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**Ichthyoplankton
off Washington, Oregon,
and Northern California,
March-April 1984**

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Ichthyoplankton off Washington, Oregon, and Northern
California, March-April 1984

by

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INTRODUCTION

This is the eighth report of a series describing cooperative U.S.-U.S.S.R. ichthyoplankton surveys conducted off the U.S. west coast from 48°-40°N. The cruise described here took place aboard the Soviet research vessel POSEYDON, and is designated 1P084. Similar reports, based on cruises occurring since April-May 1980, have already been produced (Kendall and Clark 1982a, 1982b, Bates 1984, Clark 1984, 1986a, 1986b, and Clark and Kendall 1985). These surveys were designed to determine seasonal and spatial distribution of ichthyoplankton as background information for more detailed studies of early life history of fishes of the area. The initial plans were to conduct two such surveys each year, at different times of the year, so that after several years the complete annual cycle of fish egg and larval occurrence would be documented. These are the first large-scale ichthyoplankton surveys of the area to sample all seasons. Results from these surveys eventually will be compared to those of the CalCOFI program off California and Baja California to the south, and to several smaller-scale surveys conducted previously off Washington and Oregon. In the meantime, we plan to present a data report such as this for each cruise, as soon as feasible.

During this cruise, bongo tows to 200 m were taken at 112 of the usual 124 stations. At the remaining 12 stations, deep bongo tows to 400 m were made to collect sablefish eggs and larvae (Kendall and Matarese 1987). American samples were fixed in formalin at sea but sorted fish larvae were

later transferred to 70 % ethanol for storage. This was done to inhibit bone deterioration.

METHODS AND MATERIALS

A grid of 124 stations laid out off the Washington, Oregon, and northern California coasts extended from 3 miles (5.6 km) to 200 miles (370 km) from shore (Figure 1). Stations were more closely spaced nearshore than offshore. The Soviet research vessel POSEYDON, with Dr. Y. Pashenko serving as chief scientist occupied these stations from north to south from 11 March to 4 April 1984. At each station hydrographic casts at standard depths (0, 10, 20, 30, 50, 75, 100, 150, 200, 250, 300, 400, 500, and 600 m) were made as water depth permitted. Temperature, salinity, oxygen, phosphate, and silicate determinations were made aboard ship with these samples. Results of these measurements will be reported elsewhere. Paired neuston tows using 0.3 m high by 0.5 m wide Sameoto samplers (Sameoto and Jaroszynski 1969) with 0.505 mm mesh nets were made at 2.0 knots (1.03 m/sec) for 10 min at each station. A standard MARMAP bongo tow (Smith and Richardson 1977) with 60 cm diameter frames, and 0.505 mm mesh nets was made with a maximum of 300 m of wire out at 112 of the stations and with a maximum of 570 m of wire out at 12 stations near the edge of the continental shelf. Flowmeters in the mouths of the nets were used to determine the volume of water filtered by each net. The Soviets retained one of the paired neuston and bongo samples, while the Americans retained the other. The American samples were processed by the Polish Plankton Sorting Center in Szczecin, Poland, where displacement plankton volumes were determined (for bongo samples) and all fish eggs and larvae were removed. The fish eggs were later identified and counted by Ann C. Matarese at NWAFC and Deborah Blood. Identifications were made to the lowest taxonomic

level possible, and in some cases "types" of unidentified eggs or larvae were established in hopes that with further study their identity could be established. Beverly Vinter at NWAFC checked larval identifications for both the bongo and neuston samples. Counts of fish eggs and larvae in the samples were converted to numbers per 10 m^2 of surface area for the bongo samples and numbers per $1,000 \text{ m}^3$ for the neuston samples. The logarithm of the number of eggs or larvae in the survey area is based on the Sette and Ahlstrom census as used by Richardson (1981).

RESULTS

The station pattern (Figure 1) was occupied as planned. Data associated with the 124 stations are listed in Tables 1A and 1B. A summary of the catches of fish eggs, larvae, and juveniles is presented in Tables 2, 3 and 4. Totals of 37 taxa of eggs and 48 taxa of larvae were found. Figures 2-7 illustrate the rank abundances of egg and larval catches in bongo and neuston tows for the cruise using several measures of abundance. Figures 8-32 show the geographic distribution, abundance at each station and length frequencies of larvae and eggs of the more abundant taxa. Results of recurrent group analysis of eggs and larvae from neither the neuston samples nor the bongo samples showed affinities between species at either the 0.400 or 0.300 affinity levels.

Relative Abundances

The rank order of abundance among the taxa depends on the measure of abundance examined. Four measures of abundance for each net were used: total numbers caught, percent occurrence, logarithm of number in survey area, and mean number per $1,000 \text{ m}^3$ (for neuston) and mean number per 10 m^2 (for bongo). In the bongo net, egg catches were dominated by Myctophidae according to all

abundance criteria except for percent occurrence (Figure 5), in which Bathylagidae dominated. These results are similar to the May-June 1982 cruise (Clark 1986a). In the neuston net, two of the abundance criteria for eggs were dominated by Microstomus pacificus, another by Pleuronectidae, and another by Trachipterus altivelis.

Larval and juvenile catches in the bongo net were dominated by Stenobranchius leucopsarus in all abundance criteria. These results are similar to the May-June 1981 cruise (Clark 1984). A total of 2246 Stenobranchius leucopsarus larvae was caught in the bongo net.

In the neuston net, larval catches were dominated by Hemilepidotus spinosus using two of the abundance criteria, and by Glyptocephalus zachirus and Cololabis saira using two other measures. Juvenile catches in the neuston net were dominated by Tarletonbeania crenularis in all categories except one, which was dominated by Scorpaenichthys marmoratus.

Distributions

While this is not intended to be a definitive report on these data, certain outstanding features of distribution of eggs, larvae and juveniles of the more abundant taxa will be mentioned.

Nansenia candida (Figure 8) - Larvae of the bluethroat argentine were found in bongo catches predominantly in the central one-third of the survey area. Argentinid larvae ranged from 3.8-17.6 ($\bar{x} = 7.0$) mm SL with a percent occurrence of 26%.

Bathylagidae (Figure 9) - Blacksmelt eggs were found in bongo tows throughout the survey area. They occurred at 51% of the stations occupied.

Bathylagus spp. (Figure 10) - Blacksmelt eggs from bongo catches were found throughout the survey area with the highest concentrations occurring in the southern half of the area. They were found at 39% of the stations occupied.

Bathylagus ochotensis (Figure 11) - Larvae of the popeye blacksmelt in bongo samples were caught primarily in the southern half of the survey area and ranged in length from 3.8-23.0 ($\bar{x} = 7.6$) mm SL. Larvae occurred at 45% of the stations occupied.

Myctophidae (Figure 13) - Eggs of lanternfishes were found in bongo samples in the southern half of the survey area. Lanternfish eggs were found at 32% of the stations occupied.

Stenobranchius leucopsarus (Figures 14 and 15) - Larvae of the northern lanternfish in bongo catches were distributed throughout the survey area both in continental shelf waters and in offshore areas. The larvae ranged in length from 2.0-27.0 ($\bar{x} = 5.1$) mm SL and occurred at 79% of the stations occupied. A total of 33 juveniles, distributed evenly throughout the survey area, was also found in bongo samples.

Tarletonbeania crenularis (Figures 16 and 17) - Blue lanternfish larvae caught in bongo tows ranged from 2.0-16.0 ($\bar{x} = 5.4$) mm SL and had a percent occurrence of 41%. They were found primarily in the southern half of the survey area. Blue lanternfish juveniles, which were caught in the neuston net, were found in highest concentrations in the southern half of the survey area.

Cololabis saira (Figure 18) - Larvae of the Pacific saury were found in neuston samples in the southern half of the survey area. They ranged from 5.5-59.0 ($\bar{x} = 18.4$) mm SL and occurred at 40% of the stations occupied.

Trachipterus altivelis - King-of-the-salmon eggs were found in neuston catches throughout the survey area and were especially abundant in coastal waters from 42°-46°N. They were found at 48% of the stations occupied.

Sebastes species (Figures 19 and 20) - Rockfish larvae in the bongo net were distributed fairly evenly throughout the survey area. The bongo caught larvae ranged in length from 2.0-18.9 ($\bar{x} = 4.5$) mm SL and occurred at 66% of the stations occupied. Rockfish larvae caught in the neuston net ranged from 3.0-28.0 ($\bar{x} = 16.6$) mm SL and had a percent occurrence of only 15%. Neuston caught larvae were found throughout the survey area, but were seen at highest concentrations in the southern half of the area. Larvae caught in the neuston net were considerably larger on the average than those caught in the bongo, as was the case during the April-May 1980 cruise (Kendall and Clark 1982a).

Anoplopoma fimbria (Figures 21 and 22) - Sablefish or black cod larvae in neuston samples were found throughout the survey area and ranged from 7.1-28.5 ($n = 270$, $\bar{x} = 11.2$) mm SL with a percent occurrence of 30%. A total of 5 sablefish larvae was caught in standard 200 m bongo tows at stations 6, 25, 48, 57, and 58 and ranged from 6.7-8.3 ($\bar{x} = 7.2$) mm SL. A total of 9 sablefish larvae was caught in the special deep bongo tows to 400 m at stations 2, 12, and 19 in the northern third of the survey area and ranged from 6.0-7.0 ($\bar{x} = 6.8$) mm SL. The total of 5 sablefish eggs in the deep bongo tows near the edge of the continental shelf occurred at 4 of the 12 deep bongo stations occupied (stations 2, 19, 14 and 122). No sablefish eggs were found in the 200 m bongo tows.

Hexagrammos decagrammus (Figure 23) - Kelp greenling larvae were found in neuston catches in coastal waters throughout the survey area. They ranged from 8.0-40.0 ($\bar{x} = 19.0$) mm SL and occurred at 40% of the stations occupied.

Hemilepidotus spinosus (Figure 24) - Larvae of the brown Irish lord were caught in neuston samples throughout the survey area, but occurred at highest concentrations in shelf waters in the northern half of the area. Brown Irish lord larvae ranged from 4.6-22.5 ($\bar{x} = 9.3$) mm SL and occurred at 25% of the stations occupied.

Icosteus aenigmaticus (Figure 25) - Ragfish eggs in neuston tows were found predominantly in the southern half of the survey area in waters beyond the continental shelf. Ragfish eggs occurred at 31% of the stations occupied.

Ammodytes hexapterus (Figure 26) - Pacific sand lance larvae were found in neuston samples in coastal shelf waters in the northern one-third of the survey area. They were particularly abundant near Willapa Bay. The sand lance larvae ranged from 11.8-34.0 ($\bar{x} = 16.9$) mm SL and had a percent occurrence of 8%.

Pleuronectidae (Figures 27 and 28) - Righteye flounder eggs were found in coastal shelf waters throughout the survey area in both bongo and neuston samples. Pleuronectidae eggs in the bongo occurred at 16% of the stations occupied and those in the neuston occurred at 11% of the stations occupied.

Glyptocephalus zachirus (Figure 29) - Rex sole eggs were found in neuston samples from coastal shelf waters in the northern half of the survey area. They had a percent occurrence of 19%.

Lyopsetta exilis (Figure 30) - Slender sole eggs from bongo catches were found at coastal shelf stations throughout the survey area, although there were fewer in the southern one-third of the grid. Slender sole eggs had a percent occurrence of 31%.

Microstomus pacificus (Figure 31) - Dover sole eggs were found in neuston samples from coastal waters throughout the survey area. They were especially abundant at stations 39 and 41 just north of Tillamook Bay. Dover sole eggs occurred at 29% of the stations occupied.

Parophrys vetulus (Figure 32) - English sole larvae were found in bongo samples collected primarily from coastal shelf waters in the northern half of the survey area. English sole larvae ranged from 2.6-17.8 ($\bar{x} = 7.6$) mm SL and were found at 17% of the stations occupied.

ACKNOWLEDGEMENTS

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Table 2.--Fish eggs collected in bongo and neuston tows during cruise 1P084, March-April 1984.

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Figure 29.--Distribution of Glyptocephalus zachirus eggs from neuston tows during cruise 1P084, March-April 1984. Abundance expressed as number per 1,000 m³.

Figure 30.--Distribution of Lyopsetta exilis eggs from bongo tows during cruise 1P084, March-April 1984. Abundance expressed as number per 10 m².

Figure 31.--Distribution of Microstomus pacificus eggs from neuston tows during cruise 1P084, March-April 1984. Abundance expressed as number per 1,000 m³.

Figure 32.--Distribution and lengths of Parophrys vetulus larvae from bongo tows during cruise 1P084, March-April 1984. Abundance expressed as number per 10 m².

1P084 NEUSTON AND BONGO STATION SUMMARY

STATION	POSITION		DATE YYMMDD	POLYGONAL AREA KM2	NEUSTON TOW			BONGO TOW		
	LAT (N)	LONG (W)			TIME GMT	STANDARD HAUL FACTORS*		TIME GMT	STANDARD HAUL FACTORS*	
						A	B		A	B
G001A	47 57.2	126 13.0	840311	1598	1836	0.020	13.497	2142	6.378	3.485
G002A	48 0.7	125 56.0	840311	1537	0224	0.020	13.364			
G002B	48 0.9	125 56.0	840312	1537				0133	7.065	1.811
G003A	48 2.4	125 33.0	840312	1506	0530	0.022	14.781	0456	6.685	3.575
G004A	48 0.0	125 9.0	840312	1224	0829	0.021	14.159	0802	6.371	4.110
G005A	48 0.0	124 50.0	840312	1028	1115	0.020	13.081	1054	4.229	10.070
G006A	47 40.1	125 15.0	840312	1397	2105	0.021	13.980	2031	5.942	3.178
G007A	47 40.5	124 56.0	840313	926	0231	0.019	12.340	0202	5.480	3.971
G008A	47 39.2	124 35.0	840313	870	0500	0.019	12.897	0439	6.426	19.472
G009A	47 21.4	124 28.0	840313	881	0910	0.018	12.253	0843	3.848	17.489
G010A	47 20.9	124 49.0	840313	910	1301	0.019	12.378	1229	8.238	4.246
G011A	47 20.1	125 9.0	840313	1477	1619	0.027	17.738	1540	7.636	4.062
G012A	47 21.2	125 44.0	840313	3738	2015	0.020	13.592			
G012B	47 21.5	125 43.0	840313	3738				1927	7.619	1.895
G013A	47 19.9	126 41.0	840314	5735	0234	0.020	13.130	0208	7.748	3.817
G014A	47 19.5	127 37.0	840314	5211	0819	0.019	12.590	0744	7.329	3.646
G015A	46 39.8	128 43.0	840314	4858	1622	0.020	13.208	1546	7.745	3.815
G016A	46 39.2	127 47.2	840314	5499	2135	0.019	12.706	2108	7.700	3.774
G017A	46 40.6	126 49.0	840314	5367	0349	0.018	11.983	0320	6.549	3.274
G018A	46 41.0	125 48.0	840315	5419	0959	0.018	11.792	0927	5.317	2.606
G019A	46 41.5	124 56.0	840315	1527	1611	0.020	13.086			
G019B	46 40.5	124 59.0	840315	1527				1513	5.861	1.507
G020A	47 0.0	125 0.0	840315	1675	2028	0.020	13.490	2008	6.113	4.075
G021A	46 59.9	124 37.0	840315	810	2212	0.020	13.152	2200	6.071	7.495
G022A	47 0.0	124 18.0	840316	775	0002	0.021	13.744	0017	6.695	26.779
G023A	46 40.6	124 15.0	840316	841	0344	0.020	13.119	0321	6.812	15.482
G024A	46 39.9	124 39.0	840316	1067	0633	0.019	12.768	0609	5.943	4.952
G025A	46 19.8	124 54.0	840316	1923	1002	0.019	12.497	0933	6.185	3.093
G026A	46 20.2	124 33.0	840316	980	1402	0.048	31.963	1333	6.226	5.146
G027A	46 20.5	124 12.0	840316	731	1628	0.022	14.974	1618	5.183	16.198
G028A	46 1.6	124 6.0	840316	591	2030	0.020	13.577	2020	6.522	13.587
G029A	46 0.3	124 20.0	840316	1075	2302	0.017	11.661	2232	5.108	3.930
G030A	46 0.3	124 47.0	840317	1786	1514	0.020	13.562			
G030B	46 0.1	124 47.0	840317	1786				1427	6.545	1.678
G031A	46 0.5	125 38.0	840318	4693	0138	0.020	13.020	0109	6.513	3.208
G032A	46 0.1	126 36.0	840318	5698	1433	0.023	15.186	1409	6.231	3.100
G033A	46 0.0	127 33.0	840318	5676	2116	0.020	13.406	2050	6.759	3.313
G034A	45 59.9	128 31.0	840319	5511	0333	0.025	16.949	0306	6.276	3.107
G035A	45 21.0	128 33.0	840319	5427	1007	0.022	14.901	0909	5.975	3.017
G036A	45 20.3	127 37.0	840319	5751	1531	0.024	16.149	1505	6.199	3.069
G037A	45 20.1	126 40.0	840319	5560	2045	0.017	11.297	2020	6.249	3.093
G038A	45 20.3	125 44.0	840320	5289	0140	0.019	12.578	0114	6.361	3.165
G039A	45 39.6	124 44.0	840320	2465	0741	0.016	10.584	0714	6.631	3.283
G040A	45 40.5	124 16.0	840320	1036	1031	0.018	11.802	1013	5.991	4.609
G041A	45 39.8	124 2.0	840320	448	1207	0.016	10.970	1155	6.590	13.450
G042A	45 19.9	124 7.0	840320	569	1515	0.014	9.563	1450	6.316	7.177
G043A	45 20.0	124 27.0	840320	1012	2110	0.041	27.092	2045	5.237	2.555
G044A	45 19.0	124 46.0	840321	1792	0029	0.016	10.610			
G044B	45 19.0	124 46.0	840320	1792				2342	6.895	1.711
G045A	45 0.0	124 48.0	840321	2040	0309	0.036	23.708	0243	6.379	3.173
G046A	45 0.0	124 26.0	840321	1014	0522	0.016	10.354	0455	6.390	3.195
G047A	45 0.0	124 5.0	840321	658	0702	0.017	11.299	0646	6.502	9.158
G048A	44 40.1	124 12.0	840321	765	1005	0.016	10.939	0955	5.761	11.522
G049A	44 40.0	124 31.0	840321	938	1253	0.017	11.291	1237	5.988	6.049
G050A	44 40.0	124 53.0	840321	1827	1655	0.016	10.882			
G050B	44 40.0	124 53.0	840321	1827				1608	7.245	1.784
G051A	44 40.3	125 47.0	840321	5284	2359	0.014	9.124	2334	5.592	2.796
G052A	44 40.1	126 44.0	840322	5564	0702	0.015	9.795	0650	6.585	3.228
G053A	44 40.0	127 40.0	840322	5573	1419	0.014	9.363	1351	5.618	2.795
G054A	44 40.1	128 35.0	840322	5302	2026	0.013	8.774	2002	6.123	3.046
G055A	44 0.1	128 34.0	840323	5520	0254	0.017	11.029	0230	6.793	3.346
G056A	44 0.1	127 39.0	840323	5360	0800	0.016	10.635	0732	6.558	3.346
G057A	43 59.4	126 42.0	840324	5413	0119	0.016	10.663	0048	6.604	3.285

* "A" CONVERTS CATCH TO CATCH PFR 10M2, "B" CONVERTS CATCH TO CATCH PER 100M3
(SEE SMITH AND RICHARDSON 1977)

Table 1a.--Data associated with neuston and bongo tows during cruise 1P084, March-April 1984. Bongo tows to 400 m were made at stations ending with "B". Bongo tows to 200 m were made at stations ending with "A".

