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Preliminary Report of
MIDWATER TRAWLING STUDIES
IN THE NORTH PACIFIC OCEAN

by

William Aron

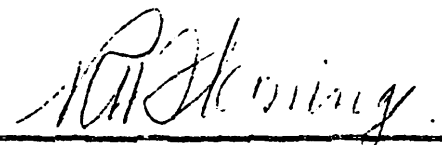
with an appendix
DESCRIPTIONS OF A NEW SPECIES OF STOMIATID
AND AN UNIDENTIFIED LEPTOCEPHALUS

by

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Abstract

A modified version of the Isaacs-Kidd midwater trawl was used for sampling in the North Pacific. Data from catches of each of 143 hauls are presented to show corrected plankton volumes; depth of fishing; dominant plankton; identity, size range, and number of fish and fish larvae; and date, time, and location of haul.

There was a wide difference between day and night catches. It appears that seasonal variation was relatively unimportant on the results of these hauls, but more data are needed to throw light on the effect of seasonal changes on plankton abundance. Findings supported previous observations that the trawl results are consistent and that plankton patchiness plays a minor role in the trawl results.

Geographic variation was analyzed on the basis of night hauls. Plankton abundance decreased with distance from the Washington coast until a marked increase in abundance was found south of the Alaska Peninsula. This increase seems to occur at the terminus of the Alaska Gyral and is probably related to high nutrient concentrations in the area. Hauls made in the Aleutian Islands region showed great variations in relative volume. These variations were correlated with oceanographic data for the cruise and indicate that high catches are made in areas of relatively warm, stable water while the low catches are made in areas of cold, unstable water.

Limited work with the invertebrate portion of the catches shows the possibility of commercially exploitable shrimp populations near Kodiak.

Variations in the fish fauna were both vertical and geographical. There appears to be an oceanographic boundary at the 50° North parallel that is reflected in the faunal distribution by dividing the Subarctic populations from those of warmer waters.

A number of rare fish and one new species were taken during the cruise. South of 50° North ten scombrid larvae were caught. Among the rare catches were Aristostomias scintillans and members of the following families: Melamphidae, Bathylagidae, Argentidae, Nemichthyidae, Sternoptychidae, and Paralepidae. Two leptocephalus larvae were taken and are described in the appendix. Five specimens of a new species of the family Stomiidae, Bathophilus flemingi, were taken and are illustrated and described in the appendix.

Acknowledgements

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CONTENTS

Introduction	1
Methods	2
Results	5
Discussion	6
1. Relative Abundance	6
2. Exploratory Results	44
3. Quantitative Evaluation of Midwater Trawl	50
Conclusions	52
Appendix	56
<u>Bathophilus flemingi</u> n. sp.	56
<u>Leptocephalus</u> larvae	61
Literature Cited	64

Tables:

1. Catch Data for Each Haul	7
2. Fish and Fish Larvae Captured for Each Haul	18
3. Depth Distribution of Trawl Catches	37
4. Depth Distribution of Myctophids	47
5. Depth Distribution of <u>L. leucopsarus</u>	48
6. Quantitative Evaluation of Midwater Trawl	51
7. Counts and Measurements of <u>B. flemingi</u>	59
8. Comparison of <u>B. flemingi</u> to Other Species in the Genus	60
9. Counts and Measurements of Leptocephali	63

Figures:

1. Cruise track	3
2. Modified Isaacs-Kidd trawl	4
3. Vertical temperature profiles from northern and southern legs	40
4. Vertical temperature profiles from Aleutian Islands region	42
5. <u>Bathophilus flemingi</u>	58
6. <u>Leptocephalus</u> larva	62

Introduction

This report summarizes the results of midwater trawling studies conducted in the North Pacific by the University of Washington, Department of Oceanography, during the summer of 1957. The trawl studies were made on a cruise devoted primarily to research for the International Geophysical Year program. The scope of the trawling program prevents the presentation of a complete analysis of the data at this time; however, it was felt desirable to make the processed data available for other investigators working on similar problems.

Previous midwater trawl research in Puget Sound (an inshore protected area) showed that great variations in plankton populations, in regard to both quantity and type, could be found in areas spatially close together (unpublished data). These variations were readily related to the available oceanographic data. Areas of unstable water conditions, such as Tacoma Narrows and Admiralty Inlet, generally were characterized by a low standing crop, whereas areas of stable water, such as Holmes Harbor and Case Inlet, were characterized by heavy concentrations of plankton. Specific areas within Puget Sound also were found to be different in regard to the composition of their plankton fauna. For example, in three areas (Admiralty Inlet, Saratoga Passage, and Port Susan) located side by side but separated by islands, very different plankton populations were found. Catches from Admiralty Inlet consisted mainly of fish and crab larvae; the catches from Saratoga Passage contained mainly euphausiids, pelagic shrimp, and mysids; while the catches from Port Susan consisted exclusively of euphausiids.

The trawling studies in the North Pacific were primarily exploratory: to find out what animals inhabit the depths under study and also to obtain some idea of their relative abundance. Within these two major objectives information was desired regarding the horizontal and vertical distribution of trawl-caught animals and to relate the biological information to the oceanographic data which were obtained during the course of the work. These data would then provide a comparison between the oceanic area and the data already available from Puget Sound.

This report covers trawl hauls made from the period 22 July to 22 September 1957 aboard the M. V. Brown Bear. The areas covered during this period and the place of each haul are shown in Figure 1.

Methods

A modified version of the Isaacs-Kidd midwater trawl was used for sampling (Isaacs and Kidd, 1953), Figure 2. The cod end was a half-meter plankton net made of net having a mesh opening of 1/8-inch (Dupont Nylon, pattern 281, Marion Textiles Inc., New York, N. Y.). It was fitted with a collecting bucket attached by means of a bayonet-type mount.

A total of 149 hauls were made at depths ranging from 20 meters to about 250 meters. For nearly each haul the net was fished 30 minutes at depth. The total time for each haul is measured from the time the net first enters the water until the time the haul is terminated and the net is removed from the water. All hauls were made with the ship proceeding at one engine full, a speed of about 6.0 knots. The net was released with the ship underway at towing speed and was recovered with the ship's speed reduced to about 4.5 knots.

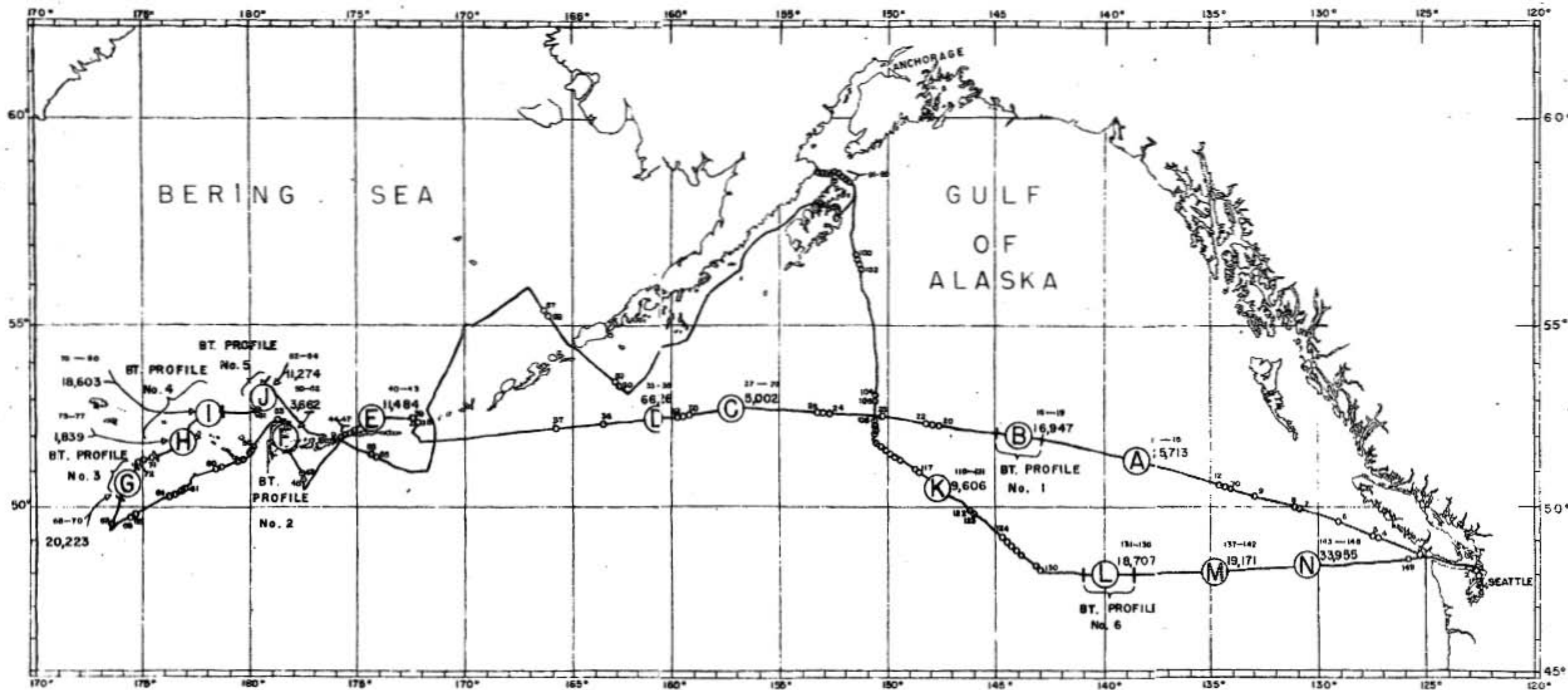


Figure 1. Cruise track showing location of each trawl, major sampling areas and their average corrected volumes, and location of vertical temperature profiles.
 (smaller numbers - trawls; larger numbers - av. corr. vol.; circled letters - major areas; brackets delineate BT profiles).

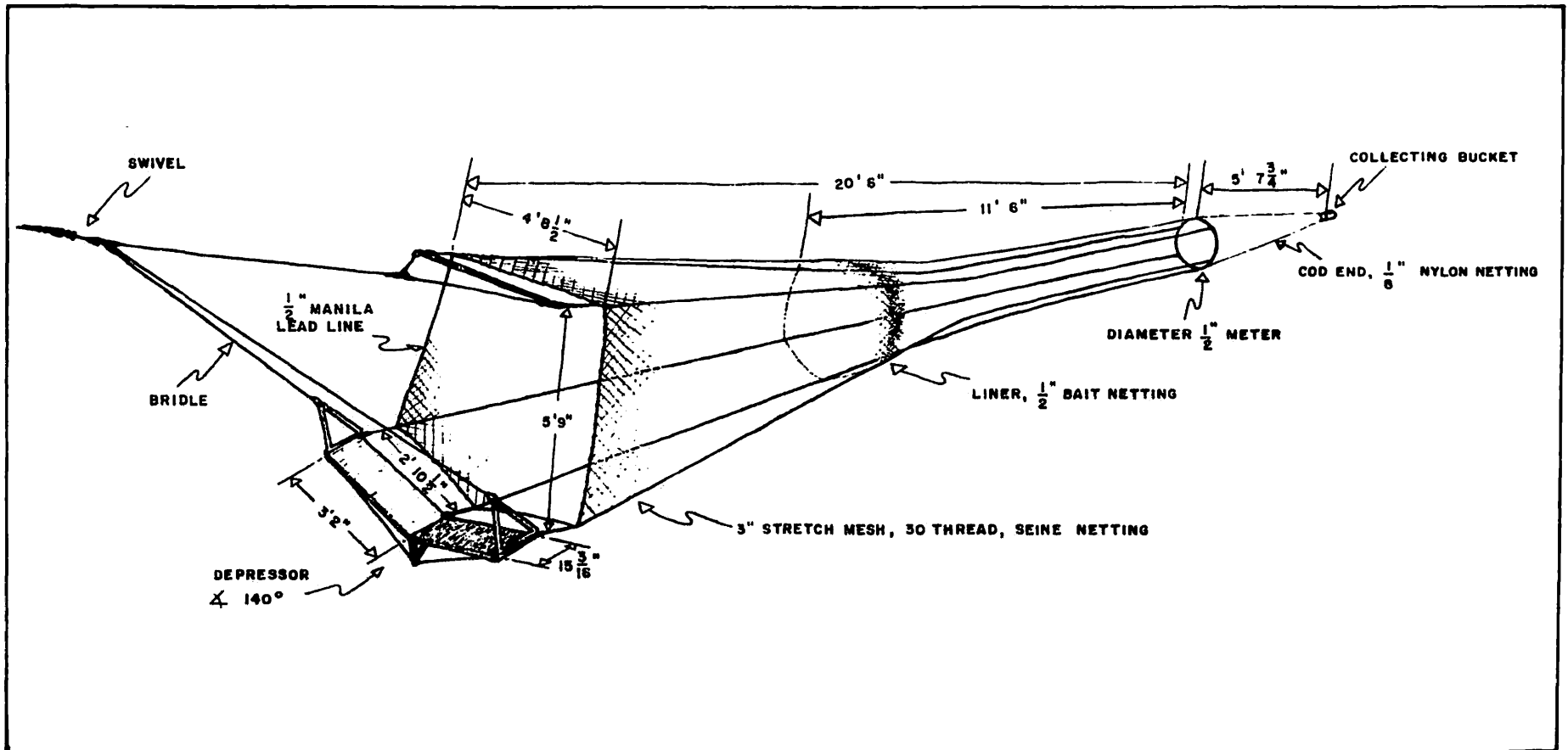


Figure 2. Modified Isaacs-Kidd trawl

The contents of each haul were preserved in 10 per cent formalin and stored in 16-ounce screw-cap jars. In the laboratory adult fish and other obvious nekton, such as squids longer than 75 mm. and large shrimps, were removed from the samples. The settled volume of each haul was then determined by placing the sample in a 500-cc tapered graduate and allowing it to settle for at least 30 minutes. For the purposes of comparison these volumes were then divided by the total time of the haul in minutes, and the resulting figure was multiplied by 1000. This number was recorded as the corrected plankton volume. After the completion of volume determinations the hauls were examined and all fish larvae were sorted out. The dominant planktonic animal or animals for each haul were noted. The fish and fish larvae were then examined. Nearly all of the adult fish were identified to species. The larvae were usually identified to family. The maximum and minimum total lengths for each species were recorded for each haul.

During the course of the cruise extensive oceanographic observations were made. A total of 437 bathythermograms were taken and 36 regular oceanographic stations were occupied. Data taken at the stations included measurements of temperature, salinity, oxygen, phosphate, and silicate, together with other information which is beyond the scope of this report. These unpublished data were made available for this preliminary study.

Results

Of the 149 midwater trawl samples only 143 were analyzed. Four of the samples (nos. 9 through 12) were lost during a storm when the lashings which secured the sample cases to the deck were broken and the cases were

washed overboard. One sample (no. 60) was discarded at sea because of extensive fouling caused by jellyfish. Sample 71 was used for isotope analysis. The remaining samples were saved for analysis.

Table 1 gives the date, location, time of hauling, corrected plankton volume, depth of fishing, dominant plankton, number of adult fish, and number of larval fish for each haul.

Table 2 records the identity, size range, and number of fish and fish larvae for each haul.

Discussion

The number of hauls may seem impressive at first; however, in terms of space and time, they are of sufficient number to permit only limited statements in relation to our two basic aims: (1), the study of relative abundance and (2), the exploratory phase of the program.

