Preliminary Report

of

The Hakuhō Maru Cruise KH-73-5

November 21 - December 18, 1973

Western North Pacific Adjacent to

Ryukyu and Taiwan Islands

Ocean Research Institute

University of Tokyo

1974

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By

The Scientific Members of the Expedition

Edited by

Syoiti Tanaka

Contents

Introduction

The Cruise KH-73-5 was the second one of a series of expeditions on Japanese eel, Anguilla japonica, to find the spawning ground and to study ecology of eggs and larvae and their environment. The first cruise was made from 20th February to 27th March of 1973 and samplings were conducted in the waters extending from south of Kyushu to east of Taiwan and also in the South China Sea. It was not successful in obtaining leptocephali of A. japonica. In the second cruise, it was planned in principle to sample at the same stations by the same method as the first cruise in order to make comparison between different seasons in the same area. As the number of days assigned to this cruise was 8 days less than that of the first cruise, stations in the South China Sea were omitted. Contrarily, new stations were added on the continental shelf area in the East China Sea.

The cruise extended over 28 days from 21st November to 18th December. on the way, the boat stopped at Naha of Okinawa Prefecture from 8th to 12th of December for supply and recreation of scientists and crews. The track chart is given on page 3. The total number of scientists aboard was 28 and the names are listed on page 3. All scientists engaged in alternating shift in net sampling operations, primary sorting of samples into leptocephali, other fish larvae, and others, and STD and BT observations.

Mostly, large nets of 4 m in diameter of round and hexagon shapes and ORI nets (1.6 m in diameter) were used. In the daytime, these nets were lowered to deeper layers with wire length of 500 m to 2000 m, but at night shallower layers were sampled with wire length of 35 m (surface), 75 m and 150 m. Besides these, the surface layer was sampled with a larval net of 1.6 m in diameter and NORPAC nets. Most of net towings were made with the ship speed of 1.5 knot.

As for environment, water temperature was observed with BT at each sampling station and others. STD operations were made at 11 stations and at the same time water samples for chemical analyses were taken from various depthes.

In the evening of 27th November, leptocephali of A. japonica were obtained at St. 10 and then the course of cruise was changed substantially from the planned one, and night towings were intensified. Frequent BT observations were made at a 12 miles interval (every one hour of cruise).

All samples obtained were sorted into three categories and then examined in detail by individual scientists. Some of live larval fish in good condition were used for the test of swimming speed. Oil globules were examined for their abundance and sessile organisms attached to them. A new method was tried for estimating the towing depth of net and the tension of the wire was measured while towing. Besides net towings, test fishing was conducted at two stations with new vertical long lines which were constructed as a tool for sampling nekton. The echo sounder operation was performed from time to time while cruising.

Although the weather condition was not quite favorable, scientific works were carried out quite satisfactory and very significant results were obtained including the first mass collection of leptocephali of A. japonica. Without the full support and timely co-operation of Captain I. Tadama and all the crew of the R.V. Hakuho-Maru, such fruitful results could not be achieved. On behalf of all scientists aboard, I wish to express our profound thanks to them. Further I should like to pay my hearty respects to the sincere effort of the scientists devoted to their purposes.

Syoiti Tanaka

Chief Scientist

Scientists Aboard

Ocean Research Institute, University of Tokyo
TANAKA, Syoiti KAJIHARA, Takeshi ISHII, Takeo SAKAMOTO, Wataru
HASUMOTO, Hiroshi OTOBE, Hirotaka INAGAKI, Tadashi SHIRAISHI, Manabu
MATSUMIYA, Yoshiharu TSUKAMOTO, Katsumi HARUTA, Chikakuni ABE, Hitoshi
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Faculty of Agriculture, Kyushu University
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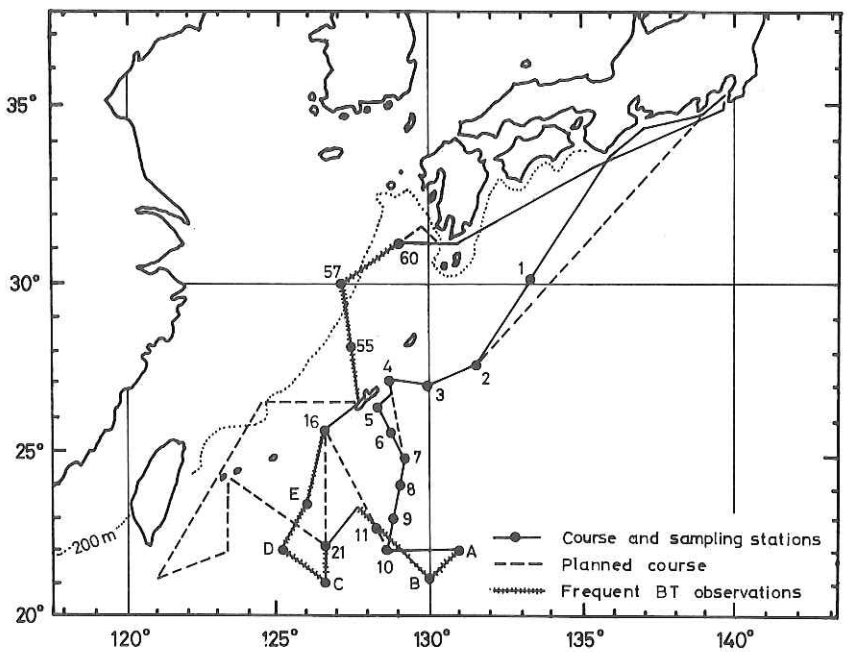
Faculty of Fisheries, Nagasaki University
KAKUI, Akira

Faculty of Fisheries, Kagoshima University
SAISHO, Toshio OZAWA, Takakazu

Track Chart of Cruise KH-73-5



1. Studies on Leptocephali

1.1 Anguillid leptocephali

T. Takai and O. Tabeta

Fifty-two specimens of anguillid leptocephali were obtained in the water south of Okinawa with the larva net of 4-meter-diameter on November 27 - December 5, 1973.

Materials examined The 52 specimens consist of 49 specimens belonging to the developing stage, and 3 to the metamorphosing stage. Localities, collection methods, dates and times are shown in Table 1 and Appendix Table I.

Description Measurements in the preserved specimens in 10% sol. of neutralized formalin with borax (mm): total length 47.3-60.2 (mean 53.4), 47.3-58.7 in the developing specimens, 53.1-60.2 in the metamorphosing specimens. Total myomeres 113-119 (116), predorsal 64-72 (67) in the developing specimens, 36-57 in the metamorphosing specimens, ano-dorsal 6-13 (8-9), preanal 70-80 (77) in the developing specimens, 44-63 in the metamorphosing specimens. First vertical blood vessel at myomere 14.0-17.0 (16.0), 2nd at 36.5-40.0 (38.0), 3rd (last) at 42.5-46.0 (44.0). Anterior margin of the gall bladder at myomere 24.0-30.0 (27.0) in the developing specimens, 20.0-28.0 in the metamorphosing specimens. Dorsal fin rays 235-270 (255.6), anal 208-232 (218.1), pectoral 17-20 (18), caudal 9-10 (10). Teeth $\frac{1 + 1 + V - VII + 10 - 16}{1 + 1 + VI - XIII + 3 - 6}$ in the developing specimens, $\frac{0 + 0 + 0 \quad + 0}{0 + 0 + 0\text{-}I + 0}$ in the metamorphosing specimens.

Body elongate, compressed, comparatively deep, olive-leaf form in the developing specimens; not so deep, anterior and posterior parts rather sub-cylindrical in the metamorphosing specimens. Head short, about 8% in total length; nasal organ well developed, frontal nasal tubes protrude. Teeth developed in the developing specimens; no teeth in the metamorphosing specimens except for 60.2 mm specimen which has I on the left and II on the right lower jaws. Gape oblique, extending over the level of middle of the eye. Color translucent, with black pigment confined to chorioid of the eye.

These specimens belong unquestionably to Anguilla japonica T. et S.

1.2 Other leptocephali

T. Takai and O. Tabeta

Other leptocephali were collected at the various depths from surface to about 1,000 meters with the larva net of 4-meter-diameter, standard fish-larva net, ORI-100 net at 21 stations. The results obtained are shown in Table 1.

These leptocephali appeared in 187 of the 238 samples obtained at 21 stations, and counted 4,407 specimens. Most of them belong to Anguillida (4,404 specimens); the remnants are referable to Clupeida (3 specimens). Anguillida leptocephali represent 11 families such as Congridae (3,606 specimens: 83.0% of total specimens), Nemichthyidae (311 specimens: 7.2%), Muraenidae (123 specimens: 2.8%), Xenocongridae (108 specimens: 2.5%), Echelidae (88 specimens: 2.0%), etc. In this treatment Serrivomeridae larvae are included in Congridae, and Saurenchelydae (D'Ancona 1928) larvae in Nettastomidae (Table 1). Congridae is the most abundant family with more than 25 species, the conspicuous genera of which are Rhynchocymba (about 1,500 specimens of 4 species) and Alloconger (about 1,000 specimens of more than 6 species). Comparing with the results obtained in the first cruise, KH-73-2, Xenocongridae larvae increased the number by quintuple as many as the former (22 specimens), while Cyemidae larvae could not be observed in the collections.

Table 1. Leptocephali collected in each station.
Negative stations are omitted.

Station No.	ANGUILLIDA										CLUPEIDA		Total
	Anguillidae	Congridae	Nemichthyidae	Muraenidae	Xenocongridae	Echelidae	Nettastomidae	Ophichthyidae	Moringuidae	Synaphobranchidae	Elopina	Unidentified	
2- 1		49	2	1									52
2- 2		28	3		1	1							33
2- 3			1										1
3- 1		13	2										15
4- 1		4	3	1		1							9
4- 3			1										1
4- 5		7	1		2				2				12
4- 6		3	1	1									5
4- 7		1	1		1								3
5- 1		2			1								3
6- 4		2											2
6- 5		2											2
6- 6		1	2										3
6- 7		3		1									4
6- 8			1										1
6- 9			3										3
6-10					1								1
6-11		2	2										4
6-12		2		1									3
8- 1					1								1
9- 1		7	1	1									9
9- 2		14	4										18
10- 1		1											1
10- 2		1											1
10- 3										1			1
10-10									1	1		1	3
10-11		1	1		1								3
10-15	2	55	2	4	1	5	1					1	71
10-16		18	1				1						20
10-17		248	9	3		5							265
10-18	1	95	4	1	1	2							104
10-19		1											1
10-20		11											11
10-21		74	4			1							79
10-22		299	4			4							307
10-23	3	238	1	4		2	4	1					253
10-24		73	1	1		2							77
10-25		152	4	2		4							162
10-27		1											1
10-28		88	7	2		5							102
10-29	1	25	4	1	1	1							33
10-30		83	3	4								1	91
10-31	4	89	1		1	1							96
10-32		97	3										100
A- 1		5	1										6

Table 1. (Continued)

Station No.	ANGUILLIDA										CLUPEIDA		Total
	Anguillidae	Congridae	Nemichthyidae	Muraenidae	Xenocongridae	Echelidae	Nettastomidae	Ophichthyidae	Moringuidae	Synaphobranchidae	Elopina	Unidentified	
A- 2		3						1					4
A- 3		3				1							4
A- 4		1											1
A- 5		1											1
A- 6		1	1					1					3
A- 7		1											1
A- 8					1								1
A- 9		2	1				1						4
A-10				1									1
A-11		1											1
A-12		1											1
B- 1	2	27	10		2								41
B- 2		7	1										8
B- 3			1										1
B- 4		5											5
B- 5		29	5	2	1								37
B- 6		36	11	2	2	2		1	1				55
B- 7		43	5	2	2				1				53
B- 8		30	3	4	3	1	1					1	43
B- 9		29	4	6	4	2			1			1	47
B-10		56	5	6	5	5			1				78
B-11		33	5	4	6	4							52
B-12		30	7	6	3								46
B-13		37	6	1	4	2							50
B-14		45	7	4	4	2	2					1	65
B-15		39	6	3		7	9		1			2	67
B-16		20	3	4	6	2							35
11- 1		12	2	3									17
11- 4		9	1										10
11- 5	1	3	4		1								9
11- 6	1	7	4		1			1					14
11- 7		5	2					1					8
11- 8		8	2		2								12
11- 9		8	5		1								14
11-10	1	9	1		3								14
11-11		4			2							2	8
11-12		3	2										5
11-13		3	1	1									5
11-14		6	1		2							1	10
11-15		2			1								3
11-16		1	1	2	1								5
21- 1		1											1
21- 2	1	13	6										20
21- 3		9	3	1	1								14
21- 6		9	2									1	12
21- 7		12	7		1	1							21
21- 8		7	3		1								11
21- 9	4	3		1	1								9

Table 1. (Continued)

Station No.	ANGUILLIDA										CLUPEIDA		Total
	Anguil-lidae	Congridae	Nemich-thyidae	Muraenidae	Xenocong-ridae	Echelidae	Nettasto-midae	Ophich-thyidae	Morin-guidae	Synaphob-ranchidae	Elopina	Uniden-tified	
21-10	1	9		1	1								12
21-11		5										1	6
21-12	3	4	1		2								10
21-13	2	5			2								9
21-14		4	1		1								6
21-15	4	5	1		1			1					12
21-16	2	7	2	1	1							1	14
21-17		2											2
C- 6		7	6	1									14
C- 7		6	4	1									11
C- 8	1	11	3										15
C- 9		6	3									1	10
C-10		5	1	1									7
C-11		2	2										4
C-12	1	6	2										9
C-13		9	4										13
C-14		10	2										12
C-15		1										3	4
C-16	1	9	1										11
C-17	2	13	4										19
C-18	1	3	1		2								7
D- 2					1								1
D- 3	2		2	1									5
D- 4	4	54		1		1			1				61
D- 5		3											3
D- 6		1											1
D- 7	1	26	4										31
D- 8		10	2										12
D- 9	3	19	7	2	2		2					1	36
D-10		5	3		1								9
D-11		10	7		1								18
D-12		19			1								20
D-13		4	5	1									10
D-14		10	2	1									13
D-15	1	6	2	2	1								12
D-16		17	5		2								24
D-17		16	6		1								23
D-18		11	1	2									14
D-19		5			2	1							8
E- 1				1									1
E- 2	1	7					1						9
E- 3		7											7
E- 4		2	2						1				5
E- 5	1	2			1								4
E- 6		9	3		2							1	15
E- 7		3			3				1				7
16- 2		3	2		1		1					1	8
16- 3		2	1				1						4

Table 1. (Continued)

Station No.	ANGUILLIDA										CLUPEIDA		Total
	Anguil-lidae	Congridae	Nemich-thyidae	Muraenidae	Xenocong-ridae	Echelidae	Nettasto-midae	Ophich-thyidae	Morin-guidae	Synaphob-ranchidae	Elopina	Uniden-tified	
16- 6		1	1										2
16- 7		5		3	2		1	1					12
16- 8		4	3	1	1				1		1		11
16- 9		4	4									2	10
16-10		4	1	1								1	7
16-11		2		1									3
55- 1		16											16
55- 2		7											7
55- 3		3											3
55- 4		2	1										3
55- 5		2											2
55- 6				2									2
55- 7		1					1						2
55- 9												1	1
55-10					1								1
55-11		1					1						2
55-12			3	3									6
55-14		8			1		1						10
57- 2		8		1		1	1						11
57- 5		30		3			3	1					37
57- 6		17		1			2						20
57- 7		4		1			1						6
57- 8		21		4		2	1						28
57- 9		42				2	2						46
57-10		8					1				1		10
57-11		15				1	2						18
57-12		3											3
57-13		6				1							7
57-14		6		1									7
57-15		7											7
57-16		4											4
60- 1		3											3
60- 2		3											3
60- 3		68				2	1					1	72
60- 4		53				4							57
60- 5		87				2	4	1			1	1	96
60- 6		79				2	8						89
60- 7		93					3						96
60- 8		103		2	1	4	3						113
60- 9		34				2							36
60-10		27					1		1				29
60-11		7											7
60-12		2											2
60-13		4											4
60-14		13					1						14
60-15		10		2				1				1	14
Total	52	3606	311	123	108	88	62	12	12	2	3	28	4407

2. Studies on Abiotic Environment

2.1 Spatial measurement of water temperature fluctuations by means of STD and BT

W. Sakamoto, H. Hasumoto, H. Otobe and T. Nakao

With the purpose to know the pattern of sea current and mixing of waters so as to get information on the environmental conditions of larval Japanese eels and their transportation from the spawning ground to Japan, temperature and salinity were measured by means of STD (HYTECH Model 9006) at 11 stations.

After the survey at St. 10, frequent BT observations were added to the routine works to calculate the direction of water movement, which were carried out every 12 miles intervals from surface to 250 m depth through the course of St. 10 to St. 60. The water movement would be shown by the difference of isothermal components which were obtained by the combination of two or three stations (10 to 20 BT observations) and some information has been obtained about the direction from which larval eels had been transported. This method seems to be effective for the study to relate the water movement with the behavior of plankton or other micro-nekton.

Data obtained by BT and STD observations are tabulated in Appendix Tables II and III.

2.2 On the living environment of the Japanese eel in larval stage

T. Nakao

The present study has been conducted in order to find out the living environment of the Japanese eel in larval stage. The vertical profiles of water temperature and salinity were constructed to about 1000 m depths by means of STD. Chemical analyses of sea water (dissolved oxygen, salinity, phosphate-P and silicate) on 108 water samples collected from 10 stations by means of Rosette Multi Sampler were conducted in due course the Oceanographic Manual, Japan (published in 1970). Further, for the purpose to obtain the detailed thermal conditions, water temperature was measured by BT at intervals of about 12 sea-miles apart

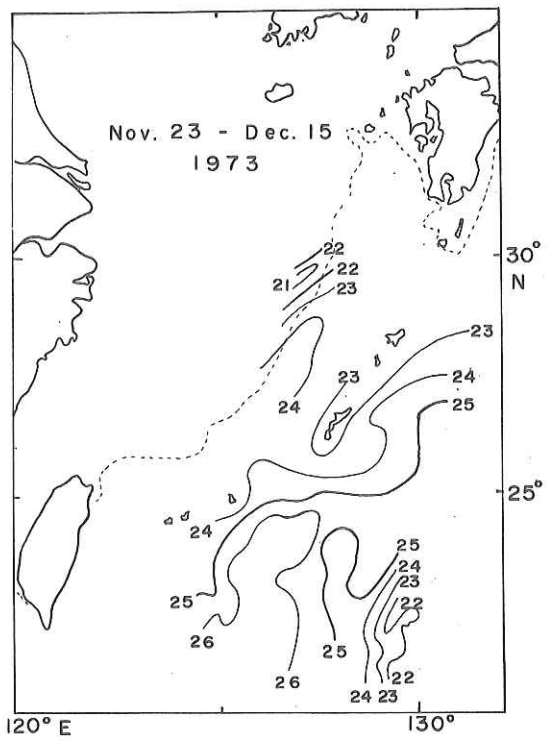
during the cruise. According to the result of our survey, the stations where the Japanese eels in larval stage were caught were located in a warm water region. In this region, water temperature, salinity, phosphate-P, silicate and dissolved oxygen at depths of 100 m and 200 m are as shown in Table 2. Iso-thermal lines are drawn for layers of 100 m depth and 200 m depth in Figs 1 and 2, respectively.

Further detailed studies shall be followed later under the guidance of Prof. Michitaka Uda.

Table 2. The ranges of water temperature and concentration of various substances.

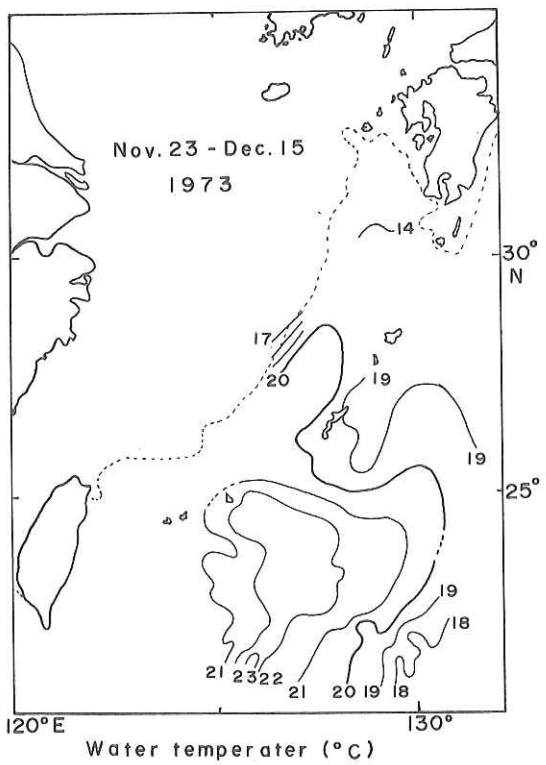
	T(°C)	S(°/oo)	PO_4-P	Si	O_2
At 100 m depth	23 - 26	34.60 - 34.88	0.01 - 0.03	1 - 8	4.32 - 4.82
At 200 m depth	18 - 23	34.79 - 35.00	0.14 - 0.44	1 - 9	4.26 - 4.50

Range of region where eel larvae were caught: 21°N to 24°N, 125°E to 130°E.
Corresponding period: November 27 to December 6, 1973.



Water temperature (°C) at 100 m depth

Fig. 1.



Water temperater (°C) at 200 m depth

Fig. 2.

3. Studies on Eggs and Larvae of Fishes

3.1 The distribution of fish and larvae

S. Matsui, T. Honda, S. Fujii and H. Tsukahara

In order to study on the distribution of fish eggs and larvae, that was one of the main objects in this cruise, samples were collected by various methods with 4m ϕ, 1.6m ϕ and ORI nets. The numbers of collected fish eggs and larvae were shown in Table 3. In this table, only about a half of the total samples are contained and another half is being analysed by T. Ozawa (Kagoshima University). Our samples were composed, on the average number, of 69% Engraulidae, with other main components ranking as follows: Gonostomatidae 7.8%; Bothinae 3.7%; Myctophidae 3.3%; Paralepididae 1.8%; and Stomiatidae 1.0%. Stolepholus sp. occupied 99.8% in Engraulidae. In this report, only the list of fish eggs and larvae collected is shown. For ecological studies of fish eggs and larvae the results will be reported elsewhere after completion of all data analyses.

Table 3. List of fish species collected by larval net hauls during KH-73-5 cruise (I).

	1-1	1-3	2-3	3-1	3-3	4-4	5-1	5-3	6-3	7-1	7-2	8-3	9-1	9-2	9-3	A-3	B-3	21-4	D-6	E-1	E-2	E-3	E-4	E-5	E-6	E-7	16-4
Engraulidae																											
Engraulis							5																				
Stolephorus					3	88		1	13	5		1	552	1006	341	218	36	55	46		416	420	223	99	47	64	38
Thrissa																											
Gonorhynchidae																											
Gonorhynchus	1			4									4	9	9												
Bathylagidae																											
Bathylagus																											
Gonostomatidae			2		3										1					3							
Pollichthys							1			2				3													
Diplophos	1			1		2	4						19	10		2	5	2									
Vinciguerria	33		67	9	1	76	26	1	1	2	2		11	4	3		12			2	2			2		3	102
Cyclothone	3		24	104		8	1	11							1		1			151							36
Gonostoma	4						15			14										9							
Valenciennellus				3																							
Maurolicus							1																				
Sternoptychidae				1																1							
Argyropelecus				1																							
Sternoptyx				1																							
Chauliodontidae																											
Chauliodus				2			6			1			3		2					1	1						
Stomiatidae																											
Stomias							4			1				2				3		1	1	4	3	3	2	1	3
Astronesthidae														1							1	1		1	1	1	
Idiacanthidae																											
Idiacanthus																											
Melanostomiatidae							1		3	1			8	7	4	3			2		1			2	1		
Eustomias															1		2	1			6	3	5		4	3	
Chlorophthalmidae																											
Chlorophthalmus																											
Synodontidae																											
Trachinocephalus	1		26	6									7														
Synodus													1														2
Saurida																											
Myctophidae	20		27	8	5	122	1	9	11	3			2	1	74	11	21	13		2		1					60
Scopelarchidae							4																				
Scopelarchus				1																							
Paralepididae	1		1	4	1	8	5	1		1	7		5	12	7	4	4	2		1				1	1		16
Evermannellidae																											
Coccorella													1														
Evermannella																											
Aulostomidae																											
Fistularia				1																							1
Macrorhamphosidae																											
Macrorhamphosus																											
Holocentridae																											
Holocentrus																											
Melamphasidae																											
Melamphaes										1																	
Trachipteridae																											
Trachipterus					2	1	1		2						1		1										
Mugilidae																											
Liza																											
Scombridae																											
Thunnus																		1									
Euthynnus																											
Katsuwonus						2							2	3	4	2		3	1								1
Auxis									1																		2
Histiophoridae																											
Tetrapturus																											
Gempylidae	7			1		1	54	5		2								1									
Diplospinus							1																			1	1
Nesiarchus							1																				
Lepidopidae																											
Trichiuridae													1		4		2	1	1								6
Coryphaenidae																											
Coryphaena					1	1	1		1									1	1								
Lepidotidae				2				1	1																		
Pteraclidae																											
Centropholis							4																				
Carangidae									1																		
Decapterus							2		25						1												5
Trachurus																											
Caranx																											
Naucrates				1																							
Nomeidae																											
Psenes																											
Apogonidae									1																		
Serranidae				1			10		3						1												2
Kyphosidae																											
Kyphosus							2																				
Bembropidae																											
Champsodontidae																											
Champsodon							3																				
Uranoscopidae																											
Gnathagnus																											
Blenniina							1																				
Schindleridae																											2
Schindleria																											2
Carapidae																											
Carapus																											1
Gobiidae						12			6						2												2
Pomacentridae																											
Labridae													2			1	1				1	1	1				1
Chaetodontidae							1																				
Acanthuridae																											
Acanthurus							1																				
Naso						1	1																				
Balistidae														1													
Tetraodontidae																											
Diodontidae																											
Diodon																											
Scorpaenidae							8		2	1			1														
Platycephalidae															2												1
Triglidae																											
Bothinae				5	1		3	3		2			6	5		22					15	7	17	4	11	16	
Arnoglossus																											
Psettina																											
Cynoglossidae																											
Bregmacerotidae																											
Bregmaceros						1	3			1																	14
Antennariidae							1																				
Ceratiina																											
Ceratiidae																											
Cryptopsaras							1						1							1							
Melanocetidae																											
Melanocetus																											
Gigantactinidae																											
Gigantactis																											
Unidentified	1		65	1	16	9	6	5	4		7	2		1	8	1	14	5	3		1		2		2		28
Egg	4	101	26	1	127	151	33	132	346	22	183	107		14	22	80	104	3	30			1			2		2
Total	76	101	238	156	161	483	212	169	421	59	199	110	626	1079	488	344	204	91	84	172	445	438	251	90	71	89	328

Table 3. List of fish species collected by larval net hauls during KH-73-5 cruise (II).

