

**Preliminary Report
of
the Hakuho Maru Cruise KH 93-1**

January 22 - March 4, 1993

**Biogeographic and Population Genetic Study of Marine Organisms
on the Sea Mounts in the Northwestern Pacific**

**Ocean Research Institute
University of Tokyo
1994**

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**by
The Scientific Members of the Expedition
Edited by
Ken-ichi NUMACHI**

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Introduction

Waters surrounding islands and atolls in the ocean have attracted much attention of oceanographic studies for plenty of biological species and high productivity in the regions. There have been, however, made rather few biological studies on the sea mounts and the surrounding oceans, although exhaustive geophysical informations have been recently accumulated increasingly on the sea mounts.

One major objective of this cruise was to lead genetic studies of organisms distributed on the sea mounts. Many of the sea mounts from lines or groups. An important problem is to see how these oceanographic discontinuity induced the genetic differentiation of organisms. The purpose of the present cruise was to give a primary information on the distribution and species compositions of the organisms inhabiting on the sea mounts in the Pacific Ocean, for future studies on population structure and population genetics of the species distributed on the sea mounts. In addition to such study, the biogeographical study of microorganisms, zooplankton, micronekton, crustacean, nekton and cetacean were also conducted, together with bathymetric and magnetic survey during the present cruise in the North and Central Pacific.

On behalf of the scientists on board, the chief scientist wishes to express his gratitude to Captain Hideji Shimamune, the Chief Officer Yoichi Jinno and to the other officers and the crew members of the Hakuho Maru for their collaboration and skillful assistance throughout the cruise. His special thanks are extended to Dr. Kouichi Kawaguchi, Dr. Makoto Terazaki, Mr. Hiroshi Hasumoto, Dr. Kazuhiro Kogure, Dr. Takanori Kobayashi and Dr. Hirohisa Kishino for fulfilling the acting chief scientist, vice-director, head secretary and general management during all the cruise.

January, 1994

Ken-ichi Numachi

Chief Scientist of KH-93-1 Cruise

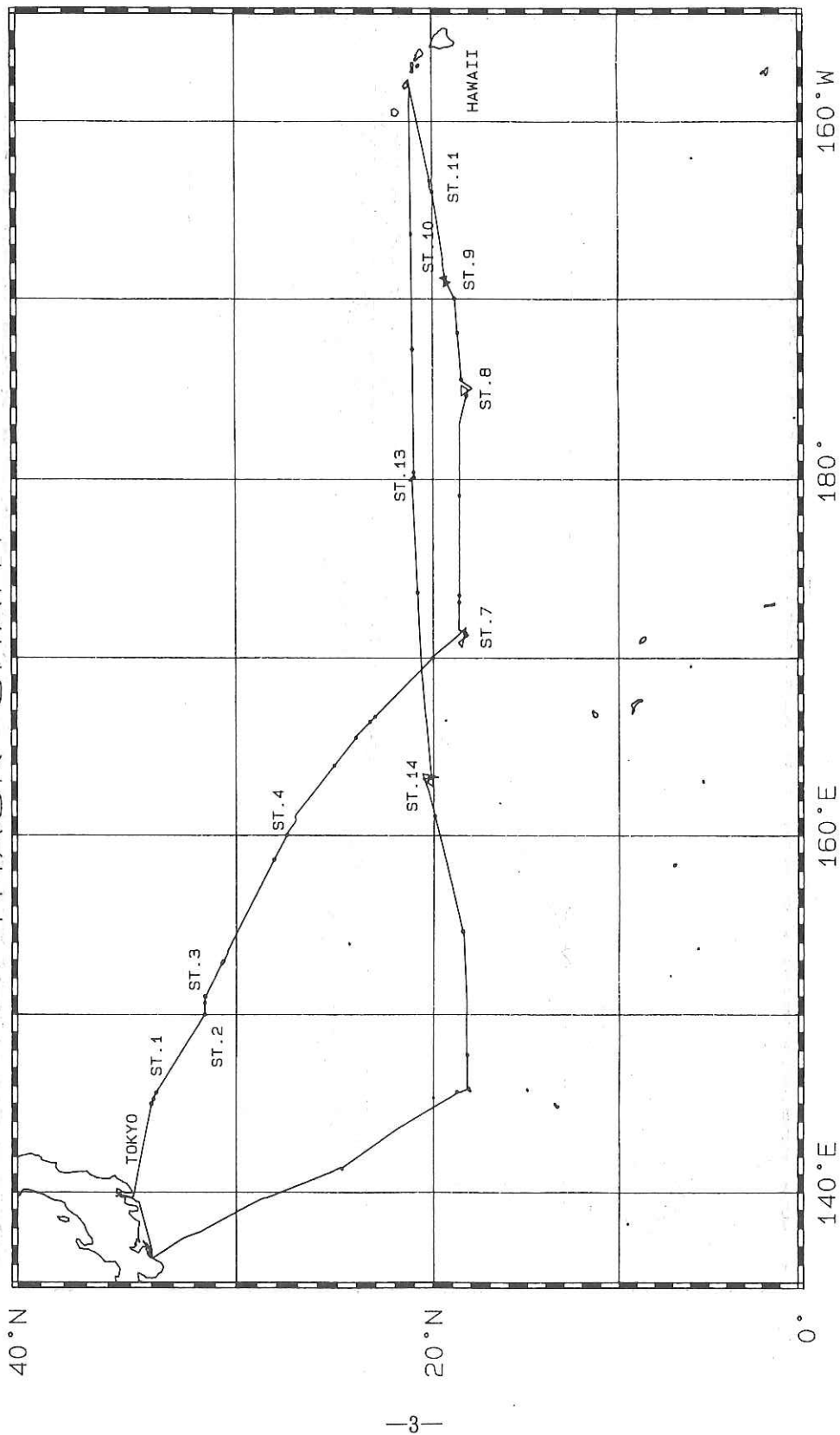
SCIENTISTS ABOARD THE R. V. HAKUHO MARU CRUISE KH - 93 -1

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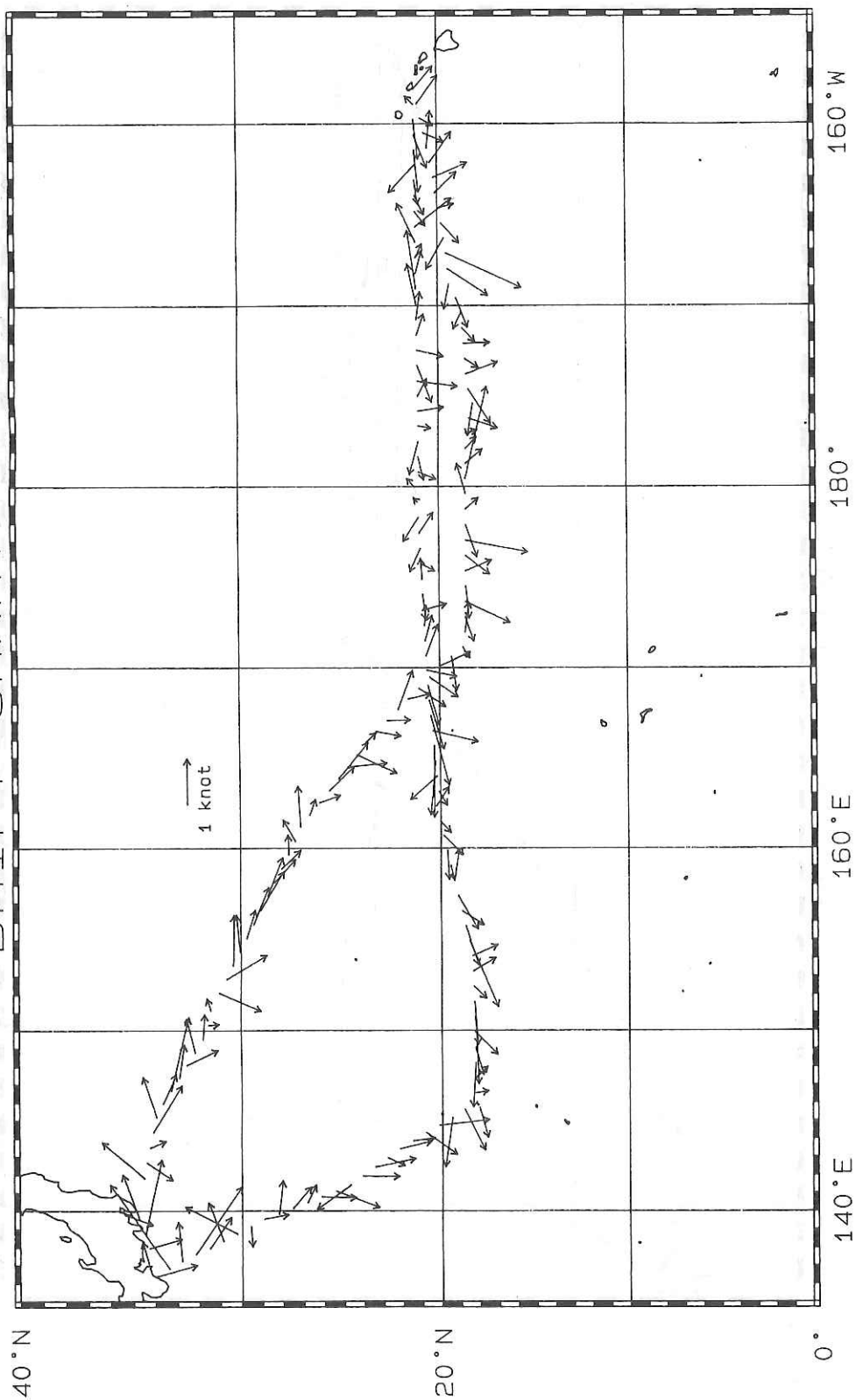
1: from January 22 (Tokyo) to February 8 (Honolulu) only

2: from February 14 (Honolulu) to March 4 (Tokyo) only

TRACK CHART



DRIIFT CHART



Bacterial Biomass and Production Rate in Pacific Ocean Water Column

Kazuhiro Kogure, Minoru Wada, Koji Hamasaki,
Michinari Sunamura

In order to assess the contribution of microbes to the carbon cycle in the ocean, microbial biomass and production rates should provide basic information. With the postulated assimilation efficiency and carbon-biomass ratio, total amount of organic matter which pass through bacterial population can be obtained from the production rate. Recent works clarified that this fraction may comprise 30-50% of the primary production in the water column. For estimating bacterial production rate, thymidine incorporation and leucine incorporation methods have been widely used. Theoretically, the thymidine method is aiming at measuring DNA synthesis rates. Although there are many assumptions, bacterial production rate is calculated from the DNA synthesis rate by a simple conversion factor. On the other hand, leucine incorporation method is intending to measure the protein synthesis rate. It is known that the amount of protein per cell will vary much more than that of DNA. However, leucine method has proven to be applicable to the estimation of production rates and many workers started to use this approach.

These two method have been utilized mainly in coastal or nearshore area, and data from open ocean is quite limited. The purpose of the present study is, first to check the methodologies of these two approaches and second, clarify the bacterial secondary production rate in open ocean oligotrophic conditions.

Materials and Methods

Seawater samples were obtained during the KH-93-1 cruise of R/V Hakuho-Maru. Vertical water samples were obtained by using Niskin microbiological samplers. Surface waters were collected with sterilized glass bottles. All samples were treated on board within 30 minutes after the collection.

Viable counts of heterotrophic bacteria were enumerated using 1/5 ZoBell 2216E agar plates. After two weeks incubation at 20° C, number of colonies appeared was counted. Total counts were also obtained by the acridine orange staining method (Hobbie *et al.* 1977).

Bacterial secondary production rate was measured either by [*methyl*-³H]thymidine (Fuhrman and Azam 1982) or [¹⁴C] leucine incorporation method (Kirchman *et al.* 1985). Both [*methyl*-³H]thymidine (specific activity, 925GBq/mM) and L-[U-¹⁴C] leucine (specific activity, 11.7GBq/mM) were purchased from Amersham. Ten nM of

either radio active compound was inoculated into 20ml sample seawater in a test tube and incubation was carried out at an ambient temperature (within 2° C) for 2 to 7 hours, depending on the condition. Triplicate tubes were used for each sample and duplicate of formalin fixed (1%) sample was treated in parallel as control. The incubation was stopped by adding 5 ml cold TCA (25%) and the samples were kept on ice for at least 5 minutes. The sample was then filtrated through Millipore GS filter (pore size 0.22 µm) followed by washing three times with cold 5% TCA. The filter was transferred to a glass vial, to which 5 ml of Aquasol 2 was added. Radioactivity was counted by LKB Wallack RackBeta 1215 liquid scintillation counter. Values of the control were subtracted from those of samples.

Results and Discussion

When [methyl-³H]thymidine incorporation method was applied during this cruise, consistent data was not obtained mainly due to high background radioactivity level of the control. The longer incubation up to 7 hours gave essentially similar results. It is possible that the filter used was not very suitable for this purpose.

On the other hand, the leucine incorporation method worked reasonably well. When time course was checked, linear increase was obtained up to 6 hours. During this cruise, 4 hours was chosen for incubation period. The original method (Kirchman *et al.* 1985) uses hot-TCA precipitate to extract protein fraction after incubation. However, hot-TCA is practically not very convenient on board. Therefore, we first compared the hot-TCA and cold-TCA. As a result, there was virtually no difference between the two (data not shown) and we used the cold-TCA extraction method during this cruise.

Fig. 1 shows the vertical profiles of viable counts, total counts and leucine incorporation rates at St. 14, as a representative. All three had clear peaks at the surface and smaller subsurface peaks. The depth of the subsurface peak of total counts and leucine incorporation was 100m, where chlorophyll a subsurface maximum layer also occurred (data from the preliminary cruise report). The peak of leucine incorporation was, however, rather broad and comparable value was also obtained at 150m. A thermocline was observed below 100m at this station. This result suggests that at subsurface layer, bacterial biomass and production may depend on the phytoplankton population occurring at the layer. At the surface, however, there may be somewhat different kind of bacterial population, of which growth is not simply explained from the phytoplankton biomass.

Viable counts had the peak at 150m. In general, there were about 4 orders of magnitudes difference between total counts and viable counts in the area during this cruise. This difference is common in offshore environments. Total counts should be

regarded as biomass of bacteria, whereas viable counts may represent a part of actively growing fraction among them. Some degraded materials originated from phytoplankton population may provide with some nutrients to those heterotrophic bacterial population.

Bacterial production is usually calculated from the amount of leucine incorporated by using an appropriate conversion factor. If we simply apply the factor, 1.64×10^{17} cells/mol leucine incorporated (Chin-Leo and Kirchman 1988), bacterial production rate in the surface layer at St. 14 was 4.4×10^3 /ml/hour. Therefore, an apparent doubling time of bacterial population is slightly more than 100 hours. However, the applicability of this conversion factor remained to be checked. During the cruise, we tried to obtain the conversion factor in open ocean waters. Small portion of seawater was inoculated into filtered seawater (1/10) and bacterial increase was observed by AODC method (Hobbie *et al.* 1977). In general, the bacterial number started to increase after more than 10 hours, whereas leucine incorporation proceeded before that. In this case, leucine incorporation may not be directly related to cell number increase but rather related to protein synthesis or increase of each cellular size. This should be due to low organic concentration and subsequent low bacterial activity or production in the area. This result suggests that it is doubtful if any reasonable conversion factor can be used or even exist to estimate bacterial cellular increase from leucine incorporation rate in oligotrophic oceanic area.

In conclusion, further methodological check and more accumulation of data will be necessary to assess the contribution of bacteria to carbon cycle in the ocean. An application of methods obtained in nearshore area to open ocean environments needs extreme caution and careful check.

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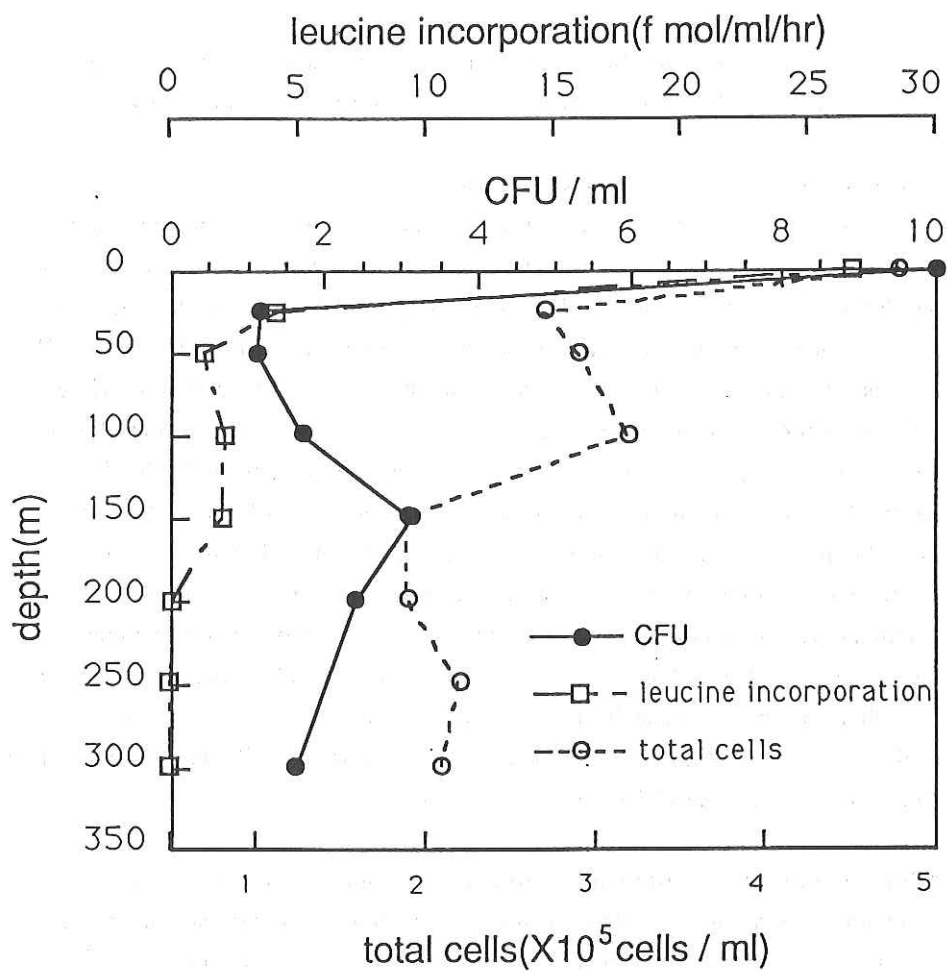


Fig. 1. Vertical profile of bacteria and leucine incorporation at St. 14.