1. Relative Abundance

Establishing relative plankton abundance between geographic areas is complicated by the diurnal migration of many planktonic animals, by their vertical stratification during any time period, by the fact that the studies were carried out over a two-month period, and also by local plankton patchiness. Variations in plankton abundance between areas, therefore, may not be a reflection of actual differences between areas but may be due to diurnal variations, vertical stratification, seasonal variation, patchiness, or to a combination of all four factors. In an attempt to eliminate fluctuations resulting from diurnal migrations, hauls made from one hour after darkness until daybreak were treated separately from hauls made during daylight hours. Variations resulting from vertical

Table 1. CATCH DATA FOR EACH HAUL

Date 1957	Haul No.	Time	Position	Corr. Plankton Volume cc/min x 1000	Fishing Depth (meters)	Dominant Plankton	No. Fish	No. Fish Larvae
July		+8						
22	1	2320-2331	Admiralty Inlet	38,636	90	Crab larvae	6	0
22-23	2	2350-0020	Admiralty Inlet	57,500	30	Crab larvae	5	1
23	3	1315-1348	Off Swiftsure Lightship	2,424	30	Crab larvae	0	0
23	4	2238-2335	49°06' N, 127°16' W	3,860	225	Shrimp, euphausiids	16	13
23-24	5	2337-0011	49°08' N, 127°25' W	10,454	30	Euphausiids, shrimp	73	42
24	6	1307-1435	49°35' N, 129°04' W	114	30	Euphausiids	1	16
24	7	2258-2334	49°57' N, 130°53' W	68,055	30	Euphausiids, shrimp	320	88
24-25	8	2345-0021	49°58' N, 131°02' W	26,388	60	Euphausiids, shrimp	115	33
Hauls 9, 10, 11, 12, washed overboard								
26-27	13	2307-0010	51°18' N, 138°16' W	17,045	225	Euphausiids, copepods	28	22
27	14	0014-0052	51°20' N, 138°36' W	19,186	60	Euphausiids	12	28
27	15	0056-0131	51°21' N, 138°44' W	40,909	30	Euphausiids, copepods, arrow worms	122	188
27-28	16	2345-0041	51°59' N, 143°10' W	5,803	225	Euphausiids, shrimp	15	3

Table 1 (continued)

Date 1957	Haul No.	Time	Position	Corr. Plankton Volume cc/min x 1000	Fishing Depth (meters)	Dominant Plankton	No. Fish	No. Fish Larvae
July		+8						
28	17	0045-0120	52°00' N, 143°20' W	12,142	60	Euphausiids	12	0
28	18	0123-0212	52°00' N, 143°28' W	3,061	150	Euphausiids	11	1
28	19	0219-0257	52°02' N, 143°36' W	32,895	30	Copepods, shrimp	28	6
28-29	20	2343-0017	52°17' N, 147°24' W	8,824	60	Euphausiids, shrimp	5	2
29	21	0026-0120	52°18' N, 147°32' W	3,704	225	Euphausiids, shrimp	6	2
29	22	0127-0200	52°19' N, 147°44' W	24,242	20	Euphausiids	16	56
29	23	1315-1414	52°34' N, 150°11' W	2,119	225	Copepods	6	1
29-30	24	2352-0101	52°39' N, 152°29' W	6,884	225	Euphausiids, copepods	18	0
30	25	0105-0149	52°40' N, 152°45' W	15,795	60	Euphausiids	16	0
30	26	0155-0225	52°40' N, 152°55' W	47,500	20	Euphausiids	12	4
31	27	0010-0115	52°46' N, 157°06' W	4,545	225	Euphausiids	5	3
31	28	0126-0203	52°45' N, 157°19' W	3,378	60	Euphausiids	8	0
31	29	0210-0310	52°44' N, 157°26' W	7,083	30	Euphausiids	21	0
31	30	1743-1820	52°35' N, 159°23' W	675	30	Euphausiids	3	1

Table 1 (continued)

Date 1957	Haul No.	Time	Position	Corr. Plankton Volume cc/min x 1000	Fishing Depth (meters)	Dominant Plankton	No. Fish	No. Fish Larvae
July		+8						
31	31	1827-1906	52°34' N, 159°36' W	3,205	90	Euphausiids	1	0
31	32	1908-2009	52°33' N, 159°39' W	40,573	225	Euphausiids	5	2
August								
1	33	0028-0140	52°30' N, 160°43' W	6,944	225	Euphausiids	12	6
1	34	0146-0222	52°29' N, 160°59' W	8,928	60	Euphausiids	19	5
1	35	0228-0305	52°28' N, 161°08' W	183,108	30	Euphausiids	13	11
1	36	1323-1415	52°21' N, 163°33' W	12,980	250	Euphausiids	23	1
1-2	37	2306-0134	52°14' N, 165°42' W	4,375	225	Euphausiids	34	10
3	38	1215-1255	52°22' N, 172°14' W	3,750	120	Copepods, amphipods	10	0
3	39	1305-1347	52°28' N, 172°19' W	2,380	100	Copepods, arrow worms, amphipods	2	6
4	40	0020-0113	52°21' N, 174°45' W	3,302	225	Arrow worms, euphausiids, copepods	12	1
4	41	0017-0155	52°19' N, 174°50' W	3,947	60	Arrow worms, euphausiids, amphipods	9	7
4	42	0201-0235	52°18' N, 174°52' W	27,205	30	Arrow worms, euphausiids	11	19
4	43	0243-0257	52°16' N, 174°57' W	32,143	20	Euphausiids	5	4

Table 1 (continued)

Date 1957	Haul No.	Time	Position	Corr. Plankton Volume cc/min x 1000	Fishing Depth (meters)	Dominant Plankton	No. Fish	No. Fish Larvae
August		+11						
6-7	44	2337-0015	51°52' N, 175°56' W	263	60	Euphausiids	1	0
7	45	0137-0210	51°49' N, 175°53' W	2,121	20	Euphausiids	0	8
7	46	0245-0338	51°41' N, 176°00' W	3,773	225	Euphausiids, arrow worms	2	3
7	47	0351-0430	51°31' N, 176°15' W	17,857	60	Arrow worms	16	8
9	48	1303-1403	50°42' N, 177°31' W	1,667	225	Arrow worms, amphipods	1	1
9	49	1418-1453	50°49' N, 177°32' W	2,571	60	Crab larvae	0	1
9	50	2324-2358	51°42' N, 178°20' W	3,676	30	Copepods	0	4
10	51	0003-0100	51°45' N, 178°22' W	1,754	225	Amphipods, arrow worms, copepods	0	2
10	52	0310-0346	52°03' N, 178°24' W	5,556	225	Copepods and arrow worms	1	2
10	53	1758-1905	52°28' N, 178°40' W	2,239	250	Arrow worms, copepods, euphausiids	49	1
11	54	1454-1550	51°47' N, 179°53' W	2,370	225	Arrow worms, copepods, euphausiids, amphipods	5	0
11	55	2044-2155	51°37' N, 179°58' W	2,465	225	Arrow worms, copepods, euphausiids, amphipods	3	4
11	56	2200-2240	51°35' N, 180°00'	4,375	60	Arrow worms, copepods, euphausiids, amphipods	3	6

Table 1 (continued)

Date 1957	Haul No.	Time	Position	Corr. Plankton Volume cc/min x 1000	Fishing Depth (meters)	Dominant Plankton	No. Fish	No. Fish Larvae
August		+11						
12	57	1116-1217	51°22' N, 179°41' E	3,279	225	Arrow worms	0	7
12	58	1221-1257	51°18' N, 179°26' E	2,500	60	Arrow worms, amphipods	1	4
12	59	1618-1716	51°08' N, 178°44' E	10,345	225	Arrow worms, copepods, euphausiids	0	2
12	60	1723-1759	51°06' N, 178°32' E	---	60	(Sample discarded)		
14-15	61	2311-0015	50°31' N, 176°54' E	3,125	225	Euphausiids	32	1
15	62	0019-0053	50°28' N, 176°49' E	2,778	60	Euphausiids	6	1
15	63	0059-0135	50°25' N, 176°45' E	6,944	60	Euphausiids	0	0
15	64	0140-0212	50°23' N, 176°42' E	7,813	20	Euphausiids	0	1
15	65	1348-1445	49°44' N, 174°27' E	1,579	225	Euphausiids	0	0
15	66	1449-1527	49°40' N, 174°20' E	526	60	Euphausiids	0	0
16	67	0752-0848	49°26' N, 173°32' E	179	120	(1) Jellyfish	0	0
16	68	2232-2341	50°44' N, 174°20' E	8,841	225	Euphausiids	67	1
16-17	69	2348-0030	50°47' N, 174°24' E	11,310	60	Arrow worms, euphausiids	78	2
17	70	0035-0104	50°50' N, 174°28' E	40,517	30	Euphausiids	659	8

Table 1 (continued)

Date 1957	Haul No.	Time	Position	Corr. Plankton Volume cc/min x 1000	Fishing Depth (meters)	Dominant Plankton	No. Fish	No. Fish Larvae
August		+11						
17	71	0110-0145	50°53' N, 174°31' E	---	60	(Sample used for isotope analysis)		
18	72	1331-1416	51°16' N, 174°49' E	128	60	Crab larvae	1	0
18	73	1411-1504	51°19' N, 175°00' E	3,302	225	Euphausiids, copepods	3	7
18	74	1848-1942	51°27' N, 175°46' E	7,212	225	Euphausiids, copepods	24	6
19	75	0336-0411	52°06' N, 177°03' E	2,000	30	Copepods, arrow worms	3	3
19	76	0414-0450	52°09' N, 177°06' E	2,500	60	Arrow worms, copepods	4	0
19	77	0453-0552	52°14' N, 177°08' E	1,017	225	Copepods, arrow worms	2	4
20	78	0005-0056	52°40' N, 178°21' E	14,705	225	Euphausiids	25	16
20	79	0101-0134	52°39' N, 178°26' E	12,879	60	Euphausiids	21	15
20	80	0139-0210	52°38' N, 178°33' E	28,226	30	Euphausiids, squid	95	71
20	81	1612-1700	52°46' N, 179°32' W	1,875	225	Copepods, euphausiids	12	4
20	82	2240-2345	52°58' N, 179°20' W	3,923	225	Euphausiids	39	27
20-21	83	2350-0033	53°04' N, 179°21' W	9,186	60	Euphausiids, arrow worms	58	28
21	84	0039-0114	53°09' N, 179°22' W	20,714	30	Euphausiids, squid	64	163

Table 1 (continued)

Date 1957	Haul No.	Time	Position	Corr. Plankton Volume cc/min x 1000	Fishing Depth (meters)	Dominant Plankton	No. Fish	No. Fish Larvae
August		+11						
24	85	0032-0124	51°26' N, 174°10' W	6,250	225	Euphausiids, arrow worms	27	39
24	86	0132-0207	51°24' N, 174°06' W	10,000	225	Euphausiids, squid, arrow worms	49	7
29	87	0041-0127	55°18' N, 166°10' W	39,394	90	Amphipods, shrimp, euphausiids	0	1
29	88	0134-0208	55°15' N, 166°07' W	30,147	60	Amphipods, shrimp	3	2
29	89	2143-2249	53°20' N, 162°42' W	5,303	225	Euphausiids	12	16
29	90	2253-2331	53°18' N, 162°37' W	24,342	60	Euphausiids	12	10
September		+8						
7	91	0820-0856	58°43' N, 152°02' W	556	45	Crab larvae, amphipods	0	16
7	92	0903-0936	58°47' N, 152°07' W	909	25	Crab larvae	0	6
7	93	1056-1140	58°45' N, 152°39' W	2,045	120	Amphipods	0	1
8	94	2157-2240	58°42' N, 153°00' W	1,395	75	Shrimp	0	55
9	95	0004-0052	58°40' N, 152°48' W	5,000	120	Shrimp, euphausiids	0	41
9	96	0053-0127	58°41' N, 152°46' W	6,765	60	Shrimp, euphausiids	5	110
9	97	0128-0205	58°43' N, 152°44' W	4,054	60	Euphausiids, shrimp	12	85

Table 1 (continued)

Date 1957	Haul No.	Time	Position	Corr. Plankton Volume cc/min x 1000	Fishing Depth (meters)	Dominant Plankton	No. Fish	No. Fish Larvae
September		+8						
9	98	0206-0240	58°45' N, 152°42' W	4,412	60	Euphausiids	1	121
9	99	0241-0317	58°45' N, 152°39' W	4,861	60	Crab larvae, euphausiids	2	88
11	100	0510-0553	56°48' N, 151°34' W	6,977	60	Euphausiids	1	3
11	101	0554-0651	56°45' N, 151°32' W	3,947	225	Euphausiids	15	2
11	102	0652-0728	56°42' N, 151°31' W	6,250	60	Euphausiids	20	1
11	103	0729-0829	56°40' N, 151°30' W	12,083	225	Euphausiids	25	3
13	104	1215-1312	53°07' N, 150°32' W	2,193	225	Copepods	2	2
13	105	1313-1347	53°07' N, 150°33' W	1,470	60	Copepods	4	4
13	106	1722-1815	52°38' N, 150°36' W	472	225	Copepods, euphausiids	4	0
13	107	1817-1904	52°34' N, 150°37' W	425	175	Copepods, euphausiids	4	1
13	108	1905-1945	52°29' N, 150°38' W	500	120	Copepods, arrow worms, euphausiids	0	0
13	109	1946-2024	52°25' N, 150°37' W	1,053	60	Copepods, euphausiids	0	0
14-15	110	2350-0040	51°49' N, 150°32' W	3,000	225	Euphausiids	5	0
15	111	0043-0126	51°45' N, 150°25' W	3,488	175	Euphausiids, arrow worms	4	1

Table 1 (continued)

Date 1957	Haul No.	Time	Position	Corr. Plankton Volume cc/min x 1000	Fishing Depth (meters)	Dominant Animals	No. Fish	No. Fish Larvae
September		+8						
15	112	0128-0207	51°42' N, 150°21' W	3,846	120	Euphausiids	4	0
15	113	0209-0245	51°40' N, 150°15' W	3,472	90	Euphausiids	2	1
15	114	0246-0318	51°38' N, 150°08' W	1,563	60	Euphausiids	1	0
15	115	0320-0350	51°36' N, 150°03' W	6,667	30	Euphausiids	0	0
15	116	1632-1730	51°00' N, 148°33' W	3,879	225	Euphausiids	0	4
15	117	1732-1809	50°58' N, 148°28' W	1,081	60	Euphausiids, jelly fish	0	0
16	118	0032-0124	50°37' N, 147°44' W	6,346	225	Euphausiids, shrimp	20	4
16	119	0126-0206	50°31' N, 147°37' W	5,500	120	Euphausiids, shrimp	10	2
16	120	0208-0242	50°27' N, 147°30' W	6,471	60	Euphausiids	12	0
16	121	0245-0315	50°24' N, 147°24' W	16,000	30	Euphausiids	74	39
16	122	1210-1300	49°49' N, 146°02' W	400	225	Euphausiids, arrow worms	4	0
16	123	1303-1336	49°46' N, 145°55' W	606	60	Euphausiids	1	11
17	124	0004-0058	49°00' N, 144°30' W	2,884	225	Euphausiids, shrimp	20	1
17	125	0100-0134	48°58' N, 144°26' W	1,765	30	Euphausiids, arrow worms	77	9
17	126	0137-0227	48°56' N, 144°21' W	4,000	225	Shrimp, arrow worms	19	4

Table 1 (continued)