	10-1	10-3	10-5	10-7	10-9	10-10	10-11	10-12	10-14	10-15	10-16	10-17	10-18	10-19	10-21	10-22	10-23	10-24	10-25	10-26	10-28	10-29	10-30	10-31	10-32	10-34
Engraulidae																										
Engraulis	43	14				2	2	29		71	17	217	383	282	173	726	1943	3359	1487	264	900	163	310	737	831	195
Stolephorus										3	1		11		6	10	12	31	6	2	10	1	3	3	7	3
Thrissa																										
Gonorhynchidae																										
Gonorhynchus																										
Bathylagidae																										
Bathylagus			1																							
Gonostomatidae		1								5	1	2	2			2	6	3	11		8	6	2	3	2	
Pollichthys		2					5	37	1	7		9	10	7	5	24	42	51	42	1	19		4		5	
Diplophos		10	2			1	5	12	2	35	12	4	1		3		67	1	8	2	2	43	45	10	4	10
Vinciguerria		315				116	65	60		4		3		1	1			3	1							
Cyclothone		2						2													2	1				
Gonostoma																										
Valenciennellus																										
Maurolicus						1	3	3																		
Sternoptychidae						1																				
Argyropelecus		1																								
Sternoptyx																										
Chauliodontidae																										
Chauliodus		2																								
Stomiatidae																										
Stomias		1		3						1			1			1	1		1		1	3	1	3	2	1
Astronesthidae								1								1					1			1		
Idiacanthidae																										
Idiacanthus		3	1	2		1	3	5	1	4	2	2					14	12	13	1	9	6	7		1	
Melanostomiatidae										1			1		1						1	1	1			
Eustomias																										
Chlorophthalmidae																										
Chlorophthalmus																										
Synodontidae																										
Trachinocephalus	7									2		19	7		9	13	9	26	29	9	16	1	7		11	2
Synodus								1				1	2				12	1	2	1	2	1		1		
Saurida																	1									
Myctophidae		1				1	9	8	3	11		2	4	20	1	4	22	12	9	26	3	1	1	5		11
Scopelarchidae																										
Scopelarchus		1																								
Paralepididae	1	4		1				2		4	3	6	5	2	5	3	24	16	21	4	14	6	10	8	3	8
Evermannellidae																										
Coccorella		1																	1							
Evermannella																										
Aulostomidae																										
Fistularia													1													
Macrorhamphosidae																										
Macrorhamphosus																										
Holocentridae																										
Holocentrus							1									1										
Melamphasidae																										
Melamphaes																										
Trachipteridae																										
Trachipterus			1	3			4	6		1					1	2	2									
Mugilidae																										
Liza								1																		
Scombridae																										
Thunnus																	1									
Euthynnus																										
Katsuwonus													1	1	1	4	7	1	3	2			1	2	2	1
Auxis																										
Histiophoridae																										
Tetrapturus																										
Gempylidae						3									1				2					2		
Diplospinus																										
Nesiarchus																										
Lepidopidae																										
Trichiuridae		3					2	2								1					1					
Coryphaenidae																										
Coryphaena			1	3			1	1						1		3										1
Lepidotidae		1								2																
Pteraclidae																										
Centropholis																										
Carangidae																										
Decapterus																										
Trachurus																										
Caranx																										
Naucrates																										
Nomeidae																										
Psenes																										
Apogonidae												1					2	6								
Serranidae																										
Kyphosidae																										
Kyphosus																										
Bembropidae																										
Champsodontidae																										
Champsodon							1	1																		
Uranoscopidae																										
Gnathagnus																										
Blenniina																										
Schindleridae																										
Schindleria																		1		1						
Carapidae																										
Carapus						1						1	1								2				2	
Gobiidae										4						1	6					1				
Pomacentridae												1							3		1					
Labridae		2					1	1		3	1	1	6		3	1	9	2	3	2	4	13	3	2		
Chaetodontidae								1																		
Acanthuridae																										
Acanthurus		1																								
Naso						1																				
Balistidae																										
Tetraodontidae																										
Diodontidae																										
Diodon																										
Scorpaenidae		1					7	2		4									2				1			
Platycephalidae																										
Triglidae																										
Bothinae	2	26				6	20	36		62	22	57	46		12	20	74	80	243	10	112	35	92	55	16	1
Arnoglossus																								1		
Psettina																										
Cynoglossidae							2										1									
Bregmacerotidae																										
Bregmaceros		1					2	4		5	1	2					3	2					2			
Antennariidae																										
Ceratiina														1												
Ceratiidae																										
Cryptopsaras		1															1		1							
Melanocetidae																										
Melanocetus								2		1																
Gigantactinidae																										
Gigantactis																										
Unidentified		2		2	3		1	5	4	4					2	1	1	1	4	4	1		1	1	2	4
Egg	14	3	63	157	35		10	21	217	7	3	45			233		26	16	1	39	59			15	4	10	21
Total	67	399	69	159	50	134	114	241	228	241	63	373	482		550	223	844	2277	3611	1929	375	1107	283	505	838	898	258

Table 3. List of fish species collected by larval net hauls during KH-73-5 cruise (III).

	C-1	C-2	C-4	C-5	C-6	C-7	C-8	C-9	C-10	C-11	C-12	C-13	C-14	C-16	C-17	C-18
Engraulidae																
Engraulis	2	15	3	43	331	156	433	58	18	11	351	178	239	268	306	174
Stolephorus																
Thrissa																
Gonorhynchidae																
Gonorhynchus													1	1		3
Bathylagidae																
Bathylagus																
Gonostomatidae			1													
Pollichthys													1		2	
Diplophos																
Vinciguerria						1	4	12	2	2	8	11	3	2	2	2
Cyclothone	131															
Gonostoma	2															
Valenciennellus																
Maurolicus																
Sternoptychidae																
Argyropelecus																
Sternoptyx																
Chauliodontidae																
Chauliodus	1															
Stomiatidae																
Stomias	1					2	4				9	2	8		4	1
Astronesthidae	1					3	2	1								
Idiacanthidae																
Idiacanthus																
Melanostomiatidae	1			1			1		2			1	2	1		1
Eustomias					1	4	2	2			1		1		2	
Chlorophthalmidae																
Chlorophthalmus																
Synodontidae																
Trachinocephalus																
Synodus																
Saurida																
Myctophidae			115				1	1			2		1	2	3	6
Scopelarchidae																
Scopelarchus					1	2	1	1	1	2	2	4	6	1		2
Paralepididae																
Evermannellidae																
Coccorella																
Evermannella																
Aulostomidae																
Fistularia																
Macrorhamphosidae																
Macrorhamphosus																
Holocentridae																
Holocentrus																
Melamphasidae																
Melamphaes																
Trachipteridae																
Trachipterus													1			
Mugilidae																
Liza																
Scombridae																
Thunnus		1		1	1	3	1									
Euthynnus															4	1
Katsuwonus					3	1							1	2	1	
Auxis																
Histiophoridae																
Tetrapturus			5													
Gempylidae			9			1									3	3
Diplospinus																
Nesiarchus																
Lepidopidae																
Trichiuridae																
Coryphaenidae																
Coryphaena																
Lepidotidae						1										
Pteraclidae																
Centropholis																
Carangidae																
Decapterus																
Trachurus																
Caranx																
Naucrates																
Nomeidae																
Psenes																
Apogonidae																
Serranidae																
Kyphosidae																
Kyphosus																
Bembropidae																
Champsodontidae																
Champsodon														1		
Uranoscopidae																
Gnathagnus																
Blenniina											1					
Schindleridae																
Schindleria																
Carapidae																
Carapus																
Gobiidae																
Pomacentridae																
Labridae							1				1					1
Chaetodontidae																
Acanthuridae																
Acanthurus																
Naso																
Balistidae																
Tetraodontidae																
Diodontidae																
Diodon																
Scorpaenidae											1					
Platycephalidae																
Triglidae																
Bothinae					3	4	4	2		1	2	4	5	4	3	1
Arnoglossus																
Psettina																
Cynoglossidae																
Bregmacerotidae																
Bregmaceros				1												
Antennariidae																
Ceratiina			1													
Ceratiidae																
Cryptopsaras																
Melanocetidae																
Melanocetus																
Gigantactinidae																
Gigantactis	1															
Unidentified	2		7			1		1	2							
Egg		2	19	4	6					4	5	3	2	1	5	6
Total	142	18	160	50	346	179	454	78	25	20	383	203	271	273	335	200

Table 3. List of fish species collected by larval net hauls during KH-73-5 cruise (IV).

	55-2	55-3	55-4	55-5	55-6	55-7	55-8	55-9	55-10	55-11	55-12	55-13	55-14	60-1	60-3	60-4	60-5	60-6	60-7	60-8	60-9	60-10	60-11	60-12	60-13	60-14	60-15
Engraulidae																		2									
Engraulis																											
Stolephorus	18	20	1	18	41	42	8	4	47	48	263	487	164	1						5	6	9	4	6	4	7	6
Thrissa	1																										
Gonorhynchidae																											
Gonorhynchus	1				1																						
Bathylagidae																											
Bathylagus														1		2	2			1	1		1				
Gonostomatidae		1																									
Pollichthys			5	7	2	3		2	2		1		4						1								
Diplophos		2	2	1	9	3	2				7	8	4			1			1								
Vinciguerria	67	80	17	14	11	22	8	12	5	2	1	3	5				3	2			1						2
Cyclothone		5	1				2		3		1		17														
Gonostoma	13		7	12	8	13		13	16	3																	
Valenciennellus																											
Maurolicus													1														
Sternoptychidae													1														
Argyropelecus																											
Sternoptyx																											
Chauliodontidae																											
Chauliodus		4	8	10	1	8	5	6	7	1	5	1	3						1								
Stomiatidae																											
Stomias	6	32	9	12	13	7	10	17	12	1	17	17	38														
Astronesthidae	1	2	2	3	1	3	1	4	2		1	1															
Idiacanthidae																											
Idiacanthus													1														
Melanostomiatidae	1	5			1	1					2	2					1										
Eustomias		3				1		2			2	6	1														
Chlorophthalmidae																											
Chlorophthalmus																											
Synodontidae																											
Trachinocephalus						1								1			2		1								
Synodus		1		1																							
Saurida																											
Myctophidae	158	80	26	26	17	46	6	37	15			1	18			2	2	1		1						1	1
Scopelarchidae													8														
Scopelarchus														1													
Paralepididae	31	38	20	12	23	21	9	14	9		3	22	12			2	2	3	1	2	1	1					
Evermannellidae		3																									
Coccorella																											
Evermannella			2		1	2	1						1														
Aulostomidae																											
Fistularia																											1
Macrorhamphosidae																											
Macrorhamphosus															1							1					
Holocentridae																											
Holocentrus																											
Melamphasidae																											
Melamphaes																											
Trachipteridae																											
Trachipterus																											1
Mugilidae																											
Liza																											
Scombridae																											
Thunnus																											
Euthynnus																											
Katsuwonus												1															
Auxis																											
Histiophoridae																											
Tetrapturus																											
Gempylidae	4	5			1	1		1		1		1	1	1													
Diplospinus																											
Nesiarchus																											
Lepidopidae								3															1				
Trichiuridae	1					1							4														
Coryphaenidae																											
Coryphaena																											
Lepidotidae													1													1	
Pteraclidae																											
Centropholis																											
Carangidae													1														
Decapterus																									1		
Trachurus																		1		1							
Caranx																		11	1			1			2	1	
Naucrates																											
Nomeidae																1											
Psenes																										1	
Apogonidae																											
Serranidae											3		4	2						1	1	2				2	
Kyphosidae																											
Kyphosus																											
Bembropidae																				2							
Champsodontidae																											
Champsodon		1												1	3		2				2					4	2
Uranoscopidae																											
Gnathagnus																				1					1		
Blenniina																							7				
Schindleridae																											
Schindleria									1																		
Carapidae																											
Carapus														2		1	1	2									
Gobiidae	1	3															1						1			1	
Pomacentridae													1														
Labridae		2			1							3	1				2				1					1	
Chaetodontidae																											
Acanthuridae																											
Acanthurus		1																									
Naso													1														
Balistidae																											
Tetraodontidae																1											
Diodontidae																											
Diodon																		1									
Scorpaenidae		1										1	2	1			1			1			2			4	2
Platycephalidae																											
Triglidae																				2				1		1	
Bothinae		1	2		1					1	3	8	4	5		7	7	3	3	9	5	8	7	1	3	4	9
Arnoglossus																					1	4				1	
Psettina																						1					
Cynoglossidae																											
Bregmacerotidae																											
Bregmaceros	3	1	2	2		3		1	1			1	14					1									
Antennariidae																											
Ceratiina																											
Ceratiidae																											
Cryptopsaras																											
Melanocetidae																											
Melanocetus													1														
Gigantactinidae																											
Gigantactis																											
Unidentified	1	19	3	11	15	21	5	1	1			1	2	1	5	3	2			1	1				2	1	6
Egg	3	1	2			1		2		1		1			9			1									
Total	310	311	109	129	147	200	57	119	121	58	309	565	315	17	18	20	33	28	9	28	19	27	14	17	13	28	32

Table 3. List of fish species collected by larval net hauls during KH-73-5 cruise (V).

	11-1	11-2	11-4	11-5	11-6	11-7	11-8	11-9	11-10	11-11	11-12	11-13	11-14	11-15	11-16	57-3	Total
Engraulidae																	54
Engraulis	1770	1297	693	125	113	53	219	143	148	54	50	26	64	47	56		24,382
Stolephorus																	1
Thrissa																	
Gonorhynchidae																	
Gonorhynchus	1					1	2		1	2	1	1		2	3		157
Bathylagidae																	
Bathylagus																	8
Gonostomatidae																	12
Pollichthys	4		3	2	9	5	6	1	3			1	4	2	3		130
Diplophos	3	2	1	2	2		1	3	7	6	1	4	1		1		394
Vinciguerria	29		14	2	2	2	5	1	2	6	7	4	10	1	10		1037
Cyclothone							1										1066
Gonostoma																	140
Valenciennellus																	3
Maurolicus																	2
Sternoptychidae																	10
Argyropelecus																	3
Sternoptyx																	1
Chauliodontidae																	
Chauliodus				1					1					1			82
Stomiatidae																	
Stomias	4	4	7		1		5	2	11	17	9	6	7	10			383
Astronesthidae	1			1	1				1				1				43
Idiacanthidae																	
Idiacanthus																	1
Melanostomiatidae	1		1			2		4	6	4	1		3	1	7		123
Eustomias			2		1	2				1	1	2	1	1	1		71
Chlorophthalmidae																	
Chlorophthalmus					1			2									3
Synodontidae	1																1
Trachinocephalus	1		1	1		1	2		2		1	5	1		7		231
Synodus			1				1		1					1			33
Saurida																	1
Myctophidae	13	35	1		1		3	3		1	1		2				1178
Scopelarchidae																	12
Scopelarchus																	3
Paralepididae	11	2	7	14	9	13	12	12	26	18	7	5	4	9	2		632
Evermannellidae																	3
Coccorella																	3
Evermannella																	7
Aulostomidae																	
Fistularia																	4
Macrorhamphosidae																	
Macrorhamphosus																	2
Holocentridae																	
Holocentrus																	2
Melamphasidae																	
Melamphaes																	1
Trachipteridae																	
Trachipterus	1					1											32
Mugilidae																	
Liza	1																1
Scombridae																	1
Thunnus	3																12
Euthynnus																	6
Katsuwonus	3		1														58
Auxis																	1
Histiophoridae																	
Tetrapturus																	5
Gempylidae																	113
Diplospinus																	1
Nesiarchus																	1
Lepidopidae																	4
Trichiuridae											1						31
Coryphaenidae																	
Coryphaena		5						1									22
Lepidotidae																	10
Pteraclidae																	
Centropholis																	4
Carangidae																	8
Decapterus	1						1										30
Trachurus																	2
Caranx																	16
Naucrates																	1
Nomeidae																	
Psenes																	1
Apogonidae	1																12
Serranidae	2	1							1			1	1				38
Kyphosidae																	
Kyphosus																	2
Bembropidae																	2
Champsodontidae																	
Champsodon															6		27
Uranoscopidae																	
Gnathagnus																	2
Blenniina	2		1														14
Schindleridae																	
Schindleria																	5
Carapidae																	
Carapus			1														15
Gobiidae	3	9													5		58
Pomacentridae	1													1			8
Labridae	2	2		1	5	2	4	2		2	1		4	2	2	1	109
Chaetodontidae																	2
Acanthuridae																	
Acanthurus																	3
Naso																	4
Balistidae																	1
Tetraodontidae																	1
Diodontidae																	
Diodon																	1
Scorpaenidae	4	1										1					52
Platycephalidae																	2
Triglidae															1		5
Bothinae	6		5	1	4		3	3	1	3	2	1	6	2	6	1	1312
Arnoglossus																	7
Psettina			1														1
Cynoglossidae	1					1							1				7
Bregmacerotidae																	
Bregmaceros	4						1			1			1				78
Antennariidae																	1
Ceratiina																	2
Ceratiidae																	
Cryptopsaras																	6
Melanocetidae																	
Melanocetus																	5
Gigantactinidae																	
Gigantactis																	1
Unidentified	1	3						1	1	3					12		360
Egg	9	123	5		17	5	2	5	1	5					20		2762
Total	1884	1484	745	150	166	88	268	183	213	123	83	57	111	80	100	46	35504

3.2 Preliminary survey of the fish larvae

T. Ozawa

About a half of the total samples except Apodes, Sternoptychidae, Astronesthidae and Cauliodontidae were examined and listed in Table 4. Some remarks on the table are as follows: taxonomic arrangement is subject to mainly Matsubara's "Fish Morphology and Hierarchy"; scientific name is succeeded by the number of specimens, developmental stage and range of standard length (mm) in parentheses; taxonomic category is divided by semicolon; specimens distinguished at the ranks lower than family are excluded from the number of specimens in the family; where more than one species are comprised in a taxon, range of standard length is not measured; genus Diplophos (family Gonostomatidae) is considered to be monospecies. Abbreviations in the table: Total NI, total number of specimens; L, larval net; 4m, 4mϕ net; ORI. ORI net; P, postlarval stage; M, metamorphosing stage; J, juvenile stage; A, adult stage.

Table 4. List of fish larvae collected.

St. 1-2 (L); Total NI, 4
Gomorhynchus abbreviatus, 1J(27.0); Myctophidae, 1P(2.7); Pomacentridae, 1J(16.0); Unidentified, 1P(1.9).

St. 2-1 (4m); Total NI, 75
Diplophos sp., 14J(25.1-29.7); Vinciguerria nimbaria, 26P(6.8-11.8); Gonostoma sp., 1P(7.0); Cyclothone sp., 1M(11.8); Trachinocephalus myops, 21,P-J(25.8-33.8); Scopelosauridae, 1,P(18.0); Paralepidae, 2, P(10.0, 13.5); Diplospinus multistriatus, 1, P(7.5); Chaeturichthys sciistius, 1,J(74.3); Lactoria diaphanus, 1,J(14.3); Bothinae sp, 4,P(8.8-11.0); Unidentified, 2,P.

St. 2-2 (4m); Total NI, 48
Gonorhynchus abbreviatus, 5,P(27.7-53.3); Diplophos sp., 3,J(27.2-32.1), 1,P(23.9); Vinciguerria nimbaria, 12, P(7.7-13.8); Chlorophthalmidae, 1,J; Trachinocephalus myops, 13,P(25.7-36.4); Symbolophorus evermanni, 2,P(7.0, 7.5); Paralepidae, 1,P(17.0); Hirundichthys speculiger, 1,J(90.2); Trachipteridae, 1,P(8.0); Bothinae spp., 7,P; Unidentified, 1,P.

St. 2-4 (L); Total NI, 162
Diplophos sp., 1, J(32.2); Vinciguerria nimbaria, 72, P(4.4-9.3); Gonostoma sp., 24,P(2.8-5.3); Cyclothone sp., 2,P(5.9, 6.0); Trachinocephalus myops, 17,P(26.9-31.3); Hygophum reinhardti, 1,P(7.2); Diogenichthys atlanticus, 1,P(5.1); Symbolophorus evermanni, 6,P(4.3-6.0); Scopelosauridae, 3,P(5.4-7.2); Lepidopus sp., 2,P(5.0,5.5); Unidentified, 33.

St. 3-2 (L); Total NI, 38
Stolephorus buccaneeri, 13,P(3.4-14.5); Vinciguerria nimbaria, 1, P(15.8); Myctophidae, 12,P; Taaningichthys sp., 3,P(4.3-5.4); Thunnus alalunga, 2,P(4.6,4.9); Diplospinus multistriatus, 3,P(2.6-3.4); Coryphaenidae, 3,P(3.1-3.7); Unidentified, 1,P(2.2)

St. 4-1 (4m); Total NI, 342
Stolephorus buccaneeri, 265,P(6.3-17.8); Gonorhynchus abbreviatus, 1,P(33.8); Diplophos sp., 5,P-J(22.2-29.5); Vinciguerria nimbaria, 22,P(4.9-13.7); Gonostoma sp., 1,P(6.8); Stomias sp., 17,P(9.5-18.0); Melanostomiatidae, 2,P(16.5,18.1); Synodus sp., 1,P(26.4); Trachinocephalus myops, 1,P(31.0); Myctophidae spp., 3,P; Hygophum reinhardti, 1,P(7.1); Benthosema sp., 1,P(6.5); Myctophum sp., 1,P(5.0); Scopelosauridae, 10,P(7.0-17.3); Paralepidae, 5,P; Scorpaenidae, 1,P(4.5); Bothinae spp., 4,P; Unidentified, 1,P(3.8).

St. 4-2 (4m); Total NI, 48
Stolephorus buccaneeri, 39,P(11.3-20.3); Diplophos sp., 1,J(24.2); Vinciguerria nimbaria, 2,P(6.5,8.8); Scopelosauridae, 2,P(21.5, 23.1); Paralepidae, 1,P(11.7); Carapidae, 1,P(187); Bothinae, 1,P(9.0); Unidentified, 1,P(3.1).

St. 4-3 (L); Total NI, 300
Stolephorus buccaneeri, 54,P(4.5-16.9); Diplophos sp., 1,P(9.0), 1, J(31.0); Vinciguerria nimbaria, 81,P(3.8-9.8); Gonostoma sp., 1,P(5.0); Cyclothone sp., 1,P(5.0); Stomias sp., 4,P(6.0-12.0); Melanostomiatidae, 1,P(7.7); Synodontidae, 1,P(7.9); Trachinocephalus myops, 1,P(31.5); Myctophidae spp., 70,P; Hygophum reinhardti, 1,P

St. 4-3 (continued)
(6.0); Hygophum proximum, 2,P(3.4,5.1); Myctophum sp., 35,P(3.0-5.0); Scopelosauridae, 9,P(6.0-11.5); Paralepidae spp., 9,P; Katsuwonus pelamis, 4,P(2.5-3.5); Schindleriidae, 2,P(3.5,3.8); Labrina, 7,P; Bothinae spp., 2,P; Bregmacerotidae sp., 3,P(2.4-3.2); Unidentified, 10,P.

St. 4-5 (4m); Total NI, 1,215
Stolephorus buccaneeri, 1,019,P(6.0-19.0); Diplophos sp., 5,J(24.7-33.0); Pollichthys mauli, 1,P(7.0); Vinciguerria nimbaria, 79,P-M(5.1-14.0); Stomias sp., 28,P(9.2-16.5); Melanostomiatidae spp., 10, P; Synodontidae, 1,P(24.0); Myctophidae spp., 18,P; Hygophum reinhardti, 1,P(9.0); Benthosema sp., 1,M(11.1); Myctophum sp., 1,P(5.7); Symbolophorus evermanni, 1,P(6.3); Lampadena sp., 1,P(8.4); Scopelosauridae sp., 13,P(7.3-23.0); Paralepidae spp., 15,P; Evermannellidae sp., 1,P(9.5); Caulopidae sp., 1,P(4.7); Apogonidae sp., 1,J(7.0); Apogon sp., 1,J(8.1); Labrina spp., 2,P; Naso sp., 1,J(11.8); Scorpaenidae sp., 1,J(9.1); Bothinae spp., 10,P; Arnoglossus sp., 1, P(31.0); Bregmacerotidae sp., 2,P-J(11.1,14.1).

St. 4-6 (4m); Total NI, 195
Stolephorus buccaneeri, 141,P(6.5-20.5); Vinciguerria nimbaria, 18, P(6.2-12.5); Cyclothone sp., 1,P(4.0); Stomias sp., 14,P(13.8-15.9); Melanostomiatidae spp., 4,P; Myctophidae spp., 5,P; Myctophum sp., 1,P(5.0); Symbolophorus evermanni, 1,P(7.9); Scopelosauridae sp., 2, P(11.2,17.7); Paralepidae spp., 2,P; Labrina sp., 2,P(8.9,14.4); Bothinae spp., 2,P; Unidentified, 2,P.

St. 4-7 (4m); Total NI, 130
Stolephorus buccaneeri, 81,P(4.9-20.8); Diplophos sp., 2,P(16.5, 25.7), 2,J(32.5-59.5); Pollichthys mauli, 5,P(9.0-17.9); Vinciguerria nimbaria, 11,P(6.0-12.6), 1,M(15); Stomias sp., 9,P(9.8-16.0); Melanostomiatidae sp., 3,P(10.3-17.2); Myctophidae spp., 2,P; Paralepidae spp., 5,P; Katsuwonus pelamis, 2,P(4.8,5.6); Apogonidae sp., 1,P(4.9); Eleotridae, 2,P(6.5,9.5); Bothinae sp., 2,P(12.1,12.1); Bregmacerotidae sp., 2,P-J(6.7,17.3).

St. 5-2 (L); Total NI, 26
Diplophos sp., 2,P(4.3,13.0); Vinciguerria nimbaria, 1,P(6.0); Myctophidae spp., 13,P; Lampadena sp., 4,P(3.6-4.9); Acinaceidae sp., 2,P(5.0,6.0); Scorpaenidae sp., 1,P(3.7); Unidentified spp., 3,P.

St. 6-1 (4m); Total NI, 13
Stolephorus buccaneeri, 1,P(13); Diplospinus multistriatus, 7,P(7.0-9.9); Aphanopus sp., 1,P(22.0); Tetraodontidae sp., 1,J(7.0); Scorpaenidae sp., 1,P(3.6); Bregmacerotidae sp., 1,P(10.5); Ceratiina sp., 1,P(3.1)

St. 6-2 (L); Total NI, 169
Stolephorus buccaneeri, 1,P(14.5); Vinciguerria nimbaria, 2,P(5.6, 6.7); Aulopus sp., 2,P(6.6,13.0); Myctophidae spp., 9,P; Symbolophorus evermanni, 1,P(9); Taaningichthys sp., 55,P(5.9-11.8); Exocoetus sp., 1,P(4.2); Prognichthys sp., 1,P(5.0); Auxis sp., 1,P(6.5); Bramidae sp., 1,P(9.7); Decapterus sp., 41,P(3.6-8.5); Naucrates ductor, 2,P(6.5,6.6); Upeneus bensasi, 15,P-J(3.7-11.0); Apogon sp., 2,J(14.0,14.0); Dasson sp., 14,P-J(4.8-12.9); Gobiina spp., 3,P-J; Poma-

Table 4. (Continued)

St. 6-2 (continued)
centridae spp., 13,P-J; Symphurus sp., 1,P(14.1); Bregmacerotidae sp., 1,P(7.0); Unidentified spp., 3,P.

St. 6-4 (ORI); Total NI, 333
Stolephorus buccaneeri, 196,P(4.3-15.3); Diplophos sp., 7,P(9.7-46.0); Pollichthys mauli, 4,P(7.9-13.2); Vinciguerria nimbaria, 34, P(5.3-13.0); Gonostoma sp., 14,P(4.0-10.0); Melanostomiatidae sp., 1,P(6.0); Trachinocephalus myops, 2,P(29.9,36.1); Myctophidae spp., 10,P; Hygophum reinhardti, 3,P(7.0-11.7); Benthosema sp., 5,P(3.7-5.1); Diogenichthys atlanticus, 6,P(3.5-5.0); Myctophum sp., 5,P(3.1-4.9); Symbolophorus evermanni, 4,P(4.0-8.2); Scopelosauridae sp., 9,P(4.8-21.2); Paralepidae spp., 4,P; Trachipteridae sp., 2,P(5.5, 9.0); Auxis sp., 1,P(4.9); Diplospinus multistriatus, 5,P(6.6-9.4); Carangidae sp., 2,P(5.5,6.9); Acropoma japonicum, 2,P-J(5.0-11.5); Eleatridae sp., 1,P(7.0); Ptereleotris sp., 7,P-J(4.9-20.2); Labrina spp., 2,P; Unidentified spp., 7,P.

St. 6-5 (ORI); Total NI, 193
Stolpephorus buccaneeri, 143,P(3.9-15.2); Diplophos sp., 5,P(11.9-50.0); Pollichthys mauli, 8,P(8.0-13.8); Vinciguerria nimbaria, 5, P(5.6-14.0); Stomias sp., 1,P(14.0); Melanostomiatidae spp., 3,P; Trachinocephalus myops, 1,P(31.7); Myctophidae spp., 7,P; Myctophum sp., 3,P(3.6-4.2); Scopelosauridae sp., 6,P(6.5-20.3); Paralepidae sp., 1,P(23.0); Eleotridae sp., 1,P(11.4); Ptereleotris sp., 2,P(7.3,10.0); Labrina sp., 2,P(12.5,13.0); Scorpaenidae sp., 1,P(8.3); Bothinae spp., 2,P; Bothus sp., 1,P(22.1); Bregmacerotidae sp., 1,P(6.5).

