foster: Roger, understand, center right "Golf" 24.

Foster: Do you like that?

Noda: That's fine.

Foster: We'll head upslope.

Zaiger: Time 8:27 on bottom. Just received a fix from the surface which places us just below the 1000 meter contour on the chart. Just left the center of the proposed cable track. Our intentions are to head on heading of about 300, to survey preferred roughness features from Seamarc II data. From what I've read this point should come up in the upper left hand corner of "Golf" 24.

Zaiger: Sediment bottom in evidence. There are a few erratics as I've said before. Erratics just seem to be breaking the plain of the sediments. They seem to be lenticular about 30 centimeters.

Noda: Bottom is sandy, very nice for a cable.

Zaiger: Noticing more benthic critters. Stalked crinoid.

Noda: Heading about 300 toward the outcropping to wee what it looks like. The swath is the proposed path, looks good.

Zaiger: Ahead on the basaltic erratics. We do have some sessile critters that looks like an anemone and some kind of soft coral. This rock is about half a meter across.

Zaiger: Time 8:30. Depth about 975 to 980, heading 285 across sand bottom.

Zaiger: The slope of the bottom is gentle. On the order of a few degrees only.

Zaiger: Time 8:33; as before, travelling upslope heading 265 approximately, depth 970. Still experiencing strong current. The bottom is very monotonous, little has changed. The character of the sand ripples has changed a little bit; they're not as well pronounced. They're more patchy looking. They indicate that there is slightly lower flow regime in this area. Also seems to correlate with more starfish on the bottom. The turbidity has increased a little bit. Seems to indicate more floculated material. However this observation is tenuous we're flying a little bit high above the bottom in which we may be getting an illusion of high turbidity. Seems to be a lot more suspended material now. Now we're seeing some dark grey patches probably due to burrowing mounds in the bottom selectively sorting fines in the top surface.

Zaiger: Fauna is basically scavengers and some bottom grubbers very few sessile, filter feeder types.

Zaiger: Silty, inclusions of pebble size, sediment character change. We went over a slight rise with more in the sand. Now it's levelling out again.

Zaiger: Time of this observation 8:35, 970 meters. Still the relief is low, very suitable for cable laying. There's some cobble-sized basalt inclusions in the sediments. Slight local _____ and (cannot understand - multiple voices).

Noda: Slope is about 5 degrees.

Zaiger: (Multiple voices). A ridge of some sort. Alright we have large basalt ridge almost looks likes like a pillow tongue in the order of a meter or so. Locally this is a well defined ridge. I think we should set down if possible and get a fix.

Zaiger: This seems to correlate with the rough feature inferred from the Seamarc data. Looking upslope, see a series of, oh I wouldn't hesitate to call them terraces. A series of outcrops of the order of a half a meter high which gives the slope the impression of a higher slope angle. Large sponges can be seen growing on these outcrops.

Zaiger: These outcrops of basalt appear to be <u>in situ</u> for a long period of time because the manganese crust on them are not disturbed, nice sessile organisms filling out.

Foster: KILA, this is PISCES V, do you copy?

Zaiger: Seem to be separated on the order of maybe 5 meters.

Surface: We have had no position since our last communications.

Foster: We just settled down here. We think we're in the neighborhood of a little outcrop. We might be able to get a position now.

Surface: Right hand corner of "Echo" 21. What is your depth? Over.

Foster: We are at 940 meters in the lower right corner of "Echo" 21.

Zaiger: Well, that means that we've travelled a long way. About a half of a kilometer.

Noda: Probably somehow we travelled ______ first to the north to the northeast ______.

(Multiple voices - cannot understand).

Noda: So we missed it; we went right on the outside; it's pretty nice. End up right here.

Zaiger: Your heading is 370.

Foster: It's possible that we skimmed right along the edge of it here. And then climbed ahead this way.

Zaiger: 08:50, depth 940 meters, fix puts us in lower right corner of "Echo" 21. Possible, I guess.

Zaiger: Plan of attack should be zig the other way?

Noda: Yeah I think so. Why don't we cut across...

Zaiger: Follow the contours until we hit the proposed cable path.

Noda: Let's see how wide this thing is.

Zaiger: Let's try a course of about 050 I guess.

Noda: Gonna want to pull you to the right to maybe about 060.

Zaiger: Time 8:55, leaving bottom. Our intention is to proceed on a heading of 040, cross the cable path, then follow the contours at about 940 meters, see if we can find the roughness feature on the other side.

Zaiger: Okay, sediment characteristics here are changed back into predominantly sand mixture getting back to the ripples. Ripples are more symmetrical than before, very short wavelengths. Time is 9:57 (sic - actually 8:57).

Zaiger: Noticing sparce basalt erratics, nothing that would pose threat to the cable in the order of two tenths centimeter's relief. We set down momentarily to try to get our cameras operating.

Zaiger: Time is 09:00. Settling down kicked up a bunch of silt sized floculated material. Very cloudy. Seems to be mostly organic in nature. Humic? acids and such.

Zaiger: Water depth about 940 meters. Time 9:03. Bottom monotonous as before. Status unchanged.

Zaiger: Time 9:05. Some of the characteristics are still basically the same, however one change from last observation is the ripples have pretty much departed where they are there in patchy areas.

Zaiger: Very flat, evidence of mounds, critter mounds ___. Approximate depth at this time is 930 meters. Time 9:07. Passing over basaltics. It appeared to be, appeared to have a mantle of coral there, not conclusive, just a white portion on it.

Noda: Pink coral right there? Take a look to the south.

Zaiger: This patch appears to be a white chunk of substrate, possibly of reef origin, not conclusive though.

Zaiger: Time 9:08 as before, heading on course approximately 040 magnetic. Depth 930 meters approximately.

Zaiger: Time 9:12, depth 960 meters, apparently we went down to a little depression. However we are now climbing up the slope and I see a basalt ridge. 945 meters now. There's a very small little ridge about 10 centimeters in height which forms a terrace, kind-of indefinite. Character of the sediment seems to be more silty than sandy. Purely a qualitative judgment.

Zaiger: Time 9:15. (Discussion regarding video recorder).

Zaiger: Slope seems to be steeper. Steeper to the north. Here we have our share of outcrops. We've very high relief however; here we're approaching a basalt terrace, very large boulders on the order of 12 meters. Very rough. Looks like we found the rough spot on other side.

Foster: Do we settle down?

Zaiger: Yeah. There you can pretty much see the gradation from sand to sediment covered basalt to basaltic outcrops. This basalt looks like pillow fragments came down, down-slope, just (letting?) the typical pillow formation. Fractured chunks on the order of less than a meter. Locally very cemented, ridgelike toes.

Zaiger: Intend to settle and try to get a fix. The relief gets higher and rougher as we progress over this pillow structure. It's lobe shaped. Looking back towards 270 looks like it would make a good route.

Noda: ____ right over there though.

Zaiger: While we're waiting for a fix, we'll try to grab a rock.

Foster: We are at 920 meters and we'd like to get a fix.

Zaiger: Time 9:19. (getting the fix).

Surface: You're in the upper right hand corner on top "Charlie" 25. Over.

Foster: Understand, upper right "Charlie" 25.

Zaiger: Our position is offset by 200 meters from inferred roughness feature depicted on the chart. (Discussion of position).

Noda: Joe wants to look at this narrower part here.

Zaiger: Following the contours should get right back to that narrower part.

Zaiger: Time now is 9:28. Our intention is now that we've got a fix... Actually it's kind a little confusing as it does not correlate roughness features according to our bathymetric chart. But anyway, we'll figure it out, post dive. Our intention is to grab a loose rock if possible. Then head on a course heading of 260 magnetic. Try to get back on the cable path at it's narrowest extent, about 200 meters wide.

Noda: We're on the top of a mound that just drops right off, on a heading of 180. Just goes down about 30 meters.

Zaiger: We're about top of this mound about 910 meters. We decided to forego this specimen and head out on course 260 magnetic and try to intersect the cable path.

Zaiger: The relief is amazing. We're just now passing a drop of a couple of meters. Steep slope down to blackness. Okay, we can see the bottom below us regrading back into the sediments. So this rough feature is actually a mound of pillow talus of fairly high relief. It jumps up maybe 10 meters to the top of the mound from the surrounding sediment floor. We're quickly grading back into our silt-sand mixture at this time.

Zaiger: The time is 9:36, on course of 280 approximately, depth 915. We seem to be skirting around the pillow structure at this time off to starboard. The slope is still greater than it was back on the sand portion. Turbidity is high; sometimes I'm not sure if that's more of a prop effect, but may not be, probably not.

Zaiger: We're flying a little high off the bottom, however, basically it's just sediments with a few basaltic erratics. I can see the slope increasing off to starboard. We're now at 925 m approximately back on the same level.

Zaiger: Seems to be about 15 meters of actual local relief between the base of the talus mound to the top. Lateral extent was on the order of maybe 20 meters. You had that much change in relief.

Zaiger: Seems we are having quite a few basaltic erratics which probably spalled off of the pillow talus flow. Seem to be more rounded, less angular than what we saw. Predominantly though, we're on a sandy, silty bottom. Topography is a little more varied, swelling and dipping a little bit, not as flat as before. We're scraping on the bottom. It seems to be harder substrate. As if the sediments are just kind

Zaiger: (continued) of breaks in the harder stuff. Time of these observations, 9:40. Continuing on heading approximately 260, depth 920 meters.

Zaiger: Time 9:41; we've come up on a local ridge. Sand seems to be close to the angle of repose coming down the side of this ridge. Each piece should be cemented talus. It jumps up perhaps 5 meters in relief. Symmetrical ridge. On this side of the limb, close to the top of the ridge, it's blockier. It seems to indicate that this side of the ridge is comprised of pieces of small talus that have spalled off. We're climbing fast and I think I see possible coral within the ridge. Small piece of white stuff, hard to tell though.

Noda: If we land on it, we could get a sample.

Zaiger: We'll try and land right on top the crest of this ridge and make our position.

Zaiger: Time is 9:43. The depth to the top of this ridge is 905 meters.

Foster: KILA, this is PISCES V, do you copy?

Surface: We have had no position since our last communication. Do you have the tracker on?

Foster: Negative. The tracker has been on. We are sitting on top of a ridge now; we'd like to get a fix.

Zaiger: Time 9:54 while awaiting fix took photograph 14 of pillow talus slope close to the ridge, showing part of cage (basket) for reference.

Foster: (Responding to surface). Understand the right side of "Charlie" 24.

Zaiger: Well, it's consistent with where we were going. We continue. (Discussion of position).

Noda: Continue, 260.

Zaiger: Time 10:02, we're leaving this ridge. Wow, look at that drop off. Looks like a cliff. And it drops off 3-5 meters to a nice sandy bottom.

Zaiger: Nice sandy bottom is relative because ahead I see mantled underneath sediments talus slope. There is sand on top of it though.

Zaiger: We seem to be skirting on our starboard side on this course, this talus feature. Are we climbing back up the same thing again? Look at that white stuff, is that reef?

Foster: Could be.

Zaiger: I think it is. On this course which we are hoping will take us back to the sandy cable path, we've come across more talus, some large erratic blocks, up to two meters in length. Overall, fairly rough relief. Still heading about 260 magnetic.

Zaiger: Time is 10:06. Couple minutes ago I thought I saw some reef rock material within the talus flow, however we were not in a position to get a good sample. Back into sandy sediment. Time 10:07, depth is about 890 meters. Again the sand is just localized like a sand sheet in the low area and again we are getting back into basaltic outcrops. Is there any possibility to grab a piece of this coral right here? Dave, right here on the right? It kind of looks like...

Foster: Doubt it.

Zaiger: Okay forget it. It doesn't look like it's in situ anyway; it looks like a block of coral rock that rolled down. It's just a lump. Lump of coral is approximately half a meter in diameter.

Zaiger: Okay, we're crossing over ridge structure which is not as high or high in relief as others and back into a depression with the sand just sort of sheet-like. Apparently what we're doing is we're crossing a series of interfingerings of high relief basalt interfingered with sand channels or sheets. Seems to indicate that we're right on the edge or close to the edge of the downslope extent of the basalt flows. This looks like reef in situ right here. Check this out Dave. I'd like to get a piece of this. Should be soft.

Noda: Time 10:09. Stop. Hopefully if you could grab a piece...

Zaiger: Yeah, right here on this edge is... it's undercut due to the exsolution. Right behind the manipulator if we could wheel about back to port a little bit. Yeah, excellent.

Zaiger: Time 10:09, approximately 885 meters. Found a small table-like plateau of reef rock material which appears to be in situ. Some exsolution is evident as it looks shelly. Dave's going to try to grab a piece. Should prove interesting when compared to samples that we took on the Kohala side. It's not that soft? Step further to the right. That ledge there.

Foster: ______ I'm going to have to ram this stuff right here.

Zaiger: See that ledge ahead of us?

Zaiger: So tail heavy. There's no way we could shift the batteries forward?

Foster: I'm doing it right now. It'll get us down a little bit.

Foster: Crumbly?

Zaiger: Yeah, it's crumbly.

Zaiger: Might be easier to see out of my window, I don't know.

Zaiger: It's crumbling but only in small little pieces.

Foster: It's awful hard to work this stuff off. You need a rammer.

Zaiger: We did break off a small piece though if we could pick it up. Is that piece under the ledge about the size of a... a little bit larger than a walnut.

(trying to pick up sample)

Zaiger: Manipulator tries to overcompensate.

Zaiger: You want to try for this little ledge right here?

Foster: Can try. That's why I love this basket so much, it's right here you can't see past it.

Zaiger: Time 10:18 managed to grab a piece about the size of or a dinosaur's brain whatever. This is definitely an situ reef. Seems to very indurate; a lot harder than the reef material we saw on the Kohala side. Leads me to speculate, I wonder if the hardness is due to scarn-like metamorphism due to the proximity of these lava flows. Probably not. Just a wild hypothesis.

Zaiger: This reef was on the same order of relief as the sand sediments. Sand ripples come right up to the reef outcrops. The relief outcrop lateral extent is about 20 meters as far as I can see on both sides.

Noda: Should take a picture.

Zaiger: I took one.

Noda: Should take some more.

End tape 1; side 1.

