Northwest and Alaska Fisheries Center

National Marine Fisheries Service

U.S. DEPARTMENT OF COMMERCE

NWAFC PROCESSED REPORT 86-14

Ichthyoplankton Off Washington, Oregon and Northern California November – December 1983

June 1986

NOTICE

Ichthyoplankton off Washington, Oregon, and Northern California

November-December 1983

By

Jay B. Clark

Resource Assessment and Conservation Engineering Division
Northwest and Alaska Fisheries Center
National Marine Fisheries Service
National Oceanic and Atmospheric Administration
7600 Sand Point Way NE, BIN C15700, Building 4
Seattle, Washington 98115

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INTRODUCTION

This report describes the sixth in a series of cooperative U.S.-U.S.S.R. ichthyoplankton surveys conducted off the U.S. west coast from 48°-40°N. Similar reports, based on previous cruises since April-May 1980, have already been produced (Kendall and Clark 1982a, 1982b, Bates 1984, Clark 1984, Clark and Kendall 1985). These surveys are designed to determine seasonal and spatial distribution of ichthyoplankton as background information for more detailed studies on early life history of fishes of the area. It is planned 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 will be documented. These will be 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.

METHODS AND MATERIALS

A grid of 113 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 near shore than off shore. The NOAA ship R/V Miller Freeman occupied these stations basically from south to north from 12 November to 2 December 1983. Due to inclement weather or other ship operations, 11 stations of our normal grid pattern had to be dropped. At each station water property profiles were obtained with either a CTD (conductivity, temperature, density) unit or an XBT (expendable bathythermograph). The CTD's were taken to near bottom, or over deeper water, to a maximum depth of 500 m. Neuston tows using 0.3 m high by 0.5 m wide Sameoto samplers (Sameoto and Jaraszynski 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, 0.505 mm mesh was made with a maximum of 285 m of wire out at each station. Flowmeters in the mouths of the nets were used to determine the volume of water filtered by each net. The 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 removed. The fish eggs were counted; the larvae were identified, counted and measured. Fish eggs were later identified and counted by Ann C. Matarese at NWAFC. 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. 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 m^3 for the neuston samples. The method of determining 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 (except for the 11 stations dropped due to weather and other ship operations). Data associated with these stations are listed in Table 1. A summary of the catches of fish eggs and larvae is presented in Tables 2 and 3. Totals of 21 taxa of eggs, and 36 taxa of larvae were found. An additional 8 taxa of juvenile fish were found, 3 of which were myctophids. The abundance measures of juvenile fish have little meaning due to the ability of these fish to avoid the net opening during a tow. Figures 2-5 illustrate the rank abundances of egg and larval catches in bongo and neuston tows for the cruise using several measures of abundance. Figures 6-28 show the geographic distribution, abundance at each station, and length frequencies of larvae of the more abundant taxa. Results of recurrent group analysis of eggs and larvae from either the neuston samples or the bongo samples showed no 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, log of number in survey area, and mean number per 1,000 m^3 (for neuston) and mean number per 10 m^2 (for bongo).

In the neuston net, egg catches were dominated by Pleuronectidae in two of the abundance measurements and by Trachipterus altivelis in the remaining two measurements. Bothidae, Citharichthys spp., and Icichthys lockingtoni

were also abundant, depending on what measurement was used (Figure 2). For eggs in the bongo net, Pleuronectidae and Trachipterus altivelis each ranked highest in two of the abundance measurements. Also abundant were eggs of Bathylagidae and Bathylagus spp. (Figure 4).

The larval catches in the neuston were dominated by Cololabis saira and Tarletonbeania crenularis (Figure 3). The measurements for these two fish indicate a lower than actual abundance due to the probable net avoidance related with their larger size ranges. Scorpaenichthys marmoratus larvae also were abundant in the neuston.

In the bongo net, very few larvae were caught compared to our cruises occurring in the spring and summer. Stenobrachius leucopsarus still dominated three of the four abundance measurements with only 61 being caught (Figure 5). Also caught were Citharichthys stigmaeus, Tarletonbeania crenularis and Sebastes spp.

Distribution

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

Teleost, Type G (Figure 6) - Unidentified fish eggs of this type were collected in bongo tows primarily in the offshore waters of Oregon and California. They occurred in 20% of the stations in relatively low numbers.

Bathylagidae (Figure 7) - Eggs of unidentified deep-sea smelt were found in 40 of the bongo tows throughout the survey area. The main concentrations were found over the shelf of southern Oregon and northern California.

Bathylagus spp. (Figure 8) - Deep-sea smelt eggs were found in 33% of the bongo tows scattered throughout the lower two-thirds of the survey area in similar locations as Bathylagidae eggs.

Chauliodus macouni (Figure 9) - Eggs of the Pacific viperfish were found in 19% of the neuston tows. They were found offshore in low numbers throughout the survey area.

Stenobrachius leucopsarus (Figure 10) - The larvae and juveniles of this lanternfish were caught in low numbers at 27% of the stations scattered over the survey area. They ranged from 3.5-79.0 ($\bar{x}$=29.7) mm SL. Due to their large average size, net avoidance is a probable cause of the low capture rate.

Tarletonbeania crenularis (Figures 11 and 12) - Larvae of this lanternfish occurred in bongo samples in low numbers. In the northern half of the survey area they were found widely distributed offshore. The southern half found them over the shelf area. They ranged from 3.0-38.0 ($\bar{x}$=15.4) mm SL in the bongo catches. In the neuston net they were caught in similar locations as the bongo, but in greater numbers and larger size, 21.9-73.2 (x=33.4) mm SL.

Protomyctophum crockeri (Figure 13) - In the bongo net these lanternfish larvae were collected in limited numbers dispersed throughout the southern half of the survey area. They ranged in size from 3.8-15.0 ($\bar{x}$=10.1) mm SL.

Cololabis saira (Figure 14) - Saury larvae and juveniles occurred in 52% of the neuston samples. They were widely distributed throughout the sampling area. The size ranged from 15.2-93.9 ($\bar{x}$=48.4) mm SL.

Trachipterus altivelis (Figures 15 and 16) - Eggs of king-of-the-salmon were taken in both bongo and neuston catches throughout the survey area. They were found in similar locations as observed in October-November 1981 (Bates 1984).

Sebastes spp. (Figure 17) - Unidentified rockfish larvae were collected in bongo tows primarily in continental shelf waters. The size ranged from 3.0-11.0 ($\bar{x}$=4.45), four larvae were collected in neuston samples and measured 12.9-15.7 ($\bar{x}$=14.27) mm SL.

Hexagrammos decagrammus (Figure 18) - Low numbers of small kelp greenling larvae were found in neuston samples primarily in nearshore samples. The size ranged from 8.0-8.2 ($\bar{x}$=8.1) mm SL.

Hexagrammos lagocephalus (Figure 19) - Small larvae of the rock greenling were found in low numbers in the nearshore and shelf waters of northern Oregon and Washington. They were collected in the neuston net and their lengths ranged from 7.4-9.8 (x=8.3) mm SL.

Scorpaenichthys marmoratus (Figure 20) - Cabezon larvae were collected in the neuston net primarily at nearshore stations along the Washington and northern California coasts. Lengths ranged from 3.7-8.2 ($\bar{x}$=5.7) mm SL.

Icichthys lockingtoni (Figure 21) - Eggs of the medusafish were found in neuston samples in waters off the coast between Coos Bay, Oregon and Cape Mendocino, California. Medusafish eggs were also collected during April-May 1980 (Kendall and Clark 1982a), indicating a prolonged spawning season.

Bothidae (Figures 22 and 23) - Unidentified eggs of lefteye flounders were found in both neuston and bongo nets. Distributions were similar in each net, mainly at nearshore stations along the coast from Cape Flattery, Washington to Cape Mendocino, California.

Citharichthys spp. (Figure 24) - Eggs of sanddabs were collected in neuston samples at nearshore stations from the mouth of the Columbia River to the Oregon-California border.

Citharichthys sordidus (Figure 25) - Small numbers of Pacific sanddab larvae were found in bongo samples scattered throughout the survey area. They ranged in size from 8.0-24.0 ($\bar{x}$=11.90) mm SL.

Citharichthys stigmaeus (Figure 26) - Speckled sanddab larvae were also found in bongo samples, the majority being found in the southern half of the survey area. Their lengths ranged from 7.3-20.0 ($\bar{x}$=11.98) mm SL.

Pleuronectidae (Figures 27 and 28) - Unidentified eggs of righteye flounders were collected in both neuston and bongo nearshore samples from Grays Harbor, Washington to Coos Bay, Oregon in moderate numbers.

ACKNOWLEDGMENTS

We wish to thank the officers and crew aboard the NOAA vessel Miller Freeman for their cooperative help at sea. Also, we wish to thank: Richard Bates and Laurel Mc Ewen who served as scientists aboard the cruise; Jim Peacock, Karen Conlan, and the staff in graphics; Judy Baxter and her staff for word processing; and Ethel Zweifel and her staff for printing and binding.

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Figure 17.--Distribution and lengths of Sebastes spp. larvae from bongo tows during cruise 1MF83, November-December 1983. Abundance expressed as numbers per 10 m^2.

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Figure 25.--Distribution and lengths of Citharichthys sordidus larvae from bongo tows during cruise 1MF83, November-December 1983. Abundance expressed as numbers per 10 m^2.

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Figure 28.--Distribution of Pleuronectidae eggs from bongo tows during cruise 1MF83, November-December 1983. Abundance expressed as numbers per 10 m^2.

					NEUSTON STATION SUMMARY				BONGO STATION SUMMARY		
STATION	POSITION LAT. N.	LONG. W.	DATE YYMMDD	AREA KM2	TIME GMT	STANDARD HAUL FACTORS * A	B		TIME GMT	STANDARD HAUL FACTORS * A	B
G001A	47 59.8	126 16.6	831112	1913.	532	0.019	12.445		500	4.526	2.647
G002A	47 20.2	127 43.6	831112	6026.	1311	0.023	15.318		1233	5.788	2.823
G003A	46 39.9	128 44.2	831112	5658.	2047	0.017	11.264		2015	5.337	2.471
G004A	45 59.5	128 33.2	831113	5459.	122	0.022	14.459		52	5.469	2.772
G005A	45 20.7	128 33.3	831113	6502.	615	0.018	11.688		545	4.836	2.382
G006A	44 1.8	128 32.8	831114	5696.	309	0.025	16.531		239	4.307	2.291
G007A	43 19.1	128 51.6	831114	5657.	922	0.017	11.636		846	5.167	2.484
G008A	42 41.0	128 48.9	831114	5193.	1414	0.017	11.615		1343	5.664	2.749
G009A	42 0.1	128 37.5	831114	5367.	1947	0.016	10.351		1920	5.667	2.661
G010A	41 21.1	128 27.7	831115	5397.	30	0.018	11.696		1	6.682	2.716
G011A	40 39.9	128 31.1	831115	5594.	441	0.017	11.066		413	5.365	2.682
G012A	40 0.4	128 20.9	831115	5395.	934	0.019	12.587		908	3.351	2.190
G013A	40 1.1	127 28.8	831115	5261.	1505	0.016	10.886		1438	6.864	2.848
G014A	40 0.4	126 34.9	831115	5346.	1936	0.017	11.190		1909	6.474	2.815
G015A	40 0.6	125 42.6	831116	4502.	1	0.016	10.952		2327	6.006	2.556
G016A	40 0.0	124 51.4	831116	1497.	704	0.019	12.962		626	5.691	2.529
G017A	39 59.7	124 31.9	831116	1108.	917	0.022	14.952		852	5.592	2.913
G018A	39 58.9	124 11.5	831116	1252.	1150	0.019	12.946		1109	4.312	2.818
G019A	40 20.3	124 27.3	831116	774.	1454	0.017	11.618		1440	3.833	5.323
G020A	40 20.2	124 47.0	831116	1076.	1705	0.020	13.263		1639	5.460	2.703
G021A	40 20.0	125 6.8	831116	2083.	1909	0.020	13.363		1843	6.746	2.972
G022A	40 39.8	124 23.8	831116	812.	2256	0.020	13.389		2249	3.975	17.283
G023A	40 40.8	124 44.0	831117	1014.	116	0.019	12.913		48	5.736	2.656
G024A	40 40.5	125 3.1	831117	1956.	329	0.018	12.005		303	6.453	2.946
G025A	40 40.3	125 55.1	831117	5210.	1008	0.020	13.092		937	6.041	2.836
G026A	40 40.0	126 47.5	831117	5458.	1643	0.019	12.612		1616	4.303	2.417
G027A	40 40.4	127 38.7	831117	5291.	2327	0.017	11.482		2258	5.123	2.499
G028A	41 20.1	127 35.9	831118	5467.	548	0.019	12.508		518	5.382	2.588
G029A	41 20.6	126 42.9	831118	5620.	957	0.018	12.003		931	3.878	2.424
G030A	41 20.9	125 49.1	831118	5563.	1416	0.020	13.612		1348	4.220	2.426
G031A	41 0.5	124 53.6	831118	1953.	1846	0.016	10.594		1820	5.329	2.692
G032A	40 59.6	124 35.8	831118	1041.	2048	0.019	12.924		2022	5.791	2.867
G033A	40 59.8	124 14.5	831118	666.	2350	0.015	9.932		2335	4.941	11.764
G034A	41 19.1	124 35.4	831119	1016.	358	0.019	12.753		330	6.993	3.136
G035A	41 39.2	124 34.5	831119	1006.	725	0.017	11.500		653	6.128	2.918
G036A	41 59.7	124 43.5	831119	1003.	1005	0.015	9.860		938	5.491	2.640
G037A	41 59.5	124 22.4	831119	698.	1235	0.017	11.171		1214	4.419	14.728
G038A	41 39.9	124 14.4	831119	603.	1633	0.019	12.718		1624	1.873	9.860
G039A	41 20.1	124 16.1	831119	986.	1927	0.019	12.459		1858	3.113	7.240
G040A	41 21.0	124 54.6	831120	1810.	241	0.021	14.330		209	5.186	2.701
G041A	41 40.4	124 54.7	831120	1799.	520	0.019	12.805		449	4.999	2.499
G042A	41 59.5	125 2.5	831120	2013.	824	0.017	11.498		759	6.443	2.997
G043A	42 1.3	125 57.1	831120	4986.	1307	0.018	11.843		1241	5.436	2.678
G044A	42 0.9	126 49.6	831120	5244.	1806	0.019	12.478		1740	4.611	2.329
G045A	41 59.8	127 42.1	831121	5401.	1	0.019	12.445		2332	4.870	2.399
G046A	42 40.5	127 58.0	831121	5222.	843	0.019	12.674		817	4.622	2.395
G047A	42 40.1	127 3.8	831121	5313.	1310	0.016	10.605		1242	4.123	2.514
G048A	42 40.2	126 10.0	831121	5342.	1816	0.021	14.044		1748	5.691	2.541
G049A	42 20.3	125 12.8	831121	2131.	2302	0.015	10.248		2236	5.480	2.635
G050A	42 20.4	124 52.2	831122	1003.	147	0.018	11.901		121	4.582	2.589
G051A	42 19.6	124 32.0	831122	842.	343	0.017	11.516		330	3.852	6.214
G052A	42 39.8	124 33.8	831122	709.	624	0.019	12.957		610	2.875	6.251
G053A	42 40.8	124 53.7	831122	1011.	825	0.018	12.181		759	5.173	2.708
G054A	42 40.7	125 15.0	831122	1873.	1100	0.020	13.464		1035	4.806	2.612
G055A	43 0.1	125 15.5	831122	2106.	1322	0.019	12.844		1257	5.180	2.800
G056A	43 0.9	124 54.8	831122	1056.	1521	0.015	10.170		1453	4.186	2.507
G057A	43 0.1	124 34.4	831122	746.	1748	0.019	12.916		1735	4.891	6.987
G058A	43 19.8	124 30.3	831122	1312.	2123	0.018	12.182		2110	3.739	5.419
G059A	43 19.5	124 51.8	831122	1606.	2323	0.019	12.559		2258	6.039	2.835
G060A	43 19.5	125 10.5	831122	2748.	154	0.023	15.018		126	6.613	2.952
G061A	43 20.0	126 6.1	831123	5520.	751	0.018	12.087		727	5.687	2.901
G062A	43 20.6	127 2.1	831123	5600.	1208	0.018	11.868		1141	5.565	2.755
G063A	43 20.2	127 56.9	831123	5616.	1727	0.019	12.696		1702	6.067	2.862

*"A" converts catch to catch per $10m^2$, "B" converts catch to catch per 1,000 m^3 (see Smith and Richardson 1977).

Table 1.--Data associated with bongo and neuston tows during cruise 1MF83, November-December 1983.