St. 6-6 (ORI); Total NI, 320
Stolephorus buccaneeri, 203,P(4.9-5.0); Diplophos sp., 11,P(6.0-24.9), 1,M(44.0); Pollichthys mauli, 2,P(8.5,9.0); Vinciguerria nimbaria, 55,P(5.3-15.2), 2,M(14.8,15.0); Cyclothone sp., 4,P(4-8.1); Melanostomiatidae spp., 2,P; Saurida sp., 1,J(24.8); Myctophidae spp., 13,P; Benthosema sp., 1,P(5.0); Symbolophorus evermanni, 4,P(6.2-7.9); Lampadena sp., 1,P(9.2); Lampanyctus punctatissimus, 1,J(14); Scopelosauridae sp., 4,P(9.0-13.0); Paralepidae spp., 2,P; Trachipteridae sp., 2,P(6.0,19.0); Diplospinus multistriatus, 1,P(3.9); Bramidae sp., 1,J(8.3); Eleotridae sp., 2,P(5.3,14.1); Pomacentridae sp., 1,J(8.8); Labrina sp., 1,P(10.9); Scorpaenidae sp., 1,J(10.9); Bothinae sp., 1,P(10.7); Unidentified spp., 3,P.

St. 6-7 (ORI); Total NI, 167
Stolephorus buccaneeri, 51,P(6.8-17.5); Diplophos sp., 6,M(25.5-28.5), 1,J(31.3), 24,P(20.9-30.2); Pollichthys mauli, 9,P(6.0-16.7); Vinciguerria nimbaria, 25,P(6.2-14.7); Cyclothone sp., 1,P(9.8); Melanostomiatidae spp., 2,P; Synodus sp., 1,P(22.1); Myctophidae spp., 15,P; Symbolophorus evermanni, 1,P(6.8); Scopelosauridae sp., 14,P(8.0-27.7); Paralepidae spp., 6,P; Evermannelidae sp., 2,P(9.7, 10.0); Acinaceidae sp., 2,P(3.3,6.0); Bothinae sp., 4,P(9.6-12.7); Unidentified spp., 3,P.

St. 6-7 (ORI); Total NI, 167
Stolephorus buccaneeri, 51,P(6.8-17.5); Diplophos sp., 24,P(20.9-

St. 6-7 (continued)
30.2), 6,M(25.5-28.5), 1,J(31.3); Pollichthys mauli, 9,P(6.0-16.7); Vinciguerria nimbaria, 25,P(6.2-14.7); Cyclothone sp., 1,P(9.8); Melanostomiatidae spp., 2,P; Synodus sp., 1,P(22.1); Myctophidae spp., 15,P; Symbolophorus evermanni, 1,P(6.8); Scopelosauridae sp., 14,P(8.0-27.7); Paralepidae spp., 6,P; Evermannelidae sp., 2,P(9.7,10.0); Acinaceidae sp., 2,P(3.3,6.0); Bothinae sp., 4,P(9.6-12.7); Bregmacerotidae sp., 1,P(16.2); Cryptopsarus sp., 1,J(3.5); Unidentified sp., 1,P(4.2).

St. 6-8 (ORI); Total NI, 77
Stolephorus buccaneeri, 29,P(7.8-11.9); Diplophos sp., 7,P(20.0-28.4); Pollichthys mauli, 1,P(11.2); Vinciguerria nimbaria, 16,P(7.1-14.9); Stomias sp., 1,P(14.2); Macrostomias sp., 1,P(21.8); Melanostomiatidae sp., 1,P(8.8); Myctophidae spp., 10,P; Scopelosauridae sp., 2,P(10.9,15.0); Paralepidae sp., 1,P(10.5); Bothinae spp., 2,P; Unidentified spp., 6,P.

St. 6-9 (L); Total NI, 324
Stolephorus buccaneeri, 22,P(5.7-22.0); Gonorhynchus abbreviatus, 21,J(25.1-54.1); Diplophos sp., 1,P(14.7), 2,J(33.0,37); Pollichthys mauli, 7,P(7.2-11.7); Vinciguerria nimbaria, 94,P(5.7-13.2); Gonostoma sp., 2,P(5.1,6.0); Cyclothone sp., 1,P(5.0); Trachinocephalus myops, 1,P(23.0); Myctophidae spp., 52,P; Diogenichthys atlanticus, 1,P(4.5); Myctophum sp., 13,P(4.0-4.7); Symbolophorus evermanni, 6,P(5.7-7.5); Scopelosauridae sp., 17,P(6.0-13.5); Paralepidae spp., 17,P; Evermannelidae sp., 1,P(9.5); Paraexocoetus brachypterus, 1,J(32.3); Acinaceidae sp., 8,P(3.8-4.7); Apogon sp., 1,J(8.4); Eleotridae sp., 1,P(7.0); Triglidae sp., 1,J(8.0); Bothidae sp., 4,P(9.0-11.2); Bregmacerotidae sp., 5,P(3.8-4.7); Unidentified spp., 45,P.

St. 6-10 (ORI); Total NI, 225
Stolephorus buccaneeri, 150,P(8.7-11.0); Vinciguerria nimbaria, 46,P(6.3-15.0), 2,M(14.9,15.0), 3,J(14.0-14.8); Cyclothone sp., 1,P(7.9); Stomias spp., 2,P-J; Melanostomiatidae sp., 1,P(12.3); Myctophidae spp., 9,P; Diogenichthys atlanticus, 1,P(4.3); Symbolophorus evermanni, 1,P(8.0); Paralepidae spp., 4,P; Trachipteridae sp., 1,P(8.0); Pomacentridae sp., 1,J(10.5); Labrina sp., 1,P(11.5); Bothidae sp., 2,P(9.5,12.0).

St. 6-11 (ORI); Total NI, 225
Stolephorus buccaneeri, 137,P(4.5-17.5); Gonorhynchus abbreviatus, 1,J(40.7); Pollichthys mauli, 1,P(8.8); Vinciguerria nimbaria, 41, P(6.0-15), 2,M(14.2,15.0), 1,J(14.2); Gonostoma sp., 4,P(4.5-7.0); Cyclothone sp., 2,P(4.7,9.8); Melanostomiatidae sp., 1,P(12.2); Myctophidae spp., 5,P; Myctophum spp., 2,P; Symbolophorus evermanni, 1,P(5.1); Lampadena sp., 1,P(5.1); Scopelosauridae sp., 6,P(5.4-21.2); Paralepidae spp., 11,P; Acinaceidae sp., 1,P(5.8); Champsodontidae sp., 1,J(7.7); Schindleriidae sp., 1,P(5.5); Carapidae sp., 1,P(24.3); Labrina spp., 2,P; Acanthurus sp., 1,J(21.0); Bregmacerotidae sp., 1,P(4.0); Unidentified sp., 1,P(4.0).

St. 6-12 (ORI); Total NI, 245
Stolephorus buccaneeri, 113,P(5.2-21.9); Diplophos sp., 1,P(5.0);

Table 4. (Continued)

St. 6-12 (continued)
Pollichthys mauli, 4,P(6.7-10.5); Vinciguerria nimbaria, 63,P(5.1-10.9); Gonostoma sp., 7,P(4.9-7.3); Stomias spp., 2,P-J; Trachinocephalus myops, 1,P(26.3); Myctophidae spp., 15,P; Hygophum reinhardti, 2,P(5,9.5); Myctophum sp., 4,P(4.0-5.2); Symbolophorus evermanni, 3,P(5.6-7.0); Scopelosauridae sp., 15,P(5.3-14.0); Paralepidae spp., 9,P; Evermannellidae sp., 1,P(8.9); Bothidae sp., 1,P(8.5); Bregmacerotidae sp., 1,P(7.5); Unidentified spp., 3,P.

St. 6-13 (ORI); Total NI, 383
Stolephorus buccaneeri, 294,P(3.8-18.3); Diplophos sp., 1,P(7.8); Pollichthys mauli., 7,P(8.0-13.6); Vinciguerria nimbaria., 39,P(4.5-12.7); Gonostoma sp., 4,P(4.0-5.8); Cyclothone sp., 3,P(5.5-6.6); Stomias sp., 3,P(14.7-14.8); Myctophidae spp., 10,P; Myctophum sp., 4,P(2.8-6.5); Symbolophorus evermanni, 1,P(7.2); Scopelosauridae sp., 4,P(8.8-14.8); Paralepidae sp., 1,P(10.5); Exocoetus volitans, 1,P(5.9); Thunnus alalunga, 1,P(6.3); Katsuwonus pelamis, 1,P(5.6); Acinaceidae sp., 1,P(5.8); Eleotridae sp., 2,P(7.1,10.8); Gobiidae sp., 1,P(6.2); Labrina sp., 1,P(10.1); Bothidae sp., 1,P(10.1); Bregmacerotidae sp., 1,P(5.2); Unidentified spp., 2,P.

St. 7-3 (L); Total NI, 23
Vinciguerria nimbaria, 2,P(3.9,4.8); Myctophidae spp., 13,P; Taaningichthys sp., 2,P(4.7,6.5); Lampadena sp., 2,P(4.2,4.6); Paralepidae sp., 1,P(4.7); Acinaceidae sp., 1,P(5.5); Bregmacerotidae sp., 1,P(4.6); Unidentified sp., 1,P(3.1).

St. 8-1 (4m); Total NI, 110
Stolephorus buccaneeri, 40,P(4.3-10.6); Diplophos sp., 2,P(17.4,25); Vinciguerria nimbaria, 7,P(6.1-9.0); Stomias sp., 2,P(8.1,10.7); Myctophidae spp., 5,P; Trachipteridae sp., 1,P(6.8); Katsuwonus pelamis, 1,P(7.0); Acinaceidae sp., 1,P(10.0); Diplospinus multistriatus, 31,P(6.5-9.9), 8,J(21.5-86.5); Decapterus sp., 2,P(7.5,8.0); Eleotridae sp., 1,P(11.7); Bothidae spp., 2,P; Bregmacerotidae sp., 1,P(7.7); Antennarius sp., 1,P(3.8); Unidentified spp., 5,P.

St. 8-2 (L); Total NI, 1
Oxyporhamphidae sp., 1,P(5.0).

St. 9-4 (L); Total NI, 1,009
Stolephorus buccaneeri, 602,P(4.0-18.7); Gonorhynchus abbreviatus, 178,J(37.1-64.3); Diplophos sp., 2,P(9.7,13.8), 1,J(45.7); Vinciguerria nimbaria, 7,P(4.3-8.3); Gonostoma sp., 4,P(5.7-6.9); Cyclothone sp., 1,P(6.0); Melanostomiatidae spp., 10,P; Trachinocephalus myops , 30,P-J(21.3-39.9); Myctophidae spp., 98,P; Myctophum sp., 11,P(3.1-5.0); Symbolophorus evermanni, 2,P(3.9,5.2); Taaningichthys sp., 1,P(3.5); Lampadena sp., 3,P(4.0-4.9); Scopelosauridae sp., 5,P(5.8-9.9); Paralepidae spp., 16,P; Trachipteridae sp., 2,P(5.3,6.1); Katsuwonus pelamis, 9,P(3.8-5.8); Acinaceidae sp., 5,P(3.5-5.6); Trichiuridae sp., 1,P(6.0); Coryphaenidae sp., 3,P(4.6-5.0); Bramidae sp., 1,P(3.1); Schindleriidae sp., 1,P(11.0); Gobiina spp., 2,P; Bregmacerotidae sp., 1,P(4.5); Cryptopsarus sp., 1,P(2.7); Unidentified spp., 12,P.

St. 10-2 (L); Total NI, 416
Stolephorus buccaneeri, 341,P(3.3-17.7); Gonorhynchus abbreviatus, 22,J(37.3-40.8); Vinciguerria nimbaria, 12,P(3.9-6.4); Trachinocephalus myops, 4,J(32.0-36.9); Myctophidae spp., 8,P; Hygophum proximum, 1,P(3.9); Myctophum sp., 1,P(2.5); Symbolophorus evermanni, 1,P(2.9); Lampadena sp., 2,P(3.7,3.9); Paralepidae spp., 17,P; Exocoetus volitans, 1,P(12.2); Katsuwonus pelamis, 2,P(4,8.0); Serranidae sp., 1,P(4.9); Bothidae sp., 2,P(9.0,9.0); Unidentified sp., 1,P(2.4).

St. 10-4(L); Total NI, 30
Stolephorus buccaneeri, 1,P(8.8); Diplophos sp., 3,P(5.3-10.0); Melanostomiatidae sp., 2,P(4.0,4.7); Myctophidae spp., 6,P; Taaningichthys sp., 1,P(5.0); Trachipteridae spp., 3,P; Acinaceidae sp., 3,P(3.2-8.6); Coryphaenidae sp., 4,P(3.3-4.0); Bramidae sp., 1,P(3.0); Scorpaenidae sp., 1,P(4.3); Ceratiina sp., 1,P(2.2); Gigantactis sp., 1,P(2.3); Unidentified spp., 3,P.

St. 10-6 (L); Total NI, 7
Stolephorus buccaneeri, 1,P(3); Taaningichthys sp., 2,P(3.4,3.6); Lampadena sp., 1,P(3.0); Coryphaenidae sp., 1,P(3.7); Bramidae sp., 1,P(4.0); Unidentified sp., 1,P(2.7).

St. 10-8 (L); Total NI, 4
Trachipteridae sp., 1,P(4.3); Acinaceidae sp., 1,P(4.5); Ceratiina sp., 2,P(2.0,2.5).

St. 10-13 (L); Total NI, 28
Diplophos sp., 5,P(4.5-8.1); Vinciguerria nimbaria, 1,P(6.0); Melanostomiatidae spp., 2,P; Myctophidae spp., 7,P; Diogenichthys atlanticus, 1,P(4.8); Taeniophoridae sp., 1,P(6.3); Trachipteridae sp., 4,P(5.1-6.0); Katsuwonus pelamis, 1,P(4.1); Acinaceidae sp., 1,P(3.8); Trichiuridae sp., 2,P(5.1,5.5); Coryphaenidae sp., 1,P(3.9); Bramidae sp., 1,P(3.3); Bothidae sp., 1,P(10.0).

St. 10-20 (L); Total NI, 477
Stolephorus buccaneeri, 419,P(4.3-13.1); Diplophos sp., 7,P(5.5-32), 1,M(30.0); Pollichthys mauli, 2,P(11.9,13.0); Cyclothone sp., 3,P(6.0-9.0); Stomiatidae sp., 1,P(5.0); Trachinocephalus myops, 1,P(35); Myctophidae spp., 33,P; Scopelosauridae sp., 1,P(14.1); Katsuwonus pelamis, 1,P(5.0); Schindleriidae sp., 1,P(8.3); Bothidae spp., 4,P; Unidentified spp., 3,P.

St. 10-27 (L); Total NI, 498
Stolephorus buccaneeri, 395,P(5.2-21.7); Gonorhynchus abbreviatus, 3,J(38.3-44.8); Diplophos sp., 3,P(9-20); Vinciguerria nimbaria, 3,P(5.3-7.3); Gonostoma sp., 1,P(4.8); Cyclothone sp., 2,P(5.0, 7.0); Stomias sp., 2,P(9,14); Synodus sp., 3,P(12.8-14.8); Trachinocephalus myops, 6,J(31.5-33.4); Myctophidae spp., 31,P; Myctophum sp., 1,P(5.7); Lampadena sp., 3,P(3.0-3.2); Scopelosauridae sp., 3,P(9.0-13); Paralepidae spp., 6,P; Trachipteridae sp., 1,P(4.8); Katsuwonus pelamis, 1,P(3.3); Schindleriidae sp., 1,P(11.7); Gobiina sp., 1,P(8.3); Labrina spp., 2,P; Bothidae spp., 21,P; Unidentified spp., 9,P.

Table 4. (Continued)

St. 10-33 (L); Total NI, 375
Stolephorus buccaneeri, 263,P(3.4-19.3); Gonorhynchus abbreviatus, 1,J(40.2); Diplophos sp., 1,P(4.9); Pollichthys mauli, 1,P(10.0); Vinciguerria nimbaria, 27,P(4.6-7.3); Cyclothone sp., 1,P(5.0); Stomias sp., 2,P(6.1,8.3); Trachinocephalus myops, 13,J(28.8-34.4); Myctophidae spp., 28,P; Myctophum sp., 8,P(2.2-4.7); Symbolophorus evermanni, 2,P(4.5,5.0); Lampadena sp., 1,P(2.5); Paralepidae spp., 20,P; Acinaceidae sp., 2,P(4.0,4.3); Trichiuridae sp., 1,P(4.9); Carapidae sp., 1,J(151); Bothidae spp., 3,P.

St. A-1 (ORI); Total NI, 64
Stolephorus buccaneeri, 12,P(6.2-10.7); Pollichthys mauli, 2,P(18.3,20.0); Vinciguerria nimbaria, 5,P(8.2-13.3), 5,M(14.2-15.0), 15,J(13.0-18.6); Melanostomiatidae sp., 2,P(11.7,14.0); Hygophum reinhardti, 1,P(12.0); Diplospinus multistriatus, 1,P(7.8); Labrina sp., 1,P(7.8); Bothidae sp., 18,P(9.0-10.2); Bregmacerotidae sp., 1,P(5.8); Unidentified sp., 1,P(9.0).

St. A-2 (L); Total NI, 564
Stolephorus buccaneeri, 461,P(4.7-17.9); Diplophos sp., 7,P(8.8-23); Vinciguerria nimbaria, 8,P(5.7-9.2); Gonostoma sp., 1,P(5.0); Melanostomatidae sp., 4,P(13.9-18.0); Synodus sp., 1P(23.5); Lampadena sp., 7,P(4.0-4.5); Paralepidae sp., 2,P(8.9,20.0); Katsuwonus pelamis, 1,P(5.0); Acinaceidae sp., 1,P(5.5); Coryphaenidae sp., 1,P(3.0); Bramidae sp., 1,P(4.1); Labrina spp., 3,P; Bothidae spp., 35,P; Unidentified sp., 1,P(7.0).

St. A-4 (ORI); Total NI, 60
Stolephorus buccaneeri, 19,P(7.0-18.0); Diplophos sp., 1,P(39.3); Vinciguerria nimbaria, 14,P(7.1-14.0), 2,M(14.1,15.7), 3,J(14.0-15.2); Stomias sp., 1,P(16.0); Melanostomiatidae sp., 3,P(15-18.0); Diaphus sp., 1,J(11.2); Paralepidae sp., 1,P(22.1); Acinaceidae sp., 1,P(6.2); Bothidae spp., 13,P; Unidentified sp., 1,P(4.6).

St. A-5 (ORI); Total NI, 22
Stolephorus buccaneeri, 8,P(10-15.2); Diplophos sp., 1,P(29.0); Pollichthys mauli, 1,P(8.9); Vinciguerria nimbaria, 7,P(9.1-11.5), 1,J(15.0); Melanostomiatidae sp., 3,P(13.0-16.5); Bothidae sp., 1,P(9.8).

St. A-6 (ORI); Total NI, 78
Stolephorus buccaneeri, 40,P(8.0-15.2); Diplophos sp., 2,P(27,30.5); Vinciguerria nimbaria, 10,P(8.4-14.8), 2,M(14.0,14.8), 1,J(13.9); Melanostomiatidae sp., 9,P(11.2-2.4); Scopelosauridae sp., 1,P(12.0); Paralepidae spp., 2,P; Trachipteridae sp., 1,P(10.1); Katsuwonus pelamis, 1,P(7.8); Labrina sp., 1,P(6.2); Bothidae sp., 8,P(8.5-10.5).

St. A-7 (ORI); Total NI, 61
Stolephorus buccaneeri, 20,P(9.8-15.7); Diplophos sp., 1,P(26.0); Vinciguerria nimbaria, 17,P(8.0-12.9), 7,J(14.0-15.1); Stomias spp., 2,P-J; Melanostomiatidae spp., 7,P; Paralepidae spp., 2,P; Oxyporhamphidae sp., 1,J(13.2); Katsuwonus pelamis, 1,P(7.0); Bothidae sp., 3,P(9.0-10.0).

St. A-8 (ORI); Total NI, 92
Stolephorus buccaneeri, 25,P(7.9-15.5); Diplophos sp., 1,P(22.5); Vinciguerria nimbaria, 22,P(6.2-14.2), 3,M(14.5-15.1), 11,J(14.0-15.1); Pollichthys mauli, 2,P(14.8,14.9); Stomias sp., 2,P(11.0, 15.4); Melanostomiatidae spp., 11,P; Synodus sp., 1,P(21.5); Paralepidae spp., 3,P; Hirundichthys speculiger, 1,J(48.5); Thunnus alalunga, 2,P(5.5,6.1); Katsuwonus pelamis, 1,P(5.3); Acinaceidae sp., 1,P(7.2); Labrina sp., 1,P(11.2); Bothidae spp., 4,P; Unidentified sp., 1,P(8.1).

St. A-9 (ORI); Total NI, 61
Stolephorus buccaneeri, 25,P(8.6-14.9); Diplophos sp., 2,P(22.8, 23); Vinciguerria nimbaria, 15,P(5.7-13.2), 1,M(15.0), 2,J(14.1, 14.7); Melanostomiatidae sp.- 4,P(13.1-20.0); Myctophidae sp., 1,P(7.4); Paralepidae sp., 1,P(28.6); Trachipteridae sp., 1,P(9.9); Katsuwonus pelamis, 1,P(6.5); Acinaceidae sp., 1,P(7.3); Labrina sp., 2,P(12.9,21.8); Bothidae spp., 5,P.

St. A-10 (ORI); Total NI, 56
Stolephorus buccaneeri, 13,P(5.0-14); Diplophos sp., 3,P(17.0-30.0); Pollichthys mauli, 1,P(17.0); Vinciguerria nimbaria, 17, P(6.1-12.7); Stomias sp., 1,P(14.3); Melanostomiatidae sp., 3,P(14.8-21.7); Myctophidae spp., 3,P; Scopelosauridae sp., 1,P(15.1); Paralepidae sp., 1,P(9.5); Labrina sp., 4,P(10.2-14.6); Bothidae sp., 8,P(9.0-9.8); Unidentified sp., 1,P(11.1).

St. A-11 (ORI); Total NI, 27
Stolephorus buccaneeri, 22,P(6.8-14.0); Vinciguerria nimbaria, 1,P(10.2); Myctophidae sp., 1,P(5.9); Scopelosauridae sp., 1,P(18.8); Nemichthys sp., 1,J(300); Bothidae sp., 1,P(9.5).

St. A-12 (ORI); Total NI, 115
Stolephorus buccaneeri, 31,P(6.1-16.1); Diplophos sp., 4,P(14.0-23.8); Vinciguerria nimbaria, 51,P(5.8-14.0), 1,J(15); Myctophidae spp., 2,P; Scopelosauridae sp., 3,P(8.0-15.5); Paralepidae spp., 4,P; Thunnus alalunga, 4,P(5.1-6.0); Katsuwonus pelamis, 5,P(4.7-5.8); Acinaceidae sp., 1,P(6.3); Carapidae sp., 1,P(101.0); Labrina sp., 2,P(11.6,12.7); Bothidae sp., 6,P(9.1-9.5).

St. B-1 (4m); Total NI, 191
Stolephorus buccaneeri, 21,P(9.5-11.7); Gonorhynchus abbreviatus, 1,J(54); Diplophos sp., 4,P(21.0-50.0); Pollichthys mauli, 1,P(17.0); Vinciguerria nimbaria, 27,P(8.2-14.6), 66,J(13.0-23.0); Cyclothone sp., 1,P(9.5), 1,M(10.7); Melanostomiatidae spp., 11,P; Chlorophthalmidae sp., 1,P(18.2); Synodus sp., 2,P(18.3,25.0); Myctophidae sp., 1,P(5.2); Myctophum sp., 1,P(8.5); Diaphus sp., 1,J(10.5); Lampadena sp., 1,P(8.9); Ceratoscopelus sp., 2,P(7.4, 7.9); Paralepidae spp., 4,P; Trachipteridae sp., 1,P(6.5); Bramidae sp., 1,P(8.0); Carapidae sp., 1,P(96.0); Eleotridae spp., 3, P-J; Labrina sp., 3,P(6.6-14.2); Naso sp., 4,P(9.8-12.6); Scorpaenidae sp., 1,P(5.5); Bothidae spp., 30,P; Cryptopsarus sp., 1,J(4.5).

St. B-2 (4m); Total NI, 46
Stolephorus buccaneeri, 6,P(8.7-19.8); Diplophos sp., 2,P(50,50); Pollichthys mauli, 1,P(17.5); Vinciguerria nimbaria, 5,P(6.9-14.6), 12,J(13.8-15.2); Cyclothone sp., 1,P(9.9); Melanostomiatidae

Table 4. (Continued)

St. B-2 (continued)
spp., 9,P; Paralepidae sp., 1,P(13); Eleotridae sp., 1,P(13.3); Bothidae sp., 7,P(9.0-10.1); Cryptopsarus sp., 1,J(7.0).

St. B-4 (L); Total NI, 212
Stolephorus buccaneeri, 50,P(3.5-12.0); Diplophos sp., 8,P(7.0-14.9); Vinciguerria nimbaria, 29,P(5.2-8.0); Cyclothone sp., 1,P(4.3); Stomiatidae sp., 1,P(5.9); Melanostomiatidae spp., 5,P; Trachinocephalus myops, 1,J(39.8); Myctophidae spp., 86,P; Taaningichthys sp., 4,P(3.2-4.0); Lampadena sp., 2,P(4.5,5.0); Scopelosauridae sp., 1,P(10.5); Paralepidae sp., 2,P(11.0,12.2); Trachipteridae sp., 1,P(8.1); Trichiuridae sp., 3,P(5.0-5.2); Bramidae sp., 3,P(1.7-4.9); Bothidae spp., 2,P; Unidentified spp., 13,P.

St. B-5 (4m); Total NI, 85
Stolephorus buccaneeri, 11,P(7-17.0); Diplophos sp., 1,P(16.0); Vinciguerria nimbaria, 8,P(7.7-11.2), 1,J(15); Cyclothone sp., 1,P(10.1); Stomias sp., 1,P(20.9); Melanostomiatidae spp., 18,P; Chlorophthalmidae sp., 1,J(15.6); Scopelosauridae sp., 1,P(24.8); Paralepidae spp., 9,P; Naso sp., 1,P(12.2); Bothidae spp., 31,P; Cryptopsarus sp., 1,J(6.6).

St. B-6 (4m); Total NI, 227
Stolephorus buccaneeri, 79,P(7.5-17.3); Diplophos sp., 12,P(10.9-50.0), 1,M(53.0), 1,J(42.5); Pollichthys mauli, 1,P(9.9); Vinciguerria nimbaria, 62,P(5.2-13.0); Stomias sp., 1,P(14.0); Melanostomiatidae spp., 29,P; Synodus sp., 4,P(19.9-33.5); Myctophidae spp., 5,P; Benthosema suborbitale, 1,J(13.7); Symbolophorus evermanni, 1,P(7.1); Paralepidae spp., 16,P; Labrina spp., 8,P; Bothidae spp., 56,P; Arnoglossus sp., 1,P(24.2).

St. B-7 (4m); Total NI, 285
Stolephorus buccaneeri, 97,P(6.3-18.0); Diplophos sp., 8,P(8.7-43.0), 14,J(30.0-43.0); Vinciguerria nimbaria, 80,P(5.8-13.0); Cyclothone sp., 2,P(8.0,9.5); Melanostomiatidae spp., 19,P; Synodus sp., 1,P(21.1); Trachinocephalus myops, 8,P(32.0-40.7); Lampadena sp., 1,P(7.0); Scopelosauridae sp., 1,P(12.2); Paralepidae spp., 9,P; Carapidae sp., 1,J(172); Bothidae spp., 40,P; Arnoglossus sp., 2,P(14.2,21.5); Unidentified spp., 2,P-J.

St. B-8 (4m); Total NI, 340
Stolephorus buccaneeri, 138,P(5.9-14.8); Diplophos sp., 14,P(9.7-45.5), 3,J(39.1-60.3); Pollichthys mauli, 3,P(16.8-17.0); Vinciguerria nimbaria, 68,P(5.9-14.8); Stomias spp., 2,P-J; Melanostomiatidae spp., 12,P; Aulopodidae sp., 1,P(9.0); Synodus sp., 3,P(14.3-22.5); Myctophidae spp., 5,P; Scopelosauridae sp., 1,P(12.3); paralepidae spp., 9,P; Gobiidae sp., 1,J(8.7); Labrina spp., 15,P; Bothidae spp., 65,P.