Date 1957	Haul No.	Time	Position	Corr. Plankton Volume cc/min x 1000	Fishing Depth (meters)	Dominant Plankton	No. Fish	No. Fish Larvae
September		+8						
17	127	0232-0307	48°54' N, 144°17' W	571	40	Arrow worms	33	3
17	128	0308-0340	48°52' N, 144°12' W	938	30	Jelly fish, arrow worms	9	5
17	129	1159-1253	48°13' N, 143°03' W	556	225	Arrow worms	0	6
17	130	1257-1336	48°11' N, 143°00' W	513	60	Arrow worms	0	8
19	131	0019-0050	47°58' N, 139°30' W	6,451	30	Shrimp, euphausiids	12	0
19	132	0052-0139	47°58' N, 139°25' W	19,681	120	Shrimp, euphausiids	12	0
19	133	0142-0233	47°58' N, 139°21' W	10,784	225	Shrimp, euphausiids	13	0
19	134	0237-0322	47°58' N, 139°16' W	15,000	175	Shrimp, euphausiids	18	0
19	135	0324-0357	47°58' N, 139°11' W	35,294	60	Euphausiids, shrimp	48	1
19	136	0403-0436	47°58' N, 139°07' W	13,636	30	Shrimp, euphausiids	18	1
20	137	0015-0047	48°03' N, 134°43' W	7,813	60	Euphausiids, shrimp, arrow worms	32	1
20	138	0050-0143	48°03' N, 134°40' W	7,075	225	Shrimp	21	5
20	139	0147-0232	48°03' N, 134°36' W	17,778	175	Shrimp	17	12

Table 1 (continued)

Date 1957	Haul No.	Time	Position	Corr. Plankton Volume cc/min x 1000	Fishing Depth (meters)	Dominant Plankton	No. Fish	No. Fish Larvae
September		+8						
20	140	0238-0327	48°03' N, 134°30' W	16,326	120	Shrimp	29	11
20	141	0331-0405	48°03' N, 134°25' W	28,675	30	Shrimp	22	29
20	142	0407-0442	48°03' N, 134°20' W	35,714	60	Shrimp	85	16
21	143	0012-0104	48°15' N, 130°10' W	10,576	225	Shrimp	11	6
21	144	0108-0153	48°15' N, 130°08' W	10,000	175	Shrimp	19	14
21	145	0156-0236	48°15' N, 130°05' W	17,500	120	Shrimp, euphausiids	32	4
21	146	0243-0316	48°15' N, 129°56' W	61,363	60	Euphausiids, shrimp	125	6
21	147	0318-0350	48°15' N, 129°52' W	25,781	30	Shrimp, euphausiids	29	3
21	148	0352-0445	48°15' N, 129°47' W	18,868	225	Euphausiids, shrimp	34	3
22	149	0022-0033	48°25' N, 125°42' W	325,000	90	Euphausiids	7	3

Table 2. FISH AND FISH LARVAE CAPTURED FOR EACH HAUL*

<u>HAUL 1</u>	<u>mm</u>	<u>HAUL 5</u>
<u>Juveniles and Adults:</u>		<u>Juveniles and Adults:</u>
4 <u>A. tobianus personatus</u>	70-130	25 <u>D. rafinesquii</u> 45-75
2 <u>T. chalcogramma</u>	70	1 <u>E. thompsoni</u> (in very bad shape) 22
<u>Larvae and Post Larvae:</u>		15 <u>L. leucopsarus</u> 20-65
No larvae		1 <u>M. californiense</u> 115
		11 <u>T. crenularis</u> 30-75
		13 Unidentified myctophids (all species, in bad shape)
		1 <u>C. saira</u> 170
		2 Argentinids (<u>L. stilbius?</u>) 32
		4 Paralepidids (<u>L. ringens?</u>) 115-130
<u>HAUL 2</u>		<u>Larvae and Post Larvae:</u>
<u>Juveniles and Adults:</u>		14 <u>M. pacificus</u> 15-20
1 <u>A. tobianus personatus</u>	65	14 <u>Sebastes spp.</u> 20-30
1 <u>E. tridentatus</u>	200	1 Liparid 20
2 <u>G. aculeatus</u>	30-70	13 Myctophids (all in bad shape) 15-20
1 <u>L. bilineata</u>	30	
1 <u>T. chalcogramma</u>	75	
<u>Larvae and Post Larvae:</u>		
No larvae		
<u>HAUL 3</u>		<u>HAUL 6</u>
No fish		<u>Juveniles and Adults:</u>
		1 <u>L. leucopsarus</u> 37
<u>HAUL 4</u>		<u>Larvae and Post Larvae:</u>
<u>Juveniles and Adults:</u>		15 <u>Sebastes spp.</u> 30-60
2 <u>D. rafinesquii</u>	65-85	
5 <u>E. thompsoni</u>	22-37	
2 <u>L. leucopsarus</u>	25-88	
3 <u>L. regalis</u>	85-125	
1 <u>T. crenularis</u>	40	
2 <u>T. macropus</u>	110-250	
1 Argentinid (<u>L. stilbius?</u> in very bad shape)	35	
2 Liparids	20	
<u>Larvae and Post Larvae:</u>		<u>HAUL 7</u>
8 <u>M. pacificus</u>	15-25	<u>Juveniles and Adults:</u>
1 Clupeid	20	35 <u>D. rafinesquii</u> 45-75
1 Myctophid	20	280 <u>L. leucopsarus</u> 26-60
1 Larva (like <u>Tactostoma</u> , but with pectoral fins)	35	3 <u>T. crenularis</u> 50-77
		1 <u>T. macropus</u> 140
		1 <u>Bathylagus sp.</u> (in bad shape) 110
		<u>Larvae and Post Larvae:</u>
		2 <u>G. zachirus</u> 50-65
		1 <u>M. pacificus</u> 18
		72 <u>Sebastes spp.</u> 13-63
		12 Myctophids 12-16
		1 Unidentified larva 20

* A key to abbreviations used in this table is found on page 36.

Table 2 (continued)

<u>HAUL 8</u>	<u>mm</u>	<u>HAUL 15</u>	<u>mm</u>
<u>Juveniles and Adults:</u>		<u>Juveniles and Adults:</u>	
8 <u>D. rafinesquii</u>	45-65	43 <u>D. rafinesquii</u>	47-85
106 <u>L. leucopsarus</u>	25-60	73 <u>L. leucopsarus</u>	23-116
1 <u>T. macropus</u>	165	1 <u>A. scintillans</u>	125
		1 <u>T. macropus</u>	150
<u>Larvae and Post Larvae:</u>		4 <u>Myctophids</u> (in bad shape)	
7 <u>M. pacificus</u>	14-60	<u>Larvae and Post Larvae:</u>	
18 <u>Sebastes spp.</u>	18-55	102 <u>Sebastes spp.</u>	10-52
1 <u>Liparid</u>	16	86 <u>Myctophids</u>	9-20
7 <u>Myctophids</u>	14-16		
<u>HAUL 13</u>		<u>HAUL 16</u>	
<u>Juveniles and Adults:</u>		<u>Juveniles and Adults:</u>	
4 <u>D. rafinesquii</u>	48-67	1 <u>D. rafinesquii</u>	90
5 <u>E. thompsoni</u>	35-45	2 <u>E. thompsoni</u>	33-38
15 <u>L. leucopsarus</u>	25-105	9 <u>L. leucopsarus</u>	28-110
1 <u>T. crenularis</u>	50	1 <u>T. crenularis</u>	47
1 <u>C. macouni</u>	75	1 <u>Melamphaes sp.</u>	75
1 <u>T. macropus</u>	260	1 <u>Cottid (G. sigalutes?)</u>	20
1 <u>Paralepidid (L. ringens?)</u>	130	<u>Larvae and Post Larvae:</u>	
<u>Larvae and Post Larvae:</u>		1 <u>Sebastes sp.</u>	22
11 <u>Sebastes spp.</u>	13-25	2 <u>Unidentified larvae</u>	18-20
8 <u>Myctophids</u>	13-25		
3 <u>Unidentified larvae</u>	20-25		
<u>HAUL 14</u>		<u>HAUL 17</u>	
<u>Juveniles and Adults:</u>		<u>Juveniles and Adults:</u>	
3 <u>D. rafinesquii</u>	45-65	11 <u>L. leucopsarus</u>	30-63
8 <u>L. leucopsarus</u>	28-72	1 <u>T. macropus</u> (very bad shape)	130
1 <u>L. regalis</u>	105	<u>Larvae and Post Larvae:</u>	
<u>Larvae and Post Larvae:</u>		No larvae	
18 <u>Sebastes spp.</u>	10-51		
10 <u>Myctophids</u>	12-20		
<u>HAUL 18</u>		<u>HAUL 18</u>	
<u>Juveniles and Adults:</u>		<u>Juveniles and Adults:</u>	
		2 <u>D. rafinesquii</u>	35-65
		9 <u>L. leucopsarus</u>	28-85
<u>Larvae and Post Larvae:</u>		<u>Larvae and Post Larvae:</u>	
		1 <u>Myctophid</u>	17

Table 2 (continued)

<u>HAUL 19</u>	<u>mm</u>	<u>HAUL 24</u>	<u>mm</u>
<u>Juveniles and Adults:</u>		<u>Juveniles and Adults:</u>	
6 <u>D. rafinesquii</u>	67-90	8 <u>E. thompsoni</u> (all in bad shape)	23-47
22 <u>L. leucopsarus</u>	25-80	9 <u>L. leucopsarus</u>	23-115
<u>Larvae and Post Larvae:</u>		1 <u>Melamphaes sp.</u>	72
6 Myctophids (3 species?)	12-20	<u>Larvae and Post Larvae:</u>	
<u>HAUL 20</u>		No larvae	
<u>Juveniles and Adults:</u>		<u>HAUL 25</u>	
1 <u>D. rafinesquii</u>	70	<u>Juveniles and Adults:</u>	
3 <u>L. leucopsarus</u>	about 20-70	6 <u>E. thompsoni</u> (in very bad shape)	25-38
1 Paralepidid (<u>L. ringens?</u>)	125	9 <u>L. leucopsarus</u>	40-115
<u>Larvae and Post Larvae:</u>		1 <u>Elephantichthys?</u>	95
2 Myctophids	11-18	<u>Larvae and Post Larvae:</u>	
<u>HAUL 21</u>		No larvae	
<u>Juveniles and Adults:</u>		<u>HAUL 26</u>	
1 <u>D. rafinesquii</u>	83	<u>Juveniles and Adults:</u>	
2 <u>E. thompsoni</u>	32	1 <u>E. thompsoni</u> (in bad shape)	30
2 <u>L. leucopsarus</u>	27-81	11 <u>L. leucopsarus</u>	25-53
1 <u>C. macouni</u>	80	<u>Larvae and Post Larvae:</u>	
<u>Larvae and Post Larvae:</u>		4 Myctophids	11-17
2 Myctophids	11	<u>HAUL 27</u>	
<u>HAUL 22</u>		<u>Juveniles and Adults:</u>	
<u>Juveniles and Adults:</u>		4 <u>L. leucopsarus</u>	20-120
5 <u>D. rafinesquii</u>	60-68	1 Myctophid (in bad shape)	32
1 <u>E. thompsoni</u>	35	<u>Larvae and Post Larvae:</u>	
10 <u>L. leucopsarus</u>	22-26	3 Unidentified larvae	19-20
<u>Larvae and Post Larvae:</u>		<u>HAUL 28</u>	
56 Myctophids		<u>Juveniles and Adults:</u>	
<u>HAUL 23</u>		7 <u>L. leucopsarus</u>	26-100
<u>Juveniles and Adults:</u>		1 <u>Bathylagus sp?</u> (in bad shape)	50
6 <u>L. leucopsarus</u>	22-27	<u>Larvae and Post Larvae:</u>	
<u>Larvae and Post Larvae:</u>		No larvae	
1 Unidentified larva (bad shape)	20		

Table 2 (continued)

<u>HAUL 29</u>	<u>mm</u>	<u>HAUL 34</u>	<u>mm</u>
<u>Juveniles and Adults:</u>		<u>Juveniles and Adults:</u>	
21 <u>L. leucopsarus</u>	23-110	18 <u>L. leucopsarus</u>	25
		1 <u>T. crenularis</u>	25-120
<u>Larvae and Post Larvae:</u>		<u>Larvae and Post Larvae:</u>	
No larvae		5 Unidentified larvae	12-34
 <u>HAUL 30</u>		 <u>HAUL 35</u>	
<u>Juveniles and Adults:</u>		<u>Juveniles and Adults:</u>	
3 <u>L. leucopsarus</u> (in bad shape)	25	13 <u>L. leucopsarus</u>	23-90
<u>Larvae and Post Larvae:</u>		<u>Larvae and Post Larvae:</u>	
1 Unidentified larva	15	11 Unidentified larvae	13-33
 <u>HAUL 31</u>		 <u>HAUL 36</u>	
<u>Juveniles and Adults:</u>		<u>Juveniles and Adults:</u>	
1 <u>L. leucopsarus</u> (in bad shape)	20+	22 <u>L. leucopsarus</u>	27-45
		1 Myctophid (in bad shape)	26
<u>Larvae and Post Larvae:</u>		<u>Larvae and Post Larvae:</u>	
No larvae		1 Unidentified larva	34
 <u>HAUL 32</u>		 <u>HAUL 37</u>	
<u>Juveniles and Adults:</u>		<u>Juveniles and Adults:</u>	
5 <u>E. thompsoni</u>	27-40	20 <u>E. thompsoni</u>	20-35
		8 <u>L. leucopsarus</u>	20-110
<u>Larvae and Post Larvae:</u>		1 <u>Elephantichthys?</u>	47
2 Unidentified larvae (in bad shape)	20-25	3 <u>C. macouni</u>	85-145
		1 <u>T. macropus</u>	155
		1 <u>Melamphaes sp.</u>	62
 <u>HAUL 33</u>		 <u>Larvae and Post Larvae:</u>	
<u>Juveniles and Adults:</u>		1 <u>Sebastodes sp.</u>	37
1 <u>E. thompsoni</u>	35	9 Unidentified larvae	15-30
10 <u>L. leucopsarus</u>	28-120		
1 <u>Melamphaes sp.</u>	80		
1 Unidentified myctophid (in bad shape)	42		
<u>Larvae and Post Larvae:</u>			
5 Unidentified larvae	15-32		

Table 2 (continued)

<u>HAUL 38</u>	<u>mm</u>	<u>HAUL 41</u>	<u>mm</u>
<u>Juveniles and Adults:</u>		<u>Juveniles and Adults:</u>	
6 <u>E. thompsoni</u> (in very bad shape)	25-35	1 <u>L. leucopsarus</u>	25
1 <u>L. leucopsarus</u> (in very bad shape)	30	1 Agonid	37
1 <u>C. macouni</u> (in very bad shape)	65	1 Argentinid (<u>L. stilbius?</u>)	55
1 Unidentified myctophid (in bad shape)	40	4 Unidentified fish (in very bad shape)	
<u>Larvae and Post Larvae:</u>		<u>Larvae and Post Larvae:</u>	
1 Cottid	30	2 <u>H. hemilepidotus</u>	33
		2 Cottids	25
		1 Unidentified larva (<u>A. tobianus personatus?</u>)	43
		4 Unidentified larvae	12-20
<u>HAUL 39</u>		<u>HAUL 42</u>	
<u>Juveniles and Adults:</u>		<u>Juveniles and Adults:</u>	
1 <u>E. thompsoni</u> (in bad shape)	22	2 <u>A. tobianus personatus</u>	about 40
1 <u>L. leucopsarus</u> (in bad shape)	24	5 Argentinids (<u>L. stilbius?</u>)	50-75
<u>Larvae and Post Larvae:</u>		4 Agonids	40
3 <u>H. hemilepidotus</u>	30-33	<u>Larvae and Post Larvae:</u>	
2 Cottids (<u>Gilbertidia?</u>)	9-12	5 <u>G. macrocephalus</u>	20-30
1 Unidentified juvenile	38	1 <u>H. hemilepidotus</u>	23
<u>HAUL 40</u>		5 <u>Sebastodes</u> sp.	17
<u>Juveniles and Adults:</u>		1 Cyclopterid (<u>Elephantichthys?</u>)	15
3 <u>D. rafinesquii?</u> (in very bad shape)	75-95	1 Liparid	18
2 <u>E. thompsoni</u>	52	2 Pleuronectids (<u>H. elassodon?</u>)	16
5 <u>L. leucopsarus?</u> (in very bad shape)	45-110	2 Juveniles (reduced pelvics, spines on priopercle)	32-36
<u>Larvae and Post Larvae:</u>		2 Unidentified larvae (in bad shape)	about 20
1 <u>H. hemilepidotus</u>	26		
2 <u>N. pelagicus</u>	40		