					NEUSTON STATION SUMMARY				BONGO STATION SUMMARY		
STATION	POSITION LAT. N.	LONG. W.	DATE YYMMDD	AREA KM2	TIME GMT	STANDARD HAUL FACTORS * A	B		TIME GMT	STANDARD HAUL FACTORS * A	B
G064A	43 59.4	127 39.1	831123	4896.	2130	0.019	12.540		2105	6.170	2.938
G065A	43 59.4	126 45.7	831124	5160.	204	0.022	14.475		138	5.980	3.005
G066A	44 0.3	125 50.2	831124	4999.	623	0.017	11.621		556	5.779	2.603
G067A	44 0.9	124 57.9	831125	3655.	345	0.019	12.866		320	4.790	2.360
G068A	44 0.2	124 32.7	831125	1938.	606	0.018	12.156		545	4.892	3.792
G069A	44 1.1	124 12.5	831125	812.	815	0.019	12.579		806	3.096	11.906
G070A	44 20.6	124 11.7	831125	1111.	1015	0.020	13.049		1005	4.076	9.704
G071A	44 40.2	124 10.1	831125	1013.	1248	0.020	13.253		1237	3.048	7.816
G072A	44 40.2	124 30.8	831125	1795.	1737	0.017	11.531		1716	5.073	4.027
G073A	44 42.8	124 54.9	831125	3633.	2127	0.018	11.801		2058	5.354	2.390
G074A	44 40.5	125 47.8	831126	4846.	137	0.019	12.987		110	5.210	2.469
G075A	44 39.5	126 44.7	831126	5240.	634	0.025	16.797		607	4.996	2.402
G076A	44 39.9	127 40.2	831126	6336.	1039	0.016	10.711		1014	6.333	2.918
G077A	45 20.3	127 37.4	831126	5283.	1526	0.016	10.626		1458	6.510	2.906
G078A	45 20.4	126 40.5	831126	5252.	1927	0.020	13.023		1902	6.073	2.799
G079A	45 18.1	125 45.5	831127	5225.	3	0.017	11.466		2339	5.162	2.731
G080A	45 20.4	124 48.6	831127	3542.	424	0.020	13.014		358	5.662	2.735
G081A	45 20.7	124 27.2	831127	1701.	700	0.018	12.150		635	6.256	2.923
G082A	45 20.2	124 6.4	831127	1069.	901	0.018	11.821		847	5.302	6.026
G083A	45 40.1	124 2.9	831127	1055.	1338	0.015	10.330		1326	4.650	6.740
G084A	46 0.1	124 4.2	831127	720.	1751	0.018	12.080		1803	5.287	9.116
G085A	45 59.9	124 22.2	831127	1301.	2255	0.018	11.884		2236	5.497	4.659
G086A	46 1.4	124 46.3	831128	2448.	100	0.019	12.595		35	5.209	2.671
G087A	46 0.1	125 37.6	831128	4928.	509	0.018	12.309		445	6.302	3.120
G088A	46 0.6	126 35.5	831128	5044.	928	0.017	11.214		902	5.872	3.123
G089A	46 0.1	127 32.3	831128	5262.	1402	0.019	12.872		1336	6.296	2.901
G090A	46 40.4	127 45.6	831128	5344.	1811	0.018	12.062		1744	5.192	2.635
G091A	46 40.4	126 48.6	831128	5513.	2252	0.019	12.628		2225	5.807	2.860
G092A	46 40.0	125 49.5	831129	5046.	430	0.019	12.353		407	6.753	3.055
G093A	46 39.7	124 58.4	831129	1718.	1158	0.018	12.236		1134	6.314	2.992
G094A	46 19.8	124 53.3	831129	1919.	1430	0.019	12.679		1405	6.247	3.033
G095A	46 20.5	124 32.2	831129	953.	1640	0.016	10.950		1622	4.600	3.801
G096A	46 22.5	124 15.4	831129	877.	1919	0.017	11.223		1908	2.285	8.162
G097A	46 40.4	124 25.2	831129	594.	2359	0.019	12.410		2347	3.841	7.113
G098A	46 40.4	124 37.2	831130	770.	253	0.018	11.670		236	4.040	4.591
G099A	46 59.5	124 59.4	831130	1753.	720	0.017	11.355		654	6.465	2.886
G100A	46 59.3	124 36.5	831130	1012.	932	0.017	11.169		918	3.104	5.007
G101A	47 0.0	124 16.6	831130	824.	1730	0.019	12.628		1712	3.417	10.051
G102A	47 20.8	124 25.5	831130	867.	2159	0.016	10.879		2149	4.434	17.053
G103A	47 19.9	124 47.6	8312 1	1074.	304	0.018	12.081		232	6.650	3.197
G104A	47 19.5	125 9.4	8312 1	1314.	458	0.019	12.451		434	6.237	2.970
G105A	47 19.2	125 40.3	8312 1	3635.	758	0.020	13.114		732	6.968	3.097
G106A	47 19.7	126 39.7	8312 1	5923.	1205	0.017	11.134		1141	6.420	3.117
G107A	47 39.4	125 17.1	8312 1	1362.	1931	0.018	11.747		1905	5.848	2.627
G108A	47 40.0	124 55.8	8311 1	1005.	2017	0.018	11.788		1958	5.353	5.248
G109A	47 39.9	124 33.8	8312 1	860.	2210	0.018	12.026		2201	5.475	17.109
G110A	48 0.5	124 50.3	8312 2	921.	248	0.018	11.785		238	4.837	12.729
G111A	47 59.9	125 11.2	8312 2	943.	652	0.020	13.038		633	5.496	4.228
G112A	47 59.7	125 35.5	8312 2	1408.	901	0.019	12.550		836	5.875	3.301
G113A	47 59.0	125 56.9	8312 2	1926.	1124	0.019	12.489		1100	6.656	3.125

*"A" converts catch to catch per $10m^2$, "B" converts catch to catch per 1,000 m^3 (see Smith and Richardson 1977).

Table 1 (continued).

STAGE: EGG

SPECIES	NEUSTON OCCUR. %	NEUSTON LOG NO. IN AREA	BONGO OCCUR. %	BONGO LOG NO. IN AREA
UNIDENTIFIED			4.42	9.9463
DISINTEGRATED	0.88	7.3061	2.65	9.6925
BATHYLAGIDAE	2.65	7.6426	35.40	11.4269
BATHYLAGUS SPP.	0.88	6.9919	32.74	11.2045
CHAULIODUS MACOUNI	18.58	8.5513	18.58	10.9223
PLEURONECTIDAE	10.62	8.6759	12.39	10.7341
ISOPSETTA ISOLEPIS	1.77	6.5775	0.88	8.7907
PAROPHRYS VETULUS	5.31	7.3373	6.19	10.1407
PSETTICHTHYS MELANOSTICTUS	5.31	7.7009	8.85	10.0436
MERLUCCIUS PRODUCTUS			3.54	9.5841
TELEOST TYPE M			7.96	10.2293
CITHARICHTHYS SPP.	6.19	8.1865	9.73	10.1837
BATHYLAGUS OCHOTENSIS	1.77	7.3289	10.62	10.3020
ICICHTHYS LOCKINGTONI	17.70	8.8179	13.27	10.6719
TRACHIPTERUS ALTIVELIS	45.13	8.8961	47.79	11.4366
ENGRAULIS MORDAX	0.88	6.1944	1.77	9.2263
BOTHIDAE	12.39	8.3928	13.27	10.5449
PLEURONICHTHYS DECURRENS	6.19	7.3628	1.77	9.1679
MICROSTOMA MICROSTOMA			0.88	9.5202
TELEOST TYPE G			20.35	11.2644
NANSENIA CRASSA	0.88	6.9536	3.54	10.0514

STAGE: JUVENILE

SPECIES	NEUSTON OCCUR. %	NEUSTON LOG NO. IN AREA	BONGO OCCUR. %	BONGO LOG NO. IN AREA
DISINTEGRATED			0.88	9.0352
PROTOMYCTOPHUM CROCKERI			1.77	9.7321
ARTEDIUS FENESTRALIS	0.88	6.4919		
LAMPANYCTUS RITTERI			0.88	9.2572
TACTOSTOMA MACROPUS			1.77	9.7409
ARGYROPELECUS LYCHNUS			1.77	9.1814
CERATOSCOPELUS TOWNSENDI			0.88	8.9538
IDIACANTHUS SPP.			0.88	9.6034

Table 2.--Fish eggs (top) and juvenile fish (bottom) collected in bongo and neuston tows during cruise 1MF83, November-December 1983.

STAGE: LARVAE

SPECIES	NEUSTON OCCUR. %	NEUSTON LOG NO. IN AREA	BONGO OCCUR. %	BONGO LOG NO. IN AREA
UNIDENTIFIED			2.65	9.5364
DISINTEGRATED	3.54	7.5490	7.96	10.3995
OSMERIDAE	0.88	6.9919		
BATHYLAGUS MILLERI			2.65	9.6977
CHAULIODUS MACOUNI			15.04	10.5247
MYCTOPHIDAE			2.65	10.1744
DIAPHUS THETA			11.50	10.4012
STENOBRACHIUS LEUCOPSARUS			26.55	11.0271
TARLETONBEANIA CRENULARIS	28.32	9.0382	23.01	10.8707
PROTOMYCTOPHUM CROCKERI			19.47	10.8066
PROTOMYCTOPHUM THOMPSONI			8.85	10.4202
SEBASTES SPP.	3.54	7.4859	17.70	10.5949
HEXAGRAMMOS DECAGRAMMUS	6.19	7.1233	1.77	8.8124
HEXAGRAMMOS LAGOCEPHALUS	5.31	7.3722		
OPHIODON ELONGATUS			0.88	8.5807
LEPTOCOTTUS ARMATUS			1.77	8.8394
AGONIDAE			0.88	8.4970
CITHARICHTHYS STIGMAEUS	2.65	6.9001	22.12	10.7705
PAROPHRYS VETULUS			1.77	9.2328
CITHARICHTHYS SPP.			1.77	9.1513
BATHYLAGUS OCHOTENSIS			3.54	9.8822
SCORPAENICHTHYS MARMORATUS	7.96	7.9996	1.77	9.2954
ICICHTHYS LOCKINGTONI			1.77	9.7100
LAMPANYCTUS RITTERI			5.31	10.0635
CITHARICHTHYS SORDIDUS			15.93	10.7486
HEMILEPIDOTUS SPINOSUS	0.88	6.4167	0.88	8.6487
TRACHIPTERUS ALTIVELIS			2.65	9.7918
COLOLABIS SAIRA	52.21	9.0020		
LESTIDIOPS RINGENS			18.58	10.7450
ARGYROPELECUS SPP.			0.88	9.2594
CYCLOTHONE SPP.			5.31	10.0665
PLEURONICHTHYS DECURRENS	0.88	6.5778		
CERATOSCOPELUS TOWNSENDI			1.77	9.4652
MELAMPHAES SPP.			1.77	9.7963
DANAPHOS OCULATUS			1.77	9.7508
CLEVELANDIA IOS			0.88	8.6906

Table 3.--Fish larvae collected in bongo and neuston tows during cruise 1MF83, November-December 1983.

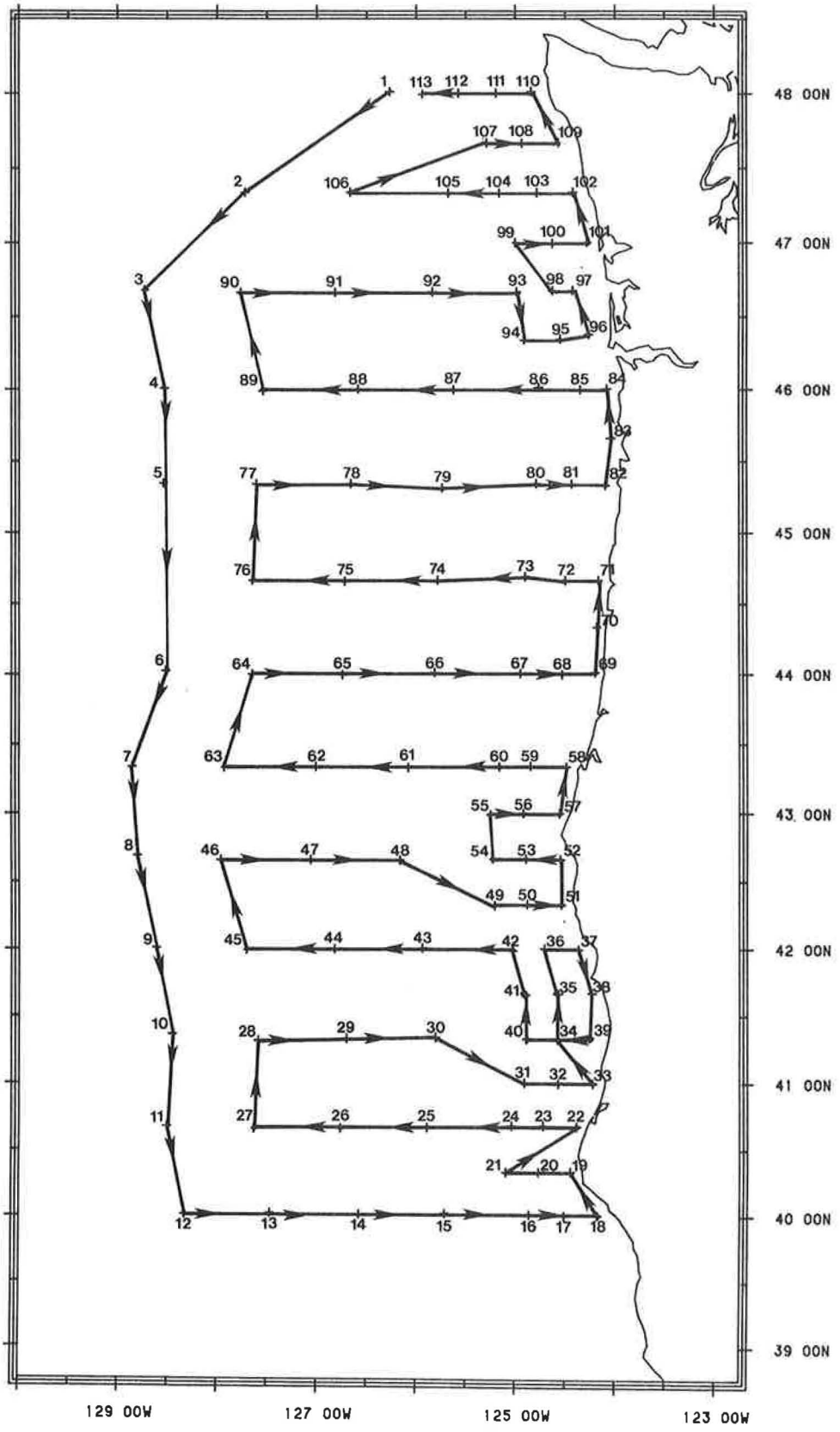

Figure 1 .--Station locations and cruise track for cruise 1MF83, November-December 1983.

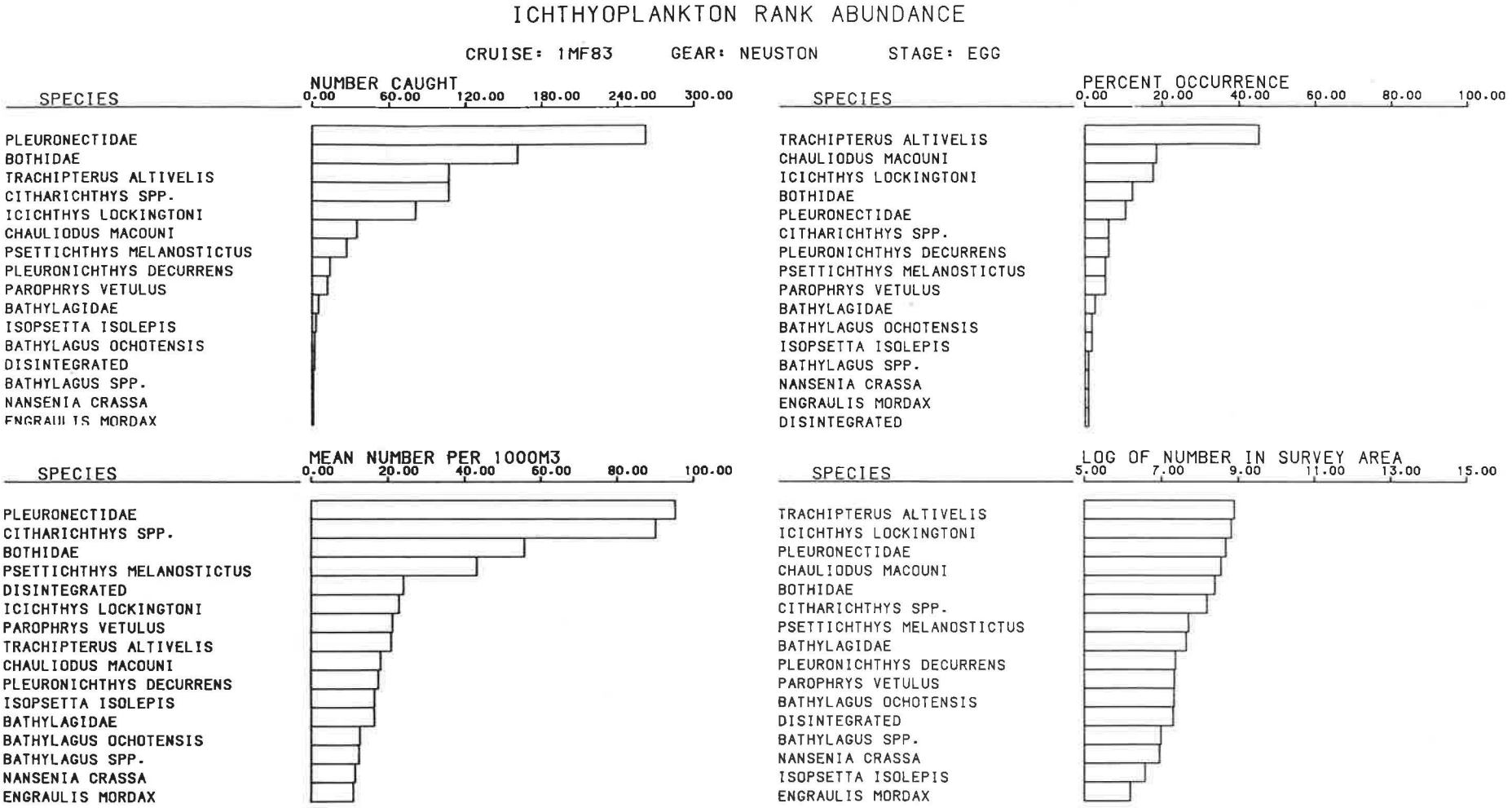

Figure 2 .--Rank abundance of fish eggs caught in neuston tows during cruise 1MF83, November-December 1983.