Ecological Studies of the Zooplankton and Micronekton in Central North Pacific

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Collection of zooplankton and micronekton

A NORPAC-twin net consisting of 0.10 mm and 0.33 mm-mesh nets was towed vertically from a depth of 200 m to the surface at four stations. A Motoda horizontal net (MTD net) was towed in 14 different strata between 1100 m and the surface at Stn. 13. Large zooplankton were collected by an oblique tow of an ORI net (0.69 mm-mesh) in the layer between ca. 1000 m and the surface at four stations. Time-series samplings of micronekton were carried out in the epipelagic layer at Stns. 13-9, 14, 16, 18, 20, 22, 25, 28, 29, 30 and 32, by oblique tows of a 10-ft IKMT (2 mm-mesh) after we observed the scattering layers by using the ABIS (Acoustic Biomass Investigation System) that has 4 frequencies (200, 120, 50 and 38 kHz). Surface horizontal tows of a 6-ft IKMT (5 mm-mesh) or an ORI net were carried out simultaneously with oblique tows of a 10-ft IKMT at 8 stations and 26 stations, respectively. A 10-ft IKPT (1 mm-mesh) was towed obliquely in the layer between ca. 500 m and the surface at 30 stations. An ORI-type Multiple Plankton Sampler (ORI-VMPS) with four nets (0.33 mm mesh) was towed vertically in 8 different strata between 800 m and the surface at Stns. 7, 10 and 14.

Study on diurnal migration and feeding of zooplankton and micronekton

Diurnal migration of zooplankton and micronekton was investigated using the specimens collected with MTD nets and an IKMT at Stn. 13. Abundance of ^{15}N and ^{13}C in biogenic substance may provide a new approach for understanding ecological phenomena occurring in natural environments. The lines of evidence so far appeared in the recent literature suggest that isotopic composition of nitrogen of an animal can be an indicator of its food source and trophic level in an ecosystem. We observed the gut contents of micronekton and also measured nitrogen and carbon isotope ratio of zooplankton and micronekton, in order to establish their position in the food web.

Zoogeography of zooplankton

Horizontal and vertical distribution of copepods, pteropods, salps and chaetognaths were examined using the samples collected with an ORI-VMPS, an ORI net and a 10 ft-IKPT.

Ten species of salps belonging to eight genera, *Salpa fusiformis*, *S. maxima*, *Weelia cylindrica*, *Thalia democratica*, *Lasis zonaria*, *Metcalfina hexagona*, *Pegea* sp., *Helicosalpa* sp. and *Ritteroella* sp. occurred in the epipelagic layer of various waters. Twenty-two species of pteropods belonging to nine genera, *Limacina bulimoides*, *L. inflata*, *L. leseure*, *Creseis virgula* f. *conica*, *C. acicula* f. *acicula*, *Stykiola subula*, *Clio pyramidata* f. *lanceolata*, *Cl. cuspidata*, *Cl. recurva*, *Cuvierina columnella* f. *columnella*, *Diacria trispinosa*, *D. danae*, *D. costata*, *Cavolinia tridentata* f. *teschi*, *Ca. gibbosa* f. *gibbosa*, *Ca. globulosa*, *Ca. inflexa*, *Diacavolinia longirostris*, *Diac. angulosa*, *Peraclis reticulata*, *P. moluccensis* and *P. apicifulva* were collected from the central Pacific.

Genetic variability and differentiation of populations in variety of pteropods and chaetognaths are studied through the use of endonuclease cleavage patterns of mitochondrial DNA.

Biology of the sapphirinid copepods

The ultrastructure of the integument of the sapphirinid copepods was studied by scanning and transmission electron microscopy. Samples were collected with an ORI net at Stn. 13. In all the species examined of *Sapphirina* and *Copilia*, a structure with multilayered platelets was found in the epidermal cells of the dorsal integument of the male. Each platelet is regular hexagonal prism. The platelets from a plate with honeycomb arrangement within each epidermal cell. Just ventral to the dorsal cuticle, 10 - 14 plates are located parallel to each other and to the cuticle. The mean diameter and thickness of the platelets measured between 1.0 - 1.8 μm and 61 - 83 nm, respectively, for the four species. The specific coloration of seven species was examined with reflected and transmitted light. The iridescent color may be explained by the theory of multiple thin-layer interference in some species which are considered to have an ideal laminar structure, but for the other species, mechanisms from non-ideal systems, including pigment-thin layer interaction, may also be involved.

Comparative morphology of the eyes of Chaetognatha

Samples were obtained by oblique tows of an ORI net at three stations. The animals were fixed immediately in 10 % formalin sea water solution. Measurements of the maximum and minimum lengths of the eye and of the pigmented area viewed from the dorsal surface were made simultaneously with measurements of the body length for each worm. For the morphological studies, the samples were fixed immediately on deck in 2.5 % glutaraldehyde in 0.1 M sodium cacodylate buffer (pH 7.4) containing 0.4 M sucrose. After decapitation, the head regions were post-fixed in 1% osmium tetroxide with the same buffer as above for 1 h at room temperature, dehydrated in an ethanol series, transferred to propylene oxide and embedded in

epoxy resin. When the eye was cut at the mid region of the pigment cell, the area of the two medial components is occupied by the pigment cell. thin sections were also stained with 1 % uranyl acetate and 0.1 % lead citrate, and examined with an transmission electron microscope.

In this study, we have classified the eyes of *Sagitta* into five types. The main criteria for classification were: the size of the pigment cell relative to that of the eye, and the presence or absence of the peripheral photoreceptive region. Most of the epipelagic species have eyes with a large pigment cell and the central photoreceptive region. A mesopelagic species also has the same type of eye, but the area of the photoreceptive region is larger than that in epipelagic ones, suggesting that it may be advantageous for deep-sea species to enlarge the photoreceptive area. The fact that the eyes of deep-sea species do not become degenerate, but are more developed for photon capture suggests the importance of light for the life of chaetognaths.

Distribution of Anguilliformes leptocephali in Central North Pacific

Tsuguo Otake, Machiko Oya, Reiji Masuda

Recent efforts have accumulated considerable information on the early life of *Anguilla* leptocephali, particularly on the spawning area, migration, age and growth. However, there is still little knowledge on the other Anguilliformes leptocephali. The final goal of our study is to make clear the life history of leptocephali including *Anguilla japonica* occurring in Japanese waters. In this preliminary report we present data on distribution of leptocephali collected during KH-93-1 research cruise.

Fish was collected by oblique tows with an IKPT (mesh aperture 1mm) and a surface tows with an ORI net (mesh aperture 0.69mm) conducted at 13 stations (S1-S13) in Leg.1 and 7 stations (S14-S20) in Leg.2. Each tow was operated at night from 20:00 or 22:00. The wire lengths of the oblique tow with IKPT were 500m at S1-S10 and 1000m at S11-S13. The surface tows with ORI net were conducted for 30min during IKPT tows.

A total of 347 Anguilliformes leptocephali was collected. The dominant families were Serrivomeridae (173 specimens, 49.9% of the total catch), Congridae (115 specimens, 33.1%), and Nemichthidae (34 specimens, 9.8%). All the specimen of Serrivomeridae were collected in stations located at south of latitude 25° north (S6-S20). *Gnathopis nystromi nystromi* and *G. n. ginanago*, dominant species of Congridae, were occurred only in 4 stations located at north of latitude 25° north and west of longitude 160° east. On the other hand, *Nemichthys scolopaceus* was found in almost whole research area.

Table 1 Leptocephali collected in each station. (): mean TL

Species	S-1	S-2	S-3	S-4	S-5	S-6	S-7
Dyssommataidae:							
Dyssomma anguillare		1(47.2)	2(45.0)	1(47.2)			
Synaphobranchidae:							
Synaphobranchidae sp.							
Nettastomatidae:							
Saurenhelys stylurus				3(98.4)			
Cyematidae:							
Cyematidae sp.							
Serrivomeridae:							
Serrivomeridae sp.						15(30.0)	7(24.5)
Derichthyidae:							
Derichthys serpentinus							
Muraenidae:							
Muraenidae sp.			1(76.2)		2(68.0)		
Nemichthyidae:							
Nemichthys scolopaceus	1(156.2)		5(73.1)	6(140.7)	3(72.3)	2(80.5)	3(56.0)
Avocettina infans							
Congridae:							
Ariosoma sp.4	2(65.8)	1(72.8)	6(73.0)	4(67.6)	4(79.5)	2(77.0)	
Ariosoma sp.7	2(85.8)	4(84.4)	5(91.0)	1(69.5)	1(88.5)		
Ariosoma sp.						1(93.4)	1(-)
Gnathophis nystromi nystromi	4(47.5)	4(64.0)	35(64.0)	9(61.0)			
G. n. ginanago			10(74.0)	5(73.3)			
Conger myriaster			2(70.7)	3(62.8)	1(72.3)		
Congridae spp.		2(80.4)		1(60.0)			
Eurypharyngidae:							
Eurypharynx pelecánoides							
Unidentified					1(-)		
Total	7	12	66	33	12	20	11

Table 1 Continued.

Species	S-8	S-9	S-10	S-11	S-12	S-13	S-14
Dyssommataidae:							
Dyssomma anguillare							
Synaphobranchidae:							
Synaphobranchidae sp.							
Nettastomatidae:							
Saurenehelys stylurus							
Cyematidae:							
Cyematidae sp.							
Serrivomeridae:							
Serrivomeridae sp.	22(30.0)	8(19.9)	15(23.4)	6(34.2)	14(23.9)	4(22.5)	11(24.5)
Derichthyidae:							
Derichthys serpentinus	2(31.8)						
Muraenidae:							
Muraenidae sp.							4(36.6)
Nemichthyidae:							
Nemichthys scolopaceus	1(84.0)		3(34.0)		2(35.9)	1(129.0)	
Avocettina infans							
Congridae:							
Ariosoma sp.4							
Ariosoma sp.7							3(51.2)
Ariosoma sp.							
Gnathophis nystromi nystromi							
G. n. ginanago							
Conger myriaster							
Congridae spp.							1(51.7)
Eurypharyngidae:							
Eurypharynx pelecانoides							1(16.0)
Unidentified						2(24.5)	
Total	30	8	18	6	16	7	20

Table 1 Continued.

Species	S-15	S-16	S-17	S-18	S-19	S-20	Total
Dyssommataidae:							
Dyssomma anguillare							4
Synaphobranchidae:							
Synaphobranchidae sp.			1(20.3)				1
Nettastomatidae:							
Saurenhelys stylurus							3
Cyematidae:							
Cyematidae sp.							
Serrivomeridae:							
Serrivomeridae sp.	11(29.2)	20(27.7)	5(32.1)	17(29.0)	2(34.2)	16(36.8)	173
Derichthyidae:							
Derichthys serpentinus				2(22.5)		1(35.5)	5
Muraenidae:							
Muraenidae sp.							7
Nemichthyidae:							
Nemichthys scolopaceus				1(22.5)			28
Avocettina infans	1(45.0)						6
Congridae:							
Ariosoma sp.4							19
Ariosoma sp.7							16
Ariosoma sp.		2(193.2)	1(-)				5
Gnathophis nystromi nystromi							52
G. n. ginanago							15
Conger myriaster							4
Congridae spp.							4
Eurypharyngidae:							
Eurypharynx pelecánoides	1(18.5)						2
Unidentified							3
Total	13	22	7	20	2	17	347

Molecular Biogeographic Study of the Marine Organisms on the Sea Mounts in the Central North Pacific

Ichiro Takeuchi, Takanori Kobayashi, Mutsuo Gotoh, Hiroyuki Sasaki,
Takashi Kamaishi, Hideharu Tsuchiya, Shigeaki Kojima, Hiroshi Hasumoto,
Ken-ichi Numachi

The mid-Pacific Mountains rise to more than 3000 m above the regional ocean floor at 5-6000 m and are covered by fine sediment on the top. In spite of the island-like arrangement of the habitat, few studies on epifunal distribution have been made in this area. During the Hakuho-Maru KH-93-1 Cruise, we planned to collect necrophagous benthic animals using a hyper-benthic baited trap at the four stations, sts. 7 (Sio Guyot), 8, 10 (Horizon Guyot) and 14.

The baited trap shown in Figure 1 was used. The trap consisted of four chambers which were made of PVC tube with length of 100 cm and a diameter of 38 cm in upper two tubes and 55 cm in lower ones. Inverted entrance cones made from acrylic plates with 2.0 mm holes was set on both sides of the tubes. About 2 to 4 kg of "SANMA" kept in a mesh bag was used as bait. The amount of bait in the upper tubes was half of that in the lower ones. The trap was recovered 15 to 18 hours after release which was conducted at 14:30 to 19:00 h in local time. The recovery of the trap was achieved by releasing iron ballast using an acoustic release (Nochiyu-giken Co. Ltd., Tokyo).

The species composition of necrophagous benthic animals collected from these stations is shown in Table 1, except for st. 14 from where all specimens were stored in an ultra low freezer. The most abundant species was the large lysianassid amphipod *Eurthenes gryllus* (Lichtenstein, 1822) which composed 68 % at st. 8 to 90 % at st. 10. The second most abundant species is the caridean shrimp *Acantheephyra eximia* (Smith, 1884) constituting 6.5 % at st. 10 to 21.1 % at st. 8. Five other species of gammarid amphipods and caridean shrimps were also collected. In addition to these crustaceans, 7 specimens of eel-like abyssal fish were collected.

The number of *Eurthenes gryllus* caught in the lower tubes (average \pm S.D.; 76.2 ± 84.3) was significantly higher than in the upper tubes (0.2 ± 0.4), while *Acantheephyra eximia* was not significantly different (lower tube; 3.3 ± 1.4 , upper tube; 2.3 ± 2.7). Although the size and amount of bait between upper and lower tubes was different, the high density of *E. gryllus* in the lower tubes reflects their hyper-benthic aggregation on the top of the peaks in the Mid-Pacific Mountains. This distribution pattern differs from *E. gryllus* inhabiting the deep ocean floor of the

North Pacific where most of individuals were collected 10 to 50 m above the bottom (e.g., Ingram and Hessler, 1983; Smith and Baldwin, 1984). We plan further studies on the present specimens of *E. gryllus*, especially ecological aspects by sex ratio and size-frequency distribution and genetic investigations using mitochondrial DNA analysis.

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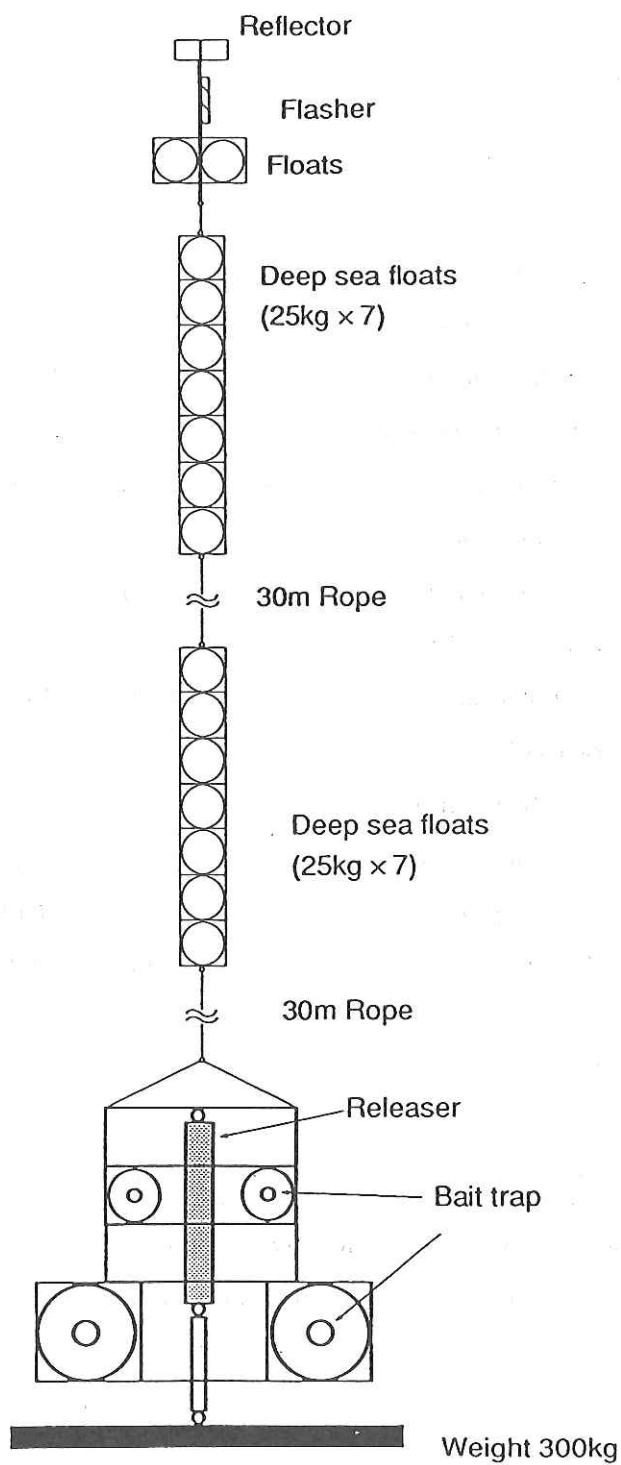


FIGURE The schematic diagram of bait traps designed by Hasumoto.

Species	St. 8	St. 9	St. 10
Crustacea			
Amphipoda			
<i>Eurythenes gryllus</i>			
(Lichtenstein, 1822)	39 (68.4)	108 (87.8)	241 (96.4)
<i>Valettietta anacanthus</i>			
(Birstein & Vinogradov, 1963)	0 (0)	2 (1.6)	0 (0)
<i>Cyclocaris tahitensis</i>			
(Stebbing, 1888)	0 (0)	1 (0.8)	0 (0)
<i>Parandania Boeckii</i>			
(Stebbing, 1888)	0 (0)	1 (0.8)	0 (0)
Decapoda			
<i>Acantheptyra eximia</i>			
(Smith, 1884)	12 (21.1)	9 (7.3)	7 (2.8)
Caridea sp. A	0 (0)	0 (0)	2 (0.8)
Caridea sp. B	1 (1.8)	0 (0)	0 (0)
Fish	5 (8.8)	2 (1.6)	0 (0)
Total	57 (100)	123 (100)	250 (100)

Table 1 Species composition of necrophagous benthic animals caught by baited traps at Sts. 8, 9, and 10. The number in parenthesis indicates percent abundance.