1P084 NEUSTON AND BONGO STATION SUMMARY

STATION	POSITION		DATE YYMMDD	POLYGONAL AREA KM2	NEUSTON TIME GMT	NEUSTON TOW		BONGO TIME GMT	BONGO TOW		
	LAT (N)	LONG (W)				STANDARD HAUL FACTORS*			STANDARD HAUL FACTORS*		
						A	B		A	B	
G058A	44	0.0	125 49.0	840324	4884	1830	0.016	10.433	1803	7.015	3.473
G059A	44	19.7	124 54.0	840324	2115	2342	0.015	10.086	2313	7.137	3.448
G060A	44	20.2	124 33.0	840324	1101	0125	0.015	10.092	0109	6.106	7.539
G061A	44	20.0	124 11.0	840324	766	0310	0.017	11.008	0303	6.133	14.602
G062A	44	0.1	124 12.0	840324	592	0554	0.029	19.162	0546	6.320	12.640
G063A	44	0.0	124 33.0	840324	936	0810	0.017	11.321	0752	6.080	4.641
G064A	43	59.9	124 54.0	840324	1804	1034	0.034	22.464	1024	5.883	9.805
G065A	43	40.0	124 57.0	840324	1649	1329	0.016	10.707	1303	6.055	3.027
G066A	43	39.9	124 37.0	840324	951	1540	0.016	10.371	1515	6.164	3.082
G067A	43	39.9	124 17.1	840324	649	1740	0.016	10.806	1731	6.258	7.631
G068A	43	20.0	124 30.0	840324	794	2035	0.017	11.361	2020	6.320	7.707
G069A	43	20.0	124 51.0	840325	1005	0130	0.024	16.194	0106	6.498	3.233
G070A	43	20.1	125 12.0	840325	2023	0455	0.025	16.505			
G070B	43	20.0	125 12.0	840325	2023				0411	7.022	1.738
G071A	43	20.5	126 5.0	840325	5057	1050	0.025	16.538	1025	6.573	3.222
G072A	43	20.0	127 1.0	840325	5209	1633	0.016	10.507	1608	6.557	3.246
G073A	43	19.7	127 57.0	840325	5120	2336	0.015	10.315	2311	6.302	3.104
G074A	43	19.9	128 52.0	840326	5258	0646	0.018	12.220	0622	6.131	3.050
G075A	42	40.0	128 51.0	840326	5758	1306	0.016	10.402	1240	5.919	3.005
G076A	42	39.9	127 57.0	840326	5870	1907	0.017	11.203	1840	6.530	3.249
G077A	42	40.0	127 3.0	840327	5616	0103	0.016	10.561	0038	6.814	3.373
G078A	42	40.0	126 9.0	840327	5611	0642	0.017	11.457	0618	7.048	3.472
G079A	42	59.8	125 15.0	840327	1940	1213	0.018	11.857	1148	7.021	3.476
G080A	43	0.0	124 55.0	840327	969	1431	0.017	11.214	1404	6.609	3.272
G081A	43	0.0	124 34.0	840327	689	1628	0.016	10.657	1620	6.388	8.997
G082A	42	40.0	124 35.0	840327	777	2120	0.017	11.465	2108	5.114	5.878
G083A	42	38.9	124 54.0	840328	1020	0011	0.016	10.947	2337	6.351	3.160
G084A	42	40.0	125 14.0	840328	1754	0339	0.016	10.507			
G084B	42	40.0	125 14.0	840328	1754				0245	7.012	1.723
G085A	42	20.0	125 13.0	840328	2213	0546	0.016	10.525	0523	6.676	3.305
G086A	42	20.0	124 53.0	840328	1069	0746	0.016	10.794	0720	6.850	3.375
G087A	42	20.0	124 33.0	840328	789	0955	0.017	11.284	0939	6.294	6.358
G088A	42	0.0	124 22.0	840328	763	1259	0.017	11.008	1240	6.946	13.892
G089A	42	0.0	124 43.0	840328	1091	1550	0.017	11.337	1523	6.319	3.175
G090A	42	0.1	125 3.0	840328	2047	1848	0.020	13.383			
G090B	42	0.0	125 3.0	840328	2047				1813	6.355	1.577
G091A	42	0.5	125 57.0	840329	5258	0132	0.017	11.448	0102	6.042	3.006
G092A	42	0.0	126 50.0	840329	5435	0737	0.016	10.363	0708	6.378	3.142
G093A	42	0.3	127 43.0	840329	5332	1346	0.017	11.547	1322	6.797	3.348
G094A	42	0.1	128 38.0	840329	5860	1916	0.017	11.179	1849	6.594	3.232
G095A	41	20.2	128 30.0	840330	5283	0201	0.015	10.132	0135	6.517	3.226
G096A	41	20.0	127 36.0	840330	5640	0732	0.015	10.209	0706	6.847	3.390
G097A	41	19.8	126 43.0	840330	5410	1301	0.023	15.453	1234	6.845	3.372
G098A	41	19.9	125 49.0	840330	5400	1826	0.030	20.290	1800	6.680	3.291
G099A	41	39.7	124 55.0	840330	1904	2334	0.017	11.525	2305	6.475	3.190
G100A	41	39.9	124 35.0	840331	1014	0137	0.016	10.466	0113	6.425	3.181
G101A	41	40.0	124 14.0	840331	650	0533	0.017	11.504	0525	7.358	22.995
G102A	41	20.0	124 15.0	840331	983	0820	0.017	11.246	0808	6.417	9.038
G103A	41	19.0	124 36.0	840331	881	1151	0.016	10.768	1125	5.892	2.932
G104A	41	19.7	124 55.0	840401	3711	0151	0.016	10.553			
G104B	41	19.9	124 55.0	840401	3711				0105	6.820	1.680
G105A	41	0.1	124 54.0	840401	1709	0417	0.015	10.198	0352	6.105	3.022
G106A	41	0.1	124 35.0	840401	1023	0615	0.014	9.602	0542	5.588	2.794
G107A	40	59.6	124 16.0	840401	738	0825	0.017	11.479	0812	5.579	13.283
G108A	40	39.7	124 23.0	840401	697	1107	0.018	11.859	1100	6.813	27.251
G109A	40	40.0	124 43.0	840401	1019	1439	0.019	12.612	1414	5.503	2.765
G110A	40	39.0	125 3.0	840401	1730	1807	0.015	10.006			
G110B	40	40.0	125 3.0	840401	1730				1720	6.573	1.627
G111A	40	40.3	125 55.0	840402	5102	0026	0.017	11.085	0000	6.153	3.092
G112A	40	40.1	126 47.0	840402	4969	0612	0.016	10.794	0543	6.664	3.283
G113A	40	39.7	127 38.0	840402	5239	1207	0.015	10.227	1143	6.962	3.446
G114A	40	39.9	128 31.0	840402	5381	1749	0.015	10.147	1723	6.462	3.215
G115A	40	1.0	128 19.0	840402	4935	2304	0.018	12.088	2238	6.604	3.221
G116A	40	0.2	127 27.0	840403	5033	0400	0.016	10.644	0335	6.539	3.253
G117A	40	0.0	126 35.0	840403	5332	0935	0.015	10.231	0911	6.486	3.227
G118A	40	0.0	125 43.0	840403	4869	1446	0.015	10.291	1422	6.669	3.317
G119A	40	20.0	125 7.0	840403	2322	1819	0.017	11.201	1842	6.806	3.353
G120A	40	20.1	124 44.4	840403	1089	2127	0.016	10.857	2058	7.000	3.466
G121A	40	20.2	124 27.0	840404	639	0219	0.015	10.232	0200	5.971	4.265
G122A	40	0.0	124 51.0	840404	1671	0645	0.016	10.353			
G122B	40	0.1	124 51.0	840404	1671				0455	6.657	1.648
G123A	40	0.2	124 31.0	840404	1033	0928	0.015	10.207	0913	6.211	3.075
G124A	39	59.5	124 11.0	840404	829	1222	0.016	10.410	1204	5.628	4.329

* "A" CONVERTS CATCH TO CATCH PER 10M2, "B" CONVERTS CATCH TO CATCH PER 1000M3
(SEE SMYTH AND RICHARDSON 1977)

Table 1b.--Data associated with neuston and bongo tows during cruise 1P084, March-April 1984 continued.

SPECIES	NEUSTON		BONGO	
	OCCUR. %	LOG NO. IN AREA	OCCUR. %	LOG NO. IN AREA
UNIDENTIFIED	4.03	7.4735	21.77	11.0910
TELEOST TYPE A	1.61	6.7196		
TELEOST TYPE E			0.81	9.0524
TELEOST TYPE H	2.42	7.4341	0.81	8.5558
TELEOST TYPE P	0.81	6.2744	3.23	10.1530
DISINTEGRATED	1.61	6.9938	4.84	10.3295
ARGENTINIDAE	0.81	6.8592	1.61	9.8249
NANSENIA CANDIDA	0.81	6.9125	9.68	10.7306
NANSENIA CRASSA	2.42	7.4244	1.61	10.0377
MICROSTOMA MICROSTOMA			0.81	9.0461
BATHYLAGIDAE	2.42	7.6108	50.81	12.1951
BATHYLAGUS SPP.	4.84	7.8776	38.71	11.8073
BATHYLAGUS OCHOTENSIS			22.58	11.1522
GONOSTOMATIDAE			0.81	9.4033
CHAULIODUS MACOUNI	12.10	8.2388	18.55	11.1459
MYCTOPHIDAE			32.26	12.8871
THERAGRA CHALCOGRAMMA			3.23	9.7141
MERLUCCIUS PRODUCTUS	0.81	6.8760	14.52	11.0842
COLOLABIS SAIRA			2.42	9.9762
TRACHIPTERIDAE	0.81	6.8760		
TRACHIPTERUS ALTIVELIS	48.39	9.2633	37.10	11.2393
SEBASTOLOBUS SPP.	4.03	7.5480	4.84	10.9539
ANOPLOPOMA FIMBRIA			3.23	9.7335
ICOSTEUS AENIGMATICUS	30.65	9.0885	33.06	11.4967
ICICHTHYS LOCKINGTONI	25.00	8.9866	16.13	11.0083
BOTHIDAE	8.87	8.1157	7.26	10.2160
CITHARICHTHYS SPP.	5.65	7.5911	5.65	10.1347
PLEURONECTIDAE	11.29	8.7618	16.13	11.2625
GLYPTOCEPHALUS ZACHIRUS	18.55	8.8685	18.55	11.0926
HIPPOGLOSSUS STENOLEPIS			4.84	10.2852
ISOPSETTA ISOLEPIS	4.03	7.1417	6.45	9.8842
LYOPSETTA EXILIS	10.48	8.2739	30.65	11.3814
MICROSTOMUS PACIFICUS	28.23	9.3751	19.35	10.9577
PAROPHRYS VETULUS	6.45	7.5463	8.06	10.1352
PLATICHTHYS STELLATUS	0.81	6.3046	3.23	9.4876
PLEURONICHTHYS COENOSUS	0.81	5.8679		
PLEURONICHTHYS DECURENS	4.84	7.6925	2.42	9.0347
PSETTICHTHYS MELANOSTICTUS	7.26	7.6204	11.29	10.1634

Table 2.--Fish eggs collected in bongo and neuston tows during cruise 1P084, March-April 1984.

CRUISE: 1P084
STAGE: LARVAE

SPECIES	NEUSTON		BONGO	
	OCCUR. %	LOG NO. IN AREA	OCCUR. %	LOG NO. IN AREA
UNIDENTIFIED	0.81	6.0417	10.48	11.0475
DISINTEGRATED	7.26	8.3282	10.48	11.0278
OSMERIDAE	0.81	7.6931	6.45	10.3503
NANSENIA CANDIDA			25.81	11.4574
BATHYLAGIDAE			9.68	11.0460
BATHYLAGUS MILLERI			1.61	9.7049
BATHYLAGUS OCHOTENSIS	1.61	7.5644	45.16	12.3160
BATHYLAGUS PACIFICUS			34.68	11.1985
LEUROGLOSSUS STILBIUS			0.81	9.8513
MACROPINNA MICROSTOMA			1.61	9.0892
CYCLOTHONE SPP.			3.23	9.9458
ARGYROPELECUS LYCHNUS			1.61	9.6535
DANAPHOS OCVLATUS			1.61	9.3025
CHAULIODUS MACOUNI			12.10	10.6739
EURYPHARYNX SPP.			0.81	9.5173
MYCTOPHIDAE			0.81	9.5217
DIAPHUS THETA	0.81	6.0987	8.06	11.0453
LAMPANYCTUS SPP.			1.61	9.8436
LAMPANYCTUS RITTERI			14.52	11.1669
STENOBRACHIUS LEUCOPSARUS			79.03	12.7519
SYMBOLOPHORUS CALIFORNIENSE			1.61	9.7998
TARLETONBEANIA CRENUULARIS	0.81	6.9538	41.13	11.9007
PROTOMYCTOPHUM CROCKERI			33.87	11.3437
PROTOMYCTOPHUM THOMPSONI	0.81	6.9517	12.90	10.7878
LESTIDIOPS RINGENS			14.52	10.9065
MICROGADUS PROXIMUS			4.03	10.1434
MERLUCCIUS PRODUCTUS			2.42	11.0455
MACROURIDAE			0.81	9.5114
OPHIDIIDAE			0.81	9.1341
COLOLABIS SAIRA	40.32	9.2206		
TRACHIPTERUS ALTIVELIS			4.84	10.2696
MELAMPHAEIDAE			14.52	11.0133
MELAMPHAES SPP.			0.81	9.4534
SEBASTES SPP.	15.32	8.5353	66.13	12.0341
SEBASTES PAUCISPINUS			0.81	9.1523
SEBASTOLOBUS SPP.			13.71	11.0721
ANOPLOPOMA FIMBRIA	29.84	9.3303	6.45	10.3060
HEXAGRAMMOS DECAGRAMMUS	35.48	8.8672		
HEXAGRAMMOS LAGOCEPHALUS	4.03	7.8125		
OPHIODON ELONGATUS	8.87	7.7098	0.81	8.8921
COTTIDAE	0.81	6.2190	0.81	8.5857
ARTEDIUS HARRINGTONI			2.42	9.1359
ARTEDIUS MEANYI			0.81	9.4589
COTTUS ASPER			0.81	8.6718
HEMILEPIDOTUS HEMILEPIDOTUS	4.03	7.9496		
HEMILEPIDOTUS SPINOSUS	25.00	9.3592	4.84	9.7743
LEPTOCOTTUS ARMATUS	0.81	6.2190	1.61	9.0531
RADULINUS ASPRELLUS			2.42	9.1630

Table 3a.--Fish larvae collected in bongo and neuston tows during cruise 1P084, March-April 1984.

CRUISE: 1P084
STAGE: LARVAE

SPECIES	NEUSTON		BONGO	
	OCCUR. %	LOG NO. IN AREA	OCCUR. %	LOG NO. IN AREA
SCORPAENICHTHYS MARMORATUS	13.71	8.2110		
AGONIDAE			1.61	9.1725
CYCLOPTERIDAE	2.42	6.8475	9.68	10.0510
RONQUILUS JORDANI			2.42	9.2789
PLECTOBRANCHUS EVIDES			0.81	8.6089
STICHAEIDAE	0.81	7.3100	0.81	8.5558
DELOLEPIS GIGANTEA	0.81	6.2340		
LYCONNECTES ALEUTENSIS	6.45	7.7627		
PHOLIS SPP.	0.81	6.5271		
ICOSTEUS AENIGMATICUS			2.42	10.0094
AMMODYTES HEXAPTERUS	8.06	8.8192	9.68	10.1776
ICICHTHYS LOCKINGTONI			3.23	10.3941
CITHARICHTHYS SORDIDUS			0.81	9.5640
CITHARICHTHYS STIGMAEUS	2.42	7.3328	2.42	9.6840
ATHERESTHES STOMIAS			1.61	9.2968
GLYPTOCEPHALUS ZACHIRUS	0.81	7.8750	7.26	9.7868
ISOPSETTA ISOLEPIS			4.84	9.5976
LYOPSETTA EXILIS			5.65	9.8703
PAROPHRYS VETULUS	4.03	7.3024	17.74	10.9736
PLATICHTHYS STELLATUS			3.23	9.5648
PSETTICHTHYS 2	0.81	6.2260		
PSETTICHTHYS MELANOSTICTUS			5.65	9.8164

Table 3b.--Fish larvae collected in bongo and neuston tows during cruise 1P084, March-April 1984 continued.

CRUISE: 1P084
STAGE: JUVENILE

SPECIES	NEUSTON		BONGO	
	OCCUR. %	LOG NO. IN AREA	OCCUR. %	LOG NO. IN AREA
ALLOSMERUS ELONGATUS			0.81	8.6148
NANSENIA CANDIDA			0.81	9.5532
BATHYLAGUS OCHOTENSIS			3.23	10.1628
TACTOSTOMA MACROPUS			2.42	9.7708
DIAPHUS THETA			0.81	9.0461
STENOBRACHIUS LEUCOPSARUS			20.16	10.8316
SYMBOLOPHORUS CALIFORNIENSE	2.42	7.8637		
TARLETONBEANIA CRENUULARIS	21.77	9.3429	2.42	9.7885
PROTOMYCTOPHUM CROCKERI			3.23	9.9461
COLOLABIS SAIRA	5.65	7.4818		
GASTEROSTEUS ACULEATUS	0.81	6.1005		
SEBASTES SPP.	0.81	6.0932		
HEXAGRAMMOS DECAGRAMMUS	4.03	7.2456		
HEXAGRAMMOS LAGOCEPHALUS	1.61	7.1185		
OPHIODON ELONGATUS	0.81	6.5205		
HEMILEPIDOTUS SPINOSUS	1.61	6.4494		
SCORPAENICHTHYS MARMORATUS	0.81	7.0463		
CITHARICHTHYS STIGMAEUS	0.81	6.4133		
LYOPSETTA EXILIS			0.81	8.8921

Table 4.--Juvenile fish collected in bongo and neuston tows during cruise 1P084, March-April 1984.

- + Neuston and 200 m bongo
 ⊕ Neuston and 400 m bongo

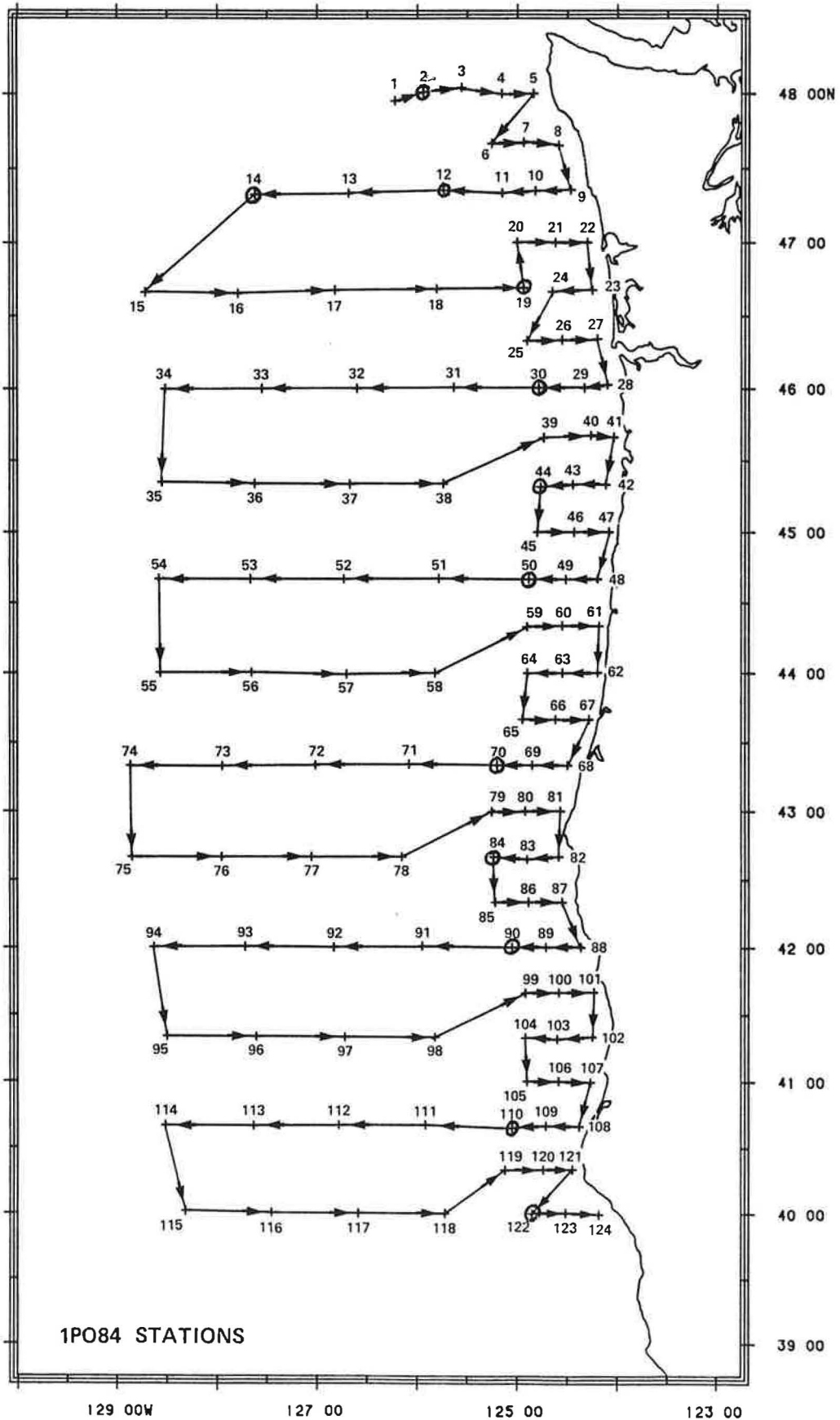


Figure 1.--Bongo and neuston station locations and cruise track for cruise 1PO84, March-April 1984.