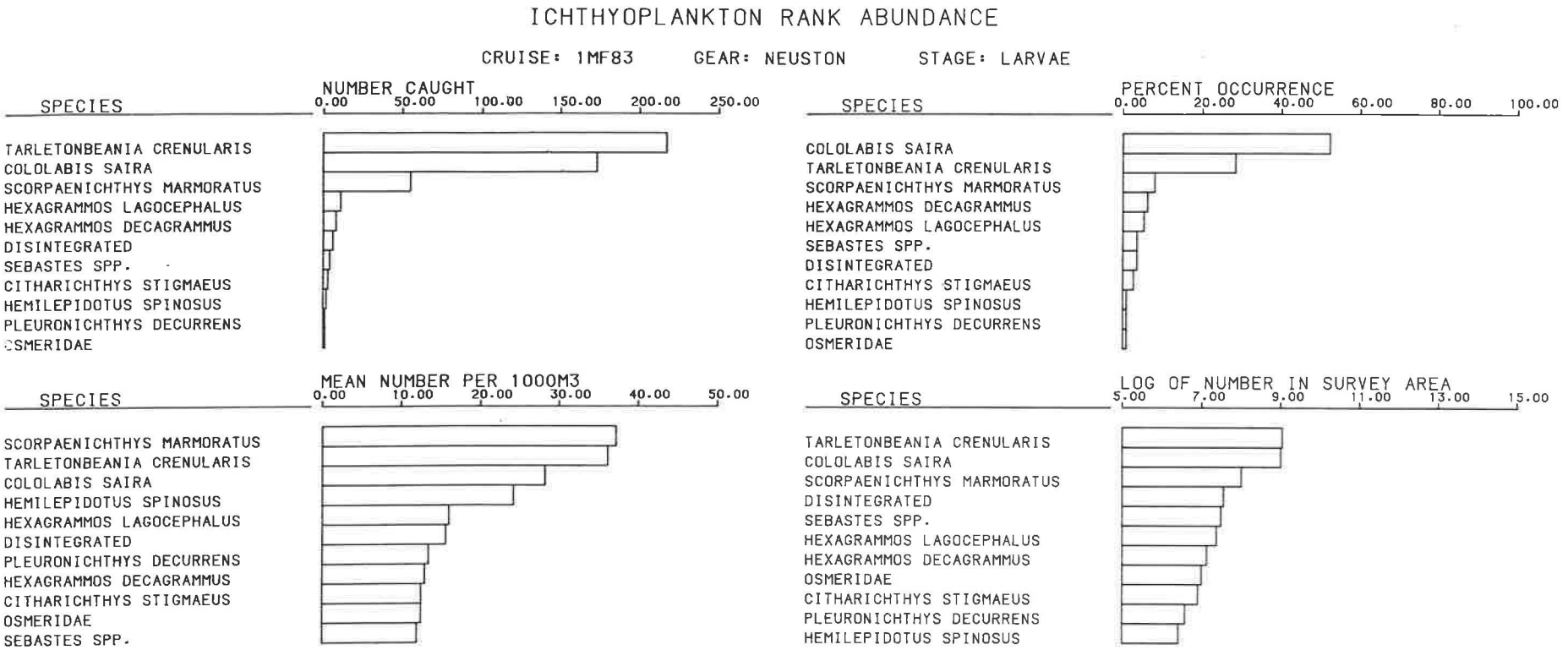

Figure 3 .--Rank abundance of fish larvae caught in neuston tows during cruise 1MF83, November-December 1983.

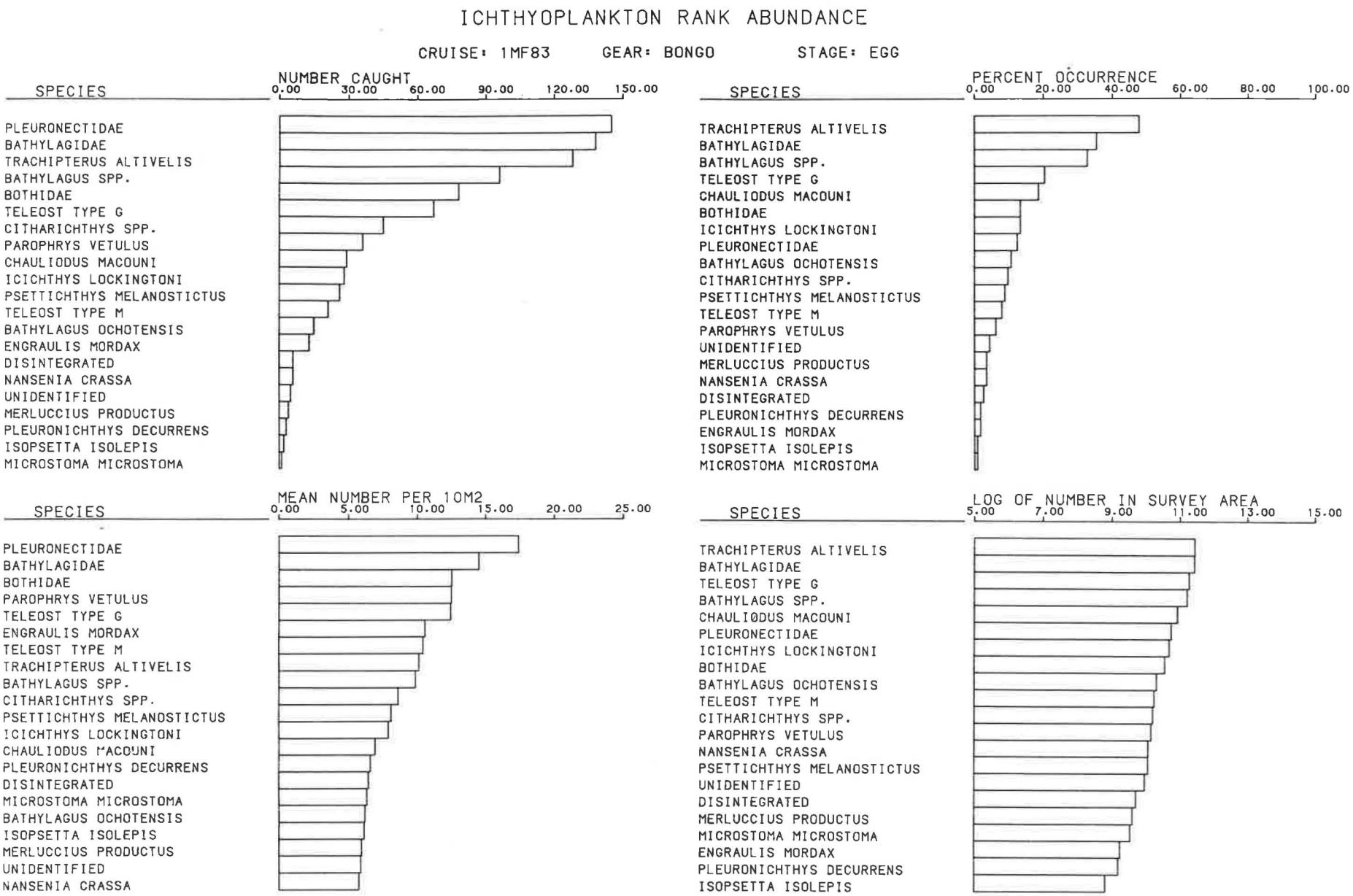

Figure 4 .--Rank abundance of fish eggs caught in bongo tows during cruise 1MF83, November-December 1983.

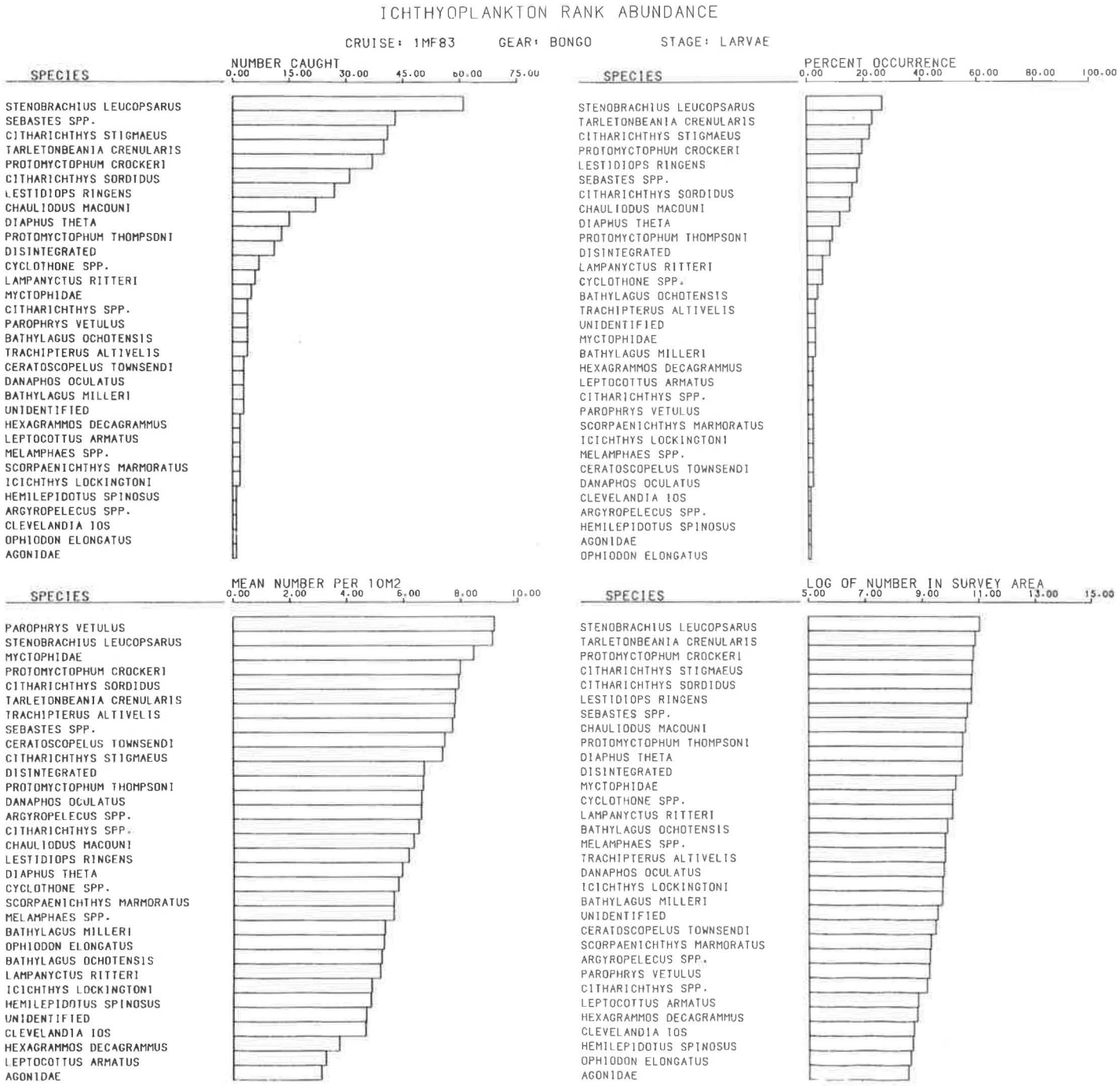

Figure 5 .--Rank abundance of fish larvae caught in bongo tows during cruise 1MF83, November-December 1983.

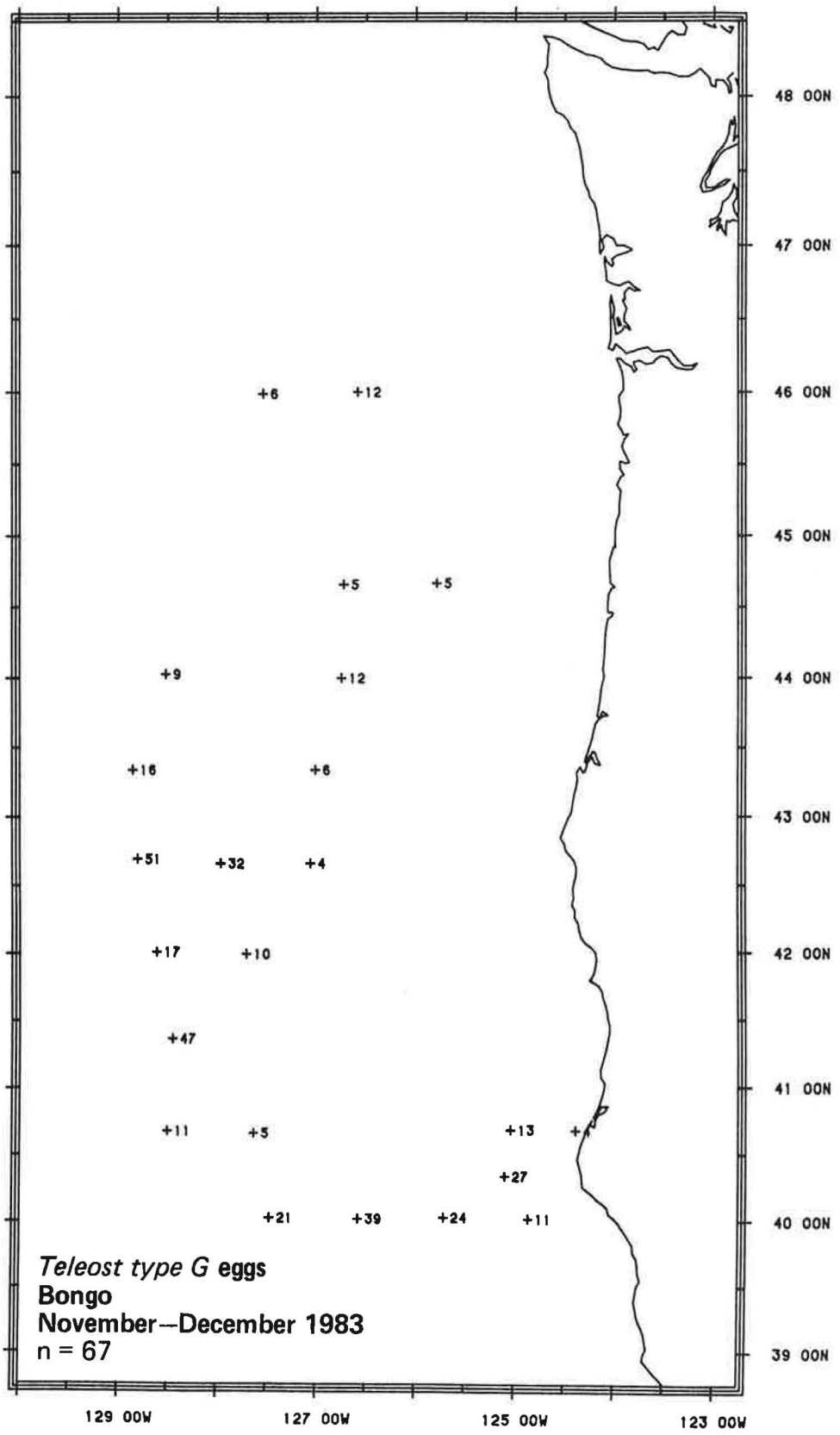

Figure 6 .--Distribution of eggs of Teleost Type G from bongo tows during cruise 1MF83, November-December 1983. Abundance expressed as numbers per 10 m^2.