Census of Cetacean Distribution in the Subtropical Region of the Western North Pacific

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Introduction

Nishiwaki(1966) and some other papers reported the distribution and abundance of the cetacean in the North Pacific. The data of these papers were based on the records of whaling or marking and sighting records in the whaling grounds. Recently, data are accumulated by operation of the Sighting Surveys in the North Pacific conducted by Japanese government. However, much of the data of baleen whale distribution in the western North Pacific is collected in high latitudinal summer feeding ground. There are not many census records from the tropical and subtropical area to where the baleen whales migrate in winter. There are reports about the humpback whales in the Ogasawara (Bonin) islands and the Okinawa (Ryukyu) islands (Darling and Mori 1993., Nishiwaki 1966), and the sei whales in western North Pacific (Miyashita 1986), but the information is limited compared with that in the feeding grounds, mainly because most of the whaling was operated mainly in high latitudinal feeding grounds. Tropical and subtropical waters is the region for reproductive activities for many species of baleen whales, and the distribution information in the areas is essential for the conservation of the whale populations. Nevertheless, there are unbalanced information about the seasonal distribution.

Darling and Mori(1993) revealed the occurrence of reproductive activities of humpback whales in Ogasawara and Okinawa where are subtropical areas of the western North Pacific. Recently, a same individual was found out in Ogasawara and Hawaii (Darling,J.D.and S.Cerchio 1993). The effort of the research in Ogasawara and Okinawa were emphasized in the area near the islands, and there is a few information about the extension limit of the breeding ground. Some researchers suspect that humpback whales may migrate to further south of Ogasawara. Ohizumi(1992) suggested this suspect from analysis of adult calf ratio, group size composition, and water temperature in Ogasawara. Furthermore, there is a report

which recorded that the humpback whales migrated in Mariana islands before the exploitation by whaling (Townsend 1935).

Under these circumstances, this survey aimed at to get the information about the distribution of cetacean, mainly humpback whales, in the subtropical region of western North pacific.

Survey area

Humpback whales migrate to the tropical or subtropical waters in winter and carry out breeding activities. It was found out that humpback whales prefer the water whose surface temperature was about 25° C and the depth was shallower than 200m from the reports in the western South pacific, Hawaii and the Pacific mainland coast of Mexico (Dawbin 1966, Herman and Antinaja 1977, Urban and Aguayo 1987). In the further south of Ogasawara, wintering migration of humpback whales is confirmed as far as Iwoto island. Therefore, we laied more survey effort for the area south of Iwoto island which has the environmental preferences of humpback whale's reproductive activities mentioned above. In the western North pacific, the isotherm of 25° C is on the 20° latitudinal line in February and March. The survey area was set over the latitudinal line.

Method

Two survey modes was carried out to search whales from the upper bridge. One mode was the passing mode and the other was the closing mode. Under passing mode, we didn't close to the whale and kept normal searching effort, whereas under closing mode, we actively closed to the whale for species and school size confirmation. Survey was started from at 30 minutes after sunrise and ended at 30 minutes before sunset at local time. Sometimes survey effort was interrupted by bad weather conditions such as (1) wind speed of over 25kt (12.8m/s) or (2) visibility of less than 1.5nm at the minke visibility. These criteria were after IDCR (International Decade of Cetacean Research). We also carried out taking photographs for identification, and acoustic scanning of depth and food by using fishing sonar.

Sighting survey was carried out from 24 January 1993 to 7 February (Leg.1; Tokyo-Honolulu) and from 14 February to 28 February (Leg.2; Honolulu-Tokyo, Table 2, Fig.1). At each sampling station, St.1 to St.14, we did not search whales except where the vessel was running under seabeam survey of bathymetry.

Leg.1

On Leg.1, mainly the passing mode survey was conducted when the vessel was running between the stations. On 6 and 7 February, the closing mode was carried out around Hawaii.

Leg.2

On Leg.2, the passing mode was conducted from Honolulu to the point 18° 14'N, 150° 50'E, and the closing mode was adopted thereafter. From Pagan island (18° 00'N, 145° 45'E) to Agrihan island in Mariana islands (18° 40'N, 145° 40'E), and around Iwoto island (24° 45'N, 141° 40'E) was the area set for the survey of humpback whales. The closing mode was conducted in these areas.

Results

The survey of Leg.1 started on 24 January, but TD steaming (Topman Down, not effort) was dominant until 27 January because of strong winds caused by the north east moving low-pressure. The first sighting was made on 29 January when we reached the south as 21° 27'N. Weather and sea condition were very suitable since then, and we conducted sighting survey by the passing mode about 10 hours every day during cruising. Survey distance was 1662.1nm (including TD) on Leg.1, and 25 groups and 1173 animals were detected in total (Table 1).

Sighting survey on Leg.2 was started just after departure from Honolulu on 14 February, and cruised for Mariana islands via the course farther north than Leg.1. The weather was fine following Leg.1, and wind speed was always about 2 in beaufort scale. The passing mode was carried out until arrival at Pagan island in Mariana islands. In Leg.2, sighting survey covered more than 1390.5nm, and sightings were 26 groups and 621 animals were sighted in total (Table 1).

Confirmed species of the large cetacean were humpback whale, bride's whale and sperm whale. Around Hawaii, humpback whales and like spinner dolphins were confirmed and around 23° N; 173° W, striped dolphins, bride's whales, sperm whales and like common dolphins were confirmed. On 27 February, we search whales off the coast of 1.5 - 3 miles around Pagan and Agrihan island by closing mode but made no sightings. On 28 February, sighting survey in same way around Iwoto island made 6 groups and 10 animals sightings of humpback whales which included one calf and mother (Table 2, Fig.1).

On both Legs, most sightings were made in the east of 0° E. Especially, sperm whales were found around 170° W which included one calf and mother. Sperm whales founded in Leg.1 were groups consisted of some smaller groups. Bride's whales were founded on Leg.1, which followed near 18° N line, 5 groups and 5 animals. However, on Leg.2, which followed near 22° N, we found only one animal. Humpback whales were confirmed around Hawaii and one animal sighted at the point distant from Hawaii (19° 23'N, 168° 39'W). No sightings were made in Mariana islands, but many sightings including a calf were made around Iwoto island. Though the survey effort around Mariana islands was not sufficient in this survey, possibly Iwoto island is the southernmost region for wintering migration of humpback whales.

We tried to get information on photo identification of humpback whales but had no good chance to take photos.

This survey was mainly conducted by the passing mode and confirmation of species was some times difficult. However, almost all large whales were able to be confirmed. This suggests that sighting survey for large cetacean can be conducted by using vessel which is not exclusive for sighting, like IDCR cruise, when experienced researchers are available. Since the information of whale distribution in winter subtropical area is rare, if cargo vessels are available for sighting survey as the research of distribution of shearwater in the North pacific (Kuroda 1991), they can be valuable data resource. The research vessel Hakuohomaru has sufficient mobility for successful close to whales. Furthermore, this vessel can investigate distribution of plankton. It can be unique if surveys of sighting whales and gathering plankton are carried out concurrently in the feeding ground of baleen.

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Table 1 Results of sighting

Species	Leg 1		Leg 2		Total	
	Number of groups	Number of animals	Number of groups	Number of animals	Number of groups	Number of animals
Humpback whale	2	3	8	12	10	15
Bride's whale	5	5	1	1	6	6
Sperm whale	3	8	2	4	5	12
Striped dolphin	0	0	2	210	2	210
Like spinner dolphin	0	0	1	2	1	2
Like common dolphin	0	0	1	6	1	6
Unidentified baleen	0	0	2	2	2	2
Unidentified toothed whale	0	0	2	6	2	6
Ziphiid sp	1	2	1	1	2	3
Unidentified dolphin	10	1151	5	376	15	1527
Unidentified whale	4	4	1	1	5	5

Table 2 - a Sighting record and cruising distance (Leg1)

Date	Noon position		Cruising distance (nm)	Species and number of groups and animals
1/24/93	31- 54 N	149- 15 E	130.7	0
1/25/93	31- 28 N	150- 58 E	47.6	0
1/26/93	29- 06 N	156- 25 E	147.1	0
1/27/93	26- 46 N	161- 36 E	140.5	0
1/28/93	24- 03 N	165- 31 E	25.7	0
1/29/93	20- 30 N	169- 28 E	123.0	UD2/700, BW2/2, ZI1/2, UW1/1
1/30/93	18- 29 N	170- 36 E	162.1	0
1/31/93	18- 16 N	171- 22 E	54.0	UD1/150
2/1/93	18- 36 N	176- 50 E	157.3	UW1/1, BW1/1
2/1/93*	18- 32 N	176- 41 W	157.5	UD3/170, UW1/1
2/2/93	18- 10 N	174- 59 W	100.1	BW2/2, UD1/80
2/3/93	18- 41 N	171- 53 W	80.6	UD1/40, UW1/1
2/4/93	19- 28 N	168- 54 W	114.4	UD1/10
2/5/93	19- 23 N	168- 39 W	83.5	HW1/1, SW3/8
2/6/93	20- 02 N	163- 56 W	0.0	0
2/7/93	20- 58 N	159- 10 W	138.1	UD1/1, HW1/2

Table 2 - b Sighting record and cruising distance (Leg2)

Date	Noon position		Cruising distance (nm)	Species and number of groups and animals
2/14/93	21- 18 N	157- 52 W	43.5	HW2/2, LS1/2, UB1/1, UW1/1, UT1/5
2/15/93	21- 09 N	163- 47 W	170.9	SD1/60, UT1/1, UD1/6
2/16/93	21- 05 N	170- 28 W	168.0	UB1/1, BW1/1, SW1/3, LC1/6
2/17/93	21- 01 N	177- 23 W	174.3	UD1/70
2/18/93	21- 11 N	179- 56 W	0.0	0
2/19/93	21- 11 N	179- 56 W	0.0	0
2/21/93	20- 55 N	175- 52 E	175.5	ZI1/1
2/22/93	20- 36 N	169- 02 E	181.0	SW1/1
2/23/93	20- 20 N	163- 00 E	120.0	0
2/24/93	20- 28 N	163- 28 E	0.0	0
2/25/93	18- 59 N	156- 56 E	181.3	UD1/300
2/26/93	18- 13 N	150- 21 E	176.0	SD1/150
2/27/93	18- 48 N	145- 34 E	**	0
2/28/93	24- 10 N	141- 51 E	**	HW6/10, UD2/21

*Date change

**Around island

BW: Bride's whale

LS: Like spinner dolphin

UT: Unidentified toothed whale

HW: Humpback whale

LC: Like common dolphin

UD: Unidentified dolphin

SW: Sperm whale

ZI: Ziphiid Sp.

UW: Unidentified whale

SD: Striped dolphin

UB: Unidentified baleen

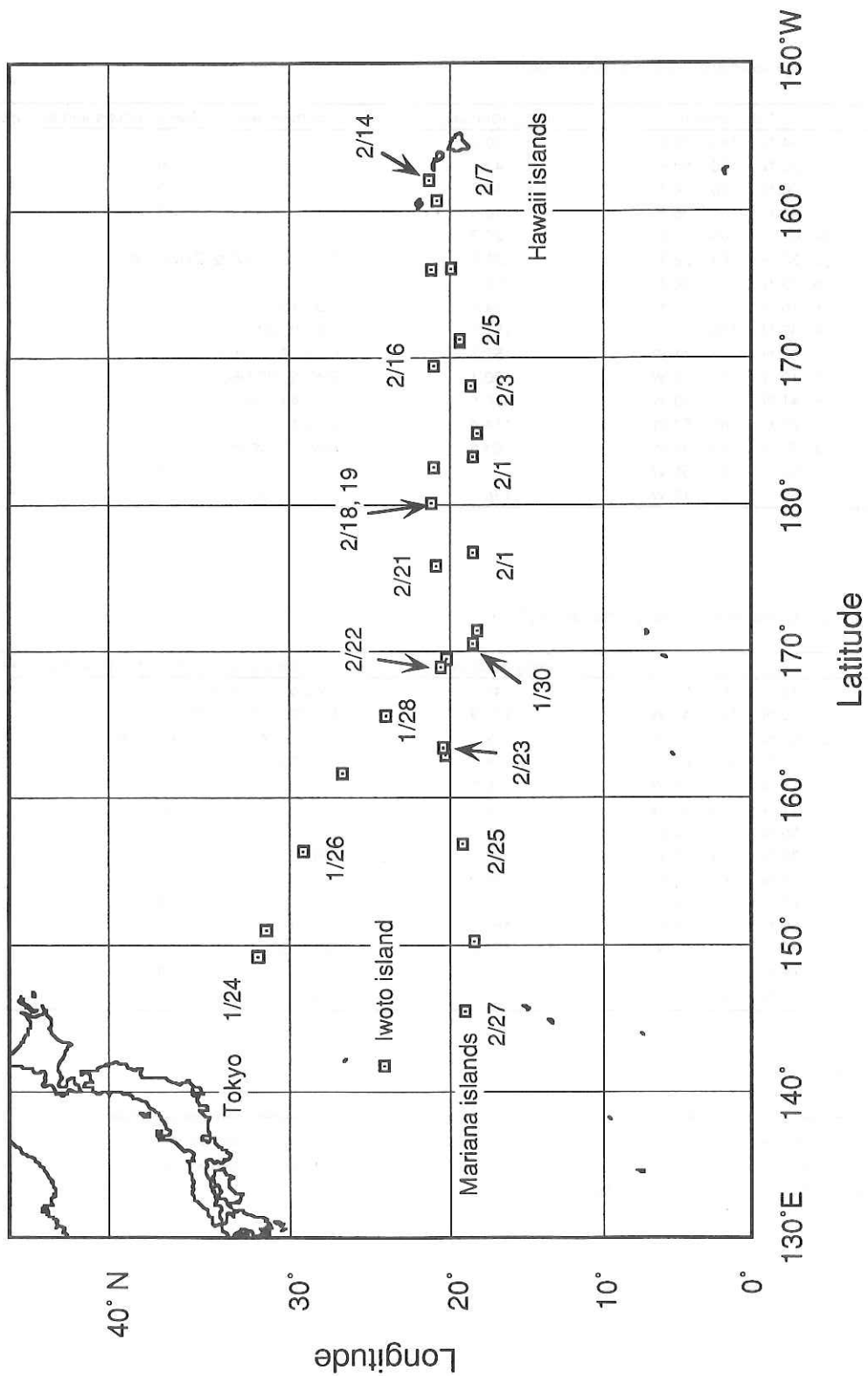
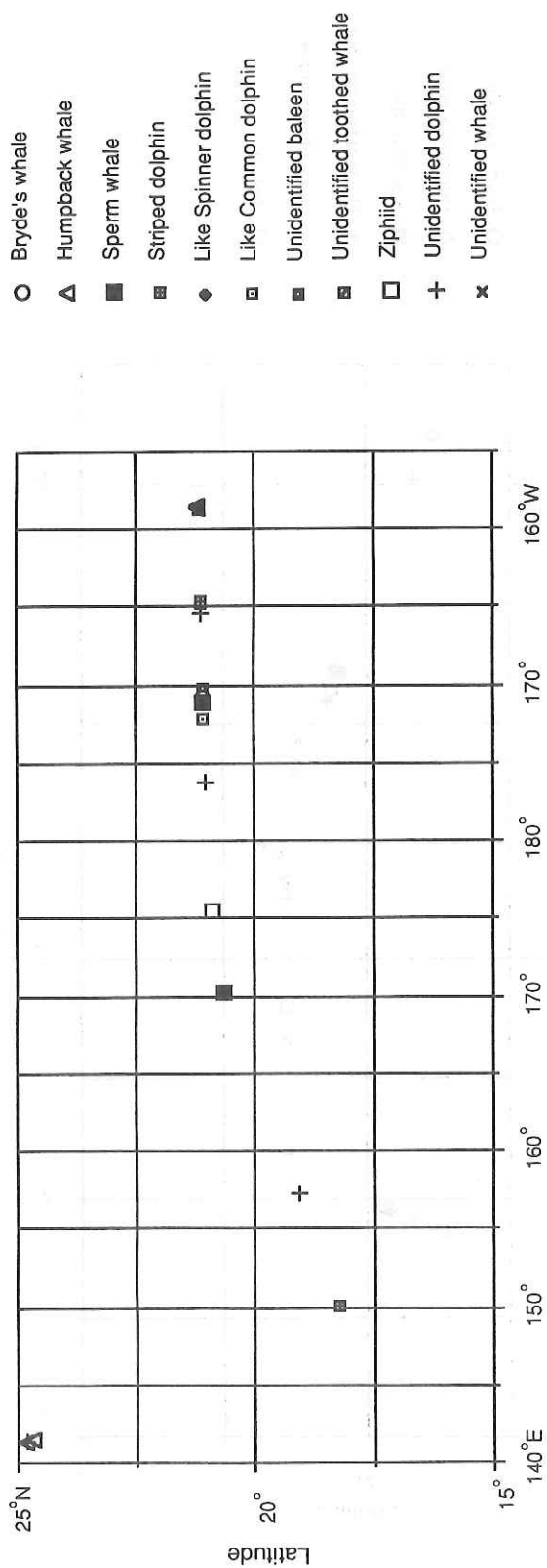


Fig. 1 Noon positions



Bathymetric and Magnetic Survey on an Unnamed Seamount

Desiderius C. P. Masalu

We conducted systematic bathymetric survey and total force measurement on an Unnamed seamount located $20^{\circ} 20'N$; $163^{\circ} 05'E$ in the northwestern Pacific ocean. We mapped the bathymetry of this seamount using the SeaBeam system installed in the R/V Hakuho-Marui (Fujimoto *et al.*, 1990). In this report we present the bathymetric and magnetic anomalies data obtained from this seamount.

