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Vertical Distribution and Abundances of Zooplankton and Ichthyoplankton on North-Eastern Georges Bank, October 1978

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VERTICAL DISTRIBUTION AND ABUNDANCES OF ZOOPLANKTON AND ICHTHYOPLANKTON ON NORTH-EASTERN GEORGES BANK, OCTOBER 1978

by

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ABSTRACT

Sameoto, D.D. and M.K. Lewis. 1980. Vertical distribution and abundance of zooplankton and ichthyoplankton on north-eastern Georges Bank, October 1978. Can. Tech. Rep. Fish. Aquat. Sci. 974: v + 62 p.

Sampling at various depths with the BIONESS opening and closing net showed copepods on the northeast end of Georges Bank to be concentrated in the top 20 m of water. The horizontal distribution of copepods, as indicated by numbers per m^2 on the different stations, was much less variable than their vertical distribution. The chaetognaths, the second most important component of the zooplankton next to copepods, had a more variable horizontal distribution than the copepods. An analysis of the length frequencies of the chaetognaths on each of the stations showed the population size distribution was tri-modal and the three sub-populations had different distributions over the study area.

Newly hatched *Clupea harengus* were collected on the eastern side of the study area. It was estimated from residual current data that the larvae were located about 3 to 4 days drift time from the spawning beds. The larvae were not abundant (a mean of 38 larvae per 100 m^2) and were located in the region with the highest concentration of large chaetognaths. It is suggested that the predominance of predatory chaetognaths may be an important factor in the low numbers of *C. harengus* larvae found.

RÉSUMÉ

Sameoto, D.D. and M.K. Lewis. 1980. Vertical distribution and abundance of zooplankton and ichthyoplankton on north-eastern Georges Bank, October 1978. Can. Tech. Rep. Fish. Aquat. Sci. 974: v + 62 p.

À la suite d'un échantillonnage effectué à diverses profondeurs avec le filet BIONESS qui peut s'ouvrir et se fermer, il a été démontré que, dans l'extrémité nord-est de Georges Bank, les copépodes étaient concentrés dans les 20 m d'eau supérieurs. La distribution horizontale des copépodes, soit le nombre de copépodes par m^2 dans les différentes stations, était beaucoup moins variable que leur distribution verticale. Les chaetognates, qui sont le second élément le plus important du zooplancton après les copépodes, présentaient une distribution horizontale plus variable que ceux-ci. Une analyse de fréquences des longueurs des chaotognates, effectuée en chacune des stations, a montré que les populations présentaient une distribution de tailles trimodale, et que les trois sous-populations présentaient des distributions differentes sur l'ensemble de la zone étudiée.

On a recueilli du côté est de la région étudiée des alevins nouvellement éclos de *Clupea harengus*. D'après les données sur les courants résiduels, on a estimé que les larves se situaient à une distance d'environ 3 à 4 jours dérive des frayères. Les larves n'étaient pas abondantes (en moyenne 38 larves par 100 m) et situées dans la région caractérisée par la plus forte concentration de chaetognates de grande taille. On suggère que la prédominance des chaetognates prédateurs explique dans une grande mesure le petit nombre de larves du *C. harengus* trouvé.

INTRODUCTION

The primary purpose of this study was to estimate the abundance of newly hatched *Clupea harengus* larvae on the northeast portion of Georges Bank in the region of the historical spawning grounds. The secondary aim was to observe the vertical distribution and abundance of zooplankton and ichthyoplankton simultaneously with acoustic and physical oceanographic parameters. The study was carried out in an area where the residual and tidal currents were being studied by physical oceanographers (Trites, 1979); therefore, combining the biological and physical studies on the same cruise provided a broader understanding of the environment of the larvae and zooplankton.

METHODS

BIOLOGICAL SAMPLING

All the biological sampling was done with the BIONESS (Sameoto et al., 1980) fitted with ten 1 m^2 mouth-opening nets made of 243 μm nitex monofilament cloth. The BIONESS was opened and closed on command at the different depths of interest. It was towed at a speed of 3 knots as it was slowly lowered (about a metre per minute) along an oblique path to the desired depths. The samples were preserved in a 5% buffered formalin sea-water solution.

The macrozooplankton (≥1 cm in length) were all removed from each sample then identified, counted, and wet-weighed. The remaining part of the sample was vacuumed to remove the free water and wet-weighed. This

part of the sample was then split a number of times using a Motoda splitter and the species in one of the split portions identified and counted. Identification of the split portions was done by MacLaren Marex Inc. of Dartmouth, Nova Scotia.

The total number and weight of the chaetognaths in each sample were determined. The body lengths of a random subsample of animals from each sample were measured to the nearest millimetre. Most chaetognaths were identified only to genus, but the subsamples were identified to species when possible.

All fish larvae were removed from the entire sample, identified, counted, and their total length measurements made to the nearest millimetre.

The total numbers of animals of the different species in each sample were converted to numbers per cubic metre or, in the case of the less abundant species, numbers per 100 m^3. This was done using the flowmeter data during each tow. The numbers per square metre for each station were calculated by integrating the numbers per cubic metre at the different depths for the water column sampled.

ACOUSTIC EQUIPMENT

The acoustic scattering layers were detected using a Simrad Scientific Sounder EK 120 kHz. The reader is referred to Sameoto (1980) for complete details of the acoustic methods. Echograms for all the tows were recorded at fixed sounder settings as follows:

Pulse length	1 ms
Pulse rate	48/min
Beam width	9° (between 3 dB points)
Bandwidth	9.9 kHz
Transmitter	1/1 (91 dB/1 μbar/W ref. 1 m)
Recorder gain	8 to 10
Discriminator	4
Range	0 to 250 m

SAMPLING STATIONS

The stations (Fig. 1) were concentrated on the northeast side of Georges Bank, since this was the region on which the historical herring spawning beds were reported to be found. Stations were located off the bank to the north to detect any drift of herring larvae off the bank.

RESULTS

ZOOPLANKTON (≤1 cm in length)

The biomass of zooplankton, which was over 90% copepods, per cubic metre was quite variable with depth on the daytime stations, but less variable on stations sampled at night (Fig. 2 and Table 1) when the biomass of zooplankton was concentrated in the upper 20 m.

The biomass of zooplankton per square metre (Table 2) was highest on stations 5 and 6. The numbers of copepods per square metre on the stations was quite similar (Table 2) except for stations 1 and 5 which had about two to three times as many copepods as the other bank stations. The station 9, which was off the bank in 278 m of water, had the lowest number of copepods per square metre.

Twenty-eight species of copepods were collected (Table 3) with the dominant species being: *Calanus finmarchicus*, *Centropages hamatus*, *C. typicus*, *Libidocera aestiva*, *Oncaea media*, *Paracalanus parvus*, and *Pseudocalanus minutus*. The vast majority of copepods was found in water above 20 m depth during both the day and night sampling periods. Abrupt changes in the numbers of copepods occurred at sharp thermoclines such as on stations 1, 2, 6 and 10 (Fig. 2).

MACROZOOPLANKTON (≥1 cm in length)

Two species of chaetognaths were identified, *Sagitta elegans* and *Eukronia hamata* with *S. elegans* being the most abundant species. The animals identified as *Sagitta* sp. (Table 1) were assumed to be *S. elegans* even though positive identification was impossible due to the condition of the specimens. This assumption was not unreasonable since no other species of *Sagitta* other than *S. elegans* were identified.

The biomass and numbers of the chaetognaths per cubic metre were greatest at depths between 20 and 50 m on most stations (Table 1, Fig. 2). The exceptions were stations 2, 6, 9, and 10, which were sampled during darkness or early morning; on these stations the animals were near the surface. These data suggested that the chaetognaths underwent a diel vertical migration up into the copepod-rich waters at night.

The chaetognaths were not uniformly distributed over all the stations. The largest numbers, up to 7459 per square metre, occurred on the eastern end of the bank on stations 11 and 12, and the lowest numbers on stations on the northern side of the bank and station 9 (Table 2). The numbers per square metre on stations 1, 2, 4, 5, and 7 ranged between

approximately 1000 and 2000. The greatest biomass per square metre was found on stations 11 and 12 (Table 2).

The length frequency distributions of the chaetognaths (Fig. 3; Table 4) on the different stations demonstrated there to be three distinct size distributions or sub-populations, one with a median value estimated to be between 7 and 8 mm, the second sub-population with a median between 12 and 13 mm and the third sub-population with a median between 15 and 16 mm. The populations on stations 1, 2, 4, 5 and 10 were made up of sub-populations 1 and 2. Stations 6 and 8 had populations containing elements of all three sub-populations. The populations on stations 7 and 11 were made up of sub-populations 1 and 3, while the station 12 population was made up of only sub-population 3. These data plus the mean length and standard deviation data of the animals at each station (Table 5) indicated that the chaetognath population was not homogeniously mixed on the bank.

Five species of euphausiids were collected (Table 3) with the most abundant species being *Meganyctiphanes norvegica*(Table 1). All species showed a great deal of variability in their vertical distribution (Fig. 2) on the different stations.

The largest numbers of euphausiids per m^2 were found on station 6 and 9 off the bank (Table 2). The number of euphausiids on the bank was low, less than 4 per m^2 at the maximum, compared to 44 per m^2 on station 9.

The amphipods and decapods were the most numerous groups of other macrozooplankton but these were not a significant component of the total number or biomass of the samples (Table 1 and 2).

ICHTHYOPLANKTON

Twelve species of fish larvae were collected during this study, (Table 3) but only three species were common, *Merluccius bilinearis*, *Urophycis chuss* and *Scophthalmus aquosus*. The size frequency distribution of these species are given in Table 6 and Fig. 4. There was no consistent pattern in the vertical distribution of the larvae with time or station (Fig. 2, Table 1). *M. bilinearis* numbers per m^3 tended to change abruptly at the thermocline. This change took the form of an increase on some stations (i.e. stations 1, 2, 4, 5, 10 and 11) but on stations 8 and 12, a decrease in the density occurred. The vertical profile of the density of *M. bilinearis* was similar to that of the copepod density on many of the stations.

The other fish larvae were not common enough to allow comparisons to be made with the temperature or copepod density profiles. There was no indication of a consistent change in the body lengths of *M. bilinearis* and *U. chuss* with sample depth, but the largest specimens of *S. aquosus* were caught deeper than the smaller specimens (Table 7).

No fish larvae were found on station 9 off the bank or station 7 on the center of the bank. These data indicated that the concentration of larvae occurred along the northern side of the bank. The numbers of larvae of different species per m^2 on each of the stations are given in Table 2.

Clupea harengus was found only on three stations, 10, 11 and 12, all of which were east of the location of the historical spawning beds (Fig. 1). Many of the larvae were in the yolk sac stage which indicated

that they were recently hatched. The total length and standard deviation of the larvae were 6±0.7 mm. During the day the majority of larvae were found at a depth between 30 to 50 m. There was an increase in the density of larvae at the thermocline (20 m depth) on station 10 similar to that found for *M. bilinearis*. This station, which was sampled at dawn, showed the larvae to be closer to the surface than stations 11 and 12 which were sampled during mid-day and early evening respectively, which may have indicated that the larvae had undergone a night time vertical migration.

There was no difference in the length of *C. harengus* larvae with depth or station position.

ACOUSTIC BACKSCATTERING

The indensity of the acoustic backscattering echos received on the different stations during sampling was generally very low and at times below the threshold of the tape recorder, (Table 1). The tape recorder was less sensitive than the echogram, therefore it was possible to see light scattering layers on the echogram when the gain was in the maximum position, but not possible to separate the backscattering signal from the electronic noise of the recording system. This meant that these signals were below -78 dB the lower-threshold of the recording system. The volume backscattering (S_V) values for the different stations ranged between -56 to below -77 dB(Table 1). It was not possible to attribute the volume backscattering to any one species or group of species on any of the stations. But it appeared that the higher value of -56 dB was due to strong targets such as fish and that the general levels of S_V were usually below -64 dB, similar to the levels recorded by Sameoto and

Lewis (1979) on the Nova Scotia shelf in August 1976.

DISCUSSION

Clupea harengus larvae were very scarce in the study area. The scarcity of *Clupea harengus* larvae in the study area may have been due to one or more of three causes. Firstly, the sampling could have been conducted too early in the year with the result that the eggs had not hatched before sampling. This was unlikely since sampling for larvae in the region by other ships after this study did not find any *C. harengus* larvae in the area. Secondly, the spawning may have occurred much earlier than the study with the result that most of the larvae had hatched and moved out of the area. This also is unlikely since no larvae larger than 7 mm were found and had a significant hatch occurred before sampling is reasonable to expect that at least a few large larvae would have been caught. The most likely explanation for the low numbers of larvae caught is that there was a very poor hatch of larvae due to either low numbers of eggs being laid or due to a high mortality rate.

The *C. harengus* larvae that were caught probably originated from the area of the historical spawning beds. Trites (1979) found the residual current was in an easterly direction and at a depth of 40 m it averaged 21.1 cm per sec. Since most of the herring larvae were found between 30 and 40 m depth, it was calculated that the larvae would drift an average of 9.8 km per day and therefore the larvae found on stations 10, 11 and 12 were between 3 and 4 days drift from the spawning grounds. The small size

and early stages of larvae suggested they were less than a week old.

The three most common fish larvae were *Merluccius bilinearis*, *Urophycis chuss* and *Scophthalmus synoglossus*. One or more of these species were present on all the stations except 7 and 9. Their absence from station 9 can be explained if the species only spawned on the bank and the larvae were prevented from moving north off the bank by the easterly current and the lower temperature of the deep water north of the bank. No explanation can be given for the total absence of any fish larvae on station 7 in the middle of the bank.

The length frequency distributions of the above three species of fish larvae suggested that each had a single spawning period, since all of the distributions closely approximated a single normal curve.

The abundance of the copepods on the stations on and near the edge of the bank were similar, while the number of copepods at station 9, in deep water north of the bank, was much lower than any of the other stations. This may have reflected a higher productivity of copepods on the bank. The density difference in copepod numbers also suggested that a barrier may exist that prevented the drift of the copepods off the bank northward. Data obtained by Trites (1979) suggested that the easterly residual current may act as this barrier. Temperature did not seem to be a factor in the copepods distributions on and off the bank for there was no noticeable difference in the temperature structure of the water column at depths in which the majority of copepods were found.

The abundance of chaetognaths on the different stations was much

more variable than that of the copepods. The one similarity between the two was the very low numbers of chaetognaths on station 9 off the bank. The reason for this may be similar to that given above for the copepods.

The size frequency analysis of the chaetognath populations on each of the stations showed that not only were the numbers of these animals quite variable on different parts of the bank but the size and therefore the age structure of the population was different with the largest and oldest animals being found on the most easterly stations.

The chaetognaths were the only abundant potential predator of young fish larvae and therefore likely the only predator of any importance. It is interesting to note that the direction of drift of the *C. harengus* larvae from the spawning beds was eastward into the area of the bank that had the highest biomass and largest individual chaetognaths. It is not inconceivable that the chaetognaths played an important role in reducing the population of young *C. harengus* larvae.

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Table 1. Numbers of animals per m^3 in each sample on each station (station is equivalent to tow) plus the time, depth, mean water temperature, acoustic voltage and volume back-scattering (S_v) of the acoustic layer at the sample depths. The total sample weight minus the chaetognath weight, the chaetognath weight and the total number of copepods per m^3 are given.

Table 1

GEORGES BANK ZOOPLANKTON DATA
TOW 1 DATE 111078

SAMPLE	1	2	3	4	5	6	7	8	9	10
TIME	2100	2109	2113	2117	2120	2123	2126	2133	2133	2136
DEPTH	0- 2	6- 4	4- 6	6- 10	10- 10	10- 10	10- 15	15- 21	21- 25	25- 32
TEMPERATURE	14.15	14.13	14.12	14.12	14.11	14.10	14.09	14.08	14.07	14.07
VOLTAGE**2	-	-	-	-	-	-	-	-	-	-
SV(DB)	-	-	-	-	-	-	-	-	-	-
CNIDARIA										
HYDROID COLONY	-	-	-	16.1	-	-	-	-	-	-
MEDUSAE *	-	-	-	-	-	-	.4	-	-	-
CEPHALOPODA										
SQUID *	-	-	-	-	.4	-	-	-	-	-
NEMATODA										
UNIDENTIFIED	-	-	-	-	-	-	-	-	-	7.2
POLYCHAETA										
TOMOPTERIS HELGOLANDICA *	-	1.0	-	-	-	-	-	-	-	.7
COPEPODA										
ACARTIA LONGIREMIS IMMAT.	-	-	-	-	-	-	-	-	7.5	-
CALANUS FINMARCHICUS	-	-	31.4	16.1	-	8.2	-	7.5	7.5	7.2
CENTROPAGES HAMATUS	625.2	317.7	831.8	741.8	356.5	335.9	480.9	414.1	519.5	494.1
CENTROPAGES TYPICUS	382.8	290.6	612.0	483.8	340.0	499.7	439.4	331.3	384.0	587.2
LABIDOCERA AESTIVA	25.5	27.0	109.9	32.3	58.0	32.8	49.7	45.2	45.2	50.1
ONCAEA MEDIA	25.5	6.8	31.4	48.4	8.3	-	-	15.1	15.1	7.2
PARACALANUS PARVUS	752.8	13.5	1004.4	1290.1	8.3	41.0	58.0	105.4	218.4	293.6
PSEUDOCALANUS MINUTUS	12.8	27.0	109.9	96.8	49.7	24.6	49.7	105.4	60.2	114.6
TEMORA LONGICORNIS	-	-	-	32.3	-	-	8.3	-	-	7.2
DAMAGED	114.8	47.3	235.4	64.5	-	73.7	33.2	7.5	15.1	28.6
AMPHIPODA										
PARATHEMISTO ABYSSORUM	-	-	-	-	-	8.2	-	-	-	-
PARATHEMISTO GAUDICHAUDII *	-	-	-	-	1.2	1.6	2.0	1.1	1.8	1.4
PARATHEMISTO SP. *	-	-	-	-	-	-	8.3	-	-	-
UNIDENTIFIED GAMMARIID *	-	-	-	-	-	-	-	-	.4	.3
LYSIANASSIDAE *	-	-	-	-	-	-	-	.4	1.1	.3
CUMACEAN										
UNIDENTIFIED *	-	-	-	-	-	-	-	-	.4	-
ISOPODA										
CIROLANA *	-	-	-	-	.4	.4	-	1.5	.7	1.4
MYSIDACEA										
SIRIELLA GORDONAE	-	-	62.8	16.1	33.2	16.4	-	-	-	7.2
SIRIELLA SP.	12.8	-	-	-	-	-	-	-	-	-
STILOMYSIS SP.	-	-	-	-	-	-	-	-	-	7.2
JUVENILE	12.8	-	62.8	48.4	107.8	73.7	74.6	105.4	60.2	71.6
DAMAGED	-	6.8	-	-	-	-	-	-	-	-
UNIDENTIFIED *	-	4.3	2.7	5.5	18.2	12.0	12.1	16.2	21.3	5.6
EUPHAUSIACEA										
MEGNYCTIPHANES NORVEGICA *	-	2.6	1.5	1.6	4.0	2.8	3.6	.4	1.1	2.8
NEMATOSCELIS MEGALOPS *	-	-	-	1.2	-	-	-	-	-	-
THYSANOESSA LONGICAUDATA *	-	-	-	-	2.4	1.6	2.0	1.1	3.3	1.7
UNIDENTIFIABLE *	-	-	-	-	.4	-	-	-	-	-
DECAPODA										
CARIDEA LARVAE	-	6.8	-	-	8.3	-	-	-	-	.0
UNIDENTIFIED LARVAE	12.8	6.8	15.7	16.1	24.9	8.2	16.6	7.5	22.6	21.5
UNIDENTIFIED SP1 *	-	-	-	-	-	-	.4	-	-	-
UNIDENTIFIED SP3 *	-	-	-	-	.4	-	.4	1.1	2.2	9.4
CARIDEA SP. *	-	-	-	-	-	-	-	-	-	.3
UNIDENTIFIED DECAPODA *	-	.3	-	-	-	-	-	-	-	-
BRACHYURAN MEGALOPA *	-	-	-	-	-	-	-	-	.4	.3
PAGURID MEGALOPA *	-	-	-	-	.4	-	-	-	-	-
OVALIPES *	-	-	-	.4	-	-	-	-	-	.3
CHAETOGNATHA										
SAGITTA SP.	28.0	21.7	39.6	19.8	19.2	21.0	29.5	26.1	22.8	22.2
UNIDENTIFIABLE	-	-	15.7	-	8.3	8.2	-	-	15.1	14.3
OSTEICHTHYES										
MERLUCCIUS BILINEARIS *	-	-	-	-	-	.4	-	-	-	-
UROPHYCIS CHUSS *	10.0	.7	-	-	.4	.4	.4	-	.4	-
SCOPHTHALMUS AQUOSUS *	2.2	1.3	1.5	15.4	6.5	3.6	4.9	7.4	7.4	5.6
OPHICHTHUS SP. *	.3	-	-	-	-	-	-	-	-	-
FISH EGGS *	19.9	21.1	12.3	12.6	-	25.6	-	23.5	-	22.4
TOTAL WEIGHT**	.246	.159	.205	.238	.209	.218	.214	.192	.225	.198
CHAETOGNATH WEIGHT	.067	.063	.057	.055	.048	.045	.051	.073	.043	.069
SUM OF COPEPODS	1939.5	730.0	2966.1	2805.9	820.9	1015.8	1119.4	1031.5	1272.5	1589.7