Zaiger: Side two of PISCES Dive 61. May 18, 1988. Voice transmission is Kimo Zaiger, scientific observer; Dave Foster, pilot; Dr. Ed Noda, the other scientific observer. Preparing to leave position on coral reef structure, reef formation that we've discovered. Time is 10:20; depth is about 985 meters. As we continue on our course of about 260. We have been seeing geologically a series of ridges and channels. Exposed ridges being lava, basaltic pillow talus structures, moderately high relief 10 to 15 meters in some instances. Interfingering with sand channels and now we've found this reef structure. As we leave the reef structure there seems to be sandy sediments that is hummocky as if it's (mirroring?) the strata beneath it. The hardness is coming from structure not from flow regimes. Leaves me to think that beneath this sediment layer is more reef rock. Again there I seem to think that I can see the white outcropping of reef material.

Zaiger: Yes, I can see reef material.

Zaiger: Okay we just bumped along the bottom, it seemed hard. Seems to verify my hypothesis, however on the right I see what appears to be a block of basalt, possibly an erratic, about 2 meters in demension. Right next to it is a piece of reef rock; however, that seems to also be an erratic displaced from upslope somewhere. We have more exposed reef rock, and some basalt erratics. Sand ripples; Amplitude is a little bit more incised, possibly higher flow regime than further down the proposed channel path. But overall the relief in this area seems to be smoother and should be able to run a cable through here.

Zaiger: The crest of the sand ripples seems to be relative to east-west 270 090. They are not symmetrical however. Turbidity of the water column is moderate I see a lot of midwater organisms which are neutrally bouyant. Sediments relatively monotonous.

Zaiger: Time is 10:25, depth about 880. See one of those blue nudibranch seaslug critters. I believe we are back in the cable, the proposed cable route section. I see another reef-rock outcrop and a ton of basalt. Basalts in the order of oh, maybe a half a meter to a meter in relief above the sediments. Seems to be shielding the reef-rock upslope of it. We're reaching an area of slightly increased slope. And stratigraphically, it looks as if we have basalt overlying reef-rock. It could possibly be an erratic however. No, it's not, there's too much to get a lateral extent. It looks like there's a thin sheet flow, basalt on top of the reef-rock. So if we can get a good date on this reef-rock, we can tell when this flow...at least get a relative statigraphic dating of this lava flow here.

Zaiger: More and more pieces of basalt.

Noda: I wonder if we crossed over the path.

Zaiger: I think we possibly could have; we should stop and get a fix.

Zaiger: It makes sense because in this area the path is less than 200 meters.

Zaiger: We're setting down this time about 10:29, depth is 865.

Foster: KILA, this is PISCES V, do you copy? We are at 860 m; would like a fix. Over.

Noda: 860 meters puts us up here.

Zaiger: You'd think we should be down here.

Foster: Could be. Maybe we just want to cross this section right here. Might as well go south. I hope we don't ___downhill.

Zaiger: Well if it's sand, it's not too bad.

Surface: You are in the lower portion of "Bravo" 21.

Foster: Understand, lower portion "Bravo" 21.

Zaiger: This correlates well with the bathymetry - the depth.

Noda: I know it's tough, but do you want to try to go downslope?

Foster: If it's sand it's OK. If it's really ____ we'll kind of have to zigzag back and forth.

Zaiger: What is this large massive rough area?

Noda: Evidently we got a little _____ or something. (Cannot understand).

Zaiger: Higher reflectivity here. I'm wondering if this more massive area here is all intermixed lava and reef. And that the (small?) longer ones are individual flows.

Noda: I'll have to look at some of the bottom photos more... interesting.

Zaiger: Time 10:40, left the bottom after a fix. Bottom is characterized by integrating coral reef rock and sediments. Coral reef rock in some cases being mantled and protected by thin sheet flows of basaltic talus. Our fix put us north of the track, proposed cable route, so we intend to fly back down-slope, staying a little high and hoping that most of this stuff we're going over is sand wo we don't drag our tail. Soon as we find what we think is the cable path again we'll probably set down for another fix. Generally we're going to zig zag on a course of 180. Depth at this time is 870 meters.

Zaiger: Right now we're looking at a bottom strata of sediment mantled talus. If this continues on this course, if the fix is correct, we should have this rough strata for about 200 meters.

Noda: This isn't bad, we can lay the cable on this.

Zaiger: Dr. Noda's pointed out, although the strata has high reflectivity because it's hard substrate, the roughness factor from an engineering standpoint is not bad for the cable purpose. Actual relief is low. In the order of centimeters.

Zaiger: Time 10:44. Bottom characteristics practically unchanged. A high percentage of the coverage is basalt of low relief, sediment mantled, sediment covered.

Zaiger: Getting a little bit lower, little bit of a ridge. Sand patch. We just came through a definite reflection point which we are back into 90 percent sand. Sand sediment cover, we left that rough spot. How far do you think we've travelled since our last fix Dave?

Foster: Oh boy, not that far. I wouldn't say 200 meters. Yeah, we're high off the bottom, there's too much stuff in the water.

Zaiger: The turbidity is pretty high. The time of this change is about 10:46. We're back to a depth of about 890. So we did drop in depth a bit.

Noda: That's south alright.

Foster: Maybe I can get a fix here?

Noda: Yeah, OK.

Zaiger: Looking at the bathymetry on our chart to correlate about where the cable path should be so we're going to set down for another fix. Nice soft sand bottom. Soft landing.

Foster: KILA, this is PISCES V, do you copy?

(Waiting for fix)

Surface: Lower right hand corner of "Bravo" 23. What is your depth?

Foster: Understand, lower right "Bravo" 23. We are at 890 meters.

Zaiger: Actually this fix is better than our last one.

Zaiger: We jumped from 10 to 1040 to 1055.

Noda: Lower right "Bravo" 23? We were in 24 the last time.

Zaiger: No, we were at "Bravo" 21 before. So we simply jumped back to the east. I think that 1040 fix must have been bogus.

Foster: Wild one huh? So we keep going south?

Noda: Could almost go south...

Zaiger: If that's the case then this is sand up here. We must have been up here somehow. We must have been set a lot... see from here, we were trying to do 260 and maybe we were just set far to the north and we just came down off of here. I don't know.

Noda: Sounds a little strange.

Zaiger: Something's weird. I think we should just keep on going south until we get in the path.

Zaiger: Again, the depth looks good. Will put us right above the 900 meter.

Zaiger: Time 11:00. Last fix kind of confused the issue. We've decided to continue south, see what we can see. We're crossing over a localized hump. The more indurante material. It's sediment mantled probably basalt. Now we're settling back down back down to the sandy area. Last fix the depth seemed to correlate well, but it had us moving inexplicably back towards the east when we had been only going south from our previous fix. If, however, this last fix is correct, it should be running into a rough area just prior to the proposed cable path in about 200 meters.

Noda: Looks pretty smooth now.

Zaiger: It's very smooth.

Zaiger: Time 11:02, depth 895 meters. Silty sand sediment characterized by ripples. Fauna is mostly these long ribbon-like fish and some benthic shrimp and an occassional starfish. The sea in a southerly course.

Zaiger: Okay on the southerly course. Time 11:04 we've run into talus. Again basaltic. The ridge we have to climb up. Significant outcrop, we're trying to climb over it. At least 5 meters in relief. Current is strong.

Zaiger: Time 11:07. Crossed over the ridge, we're back to flat bottom. Looks like we have an outcropping of reef rock with overlying sheet basalts again on the starboard side.

Zaiger: Time 11:14 we've presently set down to get another fix. Back in the soft sandy area. 910 meters may correlate to the proposed cable path. Awaiting fix.

Surface: You are on the line between "Echo" 23 and 24.

Foster: Between the line between ""Echo" 23 and 24.

Zaiger: That puts in the middle of the path. We sure moved far in just 15 minutes. And, I hope it puts us down by the 950 m line. We're supposed to be what... 910.

Noda: I think we're higher. We're on the line, but he didn't say upper or lower. Could be upper.

Zaiger: Maybe we should just head...

Noda: What about east?

Zaiger: Or west?

Noda: West - 270.

Zaiger: Time 11:20 last fix put us in the channel, exactly where, unsure. However, based on that we decided to stick with the cable route; make sure that it's clear since that is our main objective. So we set out on a course of 270 magnetic. The bottom is very suitble for cable laying. Sand/silt mixture predominantly sand, very few erratics. Turbidity is high, the current is fairly strong, making visibility low. Visibility ahead is maybe 10 meters. Back to the old monotonous terrain.

Zaiger: Seen a couple of erratic boulders small size half buried in the sand. Overall relief is maybe 20 cm. Should pose no problem. Time of observation was 11:24. At this time also the depth is 910 meters.

Zaiger: Time 11:26, large coral erratic passes to starboard, holes under it havens of little fishes and sessile stuff. (Some old erratics?) in the midst of a monotonus terrain and sandy sediments.

Zaiger: Time 11:28. Situation unchanged. Still heading about 270, depth is about 880. So we're slowly going upslope. Bottom retaining it's sandy characteristic with occasional erratics of basalt and coral reef rock. High turbidity. Moderate to high current. Fauna is mostly the scavenger type fishes or benthic shrimp.

Zaiger: Time 11:32. We're going to settle down here on the sand try to get a fix to see how we're tracking along the proposed cable route. Depth is about 870 meters. We're spinning around in the current.

Foster: KILA, this is PISCES V do you copy? We are at 870 meters; we would like another fix.

Surface: Center left "Delta" 20.

Foster: Understand, center left "Delta" 20.

Zaiger: From our last fix we went 900 meters. And we're fighting the current too.

Noda: I don't know about this tracking system. _____ right direction.

Zaiger: Time 11:46 go north till we run into the rough area again and get a fix and try to define the boundary of this rough area.

Noda: It's really too bad we can't track this continuously.

Zaiger: (Cannot understand).

Foster: Proposed cable route is clear, wide and clear.

Zaiger: Kohala is another story.

Zaiger: Stop momentarily and change videotape. I'm taking a close look at the bottom. Covering the sediments is pea-sized gravel; it's not sandy; it seems to be armored. And who knows we could refer to these as cinders or what? Go off again.

Zaiger: Time is 11:48. Depth is 870 meters.

Zaiger: Time 11:52 we stumbled across large expanse of reef rock with some inclusions of basalt. This is a predominantly reef mass; the basalt inclusions look very fractured pillows. Slope of this mass is perhaps 15 degrees. Dip.... Looks like it comes close to the top though. It peaks and then it levels off. I wonder how high we climbed. Maybe 3 meters?

Foster: I think a little more than that.

Zaiger: We're 880 meters. We just crested a gentler slope. Went from about 15 degrees to about 5 degrees. Still pretty much reef terrace. Definite reef terrace. Still going upslope on a heading of 280. Heading is upslope; the direction is about 280.

Zaiger: Do you want to set down and get a direction or...?

Noda: OK.

Zaiger: _____ on you see pillow basalt with reef rock. Large boulder.

Foster: KILA, this is PISCES V do you copy? We are at 850 meters. Can we get a position?

Zaiger: Time: 11:55. We're kind of in a channel in between pillow basalt feature to our starboard and reef rock terrace on our port side. Pretty much headed magnetically due north.

Zaiger: Picked up large amount of organic and humus _____ material.

Surface: We have you in the upper left of "Bravo" 25. Correction: upper left of "Bravo" 21.

Foster: Upper left of "Bravo" 21.

Noda: You don't think we got that far?

Foster: No.

Zaiger: Right direction but...too far. In about 10 minutes we went...500 meters.

Noda: 25 meters per minute; that's probably right eh? Not bad. The path is actually wider than he thinks. Why don't we just try to go straight south.

Zaiger: Our 1040 fix was close to this one and it's very very similar. Because I had this one marked as coral reef, so these are both coral reef. Just that the boundaries here are not...

Noda: These boundaries are not... cause we're almost at the edge...so this is much wider than he thinks. The narrowest spot he has is right almost south of us.

Zaiger: We can go south again.

Noda: Just a little bit. This stuff looks OK. Just off to the right there though.

Zaiger: Basalt is to the right.

Zaiger: Time 12:03. Heading back south to intersect with our proposed cable route again. Seems to be a mixture of coral reef and basalt. Coming down a fairly steep terrace.

Zaiger: We couldn't do that... what we're getting is a reflection from the strata underneath the sediments because it's shallow. So it's actually smoother than you think.

Zaiger: Time 12:10. Still headed on a course of approximately 180. Depth is 870 meters. We're apparently in the cable route section again. We'll continue on this course until eventually we'll end up close to our starting position.

Zaiger: Sediment characteristic here is, as described time and time before, silty sand, soft. A few erratics. Erratics consist of either coral reef rock or basalt. Fauna is predominantly scavenger fish and benthic shrimp. Very suitable for laying cable.

Zaiger: Time 12:15. No change in the course or sediment. Characteristics still monotonous. Depth is 885 m. So we're going downslope slightly. Slope here is, slope gradient is fairly continuous and it's gentle. In this particular area there's a few more erratics than ____. We're coming through sort of depressions at this time. 12:16. Just local dropped a little bit with more erratics showing through it. (Cannot understand). Sediment has changed a little bit in that sand matrix is more gravel-sized particles.

Zaiger: Sediment bed appears to be more indurate, harder. Less soft sediment on top. Seeing more starfish and fauna resting on bottom. Now we're starting to go into a little more sandy... The gravel pieces are not carbonaceous any more. Little chunks of basalt. Again it's hard to infer if they're cinders put out by a late secondary cone, or washed down here and sorted by flow regime or what. Not enough data or information.

Zaiger: Time 12:20. Same course. Sediment characteristic same as the last observation. Depth is about 900 meters. Stopping for a fix at this time. Time 12:20, depth 900 meters.

Foster: We are at 900 meters, can we get a position?

Surface: Lower left of "Delta" 22.

Foster: Lower left of "Delta" 22.

(Discussion of position).

Noda: Much wider; it's on the order of 400 meters wide instead of less than 200.

(Discussion of transponder).

Zaiger: Time is 12:30. We're progressing south to see if we're going to run into this rough area. The fix showed us close to it.

Zaiger: Characteristic of the sediment seems to be changing a little bit. Looks darker greyer.

Zaiger: Time 12:35. Heading south. Sand. Ideal for cable laying. Depth is 915 meters.

Zaiger: Time 12:37. Found a series of boulders on the order of 2 meters in dimension. Similar to the first rough feature found when we first started the dive. Those boulders are probably spaced just right so that they reflect - they look like a solid mass.

Zaiger: One last fix and then go up?

Foster: We've come full circle and located a rest spot. We'd like to get one more fix and then we'll be leaving the bottom. We're right now at 930 meters.

Surface: Center "Foxtrot" 22.

Foster: Understand center "Foxtrot" 22. We'll be leaving the bottom now from 930 meters.

Zaiger: 12:47; preparing to leave bottom.