Table 2 (continued)

<u>HAUL 43</u>	<u>mm</u>	<u>HAUL 47</u>	<u>mm</u>
<u>Juveniles and Adults:</u>		<u>Juveniles and Adults:</u>	
4 <u>Bathylagus sp.</u>	110-130	14 <u>L. leucopsarus</u>	27-57
1 Agonid	36	2 Agonids	22-25
<u>Larvae and Post Larvae:</u>		<u>Larvae and Post Larvae:</u>	
3 Juveniles (reduced pelvics, spines on priopercle) about	34	1 <u>Sebastodes sp.</u>	20
1 Unidentified larva	20	2 Cottids (<u>G. sigalutes?</u>)	10
		3 Myctophids	15
		2 Unidentified larvae	10-30
 <u>HAUL 44</u>		 <u>HAUL 48</u>	
<u>Juveniles and Adults:</u>		<u>Juveniles and Adults:</u>	
1 <u>M. catervarius</u>	150	No adults	
<u>Larvae and Post Larvae:</u>		<u>Larvae and Post Larvae:</u>	
No larvae		1 <u>Sebastodes sp.</u>	18
		1 Cyclopterid	17
 <u>HAUL 45</u>		 <u>HAUL 49</u>	
<u>Juveniles and Adults:</u>		<u>Juveniles and Adults:</u>	
No adults		No adults	
<u>Larvae and Post Larvae:</u>		<u>Larvae and Post Larvae:</u>	
3 <u>Sebastodes sp.</u>		1 Larva	17
3 Pleuronectids (<u>H. elassodon?</u>)	20-23		
2 Unidentified larvae	22		
 <u>HAUL 46</u>		 <u>HAUL 50</u>	
<u>Juveniles and Adults:</u>		<u>Juveniles and Adults:</u>	
1 <u>L. leucopsarus</u>	32	No adults	
1 <u>M. pelagicus</u>	33		
<u>Larvae and Post Larvae:</u>		<u>Larvae and Post Larvae:</u>	
1 Myctophid	18	2 <u>Sebastodes sp.</u>	16-19
2 Unidentified larvae	15-33	1 Cottid	9
		1 Unidentified larva (may be clupeid or stomiatid)	21

Table 2 (continued)

<u>HAUL 51</u>	<u>mm</u>	<u>HAUL 55</u>	<u>mm</u>
<u>Juveniles and Adults:</u>		<u>Juveniles and Adults:</u>	
No adults		1 <u>D. rafinesqui</u>	105
<u>Larvae and Post Larvae:</u>		1 Myctophid (in bad shape)	
1 <u>Sebastes sp.</u>	25	1 Cyclopterid	13
1 Unidentified larva	28	<u>Larvae and Post Larvae:</u>	
		1 Unidentified juvenile (may be hexagrammid)	27
		3 Unidentified larvae	26
<u>HAUL 52</u>		<u>HAUL 56</u>	
<u>Juveniles and Adults:</u>		<u>Juveniles and Adults:</u>	
1 <u>L. leucopsarus</u>	32	3 <u>L. leucopsarus</u>	28-48
<u>Larvae and Post Larvae:</u>		<u>Larvae and Post Larvae:</u>	
2 Unidentified larvae	18-32	1 <u>Sebastes sp.</u>	16
		5 Unidentified larvae	30-35
<u>HAUL 53</u>		<u>HAUL 57</u>	
<u>Juveniles and Adults:</u>		<u>Juveniles and Adults:</u>	
11 <u>L. leucopsarus</u>	28-47	No adults	
38 Myctophids (probably <u>L. leucopsarus</u> , in bad shape)		<u>Larvae and Post Larvae:</u>	
<u>Larvae and Post Larvae:</u>		6 Unidentified larvae	13-35
1 Larva (in bad shape)	27		
<u>HAUL 54</u>		<u>HAUL 58</u>	
<u>Juveniles and Adults:</u>		<u>Juveniles and Adults:</u>	
4 <u>L. leucopsarus?</u> (in bad shape)	30-48	1 Myctophid (in very bad shape)	20
1 <u>M. pelagicus</u> (in bad shape)	28	<u>Larvae and Post Larvae:</u>	
<u>Larvae and Post Larvae:</u>		2 <u>H. hemilepidotus</u>	30
No larvae		1 <u>Sebastes sp.</u>	19
		1 Unidentified larva	30

Table 2 (continued)

<u>HAUL 59</u>	<u>mm</u>	<u>HAUL 65</u>	<u>mm</u>
<u>Juveniles and Adults:</u> No adults		No fish	
<u>Larvae and Post Larvae:</u> 1 <u>Myctophid</u> 1 Unidentified larva	13 24	<u>HAUL 66</u> No fish	
<u>HAUL 60</u> Discarded		<u>HAUL 67</u> No fish	
<u>HAUL 61</u> <u>Juveniles and Adults:</u> 26 <u>E. thompsoni</u> (many in very bad shape, may not be <u>Electrona</u>) 3 <u>L. leucopsarus</u> 1 <u>T. crenularis</u> 2 <u>Melamphaes sp.</u>	25-41 30-120 50 77	<u>HAUL 68</u> <u>Juveniles and Adults:</u> 3 <u>D. rafinesquii</u> 41 <u>E. thompsoni</u> 19 <u>L. leucopsarus</u> 3 <u>L. regalis</u> 1 <u>N. pelagicus</u>	77-97 27-55 30-112 118-130 45
<u>Larvae and Post Larvae:</u> 1 Unidentified larva	30	<u>Larvae and Post Larvae:</u> 1 Unidentified larva (in bad shape)	21
<u>HAUL 62</u> <u>Juveniles and Adults:</u> 1 <u>E. thompsoni</u> 5 <u>L. leucopsarus</u>	33 65-115	<u>HAUL 69</u> <u>Juveniles and Adults:</u> 6 <u>D. rafinesquii</u> 67 <u>L. leucopsarus</u> 1 <u>T. crenularis</u> 2 <u>Bathylagus sp.</u> 1 <u>T. macropus</u>	70-80 25-112 40 60-70 205
<u>Larvae and Post Larvae:</u> 1 Unidentified larva	27	<u>Larvae and Post Larvae:</u> 1 Cyclopterid 2 Unidentified larvae	14 30
<u>HAUL 63</u> No fish			
<u>HAUL 64</u> <u>Juveniles and Adults:</u> No adults			
<u>Larvae and Post Larvae:</u> 1 <u>Sebastodes sp.</u>	30		

Table 2 (continued)

<u>HAUL 70</u>	<u>mm</u>	<u>HAUL 75</u>	<u>mm</u>
<u>Juveniles and Adults:</u>		<u>Juveniles and Adults:</u>	
4 <u>D. rafinesquii</u>	80	1 <u>E. thompsoni</u> (in bad shape)	32
653 <u>L. leucopsarus</u>	25-55	2 <u>L. leucopsarus</u> (in bad shape)	27
1 <u>T. crenularis</u>	30		
1 <u>Bathylagus sp.</u>	about 140	<u>Larvae and Post Larvae:</u>	
<u>Larvae and Post Larvae:</u>		1 <u>Sebastodes sp.</u>	15
4 <u>Sebastodes sp.</u>	13-27	2 Unidentified larvae	18-20
4 Unidentified larvae	17-35		
<u>HAUL 71</u>		<u>HAUL 76</u>	
Used for isotope analysis		<u>Juveniles and Adults:</u>	
		1 <u>E. thompsoni</u> (in bad shape)	about 25
		3 <u>L. leucopsarus</u>	25-75
<u>HAUL 72</u>		<u>Larvae and Post Larvae:</u>	
<u>Juveniles and Adults:</u>		No larvae	
1 <u>L. leucopsarus</u> (in bad shape)	22		
<u>Larvae and Post Larvae:</u>		<u>HAUL 77</u>	
No larvae		<u>Juveniles and Adults:</u>	
		2 <u>E. thompsoni</u>	27-44
<u>HAUL 73</u>		<u>Larvae and Post Larvae:</u>	
<u>Juveniles and Adults:</u>		3 <u>Sebastodes sp.</u>	14-25
1 <u>E. thompsoni</u>	32	1 Cottid (<u>G. sigalutes?</u>)	12
2 <u>L. leucopsarus</u> (in very bad shape)	26		
<u>Larvae and Post Larvae:</u>		<u>HAUL 78</u>	
1 Cottid (<u>G. sigalutes?</u>)	10	<u>Juveniles and Adults:</u>	
6 Unidentified larvae	17-28	3 <u>E. thompsoni</u>	about 40
		18 <u>L. leucopsarus</u>	55-126
		1 <u>C. macouni</u>	95
		1 <u>T. chalcogramma</u>	50
		1 <u>Bathylagus sp.</u>	130
		2 <u>Melamphaes sp.</u>	80
<u>HAUL 74</u>		<u>Larvae and Post Larvae:</u>	
<u>Juveniles and Adults:</u>		15 Unidentified larvae	16-35
10 <u>E. thompsoni</u>	24-35		
14 <u>L. leucopsarus</u>	28-60		
<u>Larvae and Post Larvae:</u>			
6 Unidentified larvae	20-30		

Table 2 (continued)

<u>HAUL 79</u>	<u>mm</u>	<u>HAUL 83</u>	<u>mm</u>
<u>Juveniles and Adults:</u>		<u>Juveniles and Adults:</u>	
1 <u>D. rafinesquii</u>	80	55 <u>L. leucopsarus</u>	28-110
18 <u>L. leucopsarus</u>	30-115	1 <u>A. tobianus personatus</u>	53
1 <u>A. tobianus personatus</u>	70	1 <u>Bathylagus sp.</u>	140
1 <u>Bathylagus sp.</u>	90	1 <u>Argentinid (L. stilbius?)</u>	40
<u>Larvae and Post Larvae:</u>		<u>Larvae and Post Larvae:</u>	
15 Unidentified larvae	21-35	9 <u>Sebastes sp.</u>	28
		19 Unidentified larvae	13-30
<u>HAUL 80</u>		<u>HAUL 84</u>	
<u>Juveniles and Adults:</u>		<u>Juveniles and Adults:</u>	
1 <u>D. rafinesquii</u>	83	49 <u>L. leucopsarus</u>	24-95
92 <u>L. leucopsarus</u>	28-50	11 <u>Bathylagus sp.</u>	5 about 140 6 about 35-45
2 <u>A. tobianus personatus</u>	55	4 <u>T. chalcogramma</u>	32-41
<u>Larvae and Post Larvae:</u>		<u>Larvae and Post Larvae:</u>	
9 <u>Sebastes spp.</u>	13-27	154 <u>Sebastes spp.</u>	15-30
5 Flatfish larvae (<u>H. elassodon?</u>)	20-32	9 Unidentified larvae	15-34
57 Unidentified larvae	20-38		
<u>HAUL 81</u>		<u>HAUL 85</u>	
<u>Juveniles and Adults:</u>		<u>Juveniles and Adults:</u>	
12 <u>L. leucopsarus</u> (in bad shape)	about 28	9 <u>E. thompsoni</u>	30-48
		16 <u>L. leucopsarus</u>	30-110
<u>Larvae and Post Larvae:</u>		1 <u>Bathylagus sp.</u>	130
4 Unidentified larvae	20-27	1 <u>Melamphaes sp.</u>	75
<u>HAUL 82</u>		<u>Larvae and Post Larvae:</u>	
<u>Juveniles and Adults:</u>		2 <u>Myctophids</u>	1 18
2 <u>D. rafinesquii</u>	82-95	1 <u>Sebastes sp.</u>	13
27 <u>L. leucopsarus</u>	28-115	36 Unidentified larvae	20-32
4 <u>A. tobianus personatus</u>	about 50-60		
6 <u>T. chalcogramma</u>	32-48		
<u>Larvae and Post Larvae:</u>		<u>HAUL 86</u>	
8 <u>Sebastes sp.</u>	25	<u>Juveniles and Adults:</u>	
1 Cottid (<u>G. sigalutes?</u>)	12	48 <u>L. leucopsarus</u>	20-116
18 Unidentified larvae	22-34	1 <u>C. macouni</u>	120
		<u>Larvae and Post Larvae:</u>	
		1 <u>G. zachirus</u>	35
		1 <u>Sebastes sp.</u>	19
		2 Cottid (<u>G. sigalutes?</u>)	10
		3 Unidentified larvae	21-28

Table 2 (continued)

<u>HAUL 87</u>	<u>mm</u>	<u>HAUL 91</u>	<u>mm</u>
<u>Juveniles and Adults:</u>		<u>Juveniles and Adults:</u>	
No adults		No adults	
<u>Larvae and Post Larvae:</u>		<u>Larvae and Post Larvae:</u>	
1 Larva (might be hexagrammid)	10	11 <u>H. elassodon</u>	25-33
		2 <u>Sebastodes sp.</u>	29-36
		3 Cyclopterids	14
<u>HAUL 88</u>		<u>HAUL 92</u>	
<u>Juveniles and Adults:</u>		<u>Juveniles and Adults:</u>	
1 <u>A. tobianus personatus</u>	80	No adults	
1 <u>H. hemilepidotus</u>	35		
1 Hexagrammid	60		
<u>Larvae and Post Larvae:</u>		<u>Larvae and Post Larvae:</u>	
2 Unidentified larvae	20-34	3 <u>H. elassodon</u>	24-38
		2 <u>Sebastodes sp.</u>	12
		1 Unidentified larva (bathymasterid?)	30
<u>HAUL 89</u>		<u>HAUL 93</u>	
<u>Juveniles and Adults:</u>		<u>Juveniles and Adults:</u>	
4 <u>E. thompsoni</u>	35-43	No adults	
7 <u>L. leucopsarus</u>	26-120		
1 <u>N. pelagicus</u>	37		
<u>Larvae and Post Larvae:</u>		<u>Larvae and Post Larvae:</u>	
4 Myctophids	17	1 Unidentified larva (in bad shape)	about 15
12 Unidentified larvae	14-27		
<u>HAUL 90</u>		<u>HAUL 94</u>	
<u>Juveniles and Adults:</u>		<u>Juveniles and Adults:</u>	
2 <u>E. thompsoni</u>	33	No adults	
10 <u>L. leucopsarus</u>	25-120		
<u>Larvae and Post Larvae:</u>		<u>Larvae and Post Larvae:</u>	
1 <u>G. zachirus</u>	23	2 <u>H. elassodon</u>	23
1 Myctophid	13	52 <u>M. catervarius</u> (probably mallotus)	15-31
8 Unidentified larvae		1 Unidentified larva (in bad shape)	13

Table 2 (continued)