Bathymetric mapping

The unnamed seamount we surveyed has two major peaks (Fig. 1), one on the east and another on the west. Also it has two small peaks on the southeast of the eastern peak. The western peak is oriented along northeast direction with a crestal depth ranging from 1200 m to 1400 m. The depth of the northwestern flank of this seamount is 4900 m. The southeastern flank of this seamount is 4300 m deep. The eastern peak has a crestal depth ranging from 1300 m to 1400m. The flank of this seamount on the northern and eastern sides is between 5000 m and 5300 m deep. On the southeast of this peak are located two small peaks both having crestal depths of 1400 m. The two small peaks lie on a line striking along east-northeast. The bathymetry on all four peaks reveal a feature of a flat top on the basis of which this seamount is categorised as a guyot. This geomorphic feature of a flat topped seamount suggests that some time ago the crest of this seamount was exposed above or was very near the sea surface.

Geomagnetic total force measurement

Along with the SeaBeam survey we also measured the geomagnetic total force over the unnamed seamount. We computed magnetic anomalies over this seamount from the geomagnetic total force we measured with reference to the IGRF 1990 (International Geomagnetic Reference Field, Langel, 1992). We present these anomalies in a contour map form in figure 2. Obtained magnetic anomalies are mainly located above the eastern main body of this seamount which includes the major eastern peak and the two small southeastern peaks. Positive anomalies ranging to about 300 nT and 200 nT are respectively located on the north and south of the negative anomalies that lies directly above the eastern main body of this seamount (Fig. 2). This pattern of distribution of magnetic anomalies suggests that this seamount is probably magnetized in both normal and reverse polarities or even multi-polarity magnetization. The centrally located negative

anomalies display a complex pattern. This may be due to the morphology or complex magnetization structure of the seamount itself.

The magnetization structure of this seamount will be known after we have applied the seamount paleomagnetism technique on the bathymetric and magnetic data we obtained from this seamount. We hope that results from the seamount paleomagnetism technique will contribute to our knowledge of the tectonics of the Pacific plate.

References

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FIGURE CAPTIONS

FIGURE 1.

Bathymetry of the Unnamed seamount based on data obtained from this seamount in Leg 2 of this cruise. Contour interval is 100 m.

FIGURE 2.

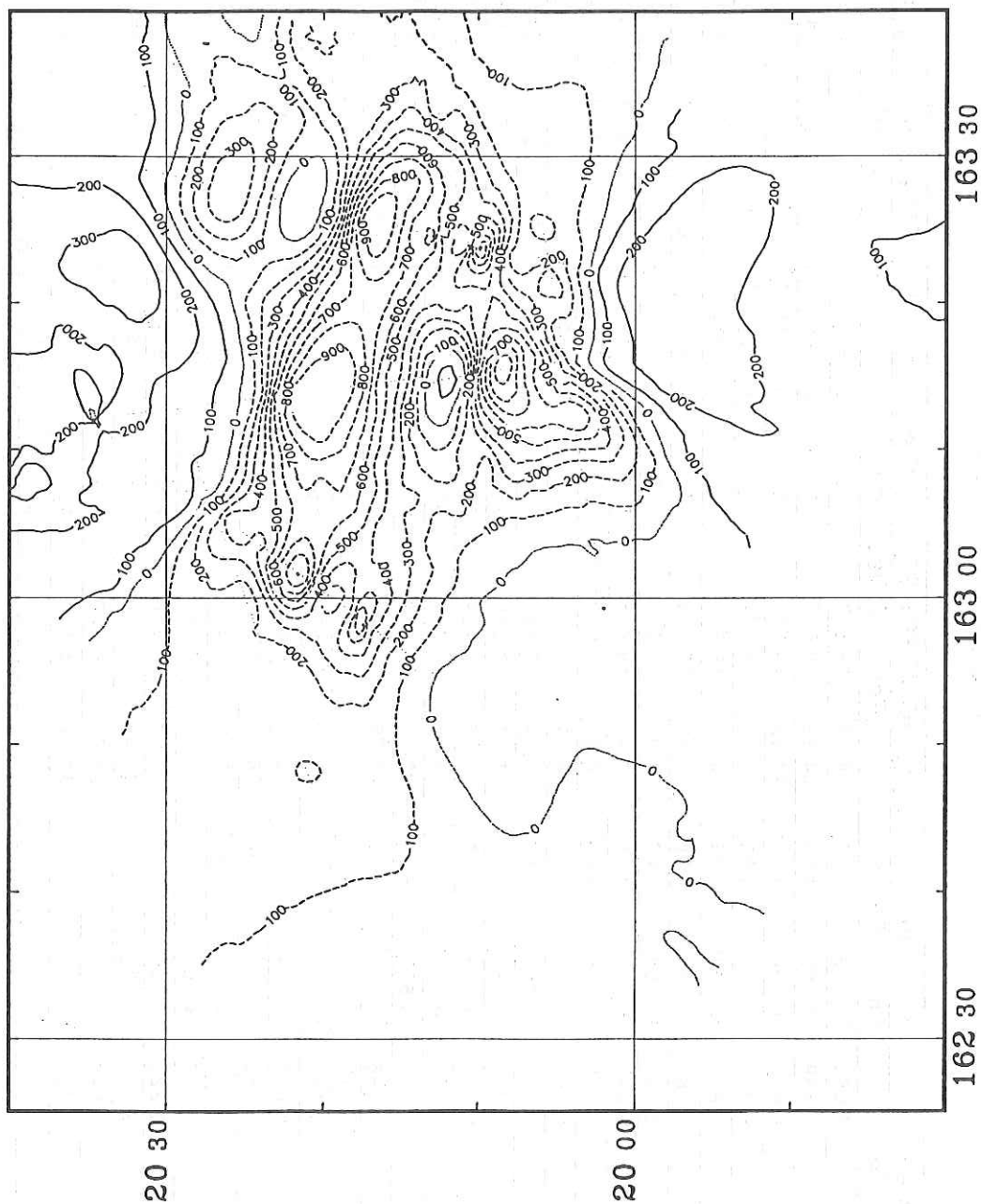
Magnetic anomalies over the Unnamed seamount based on data collected on this seamount during Leg 2 of this cruise. Contour interval is 100 nT. Negative anomalies are shown by dashed contours, positive anomalies by solid contours and zero anomalies by dotted contours. Fine dots along lines are data points along the ship's track during the survey on this seamount.



20 30

20 00

Magnetic anomaly over the Unnamed seamount



CTD DATA ST.2 ST4

ST.2	Depth 5777	Lat.24°00.35'N	Long.165°29.80'E	ST.4	Depth 5912	Lat.27°30.00'N	Long.150°00.00'E
Depth db	Temp °C	Sal.	O2 ml/l	Pot. T. °C	Temp °C	Sal.	σt
0	18.669	34.753	4.05	18.667	0	34.223	3.99
10	18.669	34.753	4.05	18.667	10	35.223	3.99
20	18.675	34.754	4.07	18.672	20	35.223	3.98
30	18.677	34.754	4.08	18.672	30	35.223	3.98
50	18.679	34.754	4.06	18.671	50	35.223	3.92
75	18.684	34.754	3.96	18.671	75	35.222	3.84
100	18.689	34.754	3.90	18.671	100	35.151	3.81
125	18.693	34.754	3.90	18.671	125	34.928	3.77
150	18.698	34.754	3.86	18.672	150	34.852	3.73
175	18.701	34.755	3.87	18.670	175	34.822	3.74
200	17.893	34.798	3.62	17.859	200	34.773	3.77
250	17.331	34.784	3.63	17.289	250	34.732	3.79
300	16.978	34.775	3.65	16.929	300	34.664	3.75
350	16.440	34.736	3.57	16.384	350	34.584	3.68
400	15.705	34.678	3.49	15.642	400	34.480	3.66
450	14.496	34.582	3.36	14.429	450	34.394	3.64
500	13.419	34.513	3.24	13.349	500	34.280	3.63
550	11.993	34.418	3.19	11.921	550	34.179	3.52
600	10.694	34.334	3.10	10.621	600	34.099	3.40
650	9.252	34.246	2.98	9.179	650	34.063	3.08
700	7.505	34.119	2.92	7.435	700	34.034	2.74
750	6.357	34.066	2.78	6.288	750	34.050	2.33
800	5.323	34.025	2.58	5.256	800	34.086	1.90
850	5.079	34.062	2.21	5.010	850	34.138	1.43
900	4.598	34.096	1.79	4.527	900	34.185	1.12
1000	4.203	34.185	1.17	4.126	950	34.237	0.84
					1000	34.281	0.63

*The amounts of dissolved oxygen were crude values.

CTD DATA ST.3

ST.3	Depth 5777				Lat.24°00.35'N				Long.165°29.80'E				ST.3				Depth 5777				Lat.24°00.35'N				Long.165°29.80'E																			
Depth db	Temp.				Sal.				O2 ml/l				σ _t				Pot. T.°C				Depth db				Temp.				Sal.				O2 ml/l				σ _t				Pot. T.°C			
0	18.933				34.763				-				-				-				1200				3.394				34.346				0.57				27.33				3.308			
10	18.931				34.763				4.57				24.86				18.930				1250				3.252				34.373				0.56				27.36				3.163			
20	18.927				34.763				4.55				24.86				18.924				1300				3.122				34.393				0.52				27.39				3.029			
30	18.929				34.763				4.56				24.86				18.924				1400				2.853				34.434				0.46				27.45				2.755			
50	18.928				34.762				4.37				24.86				18.919				1500				2.686				34.460				0.43				27.48				2.582			
75	18.894				34.761				4.22				24.87				18.880				1600				2.554				34.484				0.44				27.51				2.443			
100	18.861				34.761				4.14				24.88				18.844				1700				2.363				34.519				0.49				27.56				2.247			
125	18.785				34.757				4.09				24.89				18.763				1750				2.296				34.530				0.55				27.57				2.176			
150	18.404				34.795				3.80				25.02				18.377				1800				2.225				34.544				0.59				27.59				2.102			
175	18.136				34.801				3.73				25.09				18.106				1900				2.126				34.562				0.67				27.61				1.996			
200	17.759				34.795				3.73				25.18				17.725				2000				2.040				34.580				0.80				27.63				1.903			
250	17.201				34.778				3.73				25.30				17.159				2100				1.955				34.594				0.90				27.65				1.811			
300	16.861				34.769				3.82				25.37				16.812				2200				1.865				34.609				1.05				27.67				1.714			
350	16.353				34.729				3.70				25.46				16.297				2300				1.811				34.618				1.17				27.68				1.652			
400	15.681				34.672				3.53				25.57				15.618				2400				1.754				34.628				1.30				27.69				1.588			
450	14.294				34.574				3.40				25.80				14.228				2500				1.712				34.635				1.40				27.70				1.537			
500	12.885				34.478				3.35				26.01				12.816				2600				1.671				34.643				1.52				27.71				1.487			
550	11.452				34.380				3.27				26.21				11.382				2700				1.634				34.649				1.62				27.72				1.443			
600	9.927				34.267				3.26				26.39				9.857				2800				1.606				34.654				1.69				27.72				1.405			
650	8.544				34.155				3.31				26.53				8.475				3000				1.548				34.663				1.83				27.74				1.330			
700	7.150				34.075				3.17				26.67				7.082				3200				1.520				34.668				1.93				27.74				1.283			
750	6.042				34.029				2.91				26.78				5.975				3400				1.503				34.673				2.00				27.75				1.247			
800	5.355				34.037				2.55				26.87				5.288				3500				1.490				34.675				2.04				27.75				1.224			
850	4.947				34.069				2.14				26.94				4.878				3600				1.474				34.678				2.09				27.75				1.198			
900	4.580				34.097				1.76				27.01				4.509				3800				1.461				34.681				2.14				27.76				1.165			
1000	4.138				34.207				1.10				27.14				4.062				4000				1.453				34.684				2.20				27.76				1.135			
1100	3.699				34.291				0.73				27.25				3.618				4011				1.452				34.684				2.20				27.76				1.133			

CTD DATA ST.5

ST.5	Depth db	Depth 5777	Lat.24°00.35'N	Long.165°29.80'E	ST.5	Depth db	Depth 5777	Lat.24°00.35'N	Long.165°29.80'E	σt	Pot. T.°C
	0	23.785	-	-	-	1100	3.383	34.444	0.46	27.41	3.304
	10	23.723	-	-	-	1200	3.224	34.484	0.63	27.45	3.139
	20	23.730	35.206	3.84	23.726	1250	3.129	34.503	0.74	27.48	3.040
	30	23.243	35.247	3.92	23.237	1300	2.977	34.517	0.80	27.50	2.886
	50	22.945	35.267	3.94	24.15	1400	2.778	34.539	0.96	27.54	2.681
	75	22.838	35.272	3.88	24.19	1500	2.574	34.555	1.01	27.57	2.471
	100	21.967	35.209	3.89	24.39	1600	2.379	34.574	1.14	27.60	2.270
	125	19.022	34.975	3.91	25.00	1700	2.252	34.590	1.26	27.62	2.137
	150	17.904	34.863	3.87	25.19	1750	2.212	34.594	1.28	27.63	2.093
	175	17.285	34.813	3.90	25.30	1800	2.173	34.599	1.32	27.64	2.050
	200	16.782	34.768	3.91	25.39	1900	2.074	34.609	1.38	27.65	1.945
	250	16.152	34.728	3.98	25.50	2000	1.994	34.618	1.44	27.67	1.858
	300	15.227	34.636	3.85	25.64	2100	1.933	34.625	1.51	27.68	1.789
	350	13.452	34.485	3.77	25.90	2200	1.857	34.632	1.58	27.69	1.706
	400	12.029	34.373	3.75	26.10	2300	1.811	34.639	1.63	27.70	1.652
	450	10.459	34.259	3.72	26.30	2400	1.763	34.645	1.68	27.71	1.596
	500	9.125	34.163	3.47	26.44	2500	1.727	34.649	1.73	27.71	1.551
	550	7.867	34.090	3.13	26.58	2600	1.699	34.652	1.76	27.72	1.515
	600	6.931	34.066	2.66	26.69	2700	1.670	34.656	1.79	27.72	1.478
	650	6.167	34.065	2.16	26.79	2800	1.637	34.659	1.84	27.73	1.436
	700	5.520	34.092	1.70	26.89	3000	1.599	34.665	1.91	27.73	1.380
	750	5.121	34.133	1.23	26.97	3200	1.567	34.669	1.97	27.74	1.330
	800	4.676	34.185	0.86	27.07	3400	1.546	34.672	2.01	27.74	1.289
	850	4.348	34.238	0.61	27.14	3600	1.518	34.676	2.07	27.75	1.241
	900	4.135	34.282	0.47	27.20	3800	1.506	34.679	2.13	27.75	1.209
	1000	3.748	34.375	0.38	27.31	4000	1.488	34.682	2.19	27.76	1.169

CTD DATA ST.8

ST.8	Depth 3000	Lat.18°11.69'N	Long. 175°20.50'E	ST.8	Depth 1773	Lat.18°11.69'N	Long.175°20.50'E
Depth db	Temp °C	Sal.	O2 ml/l	Depth db	Temp.	Sal.	O2 ml/l
0	25.022	34.927	3.95	850	4.928	34.478	0.55
10	25.018	34.823	3.90	900	4.731	34.492	0.58
20	24.997	34.825	3.86	950	4.504	34.504	0.62
30	24.911	34.830	3.84	1000	4.305	34.514	0.66
40	24.862	34.844	3.77	1050	4.099	34.523	0.71
50	24.682	34.906	3.75	1100	3.947	34.530	0.73
60	24.537	34.960	3.69	1150	3.838	34.536	0.75
70	24.469	34.972	3.64	1200	3.626	34.545	0.80
80	24.448	34.982	3.60	1250	3.453	34.552	0.89
90	24.099	35.065	3.55	1300	3.382	34.555	0.91
100	23.690	35.122	3.53	1350	3.308	34.558	0.93
125	22.315	35.070	3.41	1400	3.207	34.563	0.97
150	21.333	35.097	3.32	1450	3.068	34.570	1.01
175	19.521	34.957	3.21	1500	2.983	34.573	1.04
200	17.956	34.924	3.37	1550	2.918	34.577	1.07
250	14.951	34.586	3.37	1600	2.786	34.583	1.12
300	12.759	34.381	3.44	1650	2.627	34.592	1.19
350	11.435	34.281	3.55	1700	2.539	34.597	1.23
400	9.406	34.170	3.21	1750	2.458	34.602	1.27
450	8.289	34.203	2.08				
500	7.567	34.217	1.58				
550	6.883	34.255	1.09				
600	6.216	34.330	0.71				
650	5.832	34.373	0.53				
700	5.575	34.410	0.49				
750	5.396	34.435	0.49				
800	5.179	34.457	0.52				

CTD DATA ST.9

ST.9	Depth 3167	Lat.18°50.10'N	Long. 176°59.88'E	ST.9	Depth 3167	Lat.18°50.10'N	Long. 176°59.88'E
Depth db	Temp °C	Sal.	O2 ml/l	Pot. T.°C	Temp.	Sal.	Pot. T.°C
0	25.111	34.926	3.70	23.25	900	34.493	27.306
10	24.998	34.527	3.61	22.99	950	34.503	27.337
20	24.993	34.523	3.64	22.99	1000	34.515	27.369
30	24.992	34.524	3.65	22.99	1050	34.519	27.382
40	24.997	34.531	3.66	22.99	1100	34.526	27.403
50	25.041	34.683	3.64	23.09	1150	34.531	27.421
60	24.866	34.794	3.65	23.23	1200	34.538	27.443
70	24.513	34.823	3.67	23.36	1250	34.545	27.462
80	24.181	34.856	3.68	23.48	1300	34.550	27.477
90	23.254	34.860	3.68	23.76	1350	34.555	27.492
100	22.670	34.857	3.68	23.92	1400	34.562	27.511
125	22.288	35.112	3.47	24.22	1450	34.568	27.531
150	21.107	35.106	3.34	24.55	1500	34.574	27.546
175	19.466	35.016	3.29	24.92	1550	34.579	27.561
200	17.865	34.766	3.14	25.13	1600	34.592	27.592
250	13.954	34.434	2.82	25.76	1700	34.600	27.611
300	11.829	34.288	2.91	26.07	1750	34.602	27.616
350	10.117	34.200	2.93	26.31	1800	34.607	27.627
400	8.551	34.176	2.50	26.54	1850	34.613	27.640
450	7.653	34.186	1.92	26.69	1900	34.619	27.649
500	7.125	34.234	1.35	26.80	1950	34.623	27.657
600	6.139	34.320	0.69	27.00	2000	34.625	27.663
650	5.767	34.381	0.54	27.09			
700	5.435	34.423	0.51	27.17			
750	5.330	34.433	0.50	27.19			
800	5.038	34.458	0.54	27.24			
850	4.927	34.475	0.56	27.27			

