

CRUISE REPORT
FOR
MMS CRUISE CAMP 1-3
LEG 1, LEG 2, and LEG 3
CALIFORNIA OCS PHASE II MONITORING PROGRAM

June 22, 1987

Performed for

U. S. Department of the Interior
MINERALS MANAGEMENT SERVICE
Pacific OCS Office

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1.0 INTRODUCTION

CRUISE REPORT
FOR
MMS CRUISE CAMP 1-3
R/V Robert Gordon Sproul
4 May - 1 June 1987

1.0 INTRODUCTION

Cruise CAMP 1-3 was the third and final cruise scheduled for year one of the MMS California Phase II Monitoring Program (MMS Contract No. 14-12-0001-30262). This program is designed to monitor potential environmental changes at a series of regional stations and at two arrays of site-specific stations near oil production platforms in the western Santa Barbara Channel and Santa Maria Basin region of the California OCS. Platform Hidalgo (Lease P-0450) off Point Arguello has been selected for hard-bottom, site-specific monitoring, and Platform Julius (Lease P-0409) off Point Sal has been selected for soft-bottom, site-specific monitoring. Specific objectives of the program are:

1. To detect and measure potential long-term (or short-term) changes in the marine environment adjacent to oil and gas platforms; and
2. To determine whether changes observed in the marine environment during the monitoring period are caused by drilling-related activities or are a product of natural processes.

To accomplish these objectives, we are looking closely for potential biological changes and concomitant chemical or physical changes that can be linked to specific drilling events. An overall objective of Cruise CAMP 1-3 was to provide critical pre-drilling baseline data to help make these kinds of correlations and inferences.

Cruise CAMP 1-3 was planned to consist of three legs. Leg 1 was devoted to the Sediment Transport Task in the Platform Julius Study Area. Leg 1 consisted of side-scan sonar surveys; deployments of three subsurface current-meter moorings and two GEOPROBES; collections of four box cores for detailed sediment analysis; and performing hydrographic and suspended matter surveys on the cross-slope transects.

Leg 2 was devoted to the Soft-Bottom Sampling Task. The soft-bottom sampling consisted of boxcore collections at 28 sites for various biology, chemistry, and sedimentology parameters; hydrocasts at nine regional stations for dissolved oxygen, salinity and temperature parameters; and deployment of animal traps for hydrocarbon and trace-metal tissue analysis.

Leg 3 was devoted to the Physical Oceanography and Hard-Bottom Survey Tasks. The major objectives of Leg 3 were to perform photographic surveys at hard-bottom sites; service current meters at the Platform Hidalgo site; deploy satellite telemetry systems at the Hidalgo and Julius Study Areas; service the bedform time-lapse camera at the Julius site; service the sediment traps at 22 sites in the Hidalgo and Julius Study Areas; perform hydrographic profiles at

selected stations; deploy animal traps for hydrocarbon and tissue analysis in the hard-bottom region; and collect three replicate grab samples for various chemistry and sedimentology parameters. Leg 3 encountered severe weather conditions throughout the cruise, thereby hindering all phases of operations. As a result of the limited success of Leg 3, Dr. Jeffrey Hyland, Program Manager, has requested that a fourth Leg be performed during July 1987.

The Scripps Institution of Oceanography's R/V Robert Gordon Sproul was the support vessel for Cruise CAMP 1-3, Legs 1, 2, and 3. International Underwater Contractors' M/V Aloha was rescheduled for another project during May. The R/V Robert Gordon Sproul was leased through I.U.C. at original subcontract rates.

The R/V Robert Gordon Sproul departed Ventura Harbor on 4 May 1987 for Leg 1 of Cruise CAMP 1-3 and returned 9 May 1987. Leg 2 was mobilized on 9 May 1987 and returned to Ventura on 19 May 1987. Leg 3 was mobilized on 20 May 1987 and returned to Ventura Harbor on 1 June 1987.

The reports of the consecutive cruise legs are provided in the sections below. The study area is shown in Figure 1-1.

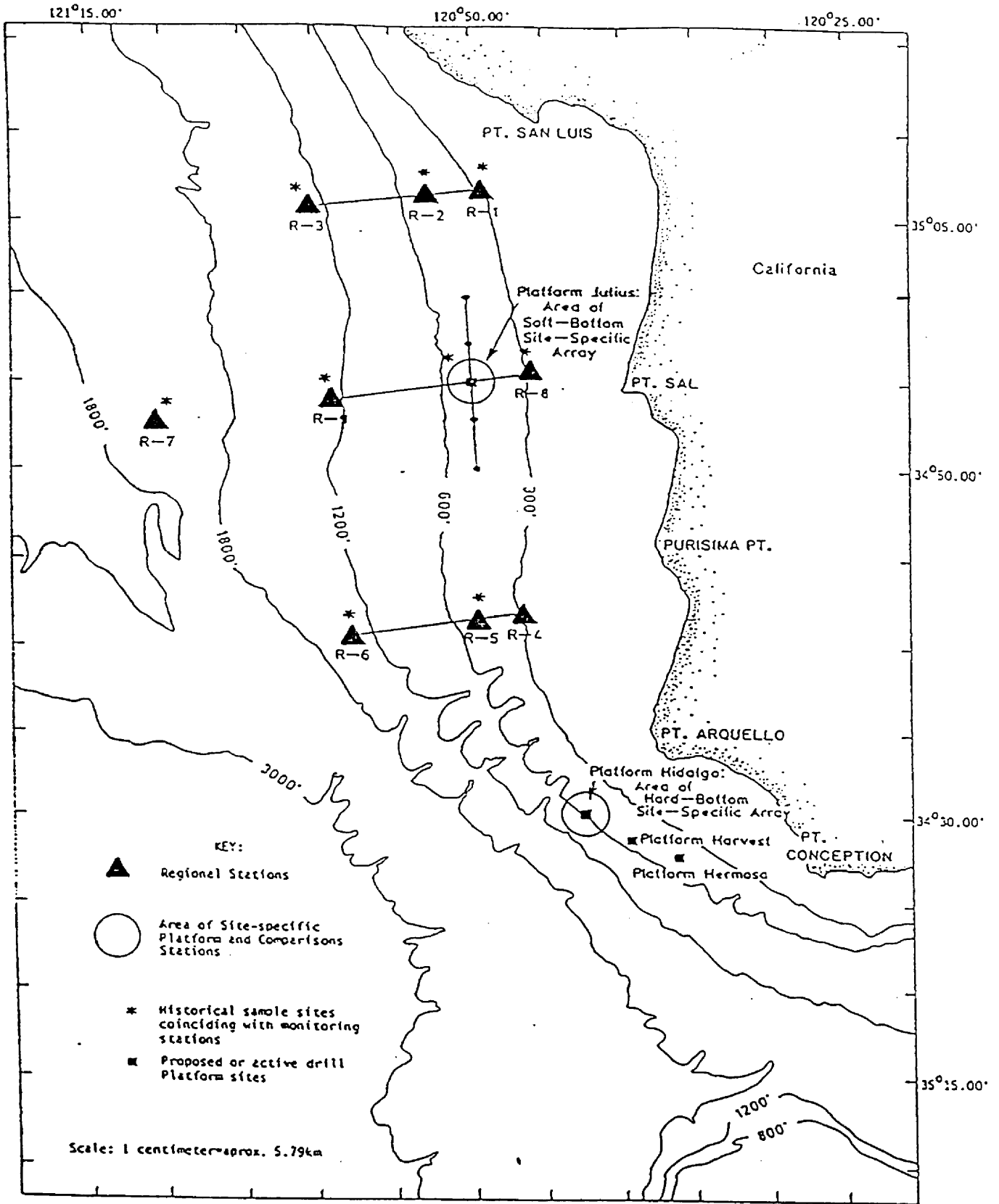


Figure 1-1 Map of study area with locations of site-specific and regional sampling stations. Platform sites and historical sampling sites that coincide with monitoring stations also are shown.

2.0 NAVIGATION

2.0 Navigation

The Northstar 7000 LORAN C receiver was the primary navigational aid for Leg 1. A navigation software package developed by Mr. Andy Eliason of Eliason Data Services was used to integrate an Apple IIe microcomputer and Epson printer with the LORAN C.

The firm of Land and Sea Surveys, Inc., provided navigational services for Legs 2 and 3. Station locations established on Cruises CAMP 1-1 and CAMP 1-2 were revisited using a Motorola Miniranger system. The Miniranger system was interfaced to a 9826 Hewlett Packard computer, which was linked to three color monitors (navigation lab, bridge, and main lab) to display the ship's position graphically. A Thinkjet printer and 7475A Hewlett Packard plotter provided hardcopy printouts of Universal Transverse Mercator (UTM) coordinates and station plots. Land and Sea also provided the Ferranti O.R.E. Track Point system enabling the subsurface monitoring of I.U.C.'s Recon IV Remotely Operated Vehicle (ROV) during the hard-bottom surveys. Positions occupied with the Miniranger system on Cruise CAMP 1-3/Leg 2 were supported with the Northstar 7000 LORAN C system described at the beginning of this section.

All LORAN time delays were in the 9940 Group Repetition Interval (GRI) using the X and Y secondary stations, the 27-K and 41-K lines, respectively.

Station depths were recorded using a 12 kHz Gifft PDR (precision depth recorder), which was standard equipment aboard the R/V Sproul. Station depths were also noted from the bridge on a Furuno digital fathometer.

Time was recorded as Pacific Daylight Time (PDT).

3.0 SEDIMENT-TRANSPORT CRUISE - LEG 1 REPORT

3.0 SEDIMENT-TRANSPORT CRUISE - LEG 1 REPORT
4-9 May 1987

3.1 Objectives

This cruise was conducted as part of the sediment transport project of the California OCS Phase II Monitoring Program. The objectives of the cruise were to:

- A. Conduct a side-scan sonar survey at three locations (in the vicinity of regional stations R-8, PJ-1, and R-9, stations A, B, and C respectively - see Figure 3-1);
- B. Deploy subsurface current moorings at these three sites;
- C. Deploy GEOPROBES at stations A and B;
- D. Collect box cores for detailed sediment analysis;
- E. Conduct a hydrographic and suspended matter survey on three cross-slope transects.

3.2 Participating Personnel

| Name | Affiliation |
|-------------------|--------------------------------------|
| Brad Butman | USGS, Woods Hole, MA |
| Bill Strahle | USGS, Woods Hole, MA |
| John Moody | USGS, Woods Hole, MA |
| Dave Drake | USGS, Menlo Park, CA |
| George Tate | USGS, Menlo Park, CA |
| Rick Vale | USGS, Menlo Park, CA |
| Jim Nicholson | USGS, Menlo Park, CA |
| Cheryl Ann Butman | Woods Hole Oceanographic Institution |
| Chris Webb | Woods Hole Oceanographic Institution |
| Gary Brewer | Minerals Management Service |
| Jim Campbell | Battelle, Ventura, CA |
| Bill Crowley | International Underwater Contractors |

3.3 Activities

| | | |
|--------|-----------|--|
| 5/4/87 | 0800-2300 | Load RV <u>Robert Gordon Sproul</u> Noted bad slip rings on side-scan winch |
| 5/5/87 | 0045 | Depart Ventura |
| | 1300 | Arrive Station C , Setup to Launch Mooring at C |
| | 1543 | Mooring 326 Deployed |
| | 1943 | Mooring 325 Deployed at Site B |
| | 2057 | Mooring 324 Deployed at Site A |
| | 2243 | Box Core at Site A |
| 5/6/87 | 0600 | Prepare GEOPROBE - Deploy GEOPROBE at Site A |
| | 1055 | Underway to Site B |
| | 1215 | Box Core at Site B |

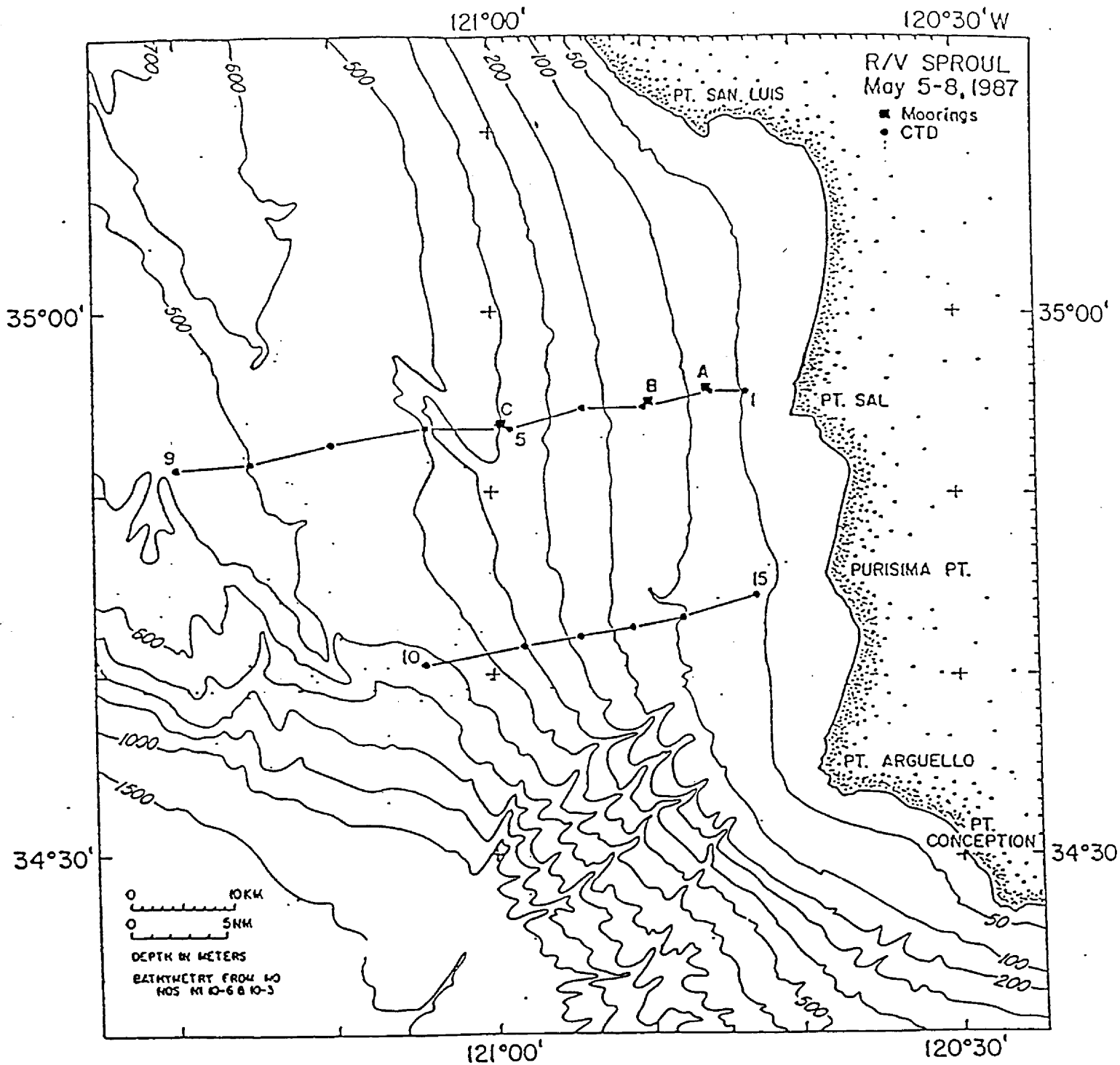


Figure 3-1. Cruise track for R/V Robert Gordon Sproul cruise, May 5-8, 1987. Moorings were deployed at stations A, B, and C. CTD casts conducted at stations 1-15. Box cores were obtained near the 3 mooring stations and near CTD station 7.

| | | |
|----------------|------|---|
| 5/6/87 (Cont.) | 1400 | Deploy GEOPROBE at Station A - Underway to Station B |
| | 1600 | Arrive Port San Luis. Receive and install slip rings for side-scan winch |
| | 1700 | Depart Port San Luis |
| | 1970 | Start Side-scan Survey at Site A |
| | 2342 | Complete Side-scan at Site A |
| | 2350 | Start Side-scan Survey at Site B |
| 5/7/87 | 0625 | Complete Side-scan Survey at Site B |
| | 0730 | Start Side-scan Survey at Site C |
| | 1200 | Complete Side-scan at Site C. Limited coverage obtained because of failure of level-wind winch and deep water |
| | 1343 | Box Core at Site |
| | 1733 | Begin CTD Transect |
| | 2130 | Problem with CTD at Station 5. Re-terminate CTD Cable. Various Test Casts of CTD System |
| 5/8/87 | 0318 | Box Core at Station R-7 |
| | 0500 | Resume CTD. Changed to ship hydro winch. |
| | 1057 | Complete Central CTD Transect Stations 1-9 |
| | 1259 | Begin Southern CTD Transect Station 10 |
| | 1743 | Complete Southern CTD Transect. Underway to Ventura |
| 5/9/87 | 0700 | Arrive Ventura Harbor |

| | | |
|-------------------------------|-----------------------------|-------|
| <u>Tabulated Information:</u> | Days at sea: | 5 |
| | Hydrographic Stations: | 15 |
| | Suspended Sediment Samples: | 30 |
| | Box Cores: | 4 |
| | Side-scan Sonar (estimated) | 90 km |

Summary

All major objectives of the R/V Robert Gordon Sproul cruise were accomplished despite temporary failure of the side-scan and CTD systems. The slip rings on the side-scan sonar winch were found to be shorted just prior to departure. Thus, the current moorings and GEOPROBES were deployed during the first part of the cruise without benefit of the side-scan survey. Replacement slip rings were picked up in Port San Luis on May 6 and the winch repaired; the side-scan survey was conducted on May 6 and 7. During the CTD survey at Station 5, the data from the fish suddenly stopped at about 200 m. Several hours of intense troubleshooting failed to correct the problem. The remainder of the hydrographic survey was conducted using the R/V Sproul's hydrographic winch, which was too small to support the sampling rosette safely; limited water samples for suspended sediment analysis were obtained using a single bottle clamped to the wire. Because of the down-time associated with the winch and CTD repair, only a central and southern hydrographic transect were completed (see Figure 3-1).