* NUMBER OF INDIVIDUALS PER 100M3
** THE SAMPLE WEIGHT IS THE TOTAL WEIGHT OF THE SAMPLE MINUS THE CHAETOGNATH WEIGHT

Table 1(continued)

GEORGES BANK ZOOPLANKTON DATA
TOW 2 DATE 121078

SAMPLE	1	2	3	4	5	6	7	8	9	10
TIME	0023	0026	0028	0031	0034	0038	0038	0038	0038	0038
DEPTH	0- 4	4- 6	6- 10	10- 15	15- 20	20- 25	0- 0	0- 0	0- 0	0- 0
TEMPERATURE	13.24	13.23	13.20	13.18	13.16	13.04	-	-	-	-
VOLTAGE**2	-	-	-	-	-	-	-	-	-	-
SV(DB)	-	-	-	-	-	-	-	-	-	-
CNIDARIA										
MEDUSAE *	-	-	-	-	.3	-	-	-	-	-
CTENOPHORA										
CTENOPHORE	1.8	1.2	-	-	-	-	-	-	-	-
UROCHORDATA										
SALPS	-	185.5	-	-	-	-	-	-	-	-
GASTROPODA										
LIMACINA TROCHIFORMIS	-	-	-	11.9	-	-	-	-	-	-
POLYCHAETA										
TOMOPTERIS HELGOLANDICA *	-	.6	-	.4	-	.2	-	-	-	-
COPEPODA										
CALANUS FINMARCHICUS	17.3	3.0	4.5	47.5	13.7	8.3	-	-	-	-
CENTROPAGES HAMATUS	95.4	53.3	53.9	95.0	27.4	74.3	-	-	-	-
CENTROPAGES TYPICUS	823.8	337.4	485.1	1092.1	671.3	503.7	-	-	-	-
CLAUSOCALANUS ARCUICORNIS	-	-	-	-	13.7	-	-	-	-	-
LABIDOCERA AESTIVA	-	3.0	9.0	23.7	13.7	-	-	-	-	-
NANNOCALANUS MINOR	-	-	4.5	35.6	-	-	-	-	-	-
ONCAEA MEDIA	-	3.0	-	-	-	-	-	-	-	-
PARACALANUS PARVUS	8.7	5.9	-	201.8	917.8	148.6	-	-	-	-
PSEUDOCALANUS MINUTUS	34.7	20.7	18.0	130.6	54.8	66.1	-	-	-	-
SAPPHIRINA NIGROMACULATA	-	3.0	-	-	41.1	-	-	-	-	-
TEMORA LONGICORNIS	-	-	-	-	-	8.3	-	-	-	-
DAMAGED	8.7	11.8	13.5	-	54.8	24.8	-	-	-	-
AMPHIPODA										
PARATHEMISTO ABYSSORUM	-	-	-	-	13.7	8.3	-	-	-	-
PARATHEMISTO SP. *	-	-	4.5	-	13.7	8.3	-	-	-	-
PHRONIMA SEDENTARIA *	-	-	-	.4	-	-	-	-	-	-
PHRONIMA SP1 *	-	-	.4	.4	.7	-	-	-	-	-
LYSIANASSIDAE *	-	-	-	-	.3	.2	-	-	-	-
ISOPODA										
CIROLANA *	-	-	-	.4	.3	-	-	-	-	-
STOMATOPODA										
SQUILLA SP. *	-	-	-	-	.3	.2	-	-	-	-
EUPHAUSIACEA										
EUPHAUSIA KROHNII *	-	-	-	.4	-	-	-	-	-	-
MEGNYCTIPHANES NORVEGICA *	.6	-	-	.4	-	-	-	-	-	-
NEMATOSCELIS MEGALOPS *	-	-	.9	-	-	-	-	-	-	-
THYSANOESSA LONGICAUDATA *	-	.6	-	2.0	1.7	.6	-	-	-	-
DECAPODA										
CARIDEA LARVAE	-	-	9.0	11.9	-	-	-	-	-	-
UNIDENTIFIED LARVAE	8.7	3.0	18.0	-	-	-	-	-	-	-
UNIDENTIFIED SP3 *	-	.6	.4	.4	-	.4	-	-	-	-
UNIDENTIFIED SP8 *	.3	.6	-	-	-	1.0	-	-	-	-
ACANTHEPHYRA SP. *	-	-	-	.8	-	-	-	-	-	-
CHAETOGNATHA										
UNIDENTIFIABLE	-	5.9	22.5	11.9	-	-	-	-	-	-
SAGITTA SP.	36.2	35.0	50.8	66.6	4.2	9.8	-	-	-	-
OSTEICHTHYES										
MERLUCCIUS BILINEARIS *	6.3	6.9	8.3	11.9	12.0	5.4	-	-	-	-
UROPHYCIS CHUSS *	3.0	2.3	.4	1.2	.7	.4	-	-	-	-
SCOPHTHALMUS AQUOSUS *	-	18.5	.9	.4	-	.2	-	-	-	-
PLATOPHYRS GROHMANNI *	-	.6	-	-	-	.2	-	-	-	-
UNIDENTIFIED SP4 *	-	-	-	.8	-	-	-	-	-	-
TOTAL WEIGHT**	.102	.044	.108	.183	.255	.168	-	-	-	-
CHAETOGNATH WEIGHT	.087	.103	.129	.178	.011	.027	-	-	-	-
SUM OF COPEPODS	988.6	441.0	588.4	1626.2	1808.3	834.1	-	-	-	-

* NUMBER OF INDIVIDUALS PER 100M3
** THE SAMPLE WEIGHT IS THE TOTAL WEIGHT OF THE SAMPLE MINUS THE CHAETOGNATH WEIGHT

Table 1(continued)

GEORGES BANK ZOOPLANKTON DATA
TOW 4 DATE 121078

SAMPLE	1	2	3	4	5	6	7	8	9	10
TIME	2051	2053	2056	2059	2102	2104	2106	2108	2110	2113
DEPTH	0- 10	10- 15	15- 20	20- 20	20- 26	26- 30	30- 35	35- 40	40- 40	40- 40
TEMPERATURE	13.44	13.41	13.35	13.30	13.24	13.14	13.00	12.51	12.41	12.37
VOLTAGE**2	-	-	.006	.001	.010	.006	.012	.017	.002	.002
SV(DB)	-	-	-77.9		-75.7	-77.9	-74.9	-73.4		
CNIDARIA										
HYDROID COLONY	-	-	16.3	-	10.4	-	5.3	-	-	.6
POLYCHAETA										
TOMOPTERIS HELGOLANDICA *	-	-	-	-	-	-	-	-	-	.4
COPEPODA										
CALANUS FINMARCHICUS	8.6	4.7	-	-	5.2	-	8.0	2.4	-	-
CENTROPAGES BRADYI	2.9	-	-	-	-	-	-	-	-	-
CENTROPAGES HAMATUS	51.8	151.7	571.2	127.5	62.7	61.4	58.7	99.5	130.5	18.4
CENTROPAGES TYPICUS	408.4	469.3	489.6	374.5	370.9	289.3	.0	104.3	68.4	16.7
LABIDOCERA AESTIVA	8.6	19.0	-	8.0	15.7	2.6	8.0	7.3	6.2	1.7
METRIDIA LUCENS	-	-	-	-	-	-	-	-	3.1	-
NANNOCALANUS MINOR	-	-	-	-	-	-	2.7	-	-	-
OITHONA SIMILIS	-	-	-	-	5.2	-	-	-	3.1	-
ONCAEA MEDIA	-	-	-	-	-	-	-	2.4	-	-
PARACALANUS PARVUS	2.9	-	1158.6	733.1	10.4	5.1	16.0	4.9	3.1	2.2
PSEUDOCALANUS MINUTUS	23.0	14.2	32.6	47.8	57.5	12.8	32.0	53.4	161.6	26.7
SAPPHIRINA NIGROMACULATA	5.8	4.7	-	8.0	-	2.6	2.7	-	3.1	1.1
TEMORA LONGICORNIS	8.6	4.7	-	-	-	-	-	-	3.1	.6
DAMAGED	17.3	9.5	97.9	31.9	10.4	17.9	8.0	9.7	9.3	1.1
AMPHIPODA										
UNIDENTIFIED GAMMARIID *	-	-	-	-	-	-	.5	-	.4	.4
LYSIANASSIDAE *	-	-	-	-	-	1.0	-	.5	-	-
UNIDENTIFIED SP2 *	-	-	-	-	-	-	-	.5	-	-
ISOPODA										
CIROLANA *	-	-	-	-	-	1.0	1.0	-	.4	-
MYSIDACEA										
UNIDENTIFIED *	-	-	-	-	.5	.5	-	.5	-	-
EUPHAUSIACEA										
MEGNYCTIPHANES NORVEGICA *	-	-	-	-	-	1.0	.5	.9	-	-
THYSANOESSA LONGICAUDATA *	-	-	-	-	-	1.0	.5	.9	-	-
FURCILIAE	-	-	-	-	-	-	5.3	4.9	-	1.1
DAMAGED	5.8	4.7	-	-	5.2	2.6	-	-	6.2	-
UNIDENTIFIABLE *	-	-	-	-	1.5	-	-	-	-	-
DECAPODA										
CARIDEA LARVAE	11.5	4.7	-	-	-	-	-	2.4	-	-
UNIDENTIFIED LARVAE	2.9	4.7	16.3	15.9	-	2.6	2.7	-	3.1	1.7
UNIDENTIFIED SP3 *	-	-	-	-	-	1.0	1.0	2.4	1.7	.4
UNIDENTIFIED SP8 *	-	-	-	-	-	-	-	-	2.1	-
ACANTHEPHYRA SP. *	-	-	-	-	-	2.0	2.6	7.1	2.6	2.2
BRACHYURAN MEGALOPA *	-	-	-	-	-	-	-	-	.9	-
CHAETOGNATHA										
SAGITTA SP.	24.9	26.2	18.9	21.6	37.1	24.7	31.0	33.0	37.1	25.2
UNIDENTIFIABLE	2.9	14.2	-	-	-	-	-	4.9	9.3	1.7
OSTEICHTHYES										
MERLUCCIUS BILINEARIS *	-	-	-	-	1.5	1.0	5.2	7.6	4.7	2.6
UROPHYCIS CHUSS *	-	-	-	-	-	-	.5	1.9	.4	-
SCOPHTHALMUS AQUOSUS *	-	-	-	-	1.0	19.0	1.6	.9	.9	-
UNIDENTIFIED SP1 *	-	-	-	-	-	-	.5	-	-	-
FISH EGGS *	-	-	-	-	-	-	-	-	-	13.9
TOTAL WEIGHT**	.115	.098	.172	.172	.096	.141	.166	.106	.112	.057
CHAETOGNATH WEIGHT	.071	.054	.040	.039	.040	.062	.075	.106	.142	.097
SUM OF COPEPODS	537.9	677.9	2349.9	1330.8	538.1	391.7	136.0	283.9	391.6	68.5

* NUMBER OF INDIVIDUALS PER 100M3
** THE SAMPLE WEIGHT IS THE TOTAL WEIGHT OF THE SAMPLE MINUS THE CHAETOGNATH WEIGHT

Table 1(continued)

GEORGES BANK ZOOPLANKTON DATA
TOW 5 DATE 121078

SAMPLE	1	2	3	4	5	6	7	8	9	10
TIME	2209	2211	2213	2215	2218	2220	2223	2226	2229	2231
DEPTH	0- 10	10- 20	20- 30	30- 40	40- 50	50- 50	50- 60	60- 70	70- 70	70- 72
TEMPERATURE	13.33	13.19	13.10	13.02	12.52	12.74	10.65	10.32	10.32	10.70
VOLTAGE**2	-	.090	.066	.103	.103	.014	.127	.135	.063	.030
SV(DB)	-	-66.2	-67.5	-65.6	-65.6	-74.2	-64.7	-64.4	-67.7	-70.9
CNIDARIA										
JELLYFISH	-	-	-	-	-	.5	-	-	-	-
GASTROPODA										
PTEROPODA THECOSOMA *	-	-	-	-	-	.5	-	-	-	-
POLYCHAETA										
TOMOPTERIS HELGOLANDICA *	-	-	.5	-	-	.9	.8	1.2	1.6	1.0
UNIDENTIFIED *	-	-	-	-	-	-	-	.4	.5	-
COPEPODA										
CALANUS FINMARCHICUS	-	7.7	5.0	9.9	-	18.6	2.2	2.1	4.2	15.2
CALIGUS CURTUS	-	-	-	-	-	-	.5	-	-	-
CENTROPAGES HAMATUS	247.7	61.8	-	9.9	35.9	14.0	2.2	1.0	.7	-
CENTROPAGES TYPICUS	1668.1	602.8	639.4	576.6	646.7	446.8	16.2	16.5	9.0	45.7
LABIDOCERA AESTIVA	-	15.5	5.0	5.0	18.0	9.3	-	1.0	-	.9
METRIDIA LUCENS	-	-	-	-	18.0	-	1.1	3.1	-	1.8
NANNOCALANUS MINOR	-	-	5.0	5.0	18.0	-	.5	-	-	.9
OITHONA SIMILIS	-	-	-	-	-	4.7	-	-	.7	.9
ONCAEA MEDIA	-	-	-	-	-	-	-	1.0	-	-
PARACALANUS PARVUS	1222.2	23.2	15.0	14.9	1940.2	18.6	2.2	3.1	4.2	3.6
PSEUDOCALANUS MINUTUS	99.1	30.9	-	.0	179.6	37.2	28.1	71.2	54.0	47.5
TEMORA LONGICORNIS	-	-	-	-	-	-	-	1.0	-	-
DAMAGED	99.1	38.6	15.0	9.9	53.9	4.7	2.2	2.1	2.1	2.7
AMPHIPODA										
PARATHEMISTO ABYSSORUM	33.0	-	15.0	14.9	18.0	18.6	2.7	3.1	-	1.8
PARATHEMISTO GAUDICHAUDII *	-	-	-	-	-	-	-	-	.5	-
PARATHEMISTO SP. *	-	-	-	5.0	-	9.3	.5	1.0	-	-
PHRONIMA SP1 *	-	-	-	-	.4	-	-	-	-	-
PHRONIMA SP2 *	.4	.4	-	-	-	-	-	-	-	.5
PHROSINA SP. *	-	-	-	-	-	-	.4	-	-	-
LYSIANASSIDAE *	-	.4	.5	-	-	-	-	-	-	-
ISOPODA										
CIROLANA *	-	-	-	-	.4	-	-	-	-	-
STOMATOPODA										
SQUILLA SP. *	.4	-	-	-	.4	-	-	-	-	-
EUPHAUSIACEA										
EUPHAUSIA KROHNII *	-	-	-	-	-	-	-	.4	-	-
NEMATOSCELIS MEGALOPS *	-	-	-	-	.9	-	-	-	-	-
THYSANOESSA LONGICAUDATA *	-	.4	-	-	-	1.4	1.7	-	1.1	-
DAMAGED	-	-	5.0	-	-	-	-	-	-	-
DECAPODA										
UNIDENTIFIED LARVAE	-	-	5.0	9.9	35.9	-	-	-	-	.9
UNIDENTIFIED SP3 *	.4	-	.5	1.0	.9	2.3	4.6	8.1	7.0	3.5
UNIDENTIFIED SP5 *	-	-	-	-	-	-	2.1	.8	.5	1.5
UNIDENTIFIED SP8 *	-	-	-	-	.4	1.8	-	-	-	-
ACANTHEPHYRA SP. *	-	.4	-	-	1.8	.5	2.1	2.4	3.2	7.4
CHAETOGNATHA										
UNIDENTIFIABLE	-	-	-	-	-	-	1.1	3.1	.7	2.7
SAGITTA SP.	41.5	19.4	13.7	16.2	51.4	63.4	64.3	47.2	18.9	19.0
OSTEICHTHYES										
MERLUCCIUS BILINEARIS *	1.2	1.9	1.5	4.9	12.7	1.8	5.1	.8	-	-
UROPHYCIS CHUSS *	1.6	1.1	5.4	1.5	-	.5	.8	-	-	-
SCOPHTHALMUS AQUOSUS *	-	.4	2.4	-	.4	-	-	-	-	-
GLYPTOCEPHALUS CYNOGLOSSUS *	-	-	-	.5	-	-	-	-	-	-
PLATOPHYRS GROHMANNI *	-	.4	-	-	-	-	-	-	-	-
EEL SP2 *	.4	-	-	-	-	-	-	-	-	-
UNIDENTIFIED SP2 *	-	-	-	-	.4	-	-	-	-	.5
UNIDENTIFIED SP3 *	-	-	-	-	-	-	-	.4	-	-
UNIDENTIFIED SP4 *	-	.4	-	-	-	-	-	-	-	-
TOTAL WEIGHT**	.302	.139	.117	.129	.164	.187	.192	.071	.081	.090
CHAETOGNATH WEIGHT	.099	.063	.042	.059	.202	.207	.227	.176	.065	.069
SUM OF COPEPODS	3336.3	780.6	684.3	631.3	2910.3	553.9	55.1	102.2	74.7	119.2

* NUMBER OF INDIVIDUALS PER 100M3
** THE SAMPLE WEIGHT IS THE TOTAL WEIGHT OF THE SAMPLE MINUS THE CHAETOGNATH WEIGHT

Table 1(continued)