CTD DATA ST.7 ST.11

ST.7	Depth 1306		Lat.18°16.51'N		Long.171°21.18'E		ST.11	Depth 5140		Lat.20°02.48'N		Long.163°54.75'W	
Depth db	Temp °C	Sal.	O2 ml/l	σt	Pot. T.°C	Depth db	Temp °C	Sal.	O2 ml/l	σt	Pot. T.°C		
0	25.129	34.916	3.82	23.240	25.128	0	24.275	34.882	3.97	23.472	24.274		
10	25.127	34.933	3.82	23.254	25.124	10	24.268	34.881	3.96	23.473	24.266		
50	25.159	34.996	3.72	23.291	25.148	20	24.254	34.880	3.94	23.477	24.250		
75	25.132	35.006	3.63	23.307	25.116	30	24.248	34.880	3.88	23.478	24.242		
100	25.010	35.034	3.59	23.366	24.988	40	24.249	34.881	3.78	23.479	24.240		
125	24.763	35.110	3.56	23.498	24.736	50	24.250	34.881	3.72	23.479	24.239		
175	22.721	35.281	3.47	24.228	22.686	60	24.250	34.886	3.67	23.482	24.238		
200	21.532	35.299	3.44	24.577	21.493	70	24.221	34.898	3.61	23.501	24.206		
300	15.094	34.614	3.61	25.654	15.048	80	24.014	34.983	3.56	23.626	23.997		
350	12.155	34.345	3.53	26.051	12.109	90	23.513	35.045	3.62	23.820	23.494		
450	8.447	34.211	2.25	26.587	8.400	100	23.371	35.088	3.62	23.894	23.351		
500	7.745	34.257	1.59	26.728	7.695	125	23.090	35.118	3.62	23.999	23.065		
550	7.189	34.247	1.32	26.800	7.136	150	22.189	35.167	3.47	24.293	22.159		
600	6.577	34.223	1.14	26.864	6.522	175	20.938	35.147	3.41	24.624	20.905		
650	6.088	34.275	0.90	26.970	6.030	200	19.480	35.066	3.34	24.950	19.443		
700	5.777	34.331	0.75	27.052	5.716	250	15.961	34.691	3.36	25.520	15.922		
800	5.141	34.424	0.81	27.202	5.075	300	12.672	34.346	3.32	25.952	12.631		
850	4.984	34.449	0.87	27.240	4.915	350	10.545	34.198	3.44	26.232	10.503		
900	4.772	34.472	0.93	27.283	4.699	400	9.096	34.137	3.21	26.427	9.053		
950	4.533	34.497	0.98	27.329	4.458	450	7.915	34.122	2.63	26.597	7.870		
1000	4.327	34.510	1.01	27.362	4.249	500	6.589	34.129	1.94	26.789	6.544		
1100	4.074	34.523	1.02	27.399	3.989	600	5.754	34.251	0.94	26.992	5.702		
1200	3.575	34.544	1.06	27.467	3.486	700	5.220	34.354	0.59	27.138	5.162		
1250	3.399	34.551	1.08	27.490	3.307	750	5.063	34.401	0.55	27.193	5.002		
						800	4.878	34.437	0.56	27.243	4.814		
						900	4.567	34.476	0.59	27.308	4.496		
						1000	4.200	34.506	0.66	27.372	4.122		

CTD DATA ST.13.ST.13-2

ST.13	Depth db	Depth 4811 Temp °C	Lat.20°59.92'N	Long.179°54.76'W	ST.13-2	Depth db	Depth 4918 Temp °C	Lat.20°58.57'N	Long.179°50.97'W
			Sal.	σ _t Pot. T. °C			Sal.	O ₂ ml/l	σ _t Pot. T. °C
	0	24.039	34.984	3.86	23.620	24.038	33.413	3.21	22.289
	10	24.044	34.986	3.82	23.619	24.042	35.019	3.86	23.640
	20	24.009	35.027	3.80	23.661	24.005	35.057	3.83	23.729
	30	23.798	35.156	3.80	23.821	23.792	35.164	3.84	23.857
	40	23.635	35.191	3.71	23.895	23.627	35.213	3.82	23.927
	50	23.527	35.210	3.69	23.941	23.517	35.241	3.80	23.981
	60	23.428	35.240	3.61	23.993	23.416	35.265	3.74	24.035
	70	23.339	35.262	3.58	24.036	23.324	35.274	3.69	24.059
	80	23.240	35.278	3.55	24.077	23.224	35.285	3.66	24.100
	90	23.118	35.281	3.55	24.114	23.099	35.287	3.60	24.140
	100	22.912	35.281	3.51	24.174	22.892	35.285	3.58	24.168
	125	22.000	35.239	3.46	24.401	21.976	35.235	3.49	24.388
	150	19.963	35.112	3.44	24.858	19.936	35.104	3.44	24.872
	175	19.109	35.044	3.37	25.028	19.078	34.962	3.43	25.185
	200	17.845	34.919	3.41	25.249	17.811	34.833	3.48	25.369
	250	15.720	34.683	3.53	25.569	15.681	34.655	3.54	25.591
	300	13.983	34.509	3.51	25.812	13.940	34.444	3.53	25.906
	350	12.422	34.373	3.56	26.022	12.375	34.321	3.48	26.087
	400	10.437	34.228	3.45	26.274	10.390	34.201	3.35	26.309
	450	8.661	34.139	3.03	26.498	8.613	34.143	3.07	26.440
	500	7.765	34.125	2.63	26.621	7.715	34.113	2.57	26.610
	600	5.858	34.203	1.44	26.941	5.806	34.241	0.93	27.001
	700	5.313	34.322	0.79	27.101	5.254	34.299	0.67	27.072
	750	4.946	34.368	0.70	27.181	4.886	34.354	0.58	27.142
	800	4.823	34.389	0.66	27.212	4.759	34.415	0.61	27.224
	900	4.529	34.447	0.69	27.290	4.458	34.475	0.72	27.322
	1000	4.191	34.491	0.75	27.362	4.114	34.495	0.76	27.368

CTD DATA ST.13-3.ST.14

ST.13-3	Depth 4673	Lat.21°00.77'N	Long. 179°56.23'W	ST.14	Depth 2273	Lat.20°13.18'N	Long. 163°13.79'E
Depth db	Temp °C	Sal.	Pot. T.°C	Depth db	Temp °C	Sal.	Pot. T.°C
0	24.091	33.670	24.090	0	25.300	-	-
10	24.026	35.078	24.024	2	-	3.09	24.914
20	23.900	35.091	23.896	10	24.706	3.73	23.565
30	23.897	35.104	23.891	20	24.663	3.71	23.576
40	23.732	35.206	23.878	30	24.652	3.71	23.580
50	23.623	35.251	23.845	40	24.648	3.65	23.581
60	23.512	35.247	23.802	50	24.646	3.59	23.581
70	23.355	35.260	23.777	60	24.646	3.56	23.582
80	23.234	35.258	23.733	70	24.643	3.52	23.583
90	23.120	35.283	23.699	80	24.569	3.48	23.611
100	22.846	35.276	23.666	90	24.470	3.48	23.645
125	21.763	35.228	21.738	100	24.336	3.46	23.687
150	19.402	35.068	19.375	125	23.645	3.47	23.905
175	18.077	34.945	18.047	150	22.660	3.47	24.178
200	17.759	34.907	17.725	175	20.970	3.40	24.614
250	15.955	34.706	15.916	200	19.582	3.39	24.901
300	14.049	34.512	14.006	250	16.793	3.50	25.395
350	11.831	34.326	11.786	408	12.280	3.36	25.390
400	10.052	34.198	10.005				
450	8.849	34.143	8.800				
500	7.791	34.123	7.741				
600	6.356	34.154	6.302				
700	5.474	34.285	5.415				
750	5.193	34.352	5.131				
800	4.883	34.395	4.819				
900	4.612	34.432	4.540				
1000	4.197	34.491	4.120				

Rosset Data ST.5

KH-93-01		Lat. 30° 50.00'S	Long. 176° 27.75'E		Depth	6073 m		
Sample	SD.Depth	Depth db	Temp °C	Sal.(CTD)	Sal.	O2 ml/l	Chl.a (ug/l)	Phae.(ug/l)
0	0	-	-	-	35.203	4.88	0.20	0.08
24	25	-	-	-	34.724	4.43	0.33	0.13
23	50	49	22.826	35.262	34.724	4.82	1.34	0.13
22	75	73	21.604	35.035	34.722	4.95	0.34	0.13
21	100	99	20.668	35.093	34.722	4.85	0.32	0.13
20	125	124	18.867	34.943	34.725	4.96	0.34	0.13
19	150	150	17.575	34.834	34.734	4.97	0.36	0.16
18	175	174	16.892	34.772	34.894	4.95	0.19	0.29
17	200	200	16.623	34.754	34.941	4.79	0.16	0.34
16	300	300	15.112	34.621	34.942	4.88		
15	400	399	12.210	34.389	34.949	4.84		
14	500	501	9.456	34.184	34.931	4.86		
13	600	599	6.904	34.064	34.820	4.79		
12	700	700	5.336	34.104	34.225	4.55		
11	800	800	4.594	34.197	34.195	1.23		
10	1000	1000	3.700	34.381	34.373	0.87		
9	1250	1294	3.079	34.506	34.494	1.32		
8	1500	1499	2.560	34.555	34.533	1.68		
7	1750	1751	2.204	34.595	34.587	2.13		
6	2000	2000	1.987	34.619	34.612	2.33		
5	2500	2500	1.721	34.649	34.642	2.70		
4	3000	3000	1.600	34.665	34.656	3.02		
3	3500	3501	1.528	34.675	34.665	3.22		
2	4000	4012	1.487	34.682	34.672	3.50		
1	4000	4013	1.487	34.682	34.667	2.09		

Rosset Data ST.7

KH-93-01		Lat. 30°50.00'S		Long. 176°27.75'E			Depth	1294 m
Sample	SD.Depth	Depth db	Temp °C	Sal.(CTD)	Sal.	O2 ml/l	Chl.a(ug/l)	Feae.(ug/l)
0	0	1	25.085	34.962	34.9755	4.74	0.05	0.02
24	25	26	25.085	34.961	34.9635	4.76	0.05	0.01
23	40	40	25.093	34.964	34.9655	4.71	0.05	0.02
22	50	50	25.154	35.002	35.0045	4.73	0.06	0.03
21	60	60	25.153	35.007	34.9944	4.80	0.19	0.08
20	70	70	25.146	35.013	35.0126	4.75	0.24	0.12
19	75	74	25.137	35.017	34.9903	4.73	0.24	0.12
18	80	79	25.12	35.021	35.0221	4.75	0.29	0.13
17	90	90	25.046	35.026	35.0221	4.71	0.38	0.14
16	100	100	24.996	35.044	35.0432	4.76	0.39	0.17
15	125	124	24.602	35.127	35.1291	4.79	0.46	0.21
14	150	148	24.318	35.21	35.2013	4.75	0.19	0.16
13	175	176	22.472	35.344	35.3473	4.44	0.25	0.70
12	200	200	20.922	35.224	35.212	4.39	0.04	0.08
11	250	251	17.975	34.925	34.925	4.49		
10	300	300	14.915	34.585	34.5846	4.42		
9	400	401	10.054	34.206	34.2408	3.69		
8	500	500	7.897	34.251	34.2489	1.88		
7	600	599	6.265	34.275	34.2711	1.20		
6	700	703	5.749	34.352	34.3797	1.29		
5	800	801	5.234	34.402	34.4034	1.27		
4	1000	1000	4.475	34.499	34.4961	1.58		
3	1250	1247	3.41	34.55	34.5473	1.75		
2	1294	1290	3.334	34.555	34.5499	1.80		
1	1294	1291	3.334	34.555				

Rosset Data ST.8

KH-93-01		Lat. 30°50.00'S		Long. 176°27.75'E			Depth	6073 m
Sample	SD.Depth	Depth db	Temp °C	Sal.(CTD)	Sal.	O2 ml/l	Chl.a (ug/l)	Phae.(ug/l)
0	0	-	-	-	35.203	4.88	0.20	0.08
24	25	-	-	-	34.724	4.43	0.33	0.13
23	50	49	22.826	35.262	34.724	4.82	1.34	0.13
22	75	73	21.604	35.035	34.722	4.95	0.34	0.13
21	100	99	20.668	35.093	34.722	4.85	0.32	0.13
20	125	124	18.867	34.943	34.725	4.96	0.34	0.13
19	150	150	17.575	34.834	34.734	4.97	0.36	0.16
18	175	174	16.892	34.772	34.894	4.95	0.19	0.29
17	200	200	16.623	34.754	34.941	4.79	0.16	0.34
16	300	300	15.112	34.621	34.942	4.88		
15	400	399	12.210	34.389	34.949	4.84		
14	500	501	9.456	34.184	34.931	4.86		
13	600	599	6.904	34.064	34.820	4.79		
12	700	700	5.336	34.104	34.225	4.55		
11	800	800	4.594	34.197	34.195	1.23		
10	1000	1000	3.700	34.381	34.373	0.87		
9	1250	1294	3.079	34.506	34.494	1.32		
8	1500	1499	2.560	34.555	34.533	1.68		
7	1750	1751	2.204	34.595	34.587	2.13		
6	2000	2000	1.987	34.619	34.612	2.33		
5	2500	2500	1.721	34.649	34.642	2.70		
4	3000	3000	1.600	34.665	34.656	3.02		
3	3500	3501	1.528	34.675	34.665	3.22		
2	4000	4012	1.487	34.682	34.672	3.50		
1	4000	4013	1.487	34.682	34.667	2.09		

Rosset Data ST.10

KH-93-01	ST.10	Lat. 19° 20.36'N		Long. 169° 00.00'W			Depth	1516 m
Sample	SD.Depth	Depth db	Temp °C	Sal.(CTD)	Sal.	O2 ml/l	Chl.a (ug/l)	Phae.(ug/l)
0	0	0	25.300	-	34.754	4.70	0.24	0.09
24	25	23	24.903	34.738	35.110	4.39	0.11	0.30
23	40	40	24.905	34.742	35.112	4.32	0.11	0.27
22	50	49	24.923	34.752	35.110	4.41	0.10	0.27
21	60	60	24.938	34.762	35.109	4.40	0.11	0.28
20	70	70	24.970	34.778	35.108	4.41	0.11	0.28
19	75	74	24.981	34.787	35.108	4.42	0.10	0.29
18	80	80	24.988	34.793	35.108	4.39	0.11	0.28
17	90	89	24.993	34.795	35.108	4.43	0.11	0.28
16	100	100	25.017	34.810	35.107	4.46	0.11	0.27
15	125	125	25.014	34.809	35.109	4.41	0.04	0.08
14	150	151	24.204	34.912	35.107	4.39	0.03	0.07
13	175	171	22.946	35.052	35.107	4.36	0.03	0.07
12	200	200	21.813	35.104	35.107	4.32	0.04	0.07
11	250	250	17.778	34.855	35.102	4.35	0.02	0.06
10	300	300	13.533	34.413	34.219	2.77	0.00	0.05
9	400	400	9.521	34.207	34.205	1.85	-	-
8	500	500	7.101	34.184	34.306	1.00	-	-
7	600	600	5.935	34.294	34.401	0.93	-	-
6	700	699	5.272	34.395	34.459	1.18	-	-
5	800	800	4.907	34.440	34.515	1.26	-	-
4	1000	998	4.170	34.512	34.551	1.44	-	-
3	1250	1248	3.452	34.547	34.585	1.60	-	-
2	1500	1500	2.851	34.580	34.585	1.44	-	-
1	1516	1515	2.852	34.579	34.584	1.76	-	-

Rosset Data ST.13-2

KH-93-01	ST.13-2	Lat. 20° 58.56'N		Long. 179° 51.04'W			Depth	1516 m
Sample	SD.Depth	Depth db	Temp °C	Sal.(CTD)	Sal.	O2 ml/l	Chl.a (ug/l)	Phae.(ug/l)
0	0	-	-		35.024	4.77	0.05	0.02
24	10	11	24.045	35.006	35.019	4.85	0.05	0.02
23	25	25	23.770	35.121	35.148	4.90	0.05	0.02
22	40	40	23.520	35.221	35.237	4.92	0.06	0.01
21	50	51	23.389	35.250	35.263	4.95	0.18	0.07
20	60	60	23.321	35.263	35.272	4.95	0.24	0.11
19	70	69	23.228	35.272	35.281	-	0.31	0.11
18	75	72	23.153	35.275	35.285	4.90	0.32	0.12
17	80	79	23.055	35.280	35.287	4.88	0.43	0.14
16	90	88	22.928	35.280	35.286	4.92	0.47	0.15
15	100	98	22.536	35.274	35.281	4.89	0.17	0.13
14	125	122	20.947	35.165	35.179	4.70	0.23	0.36
13	150	148	19.223	35.058	35.068	4.57	0.14	0.20
12	175	175	18.095	34.941	34.952	4.61	0.12	0.19
11	200	200	16.876	34.807	34.816	4.63	0.01	0.02
10	250	250	15.186	34.631	34.639	4.66	0.00	0.04
9	300	300	12.937	34.423	34.431	4.58	0.00	0.04
8	400	402	10.222	34.198	34.205	4.30	-	-
7	500	500	7.667	34.109	34.118	3.03	-	-
6	600	602	6.026	34.176	34.182	1.52	-	-
5	700	698	5.317	34.322	34.920	1.04	-	-
4	800	799	4.788	34.436	34.444	1.21	-	-
3	1000	998	4.148	34.495	34.500	1.37	-	-
2							-	-
1							-	-