The R/V Robert Gordon Sproul was an excellent vessel for this work, although the weather was generally calm. The extremely low freeboard might make the deck unworkable in rough seas. All the equipment on the Sproul was well-maintained and easy to operate. The captain and crew were very helpful and competent. On

future sediment-transport cruises, at least 2 days should be allowed for mobilization. The one day allotted was not sufficient to load, secure, and test all of the equipment.

The side-scan sonar survey revealed several interesting features. The seafloor around station R-8 was generally featureless. Around the site-specific sampling array numerous trawl marks and whale gouges were observed. Numerous large pits, 5-10 m in diameter, were observed at station R-9 as well as trawl marks. The pits may be caused by shallow gas.

Table 3-1. Moorings Deployed on R/V Robert Gordon Sproul, May 5-9, 1987.

| Station | Latitude Longitude | LORAN Time Delays | Water Depth (M) | Mooring No. | Mooring Type | Instr. Depth (m) |
|----------|---------------------------|----------------------------------|-----------------------|----------------|-----------------|------------------------|
| A (R-8) | 34°55.60'N 120°45.80'W | 16500.74 27805.61 41980.21 | 83 | 324 | SS | 63 77 |
| | 34°55.60'N 120°45.70'W | 27806.0 41979.7 | | | G | |
| B (PJ-1) | 34°54.95'N 120°49.78'W | 16495.83 27792.73 41990.65 | 148 | 325 | SS | 142 128 |
| | 34°54.80'N 120°49.80'W | 16495.90 27792.88 41989.79 | | | G | |
| C (R-9) | 34°53.70'N 120°59.50'W | 16483.28 27761.82 42017.49 | 415 | 326 | SS | 144 395 409 |

Note: SS = Subsurface Mooring
G = GEOPROBE

All LORAN time delays were in the 9940 GRI (Group Repetition Interval) using the x and y secondary stations; 27-K and 41-K lines, respectively.

Table 3-2. Hydrographic Stations Sampled on R/V Robert Gordon Sproul
May 5-9, 1987

| Station | Section | Date | | | Time (PDT) | Water Depth (M) | Latitude (N) | Longitude (W) |
|---------|---------|------|----|----|---------------|-----------------------|-----------------|------------------|
| | | Yr | Mo | Dy | | | | |
| 1 | 1 | 87 | 05 | 07 | 1733 | 34°55.4' | 120°43.6' | |
| 2 | 1 | | | | 1829 | 34°55.5' | 120°45.9' | |
| 3 | 1 | | | | 1933 | 34°54.6' | 120°50.0' | |
| 4 | 1 | | | | 2020 | 34°54.4' | 120°54.3' | |
| 5 | 1 | 87 | 05 | 08 | 1035 | 34°53.4' | 120°59.0' | |
| 6 | 1 | | | | 0920 | 34°53.6' | 121°04.3' | |
| 7 | 1 | | | | 0451 | 34°52.7' | 121°10.3' | |
| 8 | 1 | | | | 0605 | 34°51.6' | 121°15.7' | |
| 9 | 1 | | | | 0715 | 34°51.2' | 121°20.4' | |
| 10 | 2 | 87 | 05 | 08 | 1254 | 34°40.5' | 121°04.6' | |
| 11 | 2 | | | | 1415 | 34°41.4' | 120°58.1' | |
| 12 | 2 | | | | 1501 | 34°42.0' | 120°54.7' | |
| 13 | 2 | | | | 1555 | 34°42.5' | 120°51.0' | |
| 14 | 2 | | | | 1640 | 34°43.0' | 120°47.5' | |
| 15 | 2 | | | | 1730 | 34°44.1' | 120°42.3' | |

Note: Time is Pacific Daylight Time
Latitude/Longitude from Northstar 7000 algorithm

Table 3-3. Box Cores Collected on R/V Robert Gordon Sproul, May 5-9, 1987

| Sample | Date | | | Water Depth (M) | Latitude (N) | Longitude (W) | Loran Time Delays | | Station | |
|--------|------|----|----|-----------------------|-----------------|------------------|----------------------|---------|---------|------|
| | Yr | Mo | Dy | | | | | | | |
| 1 | 87 | 05 | 05 | 85 | 34°55.4' | 120°45.8' | 16500.7 | 27805.5 | 41979.1 | R-8 |
| 2 | 87 | 05 | 06 | 143 | 34°54.7' | 120°49.8' | 16495.9 | 27792.8 | 41989.3 | PJ-1 |
| 3 | 87 | 05 | 07 | 393 | 34°53.9' | 120°59.1' | | 27762.8 | 42017.0 | R-9 |
| 4 | 87 | 05 | 08 | 560 | 34°52.6' | 121°10.4' | | 27727.5 | 42047.8 | R-7 |

4.0 SOFT-BOTTOM CRUISE - LEG 2 REPORT

4.0 SOFT-BOTTOM CRUISE - LEG 2 REPORT 9-19 May 1987

4.1 Objectives

The objectives of the Soft-Bottom Leg were to collect three replicate box cores at nine regional stations and 19 site-specific station. Each box core was to be sampled for benthic infauna (macrofauna and meiofauna), sediment chemistry, and sedimentology parameters. Four primary site-specific stations were to be sampled in triplicate for sediment pore-water chemistry. A string of three replicate animal traps was to be deployed at each of three selected stations (R-2, PJ-1 and PJ-11) for the collection of hydrocarbon and trace-metal tissue samples. A single hydrocast was to be performed at each of the nine regional stations for near-bottom measurements of dissolved oxygen, salinity, and temperature. Two other objectives were added during the cruise when Dr. Jeffrey Hyland, Program Manager, requested that attempts be conducted to interrogate the current-meter mooring release at PJ-13 and to search an area in the vicinity of PJ-20 for instruments, which the fisherman, Travis Evans had buoyed.

4.2 Results

The Scripps Institution of Oceanography's R/V Robert Gordon Sproul departed from Ventura Harbor on Saturday, 9 May 1987 at 2015 hours. The cruise track and study area are shown in Figures 4-1 and 4-2. Moderate weather conditions and familiarity with sampling operations on the part of the scientific and ship's crew resulted in the timely completion of all work. Variable fog and overcast conditions throughout the cruise, kept the wind and sea down to a workable level.

Sampling operations commenced at 0800 hours on 10 May 1987 and proceeded fairly uninterrupted on a 24-hour basis until 2000 hours on 18 May 1987. The equipment aboard the R/V Sproul added to the safety and efficiency of our operations.

Several attempts were made to interrogate the current-meter mooring release at PJ-13, however, no response was received. On 18 May 1987 at 1800 hours, a visual search was conducted in the vicinity of PJ-20 and at the location (Loran-C time delays 27793.8, 41963.5) where Mr. Travis Evans had buoyed some instruments that had been caught in his net. Although the seas were moderate and the swells were 12 ft, we were unable to locate the buoy.

During a box core recovery, Elliott Gilder's hand was injured when attempting to free a stabilizing tugger wire. Elliott received first-aid attention and has not suffered any permanent damage. A second injury involved Eileen Lampp. Eileen caught 5-percent formalin in her eye while preserving meiofauna samples. She also received first-aid attention on board and subsequently visited a doctor twice for treatment and to determine the extent of injury. Fortunately, there was no permanent damage resulting from either of the accidents.

A summary of samples collected is shown in Table 4-1.

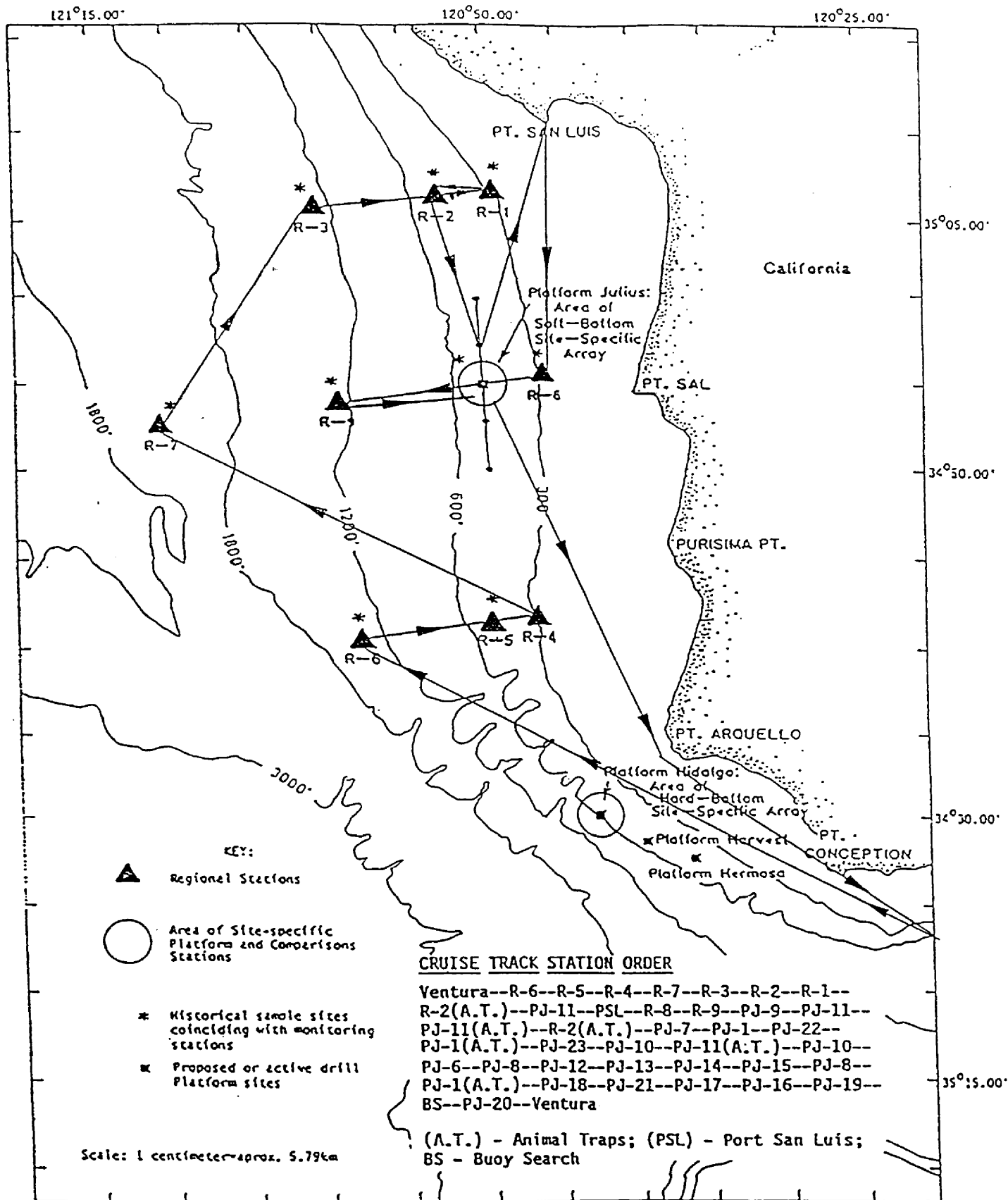


Figure 4-1. Area of Study and Station Locations with Cruise Track Indicated for MMS California Cruise CAMP 1-3; LEG 2 R/V Robert Gordon Sproul 9-19 May 1987.

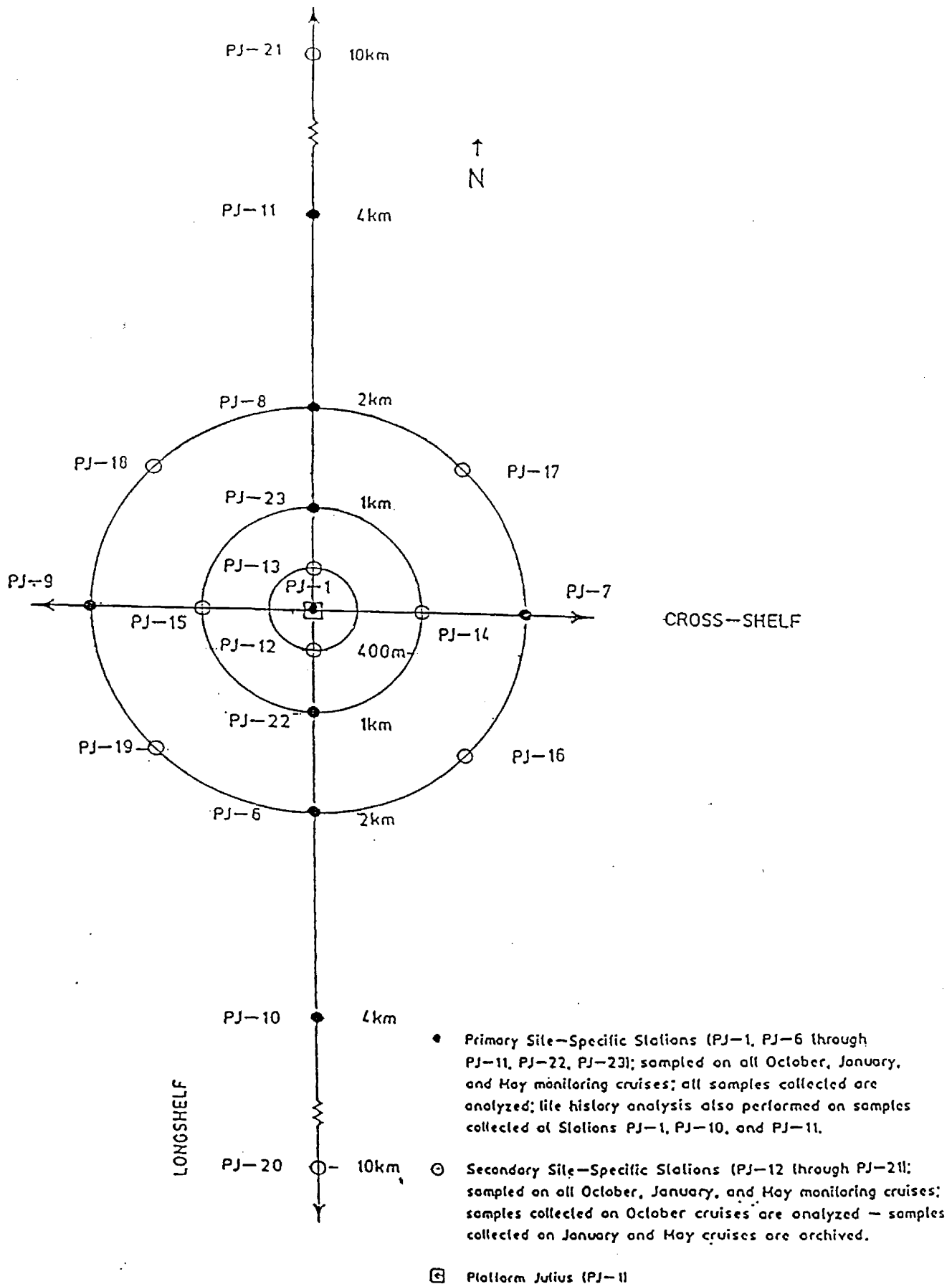


Figure 4-2. Site-Specific Array of Stations Around Platform Julius

TABLE 4-1. SUMMARY OF SAMPLES COLLECTED ON MMS CRUISE CAMP 1-3, LEG 2
(R/V Robert Gordon Sproul)

| Sample Type | Number of Stations | Number of Replicates/ Station | Total Number/ Cruise | Sample Custody |
|--------------------------------------|--------------------|-------------------------------|----------------------|--------------------|
| Infaunal Box Core | 28 | 3 | 84 | Battelle (Ventura) |
| Meiofauna | 28 | 3 | 84 | Univ. Texas |
| Core Radiography | 14 | 1(x2)(1) | 14(x2) | Univ. Maine |
| Surface Sediment (0-2cm): TM | 28 | 3 | 84 | Battelle (BNW) |
| Surface Sediment (0-2cm): HC | 28 | 3 | 84 | Battelle (BNE) |
| Subsurface Sediments (2-10cm): TM | 4 | 3 | 12 | Battelle (BNW) |
| Subsurface Sediments (2-10cm): HC | 4 | 3 | 12 | Battelle (BNE) |
| Pore-water Chemistry:TM | 4 | 3 | 12 | Battelle (BNW) |
| Pore-water Chemistry:HC | 4 | 3 | 12 | Battelle (BNE) |
| Pb/Th Ratios | 7 | 1 | 7 | Battelle (BNW) |
| Sedimentology | 28 | 3 | 84 | Kinnetics |
| Animal Tissue Chemistry | 3 | 3 | 9 | Battelle (BNE) |
| Hydrography | 9 | 1 | 9 | Kinnetics |

1. One X-ray was taken of each of the two sediment cartridges collected from the 10 x 30-cm subcore.

4.3 Box Core Sampling

A Hessler-Sandia MK-III box core, vegetatively partitioned into 25 individual 0.01m² subcores was used to collect sediment (Figure 4-3). Three replicate box cores were collected at each of the nine regional stations (R-1 through R-9) and the 19 site-specific stations (PJ-1 and PJ-6 through PJ-23) for various biological, chemical, and sedimentology parameters. An Ocean Instruments DEEPEYE Camera System was mounted on the box core for the purpose of pre-penetration photographs. At each of four stations (PJ-1, PJ-8, PJ-10 and PJ-11), three additional box core replicates were collected for the purpose of pore-water chemistry analysis using a quadrilateral 0.25-m² box.