GEORGES BANK ZOOPLANKTON DATA
TOW 6 DATE 121078

SAMPLE	1	2	3	4	5	6	7	8	9	10
TIME	2337	2339	2342	2346	2348	2352	2352	2352	2352	235
DEPTH	0- 10	10- 20	20- 20	20- 30	30- 40	0- 0	0- 0	0- 0	0- 0	0-
TEMPERATURE	12.83	12.72	12.59	12.44	11.80	-	-	-	-	-
VOLTAGE**2	-	.164	.013	.072	.028	-	-	-	-	-
SV(DB)	-	-63.6	-74.6	-67.1	-71.2	-	-	-	-	-
POLYCHAETA										
TOMOPTERIS HELGOLANDICA *	1.9	.9	-	.9	1.3	-	-	-	-	-
COPEPODA										
CALANUS FINMARCHICUS	66.4	18.2	9.0	14.4	27.1	-	-	-	-	-
CENTROPAGES HAMATUS	-	9.1	-	-	11.3	-	-	-	-	-
CENTROPAGES TYPICUS	1156.7	514.3	826.4	235.6	385.7	-	-	-	-	-
CLAUSOCALANUS ARCUICORNIS	-	-	9.0	4.8	-	-	-	-	-	-
LABIDOCERA AESTIVA	-	4.6	-	-	-	-	-	-	-	-
METRIDIA LUCENS	-	4.6	18.0	-	2.3	-	-	-	-	-
NANNOCALANUS MINOR	-	4.6	9.0	-	2.3	-	-	-	-	-
NEOCALANUS GRACILIS	-	-	-	4.8	-	-	-	-	-	-
OITHONA SPINIROSTRIS	-	-	-	9.6	-	-	-	-	-	-
PARACALANUS PARVUS	28.4	-	431.2	278.8	38.3	-	-	-	-	-
PSEUDOCALANUS MINUTUS	19.0	9.1	53.9	33.7	24.8	-	-	-	-	-
NAUPLII	-	-	-	4.8	-	-	-	-	-	-
DAMAGED	66.4	9.1	44.9	28.8	4.5	-	-	-	-	-
AMPHIPODA										
PARATHEMISTO ABYSSORUM	9.5	9.1	18.0	4.8	-	-	-	-	-	-
PARATHEMISTO SP. LARVAE	-	-	-	-	2.3	-	-	-	-	-
PARATHEMISTO SP. *	9.5	9.1	18.0	-	-	-	-	-	-	-
PHRONIMA SP1 *	.5	-	-	-	-	-	-	-	-	-
PHRONIMA SP2 *	.5	-	-	.5	.4	-	-	-	-	-
STOMATOPODA										
SQUILLA SP. *	.5	-	-	-	-	-	-	-	-	-
EUPHAUSIACEA										
EUPHAUSIA KROHNII *	-	3.1	.9	.9	9.3	-	-	-	-	-
MEGNYCTIPHANES NORVEGICA *	.9	5.3	7.9	10.8	10.1	-	-	-	-	-
NEMATOSCELIS MEGALOPS *	3.2	.9	-	1.9	7.0	-	-	-	-	-
THYSANOESSA LONGICAUDATA *	2.8	.9	1.8	1.9	3.5	-	-	-	-	-
DECAPODA										
UNIDENTIFIED SP8 *	-	-	-	.9	.4	-	-	-	-	-
ACANTHEPHYRA SP. *	-	-	-	-	.4	-	-	-	-	-
CHAETOGNATHA										
UNIDENTIFIABLE	-	-	-	-	2.3	-	-	-	-	-
SAGITTA SP.	8.6	1.5	1.5	1.2	2.2	-	-	-	-	-
OSTEICHTHYES										
MERLUCCIUS BILINEARIS *	3.2	2.2	1.3	2.8	2.6	-	-	-	-	-
UROPHYCIS CHUSS *	-	-	-	-	.4	-	-	-	-	-
OPHICHTHUS SP. *	-	-	-	.5	-	-	-	-	-	-
UNIDENTIFIED SP3 *	-	.4	-	-	-	-	-	-	-	-
TOTAL WEIGHT**	.320	.095	.157	.125	.152	-	-	-	-	-
CHAETOGNATH WEIGHT	.023	.005	.004	.004	.010	-	-	-	-	-
SUM OF COPEPODS	1336.9	573.4	1401.3	615.4	496.2	-	-	-	-	-

* NUMBER OF INDIVIDUALS PER 100M3
** THE SAMPLE WEIGHT IS THE TOTAL WEIGHT OF THE SAMPLE MINUS THE CHAETOGNATH WEIGHT

Table 1(continued)

GEORGES BANK ZOOPLANKTON DATA
TOW 7 DATE 161078

SAMPLE	1	2	3	4	5	6	7	8	9	10
TIME	1301	1303	1305	1308	1311	1314	1314	1317	1319	1323
DEPTH	0- 9	9- 15	15- 20	20- 31	31- 37	37- 37	37- 40	40- 47	47- 20	20- 20
TEMPERATURE	12.59	12.51	12.50	12.51	12.47	12.50	12.45	12.39	12.53	12.68
VOLTAGE**2	-	-	-	-	-	-	-	-	-	-
SV(DB)	-	-	-	-	-	-	-	-	-	-
CNIDARIA										
HYDROID COLONY	-	-	-	.6	-	-	-	-	-	-
MEDUSAE *	-	-	-	-	-	-	-	.5	-	-
POLYCHAETA										
TOMOPTERIS HELGOLANDICA *	-	-	-	.5	-	-	.4	.5	-	-
COPEPODA										
CALANUS FINMARCHICUS	-	2.1	3.0	4.9	4.5	-	-	2.4	.1	.3
CENTROPAGES HAMATUS	-	15.9	12.8	36.0	138.6	-	54.7	82.6	.6	.7
CENTROPAGES TYPICUS	495.5	26.4	29.6	29.3	35.8	-	42.7	42.5	6.2	11.2
LABIDOCERA AESTIVA	-	-	-	-	4.5	-	1.1	1.2	.1	-
NANNOCALANUS MINOR	-	-	-	-	4.5	-	-	-	.1	-
OITHONA SIMILIS	-	-	-	-	4.5	-	-	-	-	-
PARACALANUS PARVUS	1156.1	2.6	.6	2.4	308.5	-	1.1	16.5	.6	4.8
PSEUDOCALANUS MINUTUS	82.6	10.0	9.8	27.4	111.8	-	48.1	88.5	1.9	.7
SAPPHIRINA NIGROMACULATA	-	-	.3	.6	4.5	-	1.1	-	-	-
TEMORA LONGICORNIS	-	.5	-	-	4.5	-	-	-	-	-
DAMAGED	82.6	4.2	5.5	2.4	13.4	-	4.4	7.1	.3	.7
AMPHIPODA										
PARATHEMISTO ABYSSORUM	-	.5	-	-	-	-	1.1	-	.1	.5
PARATHEMISTO GAUDICHAUDII *	-	-	-	-	-	-	-	.5	-	-
PARATHEMISTO SP. *	-	-	-	-	-	-	-	1.2	.1	-
CUMACEAN										
LEPTOCUMA MINOR	-	-	-	.6	-	-	-	-	-	-
ISOPODA										
CIROLANA *	-	-	-	-	-	-	-	-	-	.3
EUPHAUSIACEA										
MEGNYCTIPHANES NORVEGICA *	.4	-	-	-	-	-	-	.5	-	-
THYSANOESSA LONGICAUDATA *	-	-	-	.5	.4	-	-	-	.4	-
DAMAGED	-	-	-	.6	-	-	-	-	-	-
DECAPODA										
UNIDENTIFIED LARVAE	-	1.1	.3	1.2	-	-	-	1.2	.1	-
UNIDENTIFIED SPB *	-	-	-	-	-	-	.4	-	-	-
CARIDEA SP. *	-	-	-	-	-	-	.4	-	-	-
UNIDENTIFIED DECAPODA *	-	-	-	-	-	-	.4	-	-	-
CHAETOGNATHA										
UNIDENTIFIABLE	-	.5	.3	.6	-	-	-	-	.1	-
SAGITTA *	15.1	15.5	22.0	26.2	30.7	-	19.4	16.5	11.3	.3
OSTEICHTHYES										
FISH EGGS *	-	-	-	-	27.9	-	-	-	-	-
TOTAL WEIGHT**	.119	.043	.039	.053	.070	-	.052	.035	.044	.007
CHAETOGNATH WEIGHT	.065	.069	.100	.132	.182	-	.103	.077	.056	.001
SUM OF COPEPODS	1816.8	61.9	61.6	103.0	635.0	-	153.2	240.7	9.9	18.3

* NUMBER OF INDIVIDUALS PER 100M3
** THE SAMPLE WEIGHT IS THE TOTAL WEIGHT OF THE SAMPLE MINUS THE CHAETOGNATH WEIGHT

Table 1(continued)

GEORGES BANK ZOOPLANKTON DATA
TOW 8 DATE 161078

SAMPLE	1	2	3	4	5	6	7	8	9	10
TIME	1947	1949	1951	1954	1957	1959	2001	2004	2007	2010
DEPTH	0- 7	7- 10	10- 19	19- 25	25- 27	27- 40	40- 44	44- 52	52- 62	62- 40
TEMPERATURE	12.84	12.90	12.28	11.85	11.59	10.48	9.82	9.02	8.29	10.81
VOLTAGE**2	-	-	.144	.008	.005	.022	.003	.011	.013	.098
SV(DB)	-	-	-64.1	-76.7	-78.7	-72.3		-75.3	-74.6	-65.8
GASTROPODA										
PTEROPODA THECOSOMA *	-	.3	-	-	-	-	-	-	-	-
POLYCHAETA										
TOMOPTERIS HELGOLANDICA *	.3	.3	.4	-	-	-	.5	-	2.4	.2
COPEPODA										
ACARTIA DANAE	-	3.3	-	-	-	-	-	-	-	-
ACARTIA NEGLIGENS	-	-	1.9	-	-	-	-	-	-	-
CALANUS FINMARCHICUS	96.9	6.7	13.1	32.5	29.5	38.3	35.2	38.9	58.8	10.8
CANDACIA ARMATA	-	-	1.9	-	-	-	-	-	-	-
CENTROPAGES TYPICUS	2537.9	760.5	142.5	234.4	125.2	98.5	54.0	22.7	13.5	40.8
CLAUSOCALANUS ARCUICORNIS	-	-	1.9	-	-	-	-	-	-	-
LABIDOCERA AESTIVA	-	3.3	-	-	-	-	-	-	-	-
METRIDIA LUCENS	-	-	-	3.6	1.8	1.1	5.9	3.0	3.1	1.9
OITHONA SIMILIS	-	-	1.9	-	-	-	-	-	-	-
OITHONA SPINIROSTRIS	-	-	-	-	-	-	1.2	-	-	-
PARACALANUS PARVUS	19.4	-	86.3	39.7	1.8	1.1	-	-	-	1.9
PSEUDOCALANUS MINUTUS	-	-	16.9	54.1	31.3	56.9	47.0	19.1	23.9	28.0
TEMORA LONGICORNIS	-	-	-	3.6	-	-	-	-	-	-
NAUPLII	-	-	3.8	10.8	-	-	-	-	-	-
DAMAGED	155.0	10.0	9.4	18.0	1.8	-	1.2	3.0	1.8	2.5
	-	-	-	-	-	7.7	-	-	-	-
AMPHIPODA										
PARATHEMISTO ABYSSORUM	-	3.3	1.9	-	-	-	-	.6	-	-
PARATHEMISTO SP. *	-	-	-	-	-	-	-	-	1.8	-
PHRONIMA SEDENTARIA *	-	-	-	-	-	-	-	-	-	.2
PHRONIMA SP1 *	.3	-	-	-	-	-	-	-	-	-
PHRONIMA SP2 *	.3	-	-	.4	.4	-	-	-	-	.2
LYSIANASSIDAE *	.3	-	-	-	-	-	-	.9	2.9	-
EUPHAUSIACEA										
EUPHAUSIA KROHNII *	-	-	-	-	-	-	-	-	-	.2
MEGNYCTIPHANES NORVEGICA *	-	-	-	-	-	-	-	-	.5	1.2
THYSANOESSA LONGICAUDATA *	1.3	1.0	-	.4	.7	.4	.5	1.4	1.4	6.0
UNIDENTIFIED EUPHAUDIID GB1 *	-	-	-	-	-	-	-	-	.5	-
CALYPTOSIS	-	-	1.9	-	-	-	-	-	-	-
DECAPODA										
UNIDENTIFIED LARVAE	-	-	-	-	-	-	1.2	-	-	-
UNIDENTIFIED SP3 *	-	.3	-	-	-	-	.5	.9	.5	.5
UNIDENTIFIED SP8 *	-	-	-	.4	.4	1.3	-	-	-	-
ACANTHEPHYRA SP. *	-	-	-	-	-	-	1.4	2.3	5.3	1.7
CHAETOGNATHA										
SAGITTA ELEGANS	-	-	-	-	-	-	-	-	.6	-
EUKROHNIA HAMATA	-	3.3	-	-	-	-	-	-	-	-
SAGITTA SP.	1.6	3.4	1.1	.6	.4	.5	.4	.4	.5	.3
OSTEICHTHYES										
MERLUCCIUS BILINEARIS *	-	.7	.4	.4	-	-	-	-	-	-
UROPHYCIS CHUSS *	.3	-	-	-	-	-	-	-	-	-
TOTAL WEIGHT**	.151	.126	.066	.118	.037	.058	.216	.059	.046	.037
CHAETOGNATH WEIGHT	.004	.011	.002	.002	.001	.001	.001	.001	.002	.001
SUM OF COPEPODS	2809.1	783.8	279.4	396.6	191.5	203.5	144.4	86.7	101.1	86.0

< NUMBER OF INDIVIDUALS PER 100M3
<* THE SAMPLE WEIGHT IS THE TOTAL WEIGHT OF THE SAMPLE MINUS THE CHAETOGNATH WEIGHT

Table 1(continued)

GEORGES BANK ZOOPLANKTON DATA
TOW 9 DATE 161078

SAMPLE	1	2	3	4	5	6	7	8	9	10
TIME	2230	2232	2234	2236	2238	2240	2245	2248	2252	2256
DEPTH	0- 6	6- 10	10- 10	10- 20	20- 30	30- 50	50- 60	60- 80	80- 80	80- 80
TEMPERATURE	12.43	12.43	12.43	12.39	11.78	9.62	8.81	8.56	8.55	8.88
VOLTAGE**2	-	-	.005	.837	.009	.027	.025	.015	.001	.033
SV(DB)	-	-	-78.7	-56.5	-76.2	-71.4	-71.7	-73.9		-70.5
POLYCHAETA										
TOMOPTERIS HELGOLANDICA *	-	-	-	-	-	-	.5	-	-	-
COPEPODA										
ACARTIA HUDSONICA	-	-	-	-	4.3	-	-	-	-	-
ACARTIA LONGIREMIS	3.3	-	-	-	-	-	-	-	-	-
ACARTIA SP.	3.3	-	-	-	-	-	-	-	-	-
CALANUS FINMARCHICUS	46.3	11.9	14.7	16.0	14.4	13.1	23.8	-	11.2	-
CANDACIA ARMATA	-	-	-	-	-	.2	-	-	-	-
CENTROPAGES HAMATUS	-	3.0	-	-	-	-	-	-	-	-
CENTROPAGES TYPICUS	205.0	273.0	186.0	102.4	14.0	4.1	1.8	-	1.6	-
CLAUSOCALANUS ARCUICORNIS	-	-	-	-	7.2	-	.3	-	-	-
EUCHAETA MARINA	-	3.0	-	-	-	-	-	-	-	-
EUCHAETA NORVEGICA	3.3	-	-	1.6	2.4	2.1	4.9	-	1.1	-
METRIDIA LONGA	-	-	-	-	-	.7	.3	-	-	-
METRIDIA LUCENS	-	3.0	27.6	17.6	4.8	1.6	1.2	-	.8	-
NANNOCALANUS MINOR	3.3	3.0	-	-	-	-	-	-	-	-
OITHONA SPINIROSTRIS	-	-	-	-	.5	-	-	-	-	-
PARACALANUS PARVUS	86.0	-	-	-	6.3	-	.3	-	-	-
PSEUDOCALANUS MINUTUS	59.5	32.6	5.5	11.2	14.4	6.0	5.2	-	.5	-
SCOLECITHRICELLA MINOR	-	-	-	-	.5	.7	1.2	-	.3	-
NAUPLII	-	-	-	-	-	-	.3	-	-	-
DAMAGED	16.5	5.9	11.1	1.6	4.8	.5	.9	-	.3	-
AMPHIPODA										
AEGINELLA *	-	-	-	.3	-	-	-	-	-	-
PARATHEMISTO ABYSSORUM	9.9	3.0	-	1.6	2.4	-	-	-	-	-
PARATHEMISTO SP. *	-	-	-	-	-	-	1.5	.0	-	-
EUPHAUSIACEA										
EUPHAUSIA KROHNII *	.5	1.2	-	2.5	5.6	1.8	.5	-	-	-
MEGNYCTIPHANES NORVEGICA *	290.4	61.9	27.3	35.3	30.5	49.8	24.8	-	24.9	3.0
NEMATOSCELIS MEGALOPS *	-	-	-	-	-	.4	1.9	-	2.0	-
THYSANOESSA LONGICAUDATA *	-	-	1.1	.9	1.9	.7	21.0	-	24.9	-
THYSANOESSA CALYPTOSIS	-	-	1.8	-	-	-	-	-	-	-
DECAPODA										
UNIDENTIFIED SP8 *	-	-	-	-	.4	-	-	.8	-	-
ACANTHEPHYRA SP. *	-	.4	-	-	-	-	.5	-	-	-
CHAETOGNATHA										
UNIDENTIFIABLE	3.3	-	-	1.6	.5	.2	-	-	.2	-
SAGITTA SP.	.2	.3	.3	.2	.4	.1	.0	.0	.0	-
TOTAL WEIGHT**	.249	.099	.067	.078	.065	.097	.102	-	.106	-
CHAETOGNATH WEIGHT	.001	.001	.001	.001	.001	.000	.000	.000	.000	-
SUM OF COPEPODS	426.5	335.3	244.9	150.4	73.6	28.9	40.2	-	15.9	-

* NUMBER OF INDIVIDUALS PER 100M3
** THE SAMPLE WEIGHT IS THE TOTAL WEIGHT OF THE SAMPLE MINUS THE CHAETOGNATH WEIGHT

Table 1(continued)

GEORGES BANK ZOOPLANKTON DATA
TOW 10 DATE 181078

SAMPLE	1	2	3	4	5	6	7	8	9	10
TIME	0638	0640	0643	0646	0648	0651	0655	0658	0702	0705
DEPTH	0- 5	5- 10	10- 15	15- 20	20- 25	25- 33	33- 37	37- 20	20- 20	20- 10
TEMPERATURE	11.70	11.63	11.66	11.46	10.15	9.08	8.59	8.77	9.97	11.68
VOLTAGE**2	-	-	.377	.005	.039	-	.001	.008	.001	.783
SV(DB)	-	-	-59.9	-78.7	-69.8	-		-76.7		-56.8
GASTROPODA										
LIMACINA TROCHIFORMIS	-	1.5	-	-	-	-	-	-	-	-
POLYCHAETA										
TOMOPTERIS HELGOLANDICA *	-	-	2.3	6.1	1.4	.8	-	4.3	-	.5
COPEPODA										
ACARTIA HUDSONICA	-	-	19.1	-	-	-	-	-	-	-
CALANUS FINMARCHICUS	23.0	7.6	38.1	38.6	2.5	4.3	4.5	4.1	4.3	19.5
CANDACIA ARMATA	-	3.0	-	-	-	-	-	-	1.2	-
CENTROPAGES HAMATUS	3.8	4.6	-	-	2.5	-	5.7	-	-	-
CENTROPAGES TYPICUS	406.5	214.2	581.1	579.6	251.1	219.7	104.2	112.3	117.0	780.2
CLAUSOCALANUS ARCUICORNIS	-	-	9.5	-	-	-	-	-	-	-
METRIDIA LUCENS	7.7	-	-	-	2.5	-	1.1	1.4	3.7	-
PARACALANUS PARVUS	3.8	-	447.7	425.1	-	-	-	-	-	39.0
PSEUDOCALANUS MINUTUS	7.7	4.6	57.2	67.6	32.0	53.3	68.0	89.0	4.3	24.4
DAMAGED	7.7	1.5	85.7	38.6	4.9	-	1.1	9.6	1.2	9.8
AMPHIPODA										
AEGINELLA *	-	-	.5	-	-	-	.4	-	.5	.5
BRACHYSCELUS SP. *	-	-	-	-	-	-	-	-	.5	-
PARATHEMISTO ABYSSORUM	15.3	3.0	9.5	-	2.5	2.1	3.4	1.4	-	-
PARATHEMISTO SP. LARVAE	-	-	-	9.7	-	-	-	-	-	4.9
PARATHEMISTO SP. *	-	1.5	9.5	9.7	9.8	2.1	-	-	.6	-
PHRONIMA SEDENTARIA *	-	.3	-	-	-	-	-	-	-	-
STOMATOPODA										
SQUILLA SP. *	-	-	1.0	-	-	-	-	-	-	.5
EUPHAUSIACEA										
EUPHAUSIA KROHNII *	.7	.3	.9	4.2	6.3	3.3	8.8	116.6	99.0	9.5
MEGNYCTIPHANES NORVEGICA *	.4	.3	-	.5	.5	1.3	1.3	.5	-	-
NEMATOSCELIS MEGALOPS *	-	-	-	-	-	-	-	-	.5	-
THYSANOESSA LONGICAUDATA *	-	-	-	-	1.0	1.3	.4	1.1	-	1.0
THYSANOESSA CALYPTOSIS	-	1.5	-	-	-	-	-	-	-	-
DAMAGED	-	-	-	9.7	-	-	-	-	-	-
UNIDENTIFIABLE *	-	-	-	-	-	-	.4	-	-	-
DECAPODA										
UNIDENTIFIED SP2 *	-	-	-	-	.5	-	-	-	-	-
UNIDENTIFIED SP3 *	-	-	-	-	-	.4	-	-	-	-
CHAETOGNATHA										
EUKROHNIA HAMATA	-	-	-	-	-	-	-	-	-	4.9
SAGITTA SP.	10.3	10.0	33.8	25.4	12.3	7.9	9.1	8.9	2.6	7.8
OSTEICHTHYES										
MERLUCCIUS BILINEARIS *	.4	-	.9	1.4	-	.8	1.3	.5	-	-
UROPHYCIS CHUSS *	-	2.4	3.7	-	-	-	-	-	-	-
CLUPEA HARENGUS *	-	-	3.7	-	-	6.7	37.2	25.7	.6	3.8
FISH EGGS *	-	2.4	-	-	-	-	-	-	-	-
TOTAL WEIGHT**	.085	.062	.134	.093	.029	.057	.020	.068	.038	.117
CHAETOGNATH WEIGHT	.025	.030	.058	.064	.038	.032	.047	.040	.007	.021
SUM OF COPEPODS	460.2	235.5	1238.3	1149.6	295.4	277.3	184.6	216.3	131.7	872.8