Rosset Data ST.14

KH-93-01	ST.14	Lat. 20° 12.70'N		Long. 163° 12.84'E			Depth	2401 m
Sample	SD.Depth	Depth db	Temp °C	Sal.(CTD)	Sal.	O2 ml/l	Chl.a (ug/l)	Phae.(ug/l)
0	0	-	-	-	35.185	4.89	0.06	0.01
24	10	10	24.656	35.173	35.178	4.82	0.07	0.01
23	25	25	24.643	35.172	35.178	4.85	0.19	0.06
22	40	40	24.639	35.171	35.179	4.84	0.22	0.08
21	50	50	24.638	35.172	35.181	4.85	0.23	0.07
20	60	60	24.629	35.173	35.183	4.86	0.29	0.09
19	70	70	24.452	35.185	35.196	4.82	0.35	0.09
18	75	74	24.349	35.187	35.203	4.37	0.37	0.11
17	80	80	24.000	35.196	35.210	4.85	0.40	0.11
16	90	90	23.722	35.201	35.215	4.91	0.48	0.15
15	100	99	23.608	35.197	35.212	4.90	0.56	0.22
14	125	124	22.772	35.180	35.197	4.85	0.23	0.24
13	150	150	20.937	35.128	35.143	4.60	0.17	0.29
12	175	175	19.746	35.051	35.053	4.48	0.20	0.49
11	200	198	17.817	34.876	34.887	4.58	0.03	0.09
10	250	248	16.494	34.741	34.756	4.57	0.01	0.04
9	300	300	15.085	34.599	34.615	4.36	-	-
8	400	401	11.837	34.324	34.334	4.16	-	-
7	500	501	9.014	34.155	34.169	3.67	-	-
6	600	600	6.787	34.132	34.145	2.17	-	-
5	700	699	5.518	34.203	34.213	1.35	-	-
4	800	800	4.977	34.316	34.341	1.18	-	-
3	1000	1000	4.261	34.459	34.468	1.37	-	-
2	1500	1500	2.843	34.566	34.576	2.35	-	-
1	bottom	2369	1.808	34.644	34.653	2.64	-	-

Station and working log. of KH-93-1

Y. M. D.	GMT.+T	LAT.	LONG.	DEPTH	ST.NO	CURRENT	COMENT
930123	0150+09	34-01.080N	145-00.800E	5724	1	000 0.0	IKPT-2000 DEEPEST
930123	0231+09	34-00.820N	145-02.560E	5754	1	000 0.0	IKPT-2000 FINISH
930123	0300+09	34-00.470N	145-03.680E	5736	1	000 0.0	CTD START
930123	0328+09	34-00.100N	145-04.130E	5713	1	000 0.0	CTD-1000 DEEPEST
930123	0348+09	33-59.860N	145-04.260E	5689	1	000 0.0	CTD-1000 FINISH
930123	0612+09	33-54.380N	145-14.400E	5737	1	000 0.0	4M BTR START DOWN
930123	0744+09	33-56.840N	145-14.310E	5686	1	000 0.0	SUNSET
930123	0807+09	33-57.220N	145-14.200E	5681	1	000 0.0	4M BTR ON BOTTOM
930123	0923+09	33-58.470N	145-13.970E	5681	1	000 0.0	4M BTR OFF BOTTOM
930123	1115+09	33-59.570N	145-12.770E	5735	1	000 0.0	4M BTR ON DECK
930123	1124+09	33-59.510N	145-12.650E	5737	1	000 0.0	CHANGED PROPULSION TO DIESEL
930123	1301+09	33-47.380N	145-36.590E	5722	S-1	265 1.1	IKPT NET START
930123	1311+09	33-46.950N	145-37.100E	5691	S-1	207 0.8	IKPT NET DEEPEST
930123	1312+09	33-46.900N	145-37.190E	5686	S-1	201 0.7	ORI SIDE NET START
930123	1324+09	33-46.530N	145-37.740E	5686	S-1	000 0.0	ORI SIDE NET FINISH
930123	1329+09	33-46.400N	145-37.960E	5691	S-1	000 0.0	IKPT NET FINISH
930124	0622+09	31-30.300N	149-59.780E	5905	2	000 0.0	CTD-1000 START
930124	0648+09	31-30.300N	149-59.780E	5906	2	000 0.0	CTD-1000 DEEPEST
930124	0656+09	31-30.340N	149-59.740E	5905	2	000 0.0	ED
930124	0707+09	31-30.270N	149-59.720E	5904	2	000 0.0	CTD 1000M FINISH
930124	0716+09	31-30.280N	149-59.690E	5905	2	000 0.0	IKPT-2000 START
930124	0730+09	31-29.700N	150-00.130E	5902	2	000 0.0	SUNSET
930124	0840+09	31-27.630N	150-01.790E	5890	2	000 0.0	IKPT-2000 FINISH
930124	1104+09	31-29.580N	150-38.160E	5763	S-2	265 1.9	IKPT NET START
930124	1118+09	31-28.860N	150-38.310E	5751	S-2	000 0.0	IKPT NET DEEPEST
930124	1123+09	31-28.690N	150-38.320E	5746	S-2	000 0.0	ORI SIDE NET START
930124	1136+09	31-28.180N	150-38.410E	5743	S-2	000 0.0	IKPT NET FINISH
930124	1139+09	31-28.080N	150-38.430E	5743	S-2	000 0.0	ORI SIDE NET FINISH
930124	1305+09	31-29.980N	150-59.750E	4988	3	269 2.2	CTD START
930124	1316+09	31-29.970N	150-59.620E	5004	3	000 0.0	HOVE UP CTD IN ORDER TO REPAIR
930124	1333+09	31-29.810N	150-59.520E	4993	3	000 0.0	NBS START
930124	1530+09	31-29.600N	150-58.890E	5052	3	000 0.0	NBS SEND MESS
930124	1600+09	31-29.680N	150-58.800E	5066	3	000 0.0	NBS ARR MESS
930124	1725+09	31-29.650N	150-58.530E	5083	3	000 0.0	NBS FINISH
930124	1733+09	31-29.630N	150-58.470E	5082	3	000 0.0	CTD-4000 START
930124	1841+09	31-29.680N	150-58.110E	5119	3	000 0.0	CTD-4000 DEEPEST
930124	1929+09	31-29.660N	150-57.970E	5121	3	000 0.0	CTD-4000 FINISH
930124	2011+09	31-29.620N	150-57.990E	5123	3	000 0.0	BCL STARTED
930124	2051+09	31-29.800N	150-58.110E	5126	3	000 0.0	SUNRISE
930124	2122+09	31-29.610N	150-58.270E	5103	3	000 0.0	DR
930124	2151+09	31-29.480N	150-58.330E	5089	3	000 0.0	BCL HIT BOTTOM
930124	2254+09	31-29.400N	150-58.150E	5093	3	000 0.0	BCL ON DECK
930124	2316+09	31-29.350N	150-58.110E	5099	3	000 0.0	4M BTR START DOWN
930125	0100+09	31-28.770N	150-58.280E	5059	3	000 0.0	4M BTR ON BOTTOM
930125	0223+09	31-28.140N	150-58.610E	4966	3	000 0.0	4M BTR OFF BOTTOM
930125	0339+09	31-27.870N	150-58.190E	4912	3	000 0.0	4M BTR ON DECK
930125	0346+09	31-27.850N	150-58.220E	4915	3	000 0.0	CHANGED PROPULSION TO DIESEL
930125	0346+09	31-27.850N	150-58.220E	4915	3	000 0.0	SLOW AHEAD ENGINES
930125	0348+09	31-27.850N	150-58.190E	4917	3	000 0.0	TD
930125	0352+09	31-27.820N	150-58.300E	4907	3	000 0.0	s/co on 117II

Station and working log. of KH-93-1

Y. M. D.	GMT.+T	LAT.	LONG.	DEPTH	ST.NO	CURRENT	COMENT
930125	0353+09	31-27.790N	150-58.390E	4901	3	000 0.0	PROTON SURVEY START
930125	0408+09	31-26.690N	151-01.100E	4746	3	234 0.4	RUNG UP ENGINES
930125	0700+09	31-06.500N	151-47.930E	5876	3	237 0.8	ED
930125	1102+09	30-39.940N	152-50.079E	5919	S-3	314 2.2	IKPT NET START
930125	1115+09	30-39.530N	152-49.849E	5917	S-3	000 0.0	IKPT NET DEEPEST
930125	1116+09	30-39.510N	152-49.849E	5916	S-3	000 0.0	ORI SIDE NET START
930125	1131+09	30-39.180N	152-49.589E	5917	S-3	000 0.0	ORI SIDE NET FINISH
930125	1133+09	30-39.190N	152-49.639E	5919	S-3	000 0.0	IKPT NET FINISH
930125	1214+10	30-35.970N	152-57.369E	5889	S-4	298 2.2	IKPT NET START
930125	1226+10	30-35.520N	152-57.049E	5876	S-4	000 0.0	IKPT NET DEEPEST
930125	1228+10	30-35.490N	152-57.009E	5875	S-4	000 0.0	ORI SIDE NET START
930125	1241+10	30-35.260N	152-56.679E	5829	S-4	000 0.0	ORI SIDE NET FINISH
930125	1246+10	30-35.160N	152-56.549E	5808	S-4	000 0.0	IKPT NET FINISH
930126	1004+10	28-07.550N	158-36.269E	5942	S-5	306 1.3	IKPT NET START
930126	1015+10	28-07.120N	158-36.749E	5948	S-5	000 0.0	IKPT NET DEEPEST
930126	1015+10	28-07.110N	158-36.759E	5943	S-5	000 0.0	ORI SIDE NET START
930126	1029+10	28-06.880N	158-37.289E	5950	S-5	000 0.0	ORI SIDE NET FINISH
930126	1032+10	28-06.840N	158-37.379E	5947	S-5	000 0.0	IKPT NET FINISH
930126	1600+10	27-30.310N	160-00.319E	5914	4	000 0.0	CTD-1000 START
930126	1621+10	27-30.500N	160-00.529E	5892	4	000 0.0	CTD-1000 DEEPEST
930126	1638+10	27-30.490N	160-00.579E	5889	4	000 0.0	CTD-1000 FINISH
930126	1647+10	27-30.490N	160-00.599E	5888	4	000 0.0	IKPT-2000 START
930126	1737+10	27-29.190N	159-58.709E	5890	4	000 0.0	IKPT-2000 DEEPEST
930126	1738+10	27-29.190N	159-58.679E	5892	4	000 0.0	ORI SIDE NET START
930126	1809+10	27-28.720N	159-58.189E	5868	4	000 0.0	ORI SIDE NET FINISH
930126	1819+10	27-28.550N	159-58.069E	5864	4	000 0.0	IKPT-2000 FINISH
930127	1210+10	25-06.780N	163-56.129E	5850	S-6	140 0.4	IKPT NET START
930127	1225+10	25-06.210N	163-56.899E	5886	S-6	000 0.0	IKPT NET DEEPEST
930127	1242+10	25-05.600N	163-57.649E	5902	S-6	000 0.0	IKPT NET FINISH
930127	2034+11	24-01.040N	165-30.589E	6026	5	000 0.0	CTD-RMS START
930127	2041+11	24-01.080N	165-30.689E	6041	5	000 0.0	CTD-RMS FINISH
930127	2043+11	24-01.090N	165-30.719E	6048	5	000 0.0	CTD-RMS START
930127	2219+11	24-02.030N	165-30.859E	6074	5	000 0.0	CTD-RMS DEEPEST
930128	0020+11	24-02.850N	165-30.639E	6062	5	000 0.0	CTD-RMS FINISH
930128	0042+11	24-02.880N	165-30.859E	6052	5	000 0.0	NBS START
930128	0236+11	24-03.440N	165-31.099E	6035	5	000 0.0	NBS SEND MESS
930128	0315+11	24-03.550N	165-31.129E	6037	5	000 0.0	NBS ARR MESS
930128	0423+11	24-03.950N	165-31.249E	6030	5	000 0.0	NBS FINISH
930128	0859+11	23-16.500N	166-24.349E	5873	S-7	305 1.2	IKPT NET START
930128	0916+11	23-15.870N	166-24.949E	5878	S-7	000 0.0	ORI SIDE NET START
930128	0931+11	23-15.510N	166-25.229E	5889	S-7	000 0.0	ORI SIDE NET FINISH
930128	0935+11	23-15.400N	166-25.339E	5895	S-7	000 0.0	IKPT NET FINISH
930128	1101+11	23-00.770N	166-41.669E	5913	S-8	312 2.0	IKPT NET START
930128	1115+11	23-00.200N	166-41.949E	5913	S-8	000 0.0	IKPT NET DEEPEST
930128	1115+11	23-00.180N	166-41.989E	5903	S-8	000 0.0	ORI SIDE NET START
930128	1129+11	22-59.850N	166-42.199E	5894	S-8	000 0.0	ORI SIDE NET FINISH
930128	1133+11	22-59.780N	166-42.239E	5895	S-8	000 0.0	IKPT NET FINISH
930129	0420+11	20-00.240N	169-59.299E	5492	6	000 0.0	VMPS-1000 START
930129	0540+11	20-00.470N	169-59.299E	5493	6	000 0.0	VMPS-2000 DEEPEST
930129	0620+11	20-00.730N	169-59.319E	5496	6	000 0.0	VMPS-2000 FINISH

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Y. M. D.	GMT.+T	LAT.	LONG.	DEPTH	ST.NO	CURRENT	COMENT
930129	0636+11	20-00.810N	169-58.919E	5492	6	000 0.0	SUNSET
930129	0646+11	20-00.870N	169-58.699E	5486	6	000 0.0	COMCED RELEASING TEST
930129	0749+11	20-00.880N	169-58.659E	5489	6	000 0.0	FINISHED IT
930129	0820+11	20-01.080N	169-58.729E	5486	6	000 0.0	IKPT NET START
930129	0821+11	20-01.100N	169-58.749E	5490	6	000 0.0	IKPT-2000 START
930129	0859+11	20-02.630N	169-59.999E	5525	6	000 0.0	IKPT-2000 DEEPEST
930129	0900+11	20-02.650N	170-00.019E	5525	6	000 0.0	ORI SIDE NET START
930129	0930+11	20-03.490N	170-00.519E	5538	6	000 0.0	ORI SIDE NET FINISH
930129	0943+11	20-03.830N	170-00.769E	5543	6	000 0.0	IKPT NET FINISH
930130	0537+11	18-17.050N	171-20.869E	1310	7	000 0.0	LAUNCH OF BAITE TRAP
930130	0542+11	18-16.990N	171-20.809E	1308	7	000 0.0	FINISH TO LAUNCH OF BAITE TRAP
930130	0558+11	18-16.880N	171-20.569E	1305	7	000 0.0	LAUNCH OF NUTA TRAP
930130	0606+11	18-16.840N	171-20.449E	1302	7	000 0.0	FINISH TO LAUNCH OF NUTA TRAP
930130	0629+11	18-17.000N	171-20.979E	1311	7	000 0.0	START TO RETRIEVE OF BAITE TRAP
930130	0642+11	18-16.900N	171-20.859E	1307	7	000 0.0	FINISH TO RETRIEVE OF BAITE TRAP
930130	0715+11	18-16.650N	171-20.669E	1302	7	000 0.0	BORE NUTA TRAP BEARING 35
930130	0748+11	18-16.450N	171-20.559E	1300	7	000 0.0	LAUNCH OF BAITE TRAP
930130	0753+11	18-16.390N	171-20.499E	1301	7	000 0.0	FINISH TO LAUNCH OF BAITE TRAP
930130	0833+11	18-16.330N	171-20.989E	1303	7	000 0.0	FINISH TO LAUNCH OF NUTA TRAP
930130	0855+11	18-16.040N	171-20.789E	1299	7	000 0.0	CTD-RMS START
930130	1119+11	18-14.760N	171-20.629E	1295	7	000 0.0	CTD DEEPEST
930130	1217+11	18-14.150N	171-20.969E	1287	7	000 0.0	CTD-RMS FINISH
930130	1239+11	18-13.990N	171-21.019E	1291	7	000 0.0	NBS START
930130	1326+11	18-13.670N	171-21.289E	1289	7	000 0.0	NBS SEND MESS
930130	1421+11	18-13.430N	171-21.429E	1288	7	000 0.0	NBS FINISH
930130	1442+11	18-13.300N	171-21.239E	1286	7	000 0.0	BCL STARTED
930130	1517+11	18-13.270N	171-21.169E	1285	7	000 0.0	BCL HIT BOTTOM
930130	1543+11	18-13.360N	171-21.249E	1287	7	000 0.0	BCL ON DECK
930130	1553+11	18-13.370N	171-21.229E	1288	7	000 0.0	BCL STARTED
930130	1638+11	18-13.390N	171-21.119E	1286	7	000 0.0	BCL HIT BOTTOM
930130	1701+11	18-13.480N	171-21.099E	1287	7	000 0.0	BCL ON DECK
930130	1715+11	18-13.580N	171-21.209E	1290	7	000 0.0	IKPT-2000 START
930130	1755+11	18-14.330N	171-22.829E	1312	7	000 0.0	IKPT NET DEEPEST
930130	1756+11	18-14.370N	171-22.879E	1314	7	000 0.0	ORI SIDE NET START
930130	1830+11	18-14.610N	171-23.909E	1349	7	000 0.0	ORI SIDE NET FINISH
930130	1839+11	18-14.780N	171-24.149E	1406	7	000 0.0	IKPT-2000 FINISH
930130	1851+11	18-14.700N	171-24.049E	1419	7	000 0.0	VMPS-1000 START
930130	1908+11	18-14.530N	171-24.079E	1356	7	000 0.0	SUNRISE
930130	1916+11	18-14.440N	171-24.059E	1345	7	000 0.0	VMPS DEEPEST
930130	1927+11	18-14.350N	171-24.049E	1334	7	000 0.0	VMPS FINISH
930130	1943+11	18-14.300N	171-24.069E	1334	7	000 0.0	VMPS NET START
930130	2031+11	18-14.060N	171-24.239E	1352	7	000 0.0	VMPS NET FINISH
930130	2108+11	18-11.600N	171-22.089E	1292	7	000 0.0	START TO RETRIEVE OF NUTA TRAP
930130	2121+11	18-11.500N	171-22.009E	1294	7	000 0.0	FINISH TO RETRIEVE OF NUTA TRAP
930130	2211+11	18-16.430N	171-20.499E	1300	7	000 0.0	RELEASE FOR BAITE TRAP
930130	2238+11	18-16.210N	171-20.259E	1301	7	000 0.0	POPPING UP OF BAITE TRAP
930130	2252+11	18-16.320N	171-20.649E	1300	7	000 0.0	START TO RETRIEVE OF BAITE TRAP
930130	2304+11	18-16.310N	171-20.549E	1301	7	000 0.0	FINISH TO RETRIEVE OF BAITE TRAP
930130	2316+11	18-16.190N	171-20.509E	1300	7	000 0.0	4M BTR START DOWN
930131	0000+11	18-16.050N	171-20.999E	1302	7	000 0.0	4M BTR ON BOTTOM