A total of 96 successful box-core samples were collected on Leg 2. This total surpasses any previous record set for this type of sampling gear on a ten-day cruise. Seven samples were rejected due to partial wash-outs and disturbed surfaces. The corer failed to trip on eleven occasions as a result of hard sediment/slow penetration problems, jammed trigger-pins, and rigging errors. Station R-5 was the most troublesome boxcoring station, which can be attributed to the patchiness of fossilized scallop shells at the 15 cm sediment depth. On the previous 2 boxcoring legs aboard the M/V Aloha, several box core pennant cable changes were required due to damage. Subsequent to the second boxcoring cruise, it was determined that as the trawl wire aboard the M/V Aloha was not torque-balanced, it tended to kink when the instrument made bottom contact, thereby seriously damaging the pennant cables. Since the R/V Robert Gordon Sproul's winch is equipped with torque-balanced wire, this problem was alleviated and only one pennant cable was replaced due to normal wear.

Please note that all box core samples (macrofauna, meiofauna, chemistry, and sedimentology) collected at the secondary site-specific stations (PJ-12 through PJ-21) are to be archived.

Station reference coordinates are listed in Tables 4-2, 4-3, and 4-4. A summary of sample positions is shown in Appendix A.

4.4 Biology

From each of three replicate box cores at each of the nine regional stations (R-1 through R-9) and 19 site-specific stations (PJ-1 and PJ-6 through PJ-23), ten subcores (Subcore Numbers 6-15) were taken for benthic macroinfauna, and one subcore (Subcore Number 17) was used to take a single 1-cm diameter sample for meiofauna.

Macrofaunal samples were processed on board ship in the following manner. The subcores were removed individually from the box and the upper 10 cm of sediment were extruded, cut, and placed in an elutriating bucket. The remaining portion of the subcore (>10 cm) also was extruded and placed in a separate elutriating bucket. Three to four subcores were extruded and placed in one elutriating bucket at a time. The 0 to 10 cm fraction was processed through a 0.3-mm mesh sieve and the >10 cm fraction was processed through a 1.0-mm mesh sieve. The residue from both fractions was rinsed into separate 16-oz glass jars and preserved with approximately 10-percent buffered formalin.

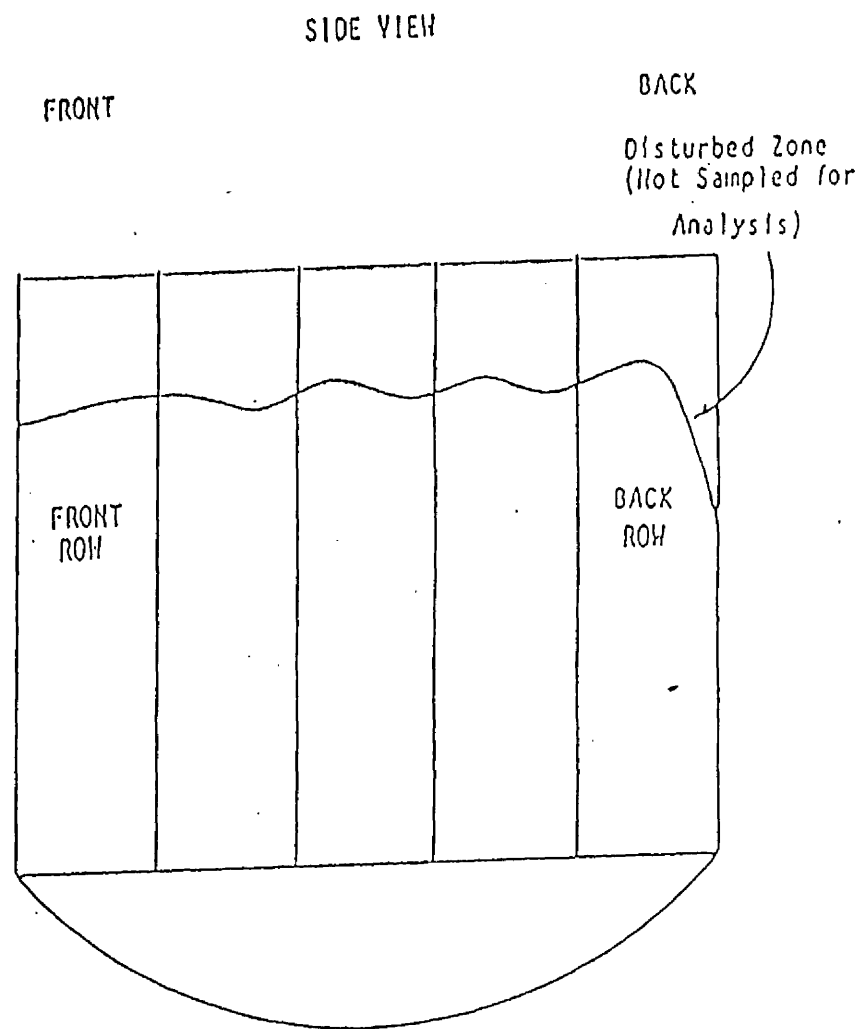
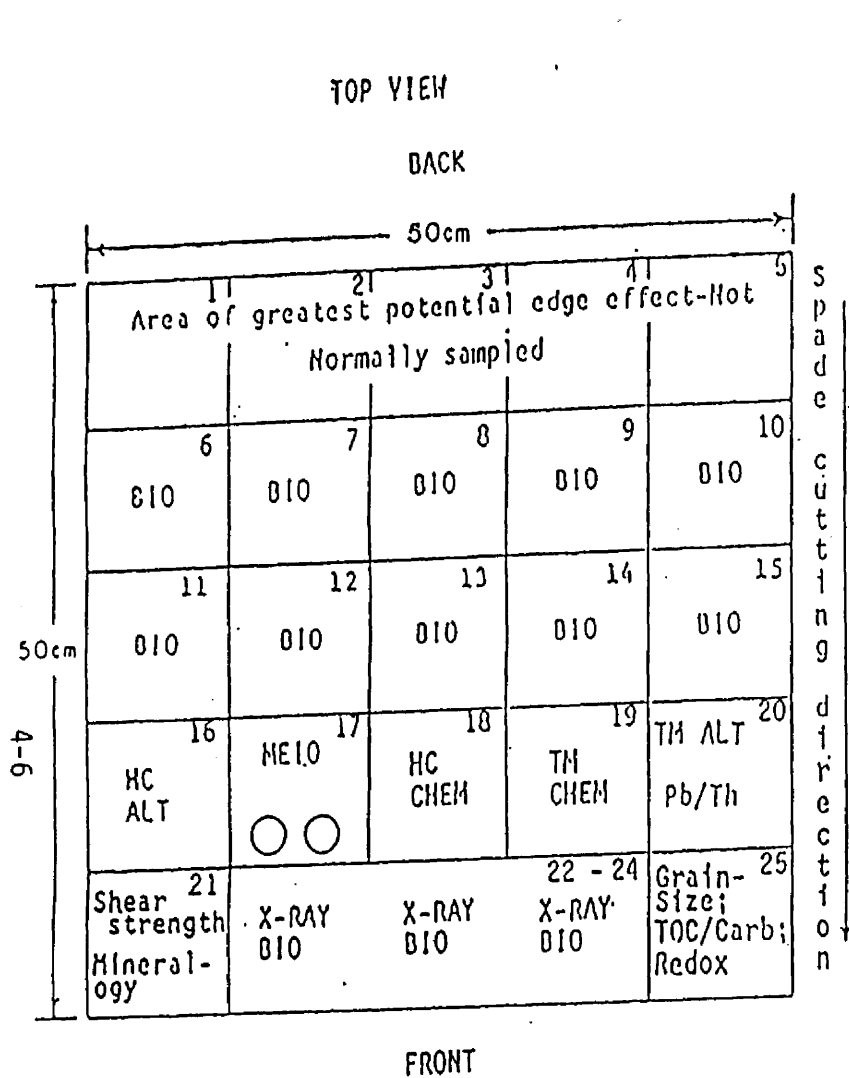


Figure 4-3. Box core illustrating "vegematic" partitioning (top view) and side view illustrating disturbed subsamples.

TABLE 4-2. REGIONAL STATIONS REFERENCE COORDINATES FOR THE
MMS CALIFORNIA PHASE II MONITORING PROGRAM.

| Station | Latitude Longitude | UTM Coordinates | LORAN Time Delays | Depth (M) |
|---------|---------------------------|---------------------|----------------------|--------------|
| R-1 | 35°05.83'N 120°49.16'W | N3885790 E698776 | 27794.9 42044.9 | 91 |
| R-2 | 35°05.50'N 120°53.40'W | N3885047 E692345 | 27780.8 42057.1 | 161 |
| R-3 | 35°05.30'N 121°00.90'W | N3884443 E680956 | 27756.2 42081.0 | 409 |
| R-4 | 34°43.01'N 120°47.39'W | N3843676 E702399 | 27800.3 41921.5 | 92 |
| R-5 | 34°42.69'N 120°50.83'W | N3842964 E697156 | 27789.8 41932.0 | 154 |
| R-6 | 34°41.40'N 120°57.90'W | N3840354 E686413 | 27768.0 41949.8 | 410 |
| R-7 | 34°52.90'N 121°10.30'W | N3861248 E667092 | 27727.7 42047.7 | 565 |
| R-8 | 34°55.30'N 120°45.87'W | N3866433 E704208 | 27805.6 41978.2 | 90 |
| R-9 | 34°53.68'N 120°59.12'W | N3863016 E684098 | 27763.2 42014.9 | 410 |

Revised 6/87

TABLE 4-3. PRIMARY SITE-SPECIFIC STATIONS REFERENCE COORDINATES
FOR THE MMS CALIFORNIA PHASE II MONITORING PROGRAM

| Station | Latitude Longitude | UTM Coordinates | LORAN Time Delays | Depth (M) |
|---------|---------------------------|---------------------|----------------------|--------------|
| PJ-1 | 34°55.79'N 120°49.91'W | N3867215 E698032 | 27792.5 41994.6 | 145 |
| PJ-6 | 34°54.71'N 120°49.91'W | N3865215 E698076 | 27792.5 41989.1 | 148 |
| PJ-7 | 34°55.79'N 120°48.60'W | N3867257 E700032 | 27796.7 41990.3 | 123 |
| PJ-8 | 34°56.87'N 120°49.91'W | N3869214 E697989 | 27792.5 42000.4 | 142 |
| PJ-9 | 34°55.79'N 120°51.23'W | N3867171 E696033 | 27788.2 41999.1 | 169 |
| PJ-10 | 34°53.63'N 120°49.91'W | N3863215 E698119 | 27792.5 41983.6 | 147 |
| PJ-11 | 34°57.95'N 120°49.91'W | N3871214 E697946 | 27792.6 42006.0 | 136 |
| PJ-22 | 34°55.25'N 120°49.93'W | N3866217 E698034 | 27792.5 41991.9 | 143 |
| PJ-23 | 34°56.33'N 120°49.90'W | N3868217 E698034 | 27792.5 41997.3 | 143 |

Revised 6/87

TABLE 4-4. SECONDARY SITE-SPECIFIC STATIONS REFERENCE COORDINATES
FOR THE MMS CALIFORNIA PHASE II MONITORING PROGRAM

| Station | Latitude Longitude | UTM Coordinates | LORAN Time Delays | Depth (M) |
|---------|---------------------------|---------------------|----------------------|--------------|
| PJ-12 | 34°55.58'N 120°49.91'W | N3866815 E698041 | 27792.6 41993.4 | 145 |
| PJ-13 | 34°56.01'N 120°49.91'W | N3867615 E698024 | 27792.5 41995.6 | 144 |
| PJ-14 | 34°55.79'N 120°49.26'W | N3867235 E699032 | 27794.8 41992.3 | 134 |
| PJ-15 | 34°55.79'N 120°50.57'W | N3867192 E697033 | 27790.5 41996.7 | 155 |
| PJ-16 | 34°55.03'N 120°48.99'W | N3865830 E699477 | 27795.5 41987.7 | 130 |
| PJ-17 | 34°56.56'N 120°48.98'W | N3868659 E699416 | 27795.6 41995.4 | 126 |
| PJ-18 | 34°56.56'N 120°50.84'W | N3868597 E696589 | 27789.5 42001.9 | 158 |
| PJ-19 | 34°55.03'N 120°50.84'W | N3865770 E696650 | 27789.6 41993.8 | 167 |
| PJ-20 | 34°50.38'N 120°49.91'W | N3857216 E698249 | 27792.5 41967.2 | 148 |
| PJ-21 | 35°01.23'N 120°51.15'W | N3877228 E695936 | 27788.3 42027.2 | 143 |

Revised 6/87

Meiofauna samples were extruded in 2-cm fractions up to 10 cm and placed in 60-ml plastic tubes. Following relaxation in MgCl for 5 minutes, the meiofauna samples were preserved in 5-percent formalin.

All biology samples were successfully collected. In some instances, alternate cores were utilized to replace cores which were washed, dropped, or disturbed. Detailed accounts of such instances were noted on the Field Log sheets.

4.5 Chemistry

From each of the three replicate box cores at each of the 28 stations (regionals and site-specifics) a 0 to 2-cm Hydrocarbon (HC) chemistry sample was collected from a solvent-rinsed subcore (Subcore No.18) and a 0 to 2-cm Trace Metal (TM) chemistry sample was collected from a Teflon-coated subcore (Subcore No. 19). Sediment Hydrocarbon and Trace Metal samples were frozen following collection.

At four site-specific stations (PJ-1, PJ-8 PJ-10 and PJ-11), the upper 10 cm of Subcores No. 18 and No. 19 were collected for HC and TM, respectively. These cores were sectioned into 0-2 cm and 2-10 cm fractions. The lower sediment-core sections will be analyzed to investigate the vertical extent of HC and TM penetration. At four site-specific stations, the same stations designated for 0 to 10 cm sediment chemistry cores (i.e., PJ-1, PJ-8, PJ-10 and PJ-11), three additional box-core replicates were collected for pore-water chemistry analysis using a quadrilateral 0.25-m² box. The entire 0 to 2 cm surface area was collected from these box cores and processed, preserved, and stored for subsequent laboratory analysis. Care was exercised to avoid the sides of the box and surface areas which indicated partial wash-outs.

At two regional stations (R-8 and R-9) and three site-specific stations (PJ-1, PJ-10, and PJ-11), one subcore (Subcore NO. 20) was taken from one of the replicate box cores for the analysis of Lead and Thorium isotope ratios. The Pb/Th ratio sample was collected by inserting an acid-washed CAB core liner into the subcore and capping both ends. The sample was frozen subsequently.

A string of replicate animal traps was deployed at each of three selected stations (R-2, PJ-1, and PJ-11) for the collection of animal tissue samples for hydrocarbon and trace-metal body-burden analyses. The traps were baited with rockfish, shark scraps, and chicken. Each set of traps was left on the station for 30 to 52 hrs. A very limited (yet still useful) catch was recovered at each of the three animal trap stations. Time limitations and sampling priorities prevented the redeployment of the animal traps. A summary of animal trap positions with catch comments is shown in Appendix B.

Several quality assurance samples and blanks were collected for chemistry analyses. These samples, which will be analyzed to detect any background contamination, are as follows:

1. Ship's hydraulic fluid samples for hydrocarbons
2. Air exposure samples for hydrocarbons
3. Milli-Q water from chemistry carboy for trace metals and hydrocarbons
4. Two Milli-Q water samples filtered through the pore-water apparatus for trace metals and hydrocarbons.