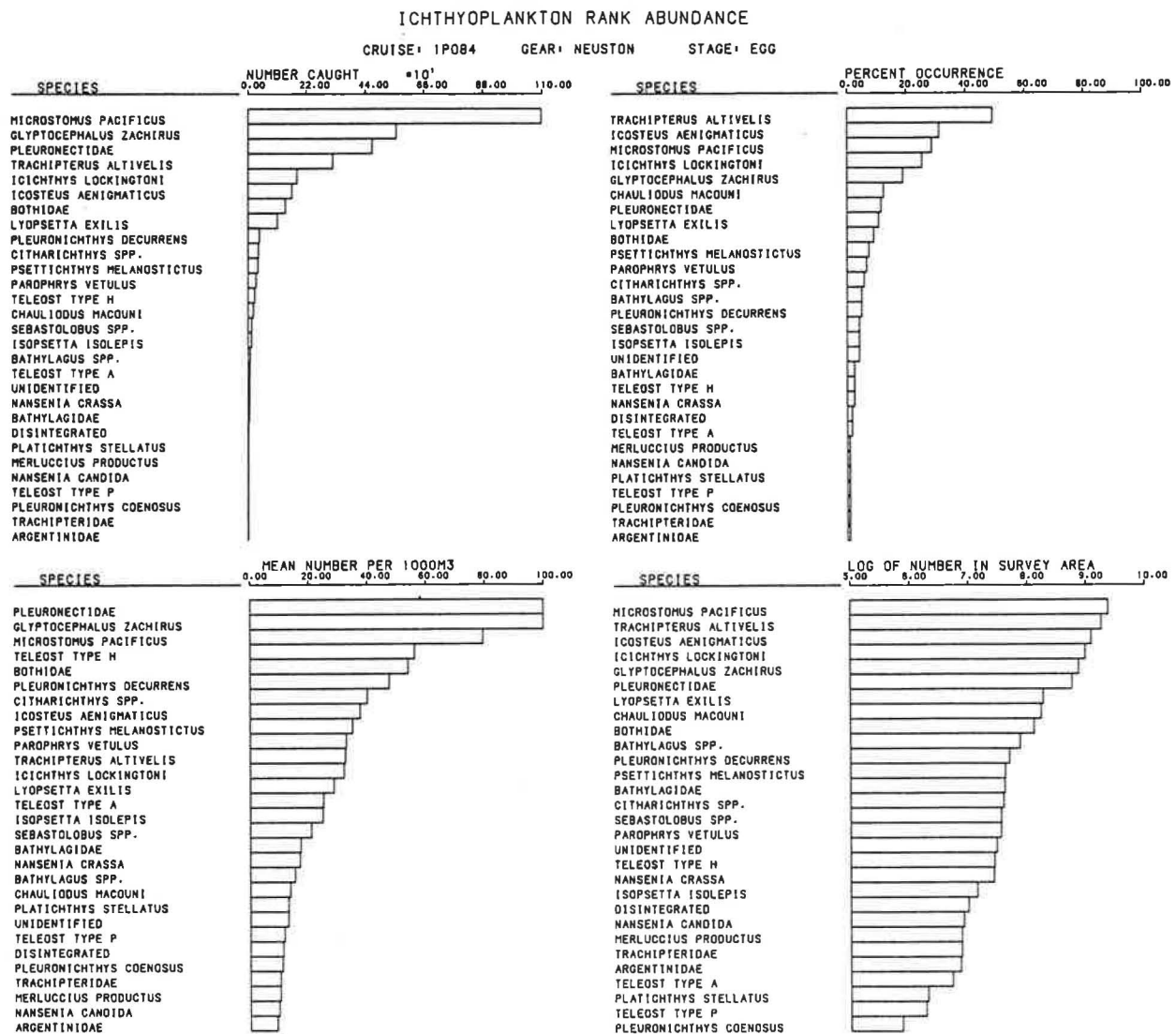


Figure 2.--Rank abundance of fish eggs caught in neuston tows during cruise 1P084, March-April 1984.

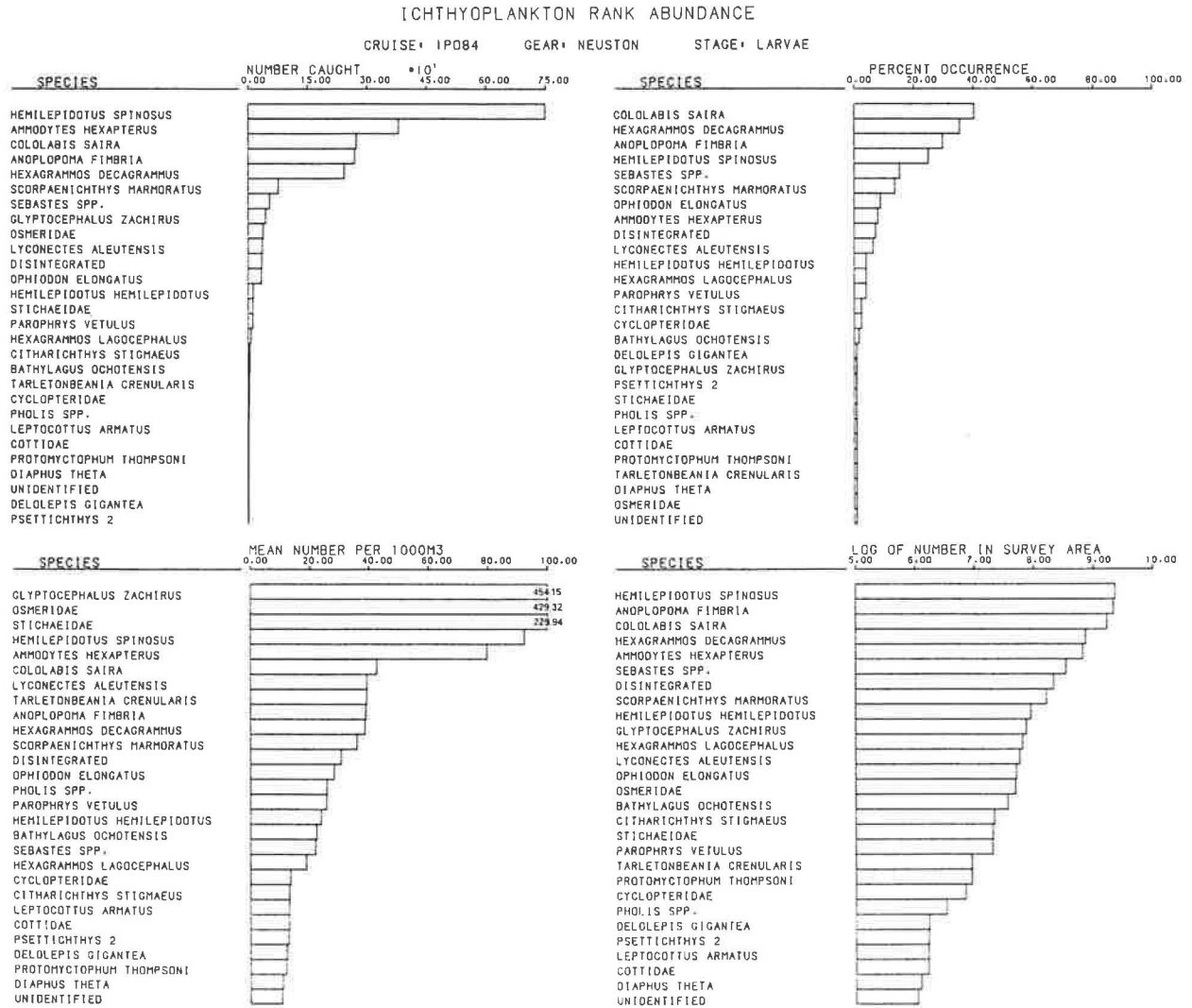


Figure 3.--Rank abundance of fish larvae caught in neuston tows during cruise 1PO84, March-April 1984.

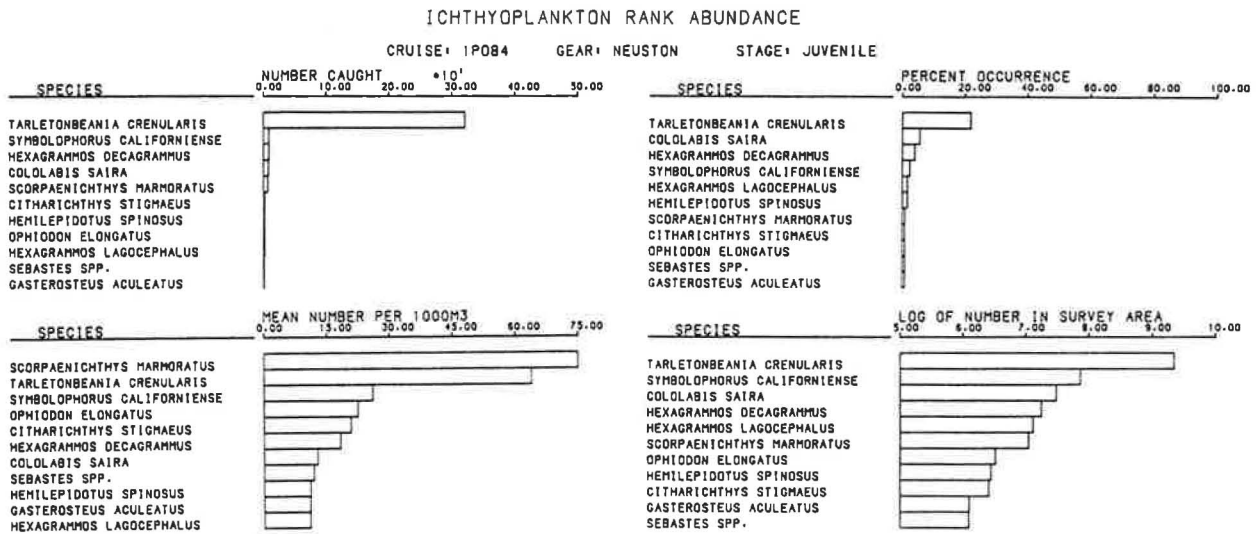


Figure 4.--Rank abundance of juvenile fish caught in neuston tows during cruise 1P084, March-April 1984.

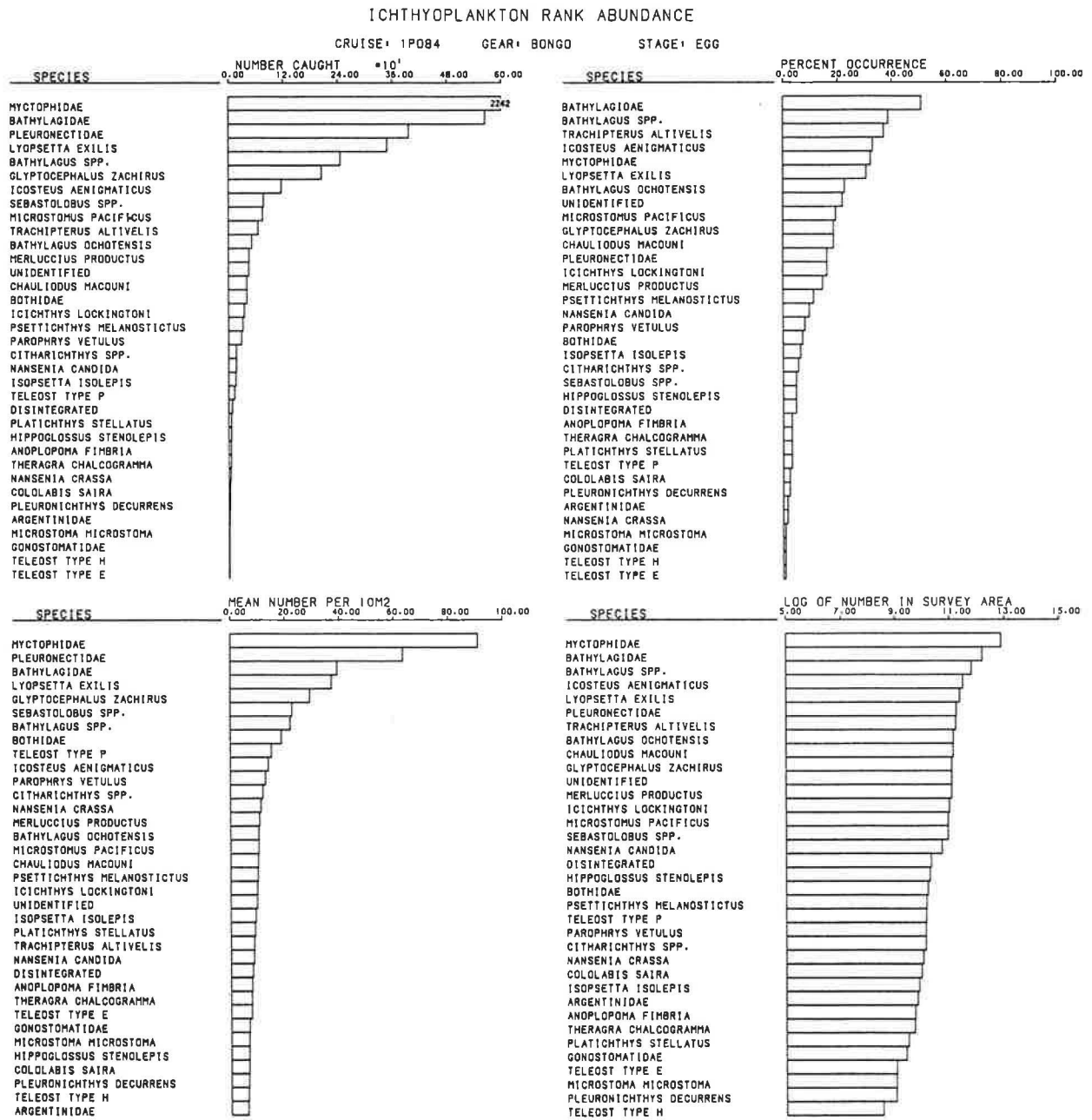


Figure 5.--Rank abundance of fish eggs caught in bongo tows during cruise 1P084, March-April 1984.

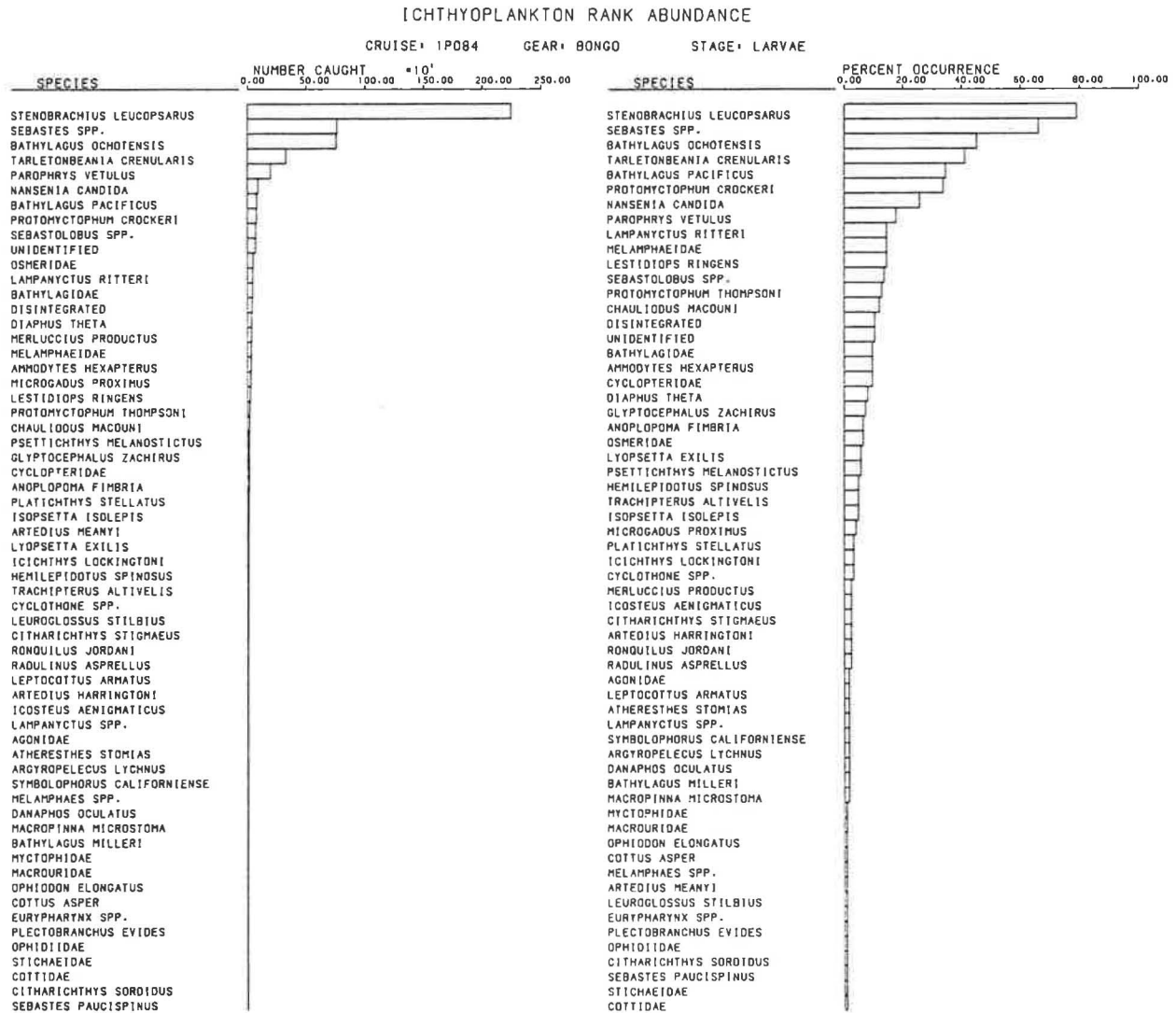


Figure 6a.--Rank abundance of fish larvae caught in bongo tows during cruise 1P084, March-April 1984.

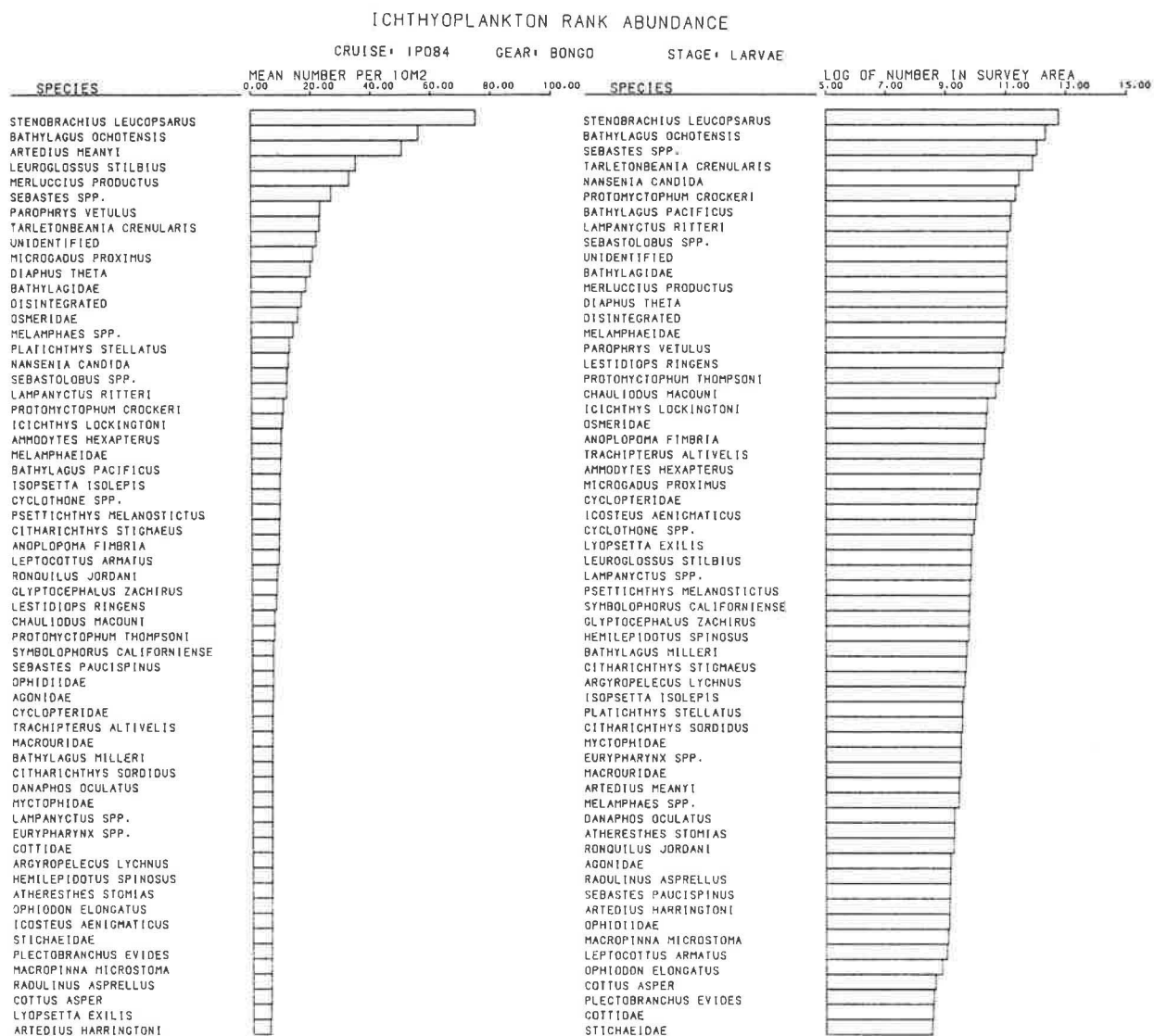


Figure 6b.--Rank abundance of fish larvae caught in bongo tows during cruise IP084, March-April 1984 continued.