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VOICE TRANSCRIPT FOR HAWAII UNDERSEA RESEARCH LABORATORY MISSION

Dive Number: P5-062

Location: Alenuihaha Channel

Date of Dive: May 20, 1988

Project Leader: A. Malahoff

Address: University of Hawaii
1000 Pope Road, MSB 319
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Phone: (808) 948-6802

Observer: A. Malahoff, G. Krasnick

Pilot: T. Kerby

Kerby: On the bottom (07:54), a little bit of a current.

Malahoff: Some rocks protruding up, very thin sediment.

Kerby: On the bottom at 1150 meters, we need a position.

Kerby: Papa 19.

Malahoff: We have to go 1 kilometer to the east to Papa 24. We have to go down 200 meters.

Malahoff: We have settled down at 1150 meters, sandy, slightly rippled bottom. Actual depth is 1165 meters. There are basaltic talus on the bottom protruding from the sediments, otherwise it looks like a thin cover of rippled sand. The ripples are about 6 inches apart.

Malahoff: The chart is in the direction of about 290.

Kerby: The current is coming from the southeast.

Malahoff: We're moving east, correct Terry?

Kerby: Right.

Malahoff: OK, we're encountering boulders that have rolled down slope. Time is 08:09. We're comming across layered bedding. (Photo 1) We're swinging around, to give you an idea of the landscape, it's still sediment covered, with, it looks like, clastic layering and basaltic boulders protruding down below. It's a fairly thin cover of sediment.

Malahoff: There is that boulder again. (Photo 2) It's 8:10 now, were moving east. We're hoping to intercept the 1300 meter isobath. As we head east, the ripples are actually in the east-west direction. The strike of the ripples is north-south.

Krasnick: Gentle little slope here. I don't see anything that looks particularly hazardous to the cables here...even though on the map it's not identified as a possible path.

Malahoff: The reason is because...see these boulders...that's an artifact of the Sea Mark...from those boulders would be a fantastic reflection.

Malahoff: In this landscape, there is at least one boulder perhaps half a meter in diameter every 5 to 10 meters.

Malahoff: Time is 08:15. Water depth is still 1150 meters.

Krasnick: Lots of shrimp here. Population density is about 1 per 20 meters.

Malahoff: Still driving right along this hazardous area.

Krasnick: If this is the most hazardous area, we're in good shape.

Malahoff: We're traversing the area that showed high refectivity. We're beginning to ___ because of the ___ substratum. ___ benches that are ___ centimeters high plus the occasional boulder that litters this landscape. Closer look at the landscape it looks eaten out, eroded. Actually what it is it is .....

Kerby: There's a dropoff over here to our right. See this ridge here.

Malahoff: It's a bench...calcareous bench. We're going to go down off the bench. At 08:19, water depth 1160, top of the bench is littered with carbonate. Looks like an old reef.

Malahoff: At 08:20, water depth still 1160 meters, top of the bench, taking samples.

Malahoff: We've encountered a reef face at 1160 meters at 08:25.

Malahoff: It's 8:45, we're heading down the face of the reef.

Malahoff: Taking a sample at 08:52; water depth 1175 meters. 09:02, this reef is solid, consists of broken pieces of staghorn coral. Some of them are several cm. in diameter. And interspaced with the staghorn coral are flat beds of consolidated sediments and then there are pieces of basalt scattered around this landscape.

Malahoff: Go southeast until you get to 1500. I've got this site nailed down. Time is 9:08; water depth 1175 meters. We need to move about a half a kilometer southeast.

Malahoff: That's karst landscape in front of us.

Malahoff: Photo 19, leaving the reef at 09:14.

Malahoff: There is a lava flow on top of the reef. There is staghorn coral growing on top of the lava as well.

Malahoff: We are now moving in a southeast direction. The time is now 09:19.

Malahoff: Water depth 1200 meters. Moving down a steep face of the reef. Extremely rugged, with an intermixing of basalt and coral. A very rough coral face. Down below us, the coral face of the reef seems to cease 10 meters below us. We're in a water depth of 1200 meters. So, the reef face is about 25 meters high.

Malahoff: We're now back into a fairly sandy bottom with odd outcrops. Water depth 1129 meters, time is 9:33 were heading southeast across another small terrace, it's a bench 1.5 to 2 meters high. I can see limestone protruding through the small terrace.

Malahoff: At 1200 meters a series of steps, limestone, reef material, going down slope, and after the initial steep face, the top of the sequence; the rest of the terrain appears to be gentle, maybe a slope of about 5 degrees.

Kerby: Upper right Papa 20 (fix from Kila).

Malahoff: 09:35, water depth is 1210. Time is 9:37, water depth is 1210, heading is east-southeast. Landscape is hard sandy bottom with frequent lumps of hard substratum poking out of it.

Malahoff: At 09:40 we've encountered another terrace, water depth is 1220 meters. At 09:41 we went past a steep dropoff, top of this particular bench is at 1225 meters, and we're now descending down the face heading in a east-southeasterly direction. Going to be a real cable-eater this one. Basalt and limestone.

Malahoff: 9:45 still pursuing a path down the slope. 1235 to 1240 meters. Alternating lava flow and reef.

Malahoff: At 9:47, water depth 1250 meters.

Malahoff: We're passing through a series of benches. The time is 9:50, alternating reefs and lava flows. At some points the lava flow has covered the entire reef and then fallen off??

Malahoff: We are at 1280 meters, at 09:55.

VIDEOTAPE 2

Malahoff: 10:00 our water depth is 1280. We're at the base of a cliff. We'll be heading east.

Kerby: We have very little current.

Malahoff: 10:10, we are encountering a fairly smooth bottom, a little debris, water depth is now 1280 meters...it's limestone, chunks of it fell down.

Krasnick: Soft sediment, looks like a good place to put a cable down.

Malahoff: Water depth is 1300 meters.

Kerby: Get a fix. Center Romeo 22.

(General conversation and pilot's report of the terrain.)

Kerby: KILA we are at 1280 meters; can you give us a position? Center Quebec 23, that's right where we thought we were.

Malahoff: It's 10:36, water depth is 1290 meters we're moving to the northeast on sandy bottom.

Malahoff: Time is 10:45, water depth is 1290 meters. We're heading along the sandy pass north towards the path through the reef.

Malahoff: 10:50, water depth 1260 meters moving upslope through the sandy channel. Pretty featureless place, just a few odd boulders sticking up.

Kerby: Center Oscar 25.

(general conversation and pilot's report of substrate)

Kerby: November 26

Malahoff: So the wall will be on George's side.

(general conversation about position of wall)

Malahoff: Time is 11:29 (multiple voices), 1210 meters, wall the right hand side. Looking for a path.

Malahoff: 11:30 we're driving along the edge of the wall. The wall consists of eroded dissolution limestone with sharp edges sticking out from the cliff.

(Report of area by pilot.)

Malahoff: 11:34, water depth (multiple voices) 1195 meters.

(General conversation about substrate.)

Malahoff: We're at the base of the wall, it's 1185 meters. Maybe you should drive to 1150 meters.

Kerby: It's 1175 meters, we're going away from the wall now. Should we get a fix?

Kerby: Right, Center Mike 25.

Malahoff: We got through it.

Kerby: We're moving northwest.

Malahoff: It's 11:57, the water depth is 1140.

VIDEOTAPE 3

Malahoff: At 12:03, we have cleared the passage.

Malahoff: We're at 1140 meters in sandy soil, flat sandy bottom. At no time did we cross the wall in coming from below the exposure covered by side scan.

Malahoff: It's wider, that's good news.

Kerby: KILA, we'll be moving downslope to the southwest to identify the other edge of the gap.

Kerby: KILA, this is PISCES. We're at 1160 meters, give us a position.

Kerby: Understand Mike 24. Leaving the bottom at this time.

Malahoff: That's wider, George, all these bits and pieces are actually boulders.

Krasnick: On the west side, that's still an area to avoid.

Malahoff: So all this is sand.

Krasnick: This is all that coral rubble and this is that terrible wall.

Malahoff: There is a path and it's wider.

END TAPE TRANSCRIPTION

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VOICE TRANSCRIPT FOR HAWAII UNDERSEA RESEARCH LABORATORY MISSION

Dive Number: P5-063

Location: HDWC Maui Slope Alenuihaha

Date of Dive: May, 23 1988

Project Leader: Dr. Alexander Malahoff

Address: Hawaii Undersea Research Laboratory
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Phone: 948-6802

Observer: J. Van Ryzen, J. Wiltshire

Pilot: D. Foster

TAPE 1, SIDE 1

Wiltshire: Dive 63. Going down the Maui slope to look at a cable route through a narrow passage.

Wiltshire: 8:10. We are sinking down blowing the ____.

Wiltshire: 8:16. We are loose from the LRT. The depth is about 20 m. The external temperature was 23 degrees.

Wiltshire: Time is 9:01. We are approaching the bottom. It is just over 1300 m. The bottom is in view. The temperature is 2.8. We are heading due north.

Wiltshire: The bottom is in view - sandy, some rubble, covered gravel, gravel-covered. The gravel was the drop weights. The bottom is of a light brown colored silt which is sloping away about 10 degrees.

Wiltshire: Awaiting position from KILA on the bottom at 1315 m.

Wiltshire: Time is 9:08. We are traversing a silty bottom on course 295. Fair number of little broken pieces of coral and fragments along the bottom. The bottom is relatively flat with no, few, no big boulders in view.

Wiltshire: Deep water shrimp in view. Nice, red one. The bottom is quite fine grained and comes out in large crowds of sediment which is surrounding the sub at the moment.

Wiltshire: Awaiting for a position from KILA before we can proceed upslope to look at our narrow passage.

Wiltshire: This position has a lower right hand corner of Q-20 which places us to the south of our target.

Wiltshire: Going to move eastward to the cable track and then northward along the cable track from our position at Q-20.

Wiltshire: Heading eastward on course 060. Present depth is just over 1300 feet. The bottom continues to be silt covered with a few odd pebbles, but no large boulders. Very little visible biological activity and gentle of few degrees.

Wiltshire: Both cameras are on and have taken one still picture heading east. Course 100. Continuing along the same sort of bottom, very even light silt cover. Very fine silt. Few fish. What's the other thing?

Van Ryzen: Big fish.

Wiltshire: Cruising along the same sort of bottom, very light silt. No visible ripple marks.

Wiltshire: Some sort of a stick fish.

Wiltshire: Proceeding course 085, east. Time is 9:24.

Wiltshire: Took a picture at time 9:25. General bottom topography. The video is on, recording the bottom sequence. Proceeding east at 1320 m. depth. Bottom is gently sloping, very uniform.

Wiltshire: Gentle slope sloping up the left.

Wiltshire: 9:28. Taking a third picture of the general bottom.

Wiltshire: Hard bottom. Light silt cover. Good cable route.

Wiltshire: There are some stick-like fish, picture number 4. Time 9:30. Depth is 1320 feet. We are heading east.

Wiltshire: A few broken bits of coral visible on the bottom.

Foster: KILA .... We have moved somewhat to the east. We are 1325 m. Can we get a position? Over.

Wiltshire: One rat-tailed fish coming into view right along the bottom.

Foster: Depth now 1325 m.

Wiltshire: Calling KILA for a position to determine whether or not we have come on to the cable route yet.

Wiltshire: We are going to head north north-east up the slope toward the area that we are after. The last fix from KILA, Sierra 22 is doubtful.

Wiltshire: Proceeding on a course of 30 degrees. The depth is now 1325. Temperature is 2.8 degrees centigrade. Time is 9:42.

Wiltshire: The bottom is still the same. It is smooth, gently sloping, hard bottom with a silt cover. Pieces of shell and rubble of various kinds.

Wiltshire: Deep water shrimp. We are proceeding up a slightly gently sloping bottom. Heading up.

Wiltshire: Taking picture number 5. General bottom photography. Time 9:44.

Foster: ....A tripod fish.

Wiltshire: Zooming in on a tripod fish. Picture number 6 - a tripod fish. Picture number 7, the tripod fish again. The silt has now surrounded it. It doesn't seem to have affected the tripod fish, it's sitting there mesmerized by the lights. Pick it up and collect it. Quite a cloud of silt around the submarine. We are waving the manipulator immediately above the tripod fish. No apparent effect. Some trouble lowering the manipulator arm to harrass the tripod fish.

Wiltshire: Proceeding upslope. Numerous deep water shrimp along the bottom.

Wiltshire: Proceeding upslope. We're at about 1305 m. Bottom coverage is unchanged.

Wiltshire: Turning to head more up the slope. The slope is fairly gentle. Light sediment cover. No distinguishing marks.

Wiltshire: Tripod fish. Seastar.

Wiltshire: Picture number 8 of an organizm at 1295 m. We are on a northeasterly course trying to go upslope which is very gentle. An unchanged bottom type. Very fine silt on a hard bottom. A fair number of fish and other organizms, particularly right near the bottom.

Wiltshire: We are in an area of more debris. Appears to be alot of broken pieces of coral. Picture number 9 of this area with alot of coral debris of some sort. Appears to be a ledge in the distance.

Wiltshire: Picture 10 taken of the relief at 1295 m.

Wiltshire: We are going to go to the north of northeast following the ledge. Now that we have found some deposit ...

Foster: The light went out.

Wiltshire: Quite a mass of ledge or outcrop directly in front of us. Major relief. It appears to be a mixture of some, we're too far to tell, with a lot of coral debris along the bottom. Some pieces of basalt, rounded pieces of basalt with coral debris.

Wiltshire: Depth is 1295 m.

Wiltshire: There's a ledge over here to the right. Goes quite a way into the distance. We are approaching the ledge now. Broken tabular pieces of basalt. A hard bottom now. Hard bottom with a dusting of silt. Heading upslope. Another tripod fish. Very docile.

Wiltshire: Picture number 11 of some fish in the bottom topography in this area. Moving northeast trying to find the ledge. Coming up on some hard bottom with more layers of basalt.

Wiltshire: Hard bottom now with very little coral debris. There's a large cliff on the left. At least 2 m. high. We are heading now north. Heading is north. Depth is 1285. The temperature is 2.9 degrees centigrade.

Wiltshire: To the right side is sand with low amplitude sand waves, a couple of centimetres. The sand waves are running basically north. This is the first time we have seen sand waves on this dive. They are fairly irregular - oscillatory type ripples with trends to the north.

Wiltshire: Photograph number 12 of the sand ripples.

Wiltshire: Rat-tailed fish and dogfish. Quite a few of them. Going basically west of 290. Coming up on broken pieces of coral and another small outcrop.

