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Species Composition and Abundance of Ichthyoplankton
in the Area of the Atlantic Corner Seamounts

by

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Abstract

49 stations were completed during an ichthyoplankton survey carried out in the area of the Atlantic Corner Seamounts in September-October 1983. The ichthyoplankton samples contained the larvae and fry of over 70 fish species belonging to 32 families. The larvae of Gonostomatidae and Myctophidae prevailed in terms of abundance and frequency of occurrence. The extensive length series represented by different stages of the early ontogenesis was a peculiar feature of the distribution of many fishes. Pre-dominance of relatively large individuals of some numerous fish species (Cyclothone braueri, Hygophum benoiti, etc.) is indicative of low intensity of spawning in the autumn period.

Introduction

The area of the Atlantic Corner Seamounts is situated between 33°40'-36°00'N and 47-53°W, and is one of the scantily explored areas in the Atlantic Ocean in terms of biology of reproduction of the fish ranging there, and their distribution at early developmental stages. Due to peculiar bottom relief and high dynamic activity of the waters, stipulated by the proximity of the Gulf Stream, the degree of aggregation of some fish species there is likely to be higher than in the adjacent regions of the open ocean. For the purpose of determining the species composition of

larval fish and estimating their abundance, the study of the ichthyoplankton from the Atlantic Corner Seamounts was initiated.

Materials and methods

49 stations (fig. 1) covered by the ichthyoplankton survey were made from 11 September to 3 October 1983 during the cruise of the SRTM-8086 "1500 Let Kievu". Ichthyoplankton was sampled using a large Bongo model with the opening diameter of 0.6 m with the nets of 0.570 mm mesh. Oblique hauling was made at each station from 400 m to the surface. The ship's speed was 2.5 knots, the net was hauled in at 50 m/min and back at 20 m/min. Flowmeters attached to plankton samplers were used to measure the volume of filtered water. The samples were preserved in 4% formalin. The larval fish were identified and measured to within 0.1 mm from tip of the snout to the end of notochord. Different keys to the ichthyoplankton, and descriptions of the fish of the Atlantic Ocean (Bekker, 1983; Kalinina, 1981; Mukhachiova, 1964; Zhiganova, 1974, 1977; Fahay, 1983; Serebryakov, 1982; Pertsieva-Ostroumova, 1964) were used to identify the fish species.

Results

The ichthyoplankton samples contained the larvae of over 70 fish species (see Annex) belonging to 32 families. The majority of species (over 20) were members of the family Myctophidae, 10 species represented the family Gonostomatidae and 8 species were of the family Paralepididae. The representatives of the two first families predominated in the ichthyoplankton and amounted to about 80% of the total abundance of the larvae (table 1).

In September, the mean abundance of the ichthyoplankton was estimated at 41 sp./m², which considerably exceeded the mean abundance of eggs (4 sp./m²); the latter were usually found individually, and not at all stations.

At some stations, the abundance of the larvae fluctuated between 4 and 81 sp./m² (fig. 2). The lowest recorded abundance was at the south-easternmost stations of the survey. The investi-

gated area had 4 zones of the maximum ichthyoplankton abundance (over 50 sp./m²), with the most extensive one stretching in the western part of the area. These zones were above the depths ranging from 5 000 to 1 600 m, around the seamounts.

According to the distribution pattern, all identified species of the mesopelagic fish larvae can be combined for three size groups as follows: 1) the species with a high frequency of occurrence and a relatively high density of concentrations, 2) the species with a high frequency of occurrence and a low density of concentrations, 3) the species with a low frequency of abundance and a low density of concentrations. Cyclothone braueri (fig. 3), the maximum abundance of which exceeded 30 sp./m², and the frequency of occurrence achieved 100%, can be related to the first group. Such species of the lightfishes as Vinciguerria attenuata and Cyclothone microdon, of the lanternfishes, Hygophum benoiti (fig.4), Diogenichthys atlanticus, Notolychnus valdiviae, Diaphus holti and Diaphus mollis, as well as some members of the families Sternoptychidae, Paralepididae, Bothidae etc. (table 1) did not form large aggregations during the investigated period, but were widely ranged. It should be noted, that although each species of the larval Myctophidae taken separately was not very abundant, their aggregate density was so high that Myctophidae were prevalent at some stations. Among the larval fish occurring individually and bearing on the third group, some species (Myctophum punctatum, Ceratoscopelus maderensis) may have high abundance in the other areas, and the other species (Scope-losaurus argenteus, Bathylagus sp., Alepisaurus sp., Melanocetus johnsoni, etc.) seem never to form large concentrations.