4.6 Sedimentology

Samples were collected from each of the three replicate box cores at each of the 28 stations in the Platform Julius study area (9 regional and 19 site-specific stations) for the determination of sediment properties. Measurements and samples for TOC, carbonate, grain-size, and REDOX were taken from Subcore NO. 25. At all stations, sediment shear-strength measurements and mineralogy samples were taken from Subcore No. 21. Only mineralogy samples collected at 10 stations (R-1 through R-7; and PJ-1, PJ-10, and PJ-11) will be analyzed. All other mineralogy samples are to be archived. Also, samples from secondary site-specific stations are to be archived.

4.7 Core Radiography

At 14 stations (R-1 through R-9; and PJ-1, PJ-10, PJ-11, PJ-22, and PJ-23) a specially designed 10 x 30-cm subcore (in place of Subcores No. 22, 23, and 24) was removed from one of the boxcore replicates for x-ray analysis (for evidence of bioturbation). Two plastic cartridges were inserted into the subcore and the surrounding mud was washed away. Immediately following collection, the x-raying took place in the ship's laboratory and the photographs were developed in a make-shift darkroom in the Bosun's locker, below the main deck. Only one set of photos was repeated due to an unsuccessful first attempt. All mud cartridges were dismantled and notes were taken as to the sample appearance.

4.8 Hydrography

A single Niskin bottle equipped with two deep-sea reversing thermometers (DSRT) was deployed at each of the nine regional stations (R-1 through R-9) to collect samples for determination of near-bottom dissolved oxygen, salinity, and temperature. Dissolved oxygen was measured in triplicate on board using the Winkler titrimetric method. Salinity samples were measured using a Hanna H-18333 conductivity probe. Temperature was recorded from two DSRT's. A 60-lb weight was attached to the hydrowire to insure the collection of a near-bottom water sample.

The 12 kHz pinger, which was to be used to track the hydrocast to the bottom, malfunctioned on the first cast. Since the ship's winch meters provided accurate monitoring of the hydrowire, it was deemed unnecessary to utilize one of the spare pingers. The variable speed and sensitivity of the R/V Sproul's hydrographic winch contributed greatly to the efficiency of the hydrocasts.

4.9 Cruise Participants

Participants on Cruise CAMP 1-3, Leg 2 and their affiliations were:

Battelle

James Campbell, Chief Scientist
Janet Kennedy, Second Scientist
Jeff Waugh, Chemist
Christie Dolstra, Technician

Kinnetic Laboratories, Inc.

Gary Gillingham
Scott Carter
Sharon Hamer
Jennifer Pelkan
Elliott Gilder

University of Texas

Eileen Lampp

Land and Sea Surveys, Inc.

Robert Dellaert
James Cooley

International Underwater Contractors

William Crowley

Ocean Instruments, Inc.

John Hedrick

4.10 Acknowledgements

The Chief Scientist and Second Scientist wish to express thanks to all scientific personnel for their monumental efforts in making this an exceptionally successful cruise -- a "clean sweep". Special thanks to Scripps Institution of Oceanography and the crew of the R/V Robert Gordon Sproul for their professionalism and expertise in ship handling.

5.0 PHYSICAL OCEANOGRAPHY/HARD-BOTTOM SURVEY - LEG 3 REPORT

5.0 PHYSICAL OCEANOGRAPHY/HARD BOTTOM SURVEY LEG 3 REPORT
20 May - 1 June 1987

5.1 Objectives

- A. Retrieve and service current meters from the Hidalgo site, and deploy the satellite telemetry systems at both sites.
- B. Obtain water quality profiles and bottle casts from two locations at each sites.
- C. Retrieve and service bedform time-lapse camera from the Julius site, and redeploy.
- D. Retrieve, service and redeploy sediment traps from nine Hidalgo locations, one Harvest location, seven regional locations and five Julius locations.
- E. Deploy traps to collect animal samples for tissue analyses from three Hidalgo locations.
- F. Obtain three replicate grab samples of sediments from nine Hidalgo locations.
- G. Obtain at least 80 replicate 70-mm photographic samples from each high-relief location (three) and each low-relief location (eight) at the Hidalgo site.
- H. Obtain specimens for identification of species in the photographic samples.

5.2 Participating Personnel

| <u>Name</u> | <u>Affiliation</u> | <u>Responsibility</u> | <u>Dates</u> |
|----------------|--------------------|---------------------------|--------------|
| G. Brewer | MMS | Observer | 5/20-5/24 |
| W. Crowley | IUC | Field Support | 5/20-6/1 |
| R. Dellaert | Land & Sea | Navigation | 5/20-6/1 |
| D. Fraser | ORE | Satellite Telemetry | 5/20-5/24 |
| R. Gale | Land & Sea | Navigation | 5/20-6/1 |
| D. Hardin | KLI | Chief Scientist | 5/20-6/1 |
| M. Hill | MMS | Observer | 5/24-5/27 |
| J. Kennedy | Battelle | Sediment/Tissue Chemistry | 5/20-6/1 |
| K. Kronschnabl | KLI | Field Support | 5/24-6/1 |
| M. Mertz | KLI | Physical Oceanography | 5/24-6/1 |
| T. Okey | KLI | Field Support | 5/20-5/24 |
| T. Parr | KLI | Video and Photo Sampling | 5/24-6/1 |
| M. Savoie | KLI | Physical Oceanography | 5/20-5/24 |
| J. Shrake | KLI | Video and Photo Sampling | 5/24-5/27 |
| P. Wilde | KLI | Physical Oceanography | 5/20-5/24 |
| Four Personnel | IUC | ROV Operations | 5/20-5/27 |

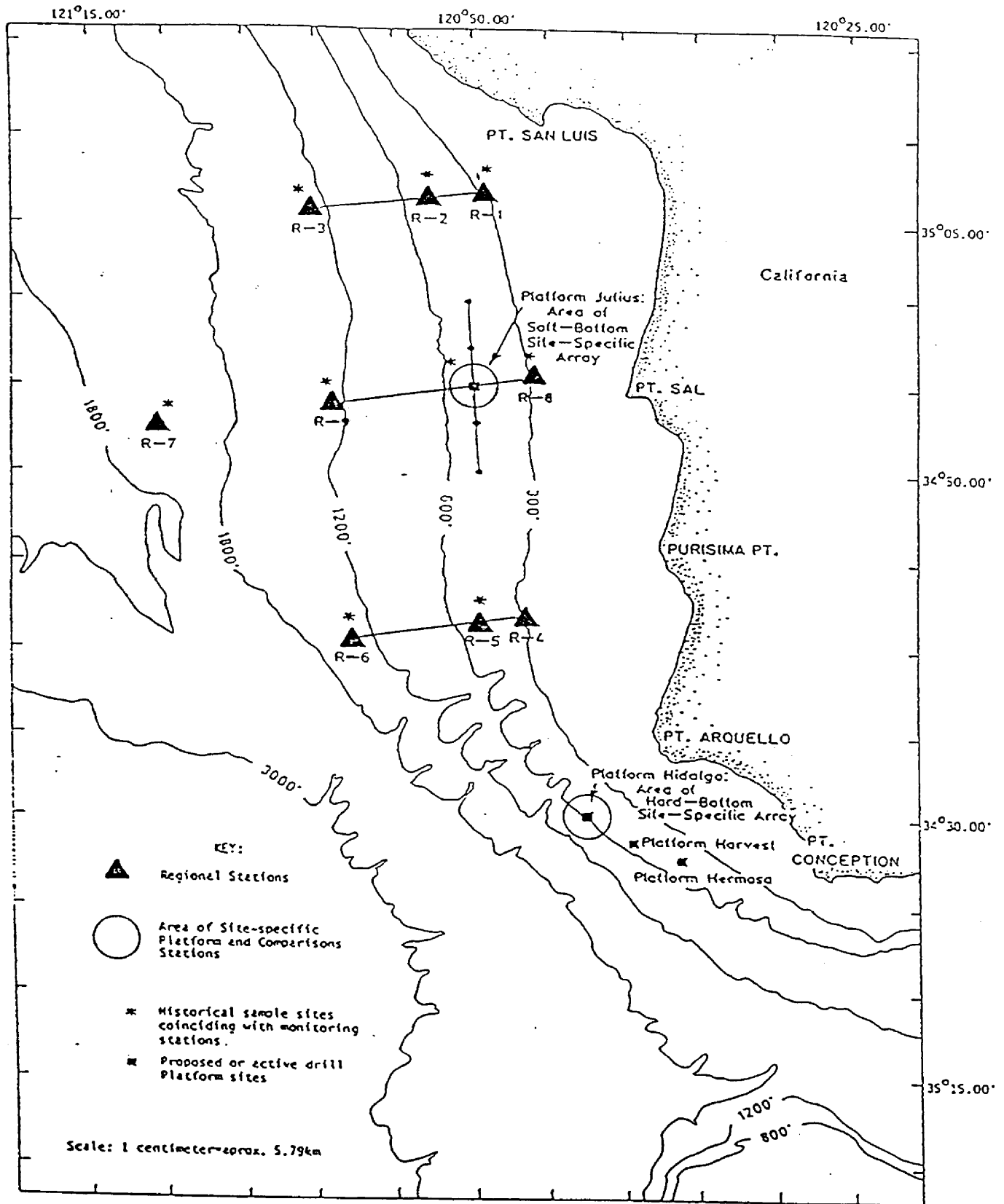


Figure 5-1. Map of study area with locations of site-specific and regional sampling stations. Platform sites and historical sampling sites that coincide with monitoring stations also are shown.

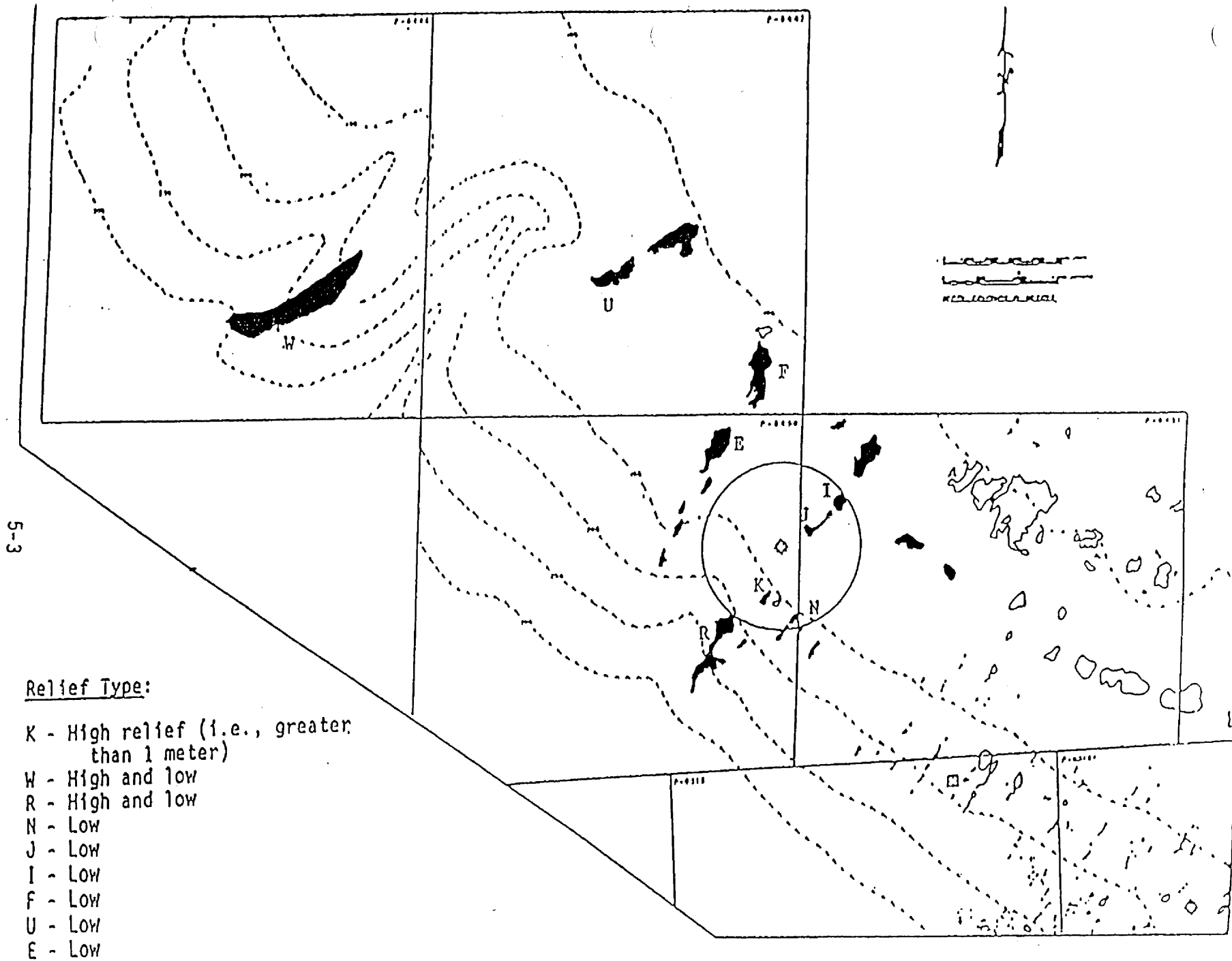


Figure 5-2. Hard-bottom features for site-specific monitoring near Platform Hidalgo.

5.3 Activities

- 5/20/87 The crew arrived in Ventura at 1040 hours, and mobilized equipment. The first telemetry system was set up. All systems checked okay. All gear was secured for departure by 0045 hours.
- 5/21/87 The ship departed the dock at 0110 hours. Arrived at Hidalgo at 0930 hours, and we attempted to fire the release on the current meters from 1000 hours to 1045 hours. No response was received. The ROV and Track Point system were rigged to search and recover current meters. The ROV was in the water at 1415 hours, but had to surface to adjust ballast after searching bottom (groundline was seen on ascent). The current meters were found at 1530 hours. Before the hook could be attached, it was discovered that the groundline was severely fouled on the ROV tether. At 1630 hours the ROV crew decided to bring the equipment and ROV to the surface with the tether. Soon after the current meter buoys were sighted on the surface, they came close enough to the ship to hook. The retrieval process proceeded more or less uneventfully until all equipment was on board at 1930 hours. The release had not operated because it had leaked through a water contact switch. The equipment was checked and serviced. The ship motored slowly just inside Santa Barbara Channel for the night after leaving the Hidalgo area at approximately 2100 hours.
- 5/22/87 The ship was back on site at Hidalgo at 0615 hours. The Sea Data pressure gauge was rigged for deployment. Deployment of the telemetry system began at approximately 1015 hours. All meters were in the water by 1022 hours, and in position on the bottom at 1055 hours. The ship made several passes by the mooring to check its appearance, and departed for PJ-13A at 1130 hours. The ship arrived at 1515 hours. We listened for the pinger and a response from the release on the current meter, but none was noted. We went to PJ-13AC to listen for the camera pinger and release, but no signals were heard. We attempted to fire the release, without success. We then rigged to drag for the equipment with a grappling hook, and began dragging at approximately 1700 hours.
- 5/23/87 A total of ten drags were made for the PJ-13A camera and meters until 0330 hours. Five drags went SW to NE, and five went SE to NW; We had no success. At about 0830 hours, we began searching along the isobath of PJ-13 by stopping every 500 meters to listen with the ORE Track Point and Helle pinger receivers for 27 or 37 kHz pingers from the meters or camera. We also tried ranging with the Datasonics release deck unit. A path totalling 4500 meters to the north and 4500 meters to the south of PJ-13A was searched without success. This search was completed at 1400 hours. We then attempted to recover the sediment trap at PJ-11. It responded to interrogation, but did not surface when fired at 1445 hours. It had not reached the surface by 1515 hours when it was necessary to depart for Port San Luis. We arrived at 1715 hours. Met Ken Kronschnabl at 1750 hrs and returned to the ship with the CSTD and another release. Assembled the second string of telemetry system for deployment at PJ-13A on 5/24.

5/24/87 Parr, Shrake, Kronschnabl, and Hill came aboard; Wilde, Savoie, Okey, Fraser, and Brewer departed. The ship left Port San Luis at 1030 hours. We arrived at PJ-11 at 1230 hours. Again, we got good responses from the sediment-trap release, but the trap would not surface. We departed at 1345 hours and headed for PJ-13A and PJ-13AC. The ROV dove to search the area at about 1600 hours. Many trawl marks and our own grappling-hook track marks were seen in the area, but no signs of the current meter were seen. The ROV surfaced at 1730 hours to move to PJ-13AC. The winds picked up after the ROV reached the bottom, so it never got a good run through the actual mooring location, just in the vicinity. The dive was aborted at 1730 hours to prepare the telemetry system for deployment. By then, the winds and seas had become unworkable (>25 knots and >8 ft seas). The ship departed for Port San Luis at 2000 hours. We arrived at 2230 hours and prepared the 70-mm camera for mounting. (Used 17.5 hours of weather down time.)