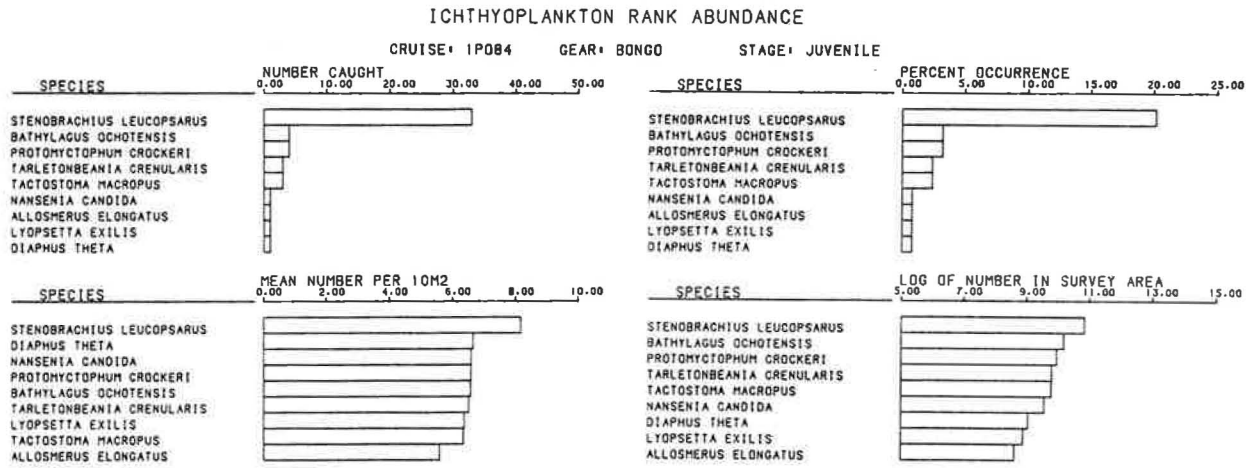


Figure 7.--Rank abundance of fish juveniles caught in bongo tows during cruise 1P084, March-April 1984.

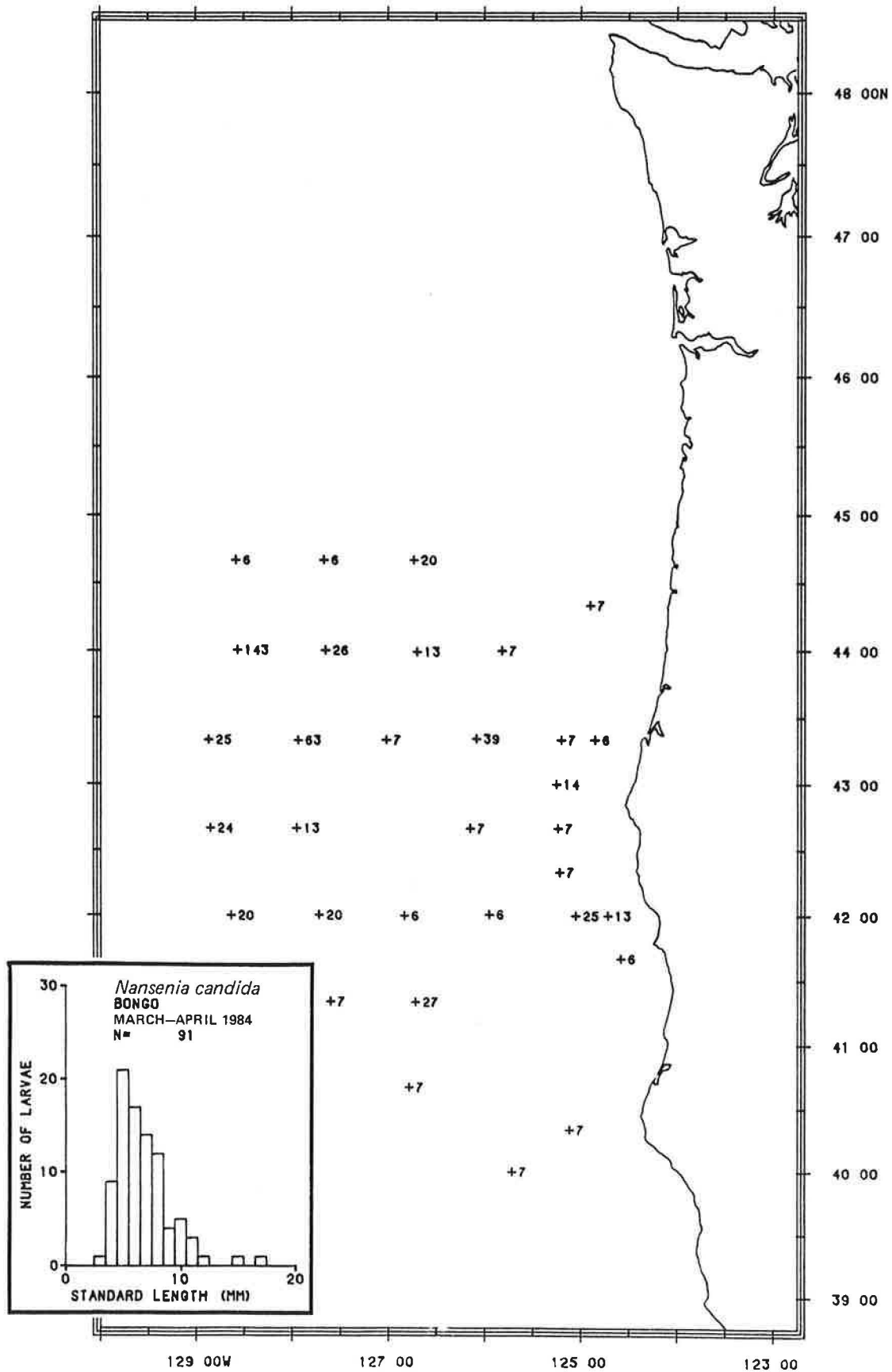


Figure 8.--Distribution and lengths of *Nansenia candida* larvae from bongo tows during cruise 1P084, March-April 1984. Abundance expressed as number per 10m².

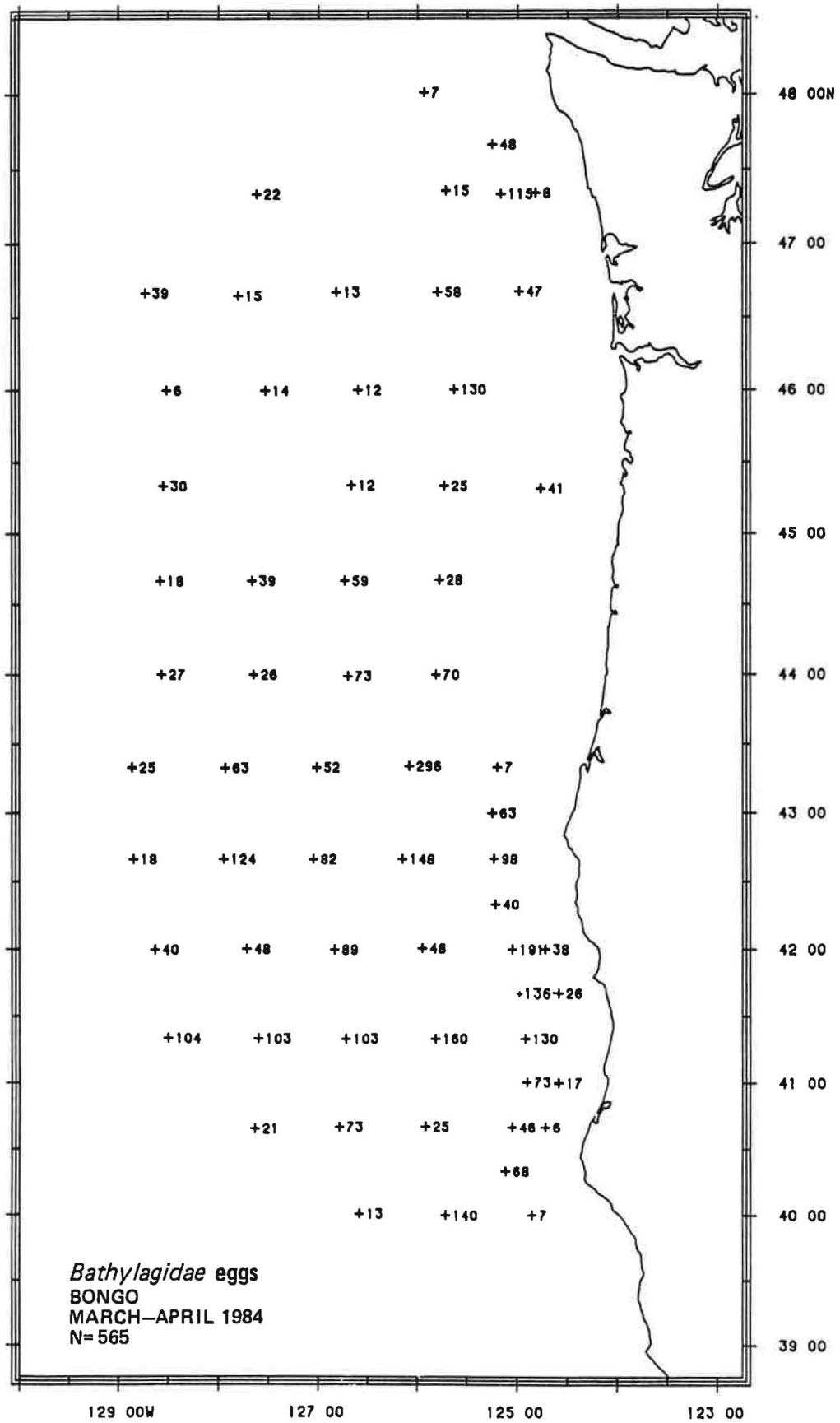


Figure 9.--Distribution of Bathylagidae eggs from bongo tows during cruise 1P084, March-April 1984. Abundance expressed as number per 10m².

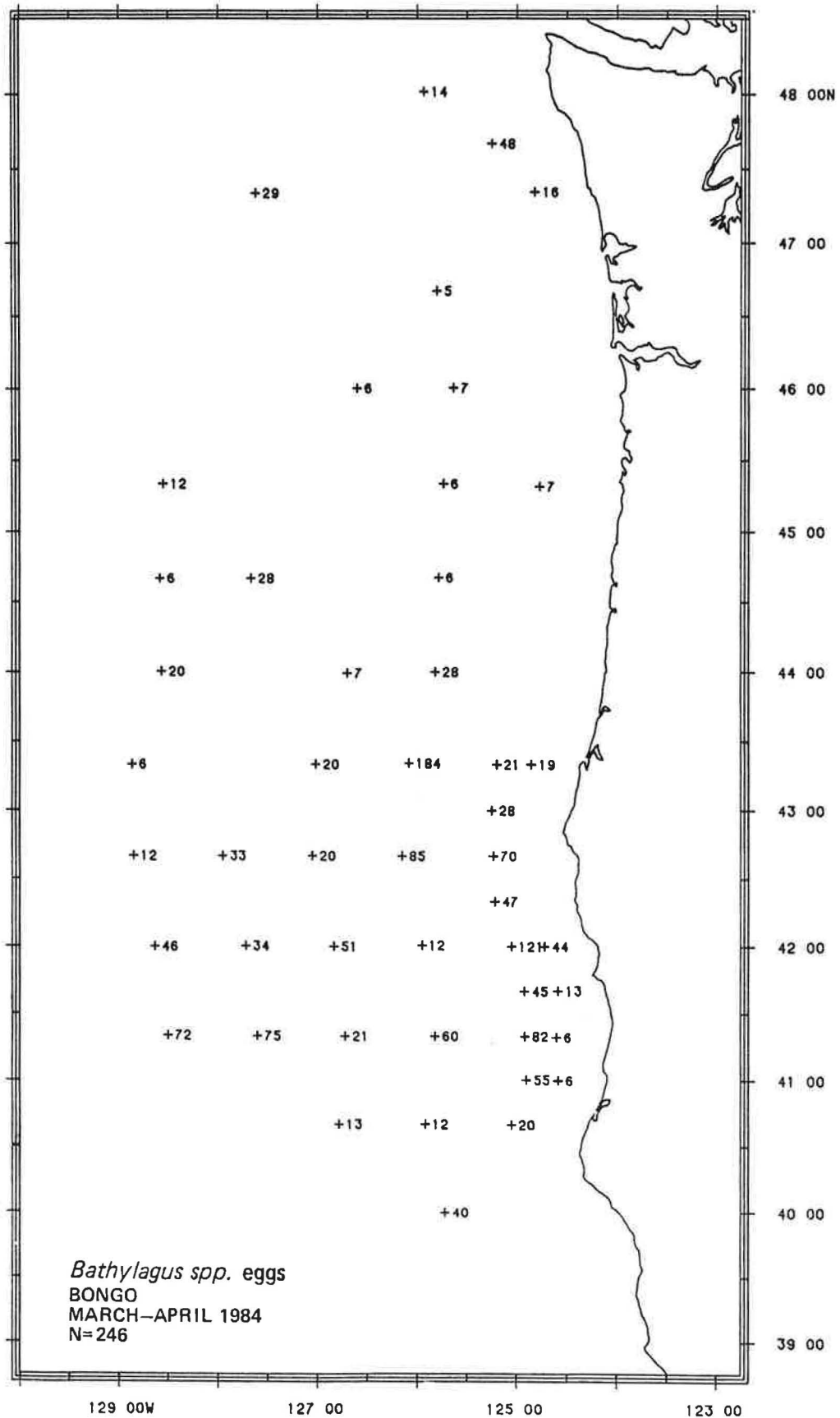


Figure 10.--Distribution of *Bathylagus* spp. eggs from bongo tows during cruise 1P084, March-April 1984. Abundance expressed as number per 10 m².

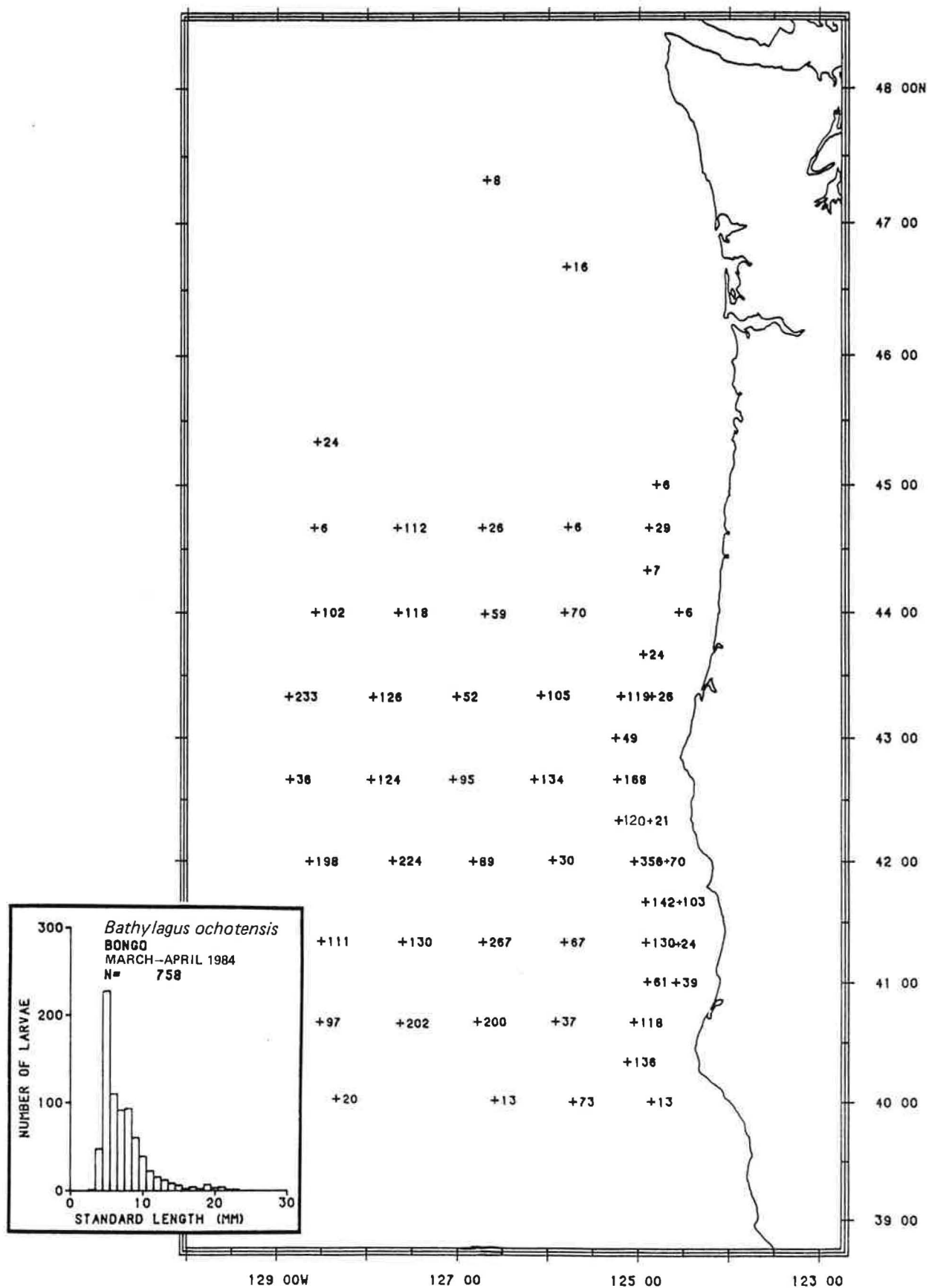


Figure 11.--Distribution and lengths of *Bathylagus ochotensis* larvae from bongo tows during cruise 1P084, March-April 1984. Abundance expressed as number per 10m².