The extensive length series represented by various stages of the early ontogenesis is a peculiar feature of the distribution of the fish widely ranged in the area. So, finless and fin-ray larvae, (according to the terms by Rass, 1946, 1948), as well as larva-fry ranging from 3 to 12 mm in length, were recorded simultaneously in p. mollis and Benthoosema suborbitale, the metamorphosis of which takes place at the length of 10-11 mm and 11-12 mm, respectively (Zhiganova, 1977).

The larvae in different developmental stages, larva-fry and juveniles of D.atlanticus, N.valdiviae and H.benoiti, the metamorphosis of which takes place within the length range of 14-15 mm, 9-10 mm and 10-12 mm, respectively (Fahay, 1983), were found simultaneously. Very extensive length series were characteristics of C.braueri and V.attenuata (table 2).

Predominance of smaller larvae of D.mollis, N.valdiviae, D.atlanticus and B.suborbitale was indicative of a continued intensive spawning of these species. In many numerous fish species, the peak of abundance fell on later larval development stages and on the stage of larva-fry (C.braueri, V.attenuata and H.benoiti).

Discussion

As reported by Kukuev (1982), the species composition of the mesobathypelagic fishes is most representative in the Atlantic Corner Seamounts ichthyofauna (over 67%), while the proportion of the thalassobathyal fishes, inhabiting the lower layers of the water column above the slopes of the seamounts, is estimated at 28%. The ichthyoplankton studies showed that at 0 to 400 m depths the larvae of the mesobathypelagic fishes prevailed in terms of both the number of species and abundance, which agrees with the Kukuev's statement.

In September, the reproduction rate was evidently lower than during the preceding period. The predominance of large larvae and juveniles, as well as an extremely low abundance of the eggs in a number of common fish species, are consistent with this supposition. Although many species sampled were represented by the fish in different stages of early ontogenesis, the majority of them showed distinct modal size groups, which can be explained by the fact that the spawning periods are of varying intensity and that the peak of spawning is timed to a definite season. The observation period yielded the results indicating that the Atlantic Corner Seamounts area is the reproduction area and the habitat of the young of many abundant mesopelagic fishes.

Summary

The ichthyoplankton samples from the Atlantic Corner Seamounts contained 70 species of the larval and juvenile fishes, with the members of families Gonostomatidae and Myctophidae prevailing. The total abundance of larval fish in the investigated area fluctuated between 4 and 81 sp./m², and averaged to 41sp/m².

Of larval D. atlanticus, D. mollis and B.suborbitale the smaller specimens below 5 mm in length were prevalent. For H.benoiti, C.braueri and V.attenuata the 11-15 mm length class predominated.

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Table 1 Abundance and frequency of occurrence of numerous ichthyoplankton species

No.	Family, predominant species	No. of sp. caught	Relative abundance, %	Mean abundance, sp./m ²	Frequency of occurrence, %
I.	Gonostomatidae	1438	50.7	20.3	100.0
1.	Cyclothone braueri	1160	40.7	16.5	100.0
2.	Vinciguerrria attenuata	47	1.8	0.7	60.5
II.	Myctophidae	811	29.1	11.7	95.3
1.	Diogenichthys atlanticus	145	5.2	2.1	72.1
2.	Hygophum benoiti	143	5.1	2.0	76.7
III.	Sternophthyichidae	231	10.5	4.2	88.4
	Argyropelecus hemigymnus	112	5.3	2.1	67.0
IV.	Paralepididae	99	3.7	1.5	74.4
	Paralepis atlantica	27	1.0	0.4	39.5
V.	Bothidae	26	1.0	0.4	34.9
	Bothus ocellatus	26	"	"	"

Table 2 Length composition of larval fish (%) in the Atlantic Corner
Seamounts area, 11 Sept.-3 Oct., 1983