<u>HAUL 95</u>	<u>mm</u>	<u>HAUL 98</u>	<u>mm</u>
<u>Juveniles and Adults:</u>		<u>Juveniles and Adults:</u>	
No adults		1 Lumpenid (probably <u>L. anguillaris</u>)	
			62
<u>Larvae and Post Larvae:</u>		<u>Larvae and Post Larvae:</u>	
1 <u>G. zachirus</u>	15	12 <u>H. elassodon</u>	16-30
4 <u>H. elassodon</u>	25-30	106 <u>M. catervarius</u>	16-40
35 <u>M. catervarius</u>	15-45	1 <u>Sebastodes sp.</u>	13
1 <u>N. oculo-fasciatus</u>	30	1 Bathymasterid?	32
		1 Pleuronectid (<u>Clioderma?</u>)	15
<u>HAUL 96</u>		<u>HAUL 99</u>	
<u>Juveniles and Adults:</u>		<u>Juveniles and Adults:</u>	
3 <u>Argentinids (L. stilbius?)</u>		1 Lumpenid (<u>L. anguillaris?</u>)	60
1 in very bad shape	53-72	1 <u>G. aculeatus</u>	30
1 Lumpenid (probably <u>L. anguillaris</u>)	65	1 Liparid	25
1 <u>G. aculeatus</u>	30		
<u>Larvae and Post Larvae:</u>		<u>Larvae and Post Larvae:</u>	
10 <u>H. elassodon</u>	22-37	1 <u>G. zachirus</u>	25
98 <u>M. catervarius</u>	14-55	11 <u>H. elassodon</u>	18-35
1 <u>Sebastodes sp.</u>	40	71 <u>M. catervarius</u>	17-42
1 Unidentified larva (hexagrammid? strange caudal)	18	1 <u>Sebastodes sp.</u>	11
		1 Bathymasterid	27
		1 Cyclopterid	10
		1 Unidentified larva (hexagrammid?)	16
<u>HAUL 97</u>		<u>HAUL 100</u>	
<u>Juveniles and Adults:</u>		<u>Juveniles and Adults:</u>	
6 <u>M. catervarius</u>	79-104	1 Unidentified myctophid	
1 <u>Argentinid (L. stilbius?)</u>	65	(<u>L. leucopsarus?</u> in bad shape)	
4 Liparid	30-45		
1 Unidentified fish (in bad shape)	about 100		
<u>Larvae and Post Larvae:</u>		<u>Larvae and Post Larvae:</u>	
1 <u>G. zachirus</u>	41	2 <u>M. catervarius</u>	23-32
11 <u>H. elassodon</u>	20-35	1 Myctophid	15
73 <u>M. catervarius</u>	15-45		
<u>HAUL 101</u>		<u>HAUL 101</u>	
<u>Juveniles and Adults:</u>		<u>Juveniles and Adults:</u>	
		12 <u>E. thompsoni</u>	25-40
		3 <u>L. leucopsarus</u>	24-35
<u>Larvae and Post Larvae:</u>		<u>Larvae and Post Larvae:</u>	
		2 Unidentified larvae	23-26

Table 2 (continued)

<u>HAUL 102</u>	<u>mm</u>	<u>HAUL 106</u>	<u>mm</u>
<u>Juveniles and Adults:</u>		<u>Juveniles and Adults:</u>	
7 <u>E. thompsoni</u> (in very bad shape)	about 30	4 <u>E. thompsoni</u>	30-38
13 <u>L. leucopsarus</u> (5 in bad shape)	25-32	<u>Larvae and Post Larvae:</u> No larvae	
<u>Larvae and Post Larvae:</u>		<u>HAUL 107</u>	
1 Pleuronectid (in bad shape)	22	<u>Juveniles and Adults:</u>	
<u>HAUL 103</u>		4 <u>E. thompsoni</u> (in very bad shape)	
<u>Juveniles and Adults:</u>		<u>Larvae and Post Larvae:</u>	
8 <u>E. thompsoni</u> (some in bad shape)	32-42	1 Myctophid	14
15 <u>L. leucopsarus</u> (some in bad shape)	about 28	<u>HAUL 108</u>	
<u>Larvae and Post Larvae:</u>		No fish	
2 Cyclopterids	15	<u>HAUL 109</u>	
3 Unidentified larvae (2 in bad shape)	25	No fish	
<u>HAUL 104</u>		<u>HAUL 110</u>	
<u>Juveniles and Adults:</u>		<u>Juveniles and Adults:</u>	
2 <u>E. thompsoni</u> (1 in bad shape)	40	3 <u>E. thompsoni</u>	27
<u>Larvae and Post Larvae:</u>		2 <u>L. leucopsarus</u>	30-100
1 Cyclopterid	12	<u>Larvae and Post Larvae:</u>	
1 Myctophid	18	No larvae	
<u>HAUL 105</u>		<u>HAUL 111</u>	
<u>Juveniles and Adults:</u>		<u>Juveniles and Adults:</u>	
4 Myctophids (in bad shape)		1 <u>D. rafinesquii</u>	75
<u>Larvae and Post Larvae:</u>		1 <u>E. thompsoni</u> (in bad shape)	
1 Myctophid	17	2 <u>L. leucopsarus</u>	25-60
3 Unidentified larvae (in bad shape)		<u>Larvae and Post Larvae:</u>	
		1 Myctophid (in bad shape)	15

Table 2 (continued)

<u>HAUL 112</u>	<u>mm</u>	<u>HAUL 118</u>	<u>mm</u>
<u>Juveniles and Adults:</u>		<u>Juveniles and Adults:</u>	
1 <u>D. rafinesquii</u>	96	2 <u>D. rafinesquii</u>	67
3 <u>L. leucopsarus</u>	30	14 <u>E. thompsoni</u>	28-40
		3 <u>L. leucopsarus</u>	26-50
<u>Larvae and Post Larvae:</u>		1 <u>Melamphaes sp.</u>	68
No larvae		<u>Larvae and Post Larvae:</u>	
<u>HAUL 113</u>		3 <u>Myctophids (probably Lampanyctus)</u>	15-22
<u>Juveniles and Adults:</u>		1 Unidentified larva	30
1 <u>D. rafinesquii</u>	85	<u>HAUL 119</u>	
1 <u>L. leucopsarus</u>	30	<u>Juveniles and Adults:</u>	
<u>Larvae and Post Larvae:</u>		1 <u>D. rafinesquii</u>	80
1 <u>Myctophid</u>	12	9 <u>L. leucopsarus</u>	32-90
<u>HAUL 114</u>		<u>Larvae and Post Larvae:</u>	
<u>Juveniles and Adults:</u>		2 <u>Myctophids (probably Lampanyctus)</u>	15-22
1 <u>L. leucopsarus</u>	22	<u>HAUL 120</u>	
<u>Larvae and Post Larvae:</u>		<u>Juveniles and Adults:</u>	
No larvae		5 <u>D. rafinesquii</u>	35-95
<u>HAUL 115</u>		6 <u>L. leucopsarus</u>	70-80
No fish		1 <u>Bathylagus sp.</u>	130
<u>HAUL 116</u>		<u>Larvae and Post Larvae:</u>	
<u>Juveniles and Adults:</u>		No larvae	
No adults		<u>HAUL 121</u>	
<u>Larvae and Post Larvae:</u>		<u>Juveniles and Adults:</u>	
3 <u>Myctophids</u>	13-17	12 <u>D. rafinesquii</u>	50-70
1 Unidentified larva	26	62 <u>L. leucopsarus</u>	30-80
<u>HAUL 117</u>		<u>Larvae and Post Larvae:</u>	
No fish		39 <u>Myctophids</u>	11-18

Table 2 (continued)

<u>HAUL 122</u>	<u>mm</u>	<u>HAUL 126</u>	<u>mm</u>
<u>Juveniles and Adults:</u>		<u>Juveniles and Adults:</u>	
4 <u>L. leucopsarus</u>	25-35	14 <u>L. leucopsarus</u>	23-90
<u>Larvae and Post Larvae:</u>		4 <u>T. macropus</u>	115-195
No larvae		1 Argentinid (<u>L. stilbius?</u>)	35
		<u>Larvae and Post Larvae:</u>	
		4 Myctophids (may be <u>Lampanyctus</u>)	12-24
<u>HAUL 123</u>		<u>HAUL 127</u>	
<u>Juveniles and Adults:</u>		<u>Juveniles and Adults:</u>	
1 <u>L. leucopsarus</u>	29	6 <u>D. rafinesquii</u> (one has large specimen of Hydractina on gill)	50-55
<u>Larvae and Post Larvae:</u>		22 <u>L. leucopsarus</u>	23-45
11 Myctophids	14-17	1 <u>L. townsendii</u>	90
		1 <u>M. californiense</u>	85
<u>HAUL 124</u>		1 Argentinid (<u>L. stilbius?</u>)	45
<u>Juveniles and Adults:</u>		2 Paralepidids (<u>L. ringens?</u>)	110
5 <u>E. thompsoni</u>	25-37	<u>Larvae and Post Larvae:</u>	
7 <u>L. leucopsarus</u>	23-115	3 Myctophids	12-16
1 <u>T. crenularis</u>	38		
2 <u>A. gilli?</u>	365-430	<u>HAUL 128</u>	
1 <u>C. macouni</u>	75	<u>Juveniles and Adults:</u>	
3 <u>T. macropus</u>	95-120	8 <u>L. leucopsarus</u>	26-41
1 Sternoptychid	68	1 <u>T. crenularis</u>	28
<u>Larvae and Post Larvae:</u>		<u>Larvae and Post Larvae:</u>	
1 Myctophid	15	1 Myctophid	15
		1 Scombrid	14
<u>HAUL 125</u>		2 Unidentified larva spiny ray (Sciaenid?)	20
<u>Juveniles and Adults:</u>		1 Leptocephalus	206
12 <u>D. rafinesquii</u>	43-53	<u>HAUL 129</u>	
58 <u>L. leucopsarus</u>	22-42	<u>Juveniles and Adults:</u>	
2 <u>L. townsendii</u>	80-85	No adults	
1 <u>M. californiense</u>	110	<u>Larvae and Post Larvae:</u>	
4 Argentinids (<u>L. stilbius?</u>)	39-52	3 Myctophids	18-21
<u>Larvae and Post Larvae:</u>		1 Scombrid	13
8 Myctophids	14-18	2 Unidentified larvae	22
1 Leptocephalus	210		

Table 2 (continued)

<u>HAUL 130</u>	<u>mm</u>	<u>HAUL 134</u>	<u>mm</u>
<u>Juveniles and Adults:</u>		<u>Juveniles and Adults:</u>	
No adults		5 <u>D. rafinesquii</u>	45-80
		7 <u>L. leucopsarus</u>	30-100
<u>Larvae and Post Larvae:</u>		1 <u>L. regalis</u>	125
7 Myctophids	17	1 <u>T. crenularis</u>	33
1 Scombrid (in bad shape)	20	1 <u>T. macropus</u>	190
		2 <u>Bathylagus</u> sp.	90-100
		1 Argentinid (<u>L. stilbius?</u>)	57
<u>HAUL 131</u>		<u>Larvae and Post Larvae:</u>	
<u>Juveniles and Adults:</u>		No larvae	
4 <u>D. rafinesquii</u>	48	<u>HAUL 135</u>	
5 <u>L. leucopsarus</u>	33-60	<u>Juveniles and Adults:</u>	
1 <u>M. californiense</u>	93	4 <u>D. rafinesquii</u> (1 has	
1 <u>T. crenularis</u>	29	Hydractina)	40-75
1 <u>C. saira</u>	48	29 <u>L. leucopsarus</u>	24-70
<u>Larvae and Post Larvae:</u>		2 <u>L. regalis</u>	80
No larvae		1 <u>L. townsendii</u>	88
<u>HAUL 132</u>		2 <u>T. crenularis</u>	26-76
<u>Juveniles and Adults:</u>		2 <u>B. flemingi</u>	about 115
1 <u>D. rafinesquii</u>	38	6 <u>T. macropus</u>	about 100-130
4 <u>L. leucopsarus</u>	35	2 <u>Bathylagus</u> sp.	115
2 <u>L. regalis</u>	90-103	<u>Larvae and Post Larvae:</u>	
1 <u>C. saira</u>	30	1 Myctophid	
2 <u>T. macropus</u>	160		
2 Paralepidids (<u>L. ringens?</u>)	85-100	<u>HAUL 136</u>	
<u>Larvae and Post Larvae:</u>		<u>Juveniles and Adults:</u>	
No larvae		2 <u>D. rafinesquii</u>	40
<u>HAUL 133</u>		9 <u>L. leucopsarus</u>	30-40
<u>Juveniles and Adults:</u>		5 <u>L. townsendii</u>	82
8 <u>L. leucopsarus</u>	26-102	1 Paralepidid (<u>L. ringens?</u>)	85
1 <u>L. regalis</u>	92	1 <u>T. macropus</u>	100
1 <u>T. crenularis</u> (has Hydractina)	32	<u>Larvae and Post Larvae:</u>	
3 <u>T. macropus</u>	195-260	1 Scombrid	
<u>Larvae and Post Larvae:</u>			
No larvae			

Table 2 (continued)

<u>HAUL 137</u>		<u>mm</u>	<u>HAUL 140</u>		<u>mm</u>
<u>Juveniles and Adults:</u>			<u>Juveniles and Adults:</u>		
2	<u>D. rafinesquii</u>	50	10	<u>L. leucopsarus</u>	23-115
24	<u>L. leucopsarus</u>	32-55	4	<u>L. regalis</u>	53-110
2	<u>T. crenularis</u>	29-75	3	<u>T. crenularis</u>	35-80
1	<u>B. flemingi</u>	about 95	3	<u>C. saira</u>	about 30
1	<u>C. saira</u>	30	9	<u>T. macropus</u>	160-220
2	<u>T. macropus</u>	about 130	<u>Larvae and Post Larvae:</u>		
<u>Larvae and Post Larvae:</u>			1	<u>M. pacificus</u>	16
1	Scombrid	10	4	<u>T. macropus?</u>	30-55
<u>HAUL 138</u>			2	<u>Sebastes spp.</u>	10-15
<u>Juveniles and Adults:</u>			4	<u>Myctophids</u>	17
1	<u>D. rafinesquii</u>	44	<u>HAUL 141</u>		
7	<u>L. leucopsarus</u>	24-115	<u>Juveniles and Adults:</u>		
3	<u>L. regalis</u>	75-110	2	<u>D. rafinesquii</u>	42-50
1	<u>T. crenularis</u>	75	17	<u>L. leucopsarus</u>	32-50
1	<u>A. gilli?</u>	520	1	<u>L. townsendii</u>	85
1	<u>B. flemingi</u>	130	1	<u>M. californiense</u>	120
1	<u>C. saira</u>	35	1	<u>T. crenularis</u>	40
6	<u>T. macropus</u>	150-275	<u>Larvae and Post Larvae:</u>		
<u>Larvae and Post Larvae:</u>			20	<u>T. macropus?</u>	18-60
1	<u>M. pacificus</u>	26	9	<u>Sebastes sp.</u>	6-12
1	<u>T. macropus</u>	about 50	<u>HAUL 142</u>		
2	<u>Myctophids</u>	about 20	<u>Juveniles and Adults:</u>		
1	Unidentified larva (may be paralepidid or stomiatid)	25	3	<u>D. rafinesquii</u>	about 45
<u>HAUL 139</u>			34	<u>L. leucopsarus</u>	20-65
<u>Juveniles and Adults:</u>			3	<u>T. crenularis</u>	26-85
1	<u>D. rafinesquii</u>	72	1	<u>A. scintillans</u>	about 115
7	<u>L. leucopsarus</u>	28-108	1	<u>C. saira</u>	43
1	<u>T. crenularis</u>	33	28	<u>T. macropus</u>	about 110-170
1	<u>A. gilli?</u>	475	5	<u>Bathylagus sp.</u>	58-90
2	<u>C. saira</u>	20-30	<u>Larvae and Post Larvae:</u>		
5	<u>T. macropus</u>	115-195	1	<u>M. pacificus</u>	20
<u>Larvae and Post Larvae:</u>			9	<u>T. macropus?</u>	15-55
4	<u>M. pacificus</u>	21-58	2	<u>Sebastes sp.</u>	6-11
1	<u>Myctophid (in bad shape)</u>	18	4	<u>Myctophids</u>	18
3	Unidentified larvae, may be scombrid (in bad shape)	about 18			
4	Unidentified larvae	about 30			

Table 2 (continued)