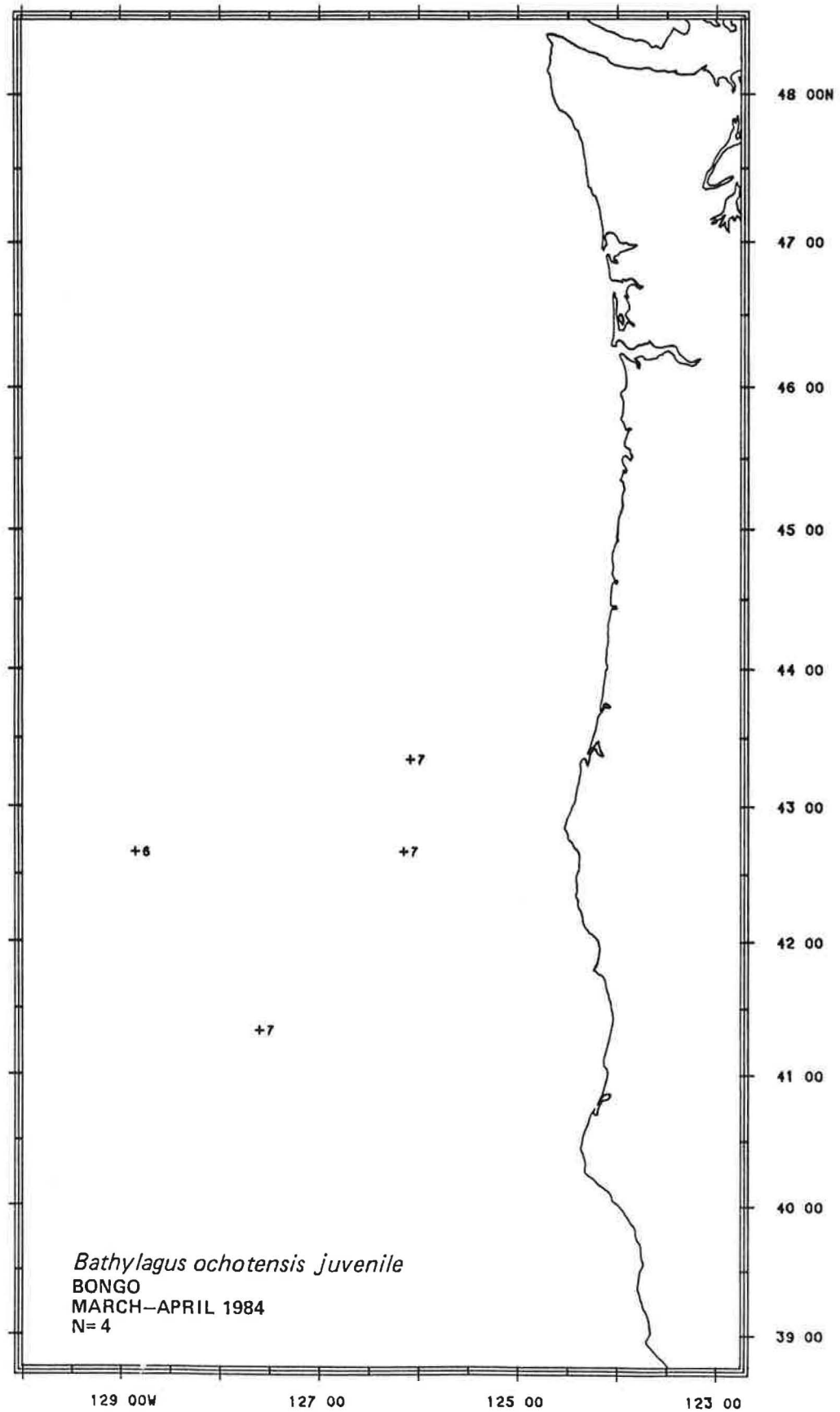


Figure 12.--Distribution of *Bathylagus ochotensis* juveniles from bongo tows during cruise 1P084, March-April 1984. Abundance expressed as number per 10 m².

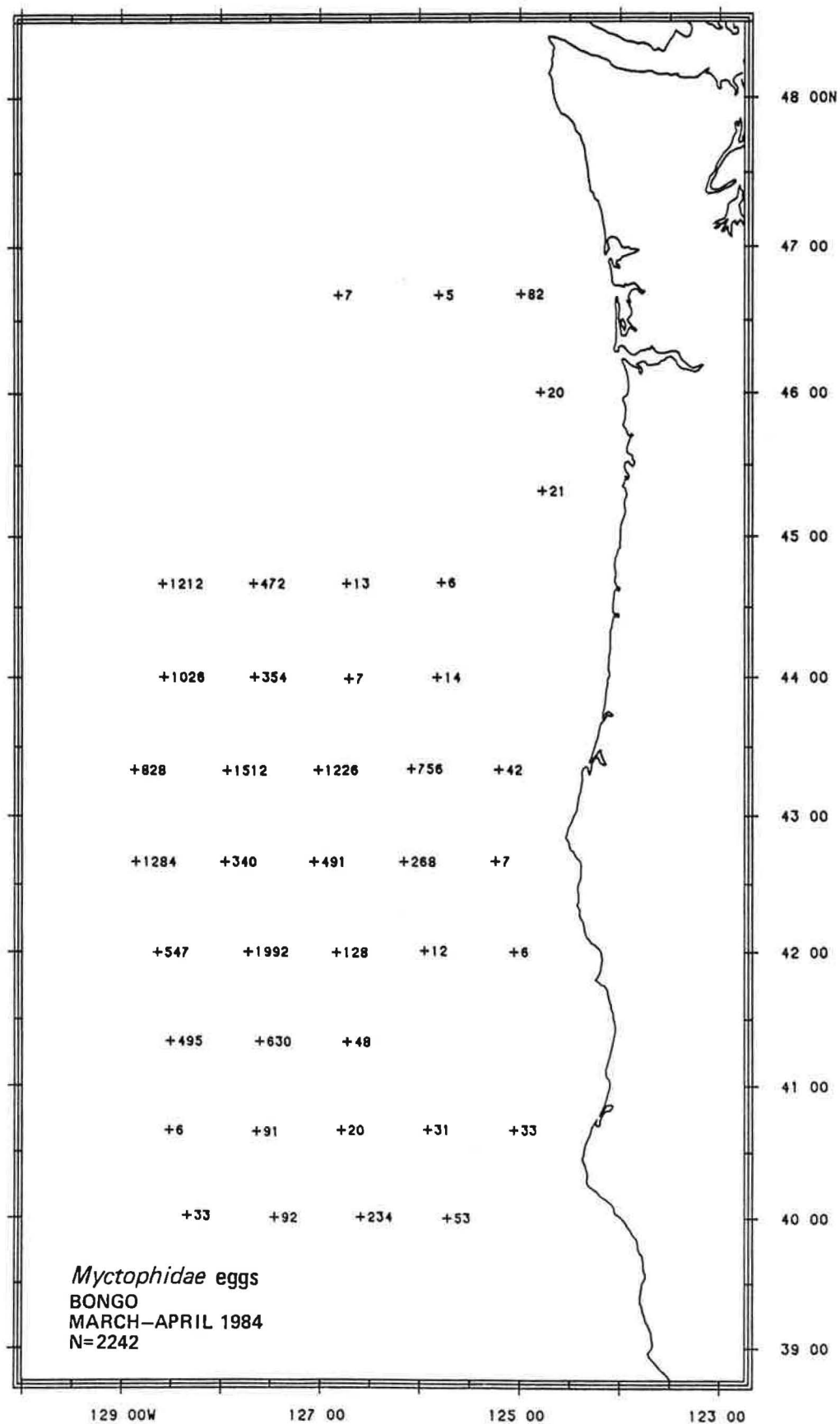


Figure 13.--Distribution of *Myctophidae* eggs from bongo tows during cruise 1P084, March-April 1984. Abundance expressed as number per 10m².

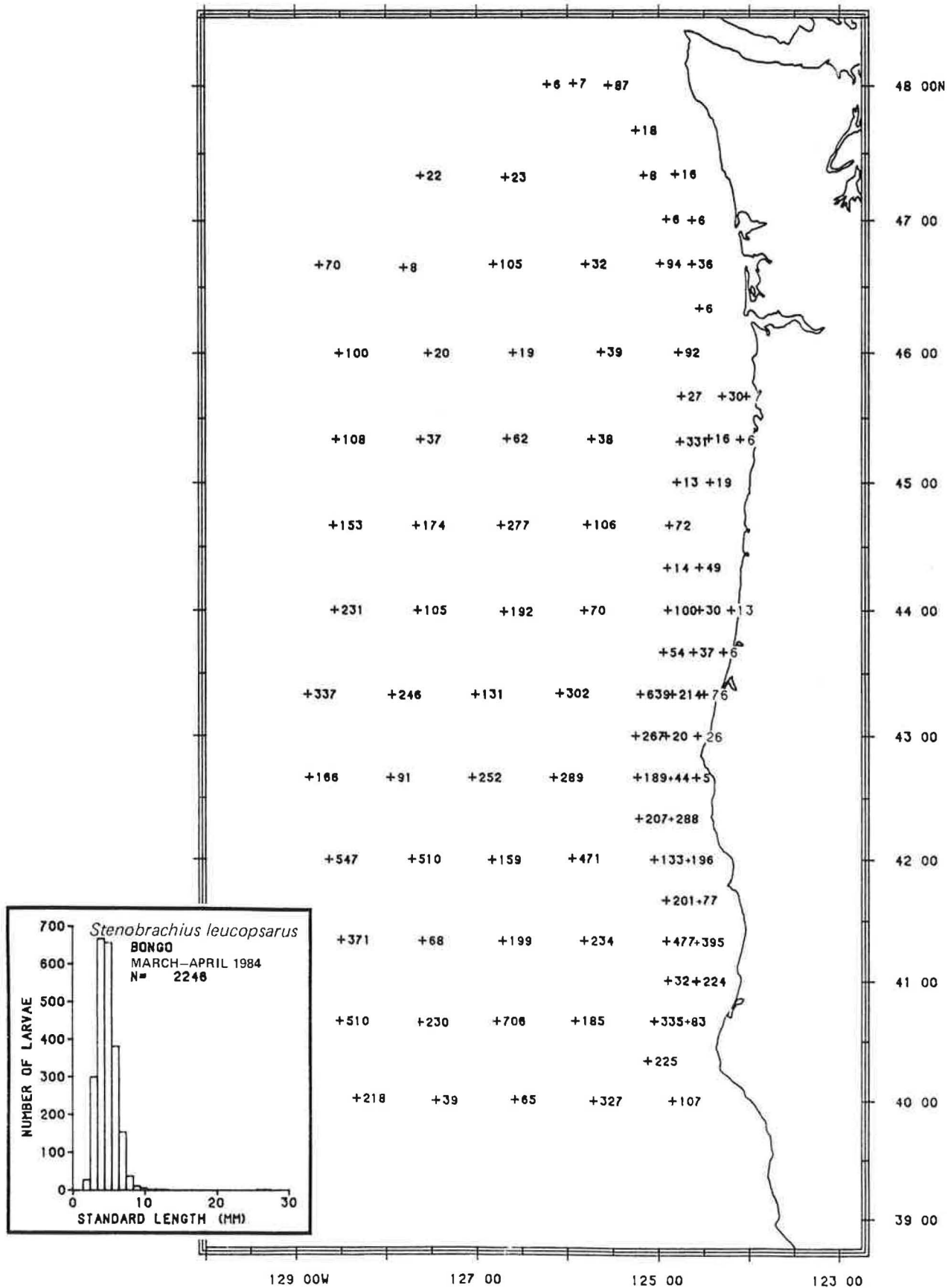


Figure 14.--Distribution and lengths of *Stenobranchius leucopsarus* larvae from bongo tows during cruise 1P084, March-April 1984. Abundance expressed as number per 10m^2 .

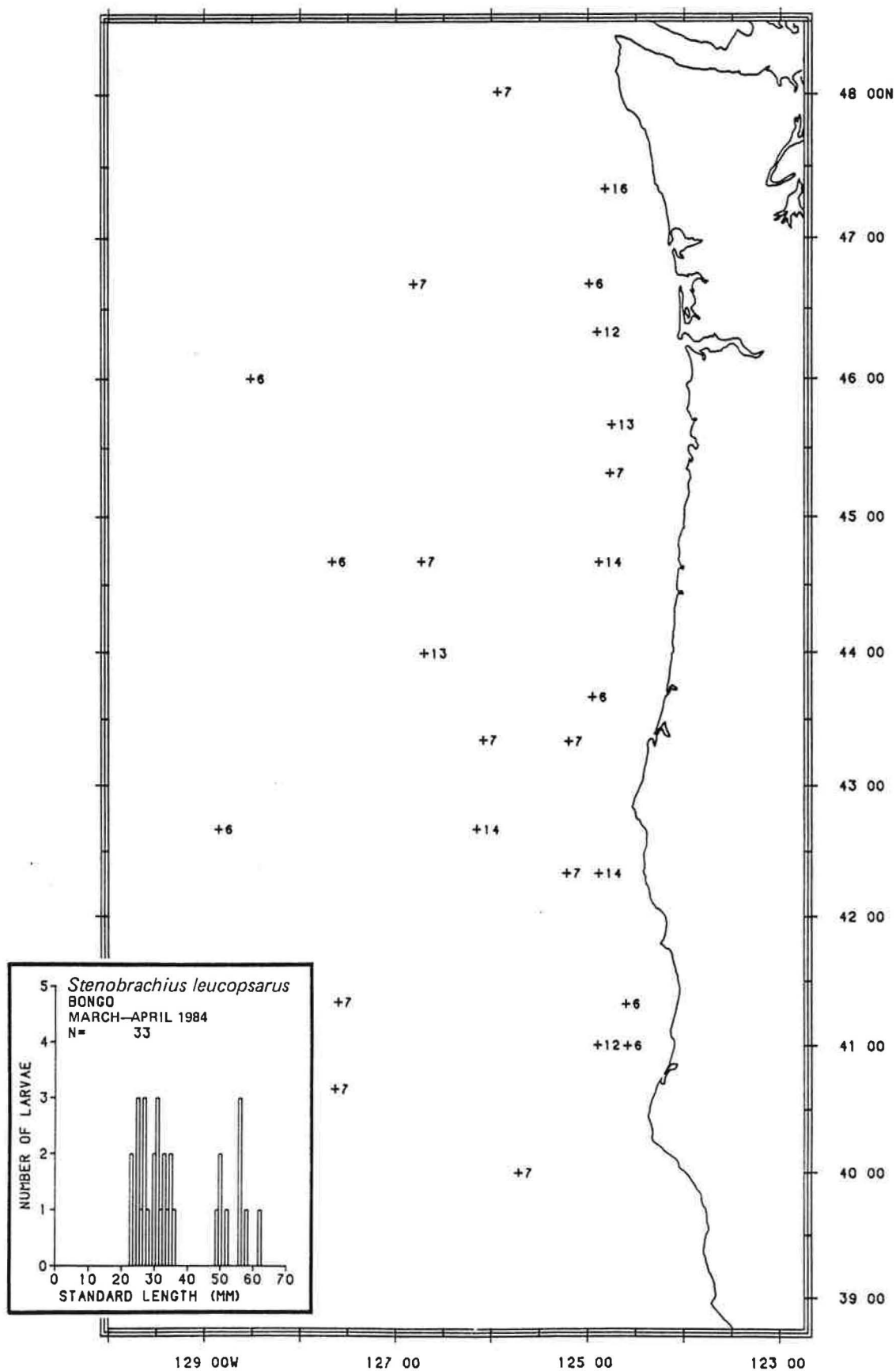


Figure 15.--Distribution and lengths of *Stenobranchius leucopsarus* juveniles from bongo tows during cruise 1P084, March-April 1984. Abundance expressed as number per 10 m².

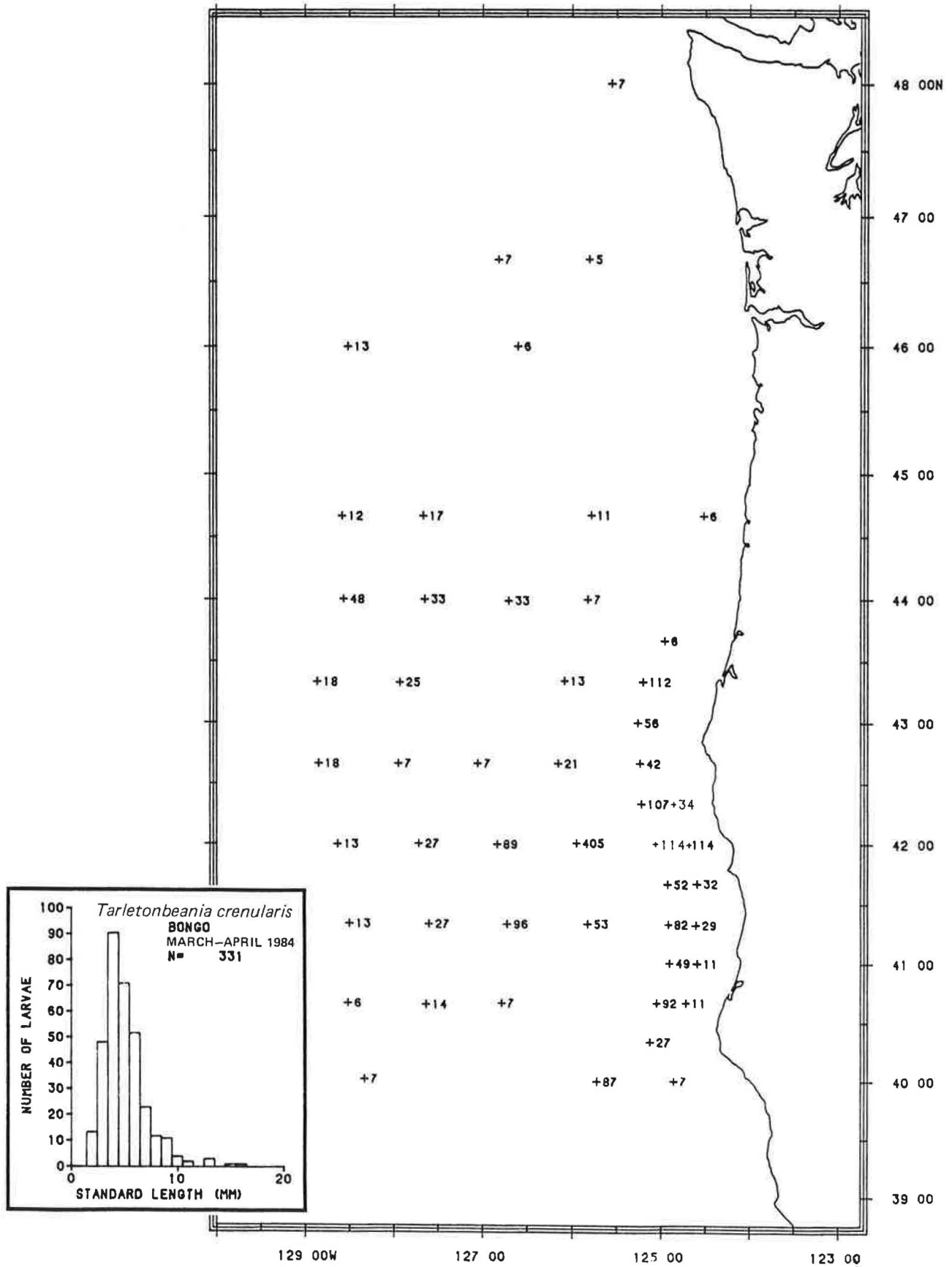


Figure 16.--Distribution and lengths of *Tarletonbeania crenularis* larvae from bongo tows during cruise 1P084, March-April 1984. Abundance expressed as number per 10m².