* NUMBER OF INDIVIDUALS PER 100M3
** THE SAMPLE WEIGHT IS THE TOTAL WEIGHT OF THE SAMPLE MINUS THE CHAETOGNATH WEIGHT

Table 1(continued)

GEORGES BANK ZOOPLANKTON DATA
TOW 11 DATE 181078

SAMPLE	1	2	3	4	5	6	7	8	9	10
TIME	1209	1211	1214	1217	1218	1221	1223	1226	1229	1233
DEPTH	0- 9	9- 15	15- 20	20- 25	25- 34	34- 39	39- 48	48- 48	48- 45	45- 45
TEMPERATURE	11.87	11.43	11.29	11.22	11.14	10.96	9.80	9.75	10.32	-
VOLTAGE**2	-	.356	.013	.010	.005	.005	.019	.002	.010	-
BV(DB)	-	-60.2	-74.6	-75.7	-78.7	-78.7	-72.9		-75.7	-
CNIDARIA										
HYDROID COLONY	-	-	-	-	-	-	-	2.3	.1	-
CTENOPHORA										
	-	-	-	-	-	-	-	-	.3	-
GASTROPODA										
LIMACINA TROCHIFORMIS	-	-	-	-	-	1.1	.6	-	-	-
POLYCHAETA										
TOMOPTERIS HELGOLANDICA *	.9	-	.9	-	-	4.4	10.8	22.4	3.1	-
COPEPODA										
ACARTIA HUDSONICA	-	2.3	-	-	-	-	-	-	-	-
CALANUS FINMARCHICUS	9.2	25.0	20.5	8.6	12.9	3.4	1.1	-	.1	-
CANDACIA ARMATA	-	-	1.1	1.7	-	-	-	-	-	-
CENTROPAGES HAMATUS	-	2.3	1.1	.6	-	-	.6	-	.1	-
CENTROPAGES TYPICUS	652.1	348.2	138.8	34.6	51.5	23.1	10.9	23.0	4.1	-
CLAUSOCALANUS ARCUICORNIS	9.2	-	-	-	-	-	-	-	-	-
EUCHAETA MARINA	-	-	1.1	-	-	-	-	-	-	-
METRIDIA LUCENS	-	-	1.1	2.3	6.4	-	-	-	-	-
NANNOCALANUS MINOR	-	6.8	-	.6	-	-	.6	-	-	-
OITHONA SPINIROSTRIS	-	-	-	-	-	-	-	-	.1	-
PARACALANUS PARVUS	551.0	4.6	-	-	373.3	-	2.3	110.2	.6	-
PSEUDOCALANUS MINUTUS	18.4	31.9	26.2	17.9	218.8	23.7	49.9	128.6	7.0	-
SAPPHIRINA NIGROMACULATA	-	-	-	-	6.4	.6	.6	2.3	-	-
SCOLECITHRIX DANAE	-	-	-	.6	-	-	-	-	-	-
TEMORA LONGICORNIS	-	2.3	-	-	-	-	-	-	-	-
DAMAGED	73.5	2.3	5.7	-	38.6	3.4	3.4	16.1	.1	-
AMPHIPODA										
AEGINELLA *	-	-	-	-	-	-	.4	-	-	-
PARATHEMISTO ABYSSORUM	-	-	3.4	3.5	6.4	1.1	1.1	6.9	.7	-
PARATHEMISTO SP. *	-	2.3	-	-	-	1.7	-	4.6	-	-
STOMATOPODA										
SQUILLA SP. *	-	.4	.4	-	-	-	-	-	-	-
EUPHAUSIACEA										
EUPHAUSIA KROHNII *	-	.4	-	-	-	2.2	1.3	2.7	.7	-
MEGNYCTIPHANES NORVEGICA *	-	-	-	-	-	-	-	.4	-	-
NEMATOSCELIS MEGALOPS *	-	-	-	-	-	-	.4	-	-	-
DAMAGED	-	-	-	1.2	6.4	-	-	-	-	-
DECAPODA										
UNIDENTIFIED SPS *	-	-	-	-	-	-	7.2	4.5	-	-
CARIDEA SP. *	-	-	-	-	-	-	-	-	.3	-
PAGURID MEGALOPA *	-	-	-	-	-	-	-	.4	-	-
CHAETOGNATHA										
SAGITTA ELEGANS	-	-	-	-	6.4	-	-	-	-	-
UNIDENTIFIABLE	-	2.3	-	-	-	.6	.6	2.3	.6	-
SAGITTA SP.	11.0	13.0	16.6	20.0	65.4	84.3	328.3	389.7	118.4	-
OSTEICHTHYES										
MERLUCCIUS BILINEARIS *	-	-	-	-	.4	1.8	4.9	4.0	3.1	-
UROPHYCIS CHUSS *	-	.4	.4	-	-	-	-	-	-	-
CLUPEA HARENGUS *	-	-	-	-	10.7	-	-	-	-	-
TOTAL WEIGHT**	.152	.130	.032	.042	-	.073	-	-	-	-
CHAETOGNATH WEIGHT	.061	.040	.049	.079	.251	.442	1.914	2.211	.686	-
SUM OF COPEPODS	1313.3	425.5	195.7	66.9	708.0	54.1	69.5	280.1	12.1	-

* NUMBER OF INDIVIDUALS PER 100M3
** THE SAMPLE WEIGHT IS THE TOTAL WEIGHT OF THE SAMPLE MINUS THE CHAETOGNATH WEIGHT

Table 1(continued)

GEORGES BANK ZOOPLANKTON DATA
TOW 12 DATE 181078

SAMPLE	1	2	3	4	5	6	7	8	9	10
TIME	1940	1943	1947	1950	1956	1959	2004	2008		2015
DEPTH	0- 6	6- 12	12- 17	17- 27	27- 33	33- 40	40- 47	47- 55	55- 17	17- 17
TEMPERATURE	11.67	11.47	10.93	10.35	10.13	10.08	10.03	9.98	10.97	11.57
VOLTAGE**2	-	.150	.006	-	-	-	-	-	-	.001
SV(DB)	-	-63.9	-77.9	-	-	-	-	-	-	
CNIDARIA										
HYDROID COLONY	-	-	-	-	.6	-	.6	1.4	-	-
POLYCHAETA										
SERPULID LARVAE	-	-	-	-	-	1.1	-	-	-	-
TOMOPTERIS HELGOLANDICA *	3.8	4.0	1.7	5.5	4.1	-	4.7	8.2	-	2.7
COPEPODA										
ACARTIA HUDSONICA	-	1.9	-	-	-	-	-	-	-	-
CALANUS FINMARCHICUS	17.4	1.9	2.2	2.0	1.8	4.3	1.8	2.8	-	5.1
CANDACIA ARMATA	-	-	-	-	-	-	-	-	-	1.7
CENTROPAGES HAMATUS	17.4	-	-	1.0	-	-	-	-	-	.6
CENTROPAGES TYPICUS	2056.7	389.6	78.3	30.0	7.0	10.8	4.8	9.8	-	70.0
METRIDIA LUCENS	-	-	.5	-	-	-	-	-	-	1.1
NANNOCALANUS MINOR	-	7.5	.5	-	-	-	-	-	-	-
PARACALANUS PARVUS	1446.7	3.8	-	1.0	1.2	3.3	2.4	-	-	5.1
PSEUDOCALANUS MINUTUS	69.7	28.2	15.7	80.0	78.3	83.5	58.0	112.5	-	30.2
NAUPLII	-	-	-	-	-	-	-	-	-	.6
DAMAGED	104.6	15.1	4.3	1.0	.6	6.5	1.8	5.6	-	1.1
AMPHIPODA										
PARATHEMISTO ABYSSORUM	-	1.9	1.1	1.0	-	-	-	-	-	.6
PARATHEMISTO SP. *	17.4	-	-	-	-	-	.6	-	-	.6
LYSIANASSIDAE *	-	-	-	-	-	-	.9	2.2	-	.4
UNIDENTIFIED SP2 *	-	-	-	-	-	-	-	.5	-	-
EUPHAUSIACEA										
EUPHAUSIA KROHNII *	.9	2.2	4.2	.4	-	-	-	.5	-	1.3
MEGNYCTIPHANES NORVEGICA *	.0	3.7	-	-	.5	-	-	-	-	1.3
NEMATOSCELIS MEGALOPS *	-	.4	-	-	-	-	-	.5	-	.4
THYSANOESSA LONGICAUDATA *	-	-	.4	-	-	-	-	-	-	.4
FURCILIAE	-	-	-	-	.6	-	-	1.4	-	-
DAMAGED	-	-	-	-	1.8	-	-	4.2	-	-
DECAPODA										
UNIDENTIFIED LARVAE	-	-	-	1.0	-	1.1	1.2	-	-	-
UNIDENTIFIED SP3 *	-	-	.4	1.2	1.8	-	3.7	.5	-	-
UNIDENTIFIED SP8 *	.9	-	1.7	2.0	2.3	-	.5	-	-	.4
CARIDEA SP. *	-	2.2	-	2.3	-	-	-	.5	-	-
ACANTHEPHYRA SP. *	-	.4	-	-	8.2	-	8.9	9.3	-	1.3
CHAETOGNATHA										
EUKROHNIA HAMATA	-	1.9	-	-	-	-	-	-	-	-
UNIDENTIFIABLE	-	-	2.2	1.0	.6	-	-	-	-	-
SAGITTA SP.	90.4	98.8	106.9	283.0	154.3	108.5	78.3	81.2	-	42.4
TELEOSTEI										
MERLUCCIUS BILINEARIS *	7.7	5.5	3.4	1.2	-	-	.9	.5	-	2.2
CLUPEA HARENGUS *	-	-	-	-	-	-	15.0	-	-	-
UNIDENTIFIED SP3 *	-	-	.4	-	-	-	-	-	-	-
TOTAL WEIGHT**	.141	.001	.128	-	.000	.148	.101	.247	-	.041
CHAETOGNATH WEIGHT	.314	.506	.579	1.802	.795	.665	.470	.528	-	.258
SUM OF COPEPODS	3712.5	448.0	101.5	115.0	88.8	108.5	68.8	130.8	-	115.5

NUMBER OF INDIVIDUALS PER 100M3
THE SAMPLE WEIGHT IS THE TOTAL WEIGHT OF THE SAMPLE MINUS THE CHAETOGNATH WEIGHT

Table 2. Total wet weight of zooplankton ($\leq$1 cm in length) and chaetognaths per m^2 , plus the numbers per m^2 of all species on the different stations.

Table 2

NUMBER OF INDIVIDUALS PER SQUARE METER

STATION	1	2	4	5	6	7	8	9	10	11	12
TIME	2100H	0023H	2051H	2209H	2337H	1301H	1947H	2230H	0638H	1209H	1940H
SPECIES											
CNIDARIA (TOTAL)	66.5	1.7	171.5	.5	-	9.9	-	-	-	2.3	18.9
HYDROID COLONY	64.5	-	171.5	-	-	6.7	-	-	-	2.3	18.9
JELLYFISH	-	-	-	.5	-	-	-	-	-	-	-
MEDUSAE *	2.0	1.7	-	-	-	3.2	-	-	-	-	-
MOLLUSCA (TOTAL)	.4	59.4	-	.5	-	-	1.0	-	7.6	10.8	-
LIMACINA TROCHIFORMIS	-	59.4	-	-	-	-	-	-	7.6	10.8	-
PTEROPODA THECOSOMA *	-	-	-	.5	-	-	1.0	-	-	-	-
SQUID *	.4	-	-	-	-	-	-	-	-	-	-
NEMATODA (TOTAL)	50.1	-	-	-	-	-	-	-	-	-	-
UNIDENTIFIED	50.1	-	-	-	-	-	-	-	-	-	-
POLYCHAETA (TOTAL)	4.9	4.2	.4	34.5	50.0	9.7	32.4	4.8	56.2	153.8	243.9
SERPULID LARVAE	-	-	-	-	-	-	-	-	-	-	7.6
TOMOPTERIS HELGOLANDICA *	4.9	4.2	.4	29.9	50.0	9.7	32.4	4.8	56.2	153.8	236.3
UNIDENTIFIED *	-	-	-	4.6	-	-	-	-	-	-	-
COPEPODA (TOTAL)	50875.3	28532.3	29203.9	85867.5	31620.3	24135.4	32220.7	7381.9	19983.9	23233.4	29556.8
ACARTIA HUDSONICA	-	-	-	-	-	-	-	43.3	95.3	13.7	11.3
ACARTIA DANAE	-	-	-	-	-	-	10.0	-	-	-	-
ACARTIA LONGIREMIS	-	-	-	-	-	-	-	19.8	-	-	-
ACARTIA LONGIREMIS IMMAT.	30.1	-	-	-	-	-	-	-	-	-	-
ACARTIA NEGLIGENS	-	-	-	-	-	-	16.9	-	-	-	-
ACARTIA SP.	-	-	-	-	-	-	-	19.8	-	-	-
CALANUS FINMARCHICUS	260.9	440.4	193.5	322.1	1269.6	125.2	2607.5	1154.7	605.6	521.6	227.8
CALIGUS CURTUS	-	-	-	5.4	-	-	-	-	-	-	-
CANDACIA ARMATA	-	-	-	-	-	-	16.9	4.6	16.4	14.3	1.7
CENTROPAGES BRADYI	-	-	28.8	-	-	-	-	-	-	-	-
CENTROPAGES HAMATUS	16999.6	1687.1	5821.1	3601.0	203.8	2129.3	-	11.9	76.9	27.4	115.1
CENTROPAGES TYPICUS	14595.8	17245.4	13243.1	42211.1	23749.1	5738.8	24798.9	3774.0	12454.2	9524.6	15670.0
CLAUSOCALANUS ARCUICORNIS	-	68.5	-	-	57.1	-	16.9	75.2	47.6	82.7	-
EUCHAETA MARINA	-	-	-	-	-	-	-	11.9	-	5.7	-
EUCHAETA NORVEGICA	-	-	-	-	-	-	-	151.1	-	-	-
LABIDOCERA AESTIVA	1542.0	229.0	377.6	455.3	45.5	38.4	10.0	-	-	-	-
METRIDIA LONGA	-	-	-	-	-	-	-	16.8	-	-	-
METRIDIA LUCENS	-	-	3.1	225.0	86.0	-	117.6	308.7	58.9	75.1	3.8
NANNOCALANUS MINOR	-	196.0	13.3	286.5	77.0	26.8	-	31.7	-	49.0	47.9
NEOCALANUS GRACILIS	-	-	-	-	48.1	-	-	-	-	-	-
OITHONA SIMILIS	-	-	34.5	7.1	-	26.8	16.9	-	-	-	-
OITHONA SPINIROSTRIS	-	-	-	-	96.2	-	4.7	4.8	-	-	-
ONCAEA MEDIA	516.3	5.9	12.1	10.3	-	-	-	-	-	-	-
PARACALANUS PARVUS	12575.3	6387.9	6747.8	32237.4	3887.4	12425.8	1167.9	581.4	4383.0	8477.2	8764.3
PSEUDOCALANUS MINUTUS	2630.7	1509.2	1523.5	4275.9	919.2	2589.2	1858.5	921.1	1547.8	3242.6	3857.1
SAPPHIRINA NIGROMACULATA	-	211.4	117.0	-	-	38.3	-	-	-	68.2	-
SCOLECITHRICELLA MINOR	-	-	-	-	-	-	-	31.1	-	-	-
SCOLECITHRIX DANAE	-	-	-	-	-	-	-	-	-	2.9	-
TEMORA LONGICORNIS	220.6	41.3	113.7	10.3	-	30.0	21.6	-	-	13.7	-
NAUPLII	-	-	-	-	48.1	-	98.7	3.0	-	-	.6
DAMAGED	1504.0	510.1	974.8	2220.0	1133.2	966.7	1358.2	216.7	698.2	1114.9	857.2
	-	-	-	-	-	-	99.6	-	-	-	-
AMPHIPODA (TOTAL)	99.3	249.4	12.2	990.5	496.6	18.4	96.1	130.3	407.8	145.9	165.6
AEGINELLA *	-	-	-	-	-	-	-	3.1	4.6	4.0	-
BRACHYSCELUS SP. *	-	-	-	-	-	-	-	-	.5	-	-
PARATHEMISTO ABYSSORUM	8.2	109.8	-	889.1	251.9	6.9	31.7	111.4	182.5	115.1	27.3
PARATHEMISTO GAUDICHAUDII *	36.7	-	-	.5	-	3.2	-	-	-	-	-
PARATHEMISTO SP. LARVAE	-	-	-	-	22.6	-	-	-	48.3	-	-
PARATHEMISTO SP. *	41.5	127.8	-	74.7	203.8	8.3	18.4	15.7	170.4	26.7	109.3
PHRONIMA SEDENTARIA *	-	2.0	-	-	-	-	-	-	1.5	-	-
PHRONIMA SP1 *	-	7.1	-	4.4	4.6	-	2.3	-	-	-	-
PHRONIMA SP2 *	-	-	-	8.8	13.7	-	5.2	-	-	-	-
PHROSINA SP. *	-	-	-	4.2	-	-	-	-	-	-	-
GAMMARIID *	3.9	-	3.5	-	-	-	-	-	-	-	-
LYSIANASSIDAE *	9.1	2.7	6.4	8.7	-	-	38.5	-	-	-	24.6
UNIDENTIFIED *	-	-	2.4	-	-	-	-	-	-	-	4.4
CUMACEAN (TOTAL)	1.5	-	-	-	-	6.7	-	-	-	-	-
LEPTOCUMA MINOR	-	-	-	-	-	6.7	-	-	-	-	-
UNIDENTIFIED *	1.5	-	-	-	-	-	-	-	-	-	-
ISOPODA (TOTAL)	22.4	3.7	9.6	4.4	-	.3	-	-	-	-	-
CIROLANA *	22.4	3.7	9.6	4.4	-	.3	-	-	-	-	-

Table 2(continued)

NUMBER OF INDIVIDUALS PER SQUARE METER (CONTINUED)