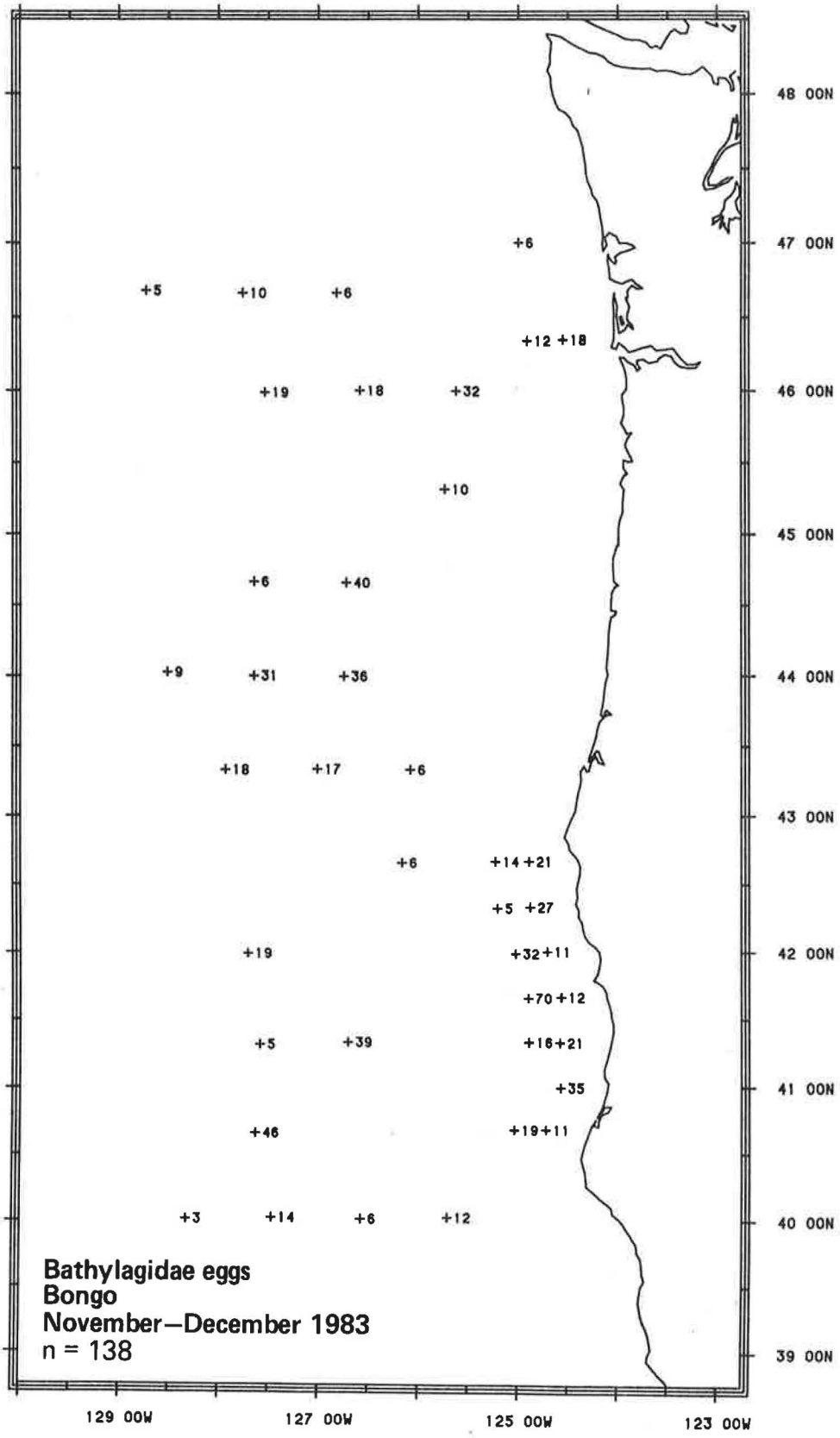

Figure 7 .--Distribution of Bathylagidae eggs from bongo tows during cruise 1MF83, November-December 1983. Abundance expressed as numbers per 10 m^2.

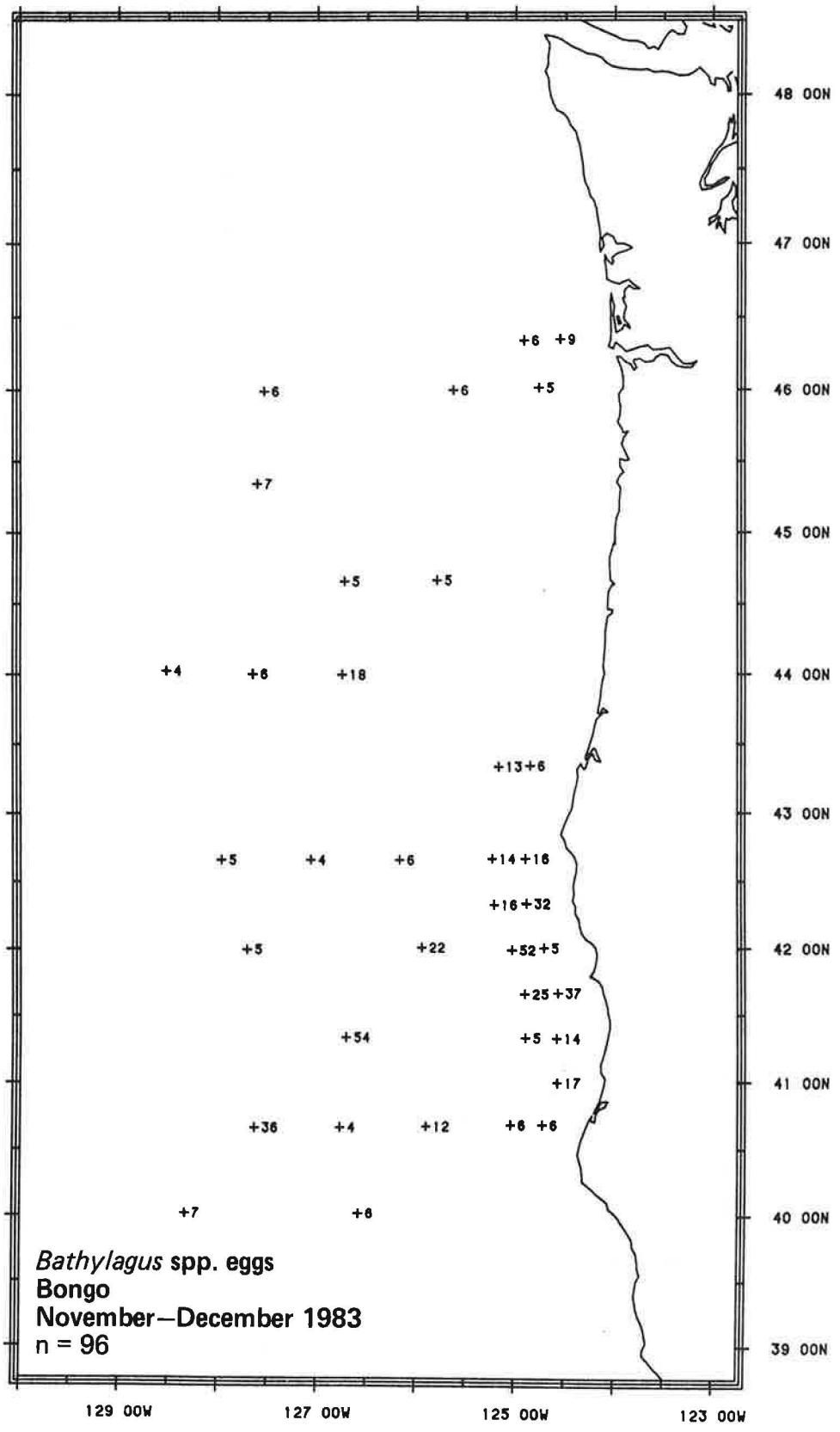

Figure 8 .--Distribution of eggs of Bathylagus spp. from bongo tows during cruise 1MF83, November-December 1983. Abundance expressed as numbers per 10 m^2.

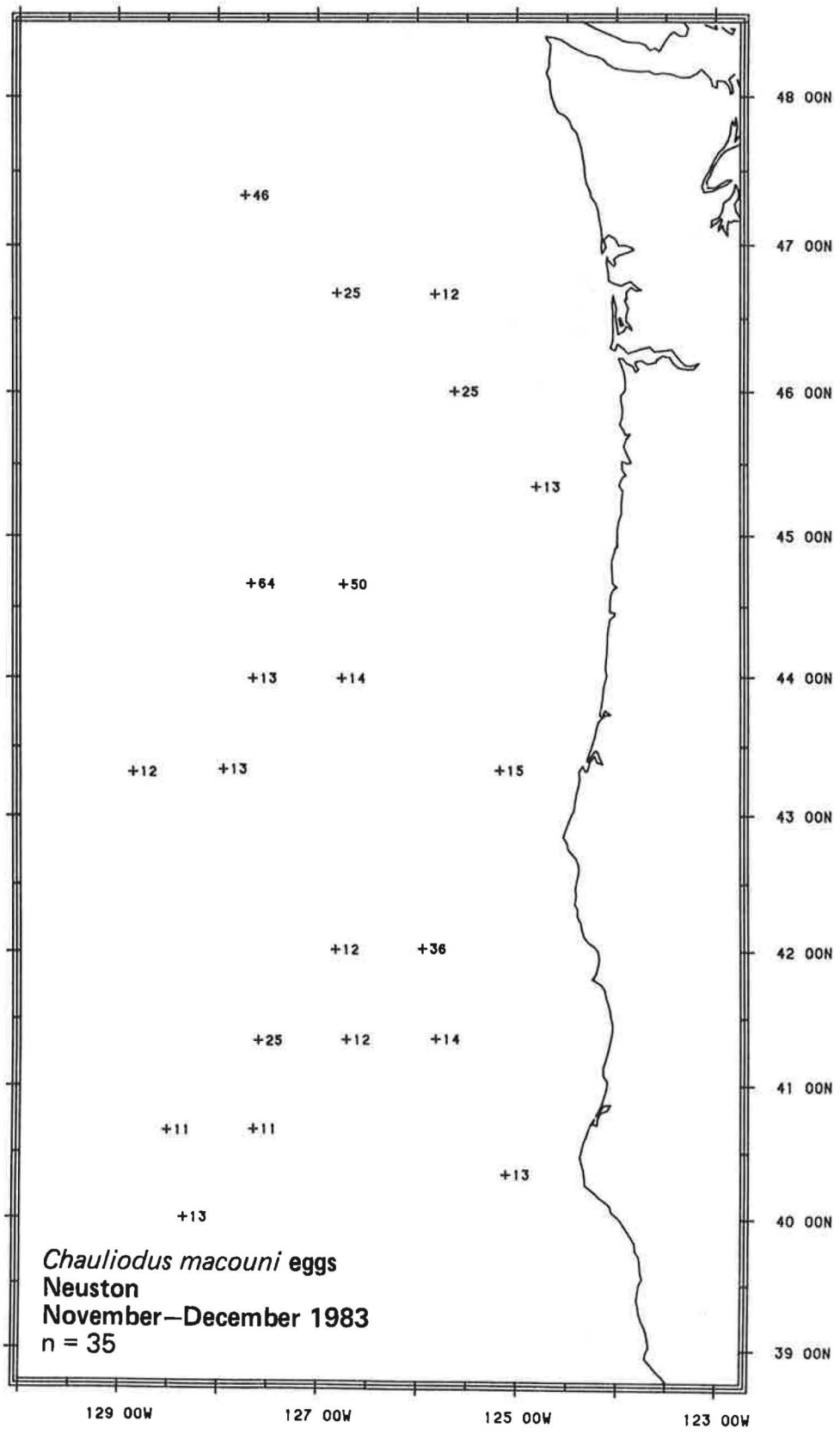

Figure 9 .--Distribution of eggs of Chauliodus macouni from neuston tows during cruise 1MF83, November-December 1983. Abundance expressed as numbers per 1000 m^3.

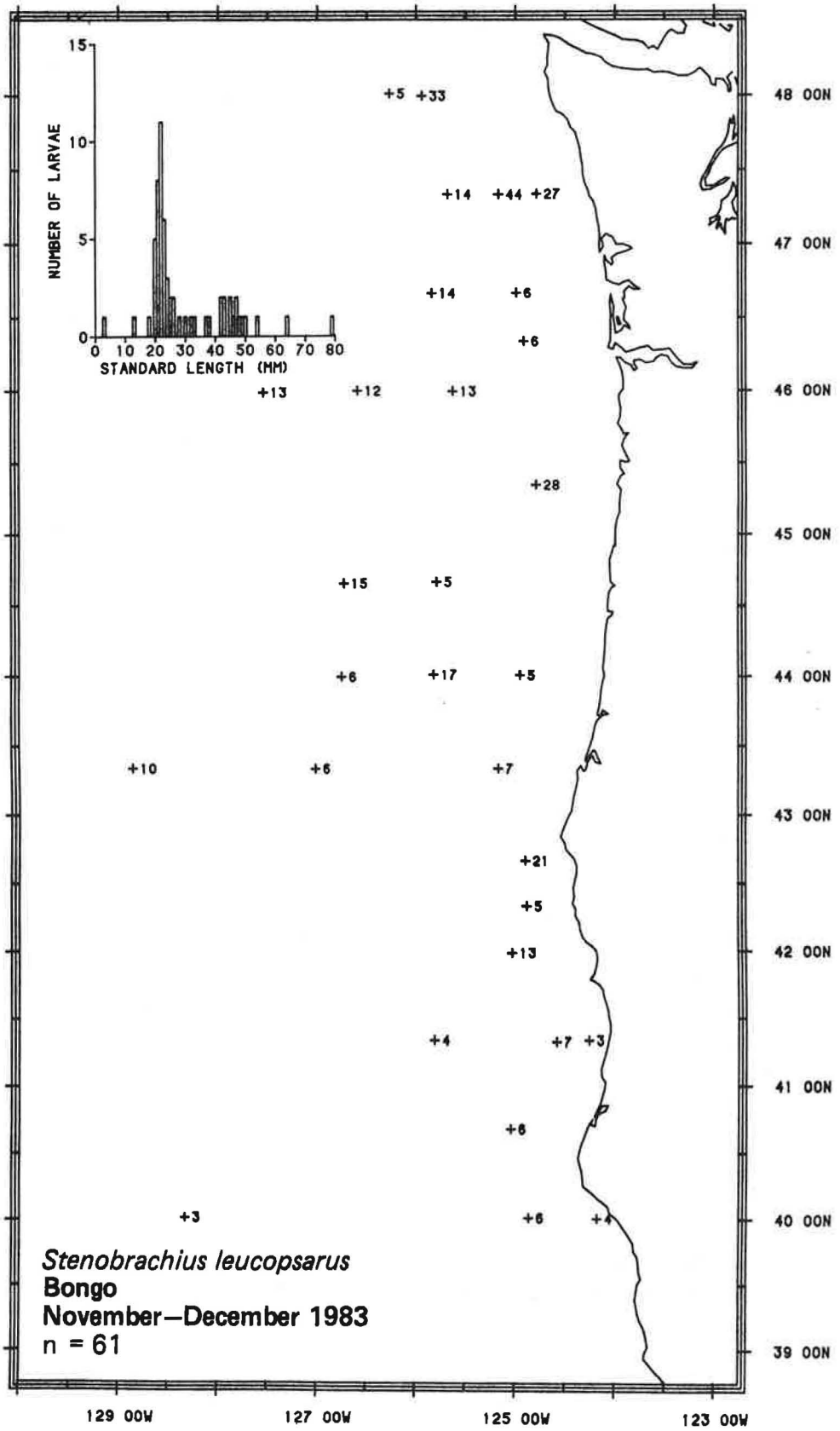

Figure 10.--Distribution and lengths of Stenobrachius leucopsarus larvae and juveniles from bongo tows during cruise 1MF83, November-December 1983. Abundance expressed as numbers per 10 m^2.

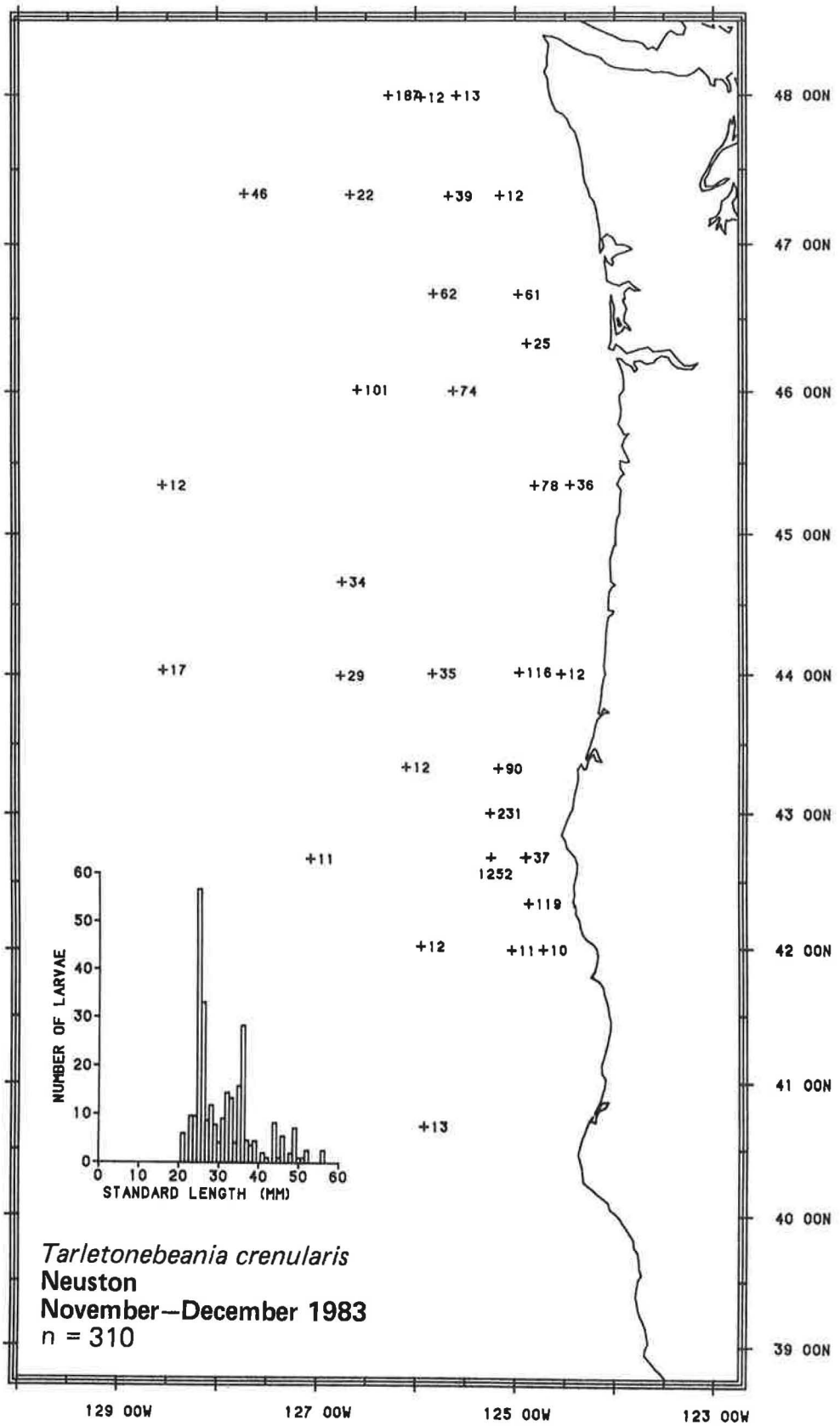

Figure 11.--Distribution and lengths of Tarletonbeania crenularis larvae and juveniles from neuston tows during cruise 1MF83, November-December 1983. Abundance expressed as numbers per 1000 m^3.