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Y. M. D.	GMT.+T	LAT.	LONG.	DEPTH	ST.NO	CURRENT	COMENT
930131	0102+11	18-15.810N	171-22.119E	1313	7	000 0.0	4M BTR OFF BOTTOM
930131	0124+11	18-15.910N	171-21.979E	1314	7	000 0.0	4M BTR ON DECK
930131	0904+11	18-36.840N	173-03.899E	4031	S-9	266 2.3	IKPT NET START
930131	0916+11	18-36.930N	173-04.439E	4025	S-9	000 0.0	IKPT NET DEEPEST
930131	0916+11	18-36.940N	173-04.459E	4026	S-9	000 0.0	ORI SIDE NET START
930131	0930+11	18-36.980N	173-04.949E	4027	S-9	000 0.0	ORI SIDE NET FINISH
930131	0934+11	18-36.940N	173-05.079E	4025	S-9	000 0.0	IKPT NET FINISH
930131	1112+11	18-36.780N	173-27.629E	4005	S-10	000 0.0	ORI SIDE NET START
930131	1128+11	18-36.850N	173-28.039E	4008	S-10	000 0.0	ORI SIDE NET FINISH
930131	1130+11	18-36.850N	173-28.109E	4007	S-10	000 0.0	IKPT NET FINISH
930201	0803+12	18-36.060N	179-04.789E	4737	S-11	306 1.3	IKPT NET START
930201	0825+12	18-36.230N	179-06.199E	4727	S-11	000 0.0	IKPT NET DEEPEST
930201	0825+12	18-36.230N	179-06.219E	4731	S-11	000 0.0	ORI SIDE NET START
930201	0857+12	18-36.340N	179-07.709E	4709	S-11	000 0.0	ORI SIDE NET FINISH
930201	0859+12	18-36.340N	179-07.799E	4714	S-11	000 0.0	IKPT NET FINISH
930202	0520+12	18-11.990N	175-20.179W	1711	8	000 0.0	LAUNCH OF BAITE TRAP
930202	0523+12	18-11.900N	175-20.239W	1676	8	000 0.0	FINISH TO LAUNCH OF BAITE TRAP
930202	0527+12	18-11.810N	175-20.319W	1679	8	000 0.0	LAUNCH OF NUTA TRAP
930202	0536+12	18-11.680N	175-20.499W	1703	8	000 0.0	SUNSET & PUT ON REGULATION LI
930202	0537+12	18-11.680N	175-20.539W	1702	8	000 0.0	FINISH TO LAUNCH OF NUTA TRAP
930202	0605+12	18-10.710N	175-21.749W	1765	8	000 0.0	CTD-RMS START
930202	0701+12	18-10.470N	175-22.119W	1771	8	000 0.0	CTD-RMS DEEPEST
930202	0759+12	18-10.480N	175-22.419W	1777	8	000 0.0	CTD-RMS FINISH
930202	0803+12	18-10.460N	175-22.489W	1779	8	000 0.0	
930202	0818+12	18-10.370N	175-22.689W	1771	8	000 0.0	NBS START
930202	0908+12	18-10.300N	175-23.129W	1817	8	000 0.0	NBS SEND MESS
930202	0931+12	18-10.330N	175-23.209W	1855	8	000 0.0	NBS ARR MESS
930202	1005+12	18-10.290N	175-23.339W	1849	8	000 0.0	NBS FINISH
930202	1050+12	18-11.940N	175-19.839W	1681	8	000 0.0	BCL STARTED
930202	1129+12	18-12.450N	175-19.929W	1686	8	000 0.0	BCL HIT BOTTOM
930202	1206+12	18-12.510N	175-19.869W	1691	8	000 0.0	BCL ON DECK
930202	1242+12	18-12.240N	175-20.539W	1720	8	000 0.0	IKPT-2000 START
930202	1320+12	18-13.860N	175-22.409W	1743	8	000 0.0	IKPT-2000 DEEPEST
930202	1324+12	18-13.930N	175-22.559W	1756	8	000 0.0	ORI SIDE NET START
930202	1354+12	18-14.380N	175-23.949W	1864	8	000 0.0	ORI SIDE NET FINISH
930202	1404+12	18-14.490N	175-24.449W	2118	8	000 0.0	IKPT-2000 FINISH
930202	1420+12	18-14.360N	175-25.019W	2236	8	000 0.0	4M BTR START DOWN
930202	1536+12	18-11.780N	175-28.169W	2018	8	000 0.0	4M BTR ON BOTTOM
930202	1814+12	18-13.000N	175-28.189W	2365	8	000 0.0	4M BTR OFF BOTTOM
930202	1816+12	18-12.990N	175-28.159W	2367	8	000 0.0	SUNRISE & PUT OFF REGULATION LI
930202	1819+12	18-12.950N	175-28.179W	2359	8	000 0.0	4M BTR OFF BOTTOM AT 0616 (SF
930202	1922+12	18-12.410N	175-30.319W	2744	8	000 0.0	4M BTR ON DECK
930202	1953+12	18-13.350N	175-31.659W	2685	8	000 0.0	START TO RETRIEVE OF NUTA TRAP
930202	2003+12	18-13.270N	175-32.019W	2626	8	000 0.0	FINISH TO RETRIEVE OF NUTA TRAP
930202	2009+12	18-13.190N	175-32.249W	2612	8	000 0.0	CHANGED PROPULSION TO DIESEL
930202	2009+12	18-13.200N	175-32.269W	2612	8	000 0.0	SLOW AHEAD ENGINES & USED CO
930202	2105+12	18-11.970N	175-20.249W	1715	8	276 2.7	STOP ENGINES
930202	2105+12	18-11.980N	175-20.249W	1712	8	276 2.7	RELEASE FOR BAITE TRAP
930202	2110+12	18-12.040N	175-20.329W	1712	8	282 2.6	CHANGED PROPULSION TO ELECTF
930202	2138+12	18-12.060N	175-20.929W	1716	8	000 0.0	POPPING UP OF BAITE TRAP

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930202	2159+12	18-12.180N	175-20.589W	1718	8	000 0.0	START TO RETRIEVE OF BAITE TRA
930202	2213+12	18-12.170N	175-20.969W	1714	8	000 0.0	FINISH TO RETRIEVE OF BAITE TRA
930203	0917-11	18-29.520N	174-28.499W	2771	S-12	269 1.0	IKPT NET START
930203	0941-11	18-29.540N	174-27.119W	2813	S-12	000 0.0	IKPT NET DEEPEST
930203	0942-11	18-29.540N	174-27.089W	2816	S-12	000 0.0	ORI SIDE NET START
930203	1009-11	18-29.560N	174-26.109W	2763	S-12	000 0.0	ORI SIDE NET FINISH
930203	1015-11	18-29.610N	174-25.909W	2771	S-12	000 0.0	IKPT NET FINISH
930203	1947-11	18-41.220N	171-53.429W	4993	9'	000 0.0	VMPS-6000 START
930203	2230-11	18-41.250N	171-53.129W	4993	9'	000 0.0	VMPS-6000 DEEPEST
930204	0012-11	18-41.440N	171-53.139W	4995	9'	000 0.0	VMPS-6000 FINISH
930204	0739-11	18-50.090N	169-59.899W	3166	9	000 0.0	CHANGED PROPULSION TO ELECTF
930204	0741-11	18-50.080N	169-59.919W	3167	9	000 0.0	CTD START
930204	0745-11	18-50.050N	169-59.969W	3168	9	000 0.0	HOVE UP CTD
930204	0747-11	18-50.040N	169-59.989W	3164	9	000 0.0	NORPAC NET START
930204	0801-11	18-49.940N	170-00.139W	3155	9	000 0.0	CTD START
930204	0856-11	18-49.610N	170-00.549W	3151	9	000 0.0	CTD DEEPEST
930204	0909-11	18-49.550N	170-00.529W	3157	9	000 0.0	NORPAC NET FINISH
930204	0947-11	18-49.410N	170-00.629W	3158	9	000 0.0	CTD FINISH
930204	1000-11	18-49.523N	170-00.586W	3154	9	000 0.0	IKPT-2000 START
930204	1040-11	18-50.590N	169-59.089W	3146	9	000 0.0	IKPT-2000 DEEPEST
930204	1041-11	18-50.620N	169-59.079W	3144	9	000 0.0	ORI SIDE NET START
930204	1115-11	18-51.190N	169-58.189W	3142	9	000 0.0	ORI SIDE NET FINISH
930204	1140-11	18-51.830N	169-57.649W	3049	9	000 0.0	IKPT-2000 FINISH
930205	0139-11	19-19.980N	169-00.089W	1512	10	000 0.0	LAUNCH OF BAITE TRAP
930205	0143-11	19-19.990N	169-00.099W	1510	10	000 0.0	FINISH TO LAUNCH OF BAITE TRAF
930205	0146-11	19-19.980N	169-00.089W	1510	10	000 0.0	LAUNCH OF NUTA TRAP
930205	0152-11	19-19.970N	169-00.059W	1508	10	000 0.0	FINISH TO LAUNCH OF NUTA TRAF
930205	0202-11	19-19.820N	168-59.839W	1501	10	000 0.0	NORPAC NET START
930205	0218-11	19-20.020N	168-59.959W	1507	10	000 0.0	CTD-RMS START
930205	0251-11	19-20.300N	168-59.959W	1514	10	000 0.0	NORPAC NET FINISH
930205	0347-11	19-20.360N	169-00.029W	1517	10	000 0.0	CTD-RMS FINISH
930205	0403-11	19-20.380N	169-00.019W	1519	10	000 0.0	NBS START
930205	0445-11	19-20.620N	169-00.089W	1526	10	000 0.0	NBS SEND MESS
930205	0507-11	19-20.760N	169-00.119W	1528	10	000 0.0	NBS ARR MESS
930205	0511-11	19-20.790N	169-00.129W	1532	10	000 0.0	SUNSET & PUT ON REGULATION LI
930205	0539-11	19-21.000N	169-00.119W	1539	10	000 0.0	NBS FINISH
930205	0555-11	19-21.110N	169-00.149W	1543	10	000 0.0	BCL STARTED
930205	0630-11	19-21.200N	169-00.149W	1549	10	000 0.0	BCL HIT BOTTOM
930205	0705-11	19-21.130N	168-59.969W	1538	10	000 0.0	BCL ON DECK
930205	0731-11	19-19.050N	169-00.049W	1477	10	000 0.0	3M BTR START DOWN
930205	0837-11	19-19.040N	168-59.299W	1468	10	000 0.0	3M BTR ON BOTTOM
930205	0942-11	19-18.540N	168-58.679W	1475	10	000 0.0	3M BTR OFF BOTTOM
930205	1026-11	19-19.350N	168-58.689W	1471	10	000 0.0	3M BTR ON DECK
930205	1042-11	19-19.790N	168-58.839W	1473	10	000 0.0	IKPT-2000 START
930205	1128-11	19-21.820N	168-59.439W	1551	10	000 0.0	IKPT-2000 DEEPEST
930205	1129-11	19-21.840N	168-59.459W	1553	10	000 0.0	ORI SIDE NET START
930205	1200-11	19-22.720N	168-59.809W	1600	10	000 0.0	ORI SIDE NET FINISH
930205	1211-11	19-23.100N	168-59.899W	1615	10	000 0.0	IKPT-2000 FINISH
930205	1253-11	19-19.120N	169-00.169W	1492	10	000 0.0	3M BTR START DOWN
930205	1344-11	19-19.060N	168-58.959W	1469	10	000 0.0	3M BTR ON BOTTOM

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930205	1452-11	19-19.370N	168-57.669W	1469	10	000 0.0	3M BTR OFF BOTTOM
930205	1530-11	19-19.470N	168-56.869W	1483	10	000 0.0	3M BTR ON DECK
930205	1541-11	19-19.460N	168-56.909W	1485	10	000 0.0	VMPS-1000 START
930205	1606-11	19-19.510N	168-57.149W	1474	10	000 0.0	VMPS-400 DEEPEST
930205	1615-11	19-19.430N	168-57.379W	1473	10	000 0.0	VMPS-400 FINISH
930205	1632-11	19-19.210N	168-57.609W	1471	10	000 0.0	VMPS-800 START
930205	1709-11	19-19.180N	168-57.939W	1467	10	000 0.0	VMPS-800 DEEPEST
930205	1730-11	19-19.220N	168-58.439W	1466	10	000 0.0	VMPS-800 FINISH
930205	2011-11	19-19.990N	169-00.149W	1511	10	269 2.6	RELEASE FOR BAITE TRAP
930205	2013-11	19-19.980N	169-00.169W	1509	10	262 2.4	CHANGED TO ELECTRIC MOTORS
930205	2039-11	19-19.500N	169-00.399W	1485	10	000 0.0	POPPING UP OF BAITE TRAP
930205	2059-11	19-20.090N	169-00.559W	1506	10	000 0.0	START TO RETRIEVE OF BAITE TR
930205	2117-11	19-19.880N	169-00.749W	1502	10	000 0.0	FINISH TO RETRIEVE OF BAITE TRA
930205	2124-11	19-19.740N	169-00.919W	1499	10	000 0.0	CHANGED TO DIESEL ENGINES
930206	1800-10	19-59.870N	163-59.679W	4718	11	000 0.0	3M BTR START DOWN
930206	2029-10	20-00.880N	163-57.399W	5181	11	000 0.0	3M BTR ON BOTTOM
930206	2156-10	20-01.830N	163-56.099W	5211	11	000 0.0	3M BTR OFF BOTTOM
930206	2344-10	20-02.650N	163-54.609W	5135	11	000 0.0	3M BTR ON DECK
930207	0004-10	20-02.670N	163-54.709W	5148	11	000 0.0	CTD-1000
930207	0027-10	20-02.480N	163-54.739W	5145	11	000 0.0	CTD-1000 DEEPEST
930207	0046-10	20-02.460N	163-54.859W	5158	11	000 0.0	CTD-1000 FINISH
930207	0054-10	20-02.410N	163-54.819W	5161	11	000 0.0	IKPT-2000 START
930207	0141-10	20-03.990N	163-53.529W	5123	11	000 0.0	IKPT-2000 DEEPEST
930207	0224-10	20-04.860N	163-52.679W	5143	11	000 0.0	IKPT-2000 FINISH
930207	0232-10	20-05.110N	163-52.479W	5147	11	000 0.0	ORI-2000 START
930207	0319-10	20-06.210N	163-51.479W	5107	11	000 0.0	ORI-2000 DEEPEST
930207	0402-10	20-07.270N	163-50.509W	5133	11	000 0.0	ORI-2000 FINISH
930207	0601-10	20-08.100N	163-22.004W	4994	S-13	248 2.0	IKPT NET START
930207	0628-10	20-08.220N	163-20.709W	4974	S-13	000 0.0	IKPT NET DEEPEST
930207	0628-10	20-08.220N	163-20.689W	4973	S-13	000 0.0	ORI SIDE NET START
930207	0658-10	20-08.290N	163-19.669W	4945	S-13	000 0.0	ORI SIDE NET FINISH
930216	0717-11	21-07.580N	166-22.209W	4939	S-14	085 1.9	IKPT NET START
930216	0738-11	21-07.630N	166-23.319W	4939	S-14	000 0.0	IKPT NET DEEPEST
930216	0741-11	21-07.600N	166-23.469W	4939	S-14	000 0.0	ORI SIDE NET START
930216	0810-11	21-07.710N	166-24.499W	4939	S-14	000 0.0	ORI SIDE NET FINISH
930216	0814-11	21-07.750N	166-24.659W	4939	S-14	000 0.0	IKPT NET FINISH
930217	0712-11	21-04.080N	172-47.869W	5242	S-15	076 1.4	IKPT NET START
930217	0733-11	21-04.050N	172-49.129W	5254	S-15	000 0.0	IKPT NET DEEPEST
930217	0734-11	21-04.050N	172-49.159W	5257	S-15	000 0.0	ORI SIDE NET START
930217	0804-11	21-04.080N	172-50.429W	5260	S-15	000 0.0	ORI SIDE NET FINISH
930217	0808-11	21-04.060N	172-50.579W	5260	S-15	000 0.0	IKPT NET FINISH
930218	0802+12	21-00.160N	179-37.829W	4824	S-16	095 1.5	IKPT NET START
930218	0823+12	21-00.070N	179-38.999W	4813	S-16	000 0.0	IKPT NET DEEPEST
930218	0824+12	21-00.060N	179-39.049W	4820	S-16	000 0.0	ORI SIDE NET START
930218	0850+12	20-59.840N	179-39.899W	4878	S-16	000 0.0	ORI SIDE NET FINISH
930218	0858+12	20-59.770N	179-40.189W	4873	S-16	000 0.0	IKPT NET FINISH
930218	1001+12	20-59.920N	179-54.769W	4813	13	100 2.5	CHANGED TO ELECTRIC MOTORS
930218	1003+12	20-59.900N	179-54.739W	4817	13	099 2.2	CTD START
930218	1027+12	20-59.820N	179-54.709W	4822	13	000 0.0	CTD DEEPEST
930218	1047+12	20-59.870N	179-54.639W	4821	13	000 0.0	CTD FINISH