Wiltshire: Water depth is now 1260 m. Time is 10:16. We are heading to the northwest. Coming up on bits of coral on the bottom of an outcrop area.

Wiltshire: Number 13. To the right hand side appears to be a partially exposed ancient coral reef sticking out through the sediment. Very altered and eroded.

Wiltshire: Photo 14 shot sitting on the bottom waiting for a position. We appear to be toward of a ledge which drops off in front of us.

Foster: Understand, upper left, Papa 23.

Foster: OK Terry, we'll be heading northeast. Over.

Wiltshire: We are caught in a cloud of dust at the moment. We are running along a slope toward the northeast trying to get into the narrow cable passage area. We have just come down off the ledge which appeared to be an old coral enbankment with many broken fragmentary pieces of coral. Another ledge is in view now. Quite steep. We are running along the side of it. It appears to be weathered coral with a dusting of sediment. We are heading basically north. On the right there is a considerable amount of coral. Maybe 10 m. in height. Very very rough terrain. Taking picture number 15. Now that we have come up over the ledge we are heading back to the east to try to get into a cable passage area.

Wiltshire: 1225 m. We are going upslope into the northeast. Taking picture number 16. Terrain has broken bits of coral and basaltic fragments. There are a number of large sponges and other organizms. Topography drops off quickly ahead of us on a northeasterly course. Drops off at least 10 m.

Wiltshire: Bottom completely dropped off on a northeasterly course from our last position. Substantial relief.

Wiltshire: As we proceed to the northeast and are dropping in water depth, here we come across another large topographic feature. It appears to be a weathered ancient coral reef with a dusting of sediment. A lot of small pukas and inter-connected area.

Wiltshire: Depth is 1230 m. Time 10:38.

Wiltshire: Now, as we proceed to the northeast, we come again upon a flat, silt covered bottom with a large number of organizms.

Wiltshire: Number 17 at 10:40. Picture 17 is typical of the current bottom sediment cover with minor ripples.

Wiltshire: Traversing upslope across a light tan colored sediment covered area. Few bits of coral rubble. Slope is gentle, gently sloping upwards in a northeasterly direction.

Wiltshire: Odd pieces of basalt, boulders, 50 cm. in diameter lying here and there scattered on the sediment, appeared to have come down slope from above.

Wiltshire: Photo 18 taken of a couple of fish on the sediment covered area.

Wiltshire: It is now about 1200 m. We are still on a course of 3030 at 10:43.

Wiltshire: 10:46 sandy bottom continues with odd pieces of basalt here and there.

Wiltshire: Some large boulders here. We can even grab one of these boulders.

Wiltshire: 10:49. On the bottom waiting for a position from KILA. We are in an area covered by basaltic boulders and a narrow chute that goes between two ledges with a relief of perhaps 10 m.

Wiltshire: Boulders are round and smooth, perhaps averaging 20 cm. in diameter.

Wiltshire: Photo 19. One of the boulders with a sponge on it.

Wiltshire: Proceeding north along the ledge to try to find the cable channel. Look at that - there's a big boulder right in front of us there. That's quite a size. There's a major ledge right in front of us here. There's a big piece of basalt and some coral on it - a few meters in diameter. To our right is a large ledge of weathered coral with pieces of basalt here and there coming off it.

Wiltshire: There's a ledge straight ahead. We are heading basically due west. There's a ledge with coral on the top and pieces of large basaltic boulders underneath. Taking picture number 20 of the boulders. Taking picture number 21. Bits of coral and broken up material with larger basaltic boulders on them and the boulders are quite rounded. A foot in size or so, some of them up to a couple of feet. Depth is about 1205 m.

Foster: Is there a ledge up there to the right?

Wiltshire: Yes, there's a ledge to the right.

Wiltshire: Our course is 300 degrees, keeping the ledge to the right and proceeding upslope with smaller pieces of basalt scattered across a bottom which is gently sloping and sediment covered. This may be a passage. This almost looks like a sediment chute.

Foster: Depth is about 1180 or so.

Wiltshire: Proceeding upslope in what seems to be a ...

Foster: Not much of a ledge. Some small basaltic rubbery stuff. I can't see any ledge out there.

Wiltshire: We are turning to the right to try and see if there's still a ledge on the right side. Slopes away to the right in a sandy silt covered bottom with very few pieces of basalt.

Foster: There's a bit of a ledge over here.

Wiltshire: We are heading ____ . There's a steep ledge over to the right hand side, about 10 feet high, perhaps more - could be 20 feet high. We are closing in for a picture. It appears to be weathered coral with rounded basaltic boulders at the bottom of it. Very definite prominent relief feature.

Wiltshire: Picture 22 of an interesting light looking fish.

Wiltshire: Some kind of a monk fish perhaps.
Wiltshire: The fish is about 4 in. in diameter.

Foster: KILA, this is Pisces V. Do you copy?

Wiltshire: Depth is 1180. Picture 23 taken of a monk fish while we are waiting for a position from KILA. Attempting to pick up monk fish. Attempting to harrass monk fish. Time 11:15.

Wiltshire: 11:18. Touched monk fish with manipulator arm. Waved his __ and monk fish took off.

Wiltshire: KILA gives us a position, which would put us right in the narrow cable passage in the north. Turning to the west to see the extent that the passage runs.

Wiltshire: Heading due west. Crossing the channel. Channel is soft sediment covered. Boulders. Taking picture of the bottom cover and the sediment area. That will be 26. We are heading essentially west. We are going downslope.

Wiltshire: ___ to come up again in front of us. Coral ledge again. Heading west. Big big ledge on the left. Taking picture number 25.

Wiltshire: In a zig-zag pattern to go through the passage to get an idea how wide it is and what the two sides are like.

END TAPE 1; SIDE 1

Wiltshire: Side 2. We are zig-zagging back across the passage.

Wiltshire: An open plain above the narrow gate area, coming down and going through it again. We're at 1160 m. heading due south.

Wiltshire: 11:57, here is our ledge. On the right, it's four or five feet in height.

Wiltshire: 11:59. The depth is 1160. Temperature is 3.2 degrees centigrade. We are running on course 215 and we are coming up behind the top of the coral ledge. Picture number 28. We are going over the ledge. It is quite steep. It appears to be a ... drop off of 30 feet.

Wiltshire: Going down the narrow gate passage. Seems to be fairly light bottom cover with odd pieces of broken coral and broken basalt.

Wiltshire: Course 150 going down the ...

Wiltshire: Going down the narrow gate area. There are little patches of coral. Few inches in size each interspersed with small pieces of basalt. We are coming up to a ledge here, a small ledge. It is covered with basalt boulders. Can they grab one of these pieces of basalt? They can grab one of those smaller of those boulders. Actually any one will be fine. See if we can tell what this stuff is. 12:05 taking our last sample. We've got this interesting looking basalt.

Wiltshire: Biggest one that I can see is probably two feet in diameter, maybe two and a half feet in diameter. The average size is less than a foot.

Wiltshire: Picture 29 taken of an area of rounded basalt boulders for sampling.

Wiltshire: Picture 32 taken of the area where we picked up the basaltic rock.

Wiltshire: 12:11, we are on a course of 245. We are on the ledge to one side of the narrow gate area.

Wiltshire: Picture 33 taken in the area.

Wiltshire: Heading 261. A lot of broken coral rubble as we head upslope. Coming to the ledge which (multiple voices), a lot of little pukas, perhaps 10 feet high.

Foster: The depth is 1170 m. We'll be moving northwest. Over.

Wiltshire: Heading west. 300 degrees to cross the terrain at the top of the narrow gate and look for the kind of reflection that produced that feature in the grid.

Wiltshire: The bottom is flat and covered by small bits of carbonate type rubble. Angular an inch or so in size.

Wiltshire: Photograph 34 records the kind of bottom we have in the area.

Wiltshire: We are coming up over quite a narrow little gulley. Very narrow gulley with a relief of 30 feet. Oh my goodness - yes, it is a very steep slope. Very steep slope at the edge of the reef here. Will drop down 30 feet on the much flatter hard area. Heading northwest on course 320.

Wiltshire: Bottom is fairly flat with a smooth silty terrain as we had before. A few small fish and shrimps. Very, very flat even terrain with very few boulders or outcrops of any sort. Just silty and muddy and _____ bottom.

Wiltshire: Another picture of the same kind of bottom. Nothing terribly exciting. We are proceeding to the northwest. The external temperature is 3 degrees. Depth is 1150 and the time is 12:26.

Wiltshire: We are beginning to proceed at the gently sloping slope to the northwest. Big basaltic boulders, two feet or three feet in diameter. Its better than the sediment as we went by round it. Most of the sediment appears to be a white silty sandy cover with no waves or ripple marks.

Wiltshire: Coral debris.

Wiltshire: We are continuing on course 310 to the northwest of the slope. Depth is now 1130 m.

Wiltshire: Course 1110 proceeding upslope. Now on 1105 m. The slope is very gentle, sediment-covered as before. Very little debris. Occasionally we get fragments of basalt embedded in the sediment.

Wiltshire: Depth 1100, 12:35. Stopping for a position.

Wiltshire: KILA has just given a position as K-21. We are proceeding northwesterly up the slope towards the large reflective feature. The bottom is very similar to what it was before, fairly gently sloping with light tan sediment on it. No particular features in it. Appears to be a silt or fine sand. Occasional organisms, sponges and fish.

Wiltshire: Water depth is 1110 m.

Wiltshire: 12:51. Picture 37 taken of the uniform bottom.

Wiltshire: Course is 315, going northwesterly toward the large reflective feature.

Wiltshire: Picture 38. Time 12:54.

Wiltshire: Picture 39. Bottom on the way to the reflecting feature.

Wiltshire: The time is 12:56. The depth is 1060. We are heading toward the reflecting feature, on course 330 running toward the northwest.

Wiltshire: We are into an area now where there are more pieces of basaltic boulders and a few sea cucumbers.

Wiltshire: Picture number 40 of a starfish.

Wiltshire: Heading on course 330. We are at a depth of 1050 m. Proceeding on a northwesterly slope at 12:59. There are a fair number of fish.

Wiltshire: We have come upon an old reef structure where it is sediment covered and the exposed side considerably with corals and pieces of basalt. Coral reef heavily calcified. There is quite a lot of relief over here to the right. There are some big boulders, some basalt boulders about three or four feet in diameter.

Wiltshire: Picture 42 of the reflective...

Wiltshire: They are all about 20 feet high, very sculptured out and solidified.

Wiltshire: Picture 43 taken.

Wiltshire: It appears to be an old reef material.

Wiltshire: We are trying to take a sample from the reflector. We are at 1110 m. Take the sample, but samples are so crumbly. We were not able to pick one up. Every time we close the manipulator arm, it would break. The samples are very very friable.

Wiltshire: Pictures up to 48 taken of sample site. Its clearly a very old reef with quite a lot of key topography.

Wiltshire: Over a cliff. Heading back on a course of 230. Depth is 1005 m.

Wiltshire: Another side of another reef face here. Probably highly weathered.

Wiltshire: Up against a large ledge. Appears to be quite weathered coral. Basaltic sample of some coral growing on it collected at 1020 m. At the bottom of a terrace. Sample 2.

Wiltshire: Position has been given at 137 as Hotel-22. We are leaving the bottom at 1000 m. The time is 11:37. The bottom temperature is 3.4 degrees centigrade.

END OF TRANSCRIPTION

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VOICE TRANSCRIPT FOR HAWAII UNDERSEA RESEARCH LABORATORY MISSION

Dive Number:	P5-064
Location:	Alenuihaha Channel, Maui Slope
Date of Dive:	May 25, 1988
Project Leader:	Dr. Alexander Malahoff
Address:	University of Hawaii Department of Oceanography 1000 Pope Road, MSB 319 Honolulu, Hawaii 96822
Phone:	948-6802
Observers:	A. Malahoff, T.Jones
Pilot:	Terry Kerby

TAPE 1, SIDE 1

Jones: 25 May 1988, Alex Malahoff, Tony Jones. Terry Kerby pilot. PISCES Dive 64.

Jones: Alenuihaha Channel, Maui slope. Objective is to go to 1625 and look at the long linear feature that runs across the cable path and then cruise up to 1300 meters and call it a day.

Jones: Depth on the bottom at 1655. A flat, sandy area.

Jones: The sand that we kicked up when we landed is still staying around. Very little current at this site.

Jones: 09:23, obtained fix and heading north-northeast to the obstacle to the right of the cable path in 1600 meters of water.

Jones: 09:35, about 1640 meters. Still trying to head north.

Malahoff: We're taking a sample at 09:40; water depth is at 1640 meters, we've come across a reef outcrop, coral reef with basaltic boulders strewn over it. There's no evidence of any manganese cap on this material, but there is this intermixture of limestone and darkish material. We will now be attempting to take a sample.

Malahoff: What do you see?

Jones: There's a big hole right here.

Malahoff: Now it looks like an old reef with black material on top of it which could be manganese crust. Still sampling. We're a depth of 1640 feet (meters). Time 09:45.

Malahoff: At 09:53 we're sampling the reef. It's definitely limestone and some dissolution holes in it. Note a depth still 1640 meters.

Malahoff: At 10:02 extracted a sample at 1640 meters on the reef south of the first deep relector.

Malahoff: At 10:10 we've sampled a piece of reef material. Water depth 1640 meters.

Malahoff: The limestone is all fluted here with... it's definitely a reef with large reef-like structures within it. It's covered by a black manganese crust. Getting a crust Terry?

Malahoff: We're now heading north.

Malahoff: Observing landscape: now we're coming out of the reef back into the sediments. Much of the reef appears to be covered by the manganese.

Kerby: Is that coral down there?

Malahoff: The reef face appears to be about a meter high coming out of the sediment.

Malahoff: The reef itself, looking at it face on is fluted with vertical flutings and it's been etched out probably through dissolution intermixed with basaltic boulders, must have rolled down the hill. Time is 10:25.

Malahoff: 10:35 we're on our way to the next outcrop. We've finished sampling. Water depth 1640 meters.

Malahoff: At 10:37, water depth 1630 meters, we are running parallel to a... heading in a general direction of 316, and we're running parallel to a reef, coral reef face probably for about 20 or 30 meters.

Malahoff: We're moving upslope. Water depth 1625 meters.

Malahoff: Traversing is a boulder strewn field of sediments. Look at that sponge. Isn't it amazing?

Malahoff: We've just received a fix just to the north of the reef. Time is 11:02; water depth of 1605 meters.