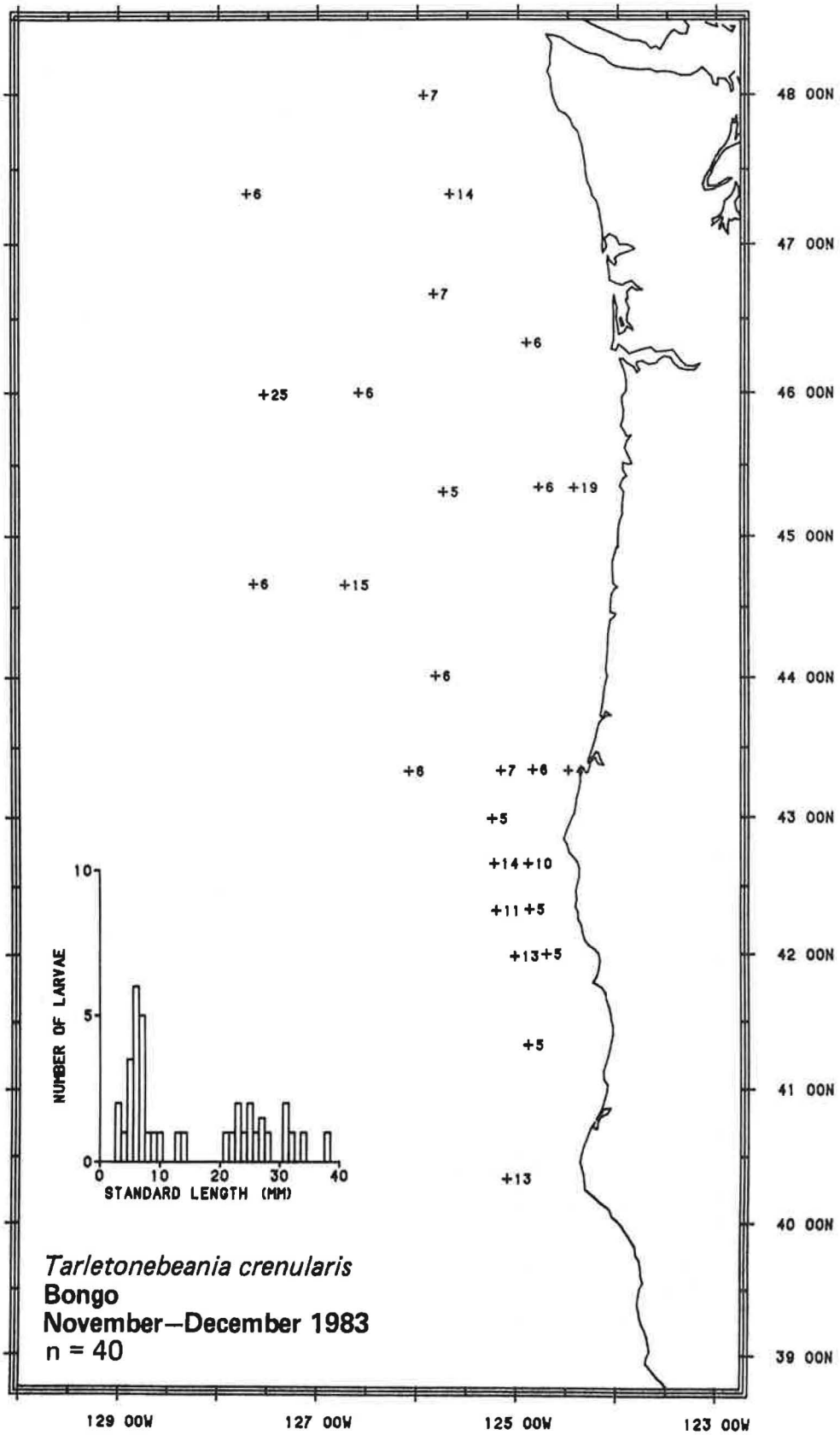

Figure 12.--Distribution and lengths of Tarletonbeania crenularis larvae and juveniles from bongo tows during cruise 1MF83, November-December 1983. Abundance expressed as numbers per 10 m^2.

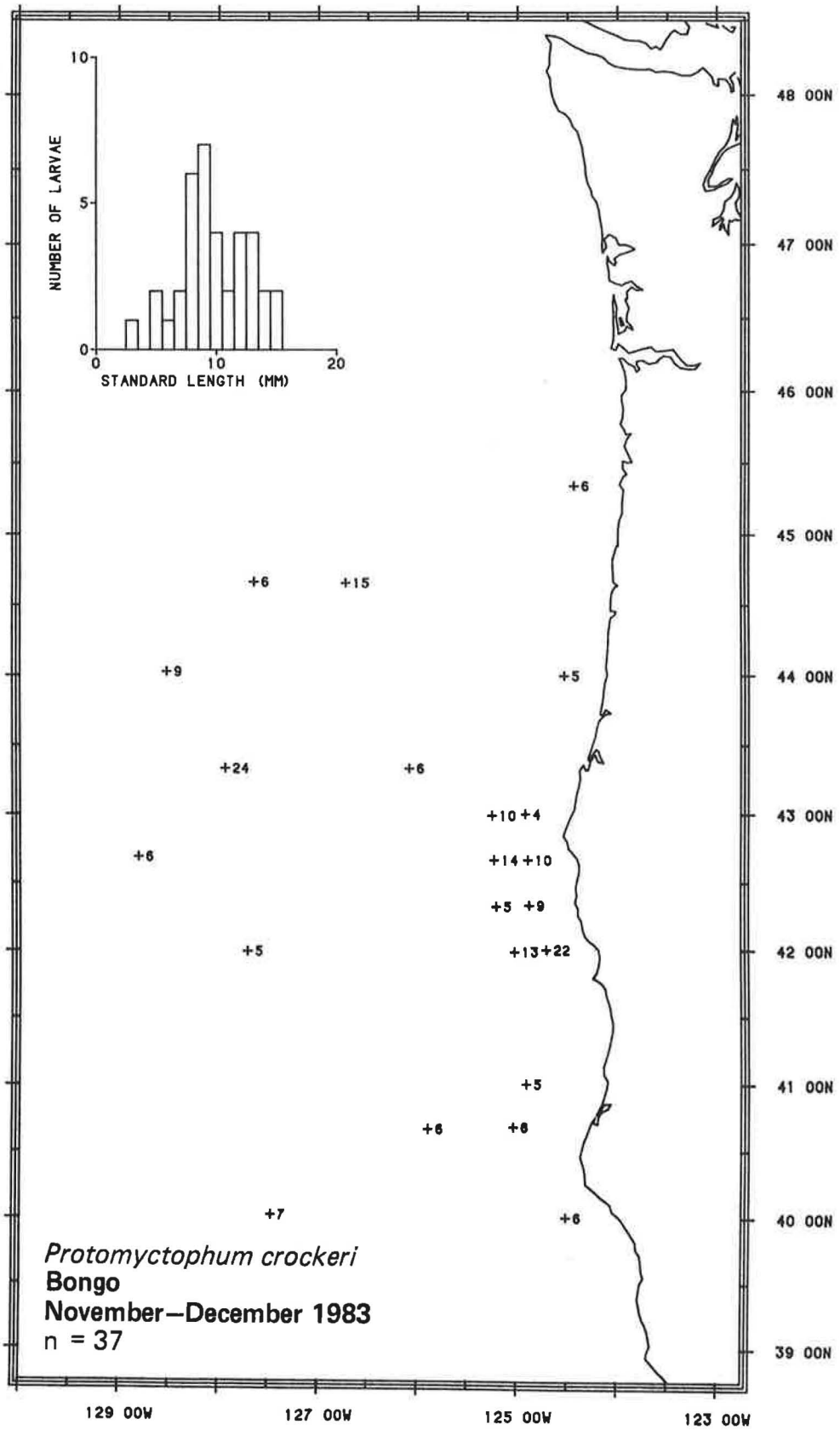

Figure 13.--Distribution and lengths of Protomyctophum crockeri larvae from bongo tows during cruise 1MF83, November-December 1983. Abundance expressed as numbers per 10 m^2.

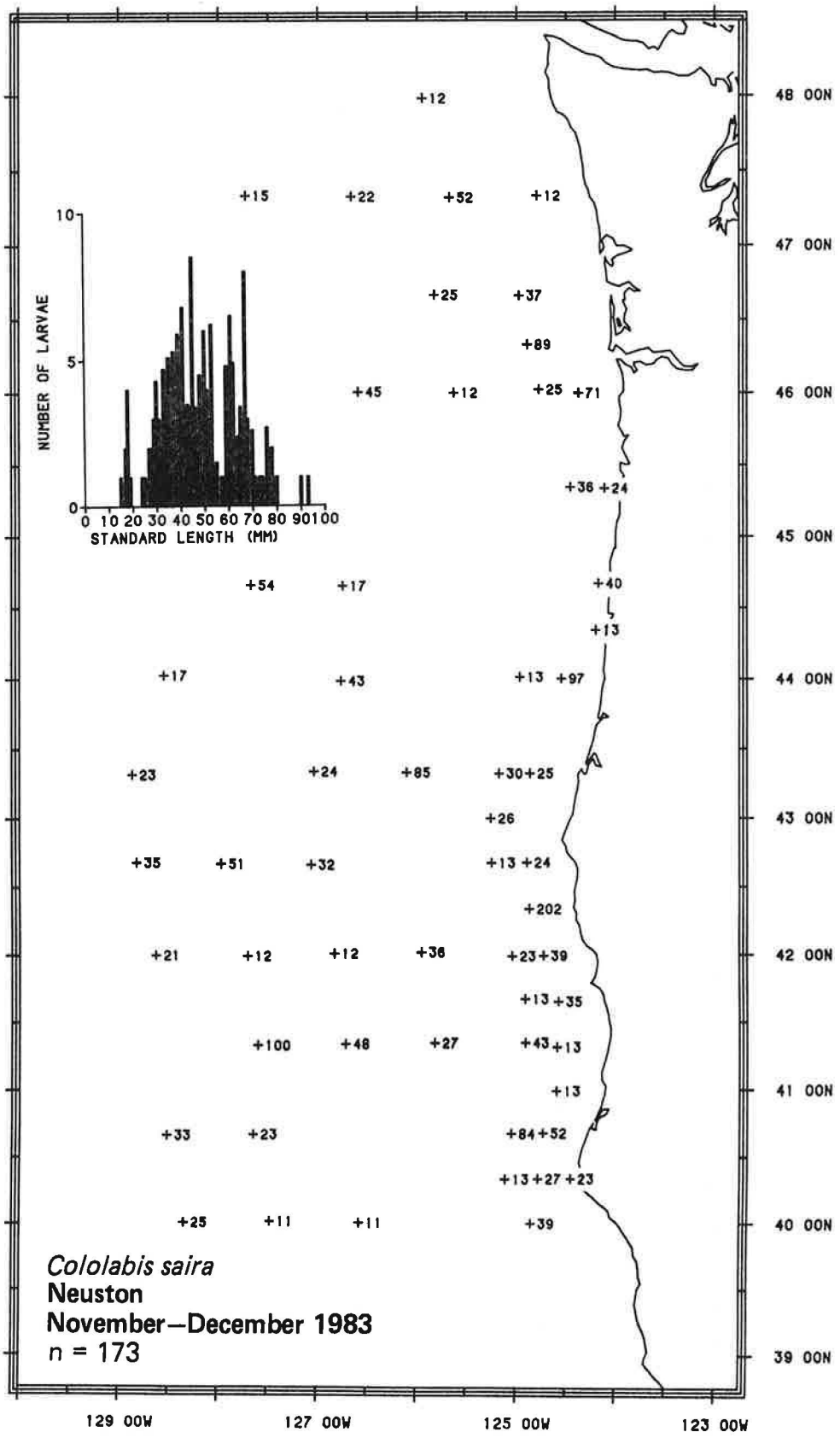

Figure 14.--Distribution and lengths of Cololabis saira larvae and juveniles from neuston tows during cruise 1MF83, November-December 1983. Abundance expressed as numbers per 1000 m^3.

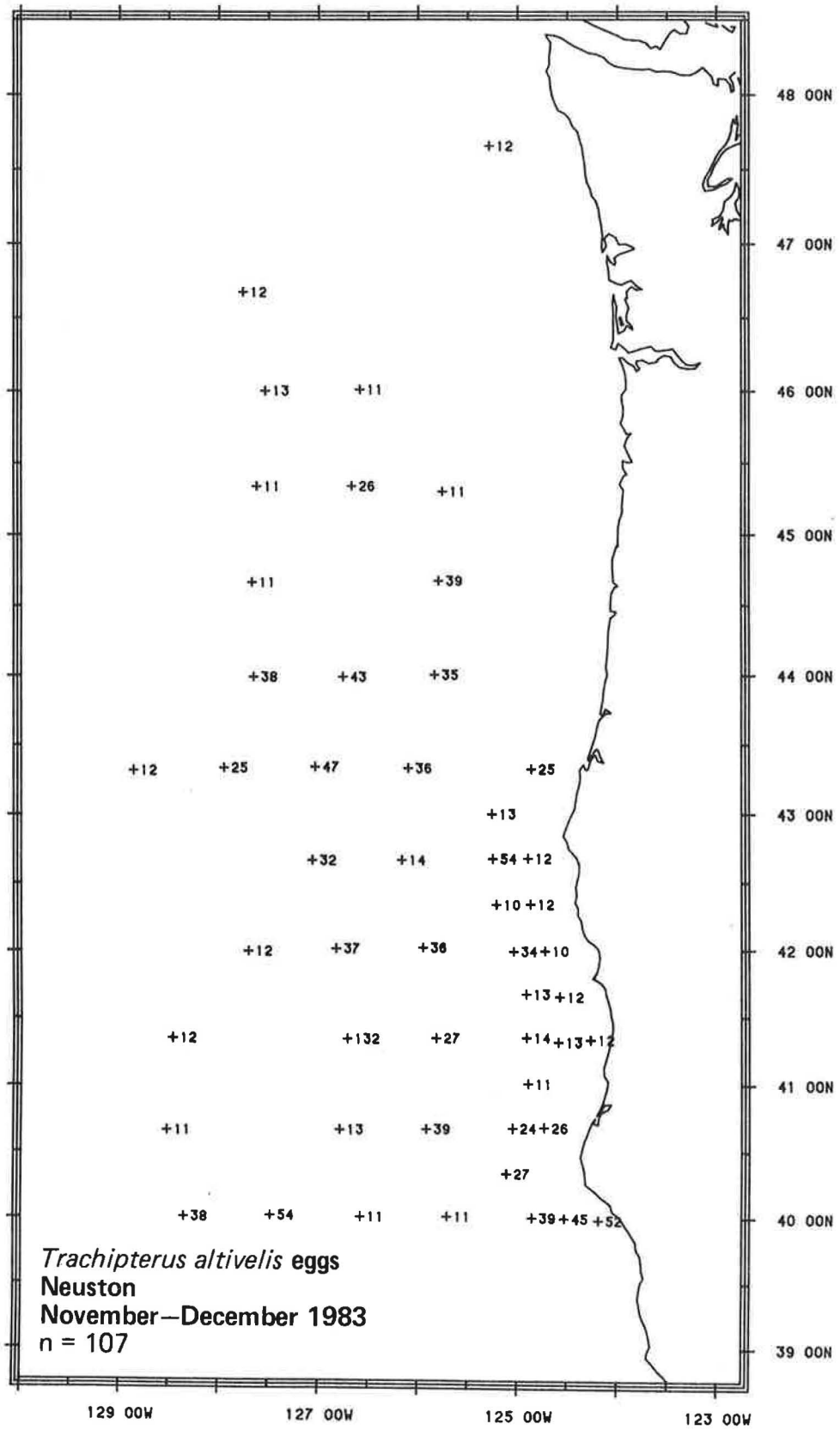

Figure 15.--Distribution of eggs of Trachipterus altivelis from neuston tows during cruise 1MF83, November-December 1983. Abundance expressed as numbers per 1000 m^3.