St. B-9 (4m); Total NI, 355
Stolephorus buccaneeri, 138,P(7.0-17.3); Diplophos sp., 3,P(15.3-39.0), 2,J(30.0,39.0); Vinciguerria nimbaria, 97,P(5.8-13.3), 1,M(15.0); Melanostomiatidae spp., 7,P; Synodus sp., 9,P(12.0-24.7); Saurida sp., 1,J(24.0); Myctophidae spp., 9,P; Myctophum spp., 2,P; Lampanyctus punctatissimus, 1,J(14.0); Paralepidae spp., 11,P; Evermannellidae sp., 1,P(6.7); Decapterus sp., 1,P(5.0); Pomacentridae sp., 1,J(11.1); Labrina spp., 14,P; Bothidae sp., 56,P(8.1-11.3); Cryptopsarus sp., 1,P(2.4).

St. B-9 (continued)
tridae sp., 1,J(11.1); Labrina spp., 14,P; Bothidae sp., 56,P(8.1-11.3); Cryptopsarus sp., 1,P(2.4).

St. B-10; Total NI, 321
Stolephorus buccaneeri, 129,P(7.0-19.3); Diplophos sp., 11,J(38.0-52.0); Vinciguerria nimbaria, 55,P(5.2-13.5); Melanostomiatidae spp., 7,P; Aulopodidae sp., 1P(12.3); Chlorophthalmidae sp., 1,J(23.8); Synodus sp., 2,P(14.0,14.1); Trachinocephalus myops, 6,J(31.7-41.2); Myctophidae spp., 6,P; Ceratoscopelus sp., 1,P(8.7); Paralepidae spp., 19,P; Evermannellidae sp., 1,P(12.8); Taeniophoridae sp., 1,J(16.5); Fistularia petimba, 1,J(54.8); Labrina spp., 7,P; Bothidae spp., 73,P.

St. B-11 (4m); Total NI, 274
Stolephorus buccaneeri, 109,P(7.7-17.5); Diplophos sp., 1,P(16.5), 10,J(29.9-65.6); Vinciguerria nimbaria, 55,P(5-13.9), 2,M(14.0, 14.3), 2,J(13,14); Melanostomiatidae spp., 7,P; Chlorophthalmidae sp., 2,J(23.1,26.0); Synodus sp., 2,P(18.5,29.1); Trachinocephalus myops, 1,P(32.7); Myctophidae spp., 3,P; Lampadena sp., 3,P(7.6-8.8); Scopelosauridae sp., 1,P(25.1); Paralepidae spp., 9,P; Nemichthys sp., 2,J(331,339); Fistularia villosa, 1,P(24.5); Eleotridae sp., 1,P(12.3); Labrina spp., 12,P-J; Naso sp., 1,J(10.7); Bothidae spp., 49,P; Arnoglossus sp., 1,P(22.4).

St. B-12 (4m); Total NI, 179
Stolephorus buccaneeri, 73,P(7.7-17.0); Diplophos sp., 1,P(45.0), 7,J(28.8-82.0); Vinciguerria nimbaria, 28,P(5.1-12.0); Cyclothone sp., 1,P(9.0); Melanostomiatidae spp., 6,P; Chlorophthalmidae sp., 4,J(24.8-27.9); Synodus sp., 3,P(23.1-28.9); Myctophidae spp., 3,P; Lampadena sp., 3,P(5.9-10.5); Lampanyctus punctatissimus, 1,J(15.0); Ceratoscopelus sp., 2,P(6.7,6.9); Hygophum proximum, 1,P(4.9); Scopelosauridae sp., 1,P(12.5); Paralepidae sp., 1,P(17); Carapidae sp., 1,P(99.0); Labrina spp., 28,P; Bothidae spp., 15,P.

St. B-13 (4m): Total NI, 242
Stolephorus buccaneeri, 96,P(7.8-17.2); Diplophos sp., 1,P(35.5), 26,J(24.1-54.4); Vinciguerria nimbaria, 38,P(5.5-14.3), 1,J(15.0); Stomias spp., 2,P-J; Melanostomiatidae spp., 9,P; Synodus sp., 3,P(16.6-21); Trachinocephalus myops, 6,P-J(23.0-42.0); Myctophidae sp., 1,P(4.2); Benthosema suborbitale, 1,J(11.5); Diogenichthys atlanticus, 1,J(11.7); Diaphus sp., 1,J(9.6); Paralepidae sp., 5,P; Evermannellidae sp., 1,P(12); Fistularia petimba, 2,J(54.7,60.0); Labrina spp., 4,P; Bothidae spp., 44,P.

St. B-14 (4m); Total NI, 560
Stolephorus buccaneeri, 155,P(8.0-23); Diplophos sp., 3,P(8.2-46.0), 22,J(25.4-51.3); Vinciguerria nimbaria, 181,P(4.8-14.8), 5,M(14.5-14.7), 40,J(13.3-19.8); Gonostoma sp., 2,P(6.3,7.5); Stomias sp., 1,P(10); Melanostomiatidae spp., 14,P; Synodus sp., 1,P(23.5); Trachinocephalus myops, 2,P-J(24.9,38.1); Myctophidae spp., 20,P; Benthosema suborbitale, 2,J(10.6,11.5); Diogenichthys atlanticus, 1,J(12.2); Taaningichthys sp., 1,P(6.8); Lampadena sp., 1,P(6.0); Lepidophanes pyrosobolus, 1,J(13.0); Ceratoscopelus sp., 8,P(6.7-10.9); Scopelosauridae spp., 3,P(7.1-20.5); Paralepidae spp., 11,P; Evermannellidae sp., 1,P(7); Nemichthys sp., 1,J(330); Exocoetus monocirrhus, 1,J(26.0); Fistularia petimba, 1,J(58.5); Promethichthys prometheus, 1,P(10.5); Labrina spp., 24,P;

Table 4. (Continued)

St. B-14 (continued)
Naso sp., 4,P(5.8-12.8); Bothidae spp., 51,P; Gigantactis sp., 1,J(5.2); Unidentified sp., 1,J(7.8).

St. B-15 (4m); Total NI, 480
Stolephorus buccaneeri, 125,P(8.0-16.8); Diplophos sp., 2,J(37.8, 46.7); Pollichthys mauli, 1,P(9.9); Vinciguerria nimbaria, 128,P(6.0-14.7), 2,J(14.2,15.2); Melanostomiatidae sp., 6,P(16.0-20.3); Synodus sp., 2,P(17.8,23.2); Myctophidae spp., 13,P; Diogenichthys atlanticus, 1,J(12.3); Lampadena sp., 1,P(8.5); Scopelosauridae sp., 10,P(12-25.0); Paralepidae spp., 5,P; Evermannellidae sp., 1,P(7.9); Nemichthys sp., 1,J(300); Fistularia petimba, 1,J(47.9); Gempylus serpens, 1,J(17); Carapidae sp., 2,P(90,94.2); Gobiina sp., 1,J(21.7); Gobiidae sp., 1,P(8.8); Labrina spp., 67,P; Scorpaenidae sp., 1,P(4.7); Bothidae spp., 108,P.

St. B-16 (4m); Total NI, 295
Stolephorus buccaneeri, 63,P(8.5-19.5); Diplophos sp., 3,P(14.8-45.8), 5,J(26.0-49.9); Vinciguerria nimbaria, 55,P(8.1-14.8), 2,J(14.0-14.2); Macrostomias sp., 1,P(63.0); Melanostomiatidae spp., 10,P-J; Synodus sp., 2,P(21.0,24.3); Myctophidae spp., 5,P; Diaphus sp., 1,J(11.2); Lampadena sp., 1,P(10.0); Ceratoscopelus sp., 2,P(6.6,9.0); Scopelosauridae spp., 6,P(17.7-25.3); Paralepidae spp., 7,P; Nemichthys sp., 1,J(280); Gobiina sp., 1,J(21.1); Labrina spp., 23,P; Bothidae spp., 106,P; Arnoglossus sp., 1,P(15.3).

St. 11-3 (L); Total NI, 322
Stolephorus buccaneeri, 299,P(7.4-18.8); Vinciguerria nimbaria, 3,P(5.4-7); Cyclothone sp., 2,P(5.8,5.8); Stomiatidae spp., 2,P; Melanostomiatidae sp., 1,P(6); Myctophidae spp., 4,P; Myctophum sp., 2,P(3.4,4.8); Paralepidae spp., 2,P; Trachipteridae sp., 1,P(4.9); Coryphaenidae sp., 1,P(4.5); Eleotridae sp., 2,P(8.9,11.3); Labrina sp., 1,P(7.1); Ceratiina sp., 1,P(2.0); Unidentified sp., 1,P(4.2).

St. 21-1 (ORI); Total NI, 79
Stolephorus buccaneeri, 6,P(10.7-19.0); Vinciguerria nimbaria, 1,P(6.9); Gonostoma gracile, 1,A(58.8); Cyclothone alba, 48,J(13.0-24.9); Cyclothone pseudopallida, 5,J-A(13-39.1); Cyclothone pallida, 9,J-A(12-52.1); Stomias sp., 1,P(13.7); Stomias nebulosus, 1,J(28.8); Myctophidae spp., 2,J; Diogenichthys atlanticus, 1,J(11.1); Lepidophanes pylosobolus, 2,J(12.0,13.0); Nemichthyidae sp., 1,J(167); Scopeloberyx sp., 1,J(32.3).

St. 21-2 (4m); Total NI, 273
Stolephorus buccaneeri, 249,P(7.3-22.0); Vinciguerria nimbaria, 5,P(6.0-14), 4,J(14.0-14.5); Stomias sp., 4,P(11.3-15.7); Melanostomiatidae spp., 3,P; Myctophidae sp., 1,P(8.2); Paralepidae sp., 1,P(25.8); Nemichthys sp., 1,J; Thunnus alalunga, 1,P(6.0); Labrina sp., 1,P(14.3); Bothidae sp., 2,P(13.0,15.0); Bothus sp., 1,p(22.7).

St. 21-3 (4m); Total NI, 133
Stolephorus buccaneeri, 120,P(8.5-19.8); Diplophos sp., 1,M(52.0); Vinciguerria nimbaria, 2,P(10.3,11); Paralepidae sp., 1,P(23.0); Thunnus albacares, 3,P-J(6.8-12.9); Katsuwonus pelamis, 1,P(8.2);

St. 21-3 (continued)
Bothidae sp., 3,P(10.8-14.1); Bothus sp., 1,P(28.3).

St. 21-5 (L); Total NI, 768
Stolephorus buccaneeri, 573,P(4.8-20.5); Diplophos sp., 6,P(8.1-17.5), 1,M(50.1); Vinciguerria nimbaria, 26,P(4.7-8.7); Stomiatidae sp., 1,P(4.2); Melanostomiatidae spp., 6,P; Myctophidae spp., 71,P; Taaningichthys sp., 9,P(2.9-3.7); Lampadena sp., 40,P(2.7-5.0); Scopelosauridae sp., 1,P(7.6); Paralepidae spp., 9,P; Evermannellidae sp., 1,P(4.5); Thunnus alalunga, 3,P(5.8-6.3); Katsuwonus pelamis, 2,P(5.8,5.9); Tetrapturus angustirostris, 1,P(2.9); Acinaceidae spp., 9,P; Trichiuridae sp., 3,P(4.9-4.9); Coryphaenidae sp., 1,P(4.7); Labrina sp., 1,P(15.8); Unidentified spp., 4,P.

St. 21-6 (4m); Total NI, 92
Stolephorus buccaneeri, 82,P(7.8-18.3); Vinciguerria nimbaria, 2,P(7.7,8.8); Stomias sp., 1,P(12.0); Melanostomiatidae sp., 1,P(13.1); Paralepidae sp., 2,P(14.6,16.0); Katsuwonus pelamis, 1,P(5.2); Brotulidae sp., 1,J(31.2); Labrina sp., 1,P(20.3); Bothidae sp., 1,P(15.1).

St. 21-7 (4m); Total NI, 71
Stolephorus buccaneeri, 61,P(10.1-19.3); Diplophos sp., 1,P(44.7); Vinciguerria nimbaria, 1,P(8.5); Stomias sp., 2,P(12.5,14.0); Myctophidae spp., 2,P; Nimichthys sp., 1,J; Bothidae spp., 3,P.

St. 21-8 (4m); Total NI, 23
Stolephorus buccaneeri, 8,P(10.7-18.8); Diplophos sp., 1,P(29.8); Pollichthys mauli, 1,P(14.7); Vinciguerria nimbaria, 3,P(7-10.9); Melanostomiatidae spp., 4,P; Scopelosauridae sp., 1,P(29.8); Paralepidae spp., 4,P; Nemichthyidae sp., 1,J.

St. 21-9 (4m); Total NI, 90
Stolephorus buccaneeri, 68,P(10.5-19.3); Vinciguerria nimbaria, 11,P(8.3-12.0); Stomias sp., 2,P(13.6,14.7); Melanostomiatidae sp., 2,P(14.0,28.2); Myctophidae sp., 3,P(5.1-7.3); Paralepidae sp., 2,P(10.0,15.0); Bothus sp., 2,P(16.5,24.4).

St. 21-10 (4m); Total NI, 89
Stolephorus buccaneeri, 81,P(9.2-20.4); Vinciguerria nimbaria, 3,P(7-10.9); Stomias sp., 2,J(18.7-20.0); Paralepidae sp., 1,P(18.0); Bothidae sp., 1,P(10.9); Bothus sp., 1,P(25.3).

St. 21-11 (4m); Total NI, 54
Stolephorus buccaneeri, 44,P(9.5-18.3); Diplophos sp., 1,P(18.0); Vinciguerria nimbaria, 1,P(11.8); Stomias sp., 2,P-J(12.0,29.7); Paralepidae spp., 5,P; Acinaceidae sp., 1,P(6.2).

St. 21-12 (4m); Total NI, 331
Stolephorus buccaneeri, 311,P(9.0-20.5); Diplophos sp., 2,J(62.9, 87.4); Vinciguerria nimbaria, 9,P(6.9-10.8); Stomias sp., 4,P(7-17.0); Paralepidae sp., 1,P(14.7); Acinaceidae sp., 1,P(5.9); Bothidae sp., 2,P(10.8,11.2); Bothus sp., 1,P(24.6).

St. 21-13 (4m); Total NI, 159
Stolephorus buccaneeri, 149,P(9.1-18.0); Diplophos sp., 1,J(55.0);

Table 4. (Continued)

St. 21-13 (continued)
Vinciguerria nimbaria, 5,P(8.3-11.2), 1,J(14.2); Myctophidae sp., 1,P(5.0); Lampadena sp., 1,P(8.3); Paralepidae sp., 1,P(10.0).

St. 21-14 (4m); Total NI, 171
Stolephorus buccaneeri, 151,P(10.2-19.4); Gonorhynchus abbreviatus, 1,J(49.3); Diplophos sp., 1,M(46.7), 6,J(37.0-51.7); Vinciguerria nimbaria, 3,P(8.2-10.1); Stomias spp., 2,P-J; Melanostomiatidae sp., 1,P(10.2); Paralepidae spp., 4,P; Bothus sp., 2,P(22.4,23.0).

St. 21-15 (4m); Total NI, 817
Stolephorus buccaneeri, 809,P(9.5-18.8); Vinciguerria nimbaria, 3,P(8.0-10.9); Stomias sp., 1,P(14.5); Melanostomiatidae spp., 2, P; Paralepidae sp., 1,P(9.4); Bothidae sp., 1,P(10.0).

St. 21-16 (4m); Total NI, 617
Stolephorus buccaneeri, 604,P(9.5-18.5); Vinciguerria nimbaria, 8,P(6.0-10.9); Stomias sp., 1,J(17.2); Paralepidae sp., 2,P(10.5, 19.8); Bothidae sp., 1,P(13.7); Bothus sp., 1,P(33.0).

St. 21-17 (4m); Total NI, 255
Stolephorus buccaneeri, 243,P(9.5-21.8); Diplophos sp., 5,P(29.2-48.3); Vinciguerria nimbaria, 2,P(8.9,9.0); Diaphus brachycephalus, 1,J(11.8); Bothidae sp., 2,P(10.0,11.0); Bothus sp., 1,P(25.2); Cryptopsarus sp., 1,J.

St. C-3 (L); Total NI, 133
Diplophos sp., 2,P(6.9,7.9); Myctophidae spp., 26,P; Taaningichthys sp., 47,P(2.7-4.7); Lampadena sp., 32,P(2.0-4.5); Notoscopelus sp., 6,P(3.5-6.0); Acinaceidae sp., 16,P(2.3-5.3); Omobranchus sp., 1, P(12.8); Unidentified spp., 3,P.

St. C-15 (L); Total NI, 912
Stolephorus buccaneeri, 1,P(15.0); Diplophos sp., 5,P(3.9-6.0); Pollichthys mauli, 1,P(5.7); Vinciguerria nimbaria, 555,P(2.0-6.7); Stomiatidae sp., 4,P(3.7-5.9); Melanostomiatidae sp., 4,P(5.7-9.1); Myctophidae spp., 155,P; Hygophum reinhardti, 11,P(2.7-7); Hygophum proximum, 12,P(2.9-4.4); Myctophum sp., 22,P(2.1-4.4); Symbolophorus evermanni, 11,P(3.0-4.5); Taaningichthys sp., 6,P(2.8-4.0); Lampadena sp., 18,P(3.6-5.3); Scopelosauridae sp., 12, P(2.9-7.5); Paralepidae spp., 62,P; Katsuwonus pelamis, 4,P(3.5-4.5); Acinaceidae sp., 7,P(2.2-4.8); Trichiuridae sp., 2,P(5.3,5.3); Coryphaenidae sp., 1,P(3.2); Bramidae sp., 1,P(3.2); Bregmacerotidae sp., 4,P(1.5-3.7); Unidentified spp., 14, P.

St. D-1 (ORI); Total NI, 117
Stolephorus buccaneeri, 1,P(9.0); Vinciguerria nimbaria, 1,P(13.2); Gonostoma gracile, 5,A(50.5-77.3); Cyclothone alba, 81,J(12.9-27.1); Cyclothone pseudopallida, 9,J(14.0-34.3); Cyclothone pallida, 6,J(13.4-36.1); Cyclothone atriata, 6,J(13.0-39.1); Idiacanthidae sp., 1,P(10.5); Myctophidae sp., 1,J(10.0); Acinaceidae sp., 1,P(7.2); Gempylus serpens, 1,P(7.2); Bothidae sp., 2,P(10.7,11.1); Unidentified spp., 2,J.

St. D-2 (4m); Total NI, 21
Stolephorus buccaneeri, 2,P(10,15); Cyclothone alba, 1,J(12.3); Stomias spp., 5,P-J; Melanostomiatidae sp., 1,P(13.5); Myctophum sp., 1,P(6.3); Scopelarchidae sp., 1,P(12.2); Diplospinus multistriatus, 1,J(22.5); Etelis marshi, 1,J; Champsodon snyderi, 1,J (11.6); Labrina sp., 1,P(8.3); Scorpaenidae sp., 1,P(8.1); Bothidae sp., 3,P(11.2-12.7); Bregmacerotidae sp., 1,P(13); Unidentified sp., 1,P(4.6).

St. D-3 (4m); Total NI, 123
Stolephorus buccaneeri, 52,P(8.3-15.2); Vinciguerria nimbaria, 2, P(7.7,9.8); Stomias sp., 10,P(11.0-23.3); Melanostomiatidae spp., 4,P; Myctophum sp., 1,P(5.7); Diplospinus multistriatus, 1,J(21); Cubiceps gracilis, 3,J(13.9-16.8); Apogonidae sp., 1,P(7.3); Bothidae sp., 46,P(9.1-20.5); Bothus sp., 1,P(30.0); Bregmacerotidae sp., 1,J(12); Unidentified sp., 1,J(12.6).

St. D-4 (4m); Total NI, 117
Stolephorus buccaneeri, 48,P(9.3-22.2); Vinciguerria nimbaria, 1, P(10.2); Cyclothone alba, 1,J(11); Stomias sp., 5,P(12.3-15.2); Melanostomiatidae spp., 9,P; Symbolophorus evermanni, 1,P(11.0); Coryphaena equisetis, 1,J(8.7); Cubiceps gracilis, 1,J(8.4); Blenniidae sp., 1,J(19.6); Carapidae sp., 1,J(222); Labrina sp., 1, P(11.3); Naso sp., 1,J(13.8); Bothidae spp., 45,P; Bregmacerotidae sp., 1,J(12.8).

St. D-5 (L); Total NI, 51
Stolephorus buccaneeri, 35,P(4.2-9.0); Myctophidae sp., 2,P(3.4, 3.8); Myctophum sp., 1,P(3.0); Paralepidae sp., 1,P(10.0); Katsuwonus pelamis, 1,P(5.6); Trichiuridae sp., 4,P(5.0-5.2); Bothidae spp., 5,P.

St. D-7 (4m); Total NI, 57
Stolephorus buccaneeri, 14,P(10.7-25.9); Vinciguerria nimbaria, 1,P(11.0); Stomias sp., 1,P(10.7); Melanostomiatidae spp., 2,P; Hygophum proximum, 2,J(13.7,17); Katsuwonus pelamis, 3,P(5.9-7); Carapidae sp., 1,J(223); Bothidae spp., 33,P.

St. D-8 (4m); Total NI, 57
Stolephorus buccaneeri, 35,P(7.3-16.7); Melanostomiatidae sp., 1, P(12); Coryphaena equisetis, 2,J(8.0,10.0); Labrina spp., 2,P; Bothidae sp., 16,P(9.0-14.7); Bothus sp., 1,P(21.3).

St. D-9 (4m); Total NI, 974
Stolephorus buccaneeri, 921,P(4.6-20.3); Diplophos sp., 2,P(23.0, 37.8); Stomias sp., 1,P(15); Melanostomiatidae spp., 12,P; Scopelosauridae sp., 1,P(21.7); Paralepidae sp., 2,P(16,17); Katsuwonus pelamis, 2,P(6.0,6.0); Labrina spp., 17,P; Bothidae sp., 14,P (10.0-11.9); Bothus sp., 2,P(22.7,29.7).

St. D-10 (4m); Total NI, 336
Stolephorus buccaneeri, 314,P(5.2-20.0); Melanostomiatidae spp., 8,P; Paralepidae sp., 2,P(17.5,25); Katsuwonus pelamis, 1,P(6.7); Acinaceidae sp., 1,P(5.8); Bramidae sp., 1,P(8.3); Carapidae sp., 1,J(203); Labrina sp., 2,P(11.9,12.3); Bothidae sp., 5,P(10.3-12.6); Arnoglossus sp., 1,P(35.6).

Table 4. (Continued)

St. D-11 (4m); Total NI, 228
Stolephorus buccaneeri, 213,P(7-18.0); Diplophos sp., 2,P(45.0, 45.9); Melanostomiatidae spp., 4,P; Trachipteridae sp., 1,P(6.0); Katsuwonus pelamis, 1,P(5.5); Coryphaena equisetis, 2,P(8.3,9.5); Labrina sp., 1,P(11.2); Bothidae sp., 3,P(10.6-14.9); Arnoglossus sp., 1,P(34.0).

St. D-12 (4m); Total NI, 65
Stolephorus buccaneeri, 61,P(9.8-20.9); Paralepidae sp., 1,P(12); Labrina sp., 1,P(9.1); Bothidae sp., 2,P(11.9,12.8).

St. D-13 (4m); Total NI, 176
Stolephorus buccaneeri, 155,P(8.6-18.3); Diplophos sp., 1,P(45.6); Stomias spp., 2,P; Melanostomiatidae spp., 3,P; Myctophidae sp., 1,P(6.2); Notolychnus valdiviae, 1,J(13.9); Trachipteridae sp., 1,P(7.0); Katsuwonus pelamis, 1,P(5.3); Coryphaena equisetis, 1,P(8.5); Labrina sp., 2,P(13.6,17.2); Bothidae sp., 5,P(7.7-16.0); Bothus sp., 3,P(13.7-32.3).

St. D-14 (4m); Total NI, 35
Stolephorus buccaneeri, 29,P(10.0-16.9); Gonorhynchus abbreviatus, 1,J(57.0); Stomias sp., 1,P(10.7); Melanostomiatidae sp., 1,P(26); Diogenichthys atlanticus, 1,J(12.6); Carapidae sp., 1,J; Bothidae sp., 1,P(10.4).

St. D-15 (4m); Total NI, 282
Stolephorus buccaneeri, 241,P(7.4-21.3); Diplophos sp., 2,P(22.3, 28.3); Melanostomiatidae spp., 5,P; Trachipteridae sp., 1,P(10.0); Coryphaena equisetis, 1,P(7.6); Labrina sp., 3,P(11.0-17.7); Bothidae sp., 26,P(8.3-13.6); Bothus sp., 1,P(18.3); Arnoglossus sp., 2,P(18.8,25.8).

St. D-16 (4m); Total NI, 285
Stolephorus buccaneeri, 270,P(6.0-20.0); Diplophos sp., 1,P(20.0); Melanostomiatidae spp., 2,P; Paralepidae sp., 2,P(10.4,11.0); Coryphaena equisetis, 1,P(6.0); Labrina spp., 3,P; Bothidae sp., 5,P(10.2-12.5); Bothus sp., 1,P(20.2).

St. D-17 (4m); Total NI, 173
Stolephorus buccaneeri, 139,P(9.0-23.1); Diplophos sp., 1,P(20.0), 1,J(75.0); Stomias sp., 3,P; Melanostomiatidae spp., 8,P; Myctophidae sp., 1,P(5.9); Paralepidae sp., 1,P(19.7); Acinaceidae spp., 2,P; Schindleriidae sp., 1,P(17.7); Labrina sp., 3,P(10.8-14.0); Bothidae sp., 13,P(10.2-17.5).

St. D-18 (4m); Total NI, 182
Stolephorus buccaneeri, 153,P(8.2-18.0); Pollichthys mauli, 1,A(48.4); Vinciguerria nimbaria, 1,P(8.7); Melanostomiatidae spp., 6,P; Thunnus albacares, 1,P(8.1); Coryphaena equisetis, 1,P(9.0); Labrina spp., 3,P; Bothidae spp., 15,P; Bothus sp., 1,P(20.1).

St. D-19 (4m); Total NI, 87
Stolephorus buccaneeri, 73,P(10.5-19.8); Gonorhynchus abbreviatus, 2,J(51.2,56.7); Melanostomiatidae spp., 4,P; Myctophidae sp., 1, P(13.1); Labrina sp., 1,P(12.7); Bothidae sp., 5,P(10.3-11.2); Bothus sp., 1,P(29.4).

St. 16-2 (4m); Total NI, 119
Stolephorus buccaneeri, 16,P(8.1-22.0); Pollichthys mauli, 4,P(5.5-20.0); Vinciguerria nimbaria, 59,P(7.2-14.5); Gonostoma sp., 1, P(8.0); Cyclothone sp., 3,P(8.9); Stomias sp., 1,P(8.0); Myctophidae spp., 2,P; Myctophum sp., 6,P(6.6-8.7); Scopelosauridae sp., 1,P(27.1); Paralepidae sp., 3,P(16.0-21.9); Nealotus tripes, 5,P(5.0-8.5); Benthodesmus sp., 2,P(9.1,11.8); Apogonidae sp., 1,P(4.7); Synagrops sp., 1,J(8.2); Gobiina sp., 1,P(8.7); Naso sp., 1,P(3.0); Scorpaenidae sp., 1,P(4.0); Bothidae sp., 8,P(9-18.1); Unidentified spp., 3,P.

St. 16-3 (4m); Total NI, 29
Stolephorus buccaneeri, 17,P(9.8-20.1); Vinciguerria nimbaria, 6, P(9.2-13.0); Paralepidae sp., 1,P(11.0); Trachipteridae sp., 1,P(29.0); Auxis sp., 1,P(8.0); Acinaceidae sp., 1,P(7.4); Apogonidae sp., 1,P(5.9); Bothidae sp., 1,P(11.5).

St. 16-5 (L); Total NI, 313
Stolephorus buccaneeri, 75,P(4.4-15.3); Diplophos sp., 3,P(15.0-21.4); Vinciguerria nimbaria, 99,P(4.0-7.9); Cyclothone spp., 8, P; Stomiatidae sp., 3,P(4.9-7.8); Melanostomiatidae sp., 1,P(4.8); Synodontidae sp., 1,P(3.7); Saurida sp., 1,P(14.6); Myctophidae spp., 70,P; Myctophum spp., 3,P; Symbolophorus evermanni, 1,P(4.8); Scopelosauridae sp., 4,P(5.9-11.6); Paralepidae sp., 5,P(4.7-10.5); Trachipteridae sp., 1,P(7.2); Acinaceidae sp., 4,P(2.4-2.7); Trichiuridae sp., 2,P(5.0,5.0); Decapterus sp., 1,P(4.0); Gobiina spp., 2,P; Labrina sp., 1,P(4.3); Tetraodontidae sp., 1,P(3.0); Bothidae sp., 1,P(4.0); Bregmacerotidae sp.- 7,P(1.9-4.5); Cryptopsarus sp., 1,P(2.0); Unidentified spp., 18,P.