STATION	1	2	4	5	6	7	8	9	10	11	12
TIME	2100H	0023H	2051H	2209H	2337H	1301H	1947H	2230H	0638H	1209H	1940H
SPECIES											
MYSIDACEA (TOTAL)	2979.1	-	7.4	-	-	-	-	-	-	-	-
SIRIELLA GORDONAE	289.7	-	-	-	-	-	-	-	-	-	-
SIRIELLA SP.	25.5	-	-	-	-	-	-	-	-	-	-
STILOMYSIS SP.	50.1	-	-	-	-	-	-	-	-	-	-
JUVENILE	2273.9	-	-	-	-	-	-	-	-	-	-
MYSID SP. *	339.9	-	7.4	-	-	-	-	-	-	-	-
STOMATOPODA (TOTAL)	-	2.7	-	8.4	4.6	-	-	-	4.7	4.9	-
SQUILLA SP. *	-	2.7	-	8.4	4.6	-	-	-	4.6	4.9	-
EUPHAUSIACEA (TOTAL)	112.0	32.8	212.9	85.9	636.7	21.4	75.3	4384.6	321.6	96.7	143.8
EUPHAUSIA KROHNII *	-	2.0	-	4.0	133.9	-	-	129.7	223.5	28.5	49.1
MEGNYCTIPHANES NORVEGICA *	60.6	4.4	11.3	-	279.8	6.9	4.8	3946.9	23.4	.4	26.1
NEMATOSCELIS MEGALOPS *	4.7	3.5	-	8.8	130.6	-	-	28.2	.5	4.0	7.0
THYSANOESSA LONGICAUDATA *	46.2	22.8	11.3	23.1	92.4	7.9	48.8	278.0	16.6	-	2.6
THYSANOESSA CALYPTOSIS	-	-	-	-	-	-	-	1.8	7.6	-	-
CALYPTOSIS	-	-	-	-	-	-	16.9	-	-	-	-
FURCILIAE	-	-	52.0	-	-	-	-	-	-	-	14.8
DAMAGED	-	-	129.0	50.0	-	6.7	-	-	48.3	63.7	44.3
UNIDENTIFIABLE *	.4	-	9.2	-	-	-	4.8	-	1.8	-	-
DECAPODA (TOTAL)	628.4	226.2	416.8	805.2	18.2	33.4	116.1	26.7	5.7	69.5	362.6
CARIDEA LARVAE	8.3	95.3	150.9	-	-	-	-	-	-	-	-
UNIDENTIFIED LARVAE	523.3	112.5	178.3	510.5	-	29.5	4.7	-	-	-	26.0
DECAPODA SP1 *	2.0	-	-	-	-	-	-	-	-	-	-
DECAPODA SP2 *	-	-	-	-	-	-	-	-	2.4	-	-
DECAPODA SP3 *	84.0	7.0	23.2	170.7	-	-	15.1	-	3.3	-	55.4
DECAPODA SP5 *	-	-	-	32.7	-	-	-	-	-	-	-
DECAPODA SP8 *	-	7.4	2.1	6.2	13.8	1.3	19.5	20.3	-	69.1	50.5
CARIDEA SP. *	2.4	-	-	-	-	1.3	-	-	-	-	41.1
ACANTHEPHYRA SP. *	-	4.1	61.3	85.2	4.4	-	76.8	6.4	-	-	189.7
UNIDENTIFIED DECAPODA *	-	-	-	-	-	1.3	-	-	-	-	-
BRACHYURAN MEGALOPA *	3.9	-	.9	-	-	-	-	-	-	-	-
PAGURID MEGALOPA *	.4	-	-	-	-	-	-	-	-	.4	-
OVALIPES *	4.0	-	-	-	-	-	-	-	-	-	-
CHAETOGNATHA (TOTAL)	1013.7	982.0	1335.5	2704.8	159.4	997.0	68.3	56.5	561.3	4796.8	7459.5
SAGITTA ELEGANS	-	-	-	-	-	-	6.1	-	-	57.9	-
EUKROHNIA HAMATA	-	-	-	-	-	-	10.0	-	-	-	11.3
UNIDENTIFIABLE	208.4	161.0	135.1	47.8	22.6	11.4	-	45.4	-	23.9	24.3
SAGITTA SP.	805.3	821.0	1200.3	2657.0	136.8	985.6	52.2	11.1	561.2	4714.9	7423.8
OSTEICHTHYES (TOTAL)	241.2	298.9	195.1	444.8	124.1	-	9.7	-	276.6	162.1	227.6
MERLUCCIUS BILINEARIS *	.4	219.2	84.5	281.9	110.5	-	7.4	-	25.6	61.2	120.8
UROPHYCIS CHUSS *	24.2	29.9	12.5	104.6	4.4	-	2.3	-	30.5	4.9	-
SCOPHTHALMUS AQUOSUS *	215.9	43.6	95.5	32.5	-	-	-	-	-	-	-
GLYPTOCEPHALUS CYNOGLOSSUS *	-	-	-	4.9	-	-	-	-	-	-	-
PLATOPHYRS GROHMANNI *	-	2.2	-	3.8	-	-	-	-	-	-	-
CLUPEA HARENGUS *	-	-	-	-	-	-	-	-	220.6	96.0	104.7
OPHICHTHIDAE *	.6	-	-	-	4.7	-	-	-	-	-	-
EEL SP2 *	-	-	-	4.0	-	-	-	-	-	-	-
FISH SP1 *	-	-	2.6	-	-	-	-	-	-	-	-
FISH SP2 *	-	-	-	5.4	-	-	-	-	-	-	-
FISH SP3 *	-	-	-	4.0	4.4	-	-	-	-	-	2.1
FISH SP4 *	-	4.1	-	3.8	-	-	-	-	-	-	-
TOTAL WEIGHT**	6.79	3.96	5.34	11.56	7.08	2.93	5.34	6.45	2.59	2.88	5.25
CHAETOGNATH WEIGHT	1.91	2.15	2.85	9.08	.42	4.89	.14	.03	1.53	25.33	43.03

* NUMBER OF INDIVIDAULS PER 100M2

** THE SAMPLE WEIGHT IS THE TOTAL WEIGHT OF THE SAMPLE MINUS THE CHAETOGNATH WEIGHT

Table 3. List of all species of animals identified in all the samples taken on all stations.

Table 3.

GROUP	SPECIES
CNIDARIA	
	HYDROID COLONY
	JELLYFISH
	MEDUSAE
	NANOMIA SP.
CTENOPHORA	
	CTENOPHORE
UROCHORDATA	
	SALPIDAE
MOLLUSCA	
	LIMACINA TROCHIFORMIS
	PTEROPODA THECOSOMA
	SQUID
NEMATODA	
	UNIDENTIFIED
POLYCHAETA	
	SERPULID LARVAE
	TOMOPTERIS HELGOLANDICA
	TOMOPTERIS SEPTENTRIONALIS
	UNIDENTIFIED
COPEPODA	
	ACARTIA HUDSONICA
	ACARTIA DANAE
	ACARTIA LONGIREMIS
	ACARTIA LONGIREMIS IMMAT.
	ACARTIA NEGLIGENS
	ACARTIA SP.
	CALANUS FINMARCHICUS
	CALIGUS CURTUS
	CANDACIA ARMATA
	CENTROPAGES BRADYI
	CENTROPAGES HAMATUS
	CENTROPAGES TYPICUS
	CLAUSOCALANUS ARCUICORNIS
	EUCHAETA MARINA
	EUCHAETA NORVEGICA
	LABIDOCERA AESTIVA
	METRIDIA LONGA
	METRIDIA LUCENS
	NANNOCALANUS MINOR
	NEOCALANUS GRACILIS
	OITHONA SIMILIS
	OITHONA SPINIROSTRIS
	ONCAEA MEDIA
	PARACALANUS PARVUS
	PSEUDOCALANUS MINUTUS
	SAPPHIRINA NIGROMACULATA
	SCOLECITHRICELLA MINOR
	SCOLECITHRIX DANAE
	TEMORA LONGICORNIS
	NAUPLII
	DAMAGED
AMPHIPODA	
	AEGINELLA
	BRACHYSCELUS SP.
	PARATHEMISTO ABYSSORUM
	PARATHEMISTO GAUDICHAUDII
	PARATHEMISTO SP. LARVAE
	PARATHEMISTO SP.
	PHRONIMA SEDENTARIA
	PHRONIMA SP1
	PHRONIMA SP2
	PHROSINA SP.
	GAMMARIID SP1
	LYSIANASSIDAE
	UNIDENTIFIED
	CAPRELLID
CUMACEAN	
	LEPTOCUMA MINOR
	UNIDENTIFIED
	CUMACEAN
ISOPODA	
	CIROLANA
MYSIDACEA	
	SIRIELLA GORDONAE
	SIRIELLA SP.
	STILOMYSIS SP.
	JUVENILE
	DAMAGED
	UNIDENTIFIED
STOMATOPODA	
	SQUILLA SP.
EUPHAUSIACEA	
	EUPHAUSIA KROHNII
	MEGNYCTIPHANES NORVEGIC
	NEMATOSCELIS MEGALOPS
	THYSANOESSA LONGICAUDAT
	THYSANOESSA CALYPTOSIS
	CALYPTOSIS
	FURCILIAE
	DAMAGED
	UNIDENTIFIABLE
	EUPHAUSIACEA LARVAE
DECAPODA	
	CARIDEA LARVAE
	UNIDENTIFIED LARVAE
	CARIDEA SP1
	ACANTHEPHYRA SP1
	BRACHYURAN ZOEA
	BRACHYURAN MEGALOPA
	PAGURID ZOEA
	PAGURID MEGALOPA
	OVALIPES
CHAETOGNATHA	
	SAGITTA ELEGANS
	EUKROHNIA HAMATA
	SAGITTA SP.
	UNIDENTIFIABLE
OSTEICHTHYES	
	MERLUCCIUS BILINEARIS
	UROPHYCIS CHUSS
	SCOPHTHALMUS AQUOSUS
	GLYPTOCEPHALUS CYNOGLOSS
	PLATOPHYRS GROHMANNI
	CLUPEA HARENGUS
	OPHICHTHIDAE
	UNIDENTIFIABLE
	FISH EGGS

Table 4. Percent frequencies of length measurements of *Sagitta* sp. in all samples taken on each of the stations. Time of the station and the depths of the samples are given, plus the number of individuals measured in each of the samples.

Table 4.

SAGITTA SP. -- PERCENTAGE FREQUENCIES OF LENGTH MEASUREMENTS

STATION 1 -- 2100H

SAMPLE DEPTH LENGTH(MM)	1 2M	2 4M	3 6M	4 10M	5 10M	6 10M	7 15M	8 21M	9 25M	10 32M	COMBINED
3.	-	-	-	-	-	-	-	-	-	4.5	.7
4.	-	-	-	-	-	-	2.8	-	6.2	9.0	3.0
5.	-	-	-	-	-	-	-	5.4	8.6	9.0	3.9
6.	-	-	-	-	-	2.1	7.0	8.1	6.2	6.0	4.8
7.	-	-	-	-	-	8.5	9.9	5.4	11.1	6.0	6.4
8.	-	-	-	-	-	8.5	5.6	5.4	13.6	6.0	6.1
9.	2.0	2.0	-	-	-	12.8	11.3	5.4	11.1	7.5	7.7
10.	10.0	6.0	-	-	-	10.6	8.5	17.6	9.9	7.5	10.2
11.	12.0	10.0	-	-	-	14.9	22.5	16.2	9.9	16.4	14.8
12.	30.0	24.0	-	-	-	31.9	14.1	21.6	13.6	16.4	20.5
13.	38.0	36.0	-	-	-	6.4	14.1	10.8	7.4	7.5	15.7
14.	2.0	18.0	-	-	-	4.3	1.4	2.7	2.5	3.0	4.3
15.	6.0	2.0	-	-	-	-	2.8	-	-	1.5	1.6
16.	-	2.0	-	-	-	-	-	1.4	-	-	.5
MEASURED	50.	50.	-	-	-	47.	71.	74.	81.	67.	440.

STATION 2 -- 0023H

SAMPLE DEPTH LENGTH(MM)	1 4M	2 6M	3 10M	4 15M	5 20M	6 25M	7 0M	8 0M	9 0M	10 0M	COMBINED
6.	-	-	-	-	4.0	2.0	-	-	-	-	1.2
7.	-	-	-	-	2.0	4.1	-	-	-	-	1.2
8.	2.0	-	6.0	6.0	4.0	8.2	-	-	-	-	5.2
9.	5.9	-	8.0	10.0	4.0	2.0	-	-	-	-	6.0
10.	5.9	-	8.0	6.0	12.0	10.2	-	-	-	-	8.4
11.	17.6	-	20.0	20.0	18.0	14.3	-	-	-	-	18.0
12.	21.6	-	26.0	24.0	24.0	26.5	-	-	-	-	24.4
13.	25.5	-	22.0	22.0	18.0	20.4	-	-	-	-	21.6
14.	15.7	-	10.0	8.0	12.0	10.2	-	-	-	-	11.2
15.	5.9	-	-	4.0	2.0	2.0	-	-	-	-	2.8
MEASURED	51.	-	50.	50.	50.	49.	-	-	-	-	250.

STATION 4 -- 2051H

SAMPLE DEPTH LENGTH(MM)	1 10M	2 15M	3 20M	4 20M	5 26M	6 30M	7 35M	8 40M	9 40M	10 40M	COMBINED
6.	-	-	-	-	-	-	-	-	2.0	-	.3
7.	-	-	-	8.0	-	-	4.0	-	2.0	-	2.3
8.	6.0	10.2	8.0	12.0	-	-	2.0	-	6.0	-	7.4
9.	10.0	8.2	12.0	16.0	-	-	14.0	-	2.0	-	10.4
10.	10.0	14.3	8.0	14.0	-	-	4.0	-	4.0	-	9.0
11.	8.0	22.4	12.0	10.0	-	-	8.0	-	16.0	-	12.7
12.	14.0	14.3	22.0	14.0	-	-	16.0	-	18.0	-	16.4
13.	28.0	16.3	20.0	20.0	-	-	18.0	-	22.0	-	20.7
14.	14.0	10.2	16.0	6.0	-	-	16.0	-	20.0	-	13.7
15.	8.0	4.1	2.0	-	-	-	16.0	-	6.0	-	6.0
16.	2.0	-	-	-	-	-	2.0	-	2.0	-	1.0
MEASURED	50.	49.	50.	50.	-	-	50.	-	50.	-	299.

Table 4(continued)

STATION 5 -- 2209M

SAMPLE DEPTH LENGTH(MM)	1 10M	2 20M	3 30M	4 40M	5 50M	6 50M	7 60M	8 70M	9 70M	10 72M	COMBINED
6.	-	2.0	-	-	-	3.6	-	-	-	-	.8
7.	-	3.9	-	-	-	1.8	-	2.0	6.0	2.0	2.2
8.	4.0	3.9	-	-	-	3.6	-	4.0	6.0	4.0	3.7
9.	2.0	3.9	-	-	-	3.6	2.0	6.0	8.0	6.0	4.5
10.	2.0	5.9	-	-	-	5.5	4.0	6.0	8.0	6.0	5.3
11.	4.0	21.6	-	-	-	9.1	6.0	16.0	2.0	4.0	9.0
12.	14.0	27.5	-	-	-	20.0	16.0	18.0	12.0	12.0	17.1
13.	20.0	15.7	-	-	-	18.2	30.0	26.0	24.0	18.0	21.6
14.	28.0	9.8	-	-	-	14.5	18.0	16.0	16.0	16.0	16.9
15.	10.0	3.9	-	-	-	12.7	18.0	4.0	12.0	22.0	11.8
16.	10.0	2.0	-	-	-	5.5	4.0	2.0	4.0	6.0	4.8
17.	6.0	-	-	-	-	-	2.0	-	2.0	4.0	2.0
18.	-	-	-	-	-	1.8	-	-	-	-	.3
MEASURED	50.	51.	-	-	-	55.	50.	50.	50.	50.	356.

STATION 6 -- 2337M

SAMPLE DEPTH LENGTH(MM)	1 10M	2 20M	3 20M	4 30M	5 40M	6 0M	7 0M	8 0M	9 0M	10 0M	COMBINED
6.	-	-	5.0	5.5	4.1	-	-	-	-	-	3.1
7.	8.0	8.2	7.5	8.2	8.2	-	-	-	-	-	8.0
8.	2.0	12.3	11.3	11.0	2.0	-	-	-	-	-	8.6
9.	6.0	6.8	11.3	11.0	6.1	-	-	-	-	-	8.6
10.	8.0	6.8	6.3	5.5	8.2	-	-	-	-	-	6.8
11.	6.0	6.8	3.8	6.8	4.1	-	-	-	-	-	5.5
12.	16.0	19.2	3.8	15.1	6.1	-	-	-	-	-	12.0
13.	20.0	12.3	21.3	9.6	12.2	-	-	-	-	-	15.1
14.	16.0	8.2	10.0	11.0	10.2	-	-	-	-	-	10.8
15.	6.0	6.8	11.3	9.6	20.4	-	-	-	-	-	10.5
16.	10.0	9.6	7.5	4.1	2.0	-	-	-	-	-	6.8
17.	2.0	2.7	1.3	2.7	2.0	-	-	-	-	-	2.2
19.	-	-	-	-	4.1	-	-	-	-	-	.6
20.	-	-	-	-	2.0	-	-	-	-	-	.3
21.	-	-	-	-	4.1	-	-	-	-	-	.6
22.	-	-	-	-	2.0	-	-	-	-	-	.3
23.	-	-	-	-	2.0	-	-	-	-	-	.3
MEASURED	50.	73.	80.	73.	49.	-	-	-	-	-	325.

STATION 7 -- 1301M

SAMPLE DEPTH LENGTH(MM)	1 9M	2 15M	3 20M	4 31M	5 37M	6 0M	7 40M	8 47M	9 20M	10 20M	COMBINED
5.	-	-	-	-	-	-	-	1.1	1.3	-	.4
6.	-	-	-	-	-	-	-	-	1.3	6.0	.8
7.	-	-	-	1.3	-	-	1.1	1.1	2.5	6.0	1.5
8.	3.3	-	-	1.3	3.4	-	-	4.5	2.5	6.0	2.8
9.	3.3	-	-	-	-	-	1.1	1.1	3.8	2.0	1.7
10.	3.3	-	-	1.3	-	-	2.2	-	1.3	6.0	1.9
11.	5.6	-	-	6.7	1.7	-	8.9	5.6	3.8	6.0	5.6
12.	12.2	-	-	9.3	6.9	-	6.7	6.7	7.5	10.0	8.5
13.	20.0	-	-	21.3	15.5	-	11.1	13.5	12.5	20.0	16.0
14.	23.3	-	-	22.7	25.9	-	11.1	19.1	13.8	18.0	18.8
15.	16.7	-	-	21.3	29.3	-	26.7	19.1	26.3	14.0	22.0
16.	11.1	-	-	12.0	10.3	-	18.9	20.2	17.5	2.0	14.1
17.	1.1	-	-	2.7	6.9	-	12.2	7.9	3.8	2.0	5.5
18.	-	-	-	-	-	-	-	-	1.3	2.0	.4
22.	-	-	-	-	-	-	-	-	1.3	-	.2
MEASURED	90.	-	-	75.	58.	-	90.	89.	80.	50.	532.