<u>HAUL 143</u>	<u>mm</u>	<u>HAUL 146</u>	<u>mm</u>
<u>Juveniles and Adults:</u>		<u>Juveniles and Adults:</u>	
3 <u>D. rafinesquii</u>	55-70	5 <u>D. rafinesquii</u>	50-73
2 <u>E. thompsoni</u>	25-39	109 <u>L. leucopsarus</u>	22-75
3 <u>L. leucopsarus</u>	42-105	1 <u>T. crenularis</u>	40
2 <u>L. regalis</u>	110	1 <u>C. saira</u>	50
1 <u>T. crenularis</u>	38	9 <u>T. macropus</u>	115-210
<u>Larvae and Post Larvae:</u>		<u>Larvae and Post Larvae:</u>	
3 <u>M. pacificus</u>	18-50	2 <u>M. pacificus</u>	13-17
3 Myctophids	18	1 <u>S. alascanus</u>	15
		2 Myctophids	10-15
		1 Scombrid?	12
<u>HAUL 144</u>		<u>HAUL 147</u>	
<u>Juveniles and Adults:</u>		<u>Juveniles and Adults:</u>	
2 <u>D. rafinesquii</u>	45-90	2 <u>D. rafinesquii</u>	47
7 <u>L. leucopsarus</u>	22-110	23 <u>L. leucopsarus</u>	22-37
1 <u>L. regalis</u>	110	3 <u>T. crenularis</u>	25-30
2 <u>T. crenularis</u>	32	1 Argentinid (<u>L. stilbius?</u>)	27
2 <u>C. saira</u>	about 21-44		
5 <u>T. macropus</u>	125-250		
<u>Larvae and Post Larvae:</u>		<u>Larvae and Post Larvae:</u>	
2 <u>G. zachirus</u>	35-77	1 <u>G. zachirus</u>	34
8 <u>M. pacificus</u>	13-60	1 Myctophid	15
1 Liparid	18	1 Scombrid	14
3 Myctophids	14-20		
<u>HAUL 145</u>		<u>HAUL 148</u>	
<u>Juveniles and Adults:</u>		<u>Juveniles and Adults:</u>	
5 <u>D. rafinesquii</u>	58-75	1 <u>D. rafinesquii</u>	58
21 <u>L. leucopsarus</u>	21-98	10 <u>E. thompsoni</u>	22-48
1 <u>T. crenularis</u>	27	17 <u>L. leucopsarus</u>	20-110
1 <u>B. flemingi</u> (in bad shape)	90	2 <u>L. regalis</u>	80-120
1 <u>C. saira</u>	60	1 <u>A. scintillans</u>	105
4 <u>T. macropus</u>	150-240	2 <u>C. saira</u>	38
		1 <u>C. macouni</u>	65
<u>Larvae and Post Larvae:</u>		<u>Larvae and Post Larvae:</u>	
1 <u>M. pacificus</u>	64	3 <u>M. pacificus</u>	14
1 Liparid	16		
2 Myctophids	15		
<u>HAUL 149</u>		<u>HAUL 149</u>	
<u>Juveniles and Adults:</u>		<u>Juveniles and Adults:</u>	
		4 <u>L. leucopsarus</u>	23-24
		2 <u>C. saira</u>	130-140
<u>Larvae and Post Larvae:</u>		<u>Larvae and Post Larvae:</u>	
		1 <u>G. zachirus</u>	30
		1 <u>M. pacificus</u>	14
		1 Liparid	23
		1 Unidentified larva	8

KEY TO ABBREVIATIONS IN TABLE 2.

<u>A. tobianus personatus</u>	<u>Ammodytes tobianus personatus</u>
<u>A. scintillans</u>	<u>Aristostomias scintillans</u>
<u>A. gilli</u>	<u>Avocettina gilli</u>
<u>B. flemingi</u>	<u>Bathophilus flemingi</u>
<u>C. macouni</u>	<u>Chauliodus macouni</u>
<u>C. saira</u>	<u>Cololabis saira</u>
<u>D. rafinesquii</u>	<u>Diaphus rafinesquii</u>
<u>E. thompsoni</u>	<u>Electrona thompsoni</u>
<u>E. tridentatus</u>	<u>Entosphenus tridentatus</u>
<u>G. macrocephalus</u>	<u>Gadus macrocephalus</u>
<u>G. aculeatus</u>	<u>Gasterosteus aculeatus</u>
<u>G. sigalutes</u>	<u>Gilbertidia sigalutes</u>
<u>G. zachirus</u>	<u>Glyptocephalus zachirus</u>
<u>H. hemilepidotus</u>	<u>Hemilepidotus hemilepidotus</u>
<u>H. elassodon</u>	<u>Hippoglossoides elassodon</u>
<u>L. leucopsarus</u>	<u>Lampanyctus leucopsarus</u>
<u>L. regalis</u>	<u>Lampanyctus regalis</u>
<u>L. townsendii</u>	<u>Lampanyctus townsendii</u>
<u>L. bilineata</u>	<u>Lepidopsetta bilineata</u>
<u>L. ringens</u>	<u>Lestidium ringens</u>
<u>L. stilbius</u>	<u>Leuroglossus stilbius</u>
<u>L. anguillaris</u>	<u>Lumpenus anguillaris</u>
<u>M. catervarius</u>	<u>Mallotus catervarius</u>
<u>M. pacificus</u>	<u>Microstomus pacificus</u>
<u>M. californiense</u>	<u>Myctophum californiense</u>
<u>N. oculo-fasciatus</u>	<u>Nautichthys oculo-fasciatus</u>
<u>N. pelagicus</u>	<u>Nectoliparis pelagicus</u>
<u>S. alascanus</u>	<u>Sebastolobus alascanus</u>
<u>T. macropus</u>	<u>Tactostoma macropus</u>
<u>T. crenularis</u>	<u>Tarletonbeania crenularis</u>
<u>T. chalcogramma</u>	<u>Theragra chalcogramma</u>

stratification were treated by grouping hauls according to depth. Table 3 summarizes the data by grouping the hauls according to time and depth and then obtaining averages for corrected volume, number of fish, number of fish larvae, and number of species of adult fish. In determining these averages several of the hauls were not used. Haul nos. 18, 24, 37, 62, 113, 114, and 115 were eliminated from the analysis, either because of trouble with the winch during the haul or because of a rip in the cod end of the net. Haul no. 149 was not considered because it was an extremely atypical haul and the large corrected volume (325,000) caught would mask the results obtained in the other catches.

In the construction of Table 3, haul nos. 96, 97, 98, and 99 were grouped and treated as a single haul. This was done because all four hauls were taken in succession at the same depth and the catches showed little variability.

Table 3, DEPTH DISTRIBUTION OF TRAWL CATCHES DURING DAY AND NIGHT HAULS

Depth Range	Time	Number of Hauls	Aver. Corr. Plankton Vol. cc/min x 1000	Average Number of Fish	Average Number of Fish Larvae	Average Number of Species Adult Fish
20-30 m	Day	4	1,031	1.0	5.8	0.5
	Night	25	29,176	67.5	30.5	3.0
31-60 m	Day	11	1,569	2.45	3.73	0.54
	Night	31	14,042	28.0	10.2	3.2
61-120 m	Day	6	2,010	2.2	1.2	1.2
	Night	9	16,364	10.3	2.6	2.4
121-250 m	Day	19	5,770	9.1	2.3	1.0
	Night	30	7,004	17.3	7.2	4.3

The data in Table 3 indicate wide differences between day and night hauls, with the differences diminishing in the deeper hauls. For night hauls there is a general decrease in plankton abundance with an increase in depth, and for day hauls the reverse holds true. The number of fish, fish larvae, and the average number of adult fish species decreases with depth, except for an increase in the deepest hauls.

No satisfactory measure of seasonal variations was obtained; however, at one point the cruise course crossed after an interval of about 45 days. Also, the start of the first leg and the end of the last leg of the cruise, although separated by a period of about 50 days, were spatially relatively close together. The data from these latter hauls, however, are complicated by a rather sharp oceanographic boundary. Table 1 gives the corrected volume of animals for haul nos. 104 and 106 (taken on 9 September) as 2193 and 472. Haul no. 23 (taken on 29 July) was positioned between haul nos. 104 and 106 and has a corrected volume of 2119. These hauls were made at 225 meters. The low volume found in haul no. 106 may be because it was made in early evening and the plankton had begun their diurnal migration.

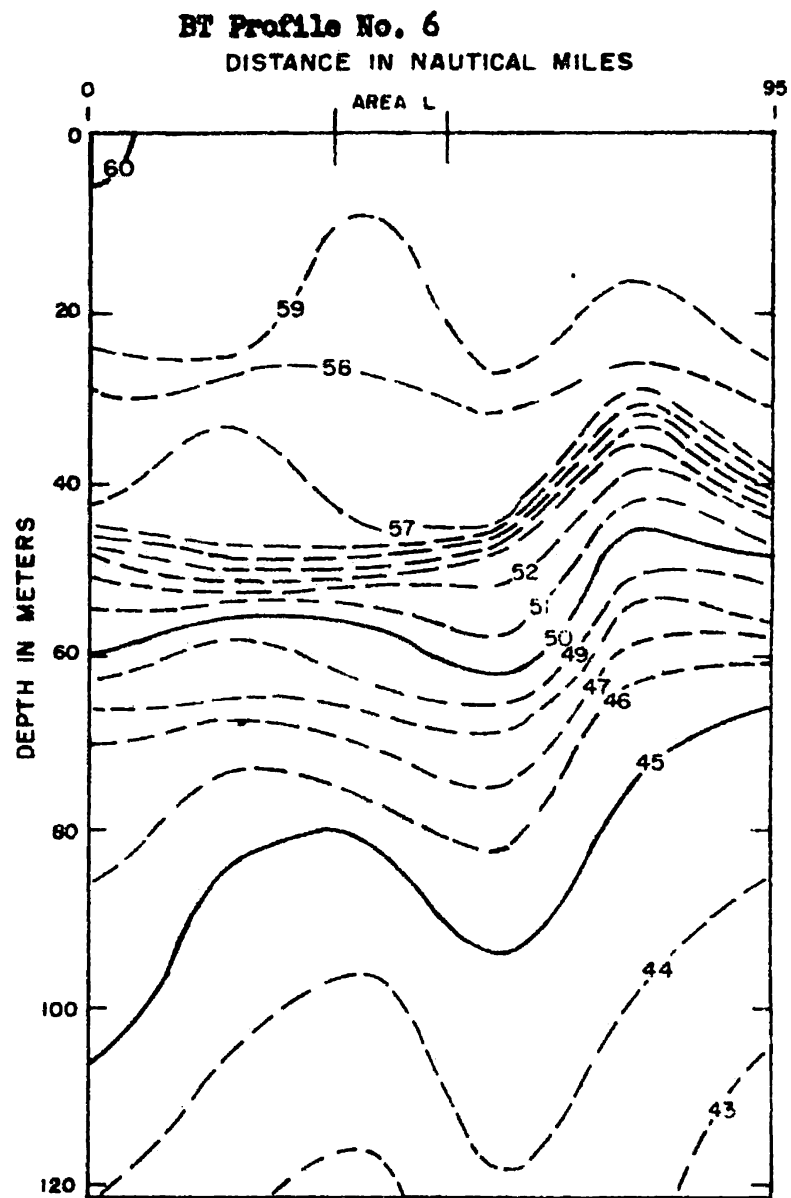
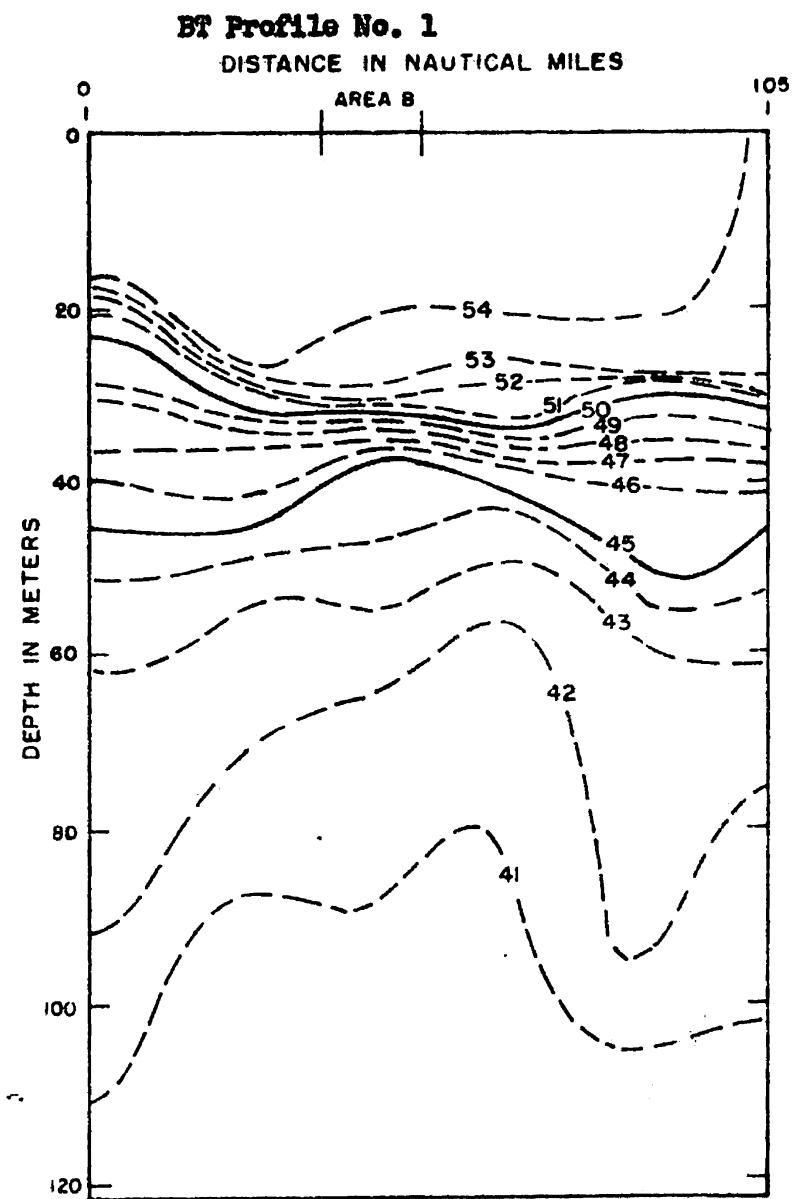
Haul nos. 24 and 27 (taken on 29-30 July and 31 July) have corrected volumes of 6884 and 4545. Haul no. 110 (taken on 14-15 September) was positioned between no. 24 and no. 27 and has a corrected volume of 3000. All of these hauls were taken at about the same time and at a depth of about 225 meters.

The average corrected volumes for the 30-, and 60-, and 225-meter hauls in area "A" (haul nos. 13, 14, and 15) and area "B" (haul nos. 16, 17 and 18), made on 26-27 July and 27-28 July respectively, were 25,713

and 16,974. The average corrected volumes for the same depths for area "L" (haul nos. 131, 133, 135) and area "M" (haul nos. 136, 137, 138, 141, and 142) were 18,707 and 19,171. These latter series of hauls were made on the 19th and 20th of September and were made south of the first series at about the same distance offshore. As haul nos. 131 and 136 were made at the same depth and in the same series, these were averaged prior to determining the average for the whole series. The same was done for haul nos. 137 and 142. A rather sharp oceanographic breakover indicated that a layer of 57°-60° F water in the upper 40 meters characterized the southern series of hauls, as compared with the 46°-54° F temperatures found in the northern series (Figure 3). This oceanographic condition appears to have concentrated the major plankton abundance in the southern hauls at a slightly lower depth than in the northern hauls.