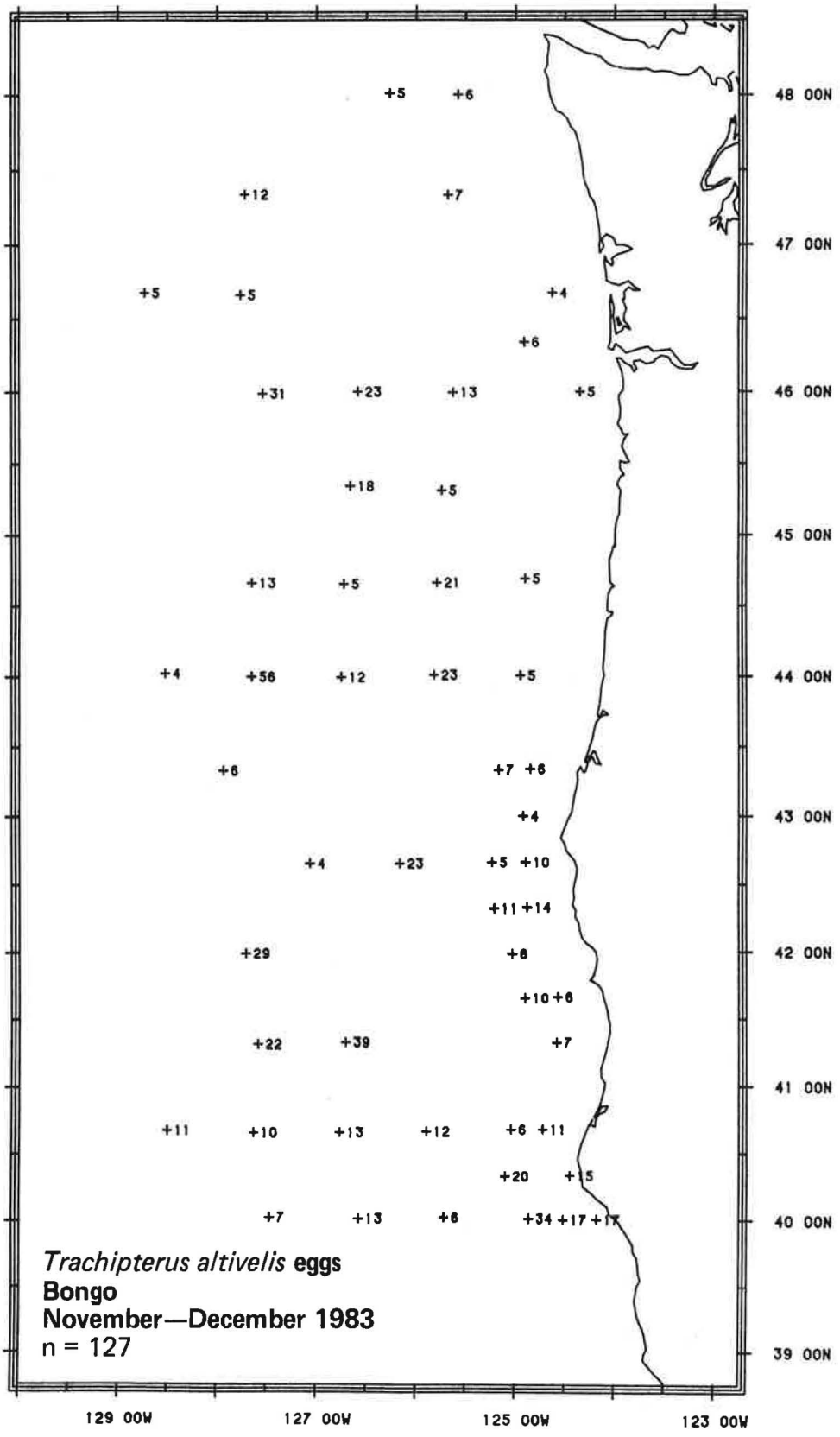

Figure 16.--Distribution of eggs of Trachipterus altivelis from bongo tows during cruise 1MF83, November-December 1983. Abundance expressed as numbers per 10 m^2.

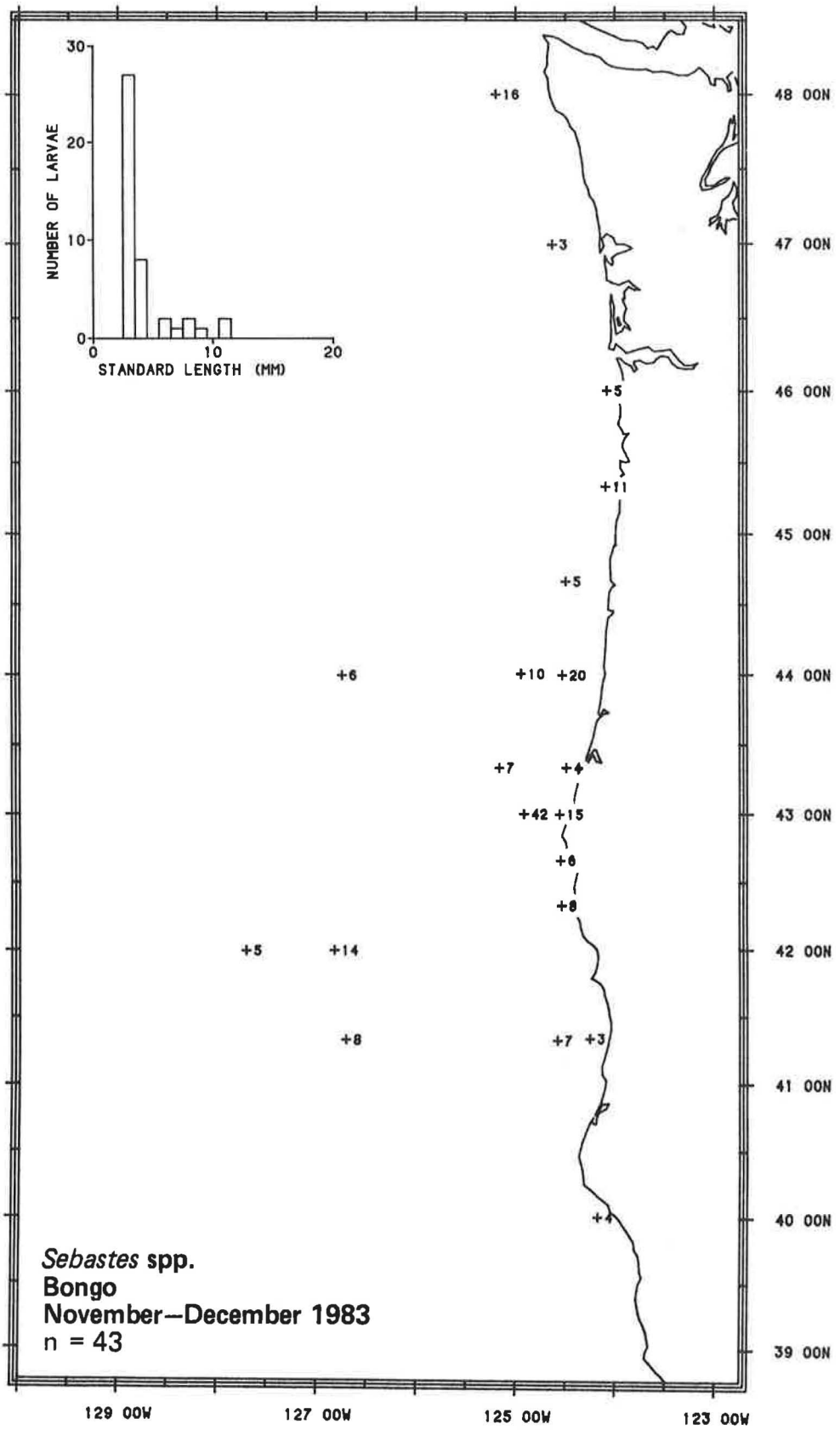

Figure 17.--Distribution and lengths of Sebastes spp. larvae from bongo tows during cruise 1MF83, November-December 1983. Abundance expressed as numbers per 10 m^2.

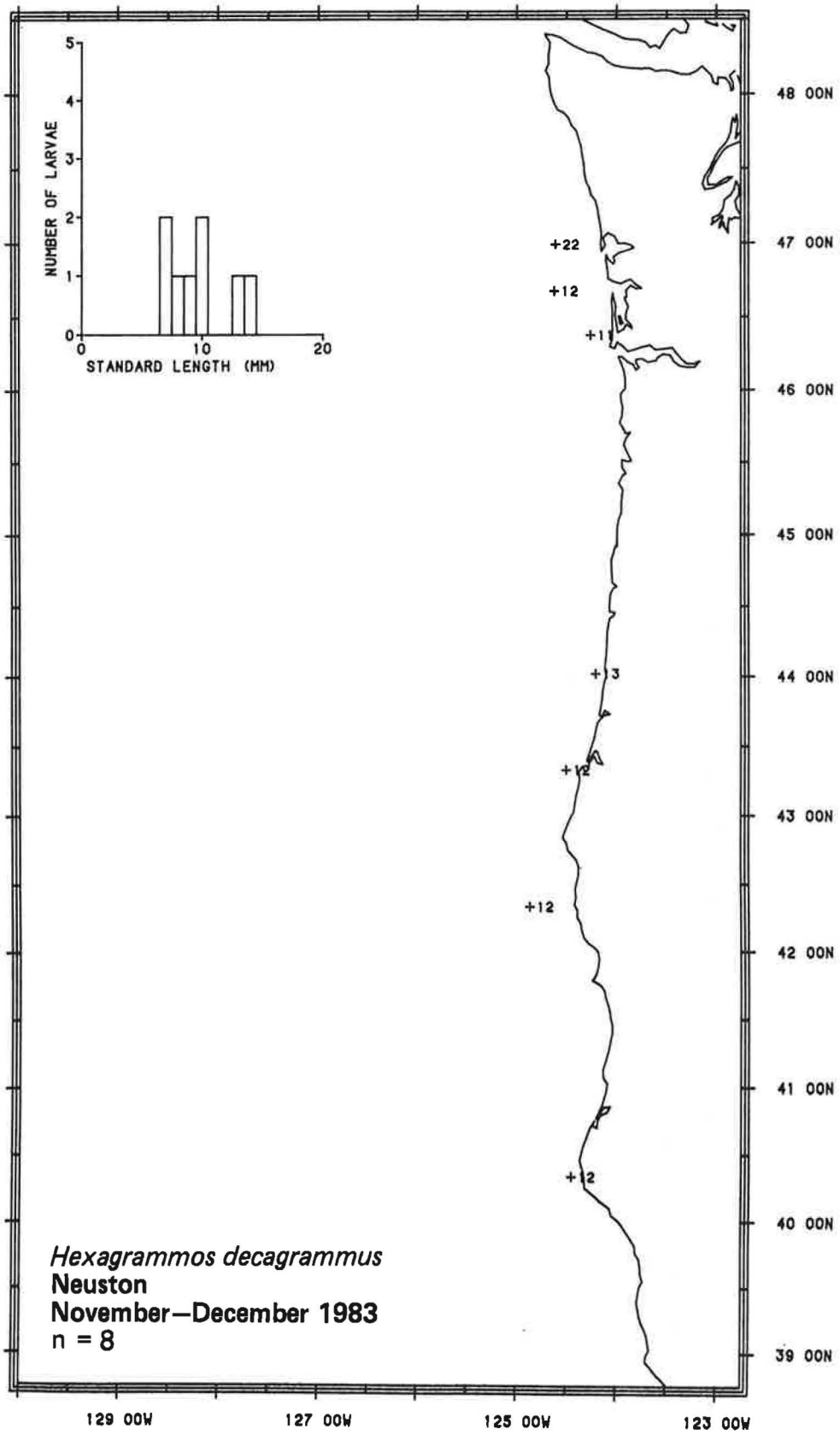

Figure 18.--Distribution and lengths of Hexagrammos decagrammus larvae from neuston tows during cruise 1MF83, November-December 1983. Abundance expressed as numbers per 1000 m^3.

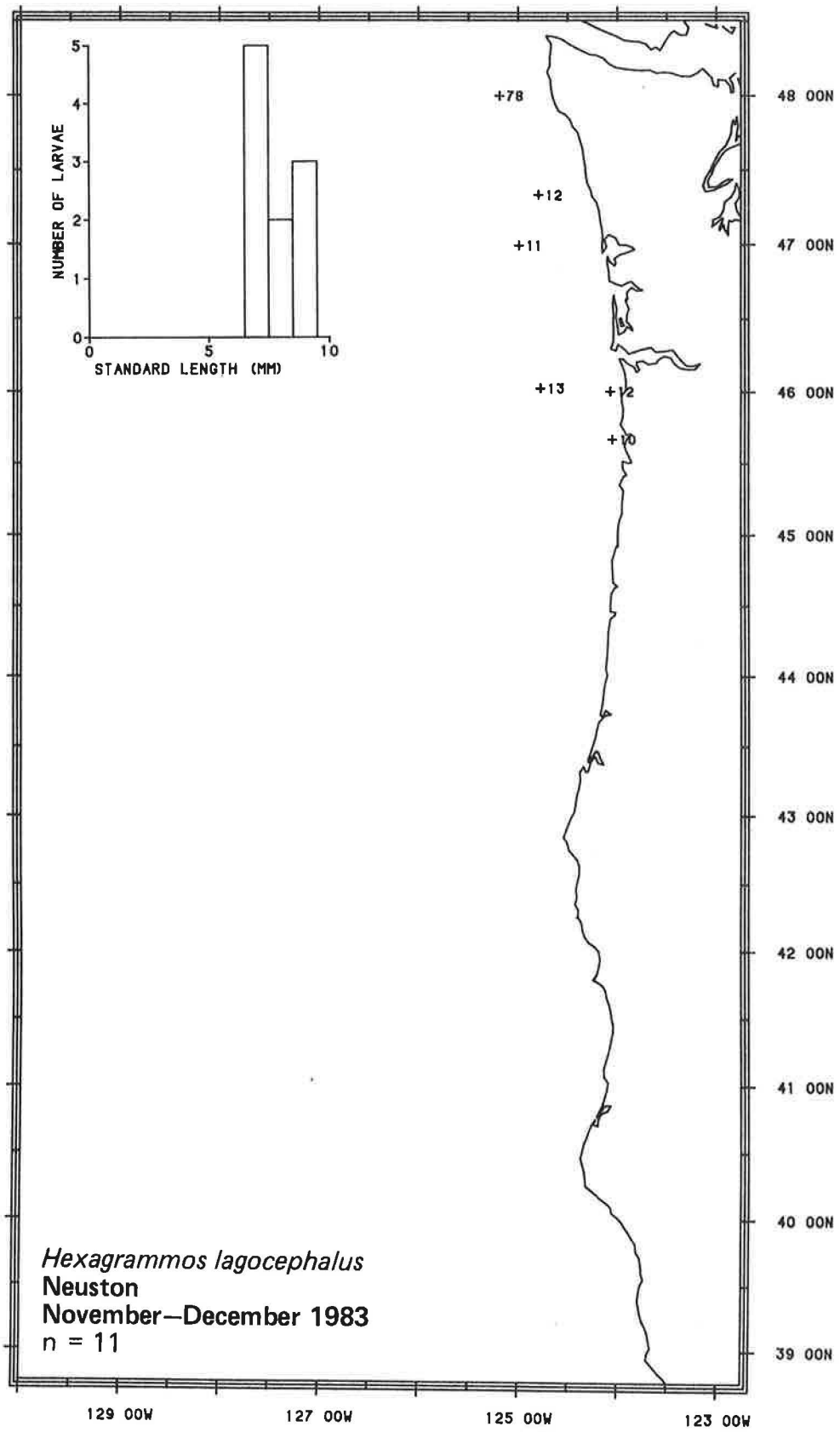

Figure 19.--Distribution and lengths of Hexagrammos lagocephalus larvae from neuston tows during the cruise 1MF83, November-December 1983. Abundance expressed as numbers per 1000 m^3.