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930218	1057+12	20-59.870N	179-54.609W	4818	13	000 0.0	MTD START
930218	1148+12	21-00.300N	179-54.389W	4779	13	000 0.0	MTD START TO TOWING
930218	1235+12	21-01.390N	179-54.409W	4558	13	000 0.0	MTD MESS CAST
930218	1319+12	21-01.540N	179-54.419W	4537	13	000 0.0	MTD FINISH
930218	1323+12	21-01.560N	179-54.429W	4529	13	000 0.0	MTD START (600M)
930218	1351+12	21-01.770N	179-54.609W	4497	13	000 0.0	MTD START TO TOWING
930218	1410+12	21-02.110N	179-54.779W	4420	13	000 0.0	MTD MESS CAST
930218	1428+12	21-02.170N	179-54.839W	4393	13	000 0.0	MTD FINISH
930218	1431+12	21-02.230N	179-54.909W	4394	13	000 0.0	MTD START (600M)
930218	1509+12	21-02.580N	179-55.169W	4276	13	000 0.0	MTD START TO TOWING (600M)
930218	1539+12	21-03.330N	179-55.349W	4074	13	000 0.0	MTD MESS CAST (600M)
930218	1610+12	21-03.510N	179-55.329W	4024	13	000 0.0	MTD FINISH (600M)
930218	1627+12	21-03.690N	179-55.359W	3969	13	000 0.0	ORI-69 START
930218	1702+12	21-05.210N	179-55.409W	3469	13	000 0.0	ORI-69 DEEPEST
930218	1807+12	21-07.020N	179-55.539W	2646	13	000 0.0	ORI-69 FINISH
930218	1810+12	21-06.990N	179-55.549W	2716	13	000 0.0	ORI-69 START
930218	1828+12	21-06.420N	179-55.489W	3018	13	000 0.0	SUNRISE
930218	1850+12	21-05.640N	179-55.469W	3325	13	000 0.0	ORI-69 DEEPEST
930218	1933+12	21-04.090N	179-55.429W	3843	13	000 0.0	ORI-69 FINISH
930218	1944+12	21-03.840N	179-55.399W	3931	13	000 0.0	VAN DORN SAMPLING START
930218	2031+12	21-03.440N	179-55.539W	4054	13	000 0.0	VAN DORN SAMPLING FINISH
930218	2038+12	21-03.390N	179-55.559W	4068	13	000 0.0	MTD START
930218	2125+12	21-03.690N	179-55.899W	3958	13	000 0.0	MTD START TO TOWING
930218	2206+12	21-04.910N	179-56.449W	3535	13	000 0.0	MTD MESS CAST
930218	2301+12	21-05.480N	179-56.839W	3384	13	000 0.0	MTD FINISH
930218	2309+12	21-05.560N	179-56.909W	3361	13	000 0.0	MTD START (SHALLOW)
930218	2335+12	21-05.910N	179-57.099W	3192	13	000 0.0	MTD START TO TOWING
930219	0001+12	21-06.600N	179-57.429W	2947	13	000 0.0	MTD MESS CAST
930219	0026+12	21-06.830N	179-57.579W	2791	13	000 0.0	MTD FINISH
930219	0042+12	21-06.550N	179-57.249W	2985	13	000 0.0	IKPT NET START
930219	0104+12	21-05.900N	179-56.529W	3252	13	000 0.0	IKPT NET DEEPEST
930219	0119+12	21-05.600N	179-56.149W	3318	13	000 0.0	IKPT NET FINISH
930219	0128+12	21-05.380N	179-55.959W	3437	13	000 0.0	IKPT NET START (2)
930219	0147+12	21-04.800N	179-55.359W	3601	13	000 0.0	IKPT NET DEEPEST
930219	0201+12	21-04.500N	179-55.159W	3716	13	000 0.0	IKPT NET FINISH (2)
930219	0209+12	21-04.230N	179-54.899W	3765	13	000 0.0	IKPT NET START (3)
930219	0233+12	21-03.330N	179-54.299W	4088	13	000 0.0	IKPT NET DEEPEST
930219	0252+12	21-02.620N	179-53.819W	4248	13	000 0.0	IKPT NET FINISH (3)
930219	0307+12	21-02.100N	179-53.459W	4435	13	000 0.0	IKPT NET START (4)
930219	0338+12	21-01.060N	179-52.719W	4667	13	000 0.0	IKPT NET DEEPEST
930219	0442+12	20-58.690N	179-51.069W	4919	13	000 0.0	IKPT NET FINISH (4)
930219	0450+12	20-58.560N	179-50.979W	4924	13	000 0.0	CTD-RMS START
930219	0535+12	20-58.570N	179-51.049W	4918	13	000 0.0	CTD-RMS DEEPEST
930219	0550+12	20-58.590N	179-51.129W	4917	13	000 0.0	NORPAC NET START
930219	0603+12	20-58.650N	179-51.219W	4916	13	000 0.0	SUNSET
930219	0627+12	20-58.690N	179-51.319W	4914	13	000 0.0	CTD-RMS FINISH
930219	0640+12	20-58.740N	179-51.359W	4910	13	000 0.0	NBS START
930219	0644+12	20-58.750N	179-51.369W	4913	13	000 0.0	NORPAC NET FINISH
930219	0707+12	20-58.890N	179-51.429W	4906	13	000 0.0	NBS SEND MESS
930219	0713+12	20-58.900N	179-51.419W	4910	13	000 0.0	NBS ARR MESS

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930219	0731+12	20-59.020N	179-51.449W	4905	13	000 0.0	NBS FINISH
930219	0742+12	20-59.080N	179-51.479W	4903	13	000 0.0	IKPT NET START
930219	0756+12	20-59.650N	179-51.819W	4887	13	000 0.0	IKPT NET DEEPEST
930219	0816+12	21-00.120N	179-52.069W	4860	13	000 0.0	IKPT NET FINISH
930219	0824+12	21-00.310N	179-52.229W	4839	13	000 0.0	IKPT NET START
930219	0837+12	21-00.800N	179-52.539W	4727	13	000 0.0	
930219	0837+12	21-00.810N	179-52.539W	4722	13	000 0.0	IKPT NET DEEPEST
930219	0855+12	21-01.250N	179-52.809W	4621	13	000 0.0	IKPT NET FINISH
930219	0902+12	21-01.470N	179-52.949W	4574	13	000 0.0	IKPT NET START
930219	0915+12	21-01.930N	179-53.259W	4469	13	000 0.0	IKPT NET DEEPEST
930219	0931+12	21-02.130N	179-53.379W	4426	13	000 0.0	IKPT NET FINISH
930219	0939+12	21-02.290N	179-53.469W	4378	13	000 0.0	IKPT NET START
930219	0947+12	21-02.600N	179-53.669W	4281	13	000 0.0	IKPT W.O 120M
930219	0953+12	21-02.740N	179-53.799W	4219	13	000 0.0	IKMT SIDE NET START
930219	1003+12	21-03.150N	179-54.019W	4125	13	000 0.0	IKPT W.O 68
930219	1041+12	21-04.400N	179-54.789W	3713	13	000 0.0	IKPT NET FINISH
930219	1044+12	21-04.430N	179-54.819W	3701	13	000 0.0	IKMT SIDE NET FINISH
930219	1057+12	21-04.520N	179-54.849W	3670	13	000 0.0	IKPT NET START
930219	1100+12	21-04.650N	179-54.949W	3629	13	000 0.0	IKMT SIDE NET START
930219	1104+12	21-04.810N	179-55.039W	3576	13	000 0.0	IKPT W.O 222M
930219	1110+12	21-05.020N	179-55.179W	3516	13	000 0.0	IKPT W.O 187M
930219	1123+12	21-05.490N	179-55.529W	3387	13	000 0.0	IKPT W.O 135
930219	1201+12	21-06.730N	179-56.439W	2851	13	000 0.0	IKPT NET FINISH
930219	1205+12	21-06.740N	179-56.469W	2850	13	000 0.0	IKMT SIDE NET FINISH
930219	1218+12	21-07.110N	179-56.729W	2591	13	000 0.0	IKPT NET START (3)
930219	1222+12	21-07.300N	179-56.869W	2554	13	000 0.0	IKMT SIDE NET START
930219	1232+12	21-07.680N	179-57.139W	2296	13	000 0.0	IKPT NET DEEPEST
930219	1329+12	21-09.450N	179-58.689W	2712	13	000 0.0	IKPT NET FINISH (3)
930219	1331+12	21-09.460N	179-58.709W	2717	13	000 0.0	IKMT SIDE NET FINISH
930219	1343+12	21-09.780N	179-58.999W	2881	13	000 0.0	IKPT NET START (4)
930219	1348+12	21-09.950N	179-59.159W	2999	13	000 0.0	IKMT SIDE NET START
930219	1401+12	21-10.430N	179-59.649W	3275	13	000 0.0	IKPT NET DEEPEST
930219	1506+12	21-12.440N	179-58.419E	3807	13	000 0.0	IKPT NET FINISH (4)
930219	1510+12	21-12.454N	179-58.386E	3811	13	000 0.0	IKMT SIDE NET FINISH
930219	1517+12	21-12.620N	179-58.209E	3829	13	000 0.0	IKPT NET START (5)
930219	1520+12	21-12.700N	179-58.079E	3864	13	000 0.0	IKMT SIDE NET START
930219	1553+12	21-13.800N	179-56.689E	3942	13	000 0.0	IKPT NET DEEPEST
930219	1648+12	21-15.590N	179-54.409E	3900	13	000 0.0	IKPT NET FINISH (5)
930219	1651+12	21-15.630N	179-54.329E	3900	13	000 0.0	IKMT SIDE NET FINISH
930219	1704+12	21-15.500N	179-54.319E	3900	13	000 0.0	IKPT NET START (4000M)
930219	1819+12	21-12.710N	179-55.699E	3900	13	000 0.0	IKPT NET DEEPEST (4000M)
930219	1827+12	21-12.530N	179-55.789E	3900	13	000 0.0	SUNRISE
930219	2026+12	21-10.630N	179-57.829E	3900	13	000 0.0	IKPT NET FINISH (4000M)
930219	2045+12	21-09.530N	179-58.489E	3604	13	000 0.0	IKPT NET START (200-500)
930219	2048+12	21-09.653N	179-58.385E	5684	13	000 0.0	IKMT SIDE NET START
930219	2236+12	21-13.090N	179-53.909E	4109	13	000 0.0	IKPT NET FINISH (300-400)
930219	2240+12	21-13.150N	179-53.809E	4109	13	000 0.0	IKMT SIDE NET FINISH
930219	2246+12	21-12.950N	179-53.749E	4077	13	000 0.0	IKPT NET START (400-500)
930220	0048+12	21-09.326N	179-56.082E	3867	13	000 0.0	IKPT NET FINISH (400-500)
930220	0105+12	21-08.720N	179-56.439E	3609	13	000 0.0	IKPT NET START (16)

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930220	0209+12	21-06.760N	179-57.589E	3251	13	000 0.0	IKPT NET DEEPEST
930220	0309+12	21-05.575N	179-58.671E	3349	13	000 0.0	IKPT NET FINISH (16)
930220	0319+12	21-05.310N	179-58.839E	3507	13	000 0.0	IKPT NET START (700M)
930220	0404+12	21-04.130N	179-59.779W	3838	13	000 0.0	IKPT NET DEEPEST (W.O.1500M)
930220	0439+12	21-03.126N	179-58.586W	4179	13	000 0.0	IKPT NET DEEPEST (W.O.2070M)
930220	0602+12	21-00.776N	179-56.216W	4674	13	000 0.0	IKPT NET FINISH
930220	0607+12	21-00.710N	179-56.159W	4689	13	000 0.0	SUNSET
930220	0613+12	21-00.740N	179-56.179W	4676	13	000 0.0	CTD-RMS START
930220	0641+12	21-00.670N	179-56.279W	4669	13	000 0.0	CTD-RMS DEEPEST
930220	0700+12	21-00.700N	179-56.329W	4664	13	000 0.0	CTD FINISH
930220	0709+12	21-00.684N	179-56.393W	4655	13	000 0.0	IKPT NET START
930220	0717+12	21-01.000N	179-56.589W	4499	13	000 0.0	IKMT SIDE NET START
930220	0717+12	21-01.014N	179-56.603W	4498	13	000 0.0	IKPT NET DEEPEST (W.O.144M)
930220	0811+12	21-03.134N	179-58.223W	4168	13	000 0.0	IKPT NET FINISH
930220	0813+12	21-03.170N	179-58.259W	4167	13	000 0.0	IKMT SIDE NET START
930220	0820+12	21-03.220N	179-58.349W	4151	13	000 0.0	IKPT NET START
930220	0823+12	21-03.360N	179-58.459W	4102	13	000 0.0	IKMT SIDE NET START
930220	0925+12	21-05.740N	179-59.929E	3295	13	000 0.0	IKPT NET FINISH
930220	0928+12	21-05.760N	179-59.939E	3293	13	000 0.0	IKMT SIDE NET FINISH
930221	0803+12	20-48.270N	173-36.829E	3970	S-17	107 1.8	IKPT NET START
930221	0824+12	20-48.110N	173-35.729E	3953	S-17	000 0.0	IKPT NET DEEPEST
930221	0825+12	20-48.110N	173-35.689E	3952	S-17	000 0.0	ORI SIDE NET START
930221	0855+12	20-47.980N	173-34.699E	3936	S-17	000 0.0	ORI SIDE NET FINISH
930221	0859+12	20-47.980N	173-34.549E	3933	S-17	000 0.0	IKPT NET FINISH
930222	0905+11	20-23.370N	166-39.679E	5474	S-18	131 0.6	IKPT NET START
930222	0926+11	20-22.830N	166-38.489E	5476	S-18	000 0.0	IKPT NET DEEPEST
930222	0927+11	20-22.790N	166-38.439E	5480	S-18	000 0.0	ORI SIDE NET START
930222	0953+11	20-22.260N	166-37.239E	5468	S-18	000 0.0	ORI SIDE NET FINISH
930222	1001+11	20-22.100N	166-36.889E	5476	S-18	000 0.0	IKPT NET FINISH
930223	0348+11	20-13.120N	163-14.739E	2054	14	000 0.0	LAUNCH OF BAITE TRAP
930223	0351+11	20-13.110N	163-14.619E	2072	14	000 0.0	FINISH TO LAUNCH OF BAITE TRAF
930223	0408+11	20-13.180N	163-13.679E	2269	14	000 0.0	CTD-RMS START
930223	0410+11	20-13.190N	163-13.639E	2280	14	000 0.0	NORPAC NET START
930223	0452+11	20-12.920N	163-13.019E	2366	14	000 0.0	NORPAC NET FINISH
930223	0523+11	20-12.700N	163-12.839E	2389	14	000 0.0	CTD-RMS DEEPEST
930223	0635+11	20-12.210N	163-12.379E	2527	14	000 0.0	CTD-RMS FINISH
930223	0646+11	20-12.160N	163-12.229E	2573	14	000 0.0	NBS START
930223	0709+11	20-12.090N	163-11.929E	2570	14	000 0.0	NBS SEND MESS
930223	0710+11	20-12.120N	163-11.889E	2567	14	000 0.0	SUNSET
930223	0721+11	20-12.110N	163-11.799E	2564	14	000 0.0	NBS ARR MESS
930223	0737+11	20-12.060N	163-11.709E	2576	14	000 0.0	NBS FINISH
930223	0743+11	20-12.060N	163-11.659E	2587	14	000 0.0	NBS START
930223	0753+11	20-12.030N	163-11.609E	2604	14	000 0.0	NBS SEND MESS
930223	0803+11	20-11.970N	163-11.579E	2614	14	000 0.0	NBS ARR MESS
930223	0812+11	20-11.880N	163-11.519E	2621	14	000 0.0	NBS FINISH
930223	0816+11	20-11.880N	163-11.489E	2633	14	000 0.0	CHANGED TO DIESEL ENGINES
930223	0816+11	20-11.880N	163-11.479E	2633	14	000 0.0	SLOW AHEAD ENGINES
930223	0903+11	20-18.910N	163-05.529E	1341	14	166 1.0	3M BTR START DOWN
930223	0935+11	20-18.860N	163-05.089E	1334	14	000 0.0	3M BTR ON BOTTOM
930223	1047+11	20-19.000N	163-03.679E	1319	14	000 0.0	3M BTR OFF BOTTOM

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930223	1116+11	20-19.040N	163-03.019E	1317	14	000 0.0	3M BTR ON DECK
930223	1122+11	20-19.050N	163-02.899E	1316	14	000 0.0	VMPS NET START
930223	1145+11	20-18.960N	163-02.649E	1313	14	000 0.0	VMPS NET DEEPEST
930223	1156+11	20-18.910N	163-02.629E	1314	14	000 0.0	VMPS NET FINISH
930223	1211+11	20-18.670N	163-02.599E	1314	14	000 0.0	VMPS NET START
930223	1253+11	20-18.380N	163-02.379E	1305	14	000 0.0	VMPS NET DEEPEST
930223	1313+11	20-18.200N	163-02.339E	1301	14	000 0.0	VMPS NET FINISH
930223	1324+11	20-18.090N	163-02.229E	1300	14	000 0.0	CHRONOMETER CALIBRATION
930223	1413+11	20-17.680N	163-02.079E	1299	14	000 0.0	CHRONOMETER CALIBRATION FIN
930223	1427+11	20-17.570N	163-01.999E	1295	14	000 0.0	BCL STARTED
930223	1457+11	20-17.400N	163-01.709E	1293	14	000 0.0	BCL HIT BOTTOM
930223	1527+11	20-17.370N	163-01.579E	1295	14	000 0.0	BCL ON DECK (FAIL)
930223	1544+11	20-17.200N	163-01.569E	1297	14	000 0.0	IKPT-2000 START
930223	1631+11	20-16.560N	163-03.879E	1297	14	000 0.0	ORI SIDE NET START
930223	1701+11	20-16.300N	163-04.779E	1309	14	000 0.0	ORI SIDE NET FINISH
930223	1713+11	20-16.220N	163-05.119E	1316	14	000 0.0	IKPT-2000 FINISH
930223	1934+11	20-12.890N	163-13.989E	2178	14	000 0.0	POPPING UP OF BAITE TRAP
930223	1951+11	20-13.080N	163-14.409E	2112	14	000 0.0	START TO RETRIEVE OF BAITE TRA
930223	2012+11	20-13.200N	163-14.259E	2111	14	000 0.0	FINISH TO RETRIEVE OF BAITE TRA
930224	1019+10	19-55.880N	161-06.189E	5378	S-19	051 1.3	IKPT NET START
930224	1039+10	19-55.730N	161-05.019E	5394	S-19	000 0.0	IKPT NET DEEPEST
930224	1040+10	19-55.720N	161-04.959E	5395	S-19	000 0.0	ORI SIDE NET START
930224	1109+10	19-55.580N	161-03.819E	5398	S-19	000 0.0	ORI SIDE NET FINISH
930224	1114+10	19-55.540N	161-03.639E	5401	S-19	000 0.0	IKPT NET FINISH
930225	1003+10	18-26.770N	154-37.339E	5650	S-20	090 1.2	IKPT NET START
930225	1024+10	18-26.390N	154-36.219E	5614	S-20	000 0.0	IKPT NET DEEPEST
930225	1024+10	18-26.380N	154-36.189E	5613	S-20	000 0.0	ORI SIDE NET START
930225	1053+10	18-25.880N	154-35.269E	5599	S-20	000 0.0	ORI SIDE NET FINISH
930225	1058+10	18-25.740N	154-35.149E	5612	S-20	000 0.0	IKPT NET FINISH