An interpretation of the above data is difficult. It appears that seasonal variation plays a relatively unimportant role in the analysis of the trawling data from this cruise. A satisfactory statement about the role of seasonal variation would require considerably more data than are available.

The fourth variable, which the nature of the gear minimizes, is plankton patchiness--that is, populations in a small area distributed in clouds of various densities (much like fish schools) rather than uniformly. Haul nos. 96, 97, 98, and 99 were all made at the same depth, one following the other, and showed corrected plankton volumes of 6765, 4054, 4412, and 4861 respectively. It can be seen that their corrected volumes are closely grouped. Unpublished data taken during different cruises seems to indicate that plankton patchiness plays an unimportant role in the trawl results.



**Figure 3. Vertical temperature profiles from the northern and southern legs.
(Location of profiles shown in Figure 1.)**

It may be further added that unpublished data from other surveys indicate the consistency of the trawl results; that is, hauls taken over the same spot, one haul following the other, give similar corrected plankton volumes.

The analysis of geographic variation is based primarily upon the night hauls. In 14 areas, shown in Figure 1, a series of three night-hauls made at 30-, 60-, and 225-meters depth, are available for comparison. The corrected volumes for the three depths were averaged to give the relative plankton abundance for each of the fourteen areas. Figure 1 shows the general decrease in plankton abundance as the distance from the Washington coast increases. This decrease continues until a sudden increase in abundance is found in area "D", south of the Alaska Peninsula (haul nos. 33, 34, 35). The average corrected volume for this area (66,326) is more than an order of magnitude greater than the corrected volumes in the neighboring area "C" (haul nos. 27, 28, 29, with an average corrected volume of 5002). Hauls made in the Aleutian Islands region show great variations in relative volumes. Area "H" (haul nos. 75, 76, and 77), for example, has an average corrected volume of 1839. It was positioned between area "G" (haul nos. 68, 69, and 70) and area "I" (haul nos. 82, 83, and 84) which had average corrected volumes of 20,223 and 18,603.

The wide variations in relative plankton abundance, between areas which are geographically close, prompted examination of the oceanographic data taken during the study. A nearly complete bathythermogram record for the cruise course provided the first indication of the cause of the great variations in the Aleutians. These data, shown in Figure 4, clearly show that the high catches, dominated by euphausiids, are made in areas of

relatively warm, stable water, (areas "G" and "I") while the low catches, dominated by copepods and arrow worms, are made in areas of cold, unstable water (areas "F" and "H"). Areas that are intermediate in bathythermic characteristics are also intermediate with respect to their biota. Haul no. 81 and area "J" (haul nos. 82, 83, and 84) have plankton volumes between those of the high and low values. In haul no. 81, copepods and euphausiids have about equal quantitative importance.

The oceanographic variations and the limited number of samples made it difficult to evaluate the relative abundance of plankton in the Aleutian regions. However, the data do indicate that the cold, less stable water is being pushed up from the south and that the regions north of the islands have a higher standing crop of plankton than have the regions to the south.

An explanation of the high volumes obtained south of the Alaska Peninsula must await further interpretation of the oceanographic results. Previous studies in the area, particularly the NORPAC cruise in 1955 (Fleming, 1956), indicate that the area of high plankton abundance is one of the termination points of the North Pacific Gyral, and is rich in phosphates and other nutrients.

2. Exploratory Results

Only limited work has been done with the invertebrate portion of the catches. The amphipod, Parathemisto libellula was found only in the Bristol Bay - Bering Sea area and in some hauls made near Kodiak. Catches of large shrimp, Pandalus borealis, near Kodiak (haul nos. 94, 95, and 96) pointed to the possibility of commercially exploitable populations in this area.

Variations in fish fauna were both geographical and vertical. In hauls made near shore Sebastes spp. and the larvae of three species of flatfish, Hippoglossoides elassodon, Microstomus pacificus, and Glyptocephalus rex, were found. In the northerly inshore waters large numbers of capelin larvae, Mallotus catervarius, were taken. Sebastes larvae down to 6 mm. in length and Microstomus larvae down to 16 mm. in length were taken more than 300 miles from the nearest land mass. In the oceanic regions the larvae of the inshore fishes disappeared and myctophid larvae were common. During the portion of cruise south of 50° N latitude, a total of 10 scombrid larvae were taken ranging in length from 10-20 mm. These are possibly albacore larvae, however three other species of scombrid are known to inhabit the area.

The fish of the open ocean appear to have widespread geographic ranges. The myctophid, Lampanyctus leucopsarus, was ubiquitous, occurring in nearly every oceanic area sampled. Two other members of the genus, L. townsendii and L. regalis, were also taken but were less common. L. townsendii was taken only in the most southerly part of the cruise. L. regalis was taken primarily in the more southerly hauls, although it was also found west of the Aleutians. With the exception of Myctophum californiense, all of the other lantern fishes taken during the cruise, Tarletonbeania crenularis, Electrona thompsoni, and Diaphus rafinesquii, had distributions paralleling the distribution of L. leucopsarus. M. californiense was found only during the southern portion of the cruise.

The stomiatid, Tactostoma macropus, and several species of argentinids were found throughout the survey area, although these fish were never as abundant as the myctophids. Less abundant but about equally widespread

was the chauliodontid, Chauliodus macouni. The melamphids, Melamphes spp., were widespread, but seemed more northerly in their distribution than either T. macropus or C. macouni.

The general pattern of fish distribution in the open ocean indicates that as the distance from the coast of Washington increases there is a decrease in the number of fish species. This was particularly apparent during the last part of the cruise: the number of species per haul increased as the hauls were taken closer to the Washington coast. This seems related to the occurrence of the North Pacific Drift water, which increases in temperature closer to the coast. The first catches of nemichthyids and of the leptocephalus were made in haul no. 124 which, from the available oceanographic data, seems to be just inside the North Pacific Drift.

There was a decrease in the number of species in the more northerly water. This would closely agree with Marshall's observations (1954) that no true bathypelagic fishes exist in Arctic waters.

Definite vertical patterns in the distribution of the more commonly taken species were apparent. All of the melamphids taken during the cruise were taken in the 225-meter hauls. The stomiatid fishes were taken mostly below 60 meters. Table 4 shows the vertical distribution of the seven species of myctophids taken during the cruise. Thirteen of the fourteen areas used in plotting the geographic distribution of plankton abundance were used in compiling this table. Area "F" was omitted because of the absence of fish.

Table 4. DEPTH DISTRIBUTION OF MYCTOPHIDS

Species	30 meters		60 meters		225 meters	
	No./Haul	% Occ.	No./Haul	% Occ.	No./Haul	% Occ.
<u>L. leucopsarus</u>	79.5	92.3	27.8	100.0	10.4	92.3
<u>L. regalis</u>	0	0	0.2	15.4	0.7	30.7
<u>L. townsendii</u>	0.3	15.4	0.1	7.7	0	0
<u>D. rafinesquii</u>	5.6	61.5	2.0	53.8	1.4	61.5
<u>T. crenularis</u>	0.4	23.1	0.6	38.5	0.4	38.5
<u>E. thompsoni</u>	0.1	7.7	0.1	7.7	5.8	69.2
<u>M. californiense</u>	0.2	15.4	0	0	0	0

Table 4 shows that E. thompsoni primarily inhabits the deeper waters, as opposed to D. rafinesquii, which is concentrated in the shallower hauls. Insufficient numbers of M. californiense are available to make a strong statement concerning its vertical distribution, however this species seems primarily concentrated at the surface. The distribution of T. crenularis is also uncertain. The data point to a fairly wide vertical range; however, based on the condition of the animals at the time of capture, the author feels that this species is primarily a surface dweller and its capture in the deeper hauls is probably the result of contamination as the net was pulled to the surface. This conclusion is supported by data from hauls not analyzed in Table 4, (See Table 2).

The depth distribution of the three species of Lampanyctus has ecological significance. L. leucopsarus ranges primarily in the surface areas, whereas L. regalis was captured mostly in the deeper hauls. These two species, therefore, seem to inhabit different ecological niches.

L. townsendii, however, is also found only in the surface hauls and appears to be in direct competition with L. leucopsarus. Table 5 gives a breakdown of the vertical distribution of L. leucopsarus for three areas on the outward leg of the cruise (areas "A", "B", and "C") and three areas on the returning southern portion of the cruise (areas "L", "M", and "N").

Table 5. DEPTH DISTRIBUTION OF L. leucopsarus
IN NORTHERN AND SOUTHERN PORTION OF CRUISE

	Northern Portion			Southern Portion		
Area:	"A"	"B"	"C"	"L"	"M"	"N"
Haul series:	13-15	16-19	27-29	133-136	137-141	143-147
<u>Depth</u>						
30 meters	73	22	21	7	17	23
60 meters	8	11	7	29	29	109
225 meters	15	9	4	8	7	10

Table 5 shows that during the southern portion of the cruise L. leucopsarus was caught in greatest numbers in the hauls made at 60 meters, while it was caught during the northern portion primarily in the hauls made at 30 meters. L. townsendii, on the other hand, was caught only in hauls made during the southern leg of the cruise and was taken in the shallow hauls. The species, therefore, do not seem to overlap greatly in their vertical distribution in the same area.

The change in depth distribution of L. leucopsarus between the first cruise-leg to the north and the returning cruise-leg to the south is probably a reflection of different oceanographic conditions of the two areas. Figure 3 shows the bathythermogram sections made for area "A" and area "L". Here it can be seen that the water at 60 meters in the south is about the same temperature as the water at 30 meters in the north.

At least one new species and a number of rare fish were taken during the cruise. The new species is in the family Stomiatidae and belongs to the genus Bathophilus. It is described in the appendix to this report.

Two leptocephalus larvae, one 210 mm. in total length and the other 206 mm. long were taken in haul nos. 125 and 128. These are also described in the appendix to this report.

Among other catches of rare and possibly new species were included ten specimens of fish belonging to the family Melamphidae, and probably representing two species, Melamphaes rugosus and M. cavernosus; several species in the family Bathylagidae; one species in the family Argentinidae, probably Leuroglossus stilbius; five specimens in the family Nemichthyidae, probably Avocettina gilli; one specimen of a hatchet fish in the family Sternoptychidae; a number of specimens in the family Paralepidae, probably all Lestidium ringens; and also three specimens of Aristostomias scintillans, belonging to the family Melanostomiatidae.

It should be noted that the capture of three specimens of A. scintillans brings to five the number of specimens of this fish caught in the Pacific. A single specimen of this fish was caught by the University of Washington

Oceanography Department in 1956 off the Washington coast (unpublished record), and the first recorded specimen was taken in 1915 (Gilbert, 1915) off the California coast. A full description of this species will be published in a separate paper. One specimen, caught during the present work, was in nearly perfect condition when it was removed from the net. The light organ at the tip of the barbel was observed to have a pinkish glow. The subocular luminous organ glowed an intense red, alternating several times between the green flashes of the postocular luminous organ.

3. Quantitative Evaluation of Midwater Trawl

There are no satisfactory estimates of the volume of water filtered by the different sections of the net, nor are there any measurements of the catching power of the trawl in relation to other nets. This makes it difficult to compare trawl catches and catches by other standard plankton-sampling devices.

Maximum values for the filtering capacity of the trawl may be computed by multiplying the cross-sectional area of the mouth opening by the length of the water column through which the net passes. Table 6 is based upon a ship's speed of 6 knots, and gives the maximum volume of water strained by different sections of the net during one minute of trawling.

During the night hauls the average plankton catch in the upper 120 meters was about 20 cc. per minute of trawling, and the average number of fish caught in the same hauls was about 0.98 per minute. Dividing the average plankton catch (based on settled volume) by a factor of 5 (Redfield, 1941) the actual weight of the plankton caught was about 4 grams per minute.

The average weight of each fish caught was about 0.75 grams. Using these weights, Table 6 gives the weights of plankton and fish per cubic meter of water, determined by assuming: (a) that all water through which the net passes is filtered; (b) that each section of the net operates independently; and (c), that when an animal passes through the mouth opening of the particular section of the net it is caught. As there is probably high escapement of plankton through the 3-inch mesh of the net, the concentration determined by using the mouth opening of this section is minimal. Escapement decreases in the section lined with 1/2-inch bait netting and decreases further in the cod end of the net. As the forward sections of the net may serve to guide the catch into the cod end, the plankton concentration based upon the mouth opening of this section is probably high. A realistic value probably lies between the concentrations obtained for the middle section of the net (0.016 grams/M³) and the cod end (0.11 grams/M³).

Table 6. QUANTITATIVE EVALUATION OF THE MIDWATER TRAWL

	Section of the Net		
	Front End (3" Netting)	Middle Section (3" Netting, Lined with 1/2" Netting)	Cod End (1/8" Netting)
Cross-sectional area of mouth opening in M ²	5.040	1.320	0.197
Water strained per minute in M ³	933.500	244.000	36.400
Plankton concentration in grams per M ³	0.004	0.016	0.110
Fish in grams per M ³	0.0008	0.003	0.020

The escapement of fish through the 3-inch section of the net is probably considerably less than the escapement of plankton. It is also probable that fish escapement through the section lined with 1/2-inch bait netting is low. A realistic value for the weight of fish per cubic meter of water, therefore, probably lies between 0.0008 and 0.003 grams.

It must be remembered that the plankton concentrations primarily refer to plankton populations a step higher on the food chain than those caught in gear such as the Clarke-Bumpus net or the standard 0.5-meter plankton nets. The fish caught by the net are probably one step higher on the food chain than the plankton caught by the net. The difference in weight of fish and weight of plankton is about one order of magnitude, a difference which could be expected between different steps of the food chain.

Conclusions

The limited amount of data and the extent of the area under consideration make definite conclusions difficult. The data presented in this report must be used with caution and with the understanding of their many limitations.

It must be remembered that all data referring to abundance are relative data. There are no measurements of how much water is filtered by the net, nor is there any indication of the effect of clogging. Although the ship's engines were kept at the same speed for nearly all of the hauls, the relative speed of the net through the water varies according both to currents at depth and currents on the surface and to weather. These variations in towing speed probably are unimportant, however they must be investigated eventually.

The measurements of seasonal variation between areas are obviously insufficient. It is possible, although in the author's opinion not probable, that the geographic variations are in fact seasonal variations.

The analysis of the data was based primarily upon the fourteen areas shown in Figure 1. This was done for convenience and clarity. All of the raw data (except the oceanographic measurements, which will be published separately) are included in the report and it can easily be seen that the pattern based on the fourteen areas is consistent with the unused data.

The following general conclusions are made for the time period involved in the study and concern only those animals caught in the midwater trawl:

(1) The abundance of both plankton and fish and the number of species of fish decreases with increasing distance from the Washington Coast out to the area south of the Alaska Peninsula, (area "D") where there is a sudden increase in plankton abundance. This increase may be related to the fact that the area is within the Alaska Gyral and is rich in phosphates and other nutrients.

(2) The area around the Aleutian Islands is characterized by large variations in the relative abundance of plankton in relatively small geographic areas. These variations are closely associated with the oceanography of the areas involved. Areas of stable water conditions have a large standing crop, while areas of unstable water conditions and extensive mixing have a low standing crop. The area to the north of the Aleutians seemed richer than the area directly to the south.

(3) There appears to be an oceanographic boundary at about 50° N latitude. Below this boundary the waters of the Pacific Drift are

encountered and fish species not taken to the north are found. There is a change in the vertical distribution of plankton abundance in this region, with the peak abundance occurring deeper than in waters to the north. This is also reflected in the vertical distribution of L. leucopsarus, the most abundant fish taken during the cruise. North of 50° this fish is concentrated at 30 meters, while south of 50° it is most abundant in the hauls made at 60 meters.