Table 4(continued)

STATION 8 --1947M

SAMPLE	1	2	3	4	5	6	7	8	9	10	COMBINED
DEPTH	7M	10M	19M	25M	27M	39M	44M	52M	62M	40M	
LENGTH(MM)											
5.	-	-	2.7	3.3	-	-	-	-	-	-	.6
6.	1.9	2.4	8.2	16.4	3.7	3.3	1.4	1.5	1.1	5.0	4.3
7.	1.9	8.3	15.1	13.1	9.3	16.4	12.7	3.0	5.7	11.7	9.7
8.	13.5	11.9	16.4	31.1	31.5	23.0	19.7	9.1	3.4	18.3	16.9
9.	5.8	4.8	13.7	11.5	20.4	16.4	11.3	16.7	12.5	13.3	12.4
10.	5.8	1.2	5.5	6.6	11.1	6.6	8.5	12.1	5.7	8.3	6.9
11.	1.9	1.2	2.7	3.3	9.3	6.6	5.6	4.5	9.1	11.7	5.5
12.	5.8	3.6	5.5	1.6	1.9	6.6	4.2	10.6	19.3	10.0	7.3
13.	7.7	3.6	6.8	4.9	3.7	4.9	5.6	12.1	20.5	8.3	8.2
14.	23.1	9.5	5.5	4.9	-	4.9	9.9	12.1	12.5	3.3	8.7
15.	15.4	17.9	5.5	-	5.6	3.3	12.7	10.6	3.4	3.3	7.9
16.	9.6	16.7	5.5	-	1.9	3.3	2.8	4.5	1.1	3.3	5.1
17.	5.8	13.1	5.5	-	-	3.3	2.8	-	2.3	3.3	3.9
18.	1.9	4.8	1.4	-	1.9	-	-	-	2.3	-	1.3
19.	-	1.2	-	1.6	-	1.6	-	-	-	-	.4
20.	-	-	-	1.6	-	-	2.8	3.0	-	-	.7
22.	-	-	-	-	-	-	-	-	1.1	-	.1
MEASURED	52.	84.	73.	61.	54.	61.	71.	66.	88.	60.	670.

STATION 9 --2230M

SAMPLE	1	2	3	4	5	6	7	8	9	10	COMBINED
DEPTH	6M	10M	10M	20M	30M	50M	60M	80M	80M	80M	
LENGTH(MM)											
9.	-	-	1.2	-	1.9	-	14.3	-	-	-	1.0
10.	8.8	2.0	3.5	3.6	14.8	15.8	14.3	-	-	-	6.9
11.	5.9	7.8	2.4	9.1	14.8	15.8	-	-	-	-	7.9
12.	8.8	13.7	5.9	12.7	16.7	10.5	-	-	-	-	10.8
13.	20.6	15.7	23.5	12.7	16.7	31.6	14.3	-	-	-	19.0
14.	23.5	13.7	17.6	12.7	11.1	10.5	42.9	-	-	-	15.7
15.	11.8	15.7	20.0	9.1	11.1	5.3	14.3	-	-	-	13.8
16.	11.8	17.6	10.6	23.6	5.6	-	-	-	-	-	12.5
17.	8.8	7.8	14.1	10.9	3.7	5.3	-	-	-	-	9.2
18.	-	5.9	1.2	5.5	3.7	-	-	-	-	-	3.0
30.	-	-	-	-	-	5.3	-	-	-	-	.3
MEASURED	34.	51.	85.	55.	54.	19.	7.	-	-	-	305.

STATION 10 -- 0638M

SAMPLE	1	2	3	4	5	6	7	8	9	10	COMBINED
DEPTH	5M	10M	15M	20M	25M	33M	37M	20M	20M	10M	
LENGTH(MM)											
6.	-	-	-	-	-	-	-	-	-	3.2	.3
7.	10.9	7.7	9.7	4.8	-	4.8	2.9	3.3	-	3.2	4.8
8.	10.9	9.2	8.1	9.7	4.8	4.8	7.2	8.2	6.6	3.2	7.3
9.	10.9	10.8	9.7	8.1	8.1	3.2	4.3	4.9	4.9	17.7	8.3
10.	7.8	16.9	17.7	6.5	9.7	4.8	5.8	3.3	4.9	4.8	8.3
11.	9.4	12.3	4.8	11.3	9.7	4.8	8.7	9.8	11.5	8.1	9.0
12.	12.5	13.8	14.5	14.5	19.4	12.9	10.1	16.4	11.5	6.5	13.2
13.	14.1	10.8	16.1	25.8	17.7	21.0	15.9	19.7	11.5	8.1	16.0
14.	9.4	9.2	9.7	9.7	16.1	21.0	18.8	16.4	26.2	14.5	15.1
15.	6.3	3.1	1.6	8.1	8.1	12.9	11.6	9.8	13.1	12.9	8.7
16.	3.1	3.1	8.1	1.6	6.5	4.8	10.1	4.9	6.6	12.9	6.2
17.	-	3.1	-	-	-	4.8	4.3	3.3	3.3	4.8	2.4
18.	3.1	-	-	-	-	-	-	-	-	-	.3
20.	1.6	-	-	-	-	-	-	-	-	-	.2
MEASURED	64.	65.	62.	62.	62.	62.	69.	61.	61.	62.	630.

Table 4(continued)

STATION 11 -- 1209H

SAMPLE DEPTH LENGTH(MM)	1 9M	2 15M	3 21M	4 25M	5 34M	6 39M	7 48M	8 48M	9 45M	10 0M	COMBINED
6.	-	7.1	-	-	-	-	-	-	-	-	1.4
7.	-	14.3	-	-	-	-	-	-	-	-	2.8
8.	-	12.5	-	-	-	-	-	-	-	-	2.5
9.	-	8.9	-	-	-	-	-	-	-	-	1.8
10.	-	7.1	-	-	-	-	-	-	-	-	1.4
11.	-	3.6	-	-	-	-	-	-	-	-	.7
12.	-	3.6	-	-	-	-	3.8	4.0	-	-	2.5
13.	-	3.6	-	-	-	12.5	5.1	8.0	-	-	5.7
14.	-	8.9	-	-	-	25.0	24.4	24.0	10.0	-	18.8
15.	-	12.5	-	-	-	33.3	21.8	40.0	20.0	-	24.8
16.	-	17.9	-	-	-	25.0	34.6	18.0	44.0	-	28.4
17.	-	-	-	-	-	4.2	7.7	6.0	24.0	-	8.2
18.	-	-	-	-	-	-	2.6	-	2.0	-	1.1
MEASURED	-	56.	-	-	-	48.	78.	50.	50.	-	282.

STATION 12 -- 1940H

SAMPLE DEPTH LENGTH(MM)	1 6M	2 12M	3 17M	4 27M	5 33M	6 40M	7 47M	8 55M	9 17M	10 17M	COMBINED
11.	4.3	-	-	-	-	-	-	-	-	2.0	.9
12.	4.3	10.0	-	-	-	2.0	-	6.0	-	2.0	3.5
13.	13.0	10.0	8.0	-	4.1	4.0	-	8.0	-	10.0	8.1
14.	37.0	14.0	18.0	-	12.2	18.0	-	12.0	-	14.0	17.7
15.	34.8	34.0	28.0	-	28.6	30.0	-	34.0	-	32.0	31.6
16.	6.5	22.0	38.0	-	44.9	26.0	-	32.0	-	32.0	29.0
17.	-	10.0	4.0	-	10.2	18.0	-	8.0	-	8.0	8.4
18.	-	-	4.0	-	-	2.0	-	-	-	-	.9
MEASURED	46.	50.	50.	-	49.	50.	-	50.	-	50.	345.

SAGITTA SP. -- SUMMARY OF PERCENTAGE FREQUENCIES OF LENGTH MEASUREMENTS FOR GEORGES BANK 1978

STATION TIME LENGTH(MM)	1 2100	2 0023	4 2051	5 2209	6 2337	7 1301	8 1947	9 2230	10 0638	11 1209	12 1940	CRUISE
3.	.7	-	-	-	-	-	-	-	-	-	-	.1
4.	3.0	-	-	-	-	-	-	-	-	-	-	.3
5.	3.9	-	-	-	-	.4	.6	-	-	-	-	.5
6.	4.8	1.2	.3	.8	3.1	.8	4.3	-	.3	1.4	-	1.7
7.	6.4	1.2	2.3	2.2	8.0	1.5	9.7	-	4.8	2.8	-	4.1
8.	6.1	5.2	7.4	3.7	8.6	2.8	16.9	-	7.3	2.5	-	6.4
9.	7.7	6.0	10.4	4.5	8.6	1.7	12.4	1.0	8.3	1.8	-	6.2
10.	10.2	8.4	9.0	5.3	6.8	1.9	6.9	6.9	8.3	1.4	-	6.0
11.	14.8	18.0	12.7	9.0	5.5	5.6	5.5	7.9	9.0	.7	.9	7.9
12.	20.5	24.4	16.4	17.1	12.0	8.5	7.3	10.8	13.2	2.5	3.5	11.9
13.	15.7	21.6	20.7	21.6	15.1	16.0	8.2	19.0	16.0	5.7	8.1	14.7
14.	4.3	11.2	13.7	16.9	10.8	18.8	8.7	15.7	15.1	18.8	17.7	13.5
15.	1.6	2.8	6.0	11.8	10.5	22.0	7.9	13.8	8.7	24.8	31.6	12.5
16.	.5	-	1.0	4.8	6.8	14.1	5.1	12.5	6.2	28.4	29.0	9.2
17.	-	-	-	2.0	2.2	5.5	3.9	9.2	2.4	8.2	8.4	3.7
18.	-	-	-	.3	-	.4	1.3	3.0	.3	1.1	.9	.7
19.	-	-	-	-	.6	-	.4	-	-	-	-	.1
20.	-	-	-	-	.3	-	.7	-	.2	-	-	.2
21.	-	-	-	-	.6	-	-	-	-	-	-	.0
22.	-	-	-	-	.3	.2	.1	-	-	-	-	.1
23.	-	-	-	-	.3	-	-	-	-	-	-	.0
30.	-	-	-	-	-	-	-	.3	-	-	-	.0
MEASURED	440.	250.	299.	356.	325.	532.	670.	305.	630.	282.	345.	4434.

Table 5. Mean lengths ± the standard deviation of *Sagitta* sp. in each sample taken on the different stations plus the mean length and standard deviation for all the chaetognaths combined in all samples for each station.

Table 5.

SAGITTA SP. -- LENGTH MEANS AND STANDARD DEVIATIONS

SAMP	STN 1 TIME 2100	2 0023	4 2051	5 2209	6 2337	7 1301	8 1947	9 2230	10 0638	11 1209	12 1940
1	12.2± 1.3	12.2± 1.6	12.1± 2.1	13.5± 2.1	12.3± 2.6	13.3± 2.0	12.7± 3.1	13.7± 2.0	11.4± 3.1	-	14.1± 1.1
2	12.6± 1.3	-	11.3± 1.9	11.6± 2.1	11.7± 2.9	-	13.2± 3.8	14.2± 2.1	11.1± 2.6	11.2± 3.6	14.8± 1.4
3	-	11.6± 1.6	11.6± 1.9	-	11.5± 3.1	-	10.3± 3.6	14.3± 1.9	11.2± 2.6	-	15.2± 1.2
4	-	11.6± 1.8	10.6± 2.1	-	11.2± 3.1	13.7± 1.9	8.8± 3.0	14.3± 2.2	11.6± 2.3	-	-
5	-	11.4± 2.1	-	-	13.2± 4.2	14.2± 1.8	9.5± 2.6	12.9± 2.2	12.3± 2.1	-	15.4± 1.0
6	10.5± 2.0	11.4± 2.1	-	12.4± 2.5	-	-	10.0± 3.1	13.4± 4.4	12.8± 2.5	14.8± 1.1	15.4± 1.3
7	10.2± 2.5	-	12.2± 2.3	13.3± 1.6	-	14.3± 2.1	11.0± 3.5	12.7± 2.3	12.7± 2.6	15.1± 1.3	-
8	10.2± 2.5	-	-	12.1± 1.9	-	13.9± 2.5	11.7± 3.0	-	12.4± 2.5	14.8± 1.1	15.0± 1.3
9	8.9± 2.8	-	12.1± 2.2	12.2± 2.6	-	13.7± 2.9	11.9± 2.8	-	12.8± 2.3	15.9± 1.0	-
10	9.0± 3.3	-	-	13.0± 2.4	-	12.1± 3.0	10.3± 2.9	-	12.3± 3.1	-	15.0± 1.3
COMB	10.3± 2.8	11.7± 1.9	11.7± 2.2	12.6± 2.3	11.9± 3.2	13.7± 2.4	11.1± 3.4	13.9± 2.3	12.1± 2.6	14.4± 2.5	15.0± 1.3

Table 6. Percent frequency of length classes on different stations for *Merluccius bilinearis*, *Urophycis chuss* and *Scophthalmus aquosus*.

Table 6.

MERLUCCIUS BILINEARIS -- PERCENTAGE FREQUENCIES OF LENGTH MEASUREMENTS

STN	1	2	4	5	6	7	8	9	10	11	12	CRUISE
TIME	2100	0023	2051	2209	2337	1301	1947	2230	0638	1209	1940	
LENGTH(MM)												
6.	-	2.8	-	-	-	-	-	-	8.3	-	3.9	1.7
7.	-	8.3	14.6	2.9	-	-	-	-	-	-	13.7	6.7
8.	-	14.6	17.1	8.7	-	-	50.0	-	-	11.8	2.0	10.5
9.	-	23.6	14.6	18.3	-	-	-	-	-	5.9	2.0	14.8
10.	-	14.6	9.8	20.2	3.7	-	-	-	8.3	5.9	15.7	13.9
11.	-	13.9	12.2	10.6	-	-	-	-	-	11.8	15.7	11.5
12.	-	9.0	9.8	11.5	18.5	-	-	-	33.3	20.6	21.6	13.4
13.	-	4.2	9.8	7.7	14.8	-	25.0	-	33.3	26.5	7.8	9.6
14.	-	2.8	4.9	8.7	29.6	-	-	-	8.3	11.8	5.9	7.4
15.	-	2.1	4.9	1.9	3.7	-	-	-	8.3	2.9	2.0	2.6
16.	-	2.1	-	2.9	7.4	-	-	-	-	2.9	5.9	2.9
17.	-	-	-	-	11.1	-	25.0	-	-	-	2.0	1.2
18.	-	.7	-	1.0	3.7	-	-	-	-	-	-	.7
19.	-	-	2.4	1.0	3.7	-	-	-	-	-	-	.7
20.	-	-	-	1.9	-	-	-	-	-	-	-	.5
21.	-	.7	-	1.0	-	-	-	-	-	-	-	.5
22.	-	.7	-	-	3.7	-	-	-	-	-	-	.5
24.	-	-	-	1.0	-	-	-	-	-	-	-	.2
26.	100.0	-	-	-	-	-	-	-	-	-	-	.2
42.	-	-	-	-	-	-	-	-	-	-	2.0	.2
47.	-	-	-	1.0	-	-	-	-	-	-	-	.2
MEASURED	1.	144.	41.	104.	27.	-	4.	-	12.	34.	51.	418.

UROPHYCIS CHUSS -- PERCENTAGE FREQUENCIES OF LENGTH MEASUREMENTS

STN	1	2	4	5	6	7	8	9	10	11	12	CRUISE
TIME	2100	0023	2051	2209	2337	1301	1947	2230	0638	1209	1940	
LENGTH(MM)												
2.	14.3	-	-	-	-	-	-	-	-	-	-	1.6
3.	-	9.5	-	13.0	-	-	-	-	50.0	50.0	-	11.1
4.	-	57.1	66.7	47.8	-	-	-	-	-	50.0	-	44.4
5.	-	4.8	-	17.4	-	-	-	-	50.0	-	-	9.5
6.	-	9.5	-	8.7	-	-	100.0	-	-	-	-	7.9
7.	-	19.0	-	4.3	-	-	-	-	-	-	-	7.9
8.	-	-	-	4.3	100.0	-	-	-	-	-	-	3.2
9.	42.9	-	33.3	-	-	-	-	-	-	-	-	7.9
10.	-	-	-	4.3	-	-	-	-	-	-	-	1.6
12.	14.3	-	-	-	-	-	-	-	-	-	-	1.6
14.	14.3	-	-	-	-	-	-	-	-	-	-	1.6
16.	14.3	-	-	-	-	-	-	-	-	-	-	1.6
MEASURED	7.	21.	6.	23.	1.	-	1.	-	2.	2.	-	63.

SCOPHTHALMUS AQUOSUS -- PERCENTAGE FREQUENCIES OF LENGTH MEASUREMENTS

STN	1	2	4	5	6	7	8	9	10	11	12	CRUISE
TIME	2100	0023	2051	2209	2337	1301	1947	2230	0638	1209	1940	
LENGTH(MM)												
2.	-	-	7.1	14.3	-	-	-	-	-	-	-	1.4
3.	.9	-	7.1	14.3	-	-	-	-	-	-	-	2.1
4.	4.3	40.0	-	28.6	-	-	-	-	-	-	-	6.4
5.	11.3	-	35.7	28.6	-	-	-	-	-	-	-	14.2
6.	29.6	20.0	-	14.3	-	-	-	-	-	-	-	25.5
7.	23.5	-	-	-	-	-	-	-	-	-	-	19.1
8.	13.0	-	21.4	-	-	-	-	-	-	-	-	12.8
9.	3.5	20.0	7.1	-	-	-	-	-	-	-	-	4.3
10.	7.0	-	7.1	-	-	-	-	-	-	-	-	6.4
11.	1.7	-	7.1	-	-	-	-	-	-	-	-	2.1
13.	.9	-	7.1	-	-	-	-	-	-	-	-	1.4
14.	.9	-	-	-	-	-	-	-	-	-	-	.7
16.	.9	-	-	-	-	-	-	-	-	-	-	.7
17.	.9	-	-	-	-	-	-	-	-	-	-	.7
18.	1.7	-	-	-	-	-	-	-	-	-	-	1.4
27.	-	20.0	-	-	-	-	-	-	-	-	-	.7
MEASURED	115.	5.	14.	7.	-	-	-	-	-	-	-	141.

Table 7. Mean length ± standard deviation of *Merluccius bilinearius*, *Urophycis chuss* and *Scopthalmus aquosus* for each of the samples on each station.

Table 7.