St. 16-6 (4m); Total NI, 96
Elopidae sp., 1,P(21.6); Stolephorus buccaneeri, 68,P(7.4-17.0); Diplophos sp., 4,P(18.0-19.8); Pollichthys mauli, 1,P(19.1); Stomias sp., 1,P(15); Melanostomiatidae sp., 2,P(9.0,10.0); Scopelosauridae sp., 4,P(19.1-27.5); Paralepidae sp., 2,P(20.0,20.0); Benthodesmus sp., 1,P(28.7); Blenniidae sp., 1,J(15.0); Carapidae sp., 1,J(146); Labrina spp., 2,P; Bothidae sp., 3,P(11.7-14.3); Bothus sp., 2,P(16.1,18.7); Unidentified spp., 3,P.

St. 16-7 (4m); Total NI, 75
Stolephorus buccaneeri, 61,P(7.8-17); Pollichthys mauli, 1,J(18.7); Vinciguerria nimbaria, 1,P(7.3); Trachinocephalus myops, 1,P(13); Scopelosauridae sp., 1,P(21.0); Katsuwonus pelamis, 1,P(5.9); Decapterus sp., 2,P(4.8,6.5); Bothidae spp., 6,P; Bothus sp., 1, P(16.0).

St. 16-8 (4m); Total NI, 53
Stolephorus buccaneeri, 36,P(8.2-14.1); Gonorhynchus abbreviatus, 1,J(46.8); Diplophos sp., 1,P(24.0); Pollichthys mauli, 1,P(11.3); Vinciguerria nimbaria, 3,P(8.1-10.3); Scopelosauridae sp., 3,P(17.9-21); Decapterus sp., 2,P(5.5,5.7); Blenniidae sp., 1,P(5.7); Labrina sp., 1,P(7.3); Bothidae spp., 4,P.

St. 16-9 (4m); Total NI, 59
Stolephorus buccaneeri, 40,P(8.6-14.6); Vinciguerria nimbaria,1, P(10.3); Cyclothone sp., 1,P(9.7); Stomias sp., 2,P(14.7,15.5);

Table 4. (Continued)

St. 16-9 (continued)
Melanostomiatidae sp., 1,P(13.3); Myctophum sp., 1,P(8.0); Lampadena sp., 1,P(9.8); Scopelosauridae sp., 7,P(13.0-29.4); Paralepidae sp., 1,P(21.7); Decapterus sp., 1,J(12.5); Bothidae spp., 3,P.

St. 16-10 (4m); Total NI, 39
Stolephorus buccaneeri, 29,P(9.3-16.2); Gonorhynchus abbreviatus, 2,J(29.5,32.4); Pollichthys mauli, 1,P(10.3); Diplophos sp., 1,P (18.0); Scopelosauridae sp., 5,P(18.3-30.0); Bothidae sp., 1,P(11.5).

St. 16-11 (4m); Total NI, 34
Stolephorus buccaneeri, 7,P(11.5-16.3); Pollichthys mauli, 2,P(17.2,20.2), 1,J(19.5); Vinciguerria nimbaria, 9,P(9.2-11.9); Melanostomiatidae sp., 1P(15); Trachinocephalus myops, 1,P(14.3); Scopelosauridae sp., 1,P(18.3); Acinaceidae sp., 3,P(5.0-6.7); Bathodesmus sp., 1,P(16.8); Apogonidae sp., 1,J(6.7); Labrina sp., 1,P (12.3); Naso sp., 2,J(8.7,10.5); Scorpaenidae sp., 1,P(4.7); Bothidae sp., 1,P(7.7); Bothus sp., 1,P(19.1); Unidentified sp., 1,P(4.2).

St. 55-1 (L); Total NI, 649
Stolephorus buccaneeri, 10,P(6.0-27.0); Gonorhynchus abbreviatus, 3,P(22.2-25.2); Diplophos sp., 2,P(20.0,21.8); Pollichthys mauli, 59,P(4.0-9.2); Vinciguerria nimbaria, 226,P(4.0-11.8); Cyclothone spp., 8,P; Icthyococcus sp., 3,P(7.2-10.5); Stomiatidae spp., 22, P; Melanostomiatidae spp., 8,P; Synodontidae sp., 1,P(5.3); Trachinocephalus myops, 2,P(24.1,25); Myctophidae spp., 151,P; Hygophum reinhardti, 10,P(4.3-6.0); Hygophum proximum, 11,P(3.1-4.7); Myctophum spp., 32,P; Symbolophorus evermanni, 7,P(3.0-6.7); Scopelosauridae spp., 52,P; Paralepidae spp., 11,P; Caulolepidae sp., 1,P(5.7); Acinaceidae spp., 3,P(3.3-5.0); Trichiuridae sp., 1,P(7.0); Champsodontidae sp., 1,P(4.0); Gobiina spp., 3,P; Labrina sp., 1,P(4.9); Bothidae sp., 1,P(18.2); Bregmacerotidae spp., 5, P; Unidentified spp., 15,P.

St. 57-1 (4m); Total NI, 28
Stolephorus buccaneeri, 10,P(12-15); Stomias sp., 3,M(18.3-20); Myctophidae sp., 2,P-J(3.8,12); Apogon kiensis, 2,J(30.4,34.7); Apogon lineatus, 2,J(37.1,37.9); Champsodon snyderi, 3,J(9.6-34.9); Neobythites sivicolus, 3,J(138-169); Chaeturichthys sciistius, 1,J(47.4); Suruga fundicola, 1,J(44.8); Pleuronichthys cornutus, 1,J(89,2).

St. 57-2 (4m); Total NI, 26
Stolephorus buccaneeri, 5,P(16-19.4); Gonorhynchus abbreviatus, 2,J(26.1,27.2); Stomias sp., 2,J(18.9,22.0); Aulopodidae sp., 1, P(12.0); Synodus sp., 1,J(27.2); Trachinocephalus myops, 5,J(28.0 -31.3); Champsodon snyderi, 5,J(8.3-16.2); Callionymidae sp., 1, P(5.7); Gobiina spp., 3,P; Bothidae sp., 1,P(8.8).

St. 57-4 (L); Total NI, 18
Gonorhynchus abbreviatus, 1,P(25.9); Champsodon snyderi, 2,P(4, 4.9); Callionymidae sp., 3,P(3.3-6.9); Gobiina spp., 10,P; Bothidae sp., 1,P(8.3); Unidentified sp., 1,P(3.1).

St. 57-5 (4m); Total NI, 99
Stolephorus buccaneeri, 3,P(14.8-17.9); Gonorhynchus abbreviatus, 1,J(31.0); Synodus sp., 4,P(15.8-23.5); Saurida sp., 2,P(18.1,20.8); Benthosema pterotum, 7,M(12.2-16.1); Trichiurus lepturus, 2,P(25.7,27.0); Synagrops philippiensis, 9,P-J(8.3-13.0); Champsodon snyderi, 29,P-J(5.5-37.3); Callionymidae sp., 3,P-J(6.0-8.3); Eleotridae sp., 34,J(15.2-19.7); Gobiidae sp., 1,J(12.4); Odontamblyopus sp., 1,J(5.9); Erisphex potti, 1,J(15.3); Bothidae sp., 1,P(14.3); Coryphaenoididae sp., 1,P(6.3).

St. 57-6 (4m); Total NI, 80
Stolephorus buccaneeri, 1,P(14.5); Synodus sp., 4,P-J(14.8-27.8); Trachinocephalus myops, 1,J(33.4); Benthosema pterotum, 2,M(12.0, 16.8); Trichiurus lepturus, 2,P(23.8,34.0); Leiognathidae sp., 1, J(8.0); Synagrops philippiensis, 8,J(11.2-18.0); Champsodon snyderi, 28,J(9.3-31.7); Callionymidae sp., 3,J(8.1-9.0); Eleotridae sp., 25,J(15.8-19.2); Gobiidae sp., 2,J(12.8,18.0); Bothidae sp., 2,P(10.1,12.0); Coryphaenoididae sp., 1,P(6).

St. 57-7 (4m); Total NI, 21
Stolephorus buccaneeri, 3,P(18.0-18.9); Gonorhynchus abbreviatus, 2,J(29.3,33.1); Aulopus japonicus, 1,J(15.5); Synodus spp., 4,P-J; Trachinocephalus myops, 3,J(30.5-41.5); Champsodon snyderi, 5, J(10.0-25.0); Eleotridae sp., 2,J(12.8,13.3); Bregmacerotidae sp., 1,J(15.9).

St. 57-8 (4m); Total NI, 51
Aulopus japonicus, 3,P(9.7-13.7); Synodus spp., 10,P-J; Benthosema pterotum, 1,M(13.5); Apogonidae sp., 1,J(8.4); Synagrops philippiensis, 4,J(6.3-11.8); Champsodon snyderi, 22,J(8.5-29.0); Eleotridae sp., 8,J(12.5-18.0); Erisphex potti, 1,J(16.1); Bothidae sp., 1,P(8.8).

St. 57-9 (4m); Total NI, 34
Stolephorus buccaneeri, 2,P(14.0,14.7); Vinciguerria nimbaria, 1, P(12.0); Synodus sp., 3,P(14.2-18.3); Synagrops philippiensis, 2, J(8.0,9.7); Serranidae sp., 1,P(5.4); Champsodon snyderi, 13,J(9.7-31.7); Gobiina sp., 1,J(11.9); Eleotridae sp., 4,P(11.0-17.2); Gobiidae sp., 1,J(9.2); Bothidae spp., 6,P.

St. 57-10 (4m); Total NI, 22
Stolephorus buccaneeri, 2,P(18.0,20.1); Synodus sp., 1,P(18.9); Trachinocephalus myops, 1,J(30.7); Trichiuridae sp., 1,P(14.0); Synagrops philippiensis, 1,P(6.0); Champsodon snyderi, 2,P(10.3, 11.0); Gobiidae sp., 2,P(7.8,8.1); Erisphex potti, 1,J(11.9); Bembras sp., 1,P(10.3); Bothidae spp., 9,P; Unidentified sp., 1,P(5.5).

St. 57-11 (4m); Total NI, 49
Stolephorus buccaneeri, 1,P(18.1); Aulopodidae sp., 1,P(11.4); Benthosema pterotum, 1,P(11.5); Champsodon snyderi, 26,P-J(5.3-25.4); Eleotridae sp., 4,P-J(12.0-17.1); Gobiidae sp., 2,J(9.7,9.8); Erisphex potti, 1,J(12.7); Triglidae sp., 1,P(7.7); Bothidae spp., 12,P.

St. 57-12 (4m); Total NI, 49
Stolephorus buccaneeri, 1,P(17.1); Benthosema pterotum, 4,P(10

Table 4. (Continued)

St. 57-12 (continued)
11.5); Diaphus sp., 1,P(8.0); Trichiuridae sp., 1,P(11.7); Synagrops philippiensis, 4,J(6.8-13.7); Champsodon snyderi, 35,P-J(7.0-27.8); Gobiidae sp., 1,J(10.5); Bothidae spp., 2,P.

St. 57-13 (4m); Total NI, 43
Champsodon snyderi, 40,P-J(6.1-26.0); Gobiina sp., 1,J(17); Bothidae sp., 1,P(18); Unidentified sp., 1,P(8.0).

St. 57-14 (4m); Total NI, 53
Stolephorus buccaneeri, 1,P(12.5); Vinciguerria nimbaria, 2,P(11.2, 14.1); Synagrops philippiensis, 3,P-J(7-9.1); Bembropidae sp., 2, P-J(7.9,9.2); Champsodon snyderi, 41,P-J(5.4-25.5); Eleotridae sp., 1,J(15.7); Gobiidae sp., 1,J(10.4); Erisphex potti, 1,J(10.0); Bothidae sp., 1,P(12.9).

St. 57-15 (4m); Total NI, 74
Stolephorus buccaneeri, 4,P(16.7-20.8); Gonorhynchus abbreviatus, 1.J(27.8); Vinciguerria nimbaria, 1,P(17.3); Benthosema pterotum, 1,P(9.0); Caranx sp., 1,P(7.5); Synagrops philippiensis, 3,P(7.8-17.0); Bembropidae sp., 3,P(7.3-8.7); Champsodon snyderi, 49,P-J(6.5-25.5); Callionymidae sp., 2,P(6.0,6.0); Erisphex potti, 1,J(11.0); Triglidae sp., 2,J(5.8,6.2); Bothidae spp., 4,P; Laemonena sp., 1,P(8.5); Unidentified sp., 1,P(7.5).

St. 57-16 (4m); Total NI, 42
Pollichthys mauli, 1,P(20.3); Vinciguerria nimbaria, 1,P(12.0); Benthosema pterotum, 1,P(12.3); Scopelosauridae sp., 1,P(27.0); Paralepidae sp., 1,P(20.7); Trichiuridae sp., 1,P(11.3); Caranx sp., 1,P(7.5); Synagrops philippiensis, 3,J(8.6-10.2); Serranidae sp., 2,P(6.6,7.0); Bembropidae sp., 1,P(7.6); Champsodon snyderi, 25,P-J(5.3-15.3); Erisphex potti, 1,J(11.0); Bothidae sp., 3,P(9.0-12.0).

St. 60-2 (L); Total NI, 9
Bathylagidae sp., 1,P(17.0); Myctophidae sp., 1,P(3.9); Champsodontidae sp., 5,P(3.3-6.3); Scorpaenidae sp., 1,J(9.0); Unidentified sp., 1,P(4.0).

3.3 Note on lanternfishes (Family Myctophidae) from post-larval stage onward

T. Kubota

The total number of myctophids collected with the various types of nets by various methods of towings at 238 stations amounted to 1,996 specimens. At 10 out of 41 daytime stations (0600-1800), 65 specimens of myctophids were collected and at 139 out of 197 night stations (1800-0600), 1,931.

Twenty six species of 14 genera of myctophids from samples were collected at 149 stations throughout this cruise. Leading species occurring at more than 5.0% of the total number were:

Symbolophorus evermanni (Gilbert)	24.6%
Benthosema suborbitale (Gilbert)	24.2%
Diogenichthys scofieldi Bolin	17.3%
Lampanyctus alatus G. & B.	6.8%

Tows were made with a larval net with diameter of 1.6 m in the surface layer at 22 stations in the daytime, but no myctophids were collected. However, at 17 out of 34 stations sampled at night, 199 myctophids were collected. The following eight species collected by larval net were identified. The numerals in parenthses show the number of specimens of myctophids.

Hygophum reinhardti (Lutken)	(15)
Hygophum proximum Becker	(12)
Myctophum nitidulum Garman	(30)
Myctophum asperum Richardson	(4)
Myctophum spinosum (Steindachner)	(25)
Myctophum obtusirosturm Taning	(13)
Symbolophorus evermanni (Gilbert)	(93)
Centrobranchus brevirostris Becker	(7)

Myctophids collected by two nets with 4.0 m diameter (ring and hexagonal nets) at the layer of 75 m wire length amounted to 612 specimens. Dominant species comprising more than 8.0% of total number collected by these methods were Benthosema suborbitale (42.3%), Diogenichthys scofieldi (23.5%) and Lampanyctus alatus (8.3%).

Five meopelagic species were collected in small numbers in this area from the nets with 4.0 m diameter. These species were identified as follows:

Lampadena liminosa (Garman)

Lobianchia gemellari (Cocco)

Diaphus lucidus (G. & B.)

Diaphus microps Brauer

Lampanyctus nobilis Taning

Further studies on the specimens are in progress. For example, the vertical and horizontal distribution of each species of myctophids will be investigated. For some kinds of these fishes, a small number of large-sized specimens will be examined for the food organisms in the stomach contents.

The number of lanternfishes taken by each of net towings is given in Table 5.

Table 5. List of individual numbers of lanternfishes (post-larval stage onward) collected.

St.	Date	No. of fish
	1973	
1-1	Nov. 23	0
1-2	"	0
1-3	"	0
2-1	Nov. 24	33
2-2	"	18
2-3	"	8
2-4	"	47
3-1	"	32
3-2	"	0
3-3	"	0
4-1	"	10
4-2	"	7
4-3	"	13
4-4	Nov. 25	2
4-5	"	18
4-6	"	3
4-7	"	7
5-1	"	0
5-2	"	0
5-3	"	0
6-1	"	0
6-2	"	0
6-3	"	0
6-4	"	3
6-5	"	2
6-6	"	13
6-7	"	12
6-8	"	0
6-9	"	16
6-10	"	12
6-11	"	28
6-12	"	6
6-13	Nov. 26	18
7-1	"	0
7-2	"	0
7-3	"	0
8-1	"	0
8-2	"	0
8-3	"	0
9-1	"	113
	1973	
9-2	Nov. 26	26
9-3	"	16
9-4	"	56
10-1	Nov. 27	0
10-2	"	0
10-3	"	3
10-4	"	0
10-5	"	0
10-6	"	0
10-7	"	0
10-8	"	0
10-9	"	0
10-10	"	2
10-11	"	1
10-12	"	0
10-13	"	0
10-14	"	0
10-15	"	0
10-16	"	0
10-17	"	13
10-18	"	64
10-19	"	0
10-20	"	0
10-21	"	21
10-22	"	28
10-23	"	58
10-24	"	16
10-25	"	13
10-26	"	1
10-27	"	1
10-28	Nov. 28	9
10-29	"	11
10-30	"	16
10-31	"	21
10-32	"	6
10-33	"	1
10-34	"	1
A-1	"	8
A-2	"	0
A-3	"	0
	1973	
A-4	Nov. 28	9
A-5	"	7
A-6	"	6
A-7	"	4
A-8	"	9
A-9	"	9
A-10	"	8
A-11	Nov. 29	0
A-12	"	18
B-1	"	24
B-2	"	7
B-3	"	1
B-4	"	9
B-5	"	37
B-6	"	113
B-7	"	28
B-8	"	43
B-9	"	34
B-10	"	30
B-11	Nov. 30	85
B-12	"	47
B-13	"	59
B-14	"	104
B-15	"	19
B-16	"	5
11-1	"	4
11-2	"	0
11-3	"	2
11-4	"	0
11-5	"	21
11-6	"	34
11-7	"	9
11-8	"	31
11-9	"	25
11-10	"	15
11-11	"	9
11-12	Dec. 1	13
11-13	"	1
11-14	"	7
11-15	"	5

Table 5. (Continued)

St.	Date	No. of fish
	1973	
11-16	Dec. 1	3
21-1	Dec. 2	2
21-2	"	1
21-3	"	2
21-4	"	0
21-5	"	0
21-6	"	4
21-7	"	3
21-8	"	12
21-9	"	2
21-10	"	2
21-11	"	4
21-12	Dec. 3	3
21-13	"	10
21-14	"	3
21-15	"	1
21-16	"	6
21-17	"	3
C-1	"	6
C-2	"	0
C-3	"	0
C-4	"	0
C-5	"	0
C-6	"	4
C-7	"	3
C-8	"	5
C-9	"	8
C-10	"	3
C-11	"	12
C-12	"	2
C-13	"	1
C-14	Dec. 4	3
C-15	Dec. 3	16
C-16	Dec. 4	2
C-17	"	3
C-18	"	11
D-1	"	3
D-2	"	0
D-3	"	0
D-4	"	3
	1973	
D-5	Dec. 4	0
D-6	"	0
D-7	"	4
D-8	"	1
D-9	"	1
D-10	"	1
D-11	"	1
D-12	"	1
D-13	"	1
D-14	"	1
D-15	Dec. 5	6
D-16	"	4
D-17	"	7
D-18	"	4
D-19	"	3
E-1	"	5
E-2	"	2
E-3	"	14
E-4	"	2
E-5	"	3
E-6	"	2
E-7	"	12
16-1	Dec. 6	0
16-2	"	0
16-3	"	0
16-4	"	0
16-5	"	0
16-6	"	0
16-7	"	0
16-8	"	1
16-9	"	0
16-10	"	0
16-11	"	1
55-1	Dec. 12	8
55-2	"	1
55-3	"	17
55-4	"	0
55-5	"	1
55-6	"	1
55-7	"	6
	1973	
55-8	Dec. 12	0
55-9	"	0
55-10	Dec. 13	3
55-11	"	1
55-12	"	0
55-13	"	2
55-14	"	14
57-1	"	0
57-2	"	0
57-3	"	0
57-4	"	0
57-5	"	0
57-6	"	0
57-7	"	0
57-8	"	0
57-9	"	0
57-10	"	0
57-11	"	0
57-12	Dec. 14	0
57-13	"	0
57-14	"	0
57-15	"	0
57-16	"	0
60-1	"	0
60-2	"	0
60-3	"	0
60-4	"	0
60-5	"	3
60-6	"	0
60-7	"	1
60-8	"	0
60-9	"	0
60-10	"	1
60-11	"	0
60-12	Dec. 15	0
60-13	"	0
60-14	"	0
60-15	"	0
Grand total		1996

3.4 Geographical distribution of marine hatchetfishes (Family Sternoptychidae)

C. Haruta

Using a large larva net (4 m in mouth diameter) and ORI net (1.6 m in mouth diameter), the geographical distribution of marine hatchetfishes was studied in the southwestern North Pacific off Taiwan. At 11 stations, hatchetfishes were collected. They are Sts. 3-1, 10-3, 10-10, 10-11, 10-12, 10-13, 21-1, C-1, D-1, E-1 and 55-4. All of the specimens were larvae, postlarvae or juveniles and are being studied for the detailed identification in the laboratory. At the stations after St. 10-15, collecting effort was concentrated to the upper 100 m layer to collect leptocephali of Anguilla japonica. As a result, only a limited number of hatchetfishes were obtained, since they inhabit mainly in 400 - 1200 m layer.

3.5 Patchiness of pelagic eggs

3.5.1 Net sampling

K. Matsushita

Patchiness of pelagic eggs was investigated at Sts. C and 57. Eggs were collected by surface horizontal haul with NORPAC net (mesh size 0.33 mm) equipped with a flow meter at 2 knots speed. Two identical nets were used in alternation for every two minutes of hauling of one hour at St. C and of two hours at St. 57.

A total of 43 eggs were collected at St. C and 51 eggs at St. 57. The eggs were classified into 15 types according to their eight characters such as egg diameter, number of oil globules, condition of egg membrane etc. There was only one type that was common to both stations. Number of eggs collected in each two-minutes sampling were examined for their distribution. However, insufficiency in number of eggs collected, 36 eggs for one type at most, made it impossible to determine distribution patterns, nor to clarify an occurence of patch of pelagic eggs. In order to know the characteristics of patchiness of pelagic eggs, it is thought that more experiments are needed in the center of spawning grounds in the

peak of spawning seasons.

3.5.2 Test of an apparatus for continuous collecting

K. Matsushita

An apparatus newly devised to collect sea water and plankton continuously was tested at two stations during this cruise (Fig. 3). The apparatus consists of a mouthpiece of funnel-form (300 mm in diameter at the mouth) and a flexible duct (70 mm in diameter and 10 m in length). The mouthpiece is kept submerged below the surface of the sea and with the mouth put forward. As ship cruise about 10 knots, sea water is forced to flow up through the duct and this enables to collect sea water continuously on board. By successive filtering of sea water thus obtained, continuous sampling of plankton is also attained.

Though, the first test at St. 1 failed in collecting sea water with a sufficient steadiness due to unfavorable oceanographic conditions, in the second test at St. 60, sea water was observed to be raised to level approximately 20-40 cm below the deck of Hakuhō-maru and it would have been possible to collect sea water steadily if the end of the duct was kept about 110 cm below the deck. This means that sea water was forced to come up to the height of about 210 cm above sea surface, which is close to the value expected from a laboratory experiment. Relation of the quantity of water collected to the speed of ship, and also to the level of the duct end above sea surface, was not determined in this cruise.

This apparatus is quite simple in structure and requires neither use of a pump nor any supply of power. Therefore, it is expected to be an inexpensive and handy tool to collect sea water and plankton continuously on board while cruising and is considered to be useful for studies to know distribution patterns of planktons to a minute detail, though modifications and further tests on applicability of the apparatus should be necessary.

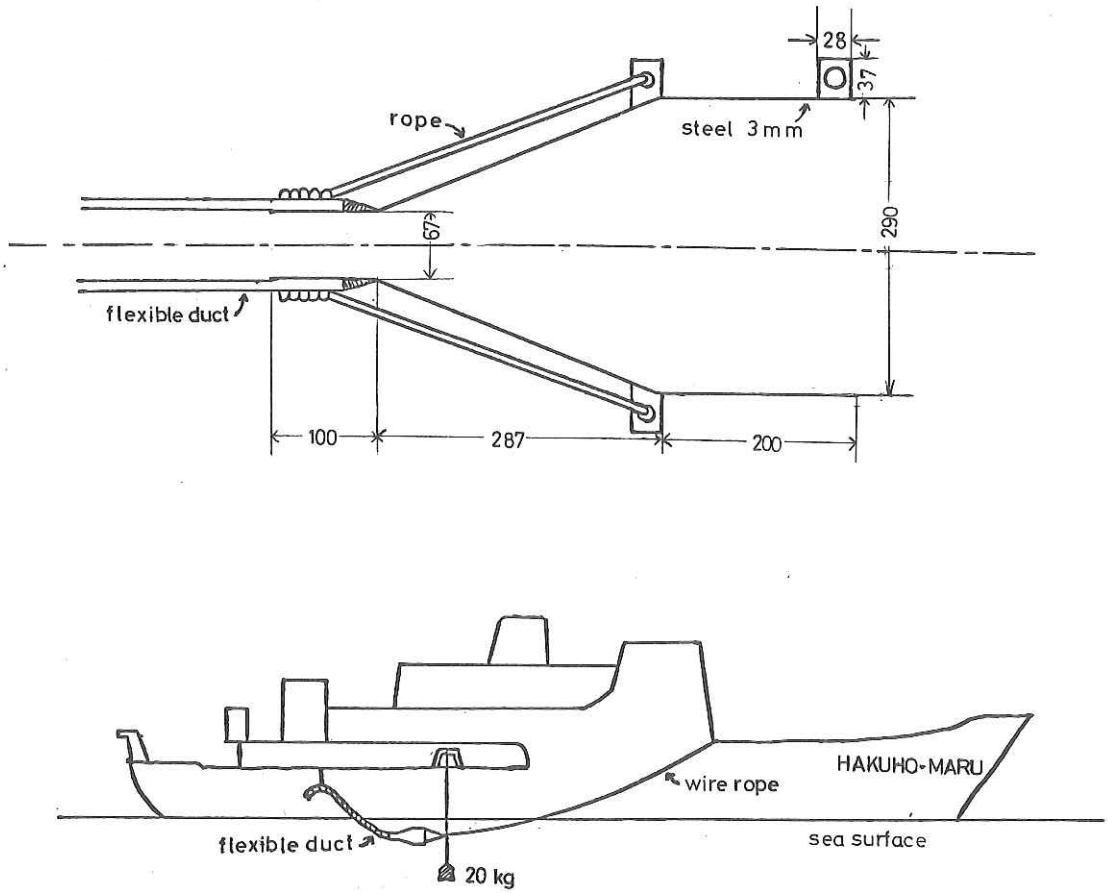


Fig. 3. New apparatus for continuous plankton collecting.

3.6 Saury larvae

Y. Matsumiya, S. Tanaka and C. H. Wang

Larvae of the saury were not collected at all by any net samplings, possibly because the season was earlier than the peak of spawning. At St. 60 on 14th December, spawning of the saury (body length range, 30-33 cm) was observed. Numerous eggs and two larvae (body length, 17 mm and 24 mm) were found from a cluster of drifting sea-weed taken on board.

4. Studies on Plankton

4.1 On the distribution of Phyllosoma larvae in the southern sea of Okinawa

T. Saisho

Phyllosoma larvae collected from 221 samples obtained at 20 stations were 6022 individuals in all; that is, 457 of genus Panulirus, 3226 of genus Scyllarus and Scyllarides, and 2247 of genus Parribacus. Almost all the Phyllosomas were collected by horizontal towing with 4 m diameter larval net at night. Average density of Phyllosoma is high at the areas of 21° - 24° N and 125° - 130° E, and the distribution of larvae decreased rapidly at the north of 26° N. Species names of larvae and the relation between its distribution and oceanographical conditions are under investigations.

Table 6. Phyllosoma larvae collected.