5/25/87 Winds and seas continued through the night offshore. The weather update at 0800 hours indicated possible moderation, so we departed at 0900 hours for PJ-11 to see if the sediment trap had surfaced. We arrived at approximately 1100 hours; no sign of the trap. We went to PJ-13A to deploy the current meters. The meters were anchored in position at 1300 hours. We departed for Hidalgo, and spent half an hour on the way looking without success for the surface float on the equipment seen by Travis Evans. We prepared animal traps for deployment. We arrived at PHA-3 and deployed traps by 1730 hours. The PHA-2 traps were deployed about 1830 hours, and the PHA-1 traps were deployed about 1900 hours. Wind had built to over 25 knots, with seas over 8 ft, so we headed for Pt. Conception to hide from the weather. A departure was planned for 0300 hours to begin photographic sampling. (Used 11.5 hours weather down time.)

5/26/87 The ship arrived at PH-W at 0630 hours. The ship's crew tested their ability to hold station under the prevailing conditions (20-25 knots; 8 ft). The ROV was in the water at 1000 hours. It was too heavy, so it returned to the surface to remove ballast. The ROV was back in the water at 1100 hours and began photographing high relief at 1130 hours. Problems with the ship's holding position and an overly heavy tether caused the dive to be aborted at 1330 hours. During the dive at station PH-W, the sediment trap was seen on the bottom, broken and with no floats. Attempts to get a response from its release (not seen) were unsuccessful. We signalled the release on the sediment trap at station PH-U and got a good response; but after one hour, the traps had not surfaced. We conducted hydrocasts and profiling at two Hidalgo stations (current-meter site = Hydro 1; and 4000 meters from Hidalgo = Hydro 2) from 1430 hours to 1630 hours. The hydrocast at Hydro 2 accidentally retrieved the animal traps lost back in October, 1986. The tether on the ROV was changed and the ROV was ready to dive by 1900 hours. The dive was continued at station PH-W with all high-relief and 20 low-relief photos taken by 2400 hours. The ROV had to surface to fix a broken video light at 2315 hours.

5/27/87

We finished shooting low-relief photos at station PH-W about 0200 hours. The ROV started up for the surface about 0230 hours. The ROV was unable to tether in (two hours spent trying), and recovery had to be made by crane. Weather conditions had deteriorated to 25 knot winds and 6-8 ft seas. The ROV swung against equipment on the ship, injuring Jay Shrake's thumb at 0430 hours. The ROV also sustained damage in recovery, as a result of the adverse weather conditions. We departed toward Port San Luis at about 0445 hours. We contacted the shuttle boat, F/V DIABLO, at 0610 hours and he was already off Pt. Sal. We rendezvoused at about 0800 hours off Purisima Pt. We transferred personnel (Shrake, Parr, Hill) and headed to Port San Luis, arriving about 1040 hours. We talked to Jeff Hyland at 0830 hours advising him of the situation. We talked to Hyland again at 1230 hours telling him that IUC personnel thought it would be necessary to return to Ventura to repair the ROV winch torque hub. Shrake and Parr were taken by Hill to Sierra Vista Regional Medical Center in San Luis Obispo, where Shrake underwent one hour of surgery and remained overnight. Parr was back on board at 1515 hours. As per direction from Hyland (who confirmed decisions with MMS), we offloaded the ROV crew, and proceeded with tasks not requiring the ROV. The ROV crew was off at about 1615 hours. We departed for Hidalgo about 1630 hours. We stopped at station PJ-11 at 1800 hours; no sign of the sediment trap was seen. We arrived at Hidalgo and started trying to communicate with the sediment trap releases at 2130 hours. We obtained no responses in three tries at stations PH-F, PH-E, PH-K, PH-N, PH-R, and Harvest; but good responses were obtained on the first attempts at stations PH-I and PH-J.

5/28/87

We concluded sediment trap signalling at 0100 hours. We were on site to begin sediment grabs at station PH-R at 0600 hours. We conducted at least 15 consecutive, unsuccessful grabs. Different combinations of weight and wire speed with low ship speed at different stations all gave the same results. We secured sediment grabbing operations and started retrieving animal traps at 1630 hours. The PHA-1 animal trap was not found; the PHA-2 animal trap was lost when the polypropylene line apparently abraded at the surface knot; and the PHA-3 trap had few animals (1 Pleurobranchaea, 2 Rathbunaster, several gastropods, and one small rockfish). We redeployed the traps at PHA-1 and PHA-2. We departed for Julius to do profiling and hydrocasts, and to try more grabbing in known sediment areas at about 1930 hours. We arrived at PJ-23 at 2330 hours for profiling and hydrocasts.

5/29/87

We completed hydrography at station PJ-23 at 0100 hours. We conducted a practice grab with the Van Veen sampler at 0700 hours at station PJ-23. The second attempt was successful, so the grab worked. We conducted hydrographic work at PJ-11 from 0730 hours to 0900 hours. We tried to recall the sediment traps at PJ-7; the release responded but did not release. We tried dragging for it with the grappling hook in a circular pattern. The top traps came to the surface and were retrieved intact at 1130 hours because the grappling hook cable abraded through the mooring line just below the top array of traps. We added 200 ft of kevlar line to the end of the cable to reduce abrasion. We dragged for the sediment traps at PJ-1, after the release responded to interrogation but it did not release. The buoys

were seen near the surface but disappeared when the mooring apparently slipped off the hook. Dragging at PJ-1 was abandoned at 1730 hours. We dragged for PJ-9 after receiving a signal from the release and had the buoy on the surface and the anchor nearly up when the mooring slipped off the hook. We lost sight of the buoys in the dusk as the anchor neared the surface. After the mooring slipped from the hook, the area was searched until 2100 hours without success. We departed for stations PJ-10, R-4, R-5, and R-6 to contact releases and attempt to release the sediment traps.

5/30/87

We completed attempts to signal releases at station R-6 at 0200 hours and then departed for Hidalgo. We were on site at station PH-R to grab sediment samples at 0630 hours. Three out of four grabs were successful; site PH-R grabbing was completed at 0915 hours. We moved to station PH-N and got three out of four acceptable grabs by 1115 hours. There was no response from the sediment trap. We started grabbing at station PH-K; three out of six attempts were successful by 1415 hours. The release on the sediment trap at this site responded, but did not release. Wind and seas built to 20-25 knots, 4-5 ft seas, making it difficult to hold station. We had contact with the gill netter, Edna Louella but were able to work around each other. We attempted dragging for double array of sediment traps at station PH-E, without contact from the release. The dragging attempts revealed nothing. We wanted to drag at station PH-I, but the Edna Louella's net was there, so we dragged at station PH-J. The condition of the kevlar after winching it aboard, the bent grappling hook, and the high cable tension indicated that the line had been in the rocks. The buoys came to the surface but without the traps. Again, the cable had apparently abraded through the rope. The buoys were retrieved and dragging was secured at 1745 hours. We retrieved animal traps from PHA-1 and PHA-2. The PHA-2 trap was lost after its buoy line went under the ship and was cut by either the screws or barnacles on the hull. At PHA-1, the traps set on both 5/25 and 5/28 were recovered. Several Pleurobranchaea and Rathbunaster were found in the traps. We collected sediment grabs from station PH-J starting at 2030 hrs. The first two or three attempts were unsuccessful. A strong SW current with winds of 20-25 knots and seas of 4-6 ft, made positioning difficult. We had problems with the winch hydraulic pressure regulator. Three good samples were collected by 2200 hours, after which operations were secured for the night.

5/31/87

We were on site at station PH-E to collect sediment grabs at 0430 hours. Three out of three grabs were successful. The keys to success in these seas (3-6 ft) are heavy weights on the grab, slow descent rate, and stopping descent during especially sharp wave action. With such an approach, more time is spent in descents, but a greater percentage of successful attempts are realized. Station PH-E was completed by 0600 hours. After two unsuccessful attempts at station PH-F, three consecutive attempts to grab sediments were completed by 0730 hours. No response was obtained from the sediment trap. Three out of four successful grabs were collected from station PH-I by 1115 hours, without problems avoiding the gill nets. We departed for station PJ-9 at 1130 hours to check for sediment trap buoys on the surface. During transit, winds and seas began to build. No buoys

were visible at station PJ-9. At R-1, winds were up to 35 knots. No contact could be established with releases at R-1, R-2, or R-3. Departed R-3 at 2100 hours. Owing to the severe weather, bad sea conditions and darkness (which would prevent retrieval of any sediment traps even if they should release), it was decided not to visit R-7, but to transit directly to station PH-W at Hidalgo for remaining sediment grabbing.

6/1/87 We arrived at station PH-W at 0100 hours. The wind was down to 20 knots, but the swell was greater than 8 ft with about a 7-second period. Numerous attempts to get the Van Veen to the bottom without pre-tripping were unsuccessful. Even with extra weight on the grab it tripped when no wire was being put out, just from the downward acceleration of the ship's stern as the swells passed. We abandoned attempts to get sediment grab samples from station PH-W at 0230 hours and departed for Ventura Harbor. The weather forecast for Pt. Conception area called for possible gale warnings on 6/1. We arrived at Ventura breakwater at 1120 hours. We demobed equipment and departed for Santa Cruz at 1800 hours.

Summary

Two objectives (A and B) were achieved completely. The current meters from Hidalgo were retrieved, in spite of a release failure, and both telemetry systems were deployed successfully. The hydrographic work also was completed.

Four objectives (D, E, F, and G) were achieved partially. One out of 26 sediment-trap arrays was retrieved. We were able to get responses from eight out of 22 releases. The poor return on sediment traps probably was the result of some equipment problems (releases) and losses due to fishing activities. We previously had received parts of moorings from PH-R and R-2, which had been recovered by vessels in the area, and we have video and still-photographic records of the destroyed trap at PH-W; so it is apparent to us that fishing activity has taken a toll. We will need to recover a release which has responded to our signals (but has not surfaced) before we can evaluate any problems with the releases themselves. Animal samples for tissue analysis were obtained from two out of three stations; sediment grab samples were collected from eight out of nine stations; and photographs were collected from one out of eight low-relief stations, and one out of three high-relief stations. The animal samples were incomplete due to equipment and operation difficulties, and insufficient time to redeploy the traps before the end of the cruise. The other two objectives were not achieved completely due to weather-related equipment problems.

Two additional objectives (C and H) also were not achieved. We assume that the loss of the bedform time-lapse camera (objective C) was due to the extensive trawling activity in the Julius area. A rock sample (part of objective H) was collected by the ROV at the end of the dive at station PH-W, but it was lost during recovery activities.

APPENDIX A - TABLES

TABLE 1. SUMMARY OF SAMPLE POSITIONS ON CRUISE CAMP 1-3, LEG 2 (R/V Robert Gordon Sproul)

| Station | Date and Time (PDT) | Sample | Latitude Longitude | UTM Coordinates | LORAN Time Delays | Depth (M) | Comments |
|---------|-----------------------|------------------------------------|---------------------------|---------------------|--------------------|-----------|--|
| R-1 | Reference Coordinates | | 35°05.83'N 120°49.16'W | N3885790 E698776 | 27794.9 42044.9 | 91 | |
| R-1 | ✓ 13 May 87 0004 | ✓ <i>sed - 00:35</i> Box Core 1 | 35°05.82'N 120°49.15'W | N3885784 E698790 | 27795.0 42044.7 | 91 | First attempt no-trip. Penetration to 13 cm. Sediment soft-hardpacked. |
| R-1 | ✓ 13 May 87 0126 | ✓ <i>sed - 00:00</i> Box Core 2 | 35°05.82'N 120°49.15'W | N3885797 E698769 | 27795.0 42044.8 | 91 | Undisturbed surfaces. Penetration to 13 cm. |
| R-1 | ✓ 13 May 87 0241 | ✓ <i>sed - 3:30</i> Box Core 3 | 35°05.83'N 120°49.15'W | N3885793 E698794 | 27795.0 42044.6 | 91 | Excellent surfaces. Penetration to 13 cm. |
| R-1 | 13 May 87 0414 | Hydrocast | 35°05.81'N 120°49.15'W | N3885763 E698785 | 27795.1 42044.8 | 91 | Bottle did not trip on two previous attempts. |
| R-2 | Reference Coordinates | | 35°05.50'N 120°53.40'W | N3885047 E692345 | 27780.8 42057.1 | 161 | |
| R-2 | ✓ 12 May 87 1527 | ✓ <i>sed</i> Box Core 1 | 35°05.51'N 120°53.39'W | N3885063 E692355 | 27780.7 42057.3 | 161 | Sediment: Silty soft, green mud. Undisturbed surface. Penetration to 20cm. |
| R-2 | ✓ 12 May 87 1845 | ✓ <i>sed</i> Box Core 2 | 35°05.51'N 120°53.40'W | N3885061 E692348 | 27780.7 42057.3 | 161 | Fishermen retrieving nets in station vicinity; coring operations delayed 1630-1843. |
| R-2 | ✓ 12 May 87 2057 | ✓ <i>sed</i> Box Core 3 | 35°05.50'N 120°53.40'W | N3885050 E692339 | 27780.7 42057.4 | 161 | First attempt no-trip. Second attempt good sample, greater than 5000 lb. pull-out tension. |
| R-2 | 12 May 87 2225 | Hydrocast | 35°05.51'N 120°53.42'W | N3885065 E692309 | 27780.6 42057.4 | 161 | |

TABLE 1. SUMMARY OF SAMPLE POSITIONS ON MMS CRUISE CAMP 1-3, LEG 2 (R/V Robert Gordon Sproul) (Cont.)

| Station | Date and Time (PDT) | Sample | Latitude Longitude | UTM Coordinates | LORAN Time Delays | Depth (M) | Comments |
|----------------------------|---------------------------------------|-------------------------|---------------------------|---------------------|--------------------|-----------|---|
| R-3 | Reference Coordinates | | 35°05.30'N 121°00.90'W | N3884443 E680956 | 27756.2 42081.0 | 409 | Latitude corrected as of this report. |
| <i>10g from R-3</i> R-3 | ✓ 12 May 87 0803 4:30 ✓ | Box Core 1 80740 | 35°05.32'N 121°00.89'W | N3884473 E680975 | 27756.2 42081.2 | 409 | Sediment: extremely silty surface, dense clay lower layers. |
| R-3 | ✓ 12 May 87 1036 ✓ | Box Core 2 11:30-200 | 35°05.32'N 121°00.89'W | N3884474 E680975 | 27756.2 42081.2 | 409 | Good sample. Pinger frame removed from corer, vent door wires changed. Urchin in X-ray. |
| R-3 | ✓ 12 May 87 1233 ✓ | Box Core 3 1330 | 35°05.30'N 121°00.90'W | N3884444 E680955 | 27756.2 42081.1 | 409 | Good sample. Sea lion sunning itself on fantail. |
| R-3 | 12 May 87 1417 | Hydrocast | 35°05.31'N 121°00.91'W | N3884454 E680949 | 27756.2 42081.2 | 409 | |
| R-4 | Reference Coordinates | | 34°43.01'N 120°47.39'W | N3843676 E702399 | 27800.3 41921.5 | 92 | Longitude corrected as of this report. |
| R-4 | ✓ 11 May 87 1045 ✓ | Box Core 1 11:41 | 34°43.02'N 120°47.39'W | N3843687 E702402 | 27800.4 41921.6 | 92 | Sediment: silty upper, clay lower layers, undisturbed surface. Penetration spd 39mpm, tension 4000 lb. |
| R-4 | ✓ 11 May 87 1330 ✓ ✓ | Box Core 2 | 34°43.00'N 120°47.37'W | N3843658 E702420 | 27800.4 41921.4 | 92 | First attempt n.g. due to disturbed core surfaces. Corer camera not deployed due to temporary battery shorts. |
| R-4 | ✓ 11 May 87 1505 ✓ ✓ | Box Core 3 | 34°43.02'N 120°47.41'W | N3843679 E702372 | 27800.3 41921.7 | 92 | Good sample; undisturbed surfaces. |
| R-4 | 11 May 87 1703 | Hydrocast | 34°43.01'N 120°47.39'W | N3843670 E702403 | 27800.3 41921.6 | 92 | Bottle hit bottom, no damage. |