No.	Species	No. of sp. caught	Length classes, mm					
			≤ 5	6-10	11-15	16-20	21-25	>25
1.	<i>Notolychnus valdiviae</i>	62	65.7	23.1	11.2	-	-	-
2.	<i>Diaphus mollis</i>	20	60.3	35.2	4.5	-	-	-
3.	<i>Benthoosema suborbitale</i>	16	74.7	14.1	11.2	-	-	-
4.	<i>Diogenichthys atlanticus</i>	145	79.5	5.8	8.2	6.5	-	-
5.	<i>Hygophum benoiti</i>	143	1.4	11.0	85.4	2.2	-	-
6.	<i>Cyclothone braueri</i>	1160	9.9	6.3	51.7	12.7	14.5	4.9
7.	<i>Vinciguerrria attenuata</i>	47	5.2	22.3	37.6	29.5	5.4	-
8.	<i>Bothus ocellatus</i>	26	-	85.6	10.4	4.0	-	-
9.	<i>Paralepis atlantica</i>	27	35.1	41.1	19.2	4.6	-	-

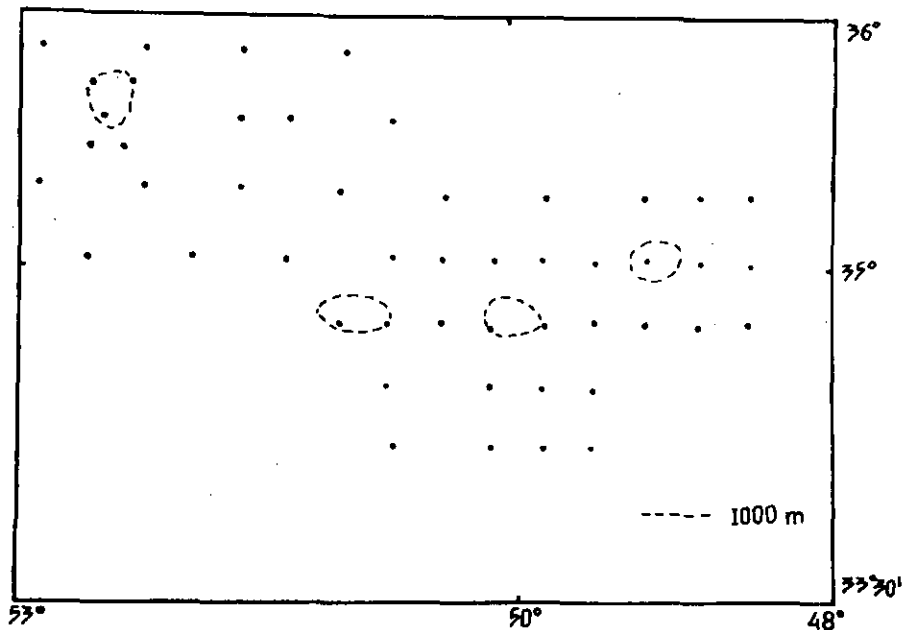


Fig. 1. A grid of stations for ichthyoplankton survey (11 Sept. - 3 Oct., 1983).

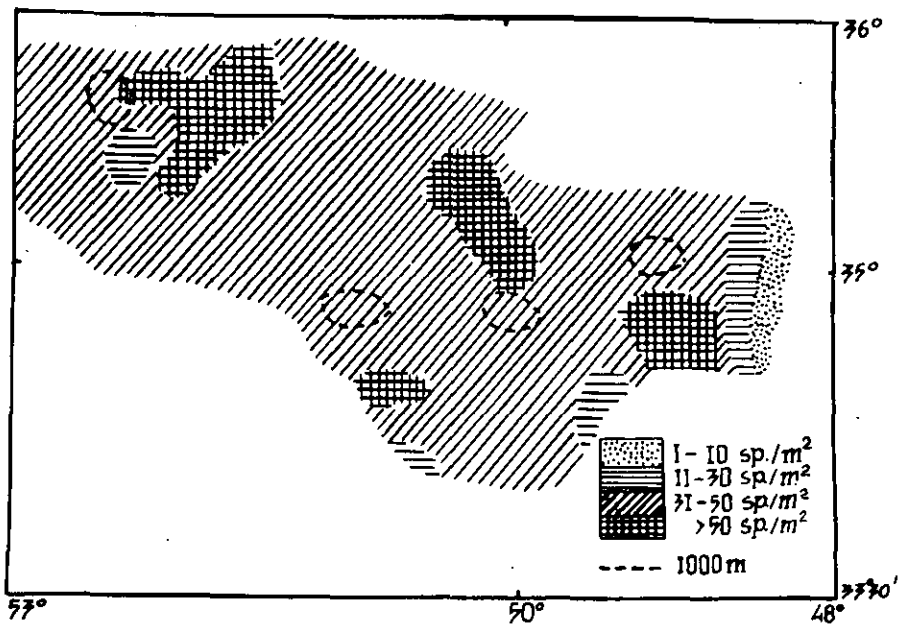


Fig. 2. Distribution of ichthyoplankton (sp./m²) in the Atlantic Corner Seamounts area (11 Sept. - 3 Oct., 1983).