Genus / St.	Panulirus	Scyllarus Scyllarides	Parribacus	Puerulus larvae	Phylamphion	Total	No. of towings
1	0	2	0	0	0	2	3
2	0	75	15	0	0	90	4
3	10	42	0	0	0	52	3
4	1	16	30	1	0	47	7
5	0	4	10	0	0	14	3
6	5	3	3	0	2	11	13
7	0	0	0	0	0	0	3
8	1	4	2	0	0	7	3
9	12	204	202	0	0	418	4
10	122	2320	1510	0	0	3952	34
A	42	63	10	0	0	115	12
B	242	400	450	0	0	1092	16
11	9	40	21	0	0	70	16
21	8	30	44	0	0	82	18
D	30	25	10	0	0	65	19
E	0	0	0	0	0	0	7
16	0	0	0	0	0	0	11
55	0	1	0	0	0	1	14
57	2	0	0	0	0	2	16
60	3	0	0	0	0	3	15
Total	457	3226	2247	1	2	6023	221

4.2 Regional distribution of epipelagic euphausiids in the area southeast of the Okinawa Islands

S. Sawamoto

The specimens used in this study were collected at 15 out of 20 stations and a total of 38 samples taken from different depths were examined. All were nighttime samples except for one tow of wire-out 500 m. When samples were too abundant, an appropriate aliquot of samples was examined. The number of specimens sorted amounted to 16,447 individuals. Net sampling was not made quantitatively, so that no consideration was made on the quantitative distribution.

Twenty species of 6 genera of the epipelagic species were obtained from the samples taken at 12 stations in the Pacific Ocean, southeast of the Okinawa Islands, and 12 species of 6 genera were obtained from the East China Sea. Dominant species occurring as more than 10% of total number were Euphausia nana*, E. mutica, E. recurva and E. hemigibba, and among rarely occurring species were E. similis, Nematobrachion flexipes, Nematoscelis gracilis and Stylocheiron affine. Besides the above, three mesopelagic species (two asterisks in the list below) were also rarely obtained in the Pacific Ocean.

Species listed below are divided into Pacific Ocean occurrence and East China Sea occurrence, the latter being further divided into continental shelf and other areas.

Pacific Ocean:

Thysanopoda tricuspidata	Euphausia diomedeae
T. subaequalis	E. recurva
T. obtusifrons	E. tenera
Pseudeuphausia latifrons	E. similis
Euphausia mutica	E. fallax
E. brevis	E. hemigibba

* This was provisionally identified as Euphausia nana, but the largest specimen is larger in body size than that described by Brinton (1962). In this specimen, the frontal plate is short and the lateral denticle is present on the midpoint of the inferior margin of the carapace.

Nematoscelis tenella**
N. microps
N. gracilis
Nematobrachion flexipes
N. boopis**
Stylocheiron carinarum
Stylocheiron affine
S. suhmii
S. microphthalma
S. longicorne**
S. abbreviatum

East China Sea:

Continental shelf

Thysanopoda tricuspidata
Pseudeuphausia latifrons
Euphausia diomedeae
Euphausia nana*
Stylocheiron carinatum

Other areas

Thysanopoda tricuspidata
Pseudeuphausia latifrons
Euphausia mutica
E. brevis
E. diomedeae
E. recurva
Euphausia nana*
E. tenera
E. fallax
Nematoscelis microps
Nematobrachion flexipes
Stylocheiron carinatum

Further studies on the specimens are in progress. Main interest is in: 1) comparisons of species composition among the stations and depths, 2) relationships of total length to carapace length, etc. in Euphausia nana and comparison with the data from other regions, 3) morphological comparison of Pseudeuphausia latifrons occurring in the southeast of the Okinawa Islands with that of the East China Sea, 4) endo- and ectoparasites in E. recurva and E. tenera and 5) morphological abnormality of E. mutica, E. tenera and Nematoscelis tenella.

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* See foot-note on the previous page.

Table 7. List of euphausiid specimens identified in each of the 38 samples.

Station	2-1	2-2	4-5	4-6	4-7	6-5	6-6	10-15	10-16	10-22	10-23	10-30	10-31	A-10	B-7	B-8	11-4	11-5	21-13	21-14
Wire-out length (m)	30	150	75	30	30	17	75	75	25	25	75	30	75	75	45	75	35	75	75	35
Net used	4m H*	4m H	4m H	4m H	4m H	ORI	ORI	4m H	4m H	4m H	4m H	4m H	4m H	ORI	4m H	4m H	4m R**	4m R	4m R	4m R
Aliquot size	1/2	1/2	1/8	1/2	1/2	1/4	1/4	1/8	1/2	1/16	1/16	1/8	1/8	1/2	1/16	1/16	1/2	1/4	1/8	1/8
Species																				
Thysanopoda tricuspidata	335	185	71	4	13	5	96	228	34	12	130	46	182	43	9	64	2	25	108	13
T. subaequalis	-	8	8	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	7	-
T. obtusifrons	-	-	-	-	-	-	5	-	-	-	-	-	-	1	-	-	-	-	-	-
T. spp.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	-	-	-	-
Pseudeuphausia latifrons	-	-	6	5	11	9	2	3	-	-	9	-	-	-	-	-	-	1	-	-
Euphausia mutica	281	99	101	109	237	113	60	46	47	76	69	109	65	99	362	172	124	280	209	197
E. brevis	24	6	21	30	41	2	1	1	3	6	9	7	1	-	5	2	11	6	9	15
E. diomedeae	1	-	4	6	5	4	2	70	30	-	4	3	5	1	-	-	3	5	2	2
E. recurva	85	47	65	50	101	111	53	53	61	71	119	213	262	19	72	125	9	89	30	52
E. nana	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
E. tenera	28	15	222	164	234	105	98	95	51	29	25	61	86	11	51	52	27	20	10	7
E. similis	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-
E. fallax	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
E. hemigibba	135	71	9	4	2	94	157	3	2	50	56	19	13	56	120	243	13	13	20	34
E. spp.	2	-	1	-	2	32	49	1	-	-	1	2	2	-	3	2	-	-	1	1
Nematoscelis tenella	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
N. microps	-	-	-	1	-	2	7	4	1	-	2	-	-	-	-	1	-	-	-	-
N. gracilis	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Nematobrachion flexipes	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-
N. boopis	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Stylocheiron carinatum	7	5	21	12	14	2	48	2	-	3	79	8	22	33	21	54	-	1	7	3
S. affine	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
S. suhmii	-	1	5	1	2	1	19	-	-	-	-	-	1	-	1	3	-	-	-	-
S. microphthalma	-	-	17	-	-	-	9	-	-	-	6	4	12	-	1	2	-	-	-	-
S. longicorne	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
S. abbreviatum	-	-	-	-	-	-	6	-	-	-	2	1	1	-	1	-	-	-	-	-
S. app.	-	-	-	-	-	1	5	-	-	-	-	-	-	-	-	-	-	-	-	-
Unidentified specimens	-	-	1	-	-	26	24	-	-	-	1	1	1	-	-	-	-	-	-	-
Total	898	437	552	386	662	507	643	507	229	247	512	474	653	263	646	723	189	440	403	324

* 4m H: 4mø hexagonal net.

** 4m R: 4mø round net.

Table 7. (Continued)

Station	C-10	C-11	D-2	D-11	D-12	E-2	E-3	16-2	16-3	16-6	16-10	16-11	55-12	55-13	57-10	57-11	60-9	60-10	Total
Wire-out length (m)	75	45	500	75	45	75	150	150	30	75	75	150	75	150	40	75	75	40	
Net used	4m R	4m R	4m R	4m R	4m R	4m R	4m R	4m R	4m R	4m R	4m R	4m R	4m R	4m R	4m R	4m R	4m R	4m R	
Aliquot size	1/4	1/4	1/1	1/1	1/1	1/4	1/2	1/1	1/1	1/4	1/4	1/2	1/2	1/4	1/16	1/16	1/1	1/1	
Species																			
Thysanopoda tricuspidata	14	1	1	-	-	11	88	88	8	30	11	27	89	38	-	1	17	11	2040
T. subaequalis	-	-	-	-	-	-	2	-	-	-	-	28	-	-	-	-	-	-	54
T. obtusifrons	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	6
T. spp.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3
Pseudeuphausia latifrons	-	-	-	-	-	-	-	-	-	-	-	-	-	-	89	304	62	119	620
Euphausia mutica	180	147	-	257	75	109	98	83	73	15	94	42	101	62	-	-	15	22	4228
E. brevis	5	18	-	5	-	9	2	3	4	1	2	-	5	8	-	-	-	-	262
E. diomedeae	1	-	-	2	1	102	121	205	103	100	59	27	20	29	1	2	225	128	1273
E. recurva	9	3	5	36	4	69	27	188	20	52	26	51	57	34	-	-	30	7	2305
E. nana	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1188	455	5	27	1675
E. tenera	6	5	1	7	1	7	8	24	11	7	17	11	52	50	-	-	38	103	1739
E. similis	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1
E. fallax	-	-	-	-	-	-	-	41	-	-	-	-	-	-	-	-	1	6	48
E. hemigibba	107	40	-	5	1	44	57	9	2	4	2	14	-	-	-	-	-	-	1399
E. spp.	-	-	-	1	1	-	1	-	-	1	-	-	-	-	-	-	-	-	103
Nematoscelis tenella	-	-	-	-	-	-	-	6	-	-	-	-	-	-	-	-	-	-	6
N. microps	-	-	-	-	-	-	-	18	1	-	-	-	-	-	-	-	1	-	38
N. gracilis	-	-	-	-	-	-	-	5	-	-	-	-	-	-	-	-	-	-	5
Nematobrachion flexipes	-	-	-	-	-	-	-	1	-	-	-	-	-	1	-	-	1	-	4
N. boopis	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1
Stylocheiron carinatum	-	-	5	-	-	5	3	90	-	3	-	1	-	-	1	1	2	1	454
S. affine	-	-	3	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	4
S. suhmii	-	-	-	-	-	-	-	1	-	-	-	1	-	-	-	-	-	-	36
S. microphthalma	-	-	-	-	-	-	-	4	-	-	-	-	-	-	-	-	-	-	55
S. longicorne	-	-	4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4
S. abbreviatum	-	-	5	-	-	-	-	7	-	-	-	-	-	-	-	-	-	-	23
S. spp.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	6
Unidentified specimens	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	55
Total	322	214	25	313	83	356	407	774	222	213	211	202	324	223	1279	763	397	424	16447

4.3 Pelagic copepods from the area southeast of the Okinawa Islands

T. Abe

In this cruise, 4 types of nets were used; 4mφ hexagonal nets, a 4mφ round net, an ORI-100 net (ORI-C net which had lost its GG54 bolting silk) and larval nets.

For the 12 samples studied in this research, only the first three types were employed. The samples were found in the nets which were cast down into the sea with wire run out of more than 400 m. The copepods were sorted out on board from other macroplanktons such as coelenterates, chaetognaths, euphausiids, ascidians and salps. At present, they have been identified up to the genus level in our laboratory.

The taxonomical and distributional details of the species of those copepods will be studied at the same laboratory.

The summary for the present is as follows:

1) Sixteen families, 38 genera, about 70 species were obtained at 12 stations.
2) The genus in which a number of species appeared were as follows:

   Gaetanus spp., 4 species; Euchirella spp., 4 species;
   Euchaeta spp., 4 " ; Pareuchaeta spp., more than 3 " ;
   Euaugaptilus spp., 8 " .
3) At St. 6-1, 645 Euchaeta wolfendeni were counted (aliquot size, 1/4) and at St. 10-3, 88 individuals were obtained.
4) At St. D-2, a large number of upper layer planktonic coelenterates, chaetognaths and salps were obtained, but copepods which are also upper layer species were very few.
5) As the meshes of these nets were too large to catch even the deep layer copepods of comparatively small size, (generally less than 3 mm in total length), to say nothing of upper layer copepods, it seemed impossible to get Pseudocalanidae (eg. Microcalanus, Spinocalanus, etc.), Aetideidae (eg. Aetideus, Aetidiopsis, etc.) and Scolecithricidae (eg. Scaphocalanus, Scolecithricella, etc.).
6) Deep layer copepods of comparatively large size (generally more than 3 mm in

total length), such as Phaenidae (eg. Xanthocalanus, Onchocalanus, etc.) and Heterorhabdidae (eg. Heterorhabdus, Mesohabdus, etc.) were not found with the only exception of Disseta scapularis, one of Heterorhabdidae, which was obtained at St. 21-1, St. C-1, St. D-1 and St. E-1.

7) Most of the Pleuromamma which were found in this study were Pleuromamma xiphias, a kind of deep layer Pleuromamma, and in them a comparatively large number of males were counted. The numbers are as follows:
St. 3-1, ♂-1; St. 10-3, ♀-6, ♂-1, ♂im-4*; St. 21-1, ♂-1; St. C-1, ♀-10, ♂-9; St. D-1, ♀-1, ♂-4; St. E-1, ♀-2, ♂-4; St. 55-14, ♀-3, ♂-12.

8) Euchaeta spinosa, one of the deep layer Euchaeta, were counted as follows:
St. 3-1, ♀-6, ♂-4; St. 10-3, ♀-11, ♂im-5; St. 10-10, ♀-2, ♂im-1; St. 21-1, ♀-6, ♂im-1; St. C-1, ♀-12, ♂-2, ♂im-3; St. D-1, ♀-7, ♂-3; St. E-1, ♀-5, ♂-9, ♂im-1.

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* ♂ im: ♂ immature.

Table 8. The list of the numbers of individuals in every Genera of the copepods at the stations of the hauling depth of 400 metres or more of the wire run out.

Stations	3-1	5-1**	6-1	10-3	10-10	21-1	C-1	D-1	D-2***	E-1	16-1	55-14
Net*	4m H	4m H	4m H	4m H	4m H	ORI100	ORI100	ORI100	4m R	ORI100	ORI100	4m R
Wire run out (m)	1000	500	500	1000	500	2000	2000	2000	500	2000	400	500
Towing method	Step	Step	Step	Step	Step	Horiz.	Horiz.	Obliq.	Horiz.	Horiz.	Horiz.	Horiz.
Genera												
Calanus	-	-	6	-	-	-	-	-	-	-	1	-
Neocalanus	-	-	-	-	-	-	-	-	-	-	-	-
Megacalanus	-	-	-	15	2	4	12	2	-	10	-	-
Undinula	-	1	6	3	-	-	-	-	-	-	-	-
Eucalanus	-	19	2	3	2	2	125	16	-	17	1	16
Rhincalanus	-	1	-	-	-	-	165	17	-	21	-	-
Aetideus	-	1	-	-	-	-	-	-	-	-	-	-
Gaidius	-	-	-	-	-	2	1	2	-	-	-	-
Gaetanus	1	-	-	5	2	2	5	4	-	10	-	-
Euchirella	5	51	5	11	-	5	11	8	-	12	-	-
Chirundina	1	-	-	1	1	1	1	4	-	11	-	-
Pseudochirella	-	-	-	3	-	-	-	3	-	4	-	4
Undeuchaeta	-	-	-	-	-	3	1	-	-	4	-	-
Euchaeta	10	653	35	104	4	8	19	10	-	15	-	20
Pareuchaeta	3	-	-	1	-	17	44	7	-	40	-	-
Onchocalanus	-	-	-	-	-	-	2	1	-	-	-	-
Cephalophanes	-	-	-	-	-	-	1	-	-	-	-	-
Scottcalanus	-	-	-	-	-	-	2	1	-	1	-	-
Lophothrix	-	-	-	-	-	1	1	4	-	4	-	-
Scaphocalanus	-	-	-	-	-	-	6	2	-	-	-	-
Scolecithrix	-	-	-	-	-	-	-	-	1	-	-	-
Scolecithricella	-	-	4	-	-	-	-	-	-	-	-	-
Centropages	-	1	-	-	-	-	-	-	-	-	-	-
Metridea	2	-	-	-	-	17	21	7	-	21	1	-
Pleuromamma	2	-	1	11	-	1	19	5	-	6	-	15
Lucicutia	-	-	-	-	-	18	33	11	-	25	-	-
Disseta	-	-	-	-	-	2	17	1	-	44	-	-
Haloptilus	-	1	1	3	-	-	11	1	-	-	1	-
Euaugaptilus	-	-	-	-	-	23	72	13	-	48	-	-
Augaptilus	-	-	-	-	-	1	2	5	-	1	-	-
Centraugaptilus	-	-	-	-	-	4	14	4	-	4	-	1
Pachyptilus	-	-	-	-	-	1	1	-	-	2	-	-
Arietellus	1	-	-	1	1	1	2	2	-	8	1	-
Candacia	1	2	3	-	-	-	2	-	-	-	-	-
Labidocera	-	-	1	-	-	-	-	-	-	-	-	-
Oncaea	-	-	1	-	-	-	-	-	-	-	-	-
Sapphirina	-	4	1	-	-	-	-	-	-	-	-	-
Copilia	-	17	5	3	3	4	56	9	3	2	4	-
Others	-	2	1	4	-	-	22	3	-	-	-	1

* 4m H: 4mφ hexagonal net, 4m R: 4mφ round net.
** Aliquot size: 1/4.
*** Aliquot size: 1/8.

5. Swimming Test of Larval Fish

T. Kajihara and K. Tsukamoto

An apparatus was made for the study of the reaction and swimming ability of pelagic fish larvae towards a current of known velocity. The apparatus tested in this cruise is shown in Fig. 4. It consists of a series of 13 mm diameter glass and rubber tubes and four 12 mm diameter stop cocks. An experimental tube, in which fish swims, is 1 m long and 26 mm in diameter and devided with black bands into 10 sections.

Water flowed by gravity feed from the header tank A into the experimental apparatus. The header tank is supplied with sea water through the inflow B. A constant level of water is maintained in it by the overflow C situated near the top. Water from the header tank is supplied to the experimental apparatus by a recirculating system. By opening and closing the appropriate stop-cocks, a constant flow of water can be obtained in one direction or can be reversed when needed. Thus when opening stop-cocks 1 and 3 the current direction is from left to right, and from right to left when 2 and 4 are opened and 1 and 3 shut.

Larvae are introduced into experimental tube through the funnel. By adjustment of screw clips, currents can be made to flow at velocities of from 1 cm/sec to 20 cm/sec. As the current meter is set just near the header tank and the outlet right under the tank, it can be considered that there is little effect of rolling or pitching of the ship.

In this cruise the experimental data was small due to an insufficient amount of materials.

Table 9. Relationship between current velocity and sustained time of fish larvae.

Species	Total length (mm)	Current vel. (cm/sec)	Sustained time (sec)	Water temp. (°C)
Naucrates indicus	30	10	113	26.5
		15	10	
Acanthuridae (unidentified)	26	5	1800	26.5
		10	156	
Antennarius sp.	15	5	215	24.8
		10	62	
Dasson trossulus	45	5	85	22.5
		10	20	

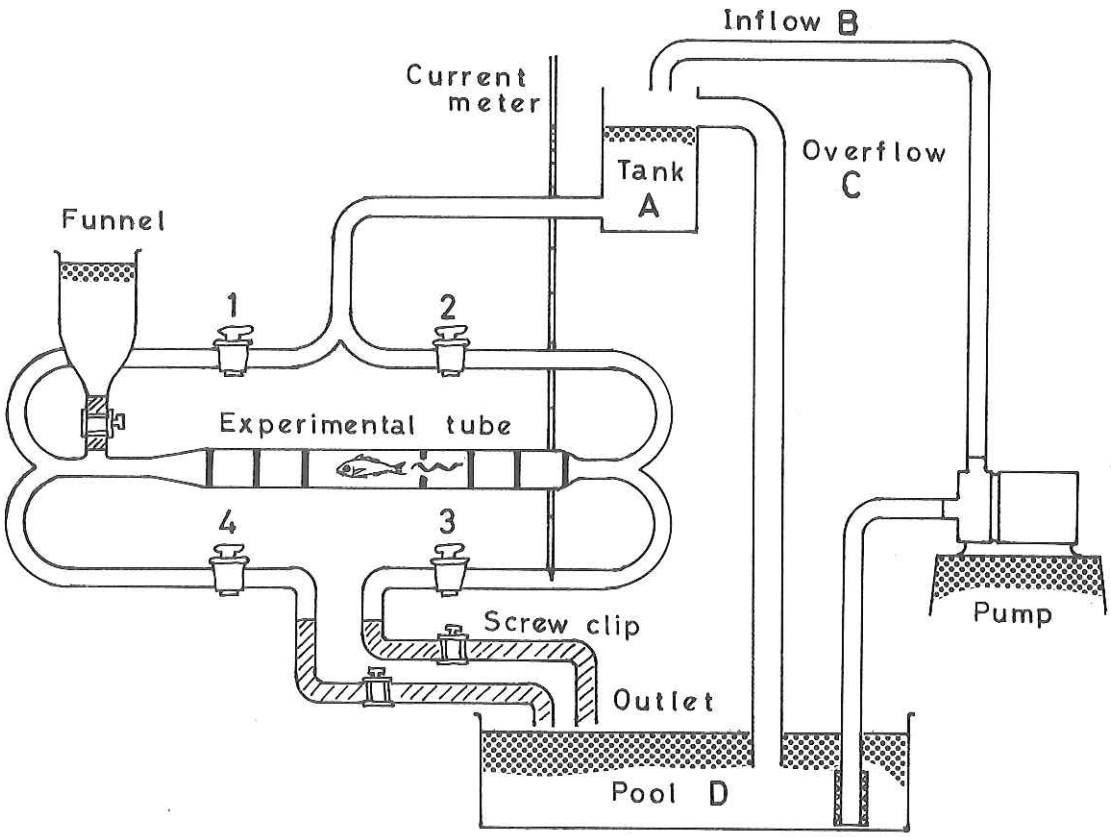

Fig. 4. Diagram of the apparatus for measurement of swimming ability of larval fish.

6. Study on Counting the Echo Pattern of Individual Fish by Pattern Analysis

T. Ishii, M. Shiraishi and H. Abe

1) Collection of the echo pattern of fish with fish detector

The echo signals were not recorded in the magnetic tape, but on the recording sheets. The main depth range of the measurement was either 0 - 100 or 50 - 150 m. A total of 22 rolls of the recording paper were obtained in this cruise.

2) Development of the automatic mask designing system

For counting the echo pattern of the large sized individual automatically, it is necessary to design the standard pattern, which is called the mask. Programs for mask designing were developed and completed during the previous cruises (KH-72-1, KH-73-2), except some points to be examined afterwards.

In this cruise, some of remaining points were worked out and programs were developed for such problems as process in various abnormal conditions and inquiry of the next process when it becomes impossible to process. From these results,

the soft wear of that data-processing in the batch system was completed entirely.

3) Total echo-counting system including the automatic mask designing process

Main programs were developed and completed in the previous cruise (KH-73-2). In this cruise, new programs were designed and tested for tabulating the counting result, and it was possible to select either counted value itself or accumulated value in time series by the entry switch.

Furthermore, the main program for recognizing and counting the echo pattern, Program 16 mentioned in the previous report was devided into two parts and developed further. New programs were as follows:

Program 17 (Program name AMREDY) Inquiry of some parameters for recognizing and counting the echo pattern in each depth range.

Program 18 (Program name AMFANA) Main program for counting the echo pattern, and that included the function for tabulating the counted results.

Total system of echo counting was completed in this cruise, and analyses of data obtained in previous cruises will be made in the next step.

7. Development and Test of New Vertical Long Line to Obtain the Nekton

W. Sakamoto, T. Inagaki, T. Kubota, T. Ishii and N. Sakurai

New vertical long lines to collect the nekton were developed and tested at two stations (Sts. 10 and 21) in the southeastern area of the Okinawa Islands. The length of vertical long line was 600 m, hooks were attached in every 50 m intervals (Fig. 5). Three lines were used in one test and they were kept in the sea for 6 hours. Two fish were caught through two tests. One of them was a lancetfish, Alepisaurus ferox LOWE, 680 mm in total length. The details of this fish is as follows:

Standard length 580 mm; Head length 110 mm; Snout length 42 mm; Number of dorsal fin rays 38; Number of anal fin rays 16; Number of pectoral fin rays (left:right) 14:14; Number of ventral fin rays (left: right) 10:9; Number of gill rakers on 1st gill arch 5+19; Number of vertebrae excluding urostyle 48.

The organisms in the stomach contents of the lancetfish were: Fish: Trachipterus

misakiensis TANAKA (91.2 mm) (Japanese name: Furisodeuo) 1; Annelids: Polychaete worm 1; Arthropods: Platyscelus sp. (Amphipods) 1.

Another fish was a kind of shark about 150 cm in total length. It escaped before fished up on board.

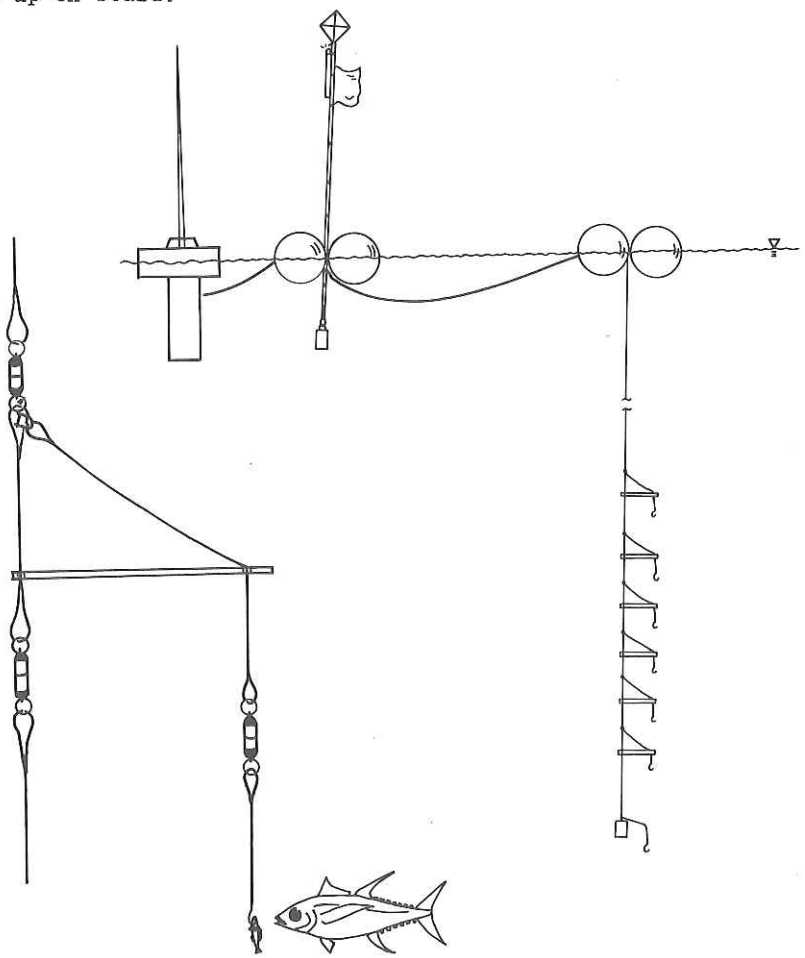

Fig. 5. The vertical long line.

8. Distribution of Tar Globules and Their Sessile Organisms

T. Kajihara and Y. Ura

Tar globules discernible with naked eye were collected from the samples of surface tows at all stations in order to clarify the horizontal distribution of tar globules and relationship between tar globules and sessile organisms attached to them.

The number and size (length, width and height in mm) of tar globules, species and body size of their sessile organisms were recorded on board. The weight of tar globules with or without sessile organisms, after drying in the air at room temperature for 3 or 6 hours, were measured separately in the laboratory.

The most abundant tar globules including a few large and soft tar lumps (max. size 50x40x30 mm) were collected by surface tow at St. 2 located in eastern area of the Ryukyu Islands. A large number of tar globules were found in eastern and southern areas such as Sts. 1, 6 and 9. Only a small number of tar globules were found in northern area of the Ryukyu Islands such as Sts. 16, 55 and 57. The wet weight of tar globules obtained from the samples of surface tow by larval net for 20 min. are shown in Fig. 6 together with the ratio in weight of tar globules with sessile organisms to total globules obtained at each station.

Dominant sessile organisms found in the surveyed area were bryozoans, barnacles (Lepas spp.), serpulids and blue-green algae.