MERLUCCIUS BILINEARIS -- LENGTH MEANS AND STANDARD DEVIATIONS

STN	1	2	4	5	6	7	8	9	10	11	12
TIME	2100	0023	2051	2209	2337	1301	1947	2230	0638	1209	1940
SAMP											
1	-	9.0± 1.7	-	11.5± .7	13.0± 2.5	-	-	-	6.0± 0.0	-	11.5± 3.0
2	-	9.2± 1.3	-	10.2± 1.6	14.4± 2.7	-	12.5± 6.4	-	-	-	11.8± 8.7
3	-	10.4± 2.3	-	10.3± 1.5	15.7± 1.5	-	8.0± 0.0	-	13.0± 0.0	-	11.0± 1.9
4	-	9.4± 2.4	-	13.0± 5.5	15.7± 3.5	-	13.0± 0.0	-	13.0± 1.0	-	10.7± 1.5
5	-	11.4± 3.4	12.0± 1.0	11.5± 3.3	14.5± 1.6	-	-	-	-	15.0± 0.0	-
6	26.0± 0.0	10.1± 2.2	9.5± 3.5	11.9± 6.1	-	-	-	-	11.0± 1.4	11.8± 2.1	-
7	-	-	10.7± 4.2	11.5± 3.2	-	-	-	-	13.3± 1.5	11.7± 1.7	10.5± .7
8	-	-	10.5± 2.9	11.0± 2.8	-	-	-	-	12.0± 0.0	10.6± 2.7	-
9	-	-	10.2± 2.3	-	-	-	-	-	-	12.9± .9	-
10	-	-	9.2± 1.8	-	-	-	-	-	-	-	14.0± 2.5
COMB	26.0± 0.0	10.1± 2.6	10.3± 2.8	11.7± 4.7	14.5± 2.6	-	11.5± 4.4	-	12.1± 2.3	11.8± 2.1	11.6± 5.1

UROPHYCIS CHUSS -- LENGTH MEANS AND STANDARD DEVIATIONS

STN	1	2	4	5	6	7	8	9	10	11	12
TIME	2100	0023	2051	2209	2337	1301	1947	2230	0638	1209	1940
SAMP											
1	2.0± 0.0	4.1± 1.2	-	5.7± 2.5	-	-	6.0± 0.0	-	-	-	-
2	12.5± 4.9	4.0± 0.0	-	6.7± 3.1	-	-	-	-	3.0± 0.0	3.0± 0.0	-
3	-	5.0± 0.0	-	4.3± 1.1	-	-	-	-	5.0± 0.0	4.0± 0.0	-
4	-	5.7± 1.5	-	4.3± .6	-	-	-	-	-	-	-
5	12.0± 0.0	7.0± 0.0	-	-	8.0± 0.0	-	-	-	-	-	-
6	14.0± 0.0	5.0± 1.4	-	5.0± 0.0	-	-	-	-	-	-	-
7	9.0± 0.0	-	9.0± 0.0	4.0± 0.0	-	-	-	-	-	-	-
8	-	-	5.3± 2.5	-	-	-	-	-	-	-	-
9	9.0± 0.0	-	4.0± 0.0	-	-	-	-	-	-	-	-
10	-	-	-	-	-	-	-	-	-	-	-
COMB	10.1± 4.5	4.7± 1.3	5.7± 2.6	4.8± 1.7	8.0± 0.0	-	6.0± 0.0	-	4.0± 1.4	3.5± .7	-

SCOPTHALMUS AQUOSUS -- LENGTH MEANS AND STANDARD DEVIATIONS

STN	1	2	4	5	6	7	8	9	10	11	12
TIME	2100	0023	2051	2209	2337	1301	1947	2230	0638	1209	1940
SAMP											
1	6.1± .7	-	-	-	-	-	-	-	-	-	-
2	7.0± 0.0	4.0± 0.0	-	5.0± 0.0	-	-	-	-	-	-	-
3	6.0± 0.0	7.5± 2.1	-	3.8± 1.5	-	-	-	-	-	-	-
4	6.6± 1.7	4.0± 0.0	-	-	-	-	-	-	-	-	-
5	7.9± 2.8	-	6.5± 2.1	5.0± 0.0	-	-	-	-	-	-	-
6	6.0± 1.0	27.0± 0.0	5.8± 2.8	-	-	-	-	-	-	-	-
7	8.2± 5.0	-	7.3± 2.1	-	-	-	-	-	-	-	-
8	6.8± 1.7	-	11.0± 0.0	-	-	-	-	-	-	-	-
9	7.7± 2.6	-	8.0± 7.1	-	-	-	-	-	-	-	-
10	8.1± 3.2	-	-	-	-	-	-	-	-	-	-
COMB	7.3± 2.6	10.0± 9.7	6.9± 3.1	4.1± 1.3	-	-	-	-	-	-	-

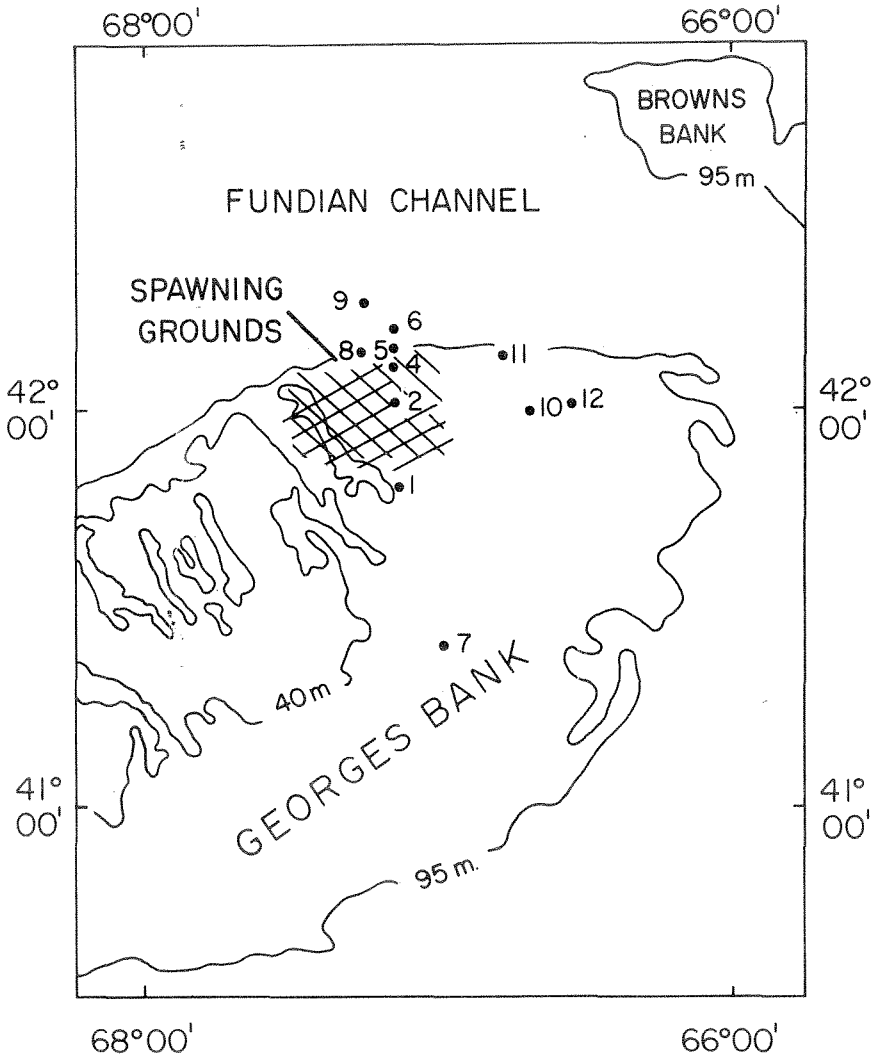

Fig. 1. Positions of sampling stations and region of historic *Clupea harengus* spawning beds on the northeast part of Geroges Bank.

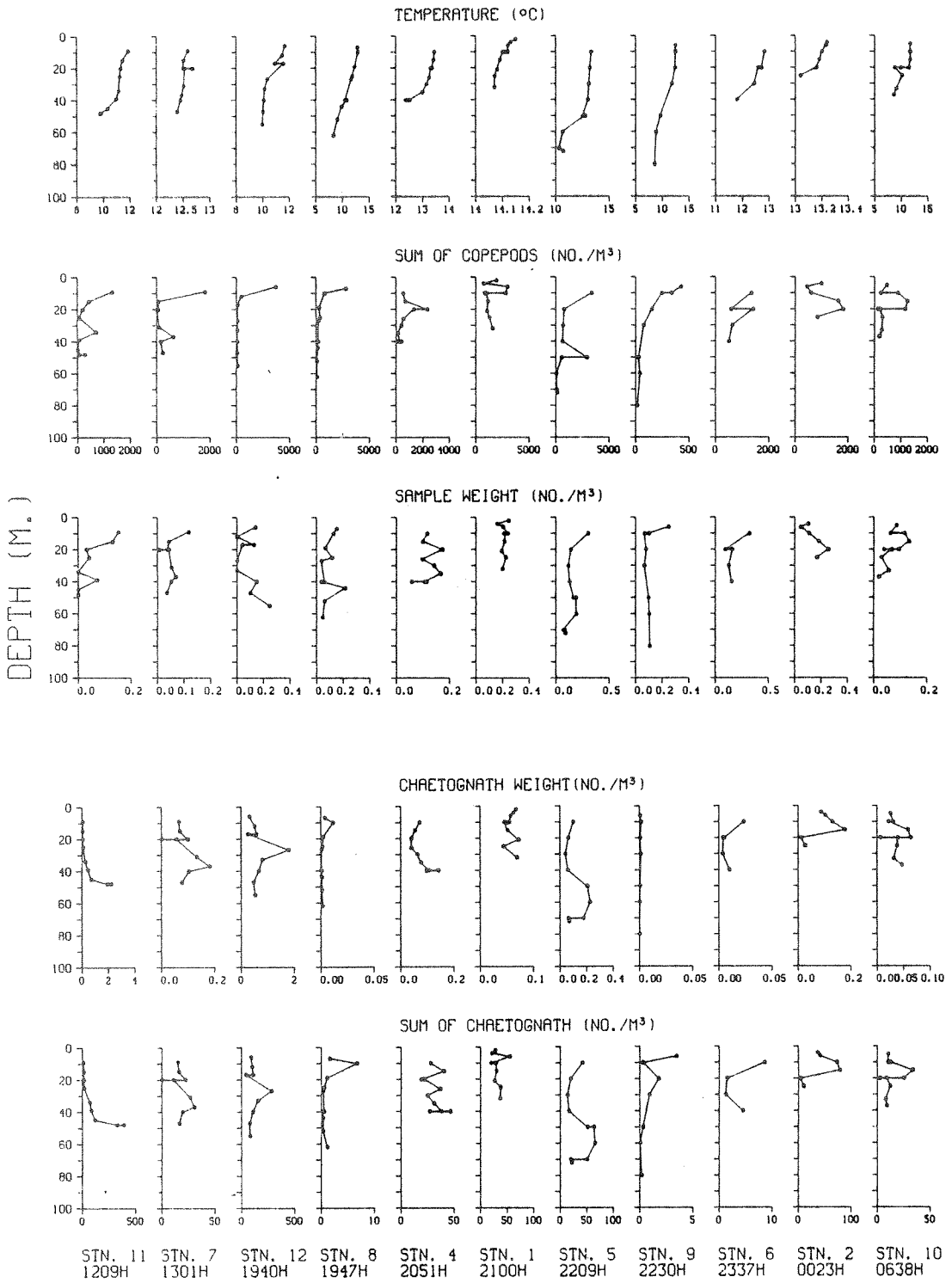

Fig. 2. Numbers of zooplankton, macrozooplankton, ichthyoplankton and temperature profile with depth on the different stations. The stations are arranged in sequence of times of sampling.

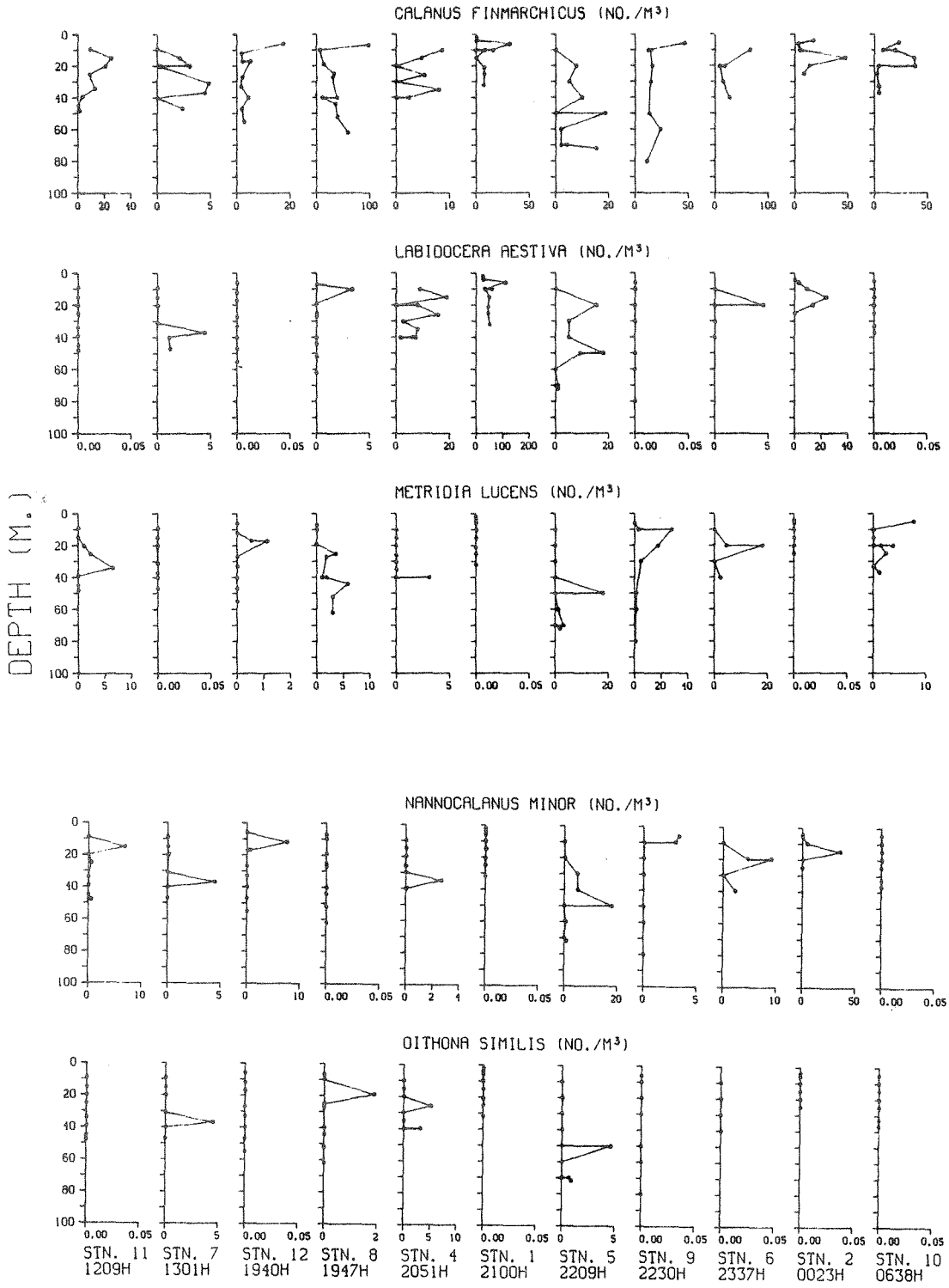

Fig. 2(continued)

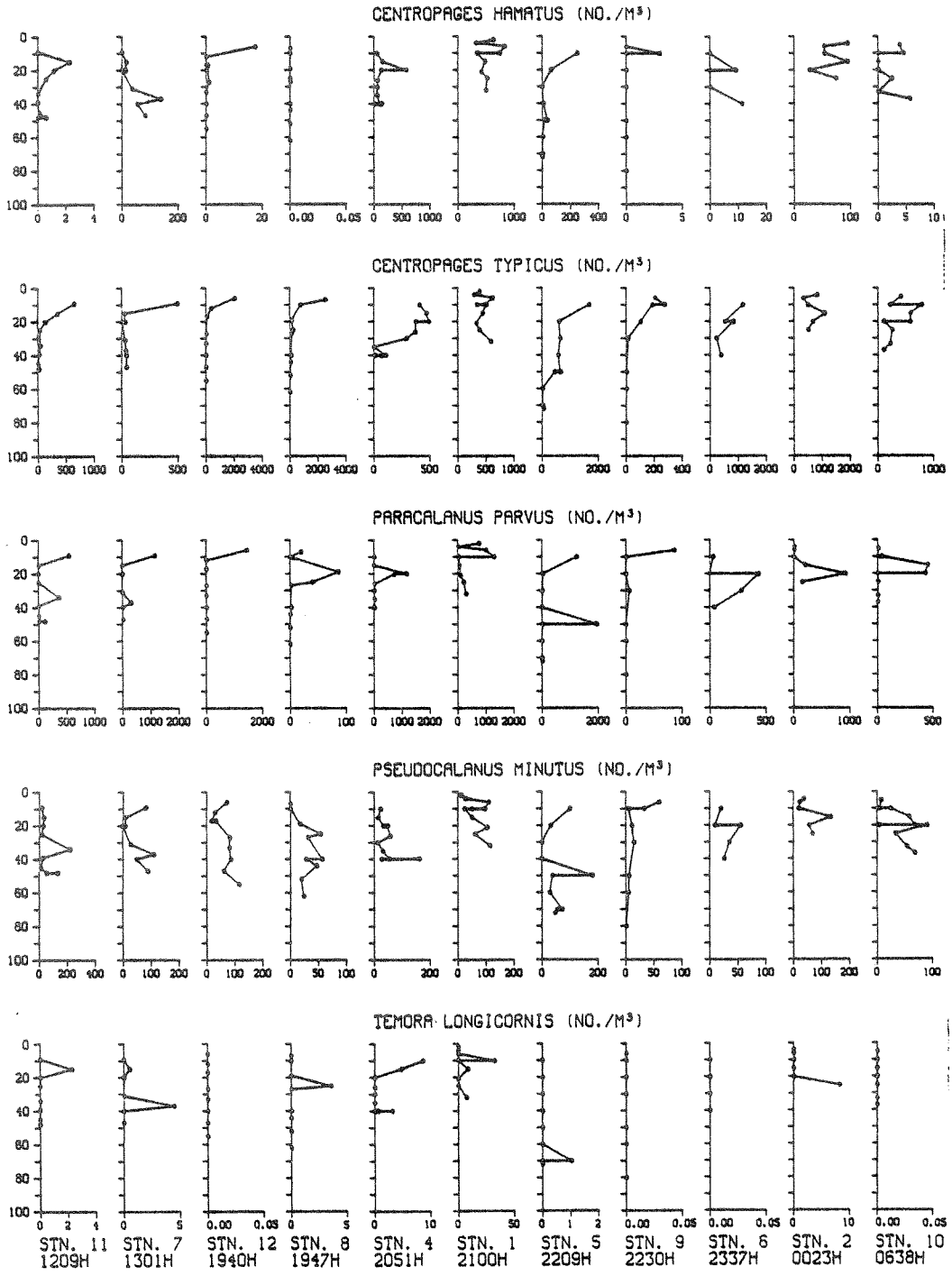

Fig 2(continued)

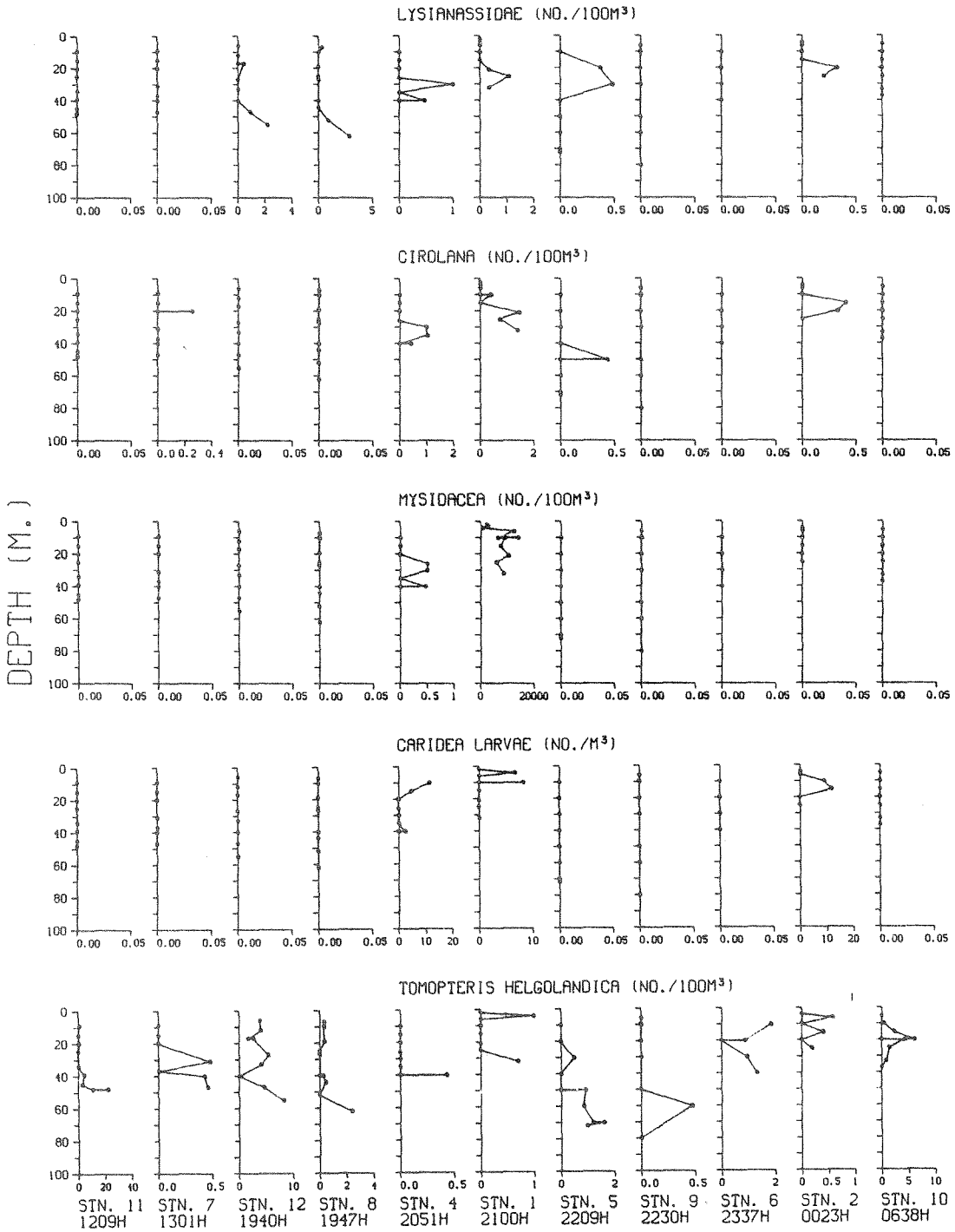

Fig. 2(continued)