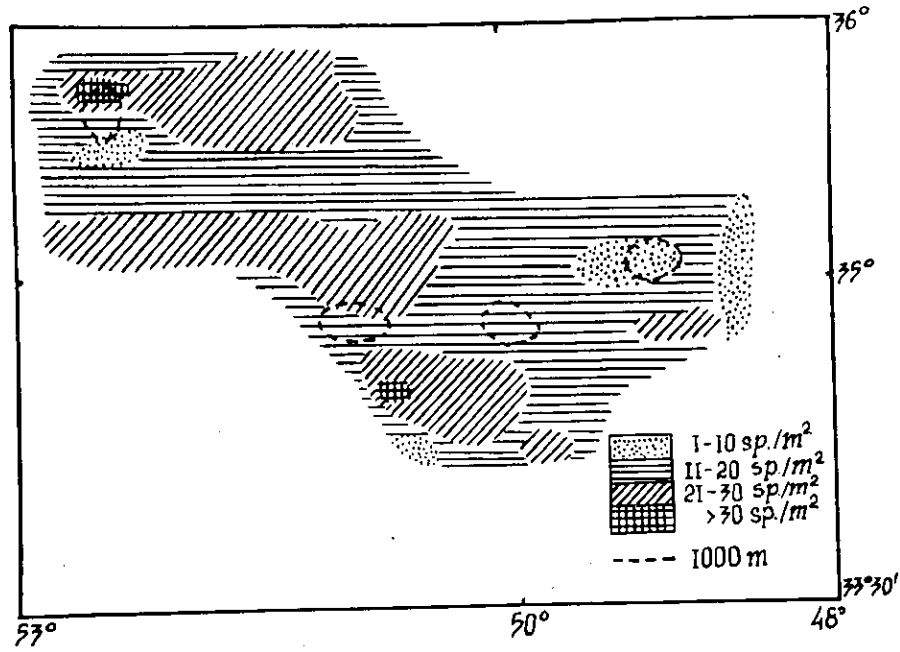


Fig. 3. Distribution of *Cyclothone braueri* (sp./m²) at early developmental stages in the Atlantic Corner Seamounts area (11 Sept. - 3 Oct., 1983).

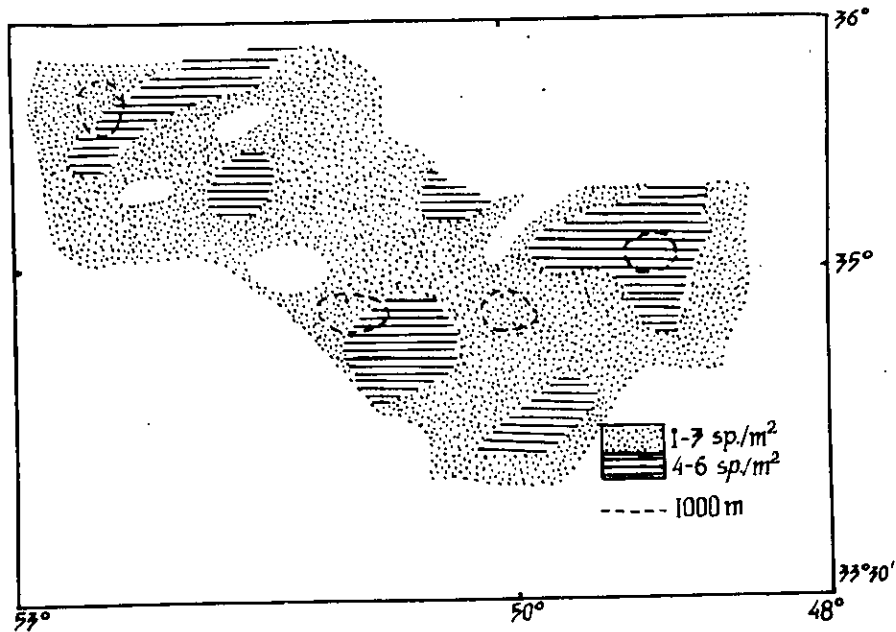


Fig. 4. Distribution of *Hygophum benoiti* (sp./m²) at early developmental stages in the Atlantic Corner Seamounts area (11 Sept. - 3 Oct., 1983).