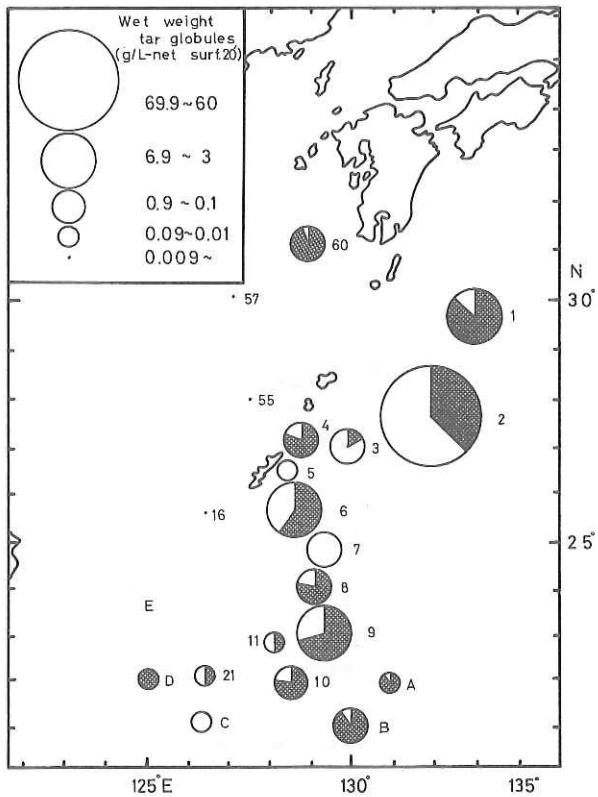

Fig. 6. Wet weights of tar globules collected from surface tow by larval net for 20 min., black area in a circle shows the ratio of tar globules with sessile organisms to the total globules.

9. On the Towing Depth and Tension of the Plankton Net

A. Kakui

The towing depth and the tension of the plankton net should be estimated accurately for scientific purpose. Usually the towing depth is estimated by the trigonometric function measuring the tilt angle and the length of wire. In this report, a different way of estimation is presented assuming that the configuration of wire in operation is a part of circular arc on the basis of KAWAKAMI and NAKASAI's method. The parameters θ_s and θ_n are the angle between the warp and the horizontal plane at the sea surface and at the connecting point to the net, respectively, and L is the length of wire. The tension was measured by tension meter set on the winch and the observer can check the lowest and the highest values of the tension in operation.

From the results obtained by this experiment, some items are concluded as follows:

1. When the tilt angle (θ_n) is 75 degrees and (θ_s), 61 degrees, the towing depth of 2000 m wire length (L) is about 740 m that is 230 m smaller than the value obtained by the traditional method.

2. The towing depth of 75 m and 150 m wire lengths were about 15 m and 60 m, respectively.

3. The comparison of 4mφ net with ORI net showed that the towing depth of ORI net was about 200 m deeper than that of the 4mφ net, when the wire length was 2000 m. However, the towing depth of circular 4mφ net was not different from that of hexagonal 4mφ net.

As to the towing tension imposed on the wire, the followings are concluded:

1. From 100 kg to 1000 kg was the tension of the 4mφ net. During the towing period, the tension was varied by various causes, mainly rolling or pitching of vessel and sea conditions. The tension was less varied when the towing depth is deep.

2. From 100 kg to 500 kg was the tension of the ORI net.

3. The tension increased sharply at hauling of the net over 2000 kg in case of the 4mφ net.

Large tension may cause the break of net, and often interupt the smooth work of winch. Consequently, the highest value of tension is considered to be an important point in designing the plankton net and its relating mechanisms.

Appendix Table I. Data of net towings.

St.	Date	Time	Locality				Net* type	Wire out	Towing durat.	Wire angle
			Net in		Net out					
	1973		N	E	N	E		(m)	(min.)	°
1-1	Nov.23	1330-1403	29-33.0	132-58.8	29-32.0	132-58.7	4m H	150,75,S(30)	10,10,10	64,60,63
1-2	"	1338-1358	29-32.7	132-58.7	29-32.0	132-58.7	L	0	20	-
1-3	"	1401-1411	27-37.8	131-28.1	27-37.6	131-28.1	L	0	10	-
2-1	Nov.24	0324-0359	27-37.8	131-28.1	27-37.5	131-28.3	4m H	S(30)	30	63
2-2	"	0405-0450	27-37.4	131-28.3	27-36.1	131-28.3	4m H	150,75,S(30)	10,10,10	62,69,73
2-3	"	0329-0339	27-37.8	131-28.1	27-37.6	131-28.1	L	0	10	-
2-4	"	0344-0404	27-37.6	131-28.1	27-37.4	131-28.3	L	0	20	-
3-1	"	1433-1652	26-57.4	129-50.3	26-57.3	129-53.6	4m H	1000,700	20,20	50,48
								300,100	20,10	46,51
3-2	"	1440-1500	26-57.4	129-50.3	-	-	L	0	20	-
3-3	"	1504-1514	-	-	26-57.1	129-51.5	L	0	10	-
4-1	"	2340-0010	27-10.5	128-40.5	27-10.2	128-40.6	4m H	S(30)	30	62
4-2	Nov.25	0028-0109	27-10.2	128-40.6	27-09.8	128-40.5	4m H	150,75,S(30)	10,10,10	72, -, -
4-3	Nov.24	2344-0004	27-10.4	128-40.5	27-10.2	128-40.6	L	0	20	-
4-4	Nov.25	0024-0034	27-10.2	128-40.6	27-10.1	128-40.6	L	0	10	-
4-5	"	0123-0153	27-09.8	128-40.5	27-09.3	128-40.4	4m H	75	30	69
4-6	"	0206-0236	27-09.3	128-40.4	27-09.1	128-40.4	4m H	S(30)	30	62
4-7	"	0247-0317	27-09.0	128-40.4	27-08.5	128-40.2	4m H	S(30)	30	61
5-1	"	0923-1038	26-18.2	128-21.9	26-21.7	128-47.0	4m H	500,250,125	20,20,20	62,50,69
5-2	"	0916-0936	26-18.3	128-21.9	26-19.5	128-21.8	L	0	20	-
5-3	"	0941-0951	26-18.3	128-21.9	26-19.5	128-21.8	L	0	10	-
6-1	"	1608-1701	25-37.7	128-47.0	25-40.3	128-44.8	4m H	500,250, -	20,20, -	60,72, -
6-2	"	1556-1616	25-37.7	128-47.0	25-38.2	128-46.7	L	0	20	-
6-3	"	1622-1632	25-38.7	128-46.3	25-39.2	128-45.9	L	0	10	-
6-4	"	1751-1828	25-41.3	128-44.1	25-42.0	128-43.0	ORI	150,75,S(15)	10,10,10	46,54,64
6-5	"	1836-1906	25-42.0	128-43.0	25-44.7	128-41.8	ORI	S(17)	30	45
6-6	"	1912-1942	25-44.7	128-41.8	25-46.3	128-40.7	ORI	75	30	49
6-7	"	1952-2022	25-46.5	128-40.6	25-49.1	128-40.0	ORI	S(17)	30	72
6-8	"	2027-2057	25-55.7	128-36.2	25-57.7	128-35.5	ORI	S(17)	30	45
6-9	"	2109-2129	25-51.5	128-38.8	25-52.6	128-38.2	L	0	20	-
6-10	"	2148-2218	25-52.8	128-38.1	25-55.4	128-36.2	ORI	75	30	31
6-11	"	2226-2256	25-55.7	128-36.2	25-57.7	128-35.5	ORI	75	30	32
6-12	"	2310-2340	25-58.3	128-35.3	26-00.0	128-34.6	ORI	S(24)	30	57
6-13	Nov.26	0001-0031	26-01.0	128-34.1	26-03.1	128-33.3	ORI	75	30	36
7-1	"	0818-0852	24-48.1	129-14.2	24-49.7	129-15.5	ORI	150,75, S	10,10,10	33,34, -
7-2	"	0819-0829	24-48.4	129-14.3	24-48.7	129-14.7	L	0	10	-
7-3	"	0831-0851	24-48.8	129-14.8	24-49.6	129-15.4	L	0	20	-
8-1	"	1321-1356	23-59.3	129-15.5	23-58.1	129-05.8	4m H	150,75,S(17)	10,10,10	68,63,53
8-2	"	1328-1348	23-58.7	129-06.4	23-58.3	129-06.0	L	0	20	-
8-3	"	1351-1401	23-58.3	129-06.0	23-58.1	129-05.8	L	0	10	-
9-1	"	2105-2139	22-54.0	128-56.8	22-51.9	128-55.5	4m H	150,75,S(30)	10,10,10	72,77,69
9-2	"	2153-2223	22-51.4	128-55.2	22-49.7	128-54.4	4m H	S(18)	30	72
9-3	"	2105-2115	22-53.8	128-56.7	22-51.7	128-55.4	L	0	10	-
9-4	"	2126-2146	22-53.8	128-56.7	22-51.7	128-55.4	L	0	20	-
10-1	Nov.27	0539-0549	21-59.8	128-46.0	21-59.7	128-45.9	L	0	10	-
10-2	"	0554-0614	21-59.6	128-45.9	21-59.4	128-46.0	L	0	20	-
10-3	"	0715-0900	21-59.2	128-46.0	21-58.7	128-48.1	4m H	1000,700	20,20	55,66
								300,100,S	20,10,5	68,67,78
10-4	"	0829-0849	21-58.8	128-47.6	21-58.7	128-47.8	L	0	20	-
10-5	"	0907-0917	21-58.7	128-48.1	21-58.5	128-48.3	L	0	10	-
10-6	"	1148-1208	21-56.3	128-46.9	21-56.1	128-47.1	L	0	20	-
10-7	"	1210-1220	21-56.1	128-47.1	21-56.0	128-47.2	L	0	10	-
10-8	"	1435-1455	21-51.9	128-45.3	21-52.4	128-45.6	L	0	20	-
10-9	"	1458-1508	21-52.4	128-45.6	21-52.6	128-45.8	L	0	10	-
10-10	"	1503-1619	21-52.2	128-45.5	21-52.8	128-46.7	4m H	500,250,125	20,20,20	61,46,56
10-11	"	1639-1714	21-52.8	128-46.7	21-53.6	128-46.5	4m H	150,75,S(35)	10,10,10	58,61,72
10-12	"	1724-1754	21-53.6	128-46.3	21-54.0	128-46.2	4m H	S(25)	30	67
10-13	"	1726-1746	21-53.7	128-46.4	21-53.9	128-46.2	L	0	20	-
10-14	"	1750-1800	21-53.9	128-46.2	21-54.0	128-46.2	L	0	10	-
10-15	"	1810-1840	21-54.1	128-46.2	21-54.6	128-46.6	4m H	75	30	63
10-16	"	1850-1920	21-54.6	128-46.6	21-55.1	128-46.5	4m H	S(25)	30	82
10-17	"	1930-2000	21-55.1	128-46.5	21-55.2	128-47.0	4m H	S(25)	30	67

* 4m H: 4mø hexagonal net. 4m R: 4mø round net. L: 1.6mø larval net.

Appendix Table I. (Continued)

St.	Date	Time	Locality				Net type	Wire out	Towing durat.	Wire angle
			Net in		Net out					
	1973		N	E	N	E		(m)	(min.)	°
10-18	Nov.27	2014-2047	21-55.3	128-47.1	21-55.7	128-47.3	4m H	150,75, S	10,10,10	63,65,66
10-19	"	2031-2041	21-55.7	128-47.3	21-56.1	128-47.4	L	0	10	-
10-20	"	2044-2104	21-55.7	128-47.3	21-56.1	128-47.4	L	0	20	-
10-21	"	2055-2125	21-55.9	128-47.4	21-56.4	128-47.6	4m H	S(25)	30	64
10-22	"	2131-2201	21-56.5	128-47.6	21-56.8	128-47.6	4m H	S(25)	30	64
10-23	"	2210-2240	21-56.8	128-47.6	21-57.3	128-47.5	4m H	75	30	72
10-24	"	2249-2319	21-57.3	128-47.5	21-57.7	128-47.4	4m H	S(29)	30	71
10-25	"	2327-2357	21-57.7	128-47.4	21-57.8	128-47.4	4m H	S(29)	30	65
10-26	"	2335-2345	21-57.8	128-47.3	-	-	L	0	10	-
10-27	"	2350-0010	-	-	21-57.8	128-47.0	L	0	20	-
10-28	Nov.28	0005-0035	21-57.8	128-47.4	21-57.8	128-46.2	4m H	S(22)	30	58
10-29	"	0045-0115	21-57.9	128-46.1	21-58.0	128-45.8	4m H	75	30	53
10-30	"	0126-0156	21-58.1	128-45.7	21-58.3	128-45.2	4m H	S(30)	30	61
10-31	"	0205-0235	21-58.3	128-45.2	21-58.7	128-44.5	4m H	75	30	73
10-32	"	0243-0313	21-58.8	128-44.2	21-59.0	128-44.0	4m H	S(25)	30	-
10-33	"	0206-0226	21-58.4	128-45.1	21-58.5	128-44.7	L	0	20	-
10-34	"	0231-0241	21-58.6	128-44.7	21-55.8	128-44.3	L	0	10	-
A-1	"	1913-1947	22-05.1	131-00.2	22-05.7	131-00.6	ORI	150,75,S(25)	10,10,10	64,45,67
A-2	"	1823-1843	22-04.2	130-59.3	22-04.6	130-59.8	L	0	20	-
A-3	"	1845-1855	22-04.6	130-59.8	22-05.0	131-00.2	L	0	10	-
A-4	"	1954-2024	22-05.7	131-00.6	22-07.9	131-01.8	ORI	75	30	30
A-5	"	2035-2106	22-08.1	131-01.9	22-09.3	131-02.0	ORI	75	30	32
A-6	"	2116-2146	22-09.5	131-02.0	22-10.8	131-01.9	ORI	75	30	47
A-7	"	2155-2225	22-10.9	131-02.0	22-12.0	131-02.4	ORI	75	30	31
A-8	"	2234-2304	22-12.2	131-02.6	22-13.2	131-03.1	ORI	75	30	31-40
A-9	"	2312-2342	22-13.4	131-03.1	22-14.4	131-03.3	ORI	75	30	55
A-10	"	2352-0022	22-14.6	131-03.4	22-15.9	131-03.9	ORI	75	30	48
A-11	Nov.29	0217-0247	22-16.5	131-04.3	22-16.1	131-04.1	4m H	75	30	73
A-12	"	0332-0402	22-16.3	131-04.2	22-17.5	131-04.0	ORI	75	30	60
B-1	"	1828-1904	20-59.5	129-59.9	21-00.1	130-00.3	4m H	150,75,S(30)	10,10,10	53,62,67
B-2	"	1915-1945	21-00.1	130-00.4	21-00.4	130-00.6	4m H	S(30)	30	67
B-3	"	1823-1833	20-59.7	130-00.1	20-59.8	130-00.2	L	0	10	-
B-4	"	1835-1855	20-59.8	130-00.2	21-00.0	130-00.3	L	0	20	-
B-5	"	1956-2026	21-00.5	130-00.7	21-00.9	130-01.3	4m H	75	30	70
B-6	"	2038-2108	21-00.9	130-01.4	21-01.3	130-02.9	4m H	75	30	68
B-7	"	2120-2150	21-01.3	130-02.9	21-01.8	130-03.3	4m H	S(45)	30	72
B-8	"	2200-2234	21-01.8	130-03.3	21-02.3	130-03.6	4m H	75	30	74
B-9	"	2239-2309	21-02.4	130-03.6	21-02.9	130-03.8	4m H	75	30	74
B-10	"	2320-2350	21-03.0	130-03.8	21-03.5	130-04.0	4m H	S(45)	30	72
B-11	Nov.30	0005-0042	21-03.7	130-04.2	21-04.1	130-04.5	4m H	150,75,S(30)	10,10,10	65,67,66
B-12	"	0100-0130	21-04.3	130-04.6	21-04.8	130-05.0	4m H	75	30	58
B-13	"	0137-0207	21-04.8	130-05.0	-	-	4m H	S(30)	30	-
B-14	"	0221-0259	21-05.4	130-05.4	21-06.4	130-06.1	4m H	150,75,S(45)	10,10,10	50,73, -
B-15	"	0314-0344	21-06.4	130-06.1	21-06.9	130-06.7	4m H	75	30	65
B-16	"	0358-0428	21-06.9	130-06.7	21-07.4	130-06.9	4m H	S(45)	30	-
11-1	"	1819-1854	22-46.4	128-18.7	22-46.6	128-18.9	4m R	150,75,S(30)	10,10,10	48,70,71
11-2	"	1816-1826	22-46.4	128-18.7	22-46.2	128-18.8	L	0	10	-
11-3	"	1830-1850	22-46.2	128-18.8	22-46.5	128-18.9	L	0	20	-
11-4	"	1902-1932	22-46.6	128-18.9	22-47.2	128-19.0	4m R	S(35)	30	-
11-5	"	1939-2009	22-47.2	128-19.0	22-47.2	128-19.3	4m R	75	30	71
11-6	"	2019-2049	22-47.2	128-19.3	22-47.7	128-19.6	4m R	75	30	67
11-7	"	2055-2125	22-47.8	128-19.6	22-48.1	128-19.9	4m R	S(35)	30	-
11-8	"	2135-2219	22-48.1	128-19.9	22-48.5	128-20.3	4m R	150,75,S(35)	10,10,10	68,67,68
11-9	"	2217-2247	22-48.5	128-20.3	22-48.8	128-21.0	4m R	75	30	67
11-10	"	2255-2325	22-48.9	128-21.1	22-49.2	128-21.5	4m R	S(40)	30	63
11-11	"	2355-0025	22-49.4	128-21.7	22-49.6	128-22.0	4m R	75	30	68
11-12	Dec. 1	0036-0106	22-49.6	128-22.0	22-49.8	128-22.4	4m R	75	30	62
11-13	"	0115-0145	22-49.8	128-22.4	22-50.0	128-22.7	4m R	S(30)	30	-
11-14	"	0154-0224	22-50.0	128-22.7	22-50.0	128-23.0	4m R	75	30	47
11-15	"	0234-0304	22-50.0	128-23.0	22-50.0	128-23.5	4m R	75	30	54

Appendix Table I. (Continued)

St.	Date	Time	Locality				Net type	Wire out	Towing durat.	Wire angle
			Net in		Net out					
	1973		N	E	N	E		(m)	(min.)	°
11-16	Dec. 1	0312-0342	22-49.9	128-23.5	22-49.9	128-24.0	4m R	S(30)	30	-
21-1	Dec. 2	0900-0930	22-01.0	126-31.2	22-05.2	126-30.0	ORI	2000	30	62,61
21-2	"	1811-1845	21-56.2	126-25.1	21-56.9	126-25.0	4m R	150,75,S(35)	10,10,10	48,62, -
21-3	"	1852-1922	21-56.9	126-25.0	21-57.6	126-25.0	4m R	S(35)	30	-
21-4	"	1811-1821	21-56.3	126-25.1	21-56.4	126-25.1	L	0	10	-
21-5	"	1822-1842	21-56.4	126-25.1	21-56.8	126-25.1	L	0	20	-
21-6	"	1930-2000	21-57.6	126-25.0	21-58.1	126-25.0	4m R	75	30	59
21-7	"	2009-2039	21-58.1	126-25.0	21-58.9	126-25.1	4m R	75	30	62
21-8	"	2046-2116	21-58.9	126-25.1	21-59.6	126-25.4	4m R	S(40)	30	64
21-9	"	2124-2154	21-59.6	126-26.0	22-00.5	126-26.0	4m R	75	30	68
21-10	"	2203-2233	22-00.5	126-26.0	22-01.5	126-25.6	4m R	75	30	72
21-11	"	2241-2311	22-01.5	126-26.5	22-02.4	126-27.1	4m R	S(45)	30	72
21-12	Dec. 3	0000-0030	22-03.6	126-27.9	22-05.3	126-28.5	4m R	75	30	79
21-13	"	0041-0111	22-05.3	126-28.5	22-06.9	126-28.8	4m R	75	30	67
21-14	"	0119-0149	22-06.9	126-28.8	22-08.1	126-29.3	4m R	S(35)	30	74
21-15	"	0158-0228	22-08.1	126-29.3	22-09.2	126-29.6	4m R	75	30	71
21-16	"	0238-0308	22-06.9	126-29.6	22-10.0	126-30.0	4m R	75	30	70
21-17	"	0318-0348	22-10.0	126-30.0	22-10.9	126-30.5	4m R	S(35)	30	70
C-1	"	1055-1155	20-59.7	126-29.5	20-59.2	126-24.2	ORI	2000	60	58
C-2	"	1708-1742	20-58.3	126-20.4	20-58.2	126-21.3	4m R	150,75,S(35)	10,10,10	56,66, -
C-3	"	1707-1727	20-58.3	126-20.4	20-58.3	126-20.9	L	0	20	-
C-4	"	1730-1740	20-58.3	126-21.0	20-58.2	126-21.2	L	0	10	-
C-5	"	1750-1820	20-58.2	126-21.4	20-58.1	126-22.0	4m R	S	30	-
C-6	"	1826-1856	20-58.1	126-22.0	20-57.9	126-22.8	4m R	75	30	71
C-7	"	1905-1935	20-57.9	126-22.8	20-57.6	126-23.3	4m R	75	30	69
C-8	"	1946-2016	20-57.6	126-23.3	20-57.3	126-24.6	4m R	150	30	69
C-9	"	2028-2058	20-57.3	126-24.6	20-56.9	126-25.3	4m R	75	30	73
C-10	"	2108-2138	20-56.9	126-25.4	20-56.5	126-26.0	4m R	75	30	71
C-11	"	2145-2215	20-56.5	126-26.1	20-56.2	126-26.7	4m R	S(45)	30	72
C-12	"	2303-2338	20-56.0	126-26.2	20-55.7	126-27.2	4m R	150	30	69
C-13	"	2350-0020	20-55.7	126-27.2	20-55.1	126-27.7	4m R	75	30	69
C-14	Dec. 4	0030-0100	20-55.1	126-27.7	20-54.6	126-28.2	4m R	75	30	69
C-15	Dec. 3	2305-2325	20-56.0	126-26.2	20-55.8	126-26.7	L	0	20	-
C-16	Dec. 4	0109-0139	20-54.6	126-28.2	20-54.1	126-28.6	4m R	75	30	71
C-17	"	0149-0219	20-54.1	126-28.6	20-53.0	126-29.0	4m R	75	30	67
C-18	"	0231-0301	20-53.0	126-29.0	20-53.8	126-29.4	4m R	150	30	67
D-1	"	1503-1632	21-58.9	124-57.4	21-00.5	124-59.4	ORI	2000	37	60
D-2	"	1659-1729	22-00.6	124-59.5	22-01.8	124-01.0	4m R	500	30	48
D-3	"	1756-1830	22-01.9	125-01.1	22-02.3	125-01.5	4m R	150,75,S(35)	10,10,10	64,52, -
D-4	"	1839-1909	22-02.3	125-01.5	22-02.9	125-01.9	4m R	S(35)	30	-
D-5	"	1904-1924	22-02.8	125-01.8	22-03.1	125-02.0	L	0	20	-
D-6	"	1928-1938	22-03.2	125-02.0	22-03.3	125-02.0	L	0	10	-
D-7	"	1917-1947	22-02.9	125-01.9	22-03.5	125-02.0	4m R	S(35)	30	72
D-8	"	1954-2024	22-03.6	125-02.0	22-07.0	125-01.8	4m R	75	30	72
D-9	"	2035-2105	22-07.1	125-01.8	22-08.6	125-02.2	4m R	150	30	69
D-10	"	2122-2152	22-08.8	125-02.4	22-09.9	125-03.1	4m R	75	30	48
D-11	"	2200-2230	22-10.0	125-03.1	22-11.0	125-03.8	4m R	75	30	69
D-12	"	2236-2306	22-11.1	125-03.9	22-12.1	125-04.2	4m R	S(45)	30	86
D-13	"	2315-2345	22-12.2	125-04.3	22-13.2	125-05.4	4m R	75	30	65
D-14	"	2355-0025	22-13.3	125-05.4	22-14.5	125-05.9	4m R	75	30	-
D-15	Dec. 5	0040-0110	22-14.5	125-05.9	22-15.0	125-06.8	4m R	150	30	52
D-16	"	0121-0151	22-15.0	125-06.8	22-15.7	125-07.6	4m R	75	30	65
D-17	"	0203-0233	22-15.7	125-07.6	22-16.6	125-08.4	4m R	75	30	68
D-18	"	0246-0316	22-16.6	125-08.4	22-17.2	125-09.2	4m R	150	30	62
D-19	"	0335-0405	22-17.2	125-09.2	22-18.8	125-08.4	4m R	150	30	58
E-1	"	1437-1537	23-32.0	126-00.7	23-36.9	126-05.1	ORI	2000	60	64
E-2	"	2009-2039	23-36.5	126-06.4	23-37.8	126-07.3	4m R	75	30	72
E-3	"	2050-2120	23-37.9	126-07.4	23-39.1	126-08.3	4m R	150	30	52
E-4	"	2131-2201	23-39.1	126-08.3	23-40.2	126-09.0	4m R	75	30	73
E-5	"	2211-2241	23-40.3	126-09.1	23-41.4	126-09.9	4m R	75	30	66

Appendix Table I. (Continued)

St.	Date	Time	Locality				Net type	Wire out	Towing durat.	Wire angle
			Net in		Net out					
	1973		N	E	N	E		(m)	(min.)	°
E-6	Dec. 5	2250-2320	23-41.5	126-10.0	23-42.8	126-10.5	4m R	75	30	71
E-7	"	2332-0002	23-42.8	126-10.5	23-43.9	126-11.3	4m R	150	30	64
16-1	Dec. 6	1556-1656	25-33.5	126-32.9	25-35.5	126-33.4	ORI	400	60	57
16-2	"	1806-1836	25-34.0	126-30.9	25-34.9	126-31.1	4m R	150	30	61
16-3	"	1848-1918	25-35.0	126-31.1	25-35.9	126-31.2	4m R	S(30)	30	72
16-4	"	1847-1857	25-35.0	126-31.1	25-35.3	126-31.1	L	0	10	-
16-5	"	1914-1934	25-35.7	126-31.1	25-36.1	126-31.2	L	0	20	-
16-6	"	1926-1956	25-35.9	126-31.2	25-37.1	126-31.7	4m R	75	30	58
16-7	"	2005-2035	25-37.2	126-31.4	25-38.3	126-31.5	4m R	75	30	58
16-8	"	2047-2117	25-38.4	126-31.5	25-39.6	126-31.5	4m R	150	30	62
16-9	"	2130-2200	25-39.7	126-31.5	25-40.6	126-31.1	4m R	75	30	72
16-10	"	2209-2239	25-40.7	126-31.1	25-41.6	126-30.6	4m R	75	30	72
16-11	"	2250-2320	25-41.7	126-30.6	25-42.2	126-30.9	4m R	150	30	55
55-1	Dec.12	1946-2006	27-59.5	127-59.5	28-01.1	127-24.4	L	0	20	-
55-2	"	2042-2052	28-02.6	127-25.5	28-03.2	127-25.5	L	0	10	-
55-3	"	1946-2021	27-59.5	127-25.2	28-01.8	127-25.4	ORI	150,75,S(30)	10,10,10	41,59,49
55-4	"	2041-2111	28-02.6	127-25.5	28-04.0	127-25.4	ORI	S(30)	30	49
55-5	"	2118-2148	28-04.2	127-25.4	28-05.9	127-25.4	ORI	75	30	63
55-6	"	2156-2226	28-06.0	127-25.4	28-07.8	127-25.3	ORI	75	30	48
55-7	"	2238-2308	28-08.0	127-25.3	28-09.8	127-25.3	ORI	150	30	51
55-8	"	2318-2348	28-09.9	127-25.3	28-11.3	127-25.2	ORI	75	30	46
55-9	"	2358-0028	28-11.4	127-25.2	28-13.2	127-25.1	ORI	75	30	39
55-10	Dec.13	0035-0105	28-13.3	127-25.1	28-14.3	127-25.3	ORI	S(12)	30	50
55-11	"	0130-0200	28-15.5	127-25.8	28-18.0	127-26.3	4m R	75	30	55
55-12	"	0210-0240	28-18.0	127-26.3	28-19.8	127-27.1	4m R	75	30	63
55-13	"	0250-0320	28-19.8	127-27.1	28-21.7	127-27.6	4m R	150	30	55
55-14	"	0346-0446	28-21.7	127-27.6	28-25.5	127-28.0	4m R	500	60	53
57-1	"	1818-1854	30-04.9	127-02.0	30-05.7	127-02.5	4m R	150,75,S(35)	10,10,10	41,61, -
57-2	"	1908-1938	30-06.1	127-02.5	30-06.6	127-02.7	4m R	S(35)	30	67
57-3	"	1817-1827	30-04.9	127-02.0	30-05.2	127-02.1	L	0	10	-
57-4	"	1831-1851	30-05.3	127-02.2	30-05.6	127-02.4	L	0	20	-
57-5	"	1947-2017	30-06.7	127-02.7	30-08.3	127-02.1	4m R	75	30	67
57-6	"	2026-2056	30-08.4	127-02.1	30-09.4	127-02.2	4m R	75	30	68
57-7	"	2104-2134	30-09.5	127-02.2	30-10.5	127-02.3	4m R	S(35)	30	76
57-8	"	2142-2212	30-10.6	127-02.3	30-11.7	127-02.4	4m R	75	30	69
57-9	"	2221-2251	30-11.8	127-02.4	30-11.7	127-02.7	4m R	75	30	67
57-10	"	2258-2328	30-12.8	127-02.8	30-14.1	127-03.0	4m R	S(40)	30	75
57-11	"	2335-0005	30-14.2	127-03.0	30-15.7	127-03.2	4m R	75	30	78
57-12	Dec.14	0014-0044	30-15.7	127-03.2	30-17.2	127-04.3	4m R	75	30	75
57-13	"	0053-0123	30-17.2	127-04.3	30-18.4	127-05.0	4m R	S(30)	30	73
57-14	"	0131-0201	30-18.4	127-05.0	30-19.5	127-05.9	4m R	75	30	71
57-15	"	0210-0240	30-19.5	127-05.9	30-20.7	127-06.7	4m R	75	30	70
57-16	"	0249-0321	30-20.7	127-06.7	30-21.8	127-07.4	4m R	S(-)	30	77
60-1	"	1805-1839	31-09.8	128-58.1	31-09.5	128-59.3	4m R	150,75,S(30)	10,10,10	62,57,60
60-2	"	1803-1823	31-09.8	128-58.1	31-09.6	128-58.8	L	0	20	-
60-3	"	1826-1836	31-09.6	128-58.8	31-09.6	128-59.0	L	0	10	-
60-4	"	1849-1919	31-09.5	128-59.3	31-09.0	129-00.0	4m R	S(30)	30	-
60-5	"	1927-1957	31-09.0	129-00.0	31-08.5	129-00.7	4m R	75	30	65
60-6	"	2005-2035	31-08.5	129-00.7	31-09.0	129-00.9	4m R	75	30	70
60-7	"	2043-2113	31-09.0	129-00.9	31-09.0	129-01.3	4m R	S(-)	30	70
60-8	"	2140-2210	31-09.5	129-01.6	31-09.6	129-02.4	4m R	75	30	73
60-9	"	2220-2250	31-09.6	129-02.4	31-10.0	129-02.5	4m R	75	30	67
60-10	"	2257-2327	31-10.0	129-02.5	31-10.6	129-03.1	4m R	S(40)	30	-
60-11	"	2337-0007	31-10.6	129-03.1	31-11.2	129-03.7	4m R	75	30	70
60-12	Dec.15	0016-0047	31-11.2	129-03.7	31-11.9	129-04.6	4m R	75	30	73
60-13	"	0055-0125	31-11.9	129-04.6	31-12.9	129-05.6	4m R	S(35)	30	72
60-14	"	0135-0205	31-12.9	129-05.6	31-13.8	129-06.3	4m R	75	30	73
60-15	"	0214-0244	31-13.8	129-06.3	31-14.8	129-07.5	4m R	75	30	68

Appendix Table II. Data from BT observations.