TABLE 1. SUMMARY OF SAMPLE POSITIONS ON MMS CRUISE CAMP 1-3, LEG 2 (R/V Robert Gordon Sproul) (Continued)

| Station | Date and Time (PDT) | Sample | Latitude Longitude | UTM Coordinates | LORAN Time Delays | Depth (M) | Comments |
|---------|------------------------|---------------------------|---------------------------|---------------------|----------------------|--------------|--|
| R-5 | | Reference Coordinates | 34°42.69'N 120°50.83'W | N3842964 E697156 | 27789.8 41932.0 | 154 | |
| R-5 | ✓ 11 May 87 ✓ 0124 | ✓ ³ Box Core 1 | 34°42.70'N 120°50.83'W | N3842983 E697154 | 27789.8 41932.2 | 154 | First attempt-washout. Second attempt 15 cm penetration. |
| R-5 | ✓ 11 May 87 ✓ 0511 | Box Core 2 | 34°42.69'N 120°50.82'W | N3842961 E697174 | 27789.8 41932.0 | 153 | Two previous attempts n.g. due to shells and shallow penetration. Third attempt acceptable 11 cm penetration. |
| R-5 | ✓ 11 May 87 ✓ 0744 | Box Core 3 | 34°42.70'N 120°50.84'W | N3842977 E697136 | 27789.7 41932.1 | 154 | First attempt no-trip. Second attempt acceptable sample, penetration to 15 cm. Wood chips in >10 cm fraction. |
| R-5 | 11 May 87 1000 | Hydrocast | 34°42.68'N 120°50.87'W | N3842948 E697094 | 27789.6 41932.2 | 154 | |
| R-6 | | Reference Coordinates | 34°41.40'N 120°57.90'W | N3840354 E686413 | 27768.0 41949.8 | 410 | Depth corrected to 410 m. |
| R-6 | ✓ 10 May 87 ✓ 1330 | Box Core 1 | 34°41.40'N 120°57.89'W | N3840351 E686435 | 27768.0 41949.9 | 410 | First attempt n.g.-washout. Second attempt good sample, undisturbed. First core of cruise. Penetration to 12 cm. |
| R-6 | ✓ 10 May 87 ✓ 1635 | Box Core 2 | 34°41.41'N 120°57.91'W | N3840371 E686405 | 27768.0 41949.9 | 410 | Marginally acceptable sample. Penetration to 10 cm, no >10 cm fraction. |
| R-6 | ✓ 10 May 87 ✓ 2005 | Box Core 3 | 34°41.38'N 120°57.89'W | N3840321 E686437 | 27768.1 41949.8 | 410 | Acceptable sample, some alternate subcores for biology. |
| R-6 | 10 May 87 2219 | Hydrocast | 34°41.64'N 120°58.16'W | N3840781 E686005 | 27767.2 41952.1 | 408 | Water sample collected approx. 500 m from box-core station. |

TABLE 1. SUMMARY OF SAMPLE POSITIONS ON MMS CRUISE CAMP 1-3, LEG 2 (Robert Gordon Sproul) (Continued)

| Station | Date and Time (PDT) | Sample | Latitude Longitude | UTM Coordinates | LORAN Time Delays | Depth (M) | Comments |
|---------|---------------------|-----------------------|---------------------------|---------------------|--------------------|-----------|---|
| R-7 | | Reference Coordinates | 34°52.90'N 121°10.30'W | N3861248 E667092 | 27727.7 42047.7 | 565 | |
| R-7 | ✓ 11 May 87 2133 | Box Core 1 | 34°52.89'N 121°10.31'W | N3861227 E667085 | 27727.8 42047.8 | 565 | First attempt n.g. forgot to leave corer pins rigged for soft sediment. |
| R-7 | ✓ 11 May 87 2328 | Box Core 2 | 34°52.89'N 121°10.29'W | N3861228 E667111 | 27727.8 42047.7 | 565 | Extremely soft green mud. Dropped the deck hand-held radio overboard. |
| R-7 | ✓ 12 May 87 0408 | Box Core 3 | 34°52.89'N 121°10.31'W | N3861232 E667082 | 27727.8 42047.9 | 565 | First attempt-no trip; rigging error. Good sample, rough recovery. |
| R-7 | 12 May 87 0337 | Hydrocast | 34°52.87'N 121°10.32'W | N3861192 E667066 | 27727.8 42047.7 | 565 | |
| R-8 | | Reference Coordinates | 34°55.30'N 120°45.87'W | N3866433 E704208 | 27805.6 41978.2 | 90 | Latitude corrected as of this report. |
| R-8 | ✓ 13 May 87 1431 | Box Core 1 | 34°55.29'N 120°45.86'W | N3866426 E704220 | 27805.7 41978.1 | 89 | Two previous attempts no-trips. Good sample, increased speed to 40 MPM. Penetration to 12 cm. |
| R-8 | ✓ 13 May 87 1530 | Box Core 2 | 34°55.30'N 120°45.86'W | N3866431 E704220 | 27805.7 41978.2 | 90 | Sediment: silty surface, low clay content. Fair sample, variable penetration. |
| R-8 | ✓ 13 May 87 1659 | Box Core 3 | 34°55.29'N 120°45.87'W | N3866428 E704212 | 27805.6 41978.3 | 89 | Penetration to 12 cm. Ship appears to be fighting a strong current. |
| R-8 | 13 May 87 1749 | Hydrocast | 34°55.29'N 120°45.87'W | N3866426 E704212 | 27805.6 41978.3 | 89 | |

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TABLE 1. SUMMARY OF SAMPLE POSITIONS ON MMS CRUISE CAMP 1-3, LEG 2 (R/V Robert Gordon Sproul) (Continued)

| Station | Date and Time (PDT) | Sample | Latitude Longitude | UTM Coordinates | LORAN Time Delays | Depth (M) | Comments |
|---------|------------------------|---------------------------------|---------------------------|---------------------|----------------------|--------------|---|
| R-9 | | Reference Coordinates | 34°53.68'N 120°59.12'W | N3863016 E684098 | 27763.2 42014.9 | 410 | Reference depth corrected to 410 m as of this report. |
| R-9 | ✓ 13 May 87 1952 | ✓ <i>scob box</i> Box Core 1 | 34°53.68'N 120°59.11'W | N3863015 E684116 | 27763.2 42015.0 | 410 | Sediment: silty, soft green mud. Penetration >25 cm. Meiofauna alternate. |
| R-9 | ✓ 13 May 87 2146 | ✓ <i>scob box</i> Box Core 2 | 34°53.68'N 120°59.12'W | N3863011 E684100 | 27763.1 42015.0 | 410 | Good surfaces. Sediment: silt/clay. Penetration >20 cm. |
| R-9 | ✓ 13 May 87 2229 | ✓ <i>scob box</i> Box Core 3 | 34°53.68'N 120°59.11'W | N3862014 E684096 | 27763.1 42015.0 | 410 | Penetration to 30 cm. |
| R-9 | 14 May 87 0137 | Hydrocast | 34°53.67'N 120°59.14'W | N3862993 E684066 | 27763.0 42015.0 | 410 | First attempt n.g., tangled wire. |
| PJ-1 | | Reference Coordinates | 34°55.79'N 120°49.91'W | N3867215 E698032 | 27792.5 41994.6 | 145 | Reference time delays corrected as of this report. |
| PJ-1 | ✓ 15 May 87 0017 | ✓ <i>scob</i> Box Core 1 | 34°55.80'N 120°49.93'W | N3867232 E698010 | 27792.5 41995.0 | 145 | Sediment: silty upper, dense lower layers. Two previous no-trip, greased thrust bolt. |
| PJ-1 | ✓ 15 May 87 0129 | ✓ <i>scob</i> Box Core 2 | 34°55.80'N 120°49.93'W | N3867220 E698009 | 27792.5 41994.9 | 143 | Good sample. Pullout tension 4400 lbs. |
| PJ-1 | ✓ 15 May 87 0242 | ✓ <i>scob</i> Box Core 3 | 34°55.79'N 120°49.91'W | N3867217 E698038 | 27792.6 41994.6 | 145 | Penetration to 30 cm. Pullout tension 5500 lbs. |

TABLE 1. SUMMARY OF SAMPLE POSITIONS ON MMS CRUISE CAMP 1-3, LEG 2 (R/V Robert Gordon Sproul) (Continued)

| Station | Date and Time (PDT) | Sample | Latitude Longitude | UTM Coordinates | LORAN Time Delays | Depth (M) | Comments |
|---------|--|--------------------------|---------------------------|---------------------|--------------------|-----------|--|
| PJ-1 | 14 May 87 2224 ✓ | Pore Water Box Core 1 | 34°55.79'N 120°49.92'W | N3867216 E698023 | 27792.5 41994.7 | 145 | First attempt no-trip. Good sample, 6000 lb. pullout. |
| PJ-1 | 14 May 87 2303 ✓ | Pore Water Box Core 2 | 34°55.79'N 120°49.92'W | N3867214 E698024 | 27792.4 41994.7 | 145 | Greased thrust bolt to relieve no-trip problems. |
| PJ-1 | 14 May 87 2336 ✓ | Pore Water Box Core 3 | 34°55.79'N 120°49.92'W | N3867218 E698027 | 27792.4 41994.8 | 145 | Adequate sample for pore-water chemistry. |
| PJ-6 | Reference Coordinates | | 34°54.71'N 120°49.91'W | N3865215 E698076 | 27792.5 41989.1 | 148 | |
| PJ-6 | ✓ 15 May 87 2157 ✓ <i>2156-500</i> | Box Core 1 | 34°54.71'N 120°49.93'W | N3865208 E698051 | 27792.4 41989.2 | 148 | Sediment: silty surface. Penetration >25 cm. Many Echinoids in sample. |
| PJ-6 | ✓ 15 May 87 2316 ✓✓ | Box Core 2 | 34°54.71'N 120°49.94'W | N3865213 E698041 | 27792.4 41989.3 | 148 | Excellent sample. |
| PJ-6 | ✓ 16 May 87 0220 ✓ <i>0.36-500</i> | Box Core 3 | 34°54.70'N 120°49.91'W | N3865197 E698088 | 22792.5 41989.1 | 146 | First attempt; trawl wire fouled on corer and reterminated wire. Penetration to 20 cm. |
| PJ-7 | Reference Coordinates | | 34°55.79'N 120°48.60'W | N3867257 E700032 | 27796.7 41990.3 | 123 | Reference time delays corrected as of this report. |
| PJ-7 | ✓ 14 May 87 1558 ✓ <i>1558-500 bio</i> | Box Core 1 | 34°55.79'N 120°48.60'W | N3867263 E700028 | 27796.7 41990.3 | 123 | Penetration to 28 cm. Much detritus in sample. |
| PJ-7 | ✓ 14 May 87 1735 ✓ <i>1745-500</i> | Box Core 2 | 34°55.79'N 120°48.61'W | N3867250 E700021 | 27796.7 41990.2 | 123 | Tension 4000 lb. Much detritus. |
| PJ-7 | ✓ 14 May 87 1900 ✓ <i>17:35-500</i> | Box Core 3 | 34°55.79'N 120°48.61'W | N3867258 E700016 | 27796.7 41990.3 | 123 | Alternate biology cores used. |

TABLE 1. SUMMARY OF SAMPLE POSITIONS ON MMS CRUISE CAMP 1-3, LEG 2 (R/V Robert Gordon Sproul) (Continued)

| Station | Date and Time (PDT) | Sample | Latitude Longitude | UTM Coordinates | LORAN Time Delays | Depth (M) | Comments |
|---------|------------------------|---------------------------------------|---------------------------|---------------------|----------------------|--------------|--|
| PJ-8 | Reference Coordinates | | 34°56.87'N 120°49.91'W | N3869214 E697989 | 27792.5 42000.4 | 142 | Reference depth corrected to 142 m as of this report. |
| PJ-8 | ✓ 16 May 87 0339 | ✓ 550 ✓ Box Core 1 | 34°56.86'N 120°49.91'W | N3869194 E697999 | 27792.4 42000.3 | 142 | Good sample, penetration to 20 cm. Actual recorded depth is 142 m. |
| PJ-8 | ✓ 16 May 87 0507 | ✓ 550 ✓ Box Core 2 | 34°56.87'N 120°49.90'W | N3869207 E698012 | 27792.5 42000.3 | 140 | Good sample, penetration >25 cm. |
| PJ-8 | ✓ 16 May 87 0650 | ✓ 550 ✓ Box Core 3 | 34°56.88'N 120°49.89'W | N3869220 E698021 | 27792.5 42000.3 | 143 | Sediment: silt upper layers, dense clay lower. |
| PJ-8 | 17 May 87 1148 | 12.0040 ✓ Pore Water Box Core 1 | 34°56.87'N 120°49.91'W | N3869209 E697989 | 27792.5 42000.3 | 143 | Excellent surface. Pore-water squeezers leaking. |
| PJ-8 | 17 May 87 1225 | ✓ Pore Water Box Core 2 | 34°56.88'N 120°49.92'W | N3869215 E697985 | 27792.5 42000.3 | 143 | Good sample. |
| PJ-8 | 17 May 87 1326 | ✓ Pore Water Box Core 3 | 34°56.87'N 120°49.92'W | N3869210 E697980 | 27792.5 42000.4 | 143 | Acceptable sample. |

TABLE 1. SUMMARY OF SAMPLE POSITIONS ON MMS CRUISE CAMP 1-3, LEG 2 (R/V Robert Gordon Sproul) (Continued)

| Station | Date and Time (PDT) | Sample | Latitude Longitude | UTM Coordinates | LORAN Time Delays | Depth (M) | Comments |
|---------|------------------------|--------------------------|---------------------------|---------------------|----------------------|--------------|---|
| PJ-9 | | Reference Coordinates | 34°55.79'N 120°51.23'W | N3867171 E696033 | 27788.2 41999.1 | 169 | Reference depth corrected to 169 m as of this report. |
| PJ-9 | ✓ 14 May 87 0259 | ✓ Box Core 1 | 34°55.80'N 120°51.23'W | N3867177 E696030 | 27788.2 41999.3 | 168 | Sediment; soft upper layers, medium dense lower layers. Door lanyards sheared. |
| PJ-9 | ✓ 14 May 87 0437 | ✓ Box Core 2 | 34°55.80'N 120°51.24'W | N3867184 E696011 | 27788.2 41999.3 | 169 | Winch sounds as if straining. Good sample. |
| PJ-9 | ✓ 14 May 87 0646 | ✓ Box Core 3 | 34°55.80'N 120°51.23'W | N3867189 E696030 | 27788.2 41999.3 | 169 | Good sample. |
| PJ-10 | | Reference Coordinates | 34°53.63'N 120°49.91'W | N3863215 E698119 | 27792.5 41983.6 | 147 | Reference time delays corrected as of this report. |
| PJ-10 | ✓ 15 May 87 1408 | ✓ Box Core 1 | 34°53.62'N 120°49.91'W | N3863207 E698128 | 27792.5 41983.6 | 147 | Good sample, penetration to 25 cm. |
| PJ-10 | ✓ 15 May 87 1535 | ✓ Box Core 2 | 34°53.63'N 120°49.92'W | N3863212 E698117 | 27792.5 41983.6 | 147 | Penetration to 27 cm. One meter off target position according to miniranger system. |
| PJ-10 | ✓ 15 May 87 1655 | ✓ Box Core 3 | 34°53.62'N 120°49.91'W | N3863191 E698127 | 27792.5 41983.6 | 147 | Penetration to 20 cm. |
| PJ-10 | 15 May 87 1956 | Pore Water Box Core 1 | 34°53.62'N 120°49.92'W | N3863197 E698118 | 27792.6 41983.6 | 147 | Good surface. Pore-water squeezers leaking. |
| PJ-10 | 15 May 87 2032 | Pore Water Box Core 2 | 34°53.63'N 120°49.91'W | N3863218 E698123 | 27792.5 41983.7 | 147 | Only half of core was acceptable; sufficient. |
| PJ-10 | 15 May 87 2112 | Pore Water Box Core 3 | 34°53.63'N 120°49.92'W | N3863215 E698118 | 27792.5 41983.6 | 147 | Sample partially washed. |

TABLE 1. SUMMARY OF SAMPLE POSITIONS ON MMS CRUISE CAMP 1-3, LEG 2 (R/V Robert Gordon Sproul) (Continued)

| Station | Date and Time (PDT) | Sample | Latitude Longitude | UTM Coordinates | LORAN Time Delays | Depth (M) | Comments |
|---------|----------------------------------|--|---------------------------|---------------------|--------------------|-----------|---|
| PJ-11 | Reference Coordinates | | 34°57.95'N 120°49.91'W | N3871214 E697946 | 27792.6 42006.0 | 136 | Reference time delays corrected as of this report. |
| PJ-11 | ✓ 13 May 87 0918 <i>9:22</i> | ✓ <i>sed</i> Box Core 1 | 34°57.96'N 120°49.92'W | N3871219 E697939 | 27792.5 42005.9 | 136 | Good sample. On deck approx 30 min prior to processing in order to collect 2nd rep. |
| PJ-11 | ✓ 13 May 87 0952 <i>10:05</i> | ✓ <i>sed</i> Box Core 2 | 34°57.95'N 120°49.91'W | N3871208 E697954 | 27792.5 42005.9 | 136 | Good sample. Making way to Pt. San Luis to drop off J. Hedrick and P/U equipment. |
| PJ-11 | ✓ 14 May 87 0839 <i>9:00</i> | ✓ <i>sed</i> Box Core 3 | 34°57.96'N 120°49.92'W | N3871218 E697942 | 27792.4 42006.0 | 136 | LORAN-C off the air between 0900 and 1000 due to Master Station Maintenance. |
| PJ-11 | 14 May 87 1032 <i>10:52</i> | ✓ <i>sed</i> Pore Water Box Core 1 | 34°57.96'N 120°49.92'W | N3871217 E697940 | 27792.4 42006.0 | 136 | Good sample. |
| PJ-11 | 14 May 87 1108 <i>11:11</i> | ✓ <i>sed</i> Pore Water Box Core 2 | 34°57.96'N 120°49.90'W | N3871230 E697961 | 27792.5 42006.0 | 136 | Good sample. |
| PJ-11 | 14 May 87 1148 <i>11:51</i> | ✓ <i>sed</i> Pore Water Box Core 3 | 34°57.96'N 120°49.93'W | N3871218 E697927 | 27792.4 42005.9 | 136 | First attempt no-trip. Good sample. |