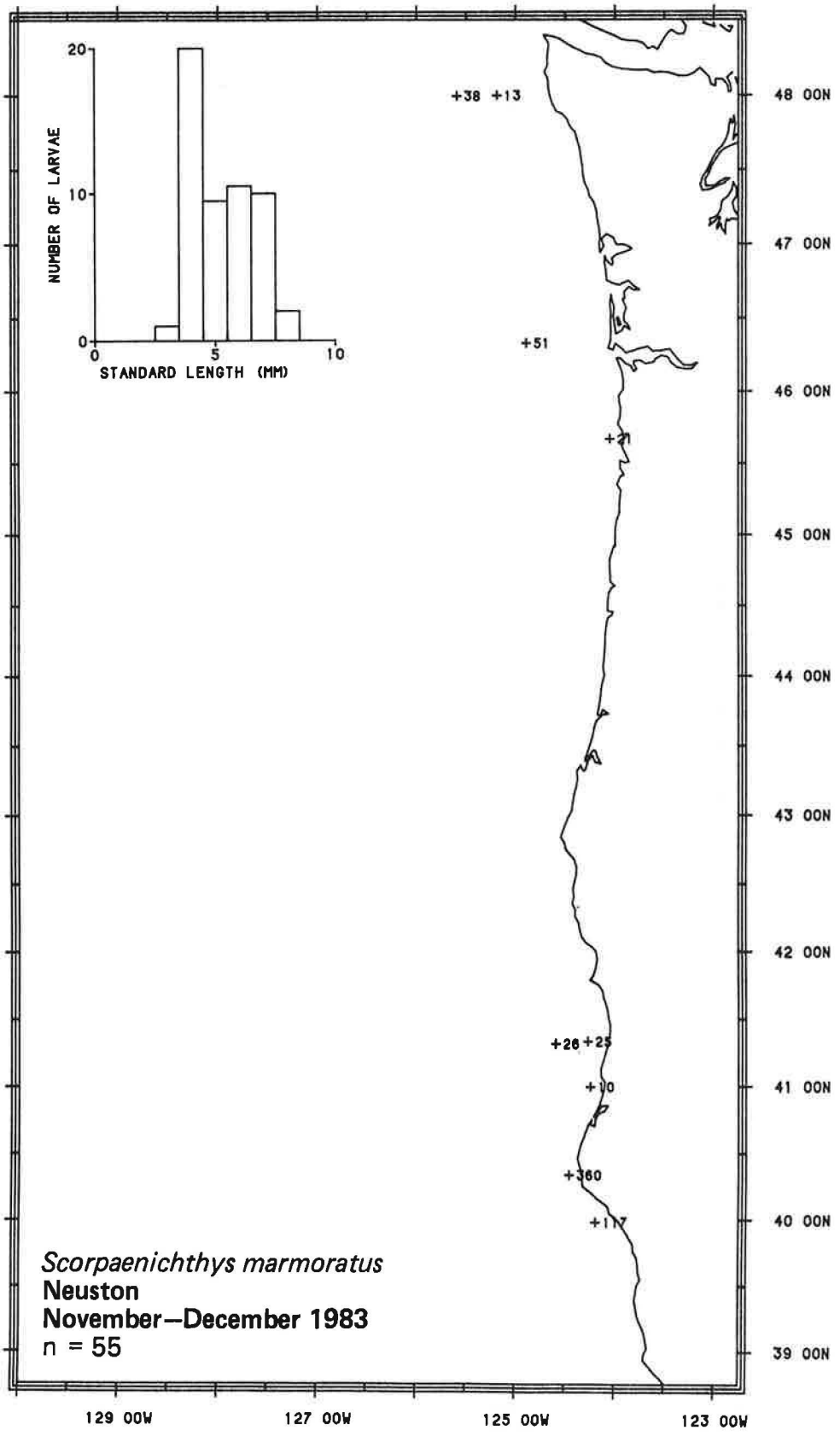

Figure 20.--Distribution and lengths of Scorpaenichthys marmoratus larvae from neuston tows during cruise 1MF83, November-December 1983. Abundance expressed as numbers per 1000 m^3.

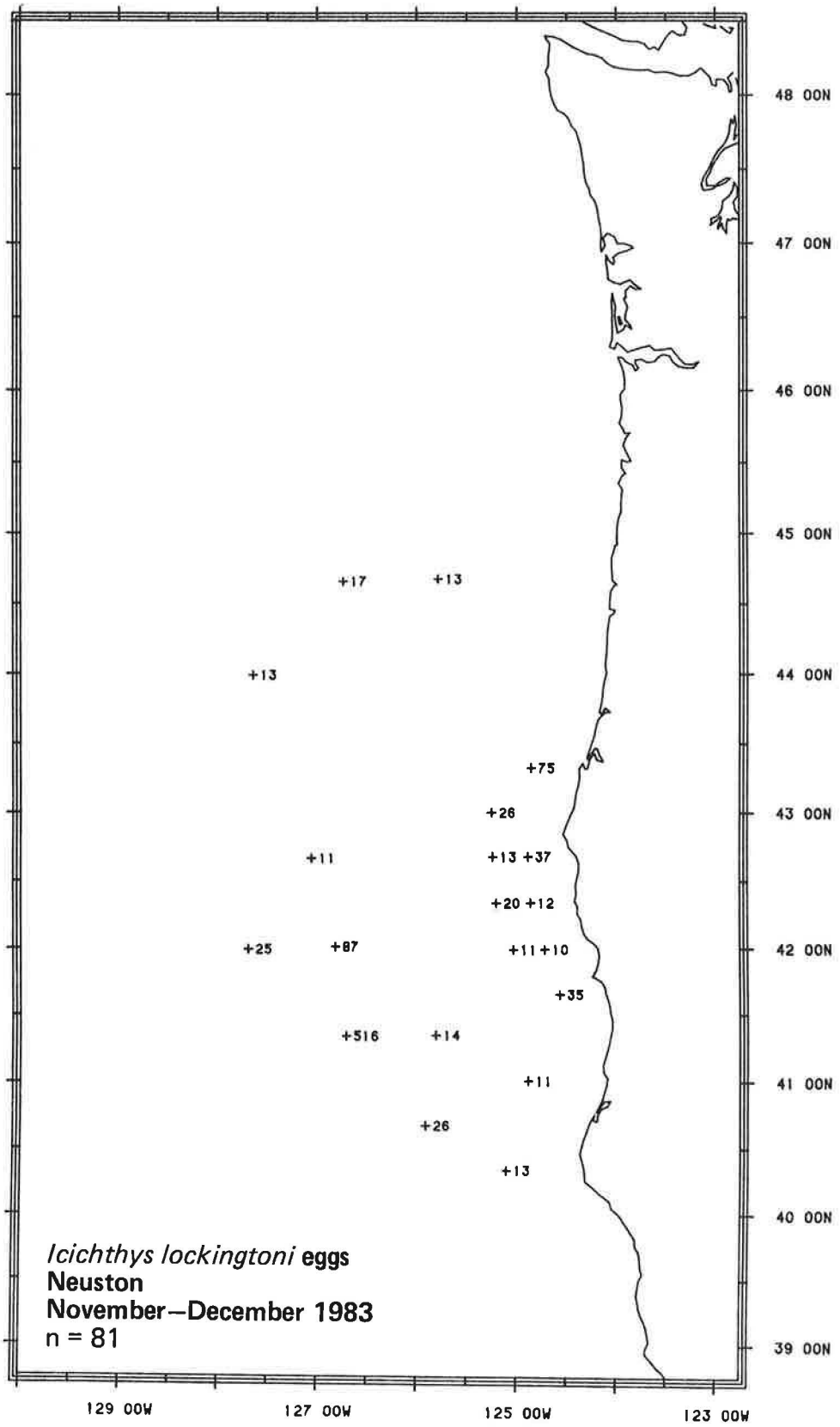

Figure 21.--Distribution of eggs of Icichthys lockington from neuston tows during cruise 1MF83, November-December 1983. Abundance expressed as numbers per 1000 m^3.

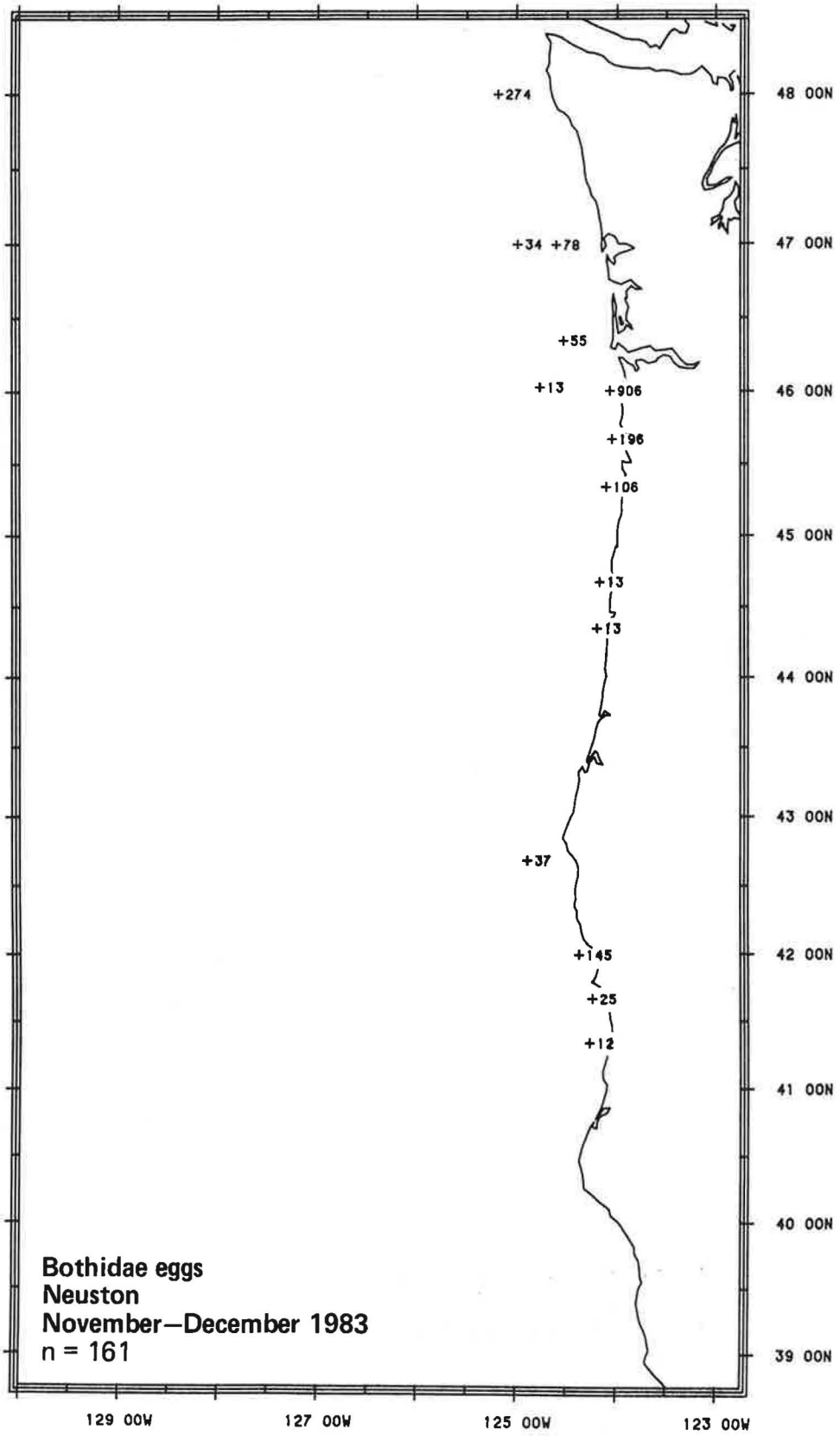

Figure 22.--Distribution of Bothidae eggs from neuston tows during cruise 1MF83, November-December 1983. Abundance expressed as numbers per 1000 m.

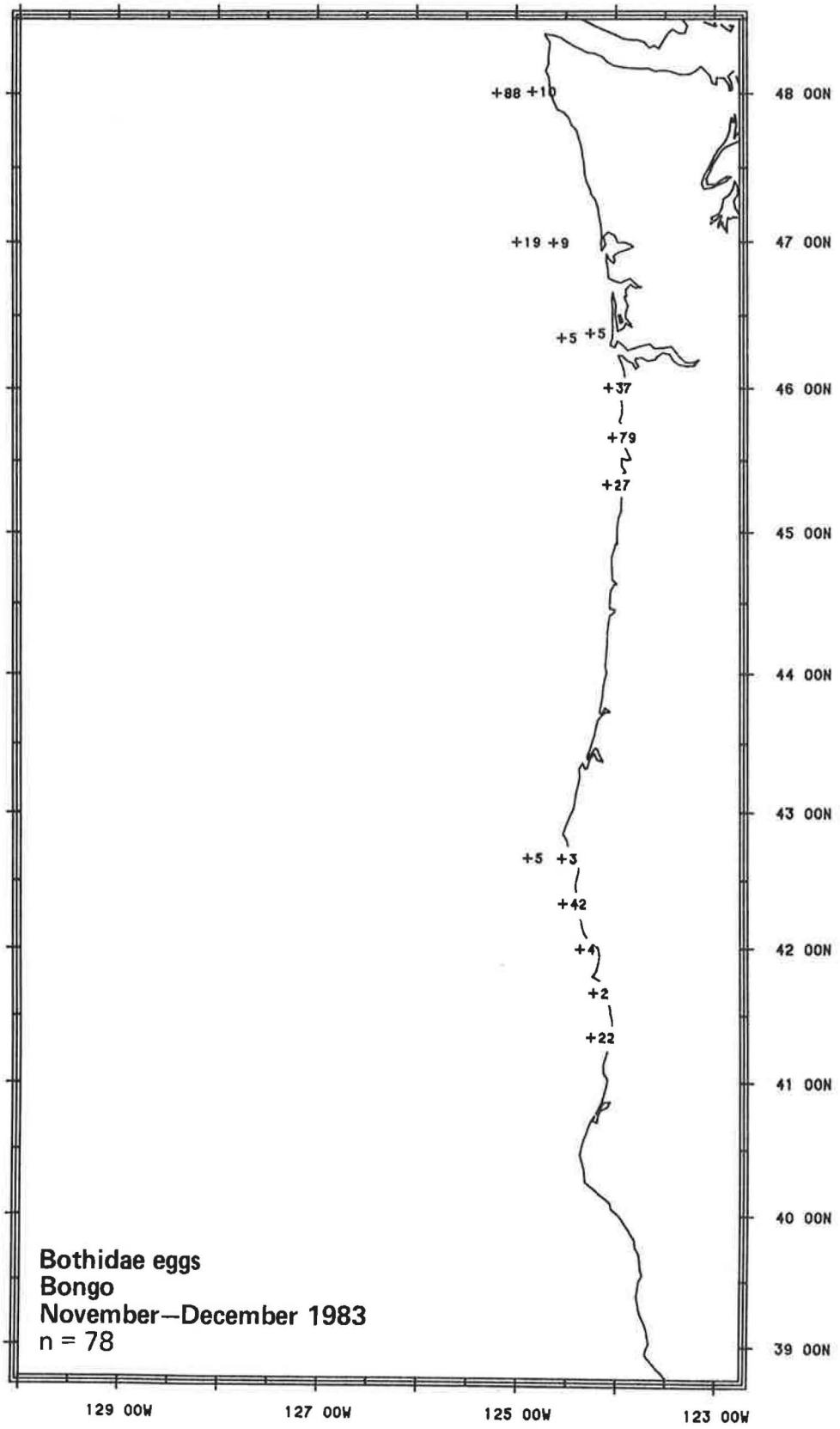

Figure 23.--Distribution of Bothidae eggs from bongo tows during cruise 1MF83, November-December 1983. Abundance expressed as numbers per 10 m^2.

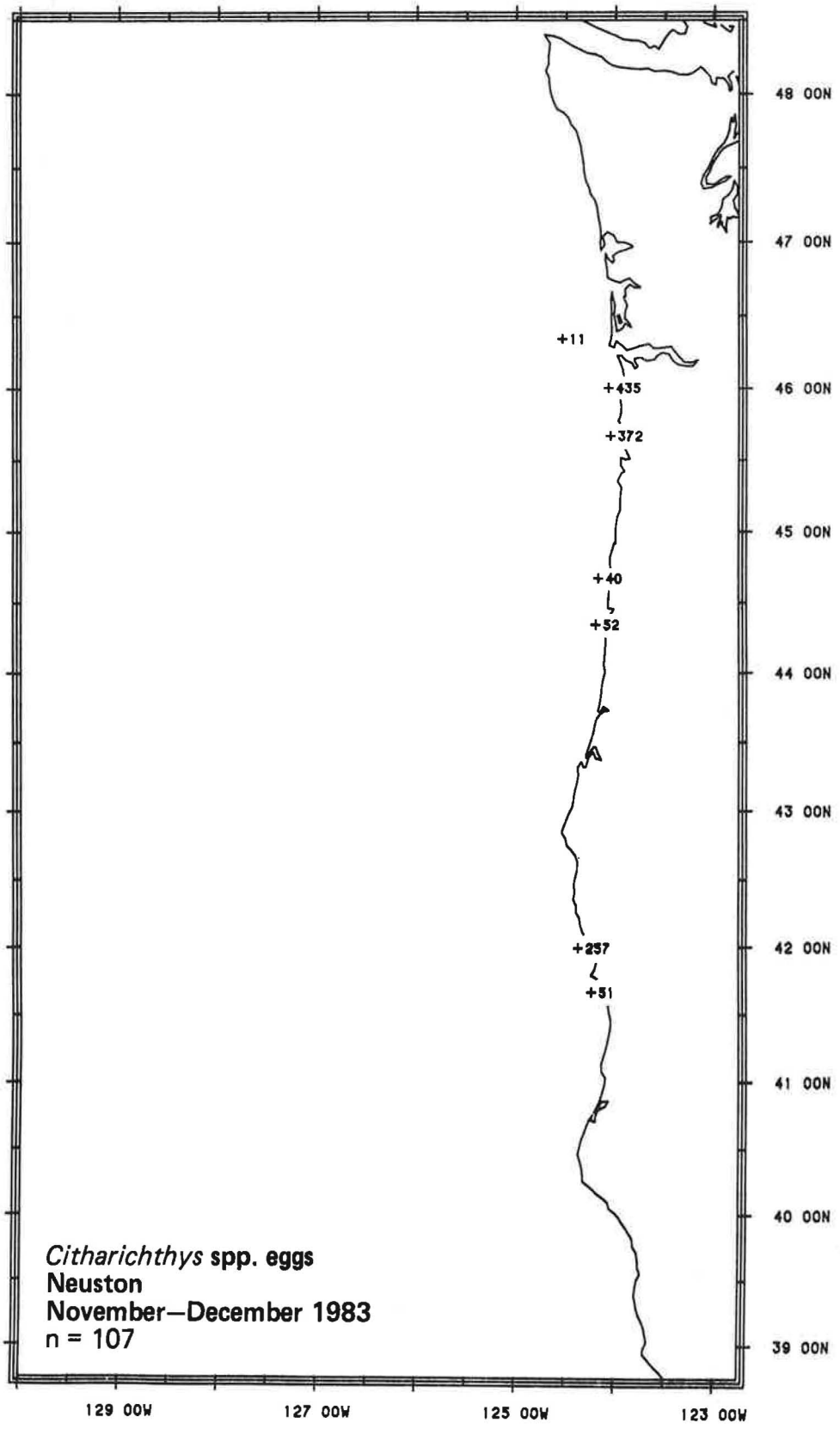

Figure 24.--Distribution of eggs of Citharichthys spp. from neuston tows during cruise 1MF83, November-December 1983. Abundance expressed as numbers per 1000 m^3.