St.	Date	Time	Lat.	Lon.	Temp. (°C) at depths (m)											Max. depth	
					0	10	20	30	50	75	100	125	150	200	250	D(m)	T(°C)
	1973		N	E													
1(1)	Nov.23	1300	29-33.7	132-58.9	22.7	22.7	22.7	22.7	22.6	22.0	21.9	21.1	20.4	18.9	18.4	285	17.1
1(2)	"	1313	"	"	22.7	22.7	22.7	22.7	22.5	22.5	22.4	21.8	21.1	19.5	18.9	268	18.4
2	Nov.24	0308	27-38.1	131-28.1	23.4	23.4	23.4	23.5	23.6	23.6	23.4	20.5	19.6	18.7	17.6	250	17.6
3	"	1155	27-00.0	129-50.7	25.4	25.3	25.3	25.3	25.3	25.0	24.3	22.7	21.5	19.3	17.8	263	17.1
4	"	2322	27-10.5	128-40.5	25.3	25.3	25.3	25.3	25.3	24.0	22.3	20.8	20.0	18.4	17.5	264	16.8
5	Nov.25	0852	26-17.9	128-22.1	25.1	25.1	25.1	25.1	25.1	25.0	24.0	23.7	22.2	19.2	18.4	264	17.6
6	"	1539	25-37.5	128-47.0	23.6	23.6	23.6	23.6	23.6	23.5	23.4	21.3	20.1	18.9	17.7	260	17.2
7	Nov.26	0807	24-48.1	129-14.2	25.9	25.9	26.0	26.0	26.1	26.1	24.6	24.3	23.8	20.8	18.8	268	17.6
8	"	1304	23-59.3	129-07.0	25.5	25.5	25.5	25.5	25.5	25.5	25.5	25.3	24.1	21.5	19.6	260	19.3
9	"	2055	22-54.8	128-27.2	25.6	25.6	25.6	25.4	24.9	24.8	24.7	24.6	24.3	22.7	19.8	258	19.2
10	Nov.27	0627	21-59.3	128-46.0	25.9	25.9	25.9	25.9	26.0	25.4	25.2	25.0	24.8	22.5	20.0	265	18.8
A*1	Nov.28	0400	21-58.6	128-49.2	25.6	25.6	25.6	25.6	25.6	25.3	24.8	24.4	24.2	21.2	18.7	278	16.4
A*2	"	0500	21-56.7	128-58.3	25.5	25.5	25.5	25.4	25.0	24.8	24.8	24.4	23.3	20.6	18.5	264	17.8
A*3	"	0600	21-56.4	129-09.2	25.6	25.6	25.6	25.3	25.2	24.7	24.9	23.4	22.0	19.8	17.7	268	16.7
A*4	"	0700	21-55.3	129-19.4	25.5	25.5	25.5	25.5	25.5	25.3	24.3	22.6	21.7	19.4	-	244	18.2
A*5	"	0800	21-56.0	129-28.3	25.4	25.4	25.4	25.0	24.8	24.7	24.6	24.3	22.8	20.6	18.0	250	18.0
A*6	"	0904	21-56.2	129-40.3	25.2	25.2	25.2	25.2	24.7	24.6	24.5	22.9	21.1	19.1	-	246	17.6
A*7	"	1006	21-57.1	129-51.0	25.0	25.0	25.0	24.9	24.7	24.5	24.8	22.2	20.8	18.9	-	241	17.3
A*8	"	1105	21-58.2	130-02.2	25.1	25.1	25.1	25.1	25.1	25.1	22.0	22.8	19.9	18.8	16.4	252	16.3
A*9	"	1205	21-59.0	130-12.5	25.0	25.0	25.0	25.0	25.0	23.5	21.6	20.3	19.2	17.7	16.5	253	16.2
A*10	"	1305	21-59.5	130-23.8	24.9	24.9	24.9	25.0	25.0	24.9	22.1	20.6	19.8	18.4	-	231	17.7
A*11	"	1405	22-00.0	130-35.0	25.1	25.1	25.1	25.1	25.1	24.9	21.8	-	-	-	-	-	-
A*12	"	1506	22-00.6	130-46.5	25.1	25.1	25.1	25.1	25.1	25.1	22.0	20.6	-	-	-	-	-
A	"	1610	22-01.9	130-58.0	25.5	25.5	25.5	25.4	25.3	25.1	21.3	19.9	19.2	17.9	16.9	258	15.2
B*1	Nov.29	0410	22-17.5	131-04.0	25.9	25.9	25.9	25.8	25.4	25.2	21.8	20.3	19.3	17.9	16.6	-	-
B*2	"	0504	22-11.6	130-57.9	25.6	25.6	25.6	25.4	25.2	22.7	21.4	20.2	19.4	18.1	-	229	17.9
B*3	"	0607	22-03.3	130-50.0	25.0	25.0	25.0	25.0	25.0	23.0	21.3	20.1	19.6	18.0	-	220	17.5
B*4	"	0706	21-54.5	130-43.3	24.9	24.9	24.9	24.9	24.9	22.6	20.9	20.1	19.3	18.0	-	204	17.9
B*5	"	0802	21-44.1	130-35.9	24.9	24.9	24.9	24.9	24.9	24.9	21.4	20.4	19.2	17.7	-	210	15.6
B*6	"	0906	21-33.6	130-29.4	24.9	24.9	24.9	24.9	24.9	24.8	22.4	20.8	19.8	18.0	-	232	17.1
B*7	"	1008	21-23.0	130-22.4	24.9	24.9	24.9	24.9	24.9	24.8	22.1	20.4	19.8	18.0	16.7	258	16.3
B*8	"	1221	21-12.0	130-12.8	24.9	24.9	24.9	24.9	24.9	24.8	21.8	20.3	19.7	17.9	-	244	16.6

Appendix Table II. (Continued)

St.	Date	Time	Lat.	Lon.	Temp. (°C) at depths (m)											Max. depth	
					0	10	20	30	50	75	100	125	150	200	250	D(m)	T(°C)
	1973		N	E													
B*9	Nov.29	1400	21-04.0	130-04.2	24.8	24.8	24.8	24.8	24.8	24.7	22.9	20.8	19.8	18.3	-	240	17.1
B*10	"	1506	20-59.2	129-59.8	24.9	24.9	24.9	24.9	24.8	24.7	23.9	21.3	19.6	18.0	16.4	250	16.4
B	Nov.30	0436	21-07.4	130-06.9	24.8	24.8	24.8	24.8	24.8	24.8	23.3	21.5	20.1	18.0	-	244	16.1
11*1	"	0504	21-09.7	130-06.5	24.9	24.9	24.9	24.9	24.8	24.8	22.8	21.3	20.0	18.1	-	220	17.2
11*2	"	0606	21-16.8	129-58.6	24.9	24.9	24.9	24.9	24.9	24.8	23.7	21.5	19.7	16.5	-	200	16.5
11*4	"	0706	21-24.7	129-50.3	24.8	24.8	24.8	24.8	24.8	24.8	23.5	21.1	-	-	-	-	-
11*5	"	0805	21-32.1	129-41.3	25.0	25.0	25.0	25.0	25.0	24.8	24.5	-	-	-	-	-	-
11*6	"	0906	21-38.9	129-33.7	25.1	25.1	25.1	25.1	24.6	24.4	-	-	-	-	-	-	-
11*7	"	1005	21-46.8	129-24.3	25.1	25.0	24.9	24.7	24.6	-	-	-	-	-	-	-	-
11*8	"	1105	21-53.7	129-15.3	-	-	-	-	-	-	-	-	-	-	-	-	-
11*9	"	1205	22-02.3	129-06.6	-	-	-	-	-	-	-	-	-	-	-	-	-
11*10	"	1305	22-09.8	128-56.7	25.8	25.8	25.7	25.7	25.6	25.5	24.5	24.1	22.3	19.3	-	227	18.4
11*11	"	1407	22-17.2	128-48.3	25.5	25.4	25.4	25.4	25.3	25.0	24.5	23.8	22.5	19.8	18.8	255	18.5
11*12	"	1505	22-25.3	128-40.0	25.9	25.8	25.8	25.7	25.5	25.4	24.7	24.2	23.5	21.6	19.3	250	19.3
11*13	"	1605	22-32.8	128-31.5	25.5	25.5	25.5	25.5	25.5	25.5	25.5	24.5	24.1	21.4	19.9	251	19.9
11	"	1706	22-41.2	128-24.2	25.7	25.6	25.6	25.6	25.6	25.6	25.6	24.7	24.6	22.4	20.0	252	19.2
21*1	Dec. 1	0349	22-49.9	128-24.0	25.5	25.5	25.5	25.5	25.5	25.4	25.3	24.6	24.1	21.3	19.2	254	19.2
21*2	"	0520	23-01.8	128-13.6	26.2	26.2	26.2	26.2	26.2	26.2	26.2	25.9	24.0	21.7	-	237	20.0
21*3	"	0601	23-07.9	128-08.3	26.1	26.1	26.1	26.1	26.1	26.1	26.1	26.1	24.0	21.5	-	233	19.9
21*4	"	0705	23-16.8	128-00.5	26.2	26.2	26.2	26.2	26.2	26.2	26.2	26.2	24.3	21.7	19.1	254	18.3
21*5	"	0806	23-26.3	127-53.7	26.2	26.2	26.2	26.2	26.2	26.2	26.2	26.2	24.5	22.2	-	236	20.5
21*6	"	0900	23-35.5	127-48.7	25.7	25.7	25.7	25.7	25.6	25.4	24.9	24.6	24.4	21.9	19.8	251	19.7
21*7	"	1000	23-43.3	127-42.8	25.9	25.9	25.9	25.9	25.8	25.5	25.3	24.3	23.8	21.5	19.3	267	18.8
21	Dec. 3	0356	22-10.9	126-30.5	25.8	25.9	25.9	25.9	25.9	25.9	25.9	25.9	24.6	21.8	19.6	263	19.1
C*1	"	0505	21-58.8	126-33.1	26.5	26.5	26.5	26.5	26.5	26.5	26.5	25.8	24.3	22.1	-	229	20.5
C*2	"	0607	21-47.3	126-32.5	25.9	25.9	25.9	25.9	25.9	25.9	25.9	25.9	24.7	21.9	-	240	19.7
C*3	"	0704	21-35.7	126-32.0	26.1	26.1	26.1	26.1	26.1	26.1	26.1	26.1	24.8	22.3	-	233	20.8
C*4	"	0803	21-24.2	126-31.3	26.2	26.2	26.2	26.2	26.2	26.2	26.2	26.2	24.8	22.0	-	233	20.3
C*5	"	0905	21-11.3	126-30.3	26.2	26.2	26.2	26.2	26.2	26.2	26.2	25.7	24.6	22.1	-	220	20.9
C(1)	"	1002	20-59.7	126-29.6	26.3	26.3	26.2	26.2	26.2	26.2	26.2	25.1	24.2	21.6	19.0	268	18.3
C(2)	"	1403	20-59.2	126-22.6	26.4	26.3	26.3	26.3	26.3	26.3	26.3	26.3	26.3	23.0	20.7	260	20.1
D*1	Dec. 4	0312	20-53.8	126-29.4	26.3	26.3	26.3	26.3	26.3	26.3	26.3	25.2	23.7	21.5	19.2	263	18.6

Appendix Table II. (Continued)

St.	Date	Time	Lat.	Lon.	Temp. (°C) at depths (m)											Max. depth	
					0	10	20	30	50	75	100	125	150	200	250	D(m)	T(°C)
	1973		N	E													
D*2	Dec. 4	0406	20-59.6	126-20.9	26.3	26.3	26.3	26.3	26.3	26.3	26.3	25.0	23.4	-	-	192	21.8
D*3	"	0505	21-07.4	126-10.0	26.2	26.2	26.2	26.2	26.2	26.2	26.2	25.9	24.4	21.4	-	200	21.4
D*4	"	0606	21-15.2	125-59.3	26.3	26.3	26.3	26.3	26.3	26.3	26.3	25.6	24.9	21.0	-	200	21.0
D*5	"	0706	21-22.7	125-48.8	26.3	26.3	26.3	26.3	26.3	26.3	26.3	25.2	23.9	20.5	-	200	20.5
D*6	"	0806	21-30.6	125-38.1	26.2	26.2	26.2	26.2	26.2	26.2	26.2	25.6	24.8	22.2	18.9	260	18.5
D*7	"	0906	21-38.6	125-26.8	26.5	26.5	26.5	26.5	26.5	26.5	26.5	25.2	23.8	20.9	18.5	263	18.2
D*8	"	1003	21-47.0	125-16.5	26.3	26.3	26.3	26.3	26.3	26.3	25.7	24.2	22.4	19.7	18.2	264	17.8
D*9	"	1105	21-55.0	125-01.1	26.6	26.6	26.6	26.6	26.6	26.5	26.2	24.3	23.4	20.8	19.3	256	19.0
D	"	1200	21-59.0	124-59.7	26.5	26.5	26.5	26.5	26.5	26.5	26.5	24.4	23.0	20.4	19.0	260	18.8
E*1	Dec. 5	0418	22-18.8	125-09.4	26.1	26.1	26.1	26.2	26.0	26.0	24.8	23.3	21.6	19.3	17.5	250	17.5
E*2	"	0508	22-24.8	125-12.3	25.9	25.9	25.9	25.9	25.9	25.9	25.9	24.4	22.8	19.7	-	241	17.8
E*3	"	0607	22-32.3	125-17.2	25.9	25.9	25.9	25.9	25.9	25.9	25.9	24.7	23.4	19.7	-	202	19.6
E*4	"	0706	22-40.3	125-22.0	25.6	25.6	25.6	25.6	25.6	25.6	25.6	23.8	22.7	19.7	-	237	18.4
E*5	"	0806	22-48.3	125-27.0	26.0	26.0	26.0	26.0	26.0	26.0	26.0	24.8	23.8	20.8	18.5	279	17.4
E*6	"	0906	22-56.0	125-32.0	26.0	26.0	26.0	26.0	26.0	26.0	25.2	24.7	23.4	21.1	18.8	273	17.9
E*7	"	1005	23-04.2	125-37.1	25.9	25.9	25.9	25.9	25.9	25.6	25.2	24.7	23.1	21.1	18.2	250	18.2
E*8	"	1105	23-11.8	125-41.9	25.9	25.9	25.9	25.9	25.9	25.8	25.4	25.2	23.8	20.8	-	240	19.1
E*9	"	1205	23-19.6	125-46.7	26.0	26.0	26.0	26.0	26.0	25.7	25.6	25.4	24.3	21.5	18.9	252	18.8
E*10	"	1305	23-25.5	125-54.2	26.0	26.0	26.0	26.0	26.0	26.0	26.0	25.3	24.2	21.5	19.1	280	17.8
E*11	"	1338	23-32.0	126-00.5	26.0	26.0	26.0	26.0	26.0	26.0	26.0	25.6	23.8	21.3	-	243	19.0
E	Dec. 6	0014	23-43.9	126-11.3	25.7	25.7	25.7	25.7	25.7	25.7	25.7	25.7	23.4	20.5	18.5	264	17.6
16*1	"	0207	23-59.4	126-13.9	25.4	25.4	25.4	25.4	25.4	25.4	25.4	24.0	23.4	20.3	-	210	20.1
16*2	"	0306	24-09.1	126-14.7	25.4	25.4	25.4	25.4	25.4	25.4	24.8	24.3	23.1	20.6	-	245	18.6
16*3	"	0405	24-18.2	126-16.1	25.4	25.4	25.4	25.4	25.4	24.8	24.0	24.0	23.6	21.2	19.0	272	18.3
16*4	"	0506	24-27.0	126-18.0	24.1	24.2	24.2	24.2	24.2	24.2	24.1	24.0	23.9	22.4	-	235	20.5
16*5	"	0606	24-35.8	126-19.7	24.3	24.3	24.3	24.3	24.3	24.3	24.3	24.3	24.3	23.1	20.0	250	20.0
16*6	"	0705	24-45.0	126-20.8	24.2	24.2	24.2	24.2	24.2	24.2	24.2	24.2	24.0	22.9	-	238	20.1
16*7	"	0806	24-54.6	126-22.5	25.1	25.1	25.1	25.1	25.1	24.4	24.2	24.2	24.1	21.6	18.4	280	17.9
16*8	"	0906	25-03.3	126-24.6	25.1	25.1	25.1	25.1	25.1	24.8	24.5	24.2	23.9	21.8	18.9	282	18.0
16*9	"	1005	25-11.7	126-26.4	24.6	24.6	24.6	24.6	24.2	24.2	24.2	24.0	23.4	23.0	19.1	269	18.2
16*10	"	1105	25-20.3	126-28.1	25.0	25.0	25.0	25.0	24.8	24.8	24.8	24.7	23.8	21.2	19.3	250	19.3
16*11	"	1205	25-29.0	126-29.7	23.9	23.9	23.9	23.9	23.8	23.6	23.5	23.3	23.0	21.2	-	214	20.2

Appendix Table II. (Continued)

St.	Date	Time	Lat.	Lon.	Temp. (°C) at depths (m)											Max. depth	
					0	10	20	30	50	75	100	125	150	200	250	D(m)	T(°C)
	1973		N	E													
16	Dec. 6	1403	25-33.6	126-30.7	24.3	24.3	24.3	24.3	24.1	23.9	23.7	23.2	23.0	20.4	17.7	260	17.5
55*1	Dec.12	1109	26-23.2	127-36.8	23.3	23.3	23.3	23.2	23.0	23.0	22.8	22.5	21.8	20.3	18.3	260	18.0
55*2	"	1205	26-33.5	127-33.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.1	21.4	19.4	-	200	19.4
55*3	"	1306	26-44.7	127-30.6	23.4	23.4	23.2	22.9	22.7	22.6	22.4	22.2	21.5	19.6	18.0	262	17.3
55*4	"	1403	26-56.0	127-27.0	23.6	23.6	23.6	23.6	23.6	23.4	23.2	22.8	21.7	20.5	-	234	19.7
55*5	"	1506	27-07.6	127-25.5	23.5	23.5	23.5	23.5	23.5	23.5	23.5	23.5	22.5	20.5	-	220	20.0
55*6	"	1605	27-19.6	127-23.2	23.9	23.9	23.9	23.9	23.9	23.9	23.9	23.8	23.4	21.2	19.6	262	18.8
55*7	"	1705	27-31.9	127-21.4	24.0	24.0	24.0	24.0	23.9	23.8	23.5	23.3	22.8	20.6	18.6	282	17.0
55*8	"	1805	27-43.3	127-22.0	24.1	24.1	24.1	24.1	24.1	24.1	24.1	23.9	22.8	20.3	18.0	280	16.2
55	"	1904	27-52.8	127-24.6	23.9	23.9	23.9	23.9	23.9	23.9	23.8	23.1	23.0	19.9	17.8	261	16.9
57*1	Dec.13	0804	28-31.7	127-26.7	24.1	24.1	24.1	24.1	24.1	24.1	24.1	24.1	24.0	20.8	15.8	260	15.4
57*2	"	0903	28-42.7	127-21.9	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	23.1	18.7	15.1	260	14.7
57*3	"	1003	28-54.0	127-17.6	23.7	23.7	23.7	23.7	23.7	23.5	23.1	22.3	21.7	16.9	14.0	262	13.0
57*4	"	1104	29-06.0	127-13.3	23.0	23.0	23.0	23.0	23.0	22.2	21.9	19.4	17.7	-	-	192	14.0
57*5	"	1204	29-17.3	127-09.6	22.4	22.4	22.4	22.4	22.1	21.9	20.4	-	-	-	-	111	17.2
57*6	"	1306	29-28.2	127-06.2	23.4	23.4	23.4	23.4	23.3	23.2	22.3	-	-	-	-	102	22.3
57*7	"	1405	29-39.8	127-04.0	23.1	23.1	23.1	23.1	23.1	22.1	-	-	-	-	-	91	21.2
57*8	"	1506	29-50.7	127-01.7	21.8	21.8	21.8	21.4	20.8	-	-	-	-	-	-	90	20.5
57	"	1603	30-01.2	127-00.7	19.7	19.7	19.7	19.7	19.7	19.7	-	-	-	-	-	94	19.5
60*1	Dec.14	0408	30-25.1	127-14.0	19.6	19.6	19.6	19.6	19.6	19.4	-	-	-	-	-	90	19.3
60*2	"	0506	30-29.0	127-25.8	20.4	20.4	20.4	20.4	20.2	18.8	-	-	-	-	-	103	18.3
60*3	"	0607	30-33.8	127-38.1	20.8	20.8	20.8	20.5	20.5	20.1	-	-	-	-	-	85	19.0
60*4	"	0705	30-39.8	127-49.3	19.6	19.6	19.6	19.6	19.4	18.2	-	-	-	-	-	93	17.3
60*5	"	0806	30-45.7	128-00.5	20.2	20.2	20.2	20.2	20.2	20.2	19.9	17.9	15.8	-	-	182	14.3
60*6	"	0908	30-51.3	128-11.3	21.2	21.2	21.2	21.2	20.3	19.3	18.3	17.7	16.1	-	-	170	15.0
60*7	"	1005	30-58.9	128-23.5	20.7	20.7	20.7	20.6	19.6	19.3	18.0	17.0	-	-	-	140	16.2
60*8	"	1203	31-04.8	128-33.2	20.3	20.3	20.3	20.3	20.3	20.2	19.0	16.8	15.6	14.0	13.4	250	13.4
60*9	"	1402	31-09.6	128-44.6	20.3	20.3	20.3	20.2	20.2	20.2	20.1	18.3	16.6	14.2	-	201	14.1
60	"	1556	31-12.3	128-58.1	20.0	20.0	20.0	20.0	20.0	19.4	19.3	18.7	17.8	13.8	11.9	260	11.8

Appendix Table III. Temperature and salinity data from STD observations.

St.	St. 1		St. 3		St. 8		St. 10		St. B	
Date, 1973	Nov. 23		Nov. 24		Nov. 26		Nov. 27		Nov. 29	
Time	15:17		12:40		14:45		09:20		15:22	
Lat. N	29-31.5		26-59.7		23-57.7		21-58.3		20-59.0	
Lon. E	132-58.6		129-51.3		129-05.8		128-48.3		129-58.8	
Depth	T °C	S °/oo	T °C	S °/oo	T °C	S °/oo	T °C	S °/oo	T °C	S °/oo
0	22.98	34.732	25.58	34.714	25.76	34.678	-	34.714	25.01	34.705
25	22.90	738	25.58	697	25.76	668	-	716	25.00	-
50	22.72	763	25.58	574	25.75	669	-	711	24.82	685
75	22.66	735	25.26	685	25.75	662	25.13	723	24.70	716
100	21.62	757	24.44	696	25.72	671	25.00	797	22.13	884
125	20.78	839	-	-	24.98	761	24.44	728	-	-
150	19.88	829	21.43	857	24.44	938	23.45	824	19.14	822
200	19.15	810	19.57	850	21.47	-	20.93	885	17.94	791
250	18.57	813	-	-	-	-	-	-	-	-
290	17.82	773	-	-	-	-	-	-	-	-
300	-	-	16.95	765	17.91	816	17.23	870	15.53	693
600	-	-	8.98	221	-	-	-	-	6.96	160
800	-	-	-	-	5.81	285	5.22	252	4.92	291
1000	-	-	4.18	357	4.33	413	3.93	407	4.14	404

St.	St. 21		St. C		St. D		St. 16		St. 55	
Date, 1973	Dec. 2		Dec. 3		Dec. 4		Dec. 6		Dec. 13	
Time	14:45		14:00		13:00		14:52		05:52	
Lat. N	22-00.3		20-59.2		21-59.1		25-33.4		28-25.7	
Lon. E	126-29.2		126-22.6		124-59.5		126-31.6		127-28.0	
Depth	T °C	S °/oo	T °C	S °/oo	T °C	S °/oo	T °C	S °/oo	T °C	S °/oo
0	26.42	34.680	26.66	34.685	26.78	34.571	24.89	34.651	24.20	34.746
10	-	-	-	-	-	-	24.89	665	-	-
20	-	-	-	-	-	-	24.89	652	-	-
25	26.40	716	26.65	681	26.71	552	-	-	24.21	729
30	-	-	-	-	-	-	24.90	648	-	-
50	26.39	670	26.64	678	26.71	565	24.67	650	24.17	727
75	26.39	671	26.64	691	-	-	24.48	662	24.06	723
100	26.39	672	26.65	680	25.89	600	24.31	653	23.99	730
150	24.23	982	25.58	973	-	-	23.56	722	23.03	936
200	21.75	972	22.80	35.000	20.49	863	21.17	730	21.23	853
250	-	-	-	-	-	-	18.25	772	-	-
300	18.17	807	18.19	34.679	17.73	755	17.57	755	14.09	563
500	-	-	-	-	11.09	298	-	-	-	-
600	9.27	213	9.06	204	7.79	147	-	-	6.93	319
800	5.60	184	5.77	170	5.32	269	-	-	5.12	384
1000	4.27	364	4.56	385	4.09	380	-	-	4.71	454
1500	-	-	-	-	2.90	532	-	-	-	-