TABLE 1. SUMMARY OF SAMPLE POSITIONS ON MMS CRUISE CAMP 1-3, LEG 2 (R/V Robert Gordon Sproul) (Continued)

| Station | Date and Time (PDT) | Sample | Latitude Longitude | UTM Coordinates | LORAN Time Delays | Depth (M) | Comments |
|---------|------------------------|----------------------------|---------------------------|---------------------|----------------------|--------------|--|
| *PJ-12 | | Reference Coordinates | 34°55.58'N 120°49.91'W | N3866815 E698041 | 27792.6 41993.4 | 145 | |
| PJ-12 | ✓ 16 May 87 0931 | ✓ 12:30-2:00 Box Core 1 | 34°55.57'N 120°49.92'W | N3866806 E698035 | 27792.4 41993.6 | 145 | Undisturbed surface. Penetration >25 cm. |
| PJ-12 | ✓ 16 May 87 1044 | ✓ Box Core 2 | 34°55.57'N 120°49.93'W | N3866808 E698016 | 27792.5 41993.7 | 145 | Undisturbed, silty surface. |
| PJ-12 | ✓ 16 May 87 1209 | ✓ 12:30-2:00 Box Core 3 | 34°55.59'N 120°49.94'W | N3866835 E698005 | 27792.4 41993.7 | 145 | Good sample. Penetration to 20 cm. |
| *PJ-13 | | Reference Coordinates | 34°56.01'N 120°49.91'W | N3867615 E698024 | 27792.5 41995.6 | 144 | |
| PJ-13 | ✓ 16 May 87 1328 | ✓ 13:30-2:00 Box Core 1 | 34°55.99'N 120°49.91'W | N3867584 E698027 | 27792.4 41995.8 | 144 | Penetration to 22 cm. |
| PJ-13 | ✓ 16 May 87 1445 | ✓ 14:30-2:00 Box Core 2 | 34°55.99'N 120°49.91'W | N3867588 E698028 | 27792.4 41995.8 | 144 | Penetration to 22 cm. LORAN down on on reps. 2 and 3. |
| PJ-13 | ✓ 16 May 87 1615 | ✓ 16:30-2:00 Box Core 3 | 34°56.01'N 120°49.90'W | N3867622 E698042 | 22792.5 41995.6 | 144 | Surfaces slightly disturbed. Variable penetration 18-22 cm. Some alternate cores used. |

* Secondary Site-Specific Station

TABLE 1. SUMMARY OF SAMPLE POSITIONS ON MMS CRUISE CAMP 1-3, LEG 2 (R/V Robert Gordon Sproul) (Continued)

| Station | Date and Time (PDT) | Sample | Latitude Longitude | UTM Coordinates | LORAN Time Delays | Depth (M) | Comments |
|---------|-----------------------|------------|---------------------------|---------------------|----------------------|--------------|---|
| *PJ-14 | Reference Coordinates | | 34°55.79'N 120°49.26'W | N3867235 E699032 | 27794.8 41992.8 | 134 | |
| PJ-14 | ✓ 16 May 87 1826 | Box Core 1 | 34°55.79'N 120°49.24'W | N3867224 E699055 | 27794.6 41992.5 | 134 | Undisturbed surfaces. Zonated Sediment. Sediment temp. 9.5°C surface, 6.3°C at 8 cm. |
| PJ-14 | ✓ 16 May 87 1944 | Box Core 2 | 34°55.80'N 120°49.24'W | N3867245 E699053 | 27794.6 41992.5 | 134 | Undisturbed surfaces. Much detritus in sample. |
| PJ-14 | ✓ 16 May 87 2110 | Box Core 3 | 34°55.79'N 120°49.25'W | N3867230 E699038 | 27794.6 41992.4 | 134 | Sediment: silty surface, dense lower layers. Penetration >25 cm. Many ophiuroids present. |
| *PJ-15 | Reference Coordinates | | 34°55.79'N 120°50.57'W | N3867192 E697033 | 27790.5 41996.7 | 155 | |
| PJ-15 | ✓ 17 May 87 0339 | Box Core 1 | 34°55.79'N 120°50.74'W | N3867189 E697027 | 27790.3 41997.0 | 154 | Very soft sediment. Some surfaces sloped. Penetration to 18 cm. |
| PJ-15 | ✓ 17 May 87 0500 | Box Core 2 | 34°55.79'N 120°50.56'W | N3867194 E697047 | 27790.5 41996.9 | 155 | Penetration to 25 cm. Patchy base sediment soft to hard. Wind and seas are building. |
| PJ-15 | ✓ 17 May 87 1025 | Box Core 3 | 34°55.79'N 120°50.57'W | N3867186 E697038 | 27790.4 41997.0 | 154 | Corer failed to trip on three previous attempts; pennant wire replaced. |

* Secondary Site-Specific Station

TABLE 1. SUMMARY OF SAMPLE POSITIONS ON MMS CRUISE CAMP 1-3, LEG 2 (R/V Robert Gordon Sproul) (Continued)

| Station | Date and Time (PDT) | Sample | Latitude Longitude | UTM Coordinates | LORAN Time Delays | Depth (M) | Comments |
|---------|------------------------|---------------------------------|---------------------------|---------------------|----------------------|--------------|--|
| *PJ-16 | | Reference Coordinates | 34°55.03'N 120°48.99'W | N3865830 E699477 | 27795.5 41987.7 | 130 | |
| PJ-16 | ✓ 18 May 87 0716 | ✓ ✓ Box Core 1 | 34°55.03'N 120°48.99'W | N3865836 E699467 | 27795.4 41987.7 | 130 | Good surfaces. Silty surface, dense lower layers. |
| PJ-16 | ✓ 18 May 87 0903 | ✓ ✓ Box Core 2 | 34°55.03'N 120°48.99'W | N3865831 E699473 | 27795.5 41987.7 | 130 | Very silty surface sediment. Re-suspension of x-ray subcore leaving sediment on screens. |
| PJ-16 | ✓ 18 May 87 1027 | ✓ ✓ Box Core 3 | 34°55.03'N 120°48.98'W | N3865836 E699483 | 27795.5 41987.6 | 130 | Some alternate subcores used due to back row biology wash-out. |
| *PJ-17 | | Reference Coordinates | 34°56.56'N 120°48.98'W | N3868659 E699416 | 27795.6 41995.4 | 126 | |
| PJ-17 | ✓ 18 May 87 0304 | ✓ ^{3:15-28} Box Core 1 | 34°56.56'N 120°48.99'W | N3868657 E699413 | 27795.4 41995.5 | 126 | Penetration to 25 cm. |
| PJ-17 | ✓ 18 May 87 0424 | ✓ ^{4:40-28} Box Core 2 | 34°56.57'N 120°48.98'W | N3868682 E699416 | 27795.5 41995.5 | 126 | Penetration to 23 cm. |
| PJ-17 | ✓ 18 May 87 0538 | ✓ ✓ Box Core 3 | 34°56.55'N 120°48.99'W | N3868652 E699412 | 27795.5 41995.4 | 126 | Undisturbed surfaces. |

* Secondary Site-Specific Station

TABLE 1. SUMMARY OF SAMPLE POSITIONS ON MMS CRUISE CAMP 1-3, LEG 2 (R/V Robert Gordon Sproul) (Continued)

| Station | Date and Time (PDT) | Sample | Latitude Longitude | UTM Coordinates | LORAN Time Delays | Depth (M) | Comments |
|---------|---------------------|----------------------------------|---------------------------|---------------------|--------------------|-----------|--|
| *PJ-18 | | Reference Coordinates | 34°56.56'N 120°50.84'W | N3868597 E696589 | 27789.5 42001.9 | 158 | Reference time delays corrected as of this report. |
| PJ-18 | ✓ 17 May 87 1526 | ✓ 12:00-10:00 sed Box Core 1 | 34°56.56'N 120°50.84'W | N3868605 E696586 | 27789.4 42001.9 | 158 | Penetration to 25 cm. Very dense >10 cm fraction. |
| PJ-18 | ✓ 17 May 87 1715 | ✓ 11:30-5:00 Box Core 2 | 34°56.56'N 120°50.85'W | N3868593 E696574 | 27789.5 42001.9 | 158 | Good sample. Several heart urchins. |
| PJ-18 | ✓ 17 May 87 2038 | ✓ ✓ Box Core 3 | 34°56.55'N 120°50.84'W | N3868592 E696585 | 27789.4 42001.9 | 159 | Very soft sediment, penetration to 25 cm. Three previous attempts n.g. due to bad weld on thrust bolt. |
| *PJ-19 | | Reference Coordinates | 34°55.03'N 120°50.84'W | N3865770 E696650 | 27789.6 41993.8 | 167 | |
| PJ-19 | ✓ May 18 87 1138 | ✓ 11:45-5:00 Box Core 1 | 34°55.03'N 120°50.84'W | N3865769 E696647 | 27789.5 41994.1 | 167 | Good sample, easy sieving. Tension 6000 lbs. Penetration to 20 cm. |
| PJ-19 | ✓ May 18 87 1254 | ✓ 13:00-13:00-5:00 Box Core 2 | 34°55.02'N 120°50.84'W | N3865764 E696655 | 27789.5 41993.9 | 167 | Good sample. Formalin accident involving E. Lampp. |
| PJ-19 | ✓ May 18 87 1513 | ✓ 3:40-5:00 Box Core 3 | 34°55.03'N 120°50.83'W | N3865782 E696663 | 27789.5 41994.0 | 167 | Good sample. Sediment slightly denser than previous reps. |

* Secondary Site-Specific Station

TABLE 1. SUMMARY OF SAMPLE POSITIONS ON MMS CRUISE CAMP 1-3, LEG 2 (R/V Robert Gordon Sproul) (Continued)

| Station | Date and Time (PDT) | Sample | Latitude Longitude | UTM Coordinates | LORAN Time Delays | Depth (M) | Comments |
|---------|------------------------|-----------------------------|---------------------------|---------------------|----------------------|--------------|---|
| *PJ-20 | | Reference Coordinates | 34°50.38'N 120°49.91'W | N3857216 E698249 | 27792.5 41967.2 | 148 | Reference time delays corrected as of this report. |
| PJ-20 | ✓ 18 May 87 1638 | ✓ 17.10 sed Box Core 1 | 34°50.39'N 120°49.90'W | N3857219 E698263 | 27792.5 41967.1 | 148 | Acceptable sample. Penetration to 14 cm. |
| PJ-20 | ✓ 18 May 87 1848 | ✓ ✓ Box Core 2 | 34°50.38'N 120°49.92'W | N3857209 E698244 | 27792.5 41967.2 | 148 | Acceptable sample, some alternate cores used. |
| PJ-20 | ✓ 18 May 87 2015 | ✓ 20.14 sed Box Core 3 | 34°50.39'N 120°49.92'W | N3857222 E698244 | 27792.6 41967.1 | 148 | Sediment loosely packed. Shallow penetration. Last sample of cruise. |
| *PJ-21 | | Reference Coordinates | 35°01.23'N 120°51.15'W | N3877228 E695936 | 27788.3 42027.2 | 143 | Reference latitude corrected as of this report. |
| PJ-21 | ✓ 17 May 87 2223 | ✓ ✓ Box Core 1 | 35°01.23'N 120°51.16'W | N3877225 E695924 | 27788.3 42027.3 | 143 | Sediment: silty surface, extremely dense base. Some surfaces disturbed. |
| PJ-21 | ✓ 18 May 87 0010 | ✓ ✓ 11.30 sed Box Core 2 | 35°01.22'N 120°51.14'W | N3877212 E695944 | 27788.3 42027.3 | 143 | Penetration to 20 cm. Very dense below 16 cm. |
| PJ-21 | ✓ 18 May 87 0135 | ✓ 1.30 sed Box Core 3 | 35°01.24'N 120°51.15'W | N3877242 E295928 | 27788.3 42027.4 | 143 | Penetration to 22 cm. Very dense >10 cm fraction. |

* Secondary Site-Specific Station

TABLE 1. SUMMARY OF SAMPLE POSITIONS ON MMS CRUISE CAMP 1-3, LEG 2 (R/V Robert Gordon Sproul) (Continued)

| Station | Date and Time (PDT) | Sample | Latitude Longitude | UTM Coordinates | LORAN Time Delays | Depth (M) | Comments |
|---------|------------------------|------------------------------|---------------------------|---------------------|----------------------|--------------|--|
| PJ-22 | Reference Coordinates | | 34°55.25'N 120°49.93'W | N3866217 E698034 | 27792.5 41991.9 | 143 | |
| PJ-22 | ✓ 15 May 87 0401 | ✓ ✓ Box Core 1 | 34°55.25'N 120°49.93'W | N3866212 E698037 | 27792.6 41991.9 | 144 | Good sample. Penetration to 30 cm. |
| PJ-22 | ✓ 15 May 87 0518 | ✓ ^{used} Box Core 2 | 34°55.25'N 120°49.92'W | N3866212 E698053 | 27792.5 41992.0 | 143 | Penetration to 30 cm. Winch sounds as if straining. |
| PJ-22 | ✓ 15 May 87 0703 | ✓ ✓ Box Core 3 | 34°55.24'N 120°49.93'W | N3866197 E698039 | 27792.5 41992.0 | 143 | Sediment: silty upper/dense lower layers, mud balls. |
| PJ-23 | Reference Coordinates | | 34°56.33'N 120°49.90'W | N3868217 E698034 | 27792.5 41997.3 | 143 | |
| PJ-23 | ✓ 15 May 87 0942 | ✓ ^{used} Box Core 1 | 34°56.33'N 120°49.91'W | N3868213 E698023 | 27792.5 41997.5 | 143 | Penetration to 25 cm. |
| PJ-23 | ✓ 15 May 87 1109 | ✓ ✓ Box Core 2 | 34°56.34'N 120°49.90'W | N3868228 E698033 | 27792.5 41997.4 | 143 | Large Asteroidea in >10 cm fraction. |
| PJ-23 | ✓ 15 May 87 1245 | ✓ ✓ Box Core 3 | 34°56.33'N 120°49.90'W | N3868205 E698037 | 27792.6 41997.5 | 143 | Good sample. |

TABLE 2. SUMMARY OF ANIMAL TRAP POSITIONS ON CRUISE CAMP 1-3, LEG-2 (R/V Robert Gordon Sproul)

| Station | Date and Time (PDT) | Sample | Latitude Longitude | UTM Coordinates | LORAN Time Delays | Depth (M) | Comments |
|---------|---|---------------------------|---------------------------|---------------------|--------------------|-----------|--|
| R-2 | 13 May 87 0647 ^{6:50} | Animal Traps Deployed | 35°05.47'N 120°53.40'W | N3884989 E692345 | 27780.3 42058.6 | 161 | High flyer in water. |
| R-2 | 14 May 87 1430 ^{14:00} | Animal Traps Recovered | not noted | not noted | 27781.4 42054.8 | | Traps recovered; 1 Cancer, 1 Pleurobranchaea, few rockfish. Hand-hauled, capstan down. |
| PJ-1 | 15 May 87 ✓ 0913 | Animal Traps Deployed | 34°55.90'N 120°49.75'W | N3867413 E698282 | 27793.1 41994.7 | 145 | High flyer in water, approx 300m from PJ-1. Pre-thawed chicken and fish. |
| PJ-2 | 17 May 87 ✓ 1440 | Animal Traps Recovered | not noted | not noted | 27792.7 41994.1 | | Traps recovered; 1 Pleurobranchaea, 1 shrimp, 1 gastropod. Hand-hauled, capstan down. |
| PJ-11 | 14 May 87 ^{10:50} 1252 ^{10:50} | Animal Traps Deployed | 34°57.96'N 120°49.93'W | N3871227 E697925 | 27792.4 42006.1 | 136 | High flyer in water. |
| PJ-11 | 15 May 87 ^{17:00} 1930 | Animal Traps Recovered | not noted | not noted | 27791.9 41992.2 | | Traps recovered; 2 Cancer. Hauled with catshead on winch. |

leg 3
 PHA-1 18:43 ^{18:43} rep1 25 05 87
 20:00 30 05 87
 1912 rep2 28 05 87
 19:00 20 05 87
 PHA-2 18:00 rep1 25 05 87
 16:00 25 05 87
 rep2 28 05 87
 PHA-3 17:00 rep1 25 05 87
 16:30 28 05 87
 15:45 rep1 19 10 86
 16:00 20 05 87