Malahoff: Sandy bottom with little relief and boulders strewn every so often. We've been following the edge of a reef until we came to the spot where we had a fix. Got 50 centimeter boulders littering the landscape at infrequent intervals. Maybe 1 boulder or so every 50-100 feet.

Malahoff: At 11:10 we're at 1600 meters.

Malahoff: At 11:20 water depth 1580. We're moving now to the northwest along the proposed track of the cable route.

Malahoff: At 11:27, 1560 meters we're heading a northwest direction paralleling the cable path now along a sandy bottom.

Malahoff: At 1550 meters, 11:30.

Malahoff: ______ protruding through the sediment. Substrate consists of limestone with a black probably manganese coating. 11:30 is the time. 1550. 1550 is the water depth.

Malahoff: 11:43 received a fix at 1540 meters and we're just on the eastern edge of the cable swath seeing reef outcrops and this coincides with the sidescan relecting horizons where we'll now move north-northwest.

Malahoff: When we move west-northwest we cut across the pavement, this manganese-coated limestone pavement protruding from the sediments. Pavement is just maybe a few centimeters high, fairly flat on top.

Malahoff: At 11:54 we're 1500 meters driving up a sandy slope.

Malahoff: Time is 12:08,9. Water depth 1475 meters. The floor is now covered by small talus, talus fragments from a centimeter to a couple centimeters across. Interspaced with sediment. The floor is smooth and we're moving upwards. There are occasional boulders, basaltic boulders.

Malahoff: Time is 12:14. Water depth 1440 meters. Still moving up the sandy rather nondescript slope.

Malahoff: 12:31, water depth 1390 meters. The floor is becoming more and more blotchy with small-scale talus.

Malahoff: 12:34, water depth 1350 meters. We arrived at the front of the lava flow. Looks like the target area. The lava flow with the pillows. Lava flow then includes pillows, boulders and talus.

Malahoff: Flow has very steep, vertical walls and consists of many boulders encased. Looks like a debris flow. No, it's not a lava flow, it's a debris flow. Water depth is 1330 so it's about 20 meters high. Okay we're now at the top and we'll get a position.

Malahoff: Well, we've reached the top of the reef, ready to go at 12:45. Water depth 1340 meters.

End transcription.

VIDEOLOG P5-061

P.L.: Malahoff

Observers: Zaiger
Noda
Pilot: Foster

Time on Tape Counter	Data Logger	Subject/"Remarks made by Observers"
Tape 1A		(Tapes 1A and 1B were copied from LP Tape 1, two duplicates were made. Your copy of Tape 1A may end before this copy and Tape 1B may be longer).
0:00:00	08:22	rippled fine sediment, fish, "center right golf 24," seastar
0:09:20	08:22	eel, sand "1000 m"
0:14:48	08:22	fine sediment, basalt, "pillow tongue," gorgonians (940 m)
0:25:20	08:22	anemone-urchins, fine sediment, outcrops, fishes
0:29:14	09:13	fine sediment, basalt
1:00:00	09:44	basalt
1:02:32	10:04	sand "890 m"
1:08:35	10:10	limestone, fine sediment
1:33:00	10:45	fine sediment, fishes
1:40:14	11:03	basalt, fine sediment
1:50:14	11:12	rippled fine sediment
2:02:56	11:24	pau tape 1A
Tape 1B		
0:00:00	11:24	fine sediment, fishes, "870 m"
0:20:15	11:44	pau tape 1B

Time on Tape Counter	Data Logger	Subject/"Remarks made by Observers"
Tape 2		
0:00:00	11:45	fine sediment "Delta 20"
0:04:00	11;49	limestone
0:23:15	12:08	fine sediment, limestone and basalt outcrops
0:49:46	12:35	"12:37," boulders, fine sediment
*0:51:30	12:36	gempylid fish, rippled fine sediment
0:55:33	12:40	pau Tape 2

VIDEOLOG P5-062

P.L.: Malahoff

Observers: Malahoff
Krasnick
Pilot: Kerby

Time on Tape Counter	Data Logger	Subject/"Remarks made by Observers"
0:00:00	07:53	1150 m, limestone, fine sediment
*0:14:06	08:07	"08:09, layered bedding," seastar, gorgonian
0:21:49	08:15	eel
0:25:22	08:18	limestone reef, basalt outcrops, sampling
1:13:00	09:06	sampling (same area)
*1:20:00	----	closeup of reef
1:27:00	----	sand, outcrops, "1200 m"
1:41:00	----	limestone, "1210 m"
1:48:00	----	limestone cliff, "1220 m, 09:40" basalt, limestone
2:00:00	09:56	fine sediment "1280 m"
2:02:00	09:57	pau tape 1

Tape 2

0:00:00	09:59	fine sediment, outcrops
*0:07:11	----	congrid, fine sediment "1280 m, 10:10," limestone
0:25:19	----	outcrop
*0:31:18	----	limestone reef, jagged edges
0:34:24	----	sand, eel
*0:43:11	10:43	sand, *Bathypterois* sp.
*0:51:30	10:50	primnoid, *Actinoscyphia* sp., rippled sand, basalt

Time on Tape Counter	Data Logger	Subject/"Remarks made by Observers"
1:08:32	11:07	fine sediment, limestone outcrop, limestone
1:30:00	----	limestone reef "11:30"
*1:46:20	11:45	fine sediment, synaptobranchid eel
2:01:00	11:59	fine sediment
2:02:03		pau tape 2

Tape 3

0:00:00	12:02	fine sediment "center Lima 24, 1140 m"
0:15:00	12:18	rippled fine sediment, basalt outcrops, shrimp
0:27:23	12:29	pau tape 3

VIDEOLOG P5-063

P.L.: Malahoff

Observers: Van Ryzin
Wiltshire
Pilot: Foster

Time on Tape Counter	Data Logger	Subject/"Remarks made by Observers"
0:00:00	09:20	fine sediment, eel, rippled, fine sediment
0:11:24	----	"1325 m," fine sediment
*0:17:18	----	fine sediment, red shrimp sp. 2 (1325 m)
0:23:00	----	09:42, rippled fine sediment, shrimp, fishes
*0:26:06	09:46	Bathypterois, fine sediment
0:34:30	----	fine sediment, squid "1295 m"
0:36:09	09:57	fine sediment, Ltalus, limestone, reef outcrop
0:45:32	----	eel, fine sediment (1295 m)
0:48:04	----	"hard bottom," fine sediment dusting, anemone, seastar, fish
*0:52:24	----	rippled fine sediment, outcrop, fish, shrimp, ophiuroid, fishes, shark
0:57:36	----	coral reef, fine sediment (1245 m)
1:15:42	----	coral reef, sponges
*1:19:40	----	sand, fishes "10:40," shark, macrourid, fishes
1:28:20	----	"1190 m," boulders, fine sediment, gorgonian
*1:38:35	----	basalt outcrop, fine sediment, shrimp, primnoid, Euplectella, anemones (1250 m)
*1:46:12	11:06	Sladenia sp., shrimp, basalt (1180 m)
1:47:12		pau tape 1

Time on Tape Counter	Data Logger	Subject/"Remarks made by Observers"
Tape 2		
0:00:00	----	Sladenia sp. shrimp, basalt
*0:16:58	----	fine sediment, basalt outcrops, limestone, fish
*0:21:54	----	fine sediment, limestone, sponge
0:30:00	----	boulders
0:34:38	----	coral reef
0:48:10	12:24	fine sediment
1:17:14	----	fine sediment, solasterid (1110 m)
1:23:26	----	reef, fine sediment, basalt outcrops, sampling
1:52:58	----	pau tape 2

VIDEOLOG P5-064

P.L.: Malahoff

Observers: Malahoff, Jones

Pilot: Kerby

Time on Tape Counter	Data Logger	Subject/"Remarks made by Observers"
0:00:00	08:43	fine sed., shrimp, coarse sed., eel
0:15:51*	---	manipulator with fish, fine sed., congrids
0:23:20	09:33	rippled fine sed., sea cucumber, sea pen
0:28:00	09:35	basalt outcrops, fine sed., _Semprella_ _cucumis_
0:29:25*	09:37	limestone outcrops, sponges "1635 m.", limestone holes, fine sed., _Hyalonema_ sp.2, _Semprella_ _cucumis_, limestone holes, _Semprella_ _spiculifera_, gorgonian
0:58:00	10:07	(same area) collecting reef
1:05:32	10:13	fine sed., limestone, limestone holes, dead gorgonian with animals, fish (see photos 40-50) 1640 m.
1:20:00	---	collecting dead gorgonian
1:43:00	10:50	fine sed. "lower right R19"
1:58:00*	11:05	fine sed., _Hyalonema_ sp.3, sponge, shrimp
2:01:47		pau Tape 1

Tape 2

0:00:00	11:11	fine sed., "1580 m."
0:15:00	11:26	fine sed., basalt talus, seastar, _Semprella_
0:18:14*	11:29	fine sed., limestone, _S_. _cucumis_, _S_. _spiculifera_, seastar

Time on Tape Counter	Data Logger	Subject/"Remarks made by Observers"
0:26:30	---	euretid, fine sed., limestone, sponge
0:35:00	---	fine sed., seastar, sea cucumber, fishes
0:55:00*	12:07	Sperosoma, fine sed. "1475 m., coarse sed."
1:15:27	12:26	"lower right P10", fine sed., coarse sed.
1:18:18*	12:29	basalt, fine sed., sponge, shark
1:23:56	12:35	basalt, boulders, "1330 m."
1:36:37		pau Tape 2

DIVE SLIDE	SUBSTRATUM	ALGAE	SPONGES	CORALS	OTHER INVERTS	VERTEBRATES	OTHER	TIME DEPTH
P5—061	(No photographic data)							

DIVE	SLIDE	SUBSTRATUM	ALGAE	SPONGES	CORALS	OTHER INVERTS	VERTEBRATES	OTHER	TIME DEPTH
P5-062 (selected slides)									
	Data Back								
01	01	fine sed. basalt			Lepidisis olapa	shrimp red Mediaster ornatus		can	08:07 1160 m.
02	02	fine sed. Ltalus boulder							08:09 1160 m.
03	03	fine sed. limestone					fish		08:17 1160 m.
04	04	basalt limestone Btalus Ltalus							08:19 1160 m.
05	05	limestone				shrimp red			08:22 1160 m.
06	06	limestone basalt						tire	08:24 1160 m.
07	07	limestone basalt				seastar			08:36 1160 m.
08	08	limestone basalt					eel		08:38 1160 m.
09	09	limestone							08:38 1160 m.
10	10	limestone							08:41 1160 m.
11	11	limestone							08:43 1160 m.
12	12	limestone basalt							08:44 1160 m.
13	13	limestone							08:50 1160 m.
15	15	limestone							08:56 1160 m.
18	20	limestone fine sed. Ltalus							09:15 1175 m.

DIVE	SLIDE	SUBSTRATUM	ALGAE	SPONGES	CORALS	OTHER INVERTS	VERTEBRATES	OTHER	TIME DEPTH
P5-062									
	Data Back								
19	21	limestone basalt							09:15 1175 m.
20	22	limestone basalt							09:16 1175 m.
23	03	limestone fine sed.			Narella cf bowersi				09:24 1200 m.
24	04	limestone fine sed.			Narella cf bowersi				09:24 1200 m.
25	05	limestone fine sed.							09:25 1200 m.
26	06	limestone fine sed.							09:27 1200 m.
27	07	limestone fine sed.			Funiculina sp.				09:27 1200 m.
28	08	limestone fine sed.							09:29 1200 m.
29	32	limestone fine sed.							09:30 1200 m.
30	33	limestone fine sed.							09:30 1200 m.
31	34	limestone fine sed.							09:30 1200 m.
32	35	limestone fine sed.							09:40 1220 m.
34	37	limestone							09:43 1225 m.
36	39	limestone							09:44 1235 m.
39	42	fine sed. limestone					eel		09:56 1280 m.

DIVE	SLIDE	SUBSTRATUM	ALGAE	SPONGES	CORALS	OTHER INVERTS	VERTEBRATES	OTHER	TIME DEPTH
P5-062									
	Data Back								
40	43	fine sed. limestone							10:07 1280 m.
41	44	fine sed. limestone							10:07 1280 m.
42	45	fine sed. limestone basalt		Semprella spicifera	primnoid				10:08 1280 m.
44	47	fine sed. limestone							10:07 1280 m.
46	49	fine sed.				Paleopatides retifer			10:12 1300 m.
47	50	fine sed.				Paleopatides retifer			10:12 1300 m.
48	51	fine sed.							10:16 1300 m.
49	52	indet.							10:24 1300 m.
52	02	limestone							10:30 1300 m.
53	03	limestone							10:30 1300 m.
54	04	limestone fine sed.		trunk					10:32 1300 m.
55	05	limestone fine sed.		trunk					10:33 1290 m.
56	06	rippled fine sed.					Bathypterois ~~guentheri~~ grallator		10:40 1290 m.
57	07	rippled fine sed.					B. ~~guentheri~~ grallator		10:40 1290 m.
58	08	rippled fine sed.					B. ~~guentheri~~ grallator		10:41 1290 m.

DIVE	SLIDE	SUBSTRATUM	ALGAE	SPONGES	CORALS	OTHER INVERTS	VERTEBRATES	OTHER	TIME DEPTH
P5-062									
	Data Back								
59	09	rippled fine sed.					B. ~~guentheri~~ grallator		10:42 1290 m.
60	10	limestone fine sed.			P~~Pt~~imnoid harp Actinernus ~~Actinerus~~ sp.1 Actinoscyphi~~id~~a sp.3	Asteroschema sp. sea cucumber			10:50 1260 m.
61	11	limestone fine sed.							11:09 1260 m.
62	12	limestone fine sed.							11:12 1260 m.
63	64	limestone							11:29 1210 m.
64	65	limestone							11:29 1210 m.
67	68	limestone							11:32 1210 m.
68	69	limestone							11:32 1210 m.
70	71	limestone							11:32 1210 m.
71	72	limestone bench basalt		scoop					11:32 1210 m.
72	73	limestone							11:36 1210 m.
73	74	limestone rippled fine sed.							11:36 1210 m.
74	75	fine sed. indet.							11:38 1210 m.
75	76	rippled fine sed. limestone							11:38 1210 m.
76	77	rippled fine sed. limestone basalt							11:38 1210 m.