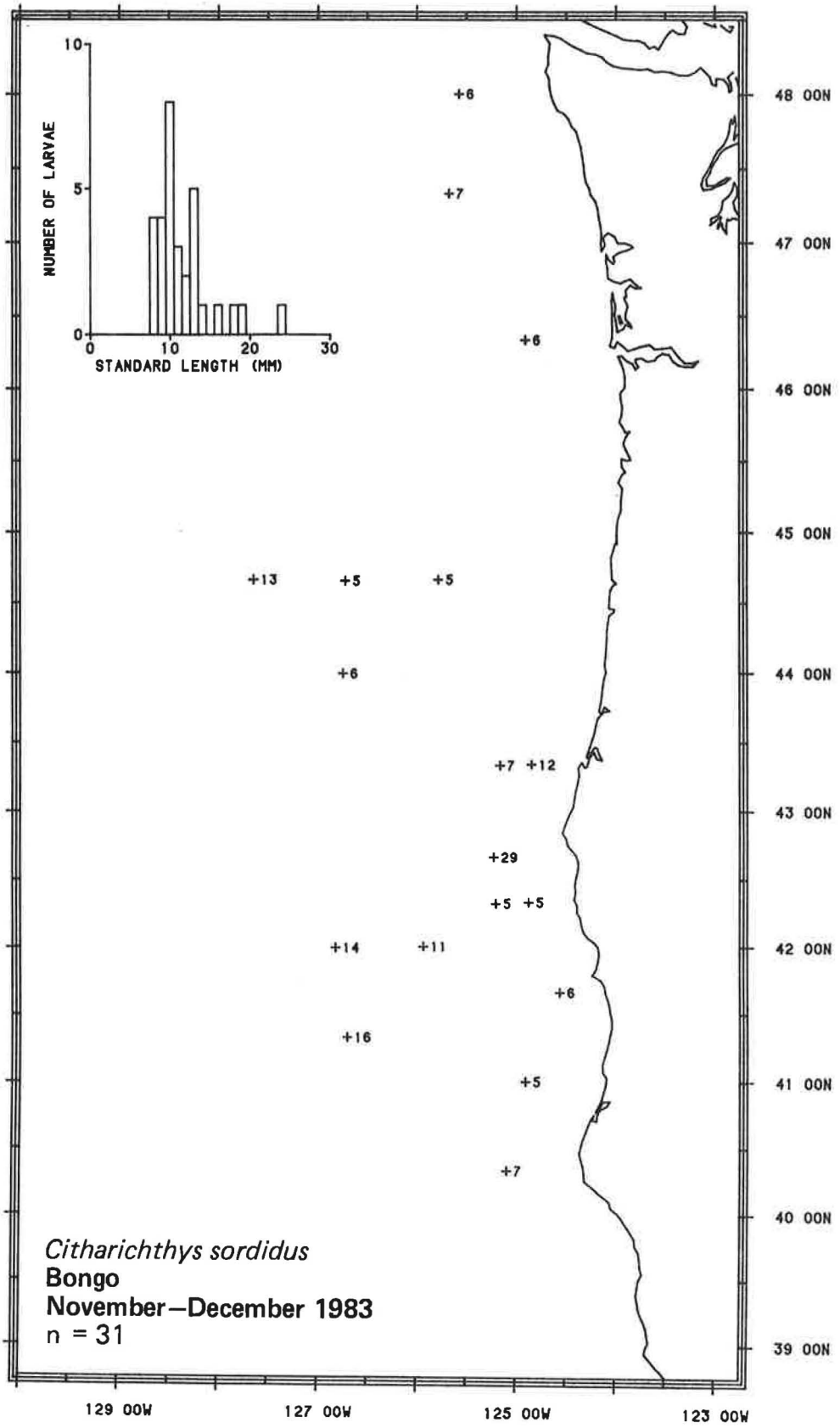

Figure 25.--Distribution and lengths of Citharichthys sordidus larvae from bongo tows during cruise 1MF83, November-December 1983. Abundance expressed as numbers per 10 m^2.

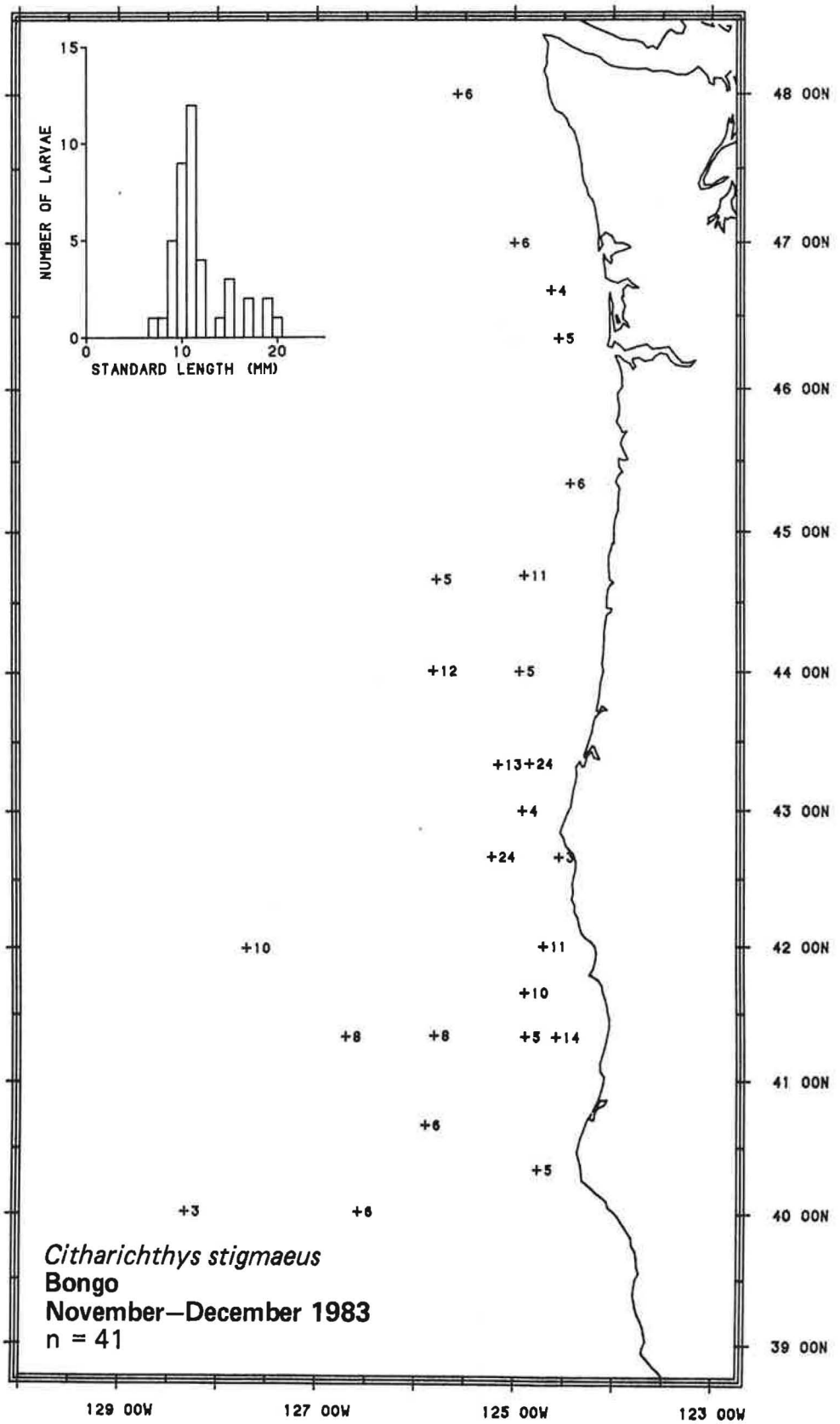

Figure 26.--Distribution and lengths of Citharichthys stigmaeus larvae from bongo tows during cruise 1MF83, November-December 1983. Abundance expressed as numbers per 10 m^2.

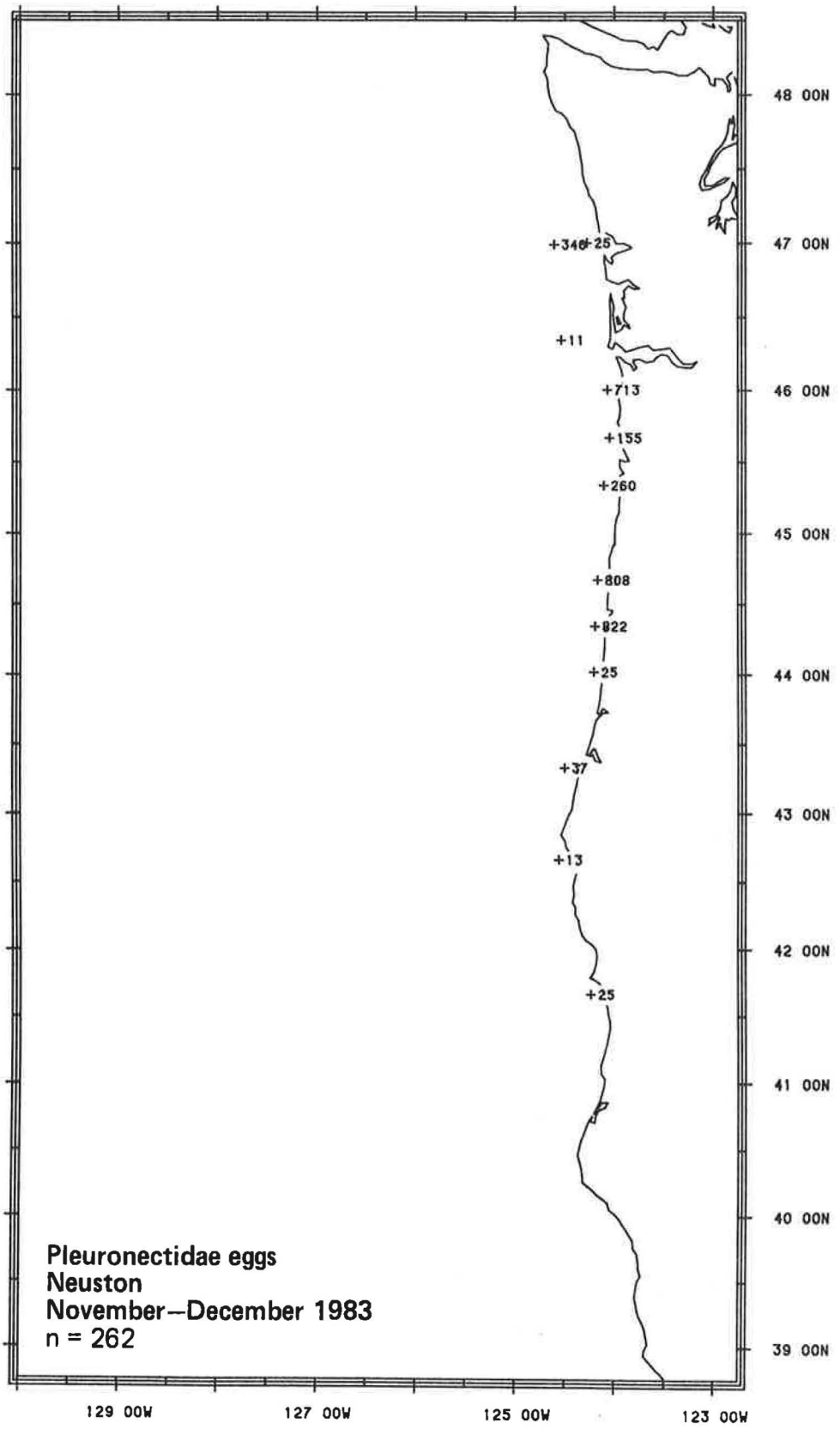

Figure 27.--Distribution of Pleuronectidae eggs from neuston tows during cruise 1MF83, November-December 1983. Abundance expressed as numbers per 1000 m^3.

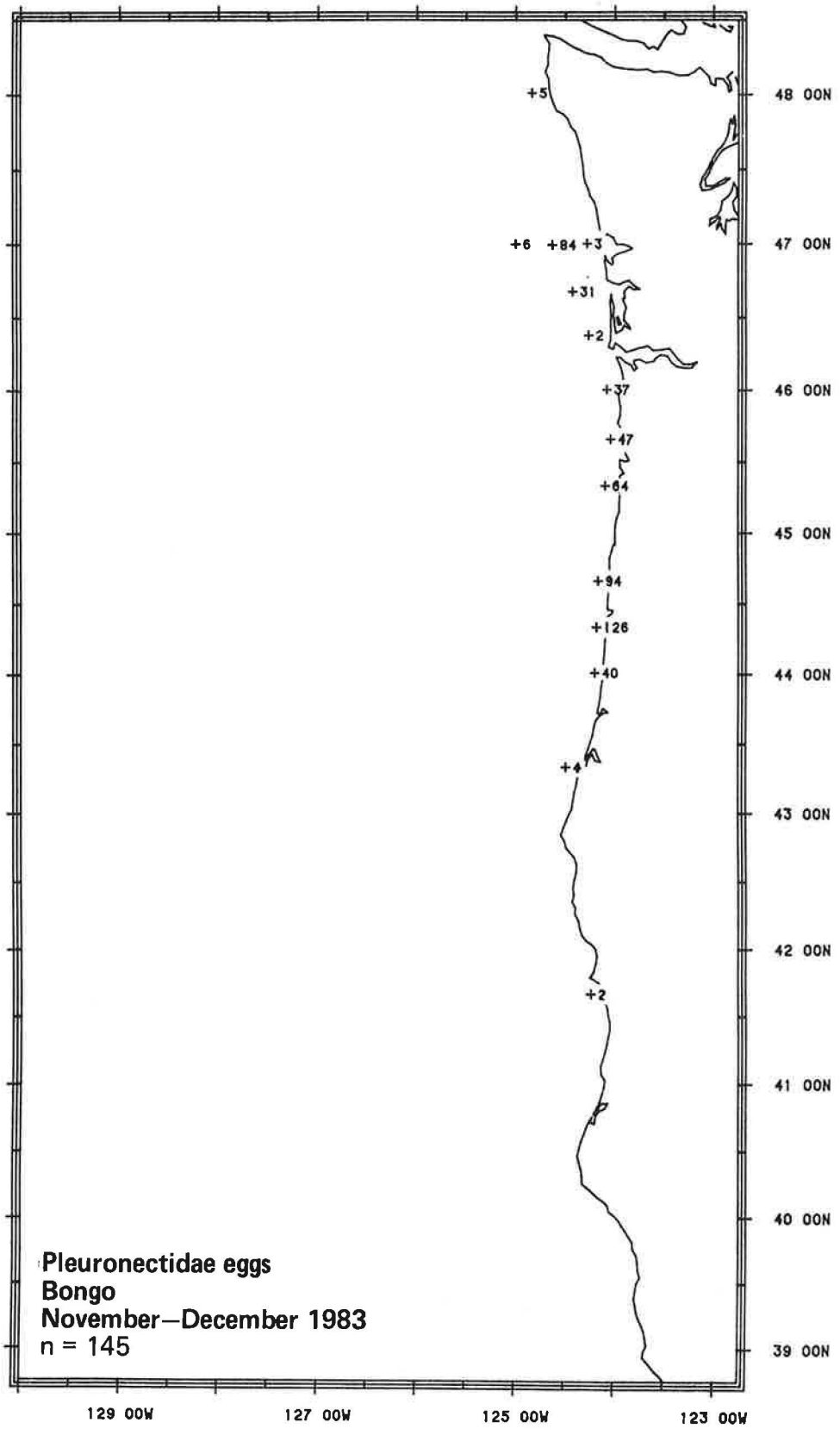

Figure 28.--Distribution of Pleuronectidae eggs from bongo tows during cruise 1MF83, November-December 1983. Abundance expressed as numbers per 10 m^2.