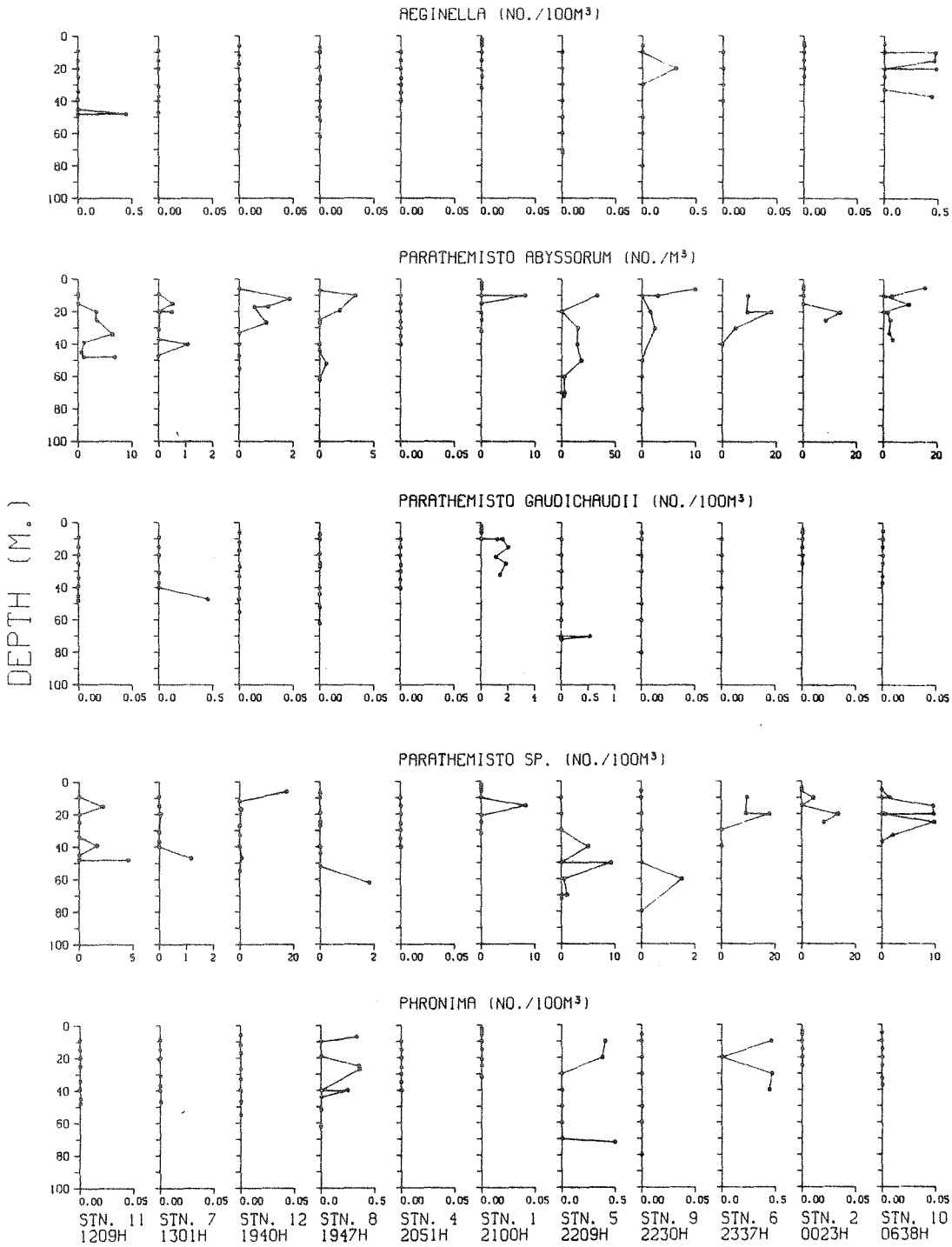

Fig. 2(continued)

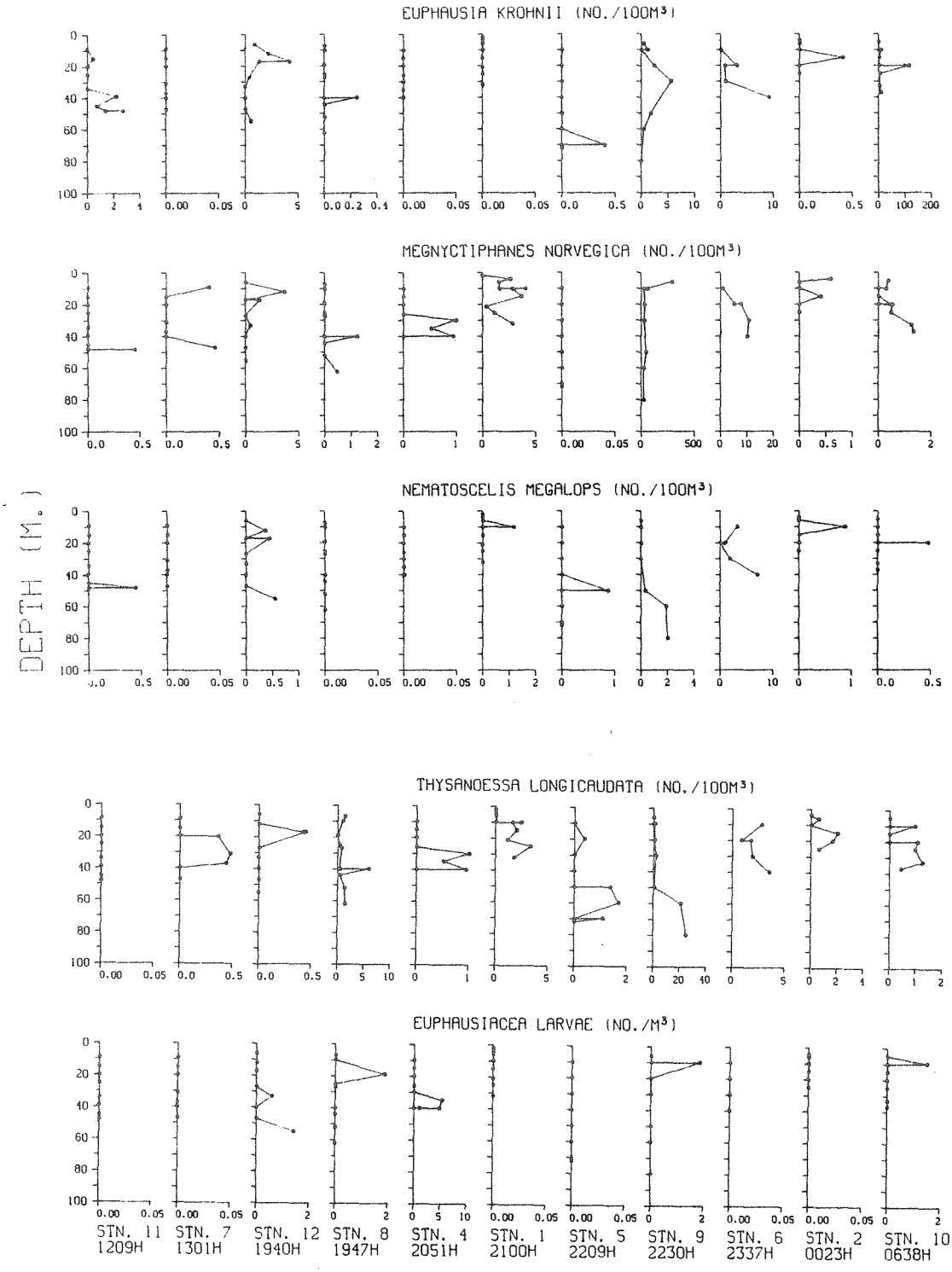

Fig. 2(continued)

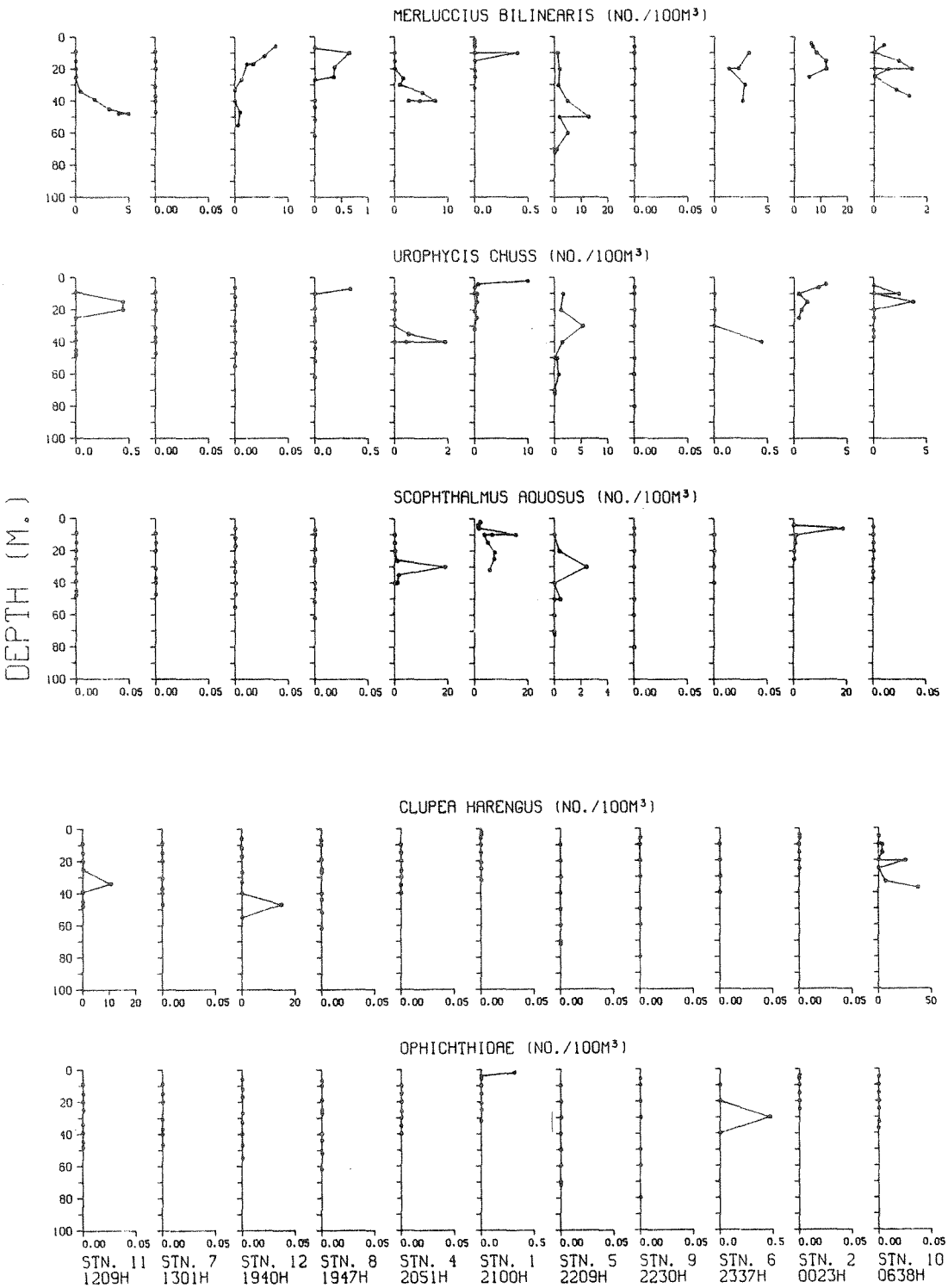

Fig. 2(continued)

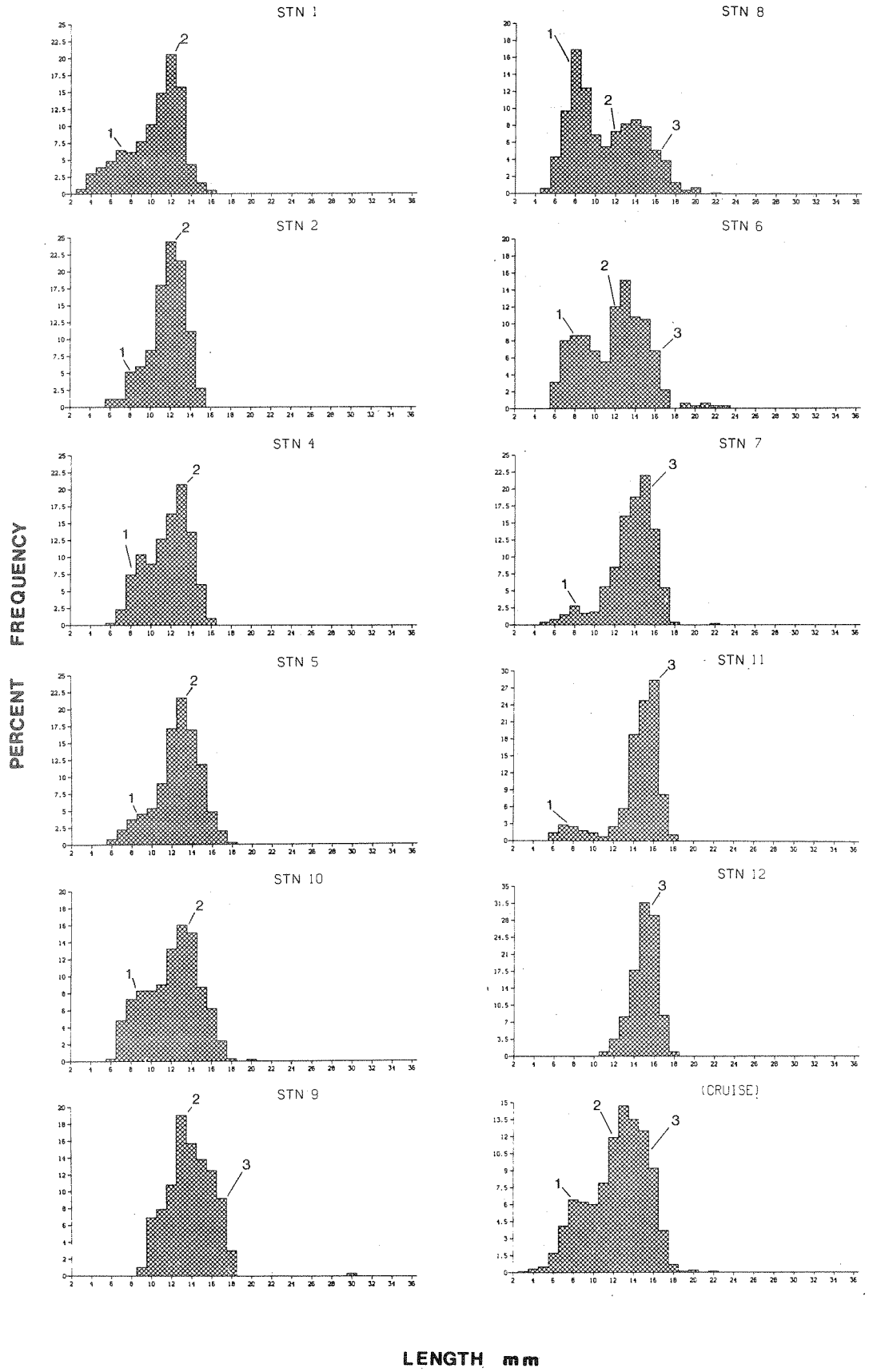

Fig. 3. Length frequency distributions of *Sagitta* sp. on each of the stations. Numbers 1, 2 and 3 refer to positions of the median values of the three sub-populations.

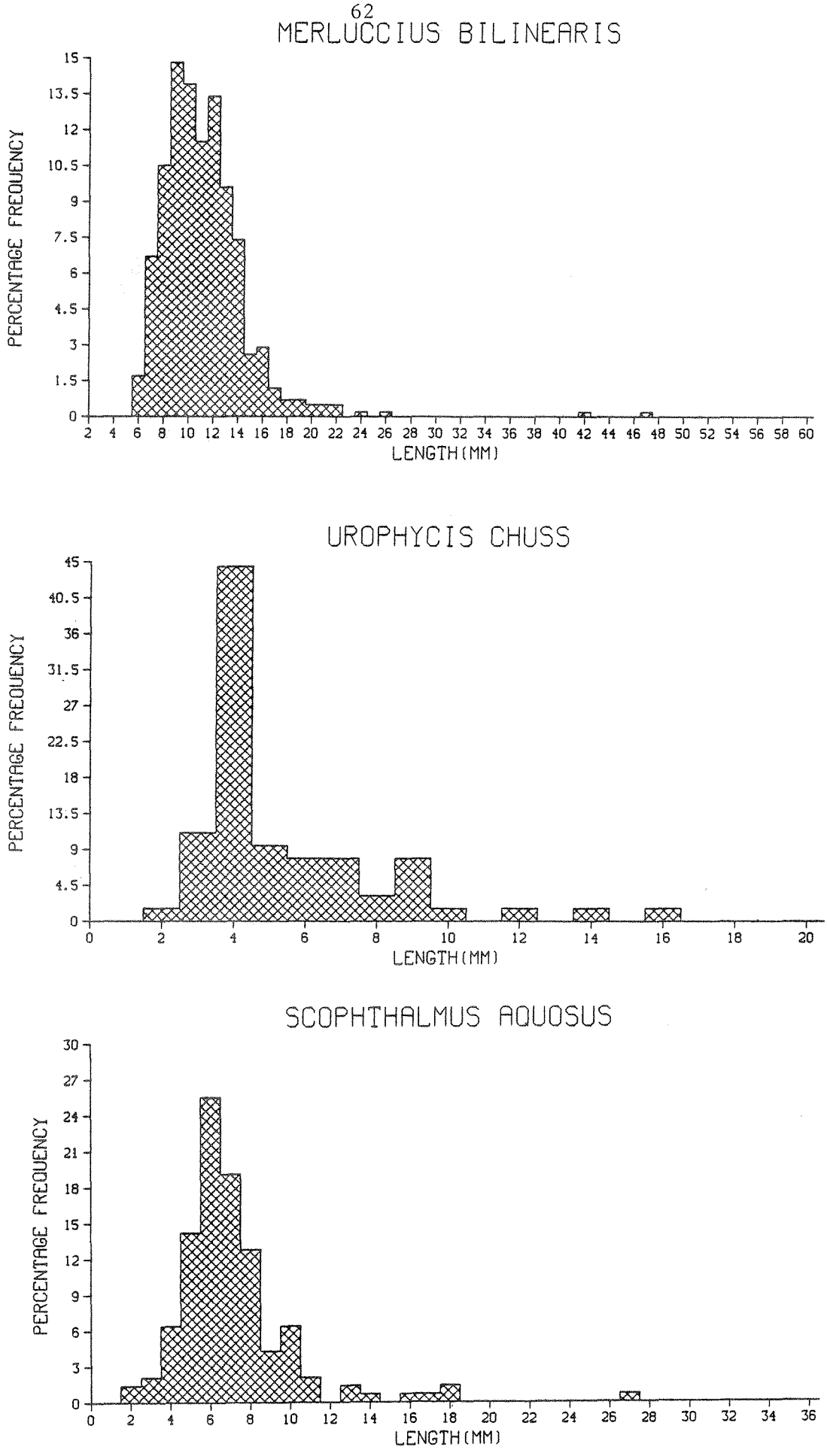

Fig. 4. Size frequency distribution of *Merluccius bilinearis*, *Urophycis chuss*, and *Scophthalmus aquosus* collected in all the samples.