DIVE	SLIDE	SUBSTRATUM	ALGAE	SPONGES	CORALS	OTHER INVERTS	VERTEBRATES	OTHER	TIME DEPTH
P5-062									
	Data Back								
77	78	fine sed.					Synaptobranchus affinis		11:46 1175 m.
78	79	fine sed.					B. ~~guentheri~~ grallator		12:07 1140 m.
79	80	indet.							12:15 1140 m.
81	82	rippled fine sed.				shrimp red			12:17 1140 m.
82	83	rippled fine sed. fine sed. basalt limestone							12:18 1140 m.
83	84	basalt fine sed. limestone							12:19 1140 m.
84	85	basalt fine sed. limestone				shrimp red			12:19 1140 m.

DIVE	SLIDE	SUBSTRATUM	ALGAE	SPONGES	CORALS	OTHER INVERTS	VERTEBRATES	OTHER	TIME DEPTH
P5-063 (selected slides kept)									
	Data Back								
01	01	fine sed.							09:19 1315 m.
04	04	fine sed.							09:30 1320 m.
05	05	fine sed.				shrimp			09:45 1325 m.
09	09	indet.							09:56 1305 m.
15	15	limestone fine sed.				shrimp red			10:20 1260 m.
16	16	limestone fine sed.							10:34 1260 m.
17	17	limestone fine sed.							10:35 1260 m.
18	18	Btalus rippled fine sed.				shrimp	fish		10:39 1260 m.
19	19	fine sed.							10:43 1200 m.
20	20	Btalus fine sed. coarse sed.			Chrysogorgia sp.1				10:55 1200 m.
21	21	limestone fine sed.							11:00 1200 m.
23	23	basalt fine sed.					Sladenia sp.		11:06 1200 m.
24	24	basalt fine sed.					Sladenia sp.		11:08 1200 m.
26	26	indet.							11:27 1200 m.
30	01	boulders							12:06 1160 m.
31	02	boulders							12:07 1160 m.

DIVE	SLIDE	SUBSTRATUM	ALGAE	SPONGES	CORALS	OTHER INVERTS	VERTEBRATES	OTHER	TIME DEPTH
P5-063									
	Data Back								
32	03	boulders fine sed.							12:08 1160 m.
33	04	limestone fine sed.							12:11 1170 m.
34	05	limestone fine sed.							12:21 1170
36	07	rippled fine sed.							12:28 1150 m.
37	08	rippled fine sed.							12:50 1130 m.
38	09	rippled fine sed.							12:53 1130 m.
39	10	rippled fine sed.				comatulid ~~brisingid~~ white			12:54 1130 m.
40	11	rippled fine sed.				Henricia pauperrima Paleopatides retifer			12:57 1060 m.
41	12	rippled fine sed.				shrimp			12:59 1050 m.
42	13	boulders limestone fine sed.							13:00 1050 m.
43	14	limestone fine sed.		hexactinellid					13:01 1050 m.
44	15	limestone							13:09 1050 m.
45	16	limestone							13:10 1110 m.
46	17	limestone							13:10 1110 m.
47	18	limestone							13:10 1110 m.

DIVE	SLIDE	SUBSTRATUM	ALGAE	SPONGES	CORALS	OTHER INVERTS	VERTEBRATES	OTHER	TIME DEPTH
P5-063									
	Data Back								
48	19	limestone							13:10 1110 m.
49	20	limestone							13:15 1110 m.
50	21	limestone fine sed.			anemone brown				13:20 1110 m.
51	22	limestone notch							13:21 1000 m.

DIVE	SLIDE	SUBSTRATUM	ALGAE	SPONGES	CORALS	OTHER INVERTS	VERTEBRATES	OTHER	TIME DEPTH
P5-064 (selected slides)									
	Data Back								
01	01	fine sed.						subweights	09:24 1655 m.
02	02	fine sed. coarse sed.						subweights	09:25 1655 m.
05	05	fine sed.							09:31 1655 m.
06	06	fine sed.							09:34 1655 m.
07	07	fine sed. limestone Btalus boulder		Semprella cucumis					09:35 1655 m.
08	08	fine sed. limestone Btalus boulder							09:35 1640 m.
09	09	limestone Btalus fine sed.		S.cucumis					09:36 1640 m.
10	10	limestone Btalus fine sed.							09:37 1640 m.
11	11	limestone Btalus fine sed.		Hyalonema sp.2					09:37 1640 m.
12	12	limestone Btalus fine sed.		S.cucumis		ophiuroid			09:38 1640 m.
13	13	limestone Btalus fine sed.							09:38 1640 m.
14	14	limestone Btalus fine sed.							09:40 1640 m.
15	15	limestone fine sed.			cnidarian				09:45 1640 m.

DIVE	SLIDE	SUBSTRATUM	ALGAE	SPONGES	CORALS	OTHER INVERTS	VERTEBRATES	OTHER	TIME DEPTH
P5-064									
	Data Back								
16	16	limestone fine sed.			cnidarian				09:46 1640 m.
17	17	limestone Btalus fine sed. Ltalus			gorgonian	ophiuroid			09:49 1640 m.
18	18	limestone Btalus fine sed. Ltalus			gorgonian	ophiuroid			09:49 1640 m.
19	19	limestone Ltalus Btalus fine sed.			gorgonian				09:49 1640 m.
20	20	limestone holes Ltalus fine sed.				shrimp red			09:50 1640 m.
21	21	limestone holes Ltalus fine sed.				shrimp red			09:50 1640 m.
22	22	limestone holes Ltalus fine sed.				shrimp red			09:50 1640 m.
23	23	limestone holes Ltalus fine sed.				shrimp red			09:51 1640 m.
24	24	limestone holes Ltalus fine sed.				shrimp red			09:51 1640 m.
25	25	limestone			gorgonian				09:54 1640 m.
26	26	basalt limestone fine sed.			Chrysogorgia sp.1				09:55 1640 m.
27	27	basalt limestone			Chrysogorgia sp.1				09:57 1640 m.

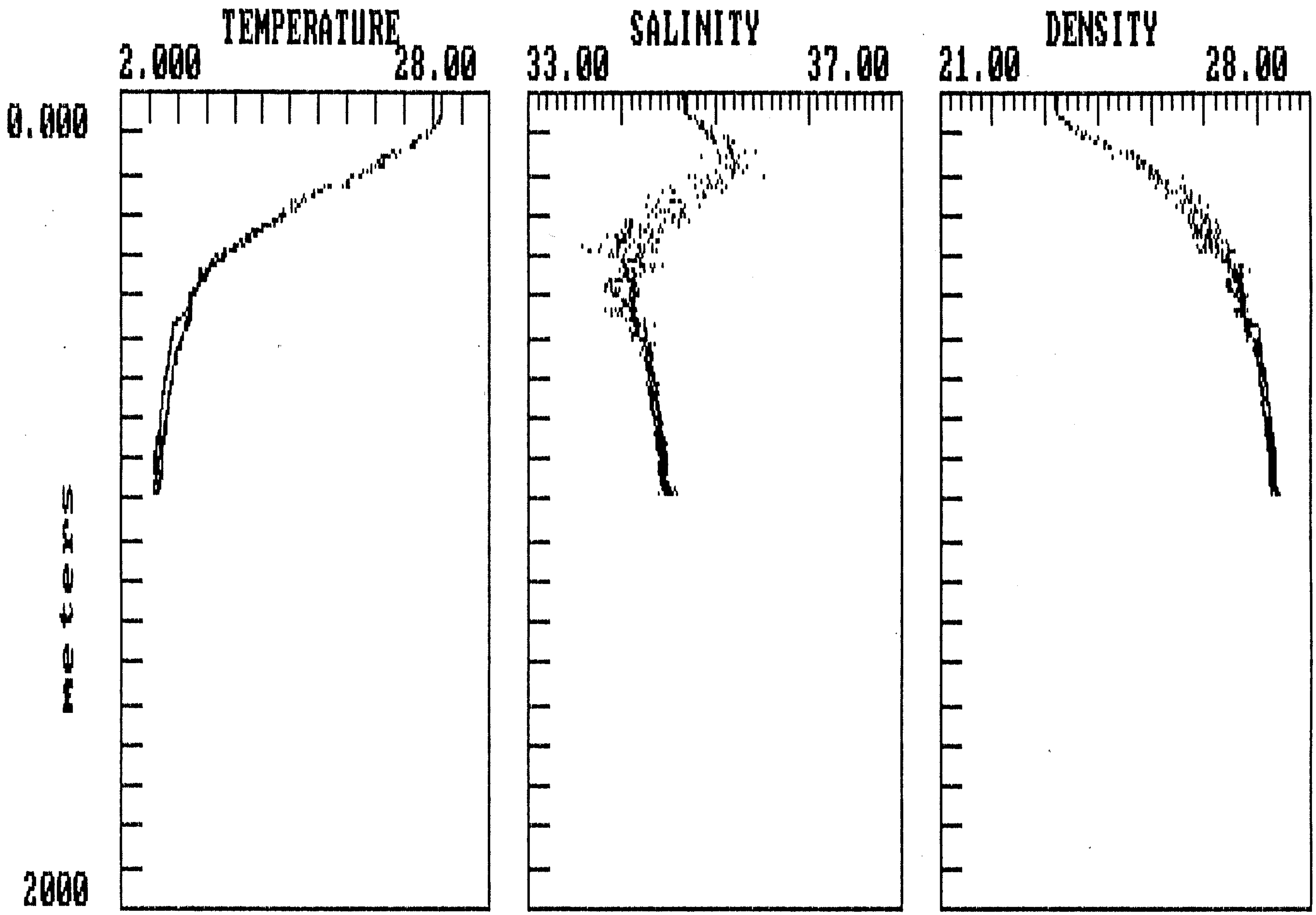
DIVE	SLIDE	SUBSTRATUM	ALGAE	SPONGES	CORALS	OTHER INVERTS	VERTEBRATES	OTHER	TIME DEPTH
P5-064									
	Data Back								
28	28	basalt limestone fine sed.			Chrysogorgia sp.1				09:59 1640 m.
30	02	basalt limestone fine sed.			Chrysogorgia sp.1				10:03 1640 m.
31	03	limestone fine sed. basalt			Chrysogorgia sp.1				10:03 1640 m.
32	04	limestone fine sed. basalt			Chrysogorgia sp.1				10:04 1640 m.
33	05	limestone fine sed. basalt			Chrysogorgia sp.1 Irridogorgia superba				10:09 1640 m.
34	06	limestone fine sed. basalt			Chrysogorgia sp.1 I.superba				10:09 1640 m.
37	09	limestone fine sed.		S.cucumis	Lepidisis olapa				10:11 1640 m.
38	10	limestone fine sed. basalt Btalus			L.olapa				10:11 1640 m.
39	11	limestone fine sed. basalt Btalus			L.olapa				10:12 1640 m.
40	12	cem. Btalus fine sed. limestone holes			zoanthid brown ~~Parazoanthus sp.~~2 hormathiid sp.2	Eumunida sp. Freyella sp.3 Arcoscalpellum alcockianum crab white ophiuroid		dead gorgonian	10:13 1640 m.
41	13	cem. Btalus fine sed. limestone holes			hormathiid sp.4 hormathiid sp.2 ~~Parazoanthus sp.2~~ " "	Eumunida sp. A.alcockianum Freyella sp.3 crab white	Ventrifossa sp.1	dead gorgonian	10:14 1640 m.

DIVE	SLIDE	SUBSTRATUM	ALGAE	SPONGES	CORALS	OTHER INVERTS	VERTEBRATES	OTHER	TIME DEPTH
P5-064									
	Data Back								
42	01	cem. Btalus fine sed. limestone holes			horm~~o~~athiid sp.4 horm~~o~~athiid sp.2 ~~Parazoanthus sp.2~~ zoanthid brown	Eumunida sp. Freyella sp.3 A.alcockianum crab white ophiuroid	Ventrifossa sp.1	dead gorgonian	10:14 1640 m.
43	02	cem. Btalus fine sed. limestone holes			horm~~o~~athiid sp.4 horm~~o~~athiid sp.2 ~~Parazoanthus sp.2~~ " " gorgonian	Eumunida sp. Freyella sp.3 A.alcockianum crab white ophiuroid	Ventrifossa sp.1	dead gorgonian	10:15 1640 m.
44	03	cem. Btalus fine sed. limestone holes			gorgonian ~~Parazoanthus sp.2~~ " " horm~~o~~athiid sp.4	Eumunida sp. Freyella sp.3 crab white A.alcockianum	Ventrifossa sp.1	dead gorgonian	10:17 1640 m.
45	04	cem. Btalus fine sed. limestone holes			horm~~o~~athiid sp.4 horm~~o~~athiid sp.2 ~~Parazoanthus sp.2~~ " " gorgonian	Eumunida sp. ophiuroid A.alcockianum crab white	Ventrifossa sp.1	dead gorgonian	10:17 1640 m.
46	05	cem. Btalus fine sed. limestone holes			horm~~o~~thiid sp.4 horm~~o~~thiid sp.2 ~~Parazoanthus sp.2~~ " " gorgonian	Eumunida sp. ophiuroid A.alcockianum crab white		dead gorgonian	10:21 1640 m.
47	06	limestone holes			~~Parazoanthus sp.2~~ " " hydroid	ophiuroid Eumunida sp. crab white A.alcockianum		dead gorgonian	10:21 1640 m.
48	07	limestone fine sed.			horm~~o~~athiid sp.4 ~~Parazoanthus sp.2~~ " "	A.alcockianum ophiuroid	Ventrifossa sp.1	dead gorgonian	10:22 1640 m.
49	08	limestone holes fine sed. cem. Btalus			horm~~o~~athiid sp.4 ~~Parazoanthus sp.2~~ " " horm~~o~~athiid sp.2	A.alcockianum Eumunida sp. ophiuroid crab white		dead gorgonian	10:22 1640 m.
50	09	limestone holes fine sed. cem. Btalus			horm~~o~~athiid sp.4 ~~Parazoanthus sp.2~~ " " horm~~o~~athiid sp.2	A.alcockianum Eumunida sp. ophiuroid crab white		dead gorgonian	10:22 1640 m.

DIVE	SLIDE	SUBSTRATUM	ALGAE	SPONGES	CORALS	OTHER INVERTS	VERTEBRATES	OTHER	TIME DEPTH
P5-064									
	Data Back								
51	10	limestone holes limestone fine sed. cem. Btalus							10:25 1640 m.
53	38	fine sed.							11:02 1605 m.
54	39	fine sed.							11:02 1605 m.
55	40	fine sed.				seastar			11:15 1600 m.
56	41	fine sed. basalt		S.cucumis					11:22 1580 m.
57	42	rippled fine sed. limestone basalt		sponge					11:30 1550 m.
58	43	fine sed. limestone cem. Btalus		S.cucumis		seastar shrimp red			11:30 1550 m.
59	44	basalt limestone fine sed.		euretid ~~Eurete sp.~~					11:31 1550 m.
61	47	basalt limestone fine sed.		" ~~Eurete sp.~~		ophiuroid			11:35 1550 m.
63	49	fine sed.		Chonelasma sp.					11:36 1550 m.
64	50	basalt limestone fine sed.		" Eurete ~~sp.~~		ophiuroid			11:37 1550 m.
65	51	basalt limestone fine sed.		" Eurete ~~sp.~~		ophiuroid			11:37 1550 m.
66	52	basalt limestone fine sed.		" Eurete ~~sp.~~		ophiuroid			11:37 1550 m.