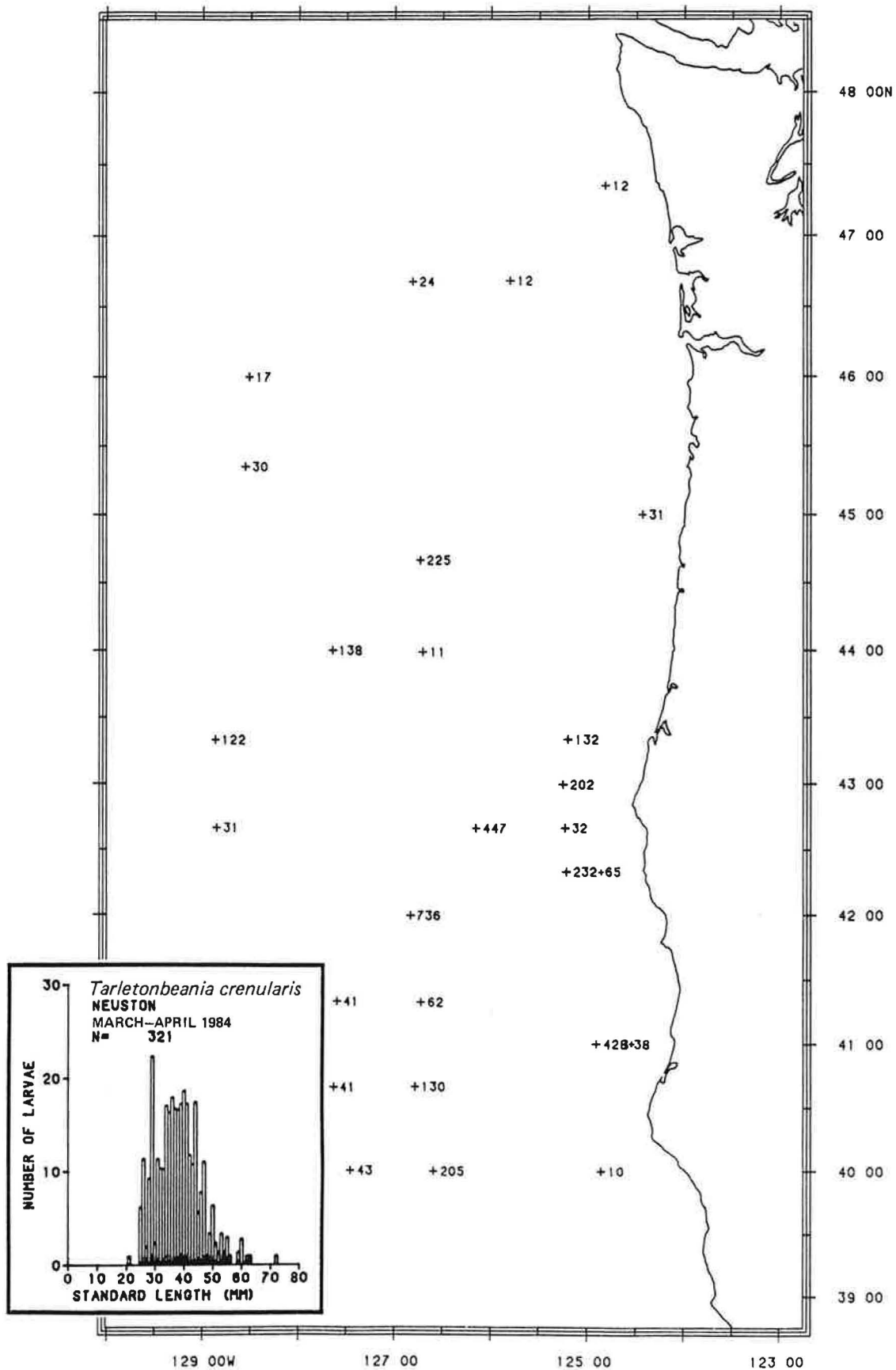


Figure 17.--Distribution and lengths of *Tarletonbeania crenularis* juveniles from bongo tows during cruise 1P084, March-April 1984. Abundance expressed as number per 10 m².

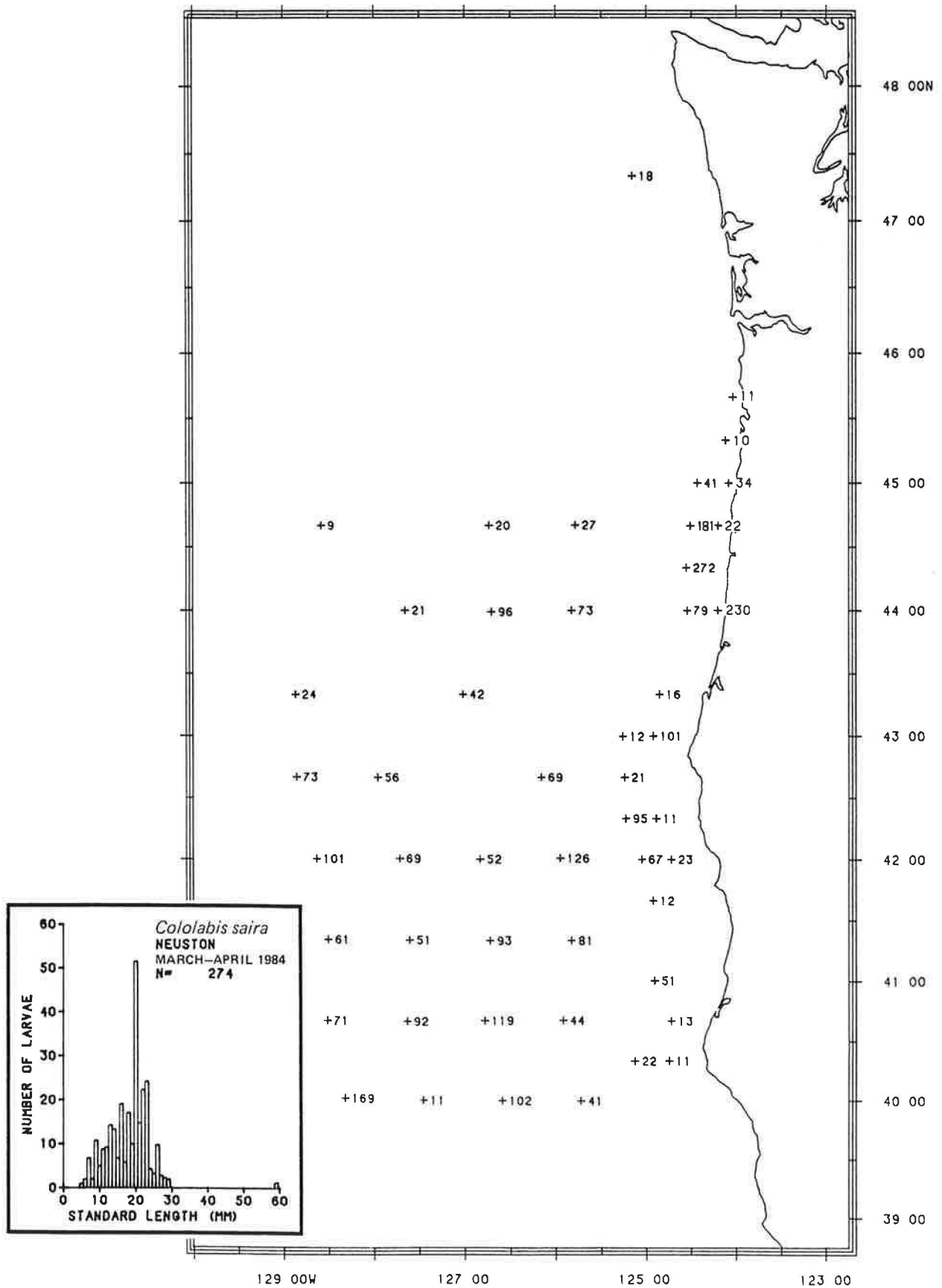


Figure 18.--Distribution and lengths of *Cololabis saira* larvae from neuston tows during cruise 1P084, March-April 1984. Abundance expressed as number per 1,000m³.

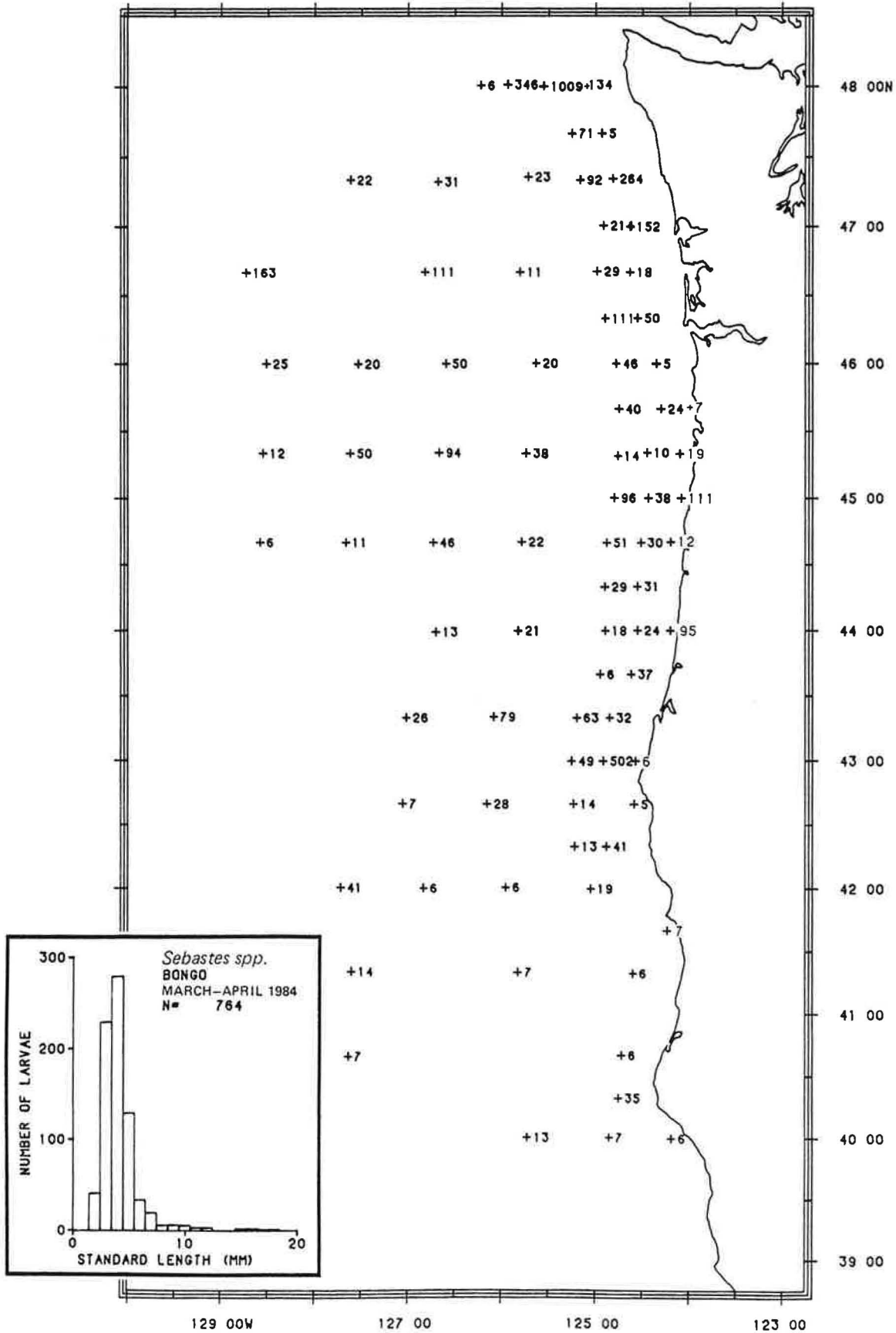


Figure 19.--Distribution and lengths of *Sebastes* spp. larvae from bongo tows during cruise 1P084, March-April 1984. Abundance expressed as number per 10 m².

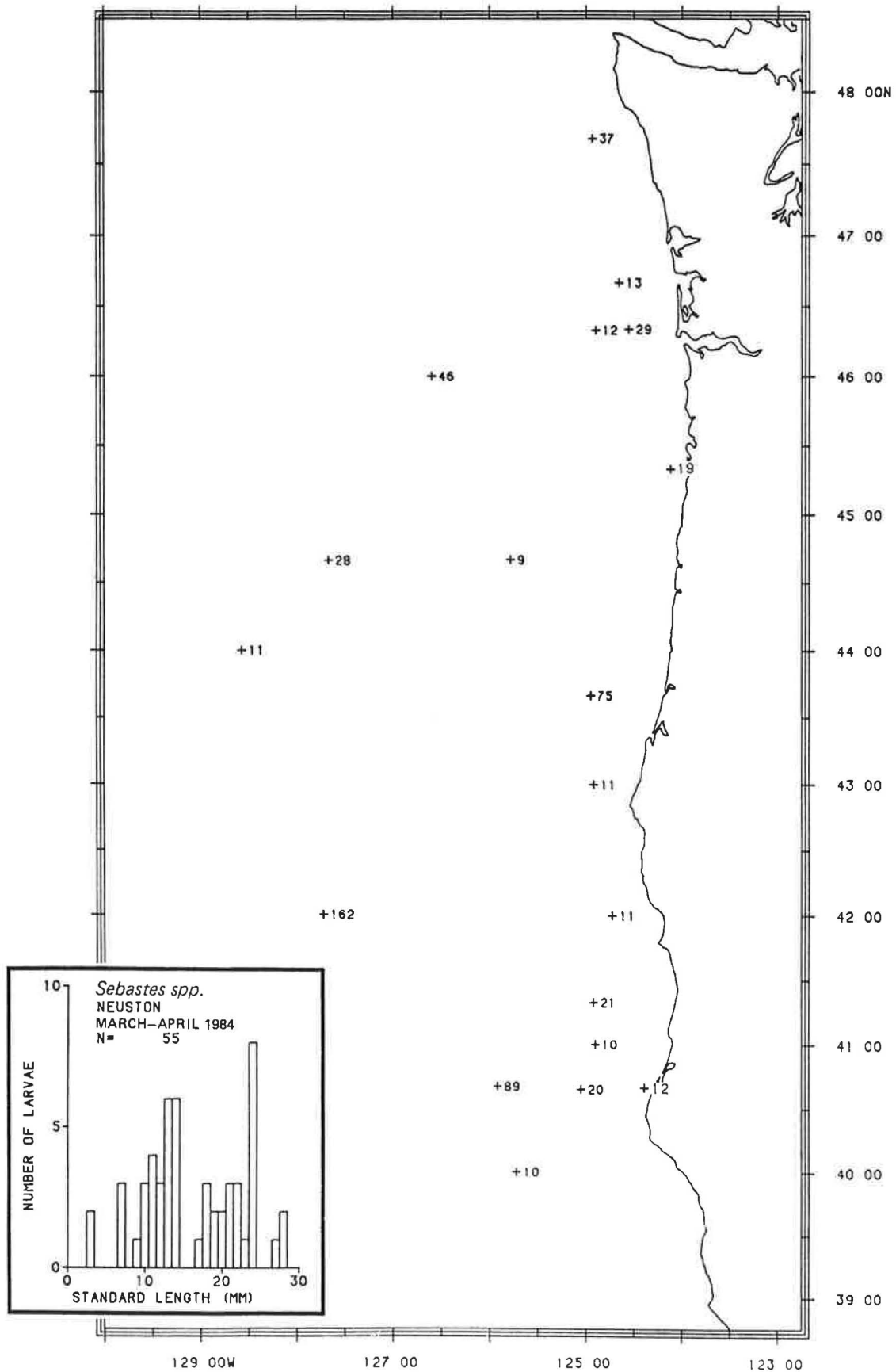


Figure 20.--Distribution and lengths of *Sebastes* spp. larvae from neuston tows during cruise 1P084, March-April 1984. Abundance expressed as number per 1,000 m³.

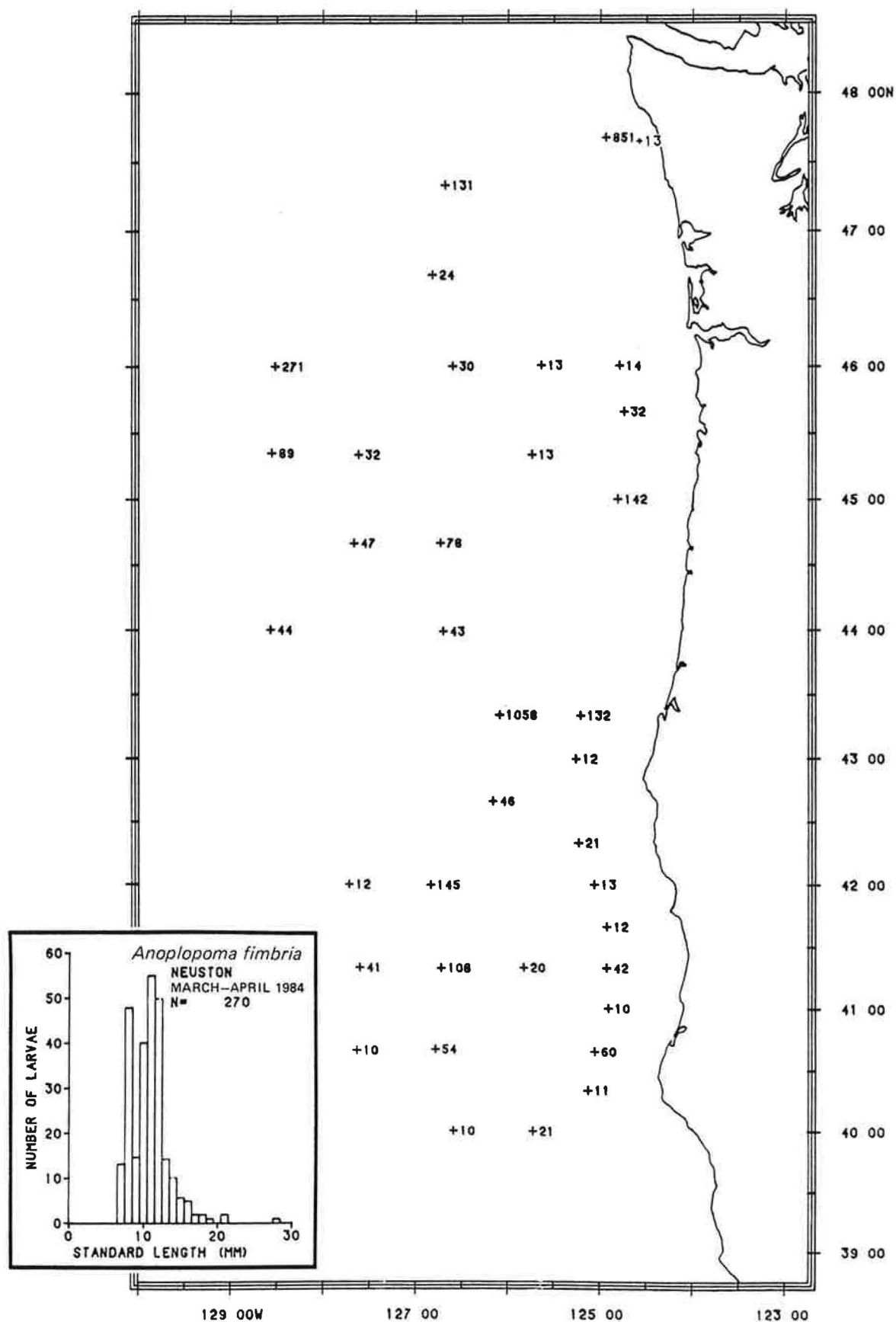


Figure 21.--Distribution and lengths of *Anoplopoma fimbria* larvae from neuston tows during cruise 1P084, March-April 1984. Abundance expressed as number per 1,000 m³.

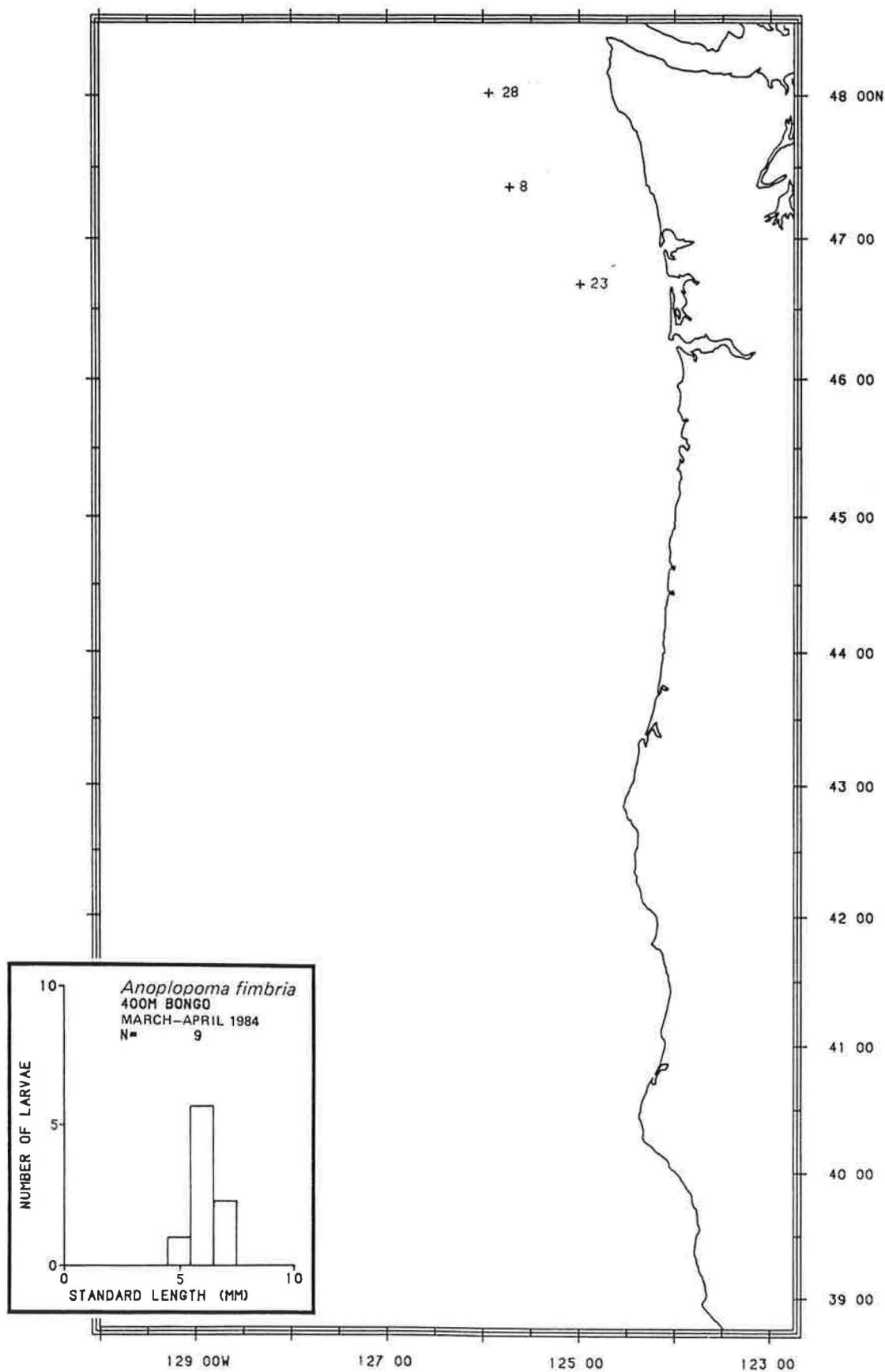


Figure 22.--Distribution and lengths of *Anoplopoma fimbria* larvae from deep bongo tows during cruise 1P084, March-April 1984. Abundance expressed as number per 10 m².