Annex

List

of identified fish species (larvae, juveniles)
from the Atlantic Corner Seamounts ichthyoplankton

Fam. Gonostomatidae

1. *Cyclothone braueri* Jespersen and Taning
2. *Cyclothone microdon* (Günther)
3. *Cyclothone pallida* Brauer
4. *Vinciguerria attenuata* (Cocco)
5. *Vinciguerria poveriae* (Cocco)
6. *Ichthyococcus ovatus* (Cocco)
7. *Margrethia obtusirostra* Jespersen and Taning
8. *Bonapartia pedaliota* Goode and Bean
9. *Valenciennellus tripunctulatus* (Esmark)
10. *Diplophos taenia* Günther

Fam. Myctophidae

1. *Diogenichthys atlanticus* (Taning)
2. *Hygophum benoiti* (Cocco)
3. *Hygophum reinhardtii* (Lutken)
4. *Notolychnus valdiviae* (Brauer)
5. *Diaphus mollis* (Taning)
6. *Diaphus holti* Taning
7. *Diaphus rafinesquii* (Cocco)
8. *Benthoosema suborbitale* (Gilbert)
9. *Bolinichthys indicus* Nafpaktitis et Nafpaktitis
10. *Lampanyctus pusillus* (Johnson)
11. *Lampanyctus alatus* Good and Bean
12. *Lampanyctus* sp.
13. *Taaningichthys minimus* (Taning)
14. *Taaningichthys paurolychnus* Davy
15. *Lampadena* sp.
16. *Notoscopelus resplendens* (Richardson)
17. *Notoscopelus* sp.
18. *Ceratoscopelus maderensis* (Lowe)
19. *Myctophum punctatum* Rafinesque

20. *Myctophum nitidulum* Garman
21. *Gonichthys cocco* (Cocco)
22. *Centrobranchus nigroocellatus* (Günther)
23. *Lobianchia dofleini* (Zugmayer)
24. *Lepidophanes gaussi* (Brauer)

Fam. Sternoptychidae

1. *Argyropelecus hemigymnus* Cocco
2. *Sternoptyx diaphana* Hermann

Fam. Paralepididae

1. *Paralepis atlantica* Krøyer
2. *Paralepis elongata* (Brauer)
3. *Lestidiops jayakari* (Boulenger)
4. *Lestidiops affinis* Ege
5. *Macroparalepis breve* Ege
6. *Notolepis rissoi krøyeri* (Lütken)
7. *Lestrolepis intermedia* (Poey)
8. *Sudis hyalina* Rafinesque

Fam. Scopelarchidae

1. *Scopelarchus analis* (Brauer)
2. *Scopelarchus guentheri* Alcock

Fam. Idiacanthidae

Idiacanthus fasciola Peters

Fam. Melanostomiidae

1. *Eustomias* spp.
2. *Bathophilus* sp.

Fam. Bathylagidae

Bathylagus spp.

Fam. Chauliodontidae

Chauliodes sloani Bloch and Schneider

Fam. Alepisauridae

Alepisaurus sp.

Fam. Scopelosauridae

Scopelosaurus argenteus (Maul)

Fam. Stomiatidae

Stomias boa ferox Reinhardt

Fam. Astronesthidae

Astronesthes sp.

Fam. Belonidae

Strongylura marina (Walbaum)

Fam. Melamphaidae

1. Melamphaes simus Günther
2. Melamphaes typhlops Günther
3. Scopelogadus sp.

Fam. Bothidae

Bothus ocellatus (Agassiz)

Fam. Nomeidae

Cubiceps sp.

Fam. Trichiuridae

Diplospinus multistriatus Maul

Fam. Tetragonuridae

Tetragonurus atlanticus Lowe

Fam. Omosudidae

Omosudis lowei Günther

Fam. Evermanellidae

Coccorella atlantica (Parr)

Fam. Nemichthyidae

Nemichthys scolopaceus Richardson

Fam. Nettastomidae

Venefica procera (Good and Bean)

Fam. Linophrynidae

Linophryne sp.

Fam. Caulophrynidae

Caulophryne jordani Good and Bean

Fam. Himantolophidae

Himantolophus groenlandicus Reinhardt

Fam. Gigantoctinidae

Gigantactis sp.

Fam. Oneirodidae

Dolopichthys sp.

Fam. Melanocetidae

Melanocetus johnsoni Günther

Scombridae gen sp.

Centrolophidae gen sp.

Congridae gen sp.