DIVE	SLIDE	SUBSTRATUM	ALGAE	SPONGES	CORALS	OTHER INVERTS	VERTEBRATES	OTHER	TIME DEPTH
P5-064									
	Data Back								
67	53	basalt limestone fine sed.		Chonelasma sp.		ophiuroid			11:38 1550 m.
69	01	limestone fine sed.		sponge					11:44 1540 m.
70	56	fine sed. Btalus				Sperosoma obscurum			12:07 1475 m.
71	57	fine sed. limestone			Actinernus Actinerus sp.1				12:08 1475 m.
72	58	fine sed.				shrimp	congrid		12:09 1475 m.
73	59	fine sed.		tan					12:10 1475 m.
74	60	fine sed.		tan					12:10 1475 m.
75	61	fine sed.					eel		12:11 1475 m.
76	62	fine sed.							12:13 1440 m.
77	63	fine sed.					shark		12:29 1440 m.
78	64	indet.							12:33 1390 m.
79	65	fine sed. Btalus				shrimp red			12:33 1390 m.
80	66	cem. Btalus fine sed.							12:34 1350 m.
81	67	cem. Btalus fine sed. boulders							12:34 1350 m.

DIVE	SLIDE	SUBSTRATUM	ALGAE	SPONGES	CORALS	OTHER INVERTS	VERTEBRATES	OTHER	TIME DEPTH
P5-064									
	Data Back								
82	68	cem. Btalus fine sed. boulders							12:34 1350 m.
83	69	cem. Btalus boulders fine sed.		Hyalonema sp.3					12:34 1350 m.
84	70	cem. Btalus boulders fine sed.							12:34 1340 m.



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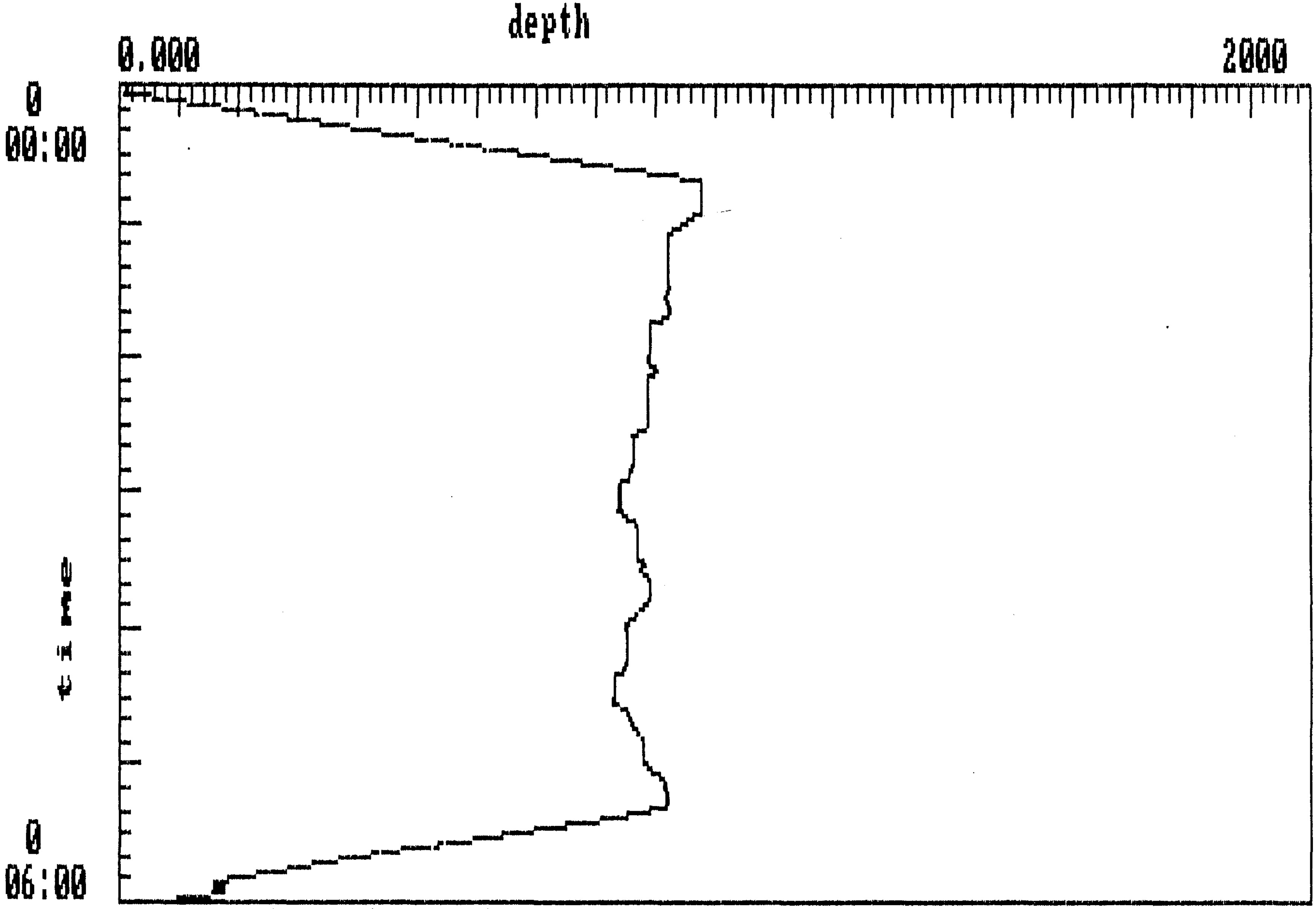
P5-061



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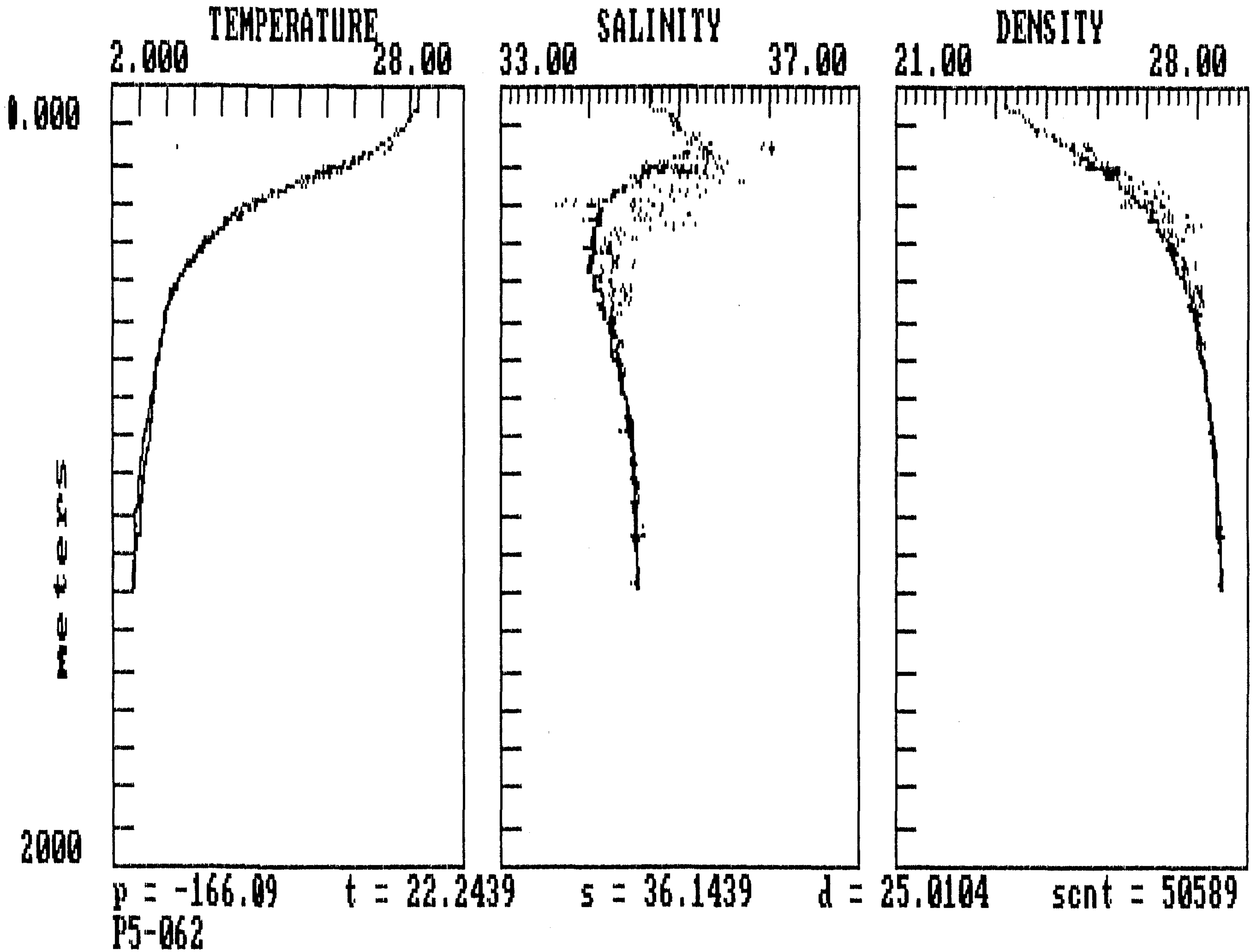
P5-061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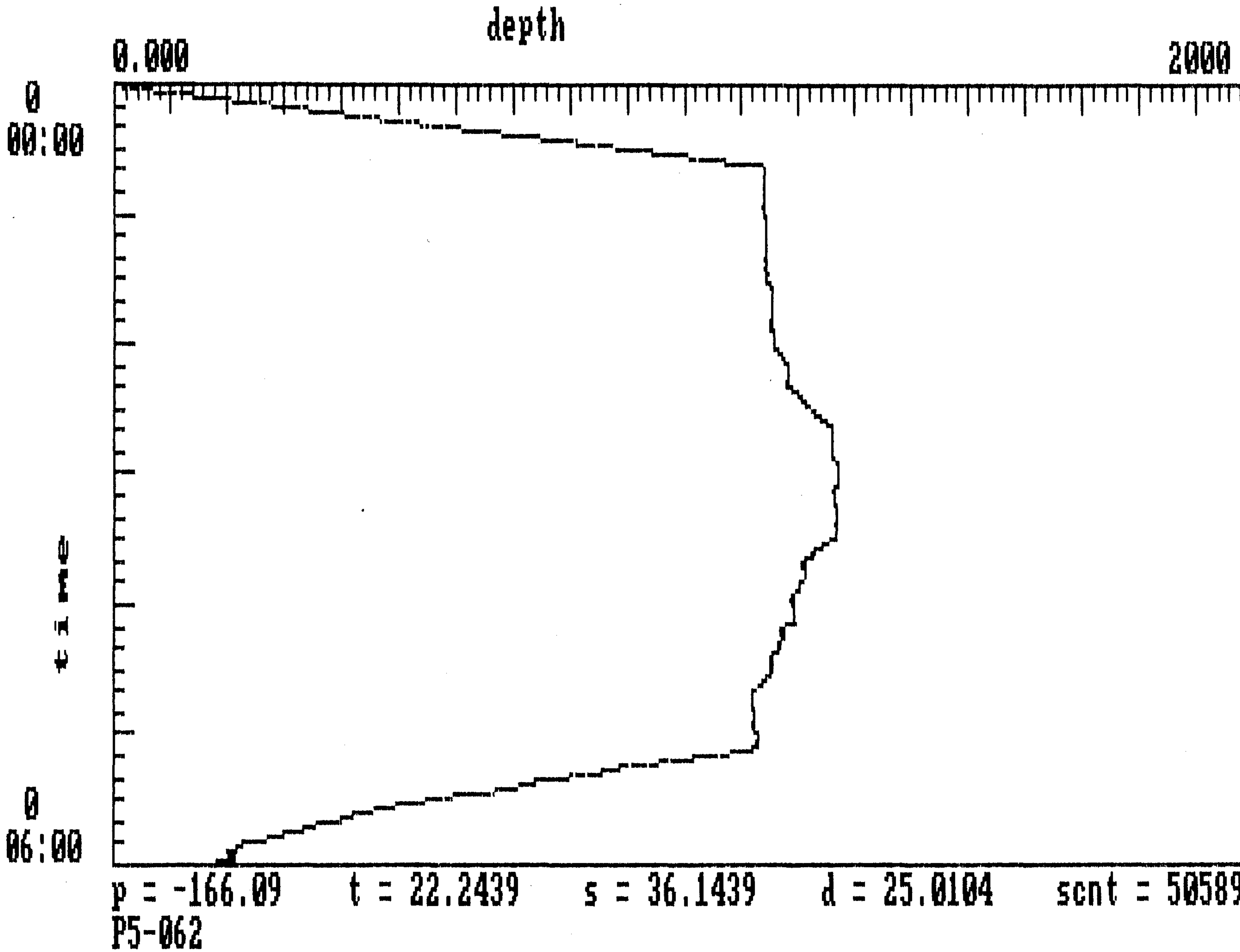
P5-062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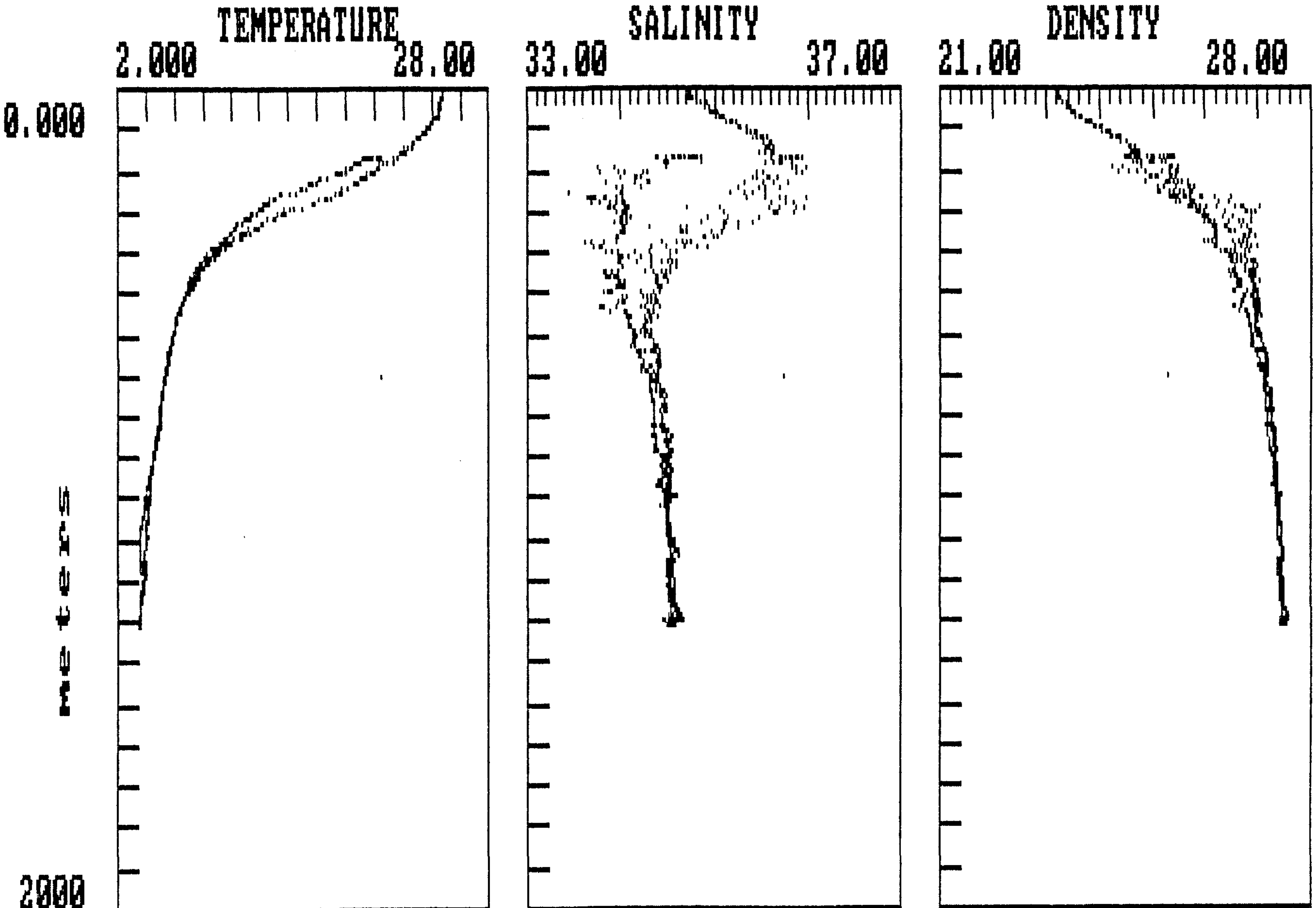
scnt = 50589
P5-062