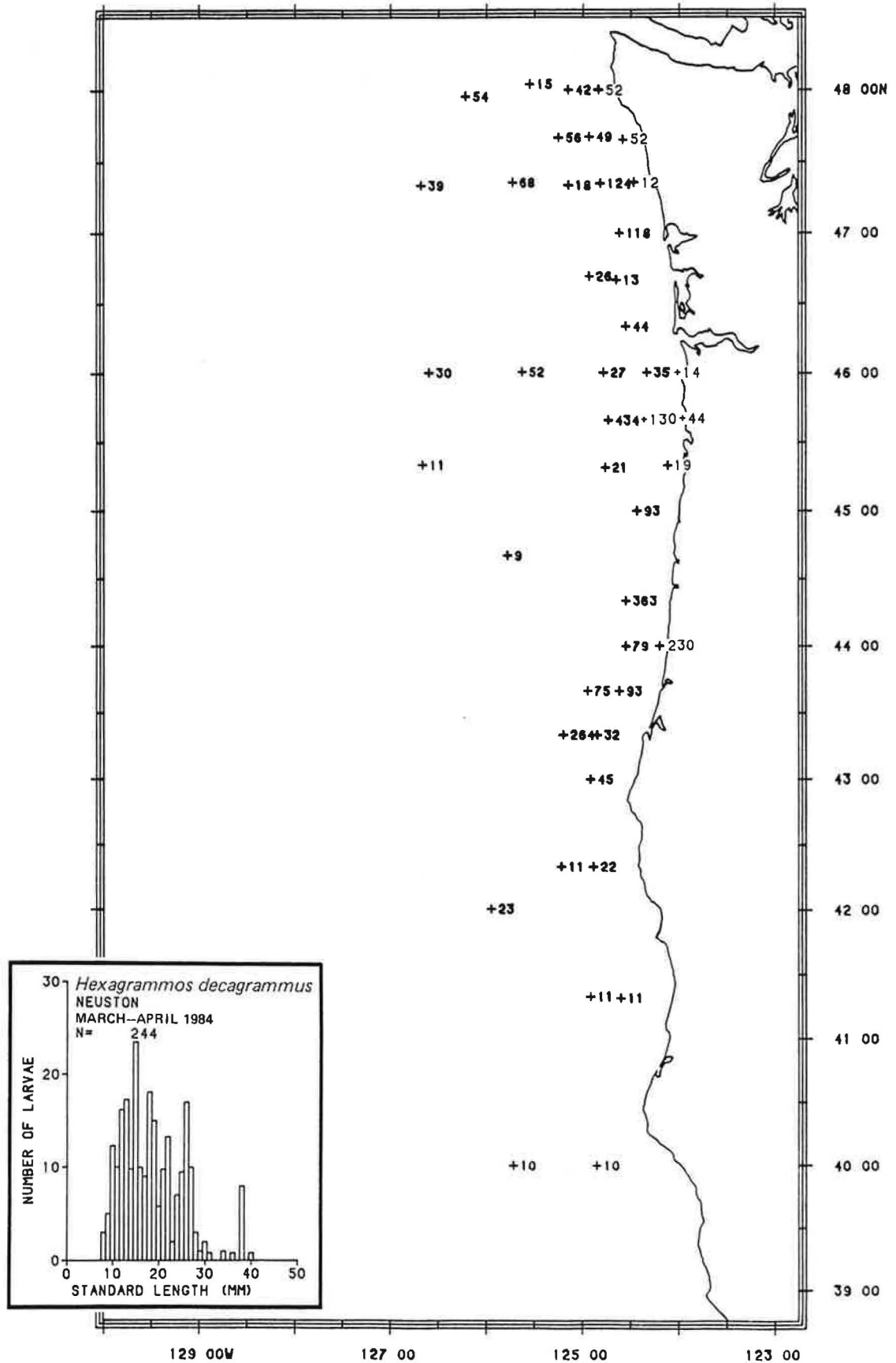


Figure 23.--Distribution and lengths of *Hexagrammos decagrammus* larvae from neuston tows during cruise 1P084, March-April 1984. Abundance expressed as number per 1,000m³.

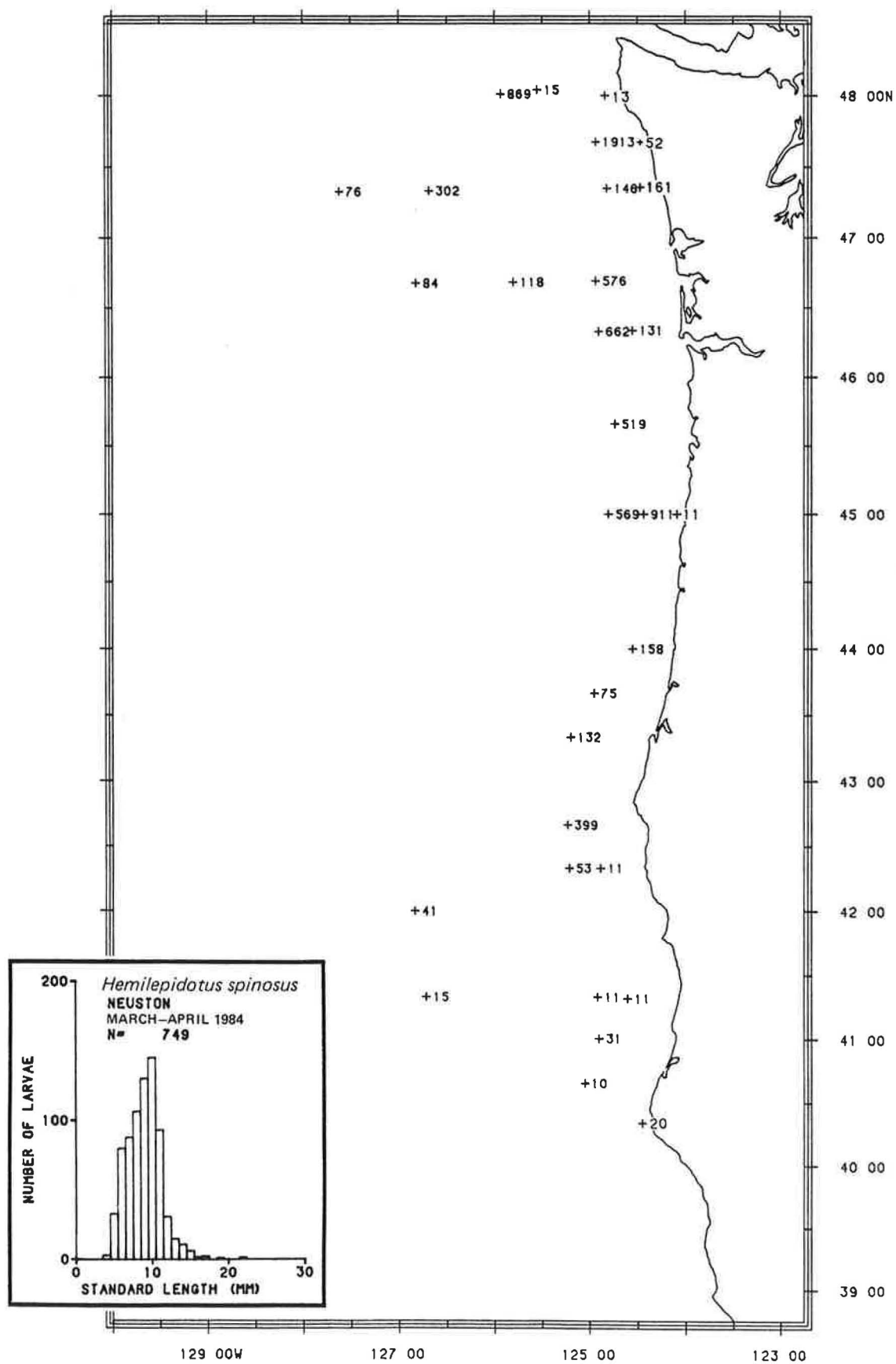


Figure 24.--Distribution and lengths of *Hemilepidotus spinosus* larvae from neuston tows during cruise 1P084, March-April 1984. Abundance expressed as number per 1,000³.

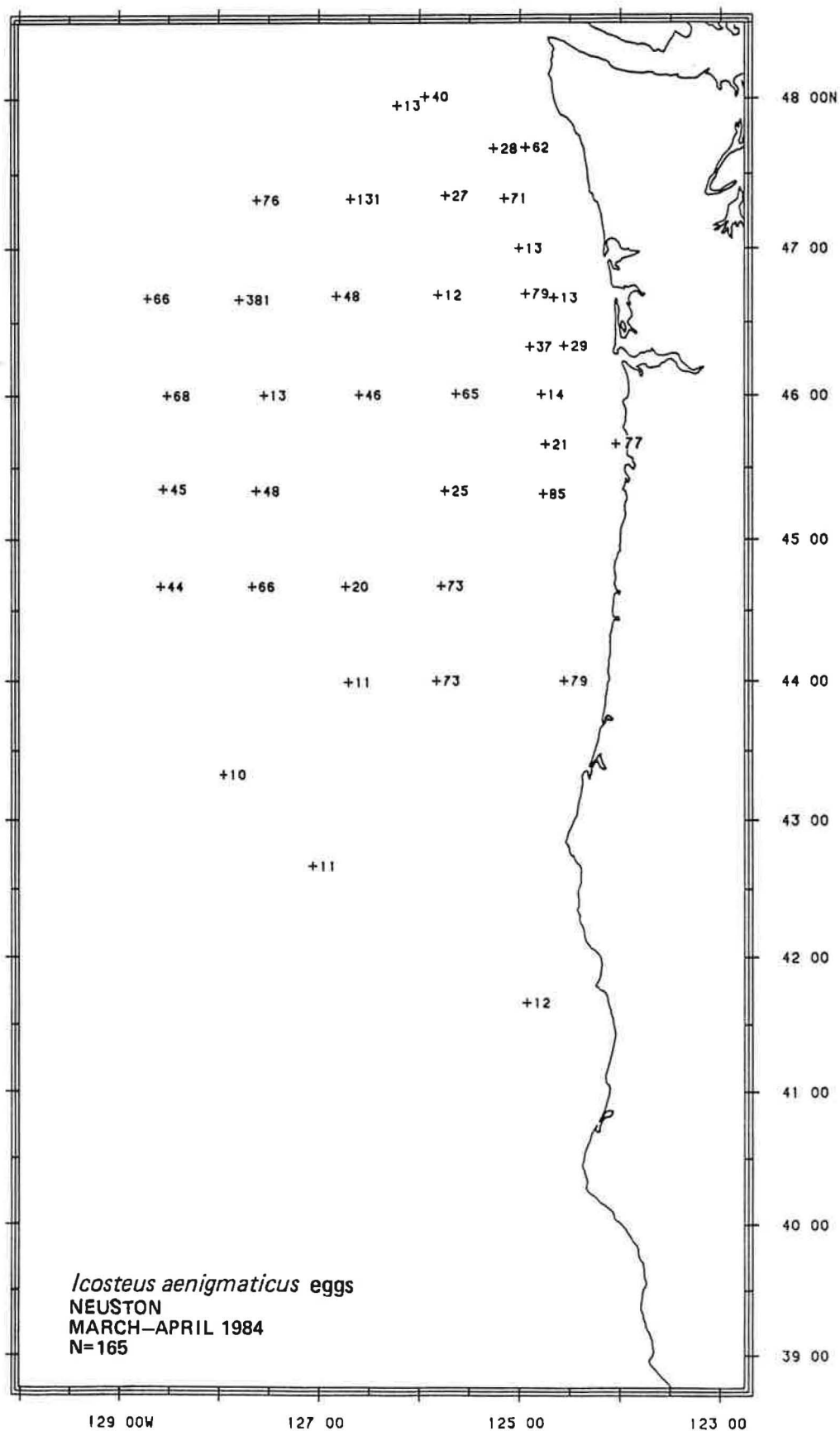


Figure 25.--Distribution of *Icosteus aenigmaticus* eggs from neuston tows during cruise 1P084, March-April 1984. Abundance expressed as number per 1,000m³.

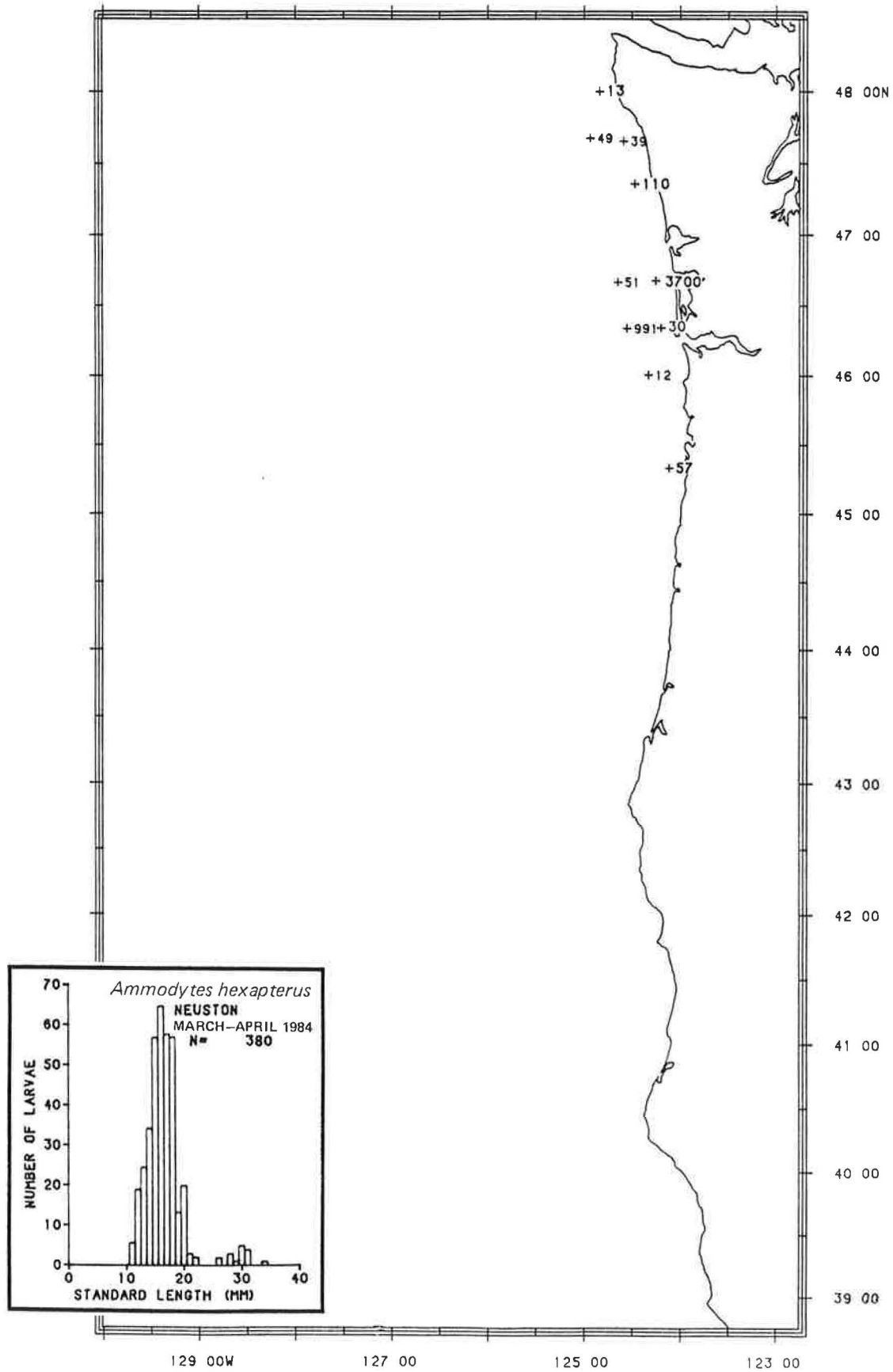


Figure 26.--Distribution and lengths of *Ammodytes hexapterus* larvae from neuston tows during cruise 1P084, March-April 1984. Abundance expressed as number per 1,000 m³.

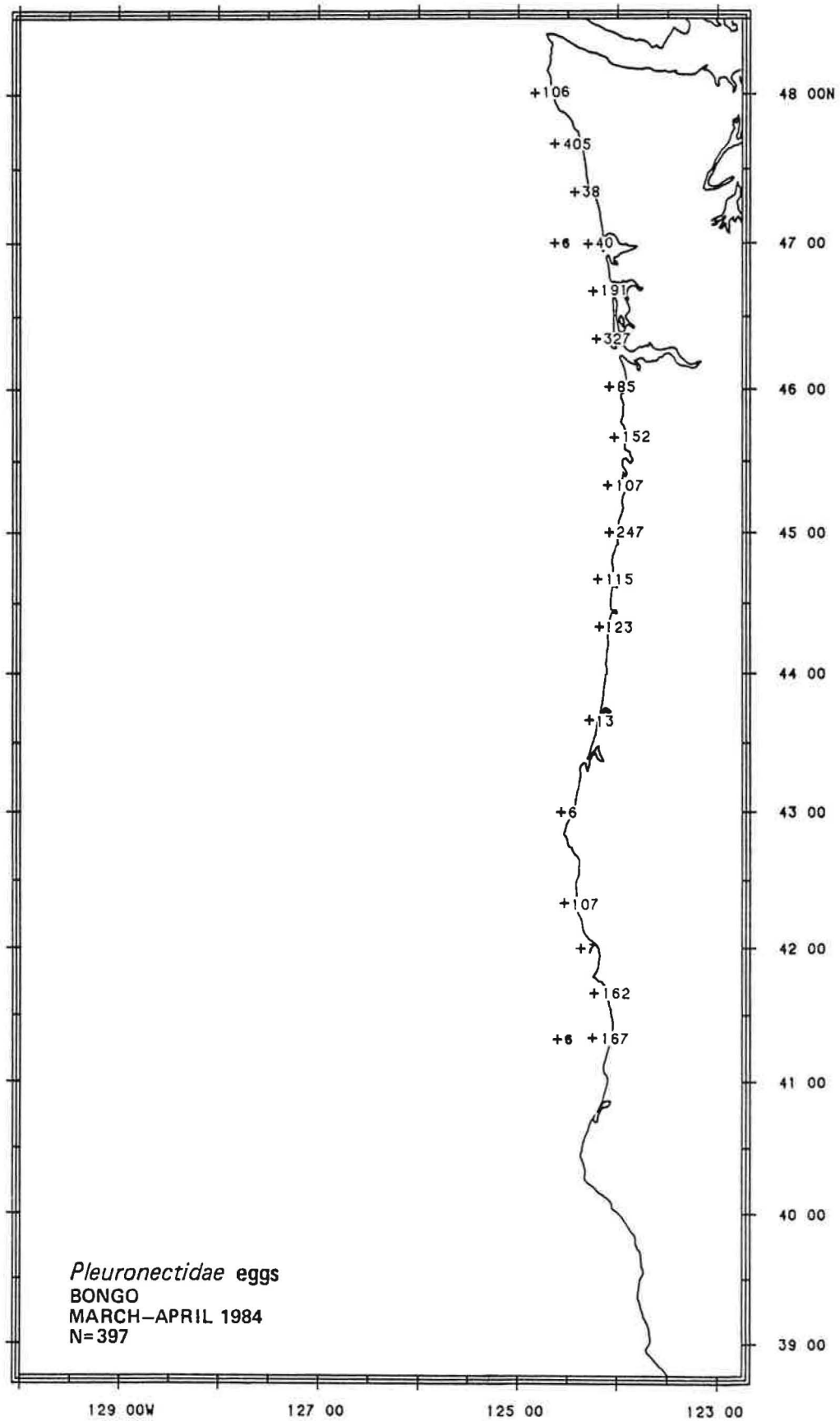


Figure 27.--Distribution of Pleuronectidae eggs from bongo tows during cruise 1P084, March-April 1984. Abundance expressed as number per 10 m².