TABLE 1. SUMMARY OF GRAB SAMPLE POSITIONS ON MMS CRUISE CAMP 1-3, LEG 3 (R/V Robert Gordon Sproul) (Continued)

| Station | Date and Time (PDT) | Sample | Latitude Longitude | UTM Coordinates | Comments |
|---------|-----------------------|--------|---------------------------|---------------------|------------------------------|
| PH-I | Reference Coordinates | | 34°29.95'N 120°41.72'W | N3819711 E711603 | Depth 107 m. |
| PH-I | 31 May 87 ✓✓ 1015 | Grab 1 | 34°29.96'N 120°41.73'W | N3819734 E711586 | Surface contacting grab lid. |
| PH-I | 31 May 87 ✓✓ 1040 | Grab 2 | 34°29.95'N 120°41.74'W | N3819712 E711576 | Good surface. |
| PH-I | 31 May 87 ✓✓ 1057 | Grab 3 | 34°29.94'N 120°41.74'W | N3819702 E711568 | Good surface |
| PH-J | Reference Coordinates | | 34°29.83'N 120°41.86'W | N3819495 E711399 | Depth 117 m. |
| PH-J | 30 May 87 ✓✓ 2118 | Grab 1 | 34°29.86'N 120°41.87'W | N3819540 E711372 | Slightly disturbed surface. |
| PH-J | 30 May 87 ✓✓ 2134 | Grab 2 | 34°29.84'N 120°41.91'W | N3819514 E711315 | Slightly disturbed surface. |
| PH-J | 30 May 87 ✓✓ 2153 | Grab 3 | 34°29.85'N 120°41.82'W | N3819535 E711457 | Slightly disturbed surface. |

~~leg 4 PH-W 920 1 ✓
10:00 2 ✓
11:03 3 ✓~~

TABLE 1. SUMMARY OF GRAB SAMPLE POSITIONS ON MMS CRUISE CAMP 1-3, LEG 3 (R/V Robert Gordon Sproul) (Conti

| Station | Date and Time (PDT) | Sample | Latitude Longitude | UTM Coordinates | Comments |
|---------|------------------------|--------|---------------------------|---------------------|---|
| PH-K | Reference Coordinates | | 34°29.41'N 120°42.29'W | N3818700 E710750 | Depth 160 m. |
| PH-K | 30 May 87 ✓✓ 1219 | Grab 1 | 34°29.41'N 120°42.27'W | N3818698 E710791 | Shell hash. Surface slightly disturbed. |
| PH-K | 30 May 87 ✓✓ 1245 | Grab 2 | 34°29.41'N 120°42.25'W | N3818694 E710807 | Less shell than rep 1. Overlying water, sloped surface. |
| PH-K | 30 May 87 ✓✓ 1405 | Grab 3 | 34°29.41'N 120°42.32'W | N3818695 E710703 | No shell hash. Good surface. Overlying water. |
| PH-N | Reference Coordinates | | 34°29.24'N 120°42.10'W | N3818399 E711045 | Depth 166 m. |
| PH-N | 30 May 87 ✓✓ 1026 | Grab 1 | 34°29.23'N 120°42.10'W | N3818383 E711059 | Good sample. |
| PH-N | 30 May 87 ✓✓ 1045 | Grab 2 | 34°29.27'N 120°42.11'W | N3818440 E711037 | Good sample. |
| PH-N | 30 May 87 ✓✓ 1103 | Grab 3 | 34°29.24'N 120°42.10'W | N3818402 E711055 | Surface slightly disturbed, portions not collected. |

TABLE 1. SUMMARY OF GRAB SAMPLE POSITIONS ON MMS CRUISE CAMP 1-3, LEG 3 (R/V Robert Gordon Sproul) (Continued)

| Station | Date and Time (PDT) | Sample | Latitude Longitude | UTM Coordinates | Comments |
|---------|-----------------------|--------|---------------------------|---------------------|---|
| PH-R | Reference Coordinates | | 34°29.18'N 120°42.45'W | N3818266 E710518 | Reference Coordinate changed to CAMP 1-1 PH-R Grab-3 position to ensure acceptable samples. |
| PH-R | 30 May 87 ✓ ✓ 0734 | Grab 1 | 34°29.16'N 120°42.42'W | N3818241 E710569 | Good surface, some overlying water in in grab. |
| PH-R | 30 May 87 ✓ ✓ 0843 | Grab 2 | 34°29.19'N 120°42.43'W | N3818287 E710549 | Portion of surface in contact with lid; portion not collected. |
| PH-R | 30 May 87 ✓ ✓ 0903 | Grab 3 | 34°29.19'N 120°42.46'W | N3818293 E710501 | Undisturbed surface. |
| PH-U | Reference Coordinates | | 34°31.41'N 120°43.47'W | N3822370 E708870 | Depth 113 m. |
| PH-U | 31 May 87 ✓ ✓ 0832 | Grab 1 | 34°31.42'N 120°43.47'W | N3822376 E708865 | Surface contacting lid. Marginal sample. |
| PH-U | 31 May 87 ✓ ✓ 0853 | Grab 2 | 34°31.43'N 120°43.44'W | N3822389 E708905 | Overlying water, sample contacting lid. |
| PH-U | 31 May 87 ✓ ✓ 0909 | Grab 3 | 34°31.42'N 120°43.46'W | N3822373 E708876 | Marginal sample, surface contacting lid. |

TABLE 1. SUMMARY OF GRAB SAMPLE POSITIONS ON MMS COURSE CAMP 1-3, LEG 3 (R/V Robert Gordon Sproul)

| Station | Date and Time (PDT) | Sample | Latitude Longitude | UTM Coordinates | Comments |
|---------|------------------------|--------|---------------------------|---------------------|--|
| PH-E | Reference Coordinates | | 34°30.19'N 120°42.68'W | N3820125 E710125 | Depth 119 m. |
| PH-E | 31 May 87 ✓ 0510 | Grab 1 | 34°30.19'N 120°42.67'W | N3820128 E710140 | Slightly disturbed surface. |
| PH-E | 31 May 87 ✓ 0529 | Grab 2 | 34°30.18'N 120°42.67'W | N3820113 E710138 | Undisturbed surface. |
| PH-E | 31 May 87 ✓ 0550 | Grab 3 | 34°30.19'N 120°42.65'W | N3820123 E710170 | Good surface. |
| PH-F | Reference Coordinates | | 34°30.79'N 120°42.52'W | N3821250 E710350 | Depth 105 m. |
| PH-F | 31 May 87 ✓ 0647 ✓ | Grab 1 | 34°30.79'N 120°42.51'W | N3821248 E710354 | Good surface. Q. C. air sample collected. |
| PH-F | 31 May 87 ✓ 0703 ✓ | Grab 2 | 34°30.79'N 120°42.50'W | N3821254 E710372 | Slightly disturbed surface. |
| PH-F | 31 May 87 ✓ 0717 | Grab 3 | 34°30.79'N 120°42.51'W | N3821244 E710361 | Slightly disturbed surface. Overlying water. |

APPENDIX B - TABLE

APPENDIX C

REPORT OF OBSERVATIONS/SAMPLES COLLECTED BY OCEANOGRAPHIC PROGRAMS

(ROSCOP)

NOAA FORM 24-23
(1-76)

U. S. DEPARTMENT OF COMMERCE
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
NATIONAL OCEANOGRAPHIC DATA CENTER

A00 DATA CENTER

OCEANOGRAPHY - GENERAL CRUISE INVENTORY
(ROSCOP - II)

A40 REFERENCE NUMBER

| | | | | | |
|--|--|---|----|-----------------------------------|---|
| A01 EXPEDITION/PROJECT California OCS Phase II Monitoring Program | | YES | NO | PART | |
| A11 CRUISE NUMBER OR NAME CAMP 1-3, LEGS 1, 2, and 3 | | A91 Declared national program? | | X | |
| A02 SHIP OR PLATFORM R/V Robert Gordon Sproul | | A81 Exchange restricted? | | | X |
| A12 PLATFORM TYPE 01 | | A92 Co-operative program? | | | X |
| A03 COUNTRY USA | | A04 ORGANIZATION Battelle/U.S.G.S./Kinnetics | | A82 Co-ordinated internationally? | |
| | | | | A72 NAME | |
| | | | | A62 BY WHOM? | |
| | | A05 CHIEF SCIENTIST(S) J. F. Campbell, Battelle Dr. B. Butman, U.S.G.S. D. Hardin, Kinnetics | | | |

| | | | |
|--|--|---------------------------|--|
| A06 NAME AND ADDRESSES OF ORGANIZATIONS AND PERSONS WHOM TO QUERY | | FINAL DISPOSITION OF DATA | |
| A1 J. L. Hyland, Battelle, Ventura, CA | | A2 J. L. Hyland | |
| B1 P. D. Boehm, Battelle, Duxbury, MA | | B2 Program Manager | |
| C1 E. Crecilius, Battelle, Sequim, WA | | C2 Battelle | |
| D1 P. Kinney, Kinnetics, Santa Cruz, CA | | D2 1431 Spinnaker Drive | |
| E1 L. Watling, Univ. of Maine, Walpole, ME | | E2 Ventura, CA 93001 | |

| | | | | | |
|----------|-----|-------|------|-------------------------|---|
| DATE | DAY | MONTH | YEAR | A08 GENERAL OCEAN AREAS | |
| A07 FROM | 0 | 4 | 05 | 87 | 57A NE Pacific Ocean 121°W |
| A17 TO | 0 | 1 | 06 | 87 | A09 TYPE(S) OF MARINE ZONE(S) 07, 08 |

| | | | | | |
|--|--|--------------|--|---------------|--|
| GEOGRAPHIC AREA | | A10 LATITUDE | | A20 LONGITUDE | |
| <i>If all data were collected at a fixed station, fill in the co-ordinates</i> | | " N/S | | " E/W | |

A15 FEDERAL SUPPORT U. S. D. I. - Minerals Management Service

A25 REMARKS
 F1 B. Butman, U.S.G.S., Woods Hole MA F2 J. L. Hyland, Battelle, Ventura, CA
 GU - Measurements underway. All photographs and motion pictures were taken by cameras attached to a Remotely Operated Vehicle (ROV).
Sediment Collection - 28 stations sampled by 0.25m² boxcore
 8 stations sampled by 0.1m² grab

| DISCIPLINE AND TYPE OF MEASUREMENTS | Index 10° x 10° | | | | INDEX 1° x 1° | DISCIPLINE AND TYPE OF MEASUREMENTS | Index 10° x 10° | | | | INDEX 1° x 1° |
|-------------------------------------|-----------------|---|---|---|---------------|-------------------------------------|-----------------|---|---|---|---------------|
| | Qc | L | G | G | | | Qc | L | G | G | |
| A GL, GU, GS B | 7 | 3 | 1 | 2 | | A | B | | | | |
| A D, H(NSF), HP, B | 7 | 3 | 1 | 2 | | A | B | | | | |
| A HC, P, B, BS B | 7 | 3 | 1 | 2 | | A | B | | | | |
| A B | | | | | | A | B | | | | |
| A B | | | | | | A | B | | | | |
| A B | | | | | | A | B | | | | |
| A B | | | | | | A | B | | | | |

B - BIOLOGY

| | NUMBER | i | l | FORMAT | | NUMBER | i | l | FORMAT |
|--|--------|---|---|--------|---|--------|---|---|--------|
| B01 Primary productivity | | | | | B31 Vitamin concentrations | | | | |
| B02 Phytoplankton pigments | | | | | B32 Amino acid concentration | | | | |
| B03 Seston | | | | | B33 Hydrocarbon concentrations | | | | |
| B04 Particulate organic carbon | | | | | B34 Lipid concentrations | | | | |
| B05 Particulate organic nitrogen | | | | | B35 ATP-ADP-AMP concentrations | | | | |
| B06 Dissolved organic matter | | | | | B36 DNA-RNA concentrations | | | | |
| B07 Bacterial and pelagic micro-organisms | | | | | B37 Taggings | | | | |
| B08 Phytoplankton | | | | | B80 Other measurements | | | | |
| B09 Zooplankton | | | | | Sediment X-Rays | | E | A | |
| B10 Neuston | | | | | 1 | 2 | | | |
| B11 Nekton | | | | | BS TYPES OF STUDIES | | | | |
| B12 Invertebrate nekton | | | | | B51 Identification | 28 | A | A | 9 |
| B13 Pelagic eggs and larvae | | | | | B52 Spatial and temporal distribution | 28 | A | A | 9 |
| B14 Pelagic fish | | | | | B53 Monitoring and surveillance | 28 | A | A | 9 |
| B15 Amphibians | | | | | B54 Biomass determination | | | | |
| B16 Benthic bacteria and micro-organisms | | | | | B55 Description of communities | 28 | A | A | 9 |
| B17 Phytobenthos | | | | | B56 Food chains energy transfers | | | | |
| B18 Zoobenthos | 28 | A | A | 9 | B57 Population and environments | 28 | A | A | 9 |
| B19 Commercial demersal fish | | | | | B58 Population structures | 28 | A | A | 9 |
| B20 Commercial benthic molluscs | | | | | B59 Taxonomy, systematics, classification | 28 | A | A | 9 |
| B21 Commercial benthic crustacean | | | | | B60 Physiology | | | | |
| B22 Attached plants and algae | | | | | B61 Behaviour | | | | |
| B23 Intertidal organisms | | | | | B62 Pathology, parasitology | | | | |
| B24 Borers and foulers | | | | | B63 Toxicology | | | | |
| B25 Birds | | | | | B64 Gear research | | | | |
| B26 Mammals and reptiles | | | | | B65 Exploratory fishing | | | | |
| B27 Deep scattering layers | | | | | B66 Commercial fishing | | | | |
| B28 Acoustical reflections on marine organisms | | | | | B67 Aquaculture | | | | |
| B29 Biologic sounds | | | | | B90 Other measurements | | | | |
| B30 Bioluminescence | | | | | | | | | |

| H- HYDROGRAPHY | | | | | | | | | | | |
|-------------------------------|--|--------|----|---|--------|---------------|----------------------------------|--------|---|---|--------|
| HS SURFACE | | NUMBER | i | l | FORMAT | HC CHEMICAL | | NUMBER | i | l | FORMAT |
| H01 | Continuous temperature recording | | | | | H26 | Silicates | | | | |
| H02 | Continuous salinity recording | | | | | H27 | Alkalinity | | | | |
| H03 | Discrete temperature measurements | | | | | H28 | pH | | | | |
| H04 | Discrete salinity measurements | | | | | H29 | Chlorinity | | | | |
| NEAR SEA FLOOR (≤ 10 m) | | | | | | H30 | Trace elements | | | | |
| H05 | Continuous temperature recording | | | | | H31 | Radioactivity | | | | |
| H06 | Continuous salinity recording | | | | | H32 | Isotopes Pb/Th in sediment | 5 | C | A | 9 |
| H07 | Discrete temperature measurements | 13 | D | A | 9 | H33 | Dissolved gases | | | | |
| H08 | Discrete salinity measurements | 13 | D | A | 9 | H90 | Other measurements | | | | |
| HP PHYSICAL | | | | | | | | | | | |
| H09 | Classical oceanographic stations | | | | | | | | | | |
| H10 | Vertical profiles (STD/CTD) | 19 | DF | A | 2,3,7 | P - POLLUTION | | | | | |
| H11 | Sub-surface measurements underway | | | | | P01 | Suspended solids | | | | |
| H12 | Mechanical bathythermograph (No. of drops) | | | | | P02 | Heavy metals in sediment | 36 | C | A | 9 |
| H13 | Bathythermograph-expendable (No. of drops) | | | | | P03 | Petroleum residues in sediment | 36 | B | B | 9 |
| H14 | Sound velocity stations | | | | | P04 | Chlorinated hydrocarbons | | | | |
| H15 | Acoustic stations | | | | | P05 | Other dissolved substances | | | | |
| H16 | Transparency | | | | | P06 | Thermal pollution | | | | |
| H17 | Optics | | | | | P07 | Waste water: BOD | | | | |
| H18 | Diffusion (Dynamic) | | | | | P08 | Waste water: Nitrates | | | | |
| H80 | Other measurements | | | | | P09 | Waste water: Microbiology | | | | |
| | Suspended Matter | 15 | F | A | 9 | P10 | Waste water: Other | | | | |
| | | | | | | P11 | Discolored water | | | | |
| | | | | | | P12 | Bottom deposits | | | | |
| HC CHEMICAL | | | | | | P13 | Contaminated organisms | | | | |
| H21 | Oxygen dissolved | 13 | D | A | 9 | P90 | Other measurements | | | | |
| H22 | Phosphates | | | | | | Heavy metals in pore water | 4 | C | A | 9 |
| H23 | Total-P | | | | | | Petroleum residues in pore water | 4 | B | A | 9 |
| H24 | Nitrates | | | | | | Heavy metals in organisms | 6 | C | A | 9 |
| H25 | Nitrites | | | | | | Petroleum residues in organisms | 6 | B | A | 9 |