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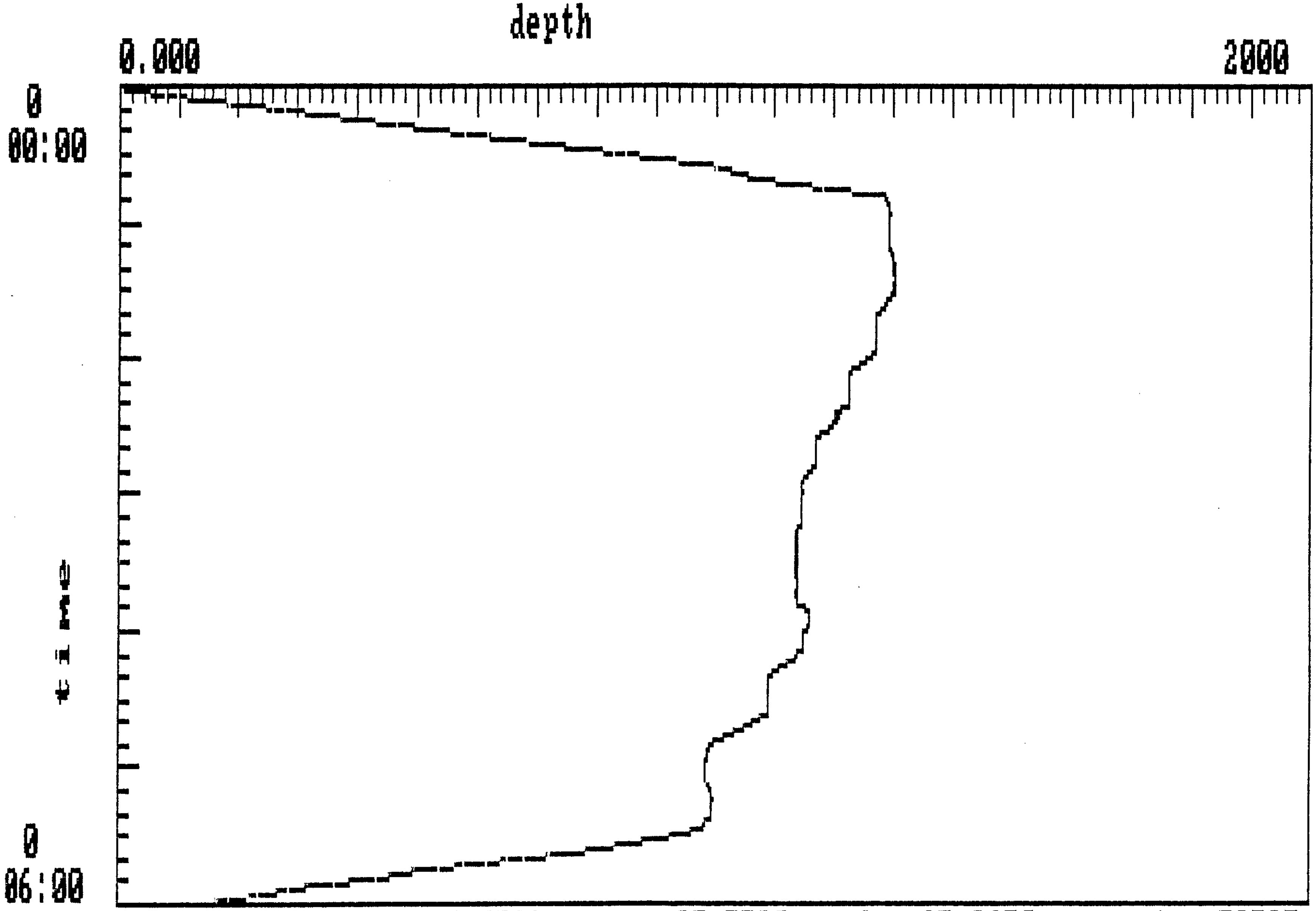
P5-063



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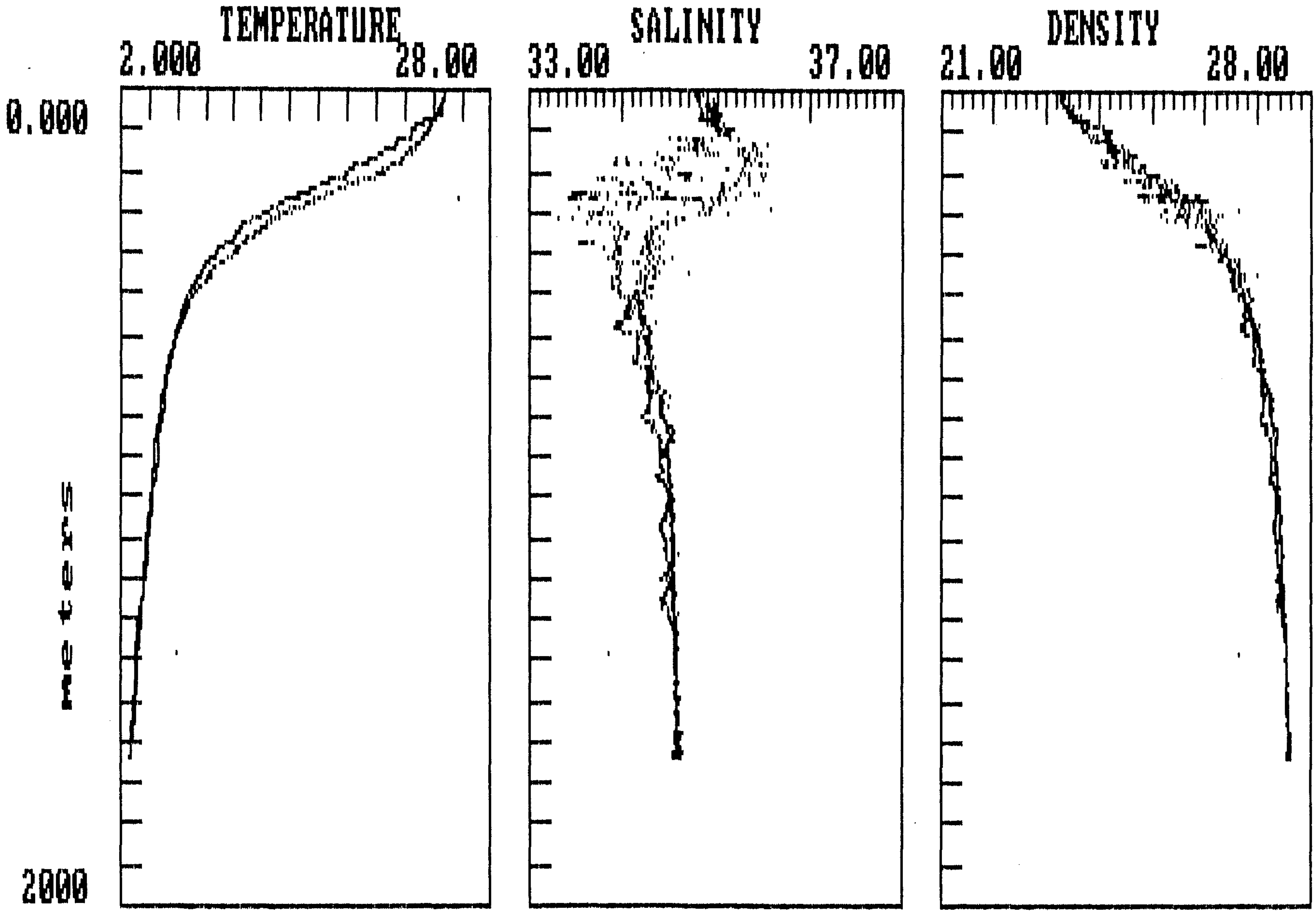
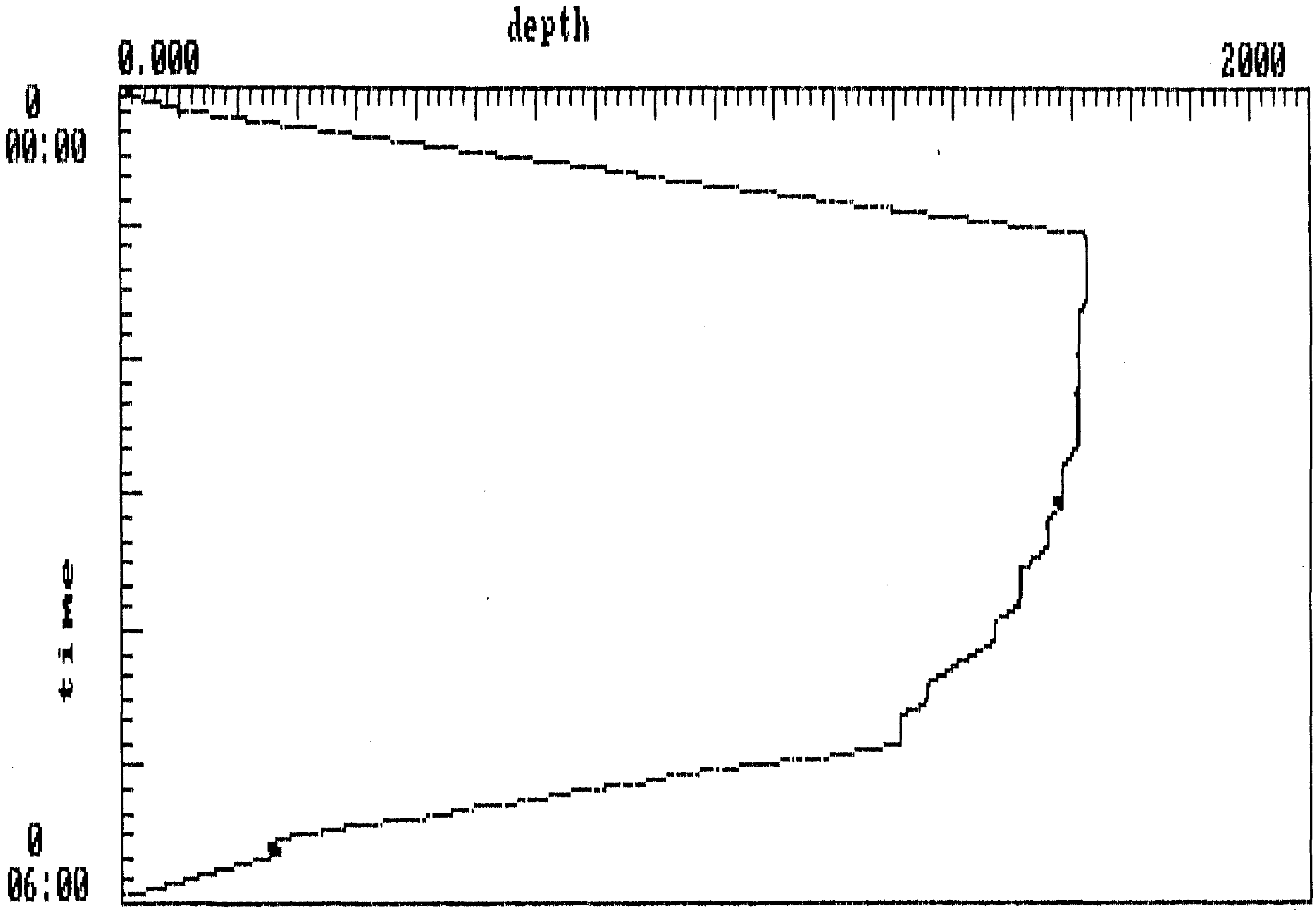
P5-063



p = 266.69 t = 25.8198 s = 17.6018 d = 10.0342 scnt = 47201

P5-064



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P5-064