A great deal of work remains to be accomplished. Future studies may be divided into two phases: (1) a more complete analysis of the data already obtained and (2), continued exploration of the area and a further study of existing conditions. Under the first phase the more pressing problems include:

- a. Identification of the invertebrates to species and a study of their distribution in relation to the oceanography of the area
- b. Identification of the fish larvae to species with a study of their distribution in relation to the oceanography of the area
- c. Identification of the remaining unidentified adult fish.

For the second phase of the program the following problems should be examined:

- a. The relationship of fauna north of 50° N with fauna to the south
- b. A determination of the depth of maximum plankton abundance in the daytime

- c. A study of the fishing power of the trawl to enable the catches to be placed on an absolute rather than a relative level.

The modified Isaacs-Kidd midwater trawl stands as one of our best tools in the investigation of the macroplankton and the small nekton. The close relationship between the oceanographic data and the biological data and the consistency of the results are strong points in favor of the gear. It may also be important to note that the catch content of the midwater trawl closely resembles the stomach contents of the salmon (Allen and Aron, 1957).

APPENDIX

DESCRIPTIONS OF A NEW SPECIES OF STOMIATID AND
AN UNIDENTIFIED LEPTOCEPHALUS

by

William Aron and Peter McCrery

Bathophilus flemingi n. sp.

A total of five specimens of this fish were taken, two in haul no. 135 and one each in haul nos. 137, 138 and 145. The fish is illustrated in Figure 5 and the counts and measurements are given in Table 6. In Table 7 counts and measurements for the new species are compared with similar data for those species of Bathophilus to which it seems closely related. B. filifer is included in this table because it is the only previously recorded member of the genus captured in the Pacific, having been captured off Central America and the Galapagos. It is easily distinguished from B. flemingi by its pectoral fin, which consists of a single ray.

The new species is characterized by the bullous appearance of its ventral surface, and the proximity of the subocular light organ (white spot) to the postocular light organ. The bullae may be the result of handling, however their consistency from specimen to specimen indicates that they are a true structure. The bullae may provide a means of expansion following feeding by the fish. Table 6 also indicates the possibility that the fish is asymmetrical in regard to the placement of the ventral fins.

The length of the chin barbel is uncertain. In the haul with the specimen having the longest intact barbel were found pieces of barbel which, if belonging to the specimen captured, would make the barbel about four times the standard length of the fish. It is, of course, possible that the barbel pieces found belonged to a specimen which avoided capture.

By examining Table 7, the new species may easily be separated from B. ater and B. longipes by the greater number of rays in its ventral fin. B. ater has a light spot under its postocular light organ which is not found in the new species. The only specimen of B. indicus was unfortunately destroyed; however, it has fewer rays in its pectoral fin than B. flemingi and also appears to have fewer photophores than the new species. B. longipinnis is best distinguished from the new species by the fact that the subocular light organ is well separated from the postocular light organ. B. longipinnis also appears to lack both the light spot associated with the ventral fin and the ventral series of photophores.

The holotype (129 mm. specimen from haul no. 135) and paratypes are presently stored in the collection of the University of Washington School of Fisheries. The holotype and one paratype, however, will eventually be forwarded to the United States National Museum.

The new species is named in honor of Richard H. Fleming for his contributions to biological oceanography.

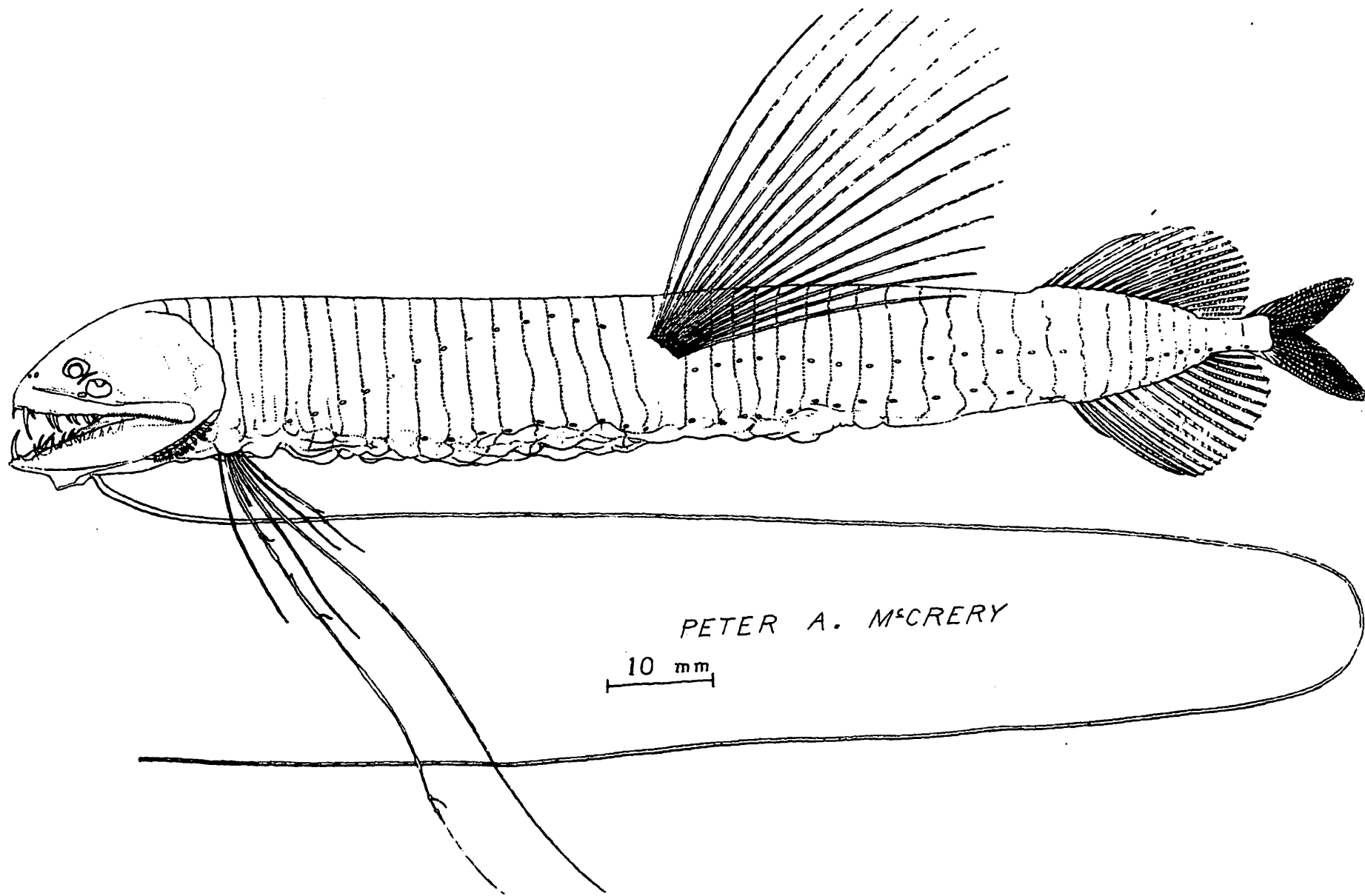


Figure 5. *Bothophilus flemingi*

Table 7. COUNTS AND MEASUREMENTS FOR 5 SPECIMENS
OF Bathophilus flemingi

(All measurements in mm)

	Haul No. 135		Haul No. 137	Haul No. 138	Haul No. 145
	Fish A	Fish B			
Total length	129	125	108	117	96
Standard length	120	116	100	110	88
Head length	21	21	17	18	15
Depth behind head	15	15	14	16	12
Depth just anterior to pelvic	15	14	13	15	11
No. of dorsal rays	± 14	14	± 12	± 14	± 14
Length of longest dorsal ray	12	13	9	10	5
No. of anal rays	15	14	± 14	± 14	± 14
Length of longest anal ray	8	13	9	11	4
No. of caudal rays	± 16	± 18	± 18	± 17	± 18
Length of longest caudal ray	12	11	9	9	8
No. of rays, right ventral	± 15	15	± 15	15	---
Length of longest ray, right ventral	39	42	28	38	---
No. of rays, left ventral	± 15	± 16	± 16	± 15	---
Length of longest ray, left ventral	43	38	25	34	---
No. of rays, right pectoral	± 7	± 6	± 7	± 5	± 5
Length of longest ray, right pectoral	70	59	34	43	34
No. of rays, left pectoral	7	± 6	± 7	± 5	± 5
Length of longest ray, left pectoral	49	45	41	15	22
Eye diameter	2.4	2.2	2.1	2.1	2.1
Pupil diameter	1.3	1.2	1.2	1.3	1.2
Length subocular light organ	0.7	0.9	0.8	0.8	0.8
Length postocular light organ	2.7	2.3	1.2	2.2	1.4
Length of barbel	250	40	188	168	23
Depth from dorsal surface to center of base of right ventral	13	---	11	8.9	---
Depth from dorsal surface to center of base of left ventral	5.4	---	5.8	7.2	---
<u>Photophores</u>					
Lateral series, opercle-ventral	13	---	15	15	---
Lateral series, ventral-anal	14	---	13	12	---
Ventral series, isthmus-pectoral	± 4	---	5	4	4
Ventral series, pectoral-ventral	6+	---	± 14	15	---
Ventral series, ventral-anal	6+	---	± 10	13	---
Ventral series, anal-caudal	7	---	---	5+	---

Table 8. COMPARISON OF B. flemingi TO OTHER SPECIES IN THE GENUS

	<u>B. flemingi</u> n. sp.	<u>B. longipinnis</u> Pappenheim, 1914	<u>B. filifer</u> * Garman, 1899	<u>B. ater</u> A. Brauer, 1902 & 1908	<u>B. indicus</u> A. Brauer 1902 & 1908	<u>B. longipes</u> Regan and Trewavas, 1930
Dorsal rays	12-14	14-16	12-16	17	13	13-16
Anal rays	14-15	15-16	14-17	17	16	13-16
Pectoral rays	5-7	5-8	1	5	4	10-16
Pelvic rays	15-16	11-14	4-5	9	16	7-10
Caudal rays	16-18	---				
Pelvic light spot	present	not described	not described	not described	not described	present
Depth in standard length, mm.	7.1-8.0	6.5-8.0	9.0-12.0	8.0	7.5	6.5-10.0
Head in standard length, mm.	5.4-6.1	4.0-5.0	5.0-8.0	5.5	4.5	4.5-6.0
Subocular light spot in relation to postocular light spot	very close, almost bordering	well in front	below	separation distinct, additional light spot under postocular organ	---	separation distinct
<u>Photophores</u>						
Ventral series:						
isthmus-pectoral	+ 4	---	---	---	---	5
pectoral-ventral	+ 14	---	---	18	15	17
ventral-anal	+ 13	---	---	13-15	13-15	11
anal-caudal	5-7 ?	---	---	---	---	5
Lateral series:						
opercle-ventral	13-15	13-16	---	16	---	14-16
ventral-anal	12-14	10-12	---	13-15	---	9-10

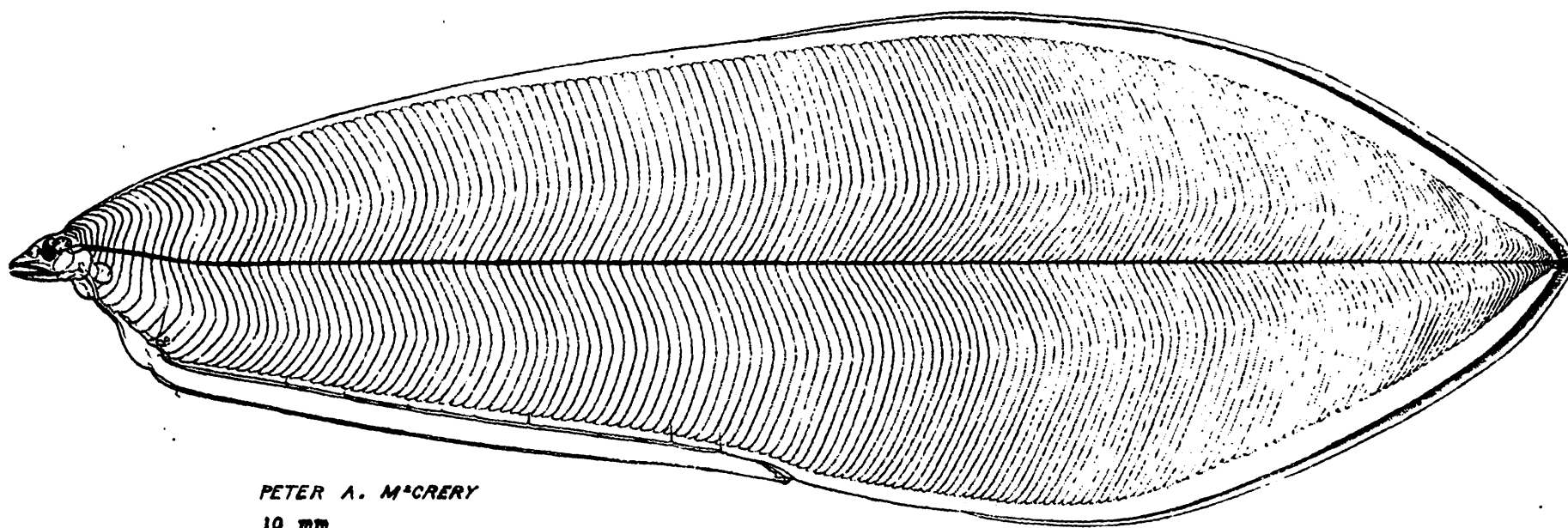
* Based on description of (Parr, 1927) and (Regan and Trewavas, 1930).

Leptocephalus larvae

Two leptocephali were taken during the southern leg of the cruise, one 210 mm. in total length taken in haul no. 125, and the other 206 mm. long taken in haul no. 128. At the time of capture both specimens were alive and in perfect condition. Except for their eyes, they were absolutely transparent and could not be seen when immersed in sea water. The condition of the leptocephali at the time of their capture strongly suggests that they were captured close to the surface during the retrieve of the trawl.

Table 9 gives the counts and measurements of the leptocephali, and the 206 mm. specimen is illustrated in Figure 6. At the time of capture both specimens were preserved in 10% formalin in sea water neutralized with borax. In the laboratory one specimen was switched to 5% formalin in artificial sea water neutralized with borax and the other was switched to 70% ethyl alcohol. Both specimens swelled badly and it became necessary to puncture the skin to prevent bursting. The 210 mm. specimen was found to have a scar, about 25 mm. in length just behind the anus and extending vertically towards the mid line. The counts and measurements were made in the laboratory after the animals had swelled and it is possible that the location of the blood vessels has been altered. Other measurements may have also been changed slightly.

At present there are no indications what the adult form of these larvae may be; however, it must be pointed out that the only apodes found in the area belong to the family Nemichthyidae. It may be significant to note that the two specimens were both taken in water of the North Pacific Drift.



PETER A. MACRERY

10 mm

Figure 6. Unidentified Leptocephalus

Table 9. COUNTS AND MEASUREMENTS OF LEPTOCEPHALI*

	Haul 125	Haul 128
Total length	210.0 mm.	206.5 mm.
Standard length	207.8 mm.	204.5 mm.
Preal anal myomeres	67	71
Postanal myomeres	± 85	92
Ano-dorsal distance (expressed in number of myomeres)	4	3
Length of head	11.0 mm.	9.0 mm.
Maximum height	75.4 mm.	65.0 mm.
Height at anus	70.3 mm.	59.0 mm.
Length of pectoral fin	27.0 mm.	3.0 mm.
Dentition (upper jaw)		
frontal teeth	1 ?	2
grasping teeth	7	10
small teeth	8	8
Position of ventral blood vessel (expressed as myomere into which vessel first appears to enter)	27 33 38 44 47 58 61	27 33 39 43 49 62 67

* Based on methods described by Jespersen (1942), except for position of blood vessels.

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