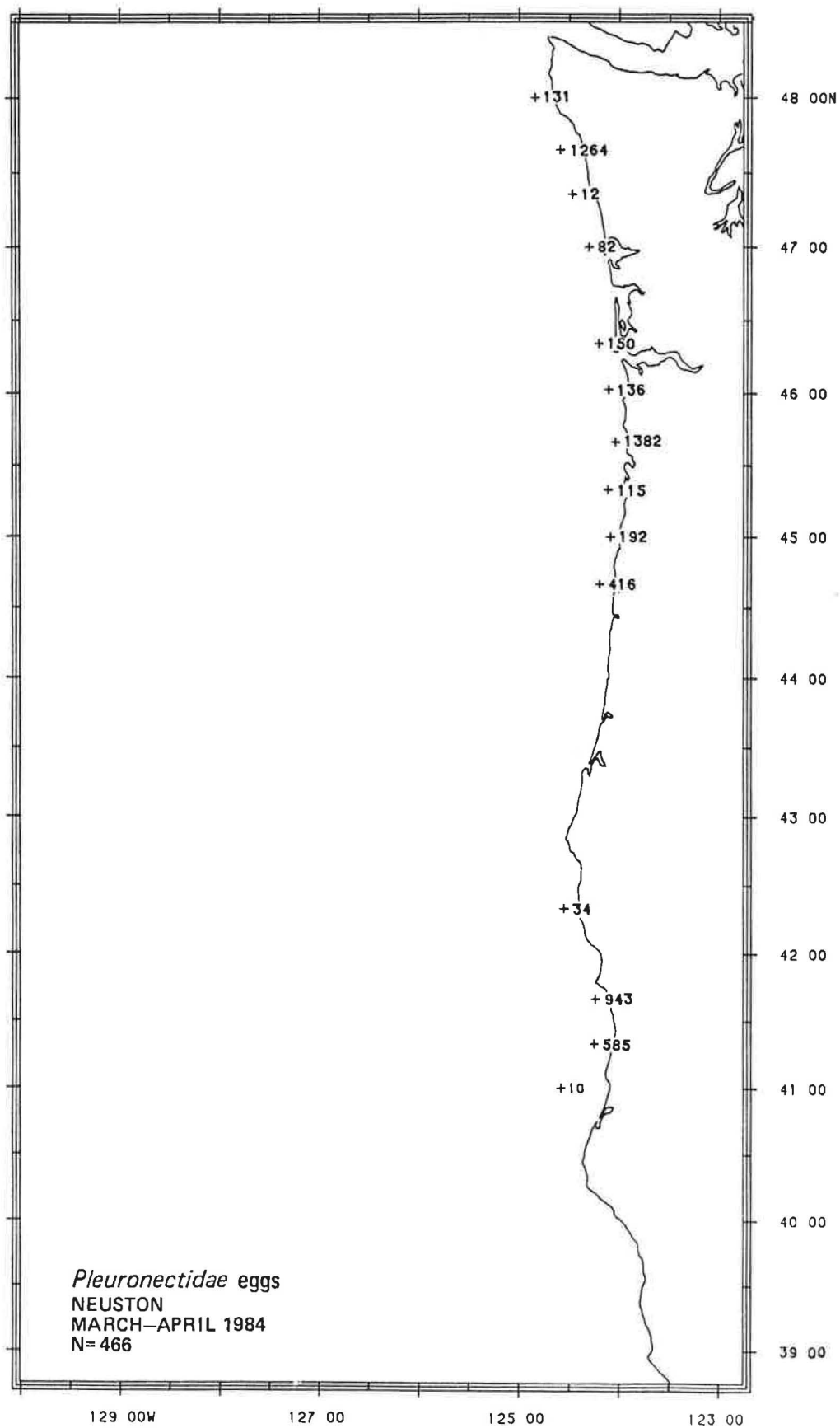


Figure 28.--Distribution of Pleuronectidae eggs from neuston tows during cruise 1P084, March-April 1984. Abundance expressed as number per 1,000m³.

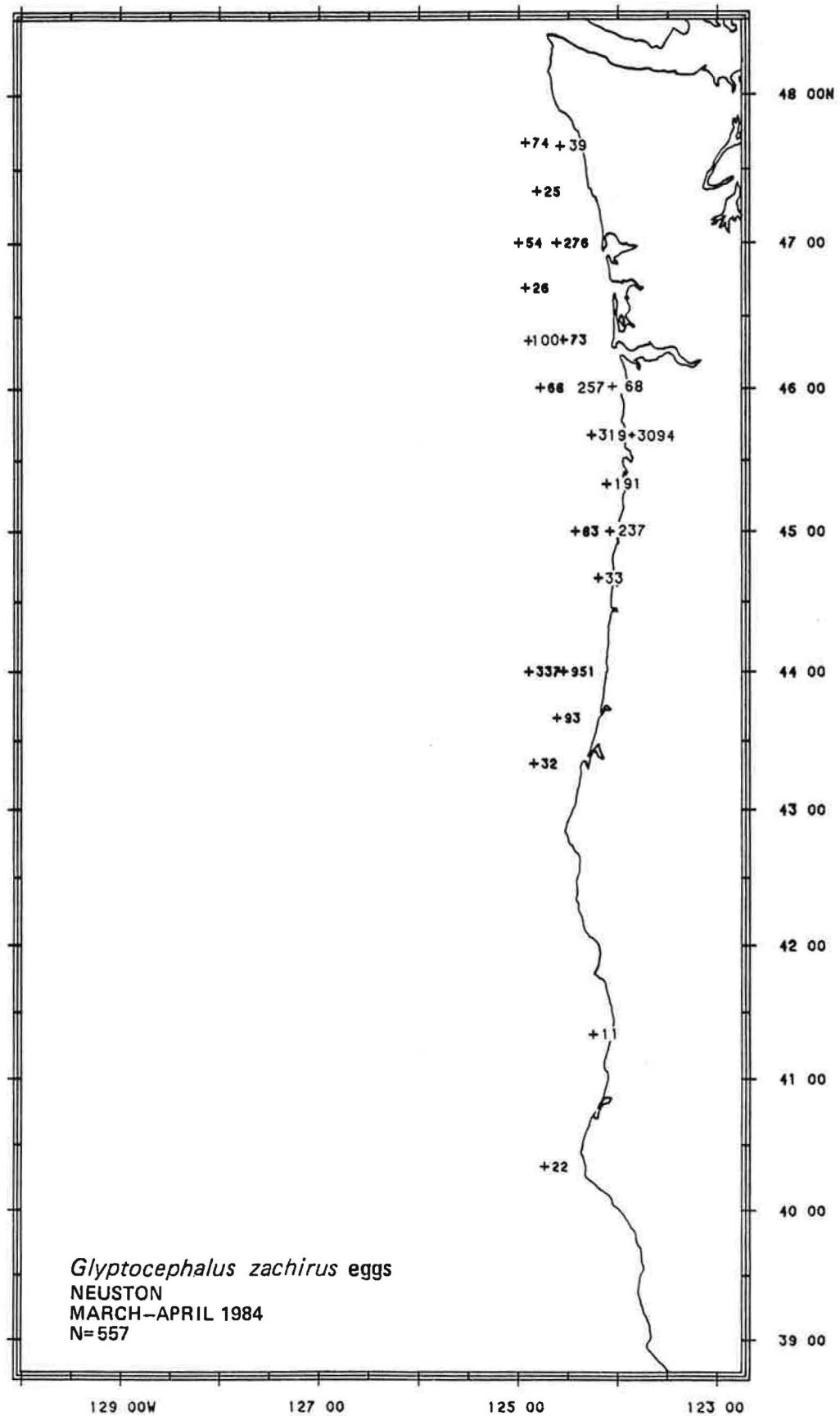


Figure 29.--Distribution of *Glyptocephalus zachirus* eggs from neuston tows during cruise 1P084, March-April 1984. Abundance expressed as number per 1,000 m³.

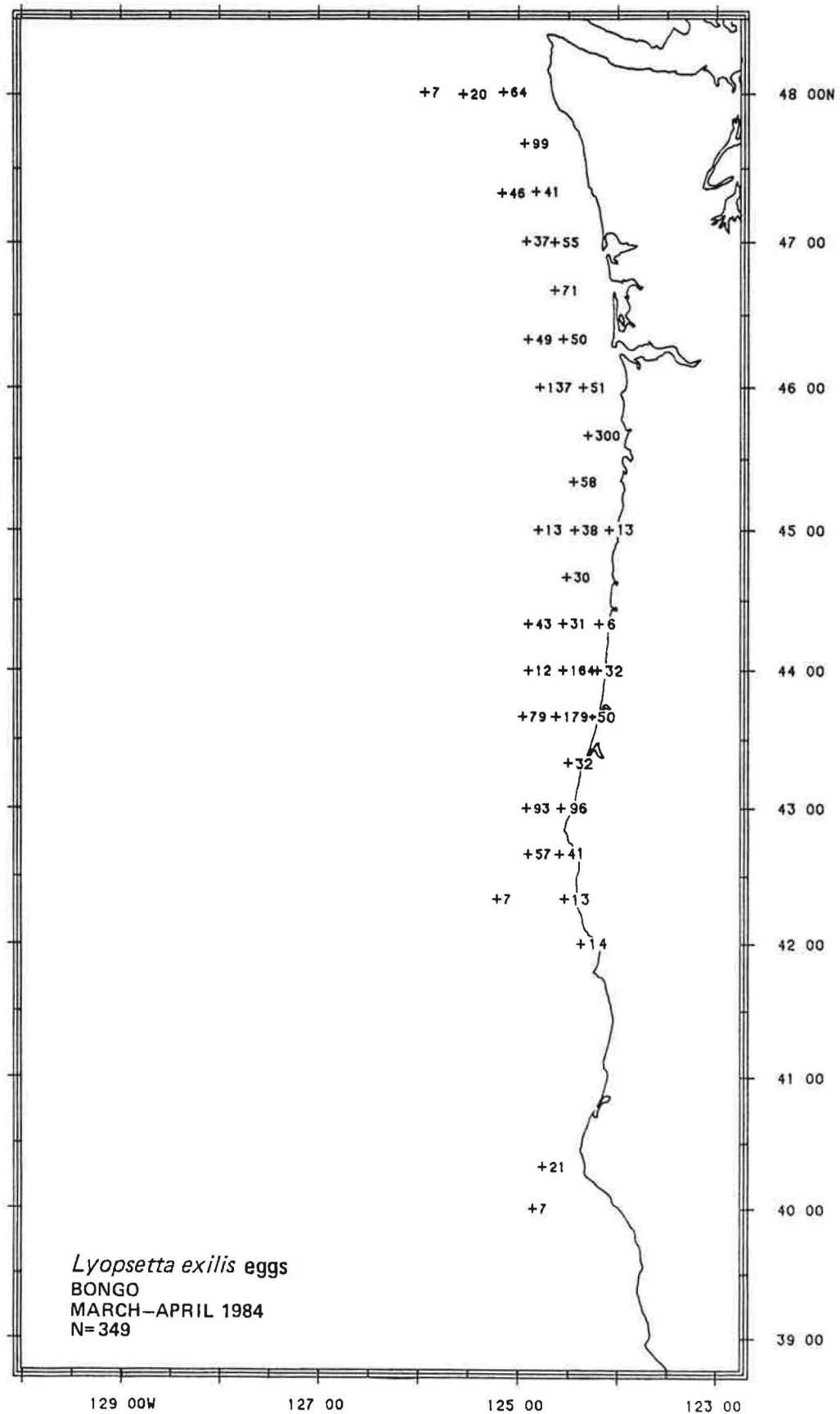


Figure 30.--Distribution of *Lyopsetta exilis* eggs from bongo tows during cruise 1P084, March-April 1984. Abundance expressed as number per 10m².

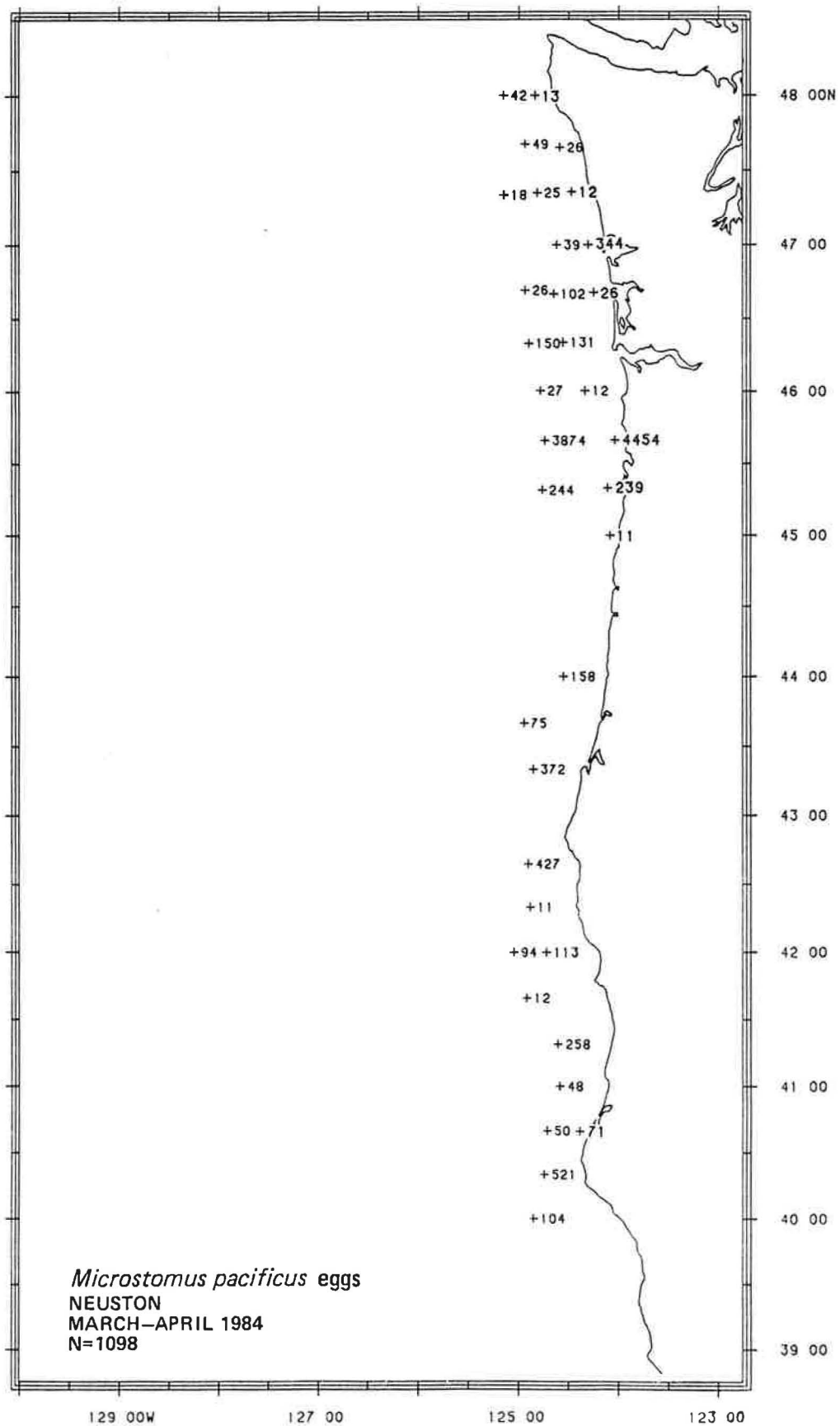


Figure 31.--Distribution of *Microstomus pacificus* eggs from neuston tows during cruise 1P084, March-April 1984. Abundance expressed as number per 1,000 m³.

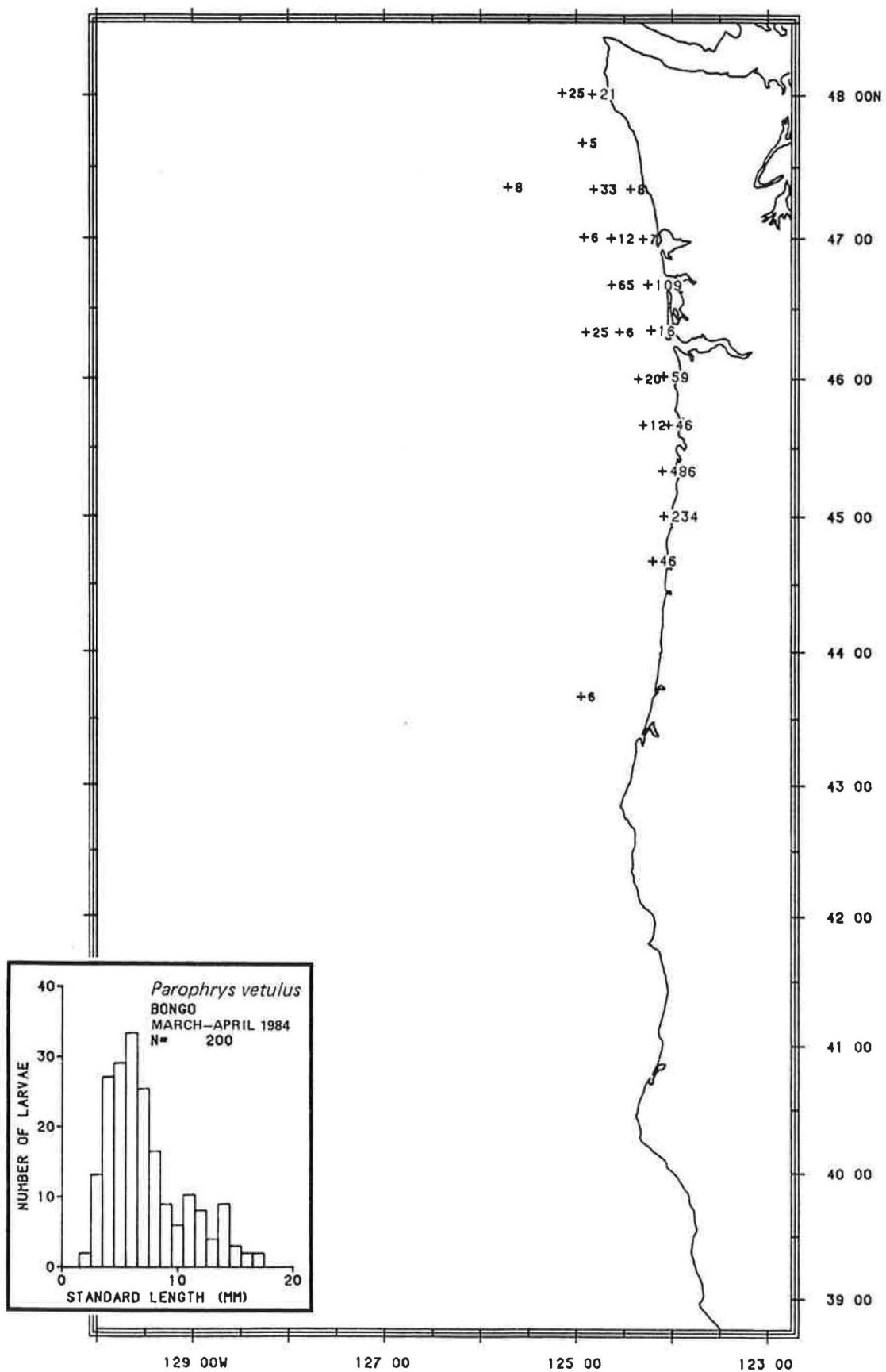


Figure 32.--Distribution and lengths of *Parophrys vetulus* larvae from bongo tows during cruise 1P084, March-April 1984. Abundance expressed as number per 10 m².