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ICHTHYOPLANKTON OF THE CANADIAN ZONE OF THE GULF STREAM IN NOVEMBER-DECEMBER, 1974

by

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The studies of ichthyoplankton inhabiting the Gulf Stream are undoubtedly of great interest in many respects, as the determination of its species composition and the quantitative assessment of every component of ichthyoplankton community allow to evaluate the effect of the Gulf Stream on the dispersal of the shelf and oceanic fishes at their early stage of development, to obtain definite knowledge of the drift rate of shelf fish eggs and larvae beyond the area of the adult part of population and to determine the peculiarities of the recruitment of the populations inhabiting the North American Shelf within the Gulf Stream zone.

Data represented in literature (Anderson, 1957; Berry, 1959; Gehringer, 1957; Caldwell, 1962; Smith et al., 1975; Evseenko, 1976; Powles H.A.; and others) show that the Gulf Stream is a transporter of eggs, larvae and juveniles of some fish species, to which the whole life cycle is connected with shelf waters (neritic species), and, apparently, of all species keeping their initial periods of development in the open oceanic waters (nerito-oceanic species).

The comparison of data on distribution of shelf species eggs and larvae in the shallow waters and in the Gulf Stream zone allows to determine the belonging of the shelf species to any ecological group (neritic or nerito-oceanic). This is of great significance while solving the forecasting problems of

this species stock condition, as one should expect that nerito-oceanic fish abundance fluctuates to a greater extent compared to that one of the neritic species (Evseenko, in press).

The species composition of the Gulf Stream ichthyoplankton and its seasonal dynamics are practically not studied. There are only data on the occurrence of some shelf species larvae within the area of this current (see authors cited above), as well as of a number of oceanic fish (Ege, 1930; Tofen, 1966; and others). A paper by Markle et al. (1980) might make the most valuable contribution to the getting to know the Gulf Stream ichthyoplankton, there were reported numerous facts, when larvae of subtropical and tropical fish were brought with this current on the Nova Scotian Shelf.

The main difficulty of the Gulf Stream ichthyoplankton studying is to determine its species composition due to a great diversity of the southern forms in the plankton, most of them are yet unknown at their early stages of development. This papar gives the results of investigations of the species composition of the ichthyoplankton in the frontal Gulf Stream zone off the Nova Scotian Shelf.

Material and method

The ichthyoplankton collections taken from board RTM "Belogorsk" beyond the Nova Scotian Shelf within the period from 14 November up to 2 December, 1974 served as base for the analysis. There were collected 70 samples at 70 stations (Fig.1), the ichthyoplankton was found in 38 samples (see Appendix). The ichthyoplankton was collected with help of small Bongo nets having the diameter of its opening as high as 20.5 cm, gauze N 14. Oblique haul was performed at each station in the layer 100-0 m during 20 min. approximately at a vessel speed of 3,5 knots. Data on hydrological and hydrobiological condition during the survey are given by Noskov et al. (1977). The samples were fixated with 4% solution of formalin. Larvae were cleared and stained with alizarin according to Yakubovsky me-

thod (1970) for precise vertebral and fin rays counts. There was used the development periodicity proposed by T.S. Rass (1949) to determine the stages and phases of larval development. Abbreviations used for larval parameters are as follows: TL = total length, SL = standard body length, BD = body depth at anus, PAL = preanal length, HL = head length, ED = eye diameter; D, A, C, P and V-rays refer to the dorsal, anal, caudal, pectoral and ventral fins respectively. Figures of larvae were completed with help of the projecting microscrope "Promar".

Results

Congridae

Gnathophis bathytopos Smith et Kanazava

1 larva, 24.0 mm SL (st. 326).

The larva has properties characteristic to G.bathytopos (Smith, 1979), namely, its snout is elongated, sharpened; there is a crescentic patch of black pigment under the eye, ventral pigment extends along the length of the gut, 132-133 myomeres.

Gonostomatidae

Vinciguerria poweriae (Cocco)

2 larvae: 9.8 mm SL (st. 312) and 10.6 mm SL (st.359).

Identification was based on the description of Ahlstrom and Counts (1958). V. poweriae is found in the eastern North Atlantic south of 43°N (Mitchell, 1973). This species has been recorded only off Bermuda and in the Gulf of Mexico in the Western North Atlantic. Larvae of this species were found at Bermuda (Grey, 1964). Our specimens were caught in the Canadian zone of the Gulf Stream for the first time.

Gonostoma elongatum Günther

3 larvae: 7 mm SL (st. 317), 9.3 mm SL (st.320) and 9.6 mm SL (st.315).

The specimen fits to the description of G.elongatum by Jespersen and Taning (1926). In the Western North Atlantic G. elongatum are observed south of Newfoundland (40°08'N, 52°-50°W) Leim and Scott, 1966) and off the northern United States coast (41°N) westwards to Bermuda and southwards at least to the north-

eastern coast of South America. The larvae have been found off Florida, east to the Leeward Islands, in the Central Atlantic (Grey, 1964) and in the Georges Bank (Joakimsson, 1978). Our specimens are the first larvae caught in the area.

Cyclothone braueri Jespersen and Tåning

1 juvenile, 18.0 mm. SL (st.329)

C.braueri are widely distributed in the Atlantic Ocean. They have been found in the Western Atlantic from 65° in the Devis Strait up to 43°S (Mukacheva, 1974).

Sternoptychidae

Sternoptyx diaphana Hermann

1 larva at metamorohic stage, 7.4 mm SL (st. 310).

A paper of Badcock and Baird (1980) was used at the larva identification. The most northern range record of S.diaphana in the Western North Atlantic was lying near La Have Bank off Nova Scotia (42°46'N, 63°22'W) (Schultz, 1961). Our specimen was caught near the northern limit of this species distribution in the Western Atlantic.

Melanostomiatidae

1 larva, 9.1 mm SL (st.333). Genus? Species?

Description. The larva has a long, narrow, slightly laterally compressed body. The remains of a high fin fold were kept. The larva head is long. The upper profile of its snout is slightly concave. There are 7 teeth on the praemaxillare, 10 teeth on the maxillare, 17 teeth on the dentale from each side. The teeth 2-3, 4-5, 6-7 and 9-10 on the upper jaw are doubled. The pectoral fins are underlying. The number of myomeres is 66. Posterior part of the gut is suspending freely, it is going from the body at the level of 54 myomeres. Anus is opened at the level of 60 myomere . The end of the anal fin is located on 64th myomere. The urostyle is curved. There is observed the formation of the 12-13 dorsal and 14-15 anal fin rays. The first ray of the anal fin is at the level of the 5th ray of the dorsal fin. The pigmentation is represented by dorsal and ventro-lateral rows of melanophores distributing along

the both sides of the body. The dorsal row is formed of enough large stellate and bright melanophores, every myomere has one melanophore, the row begins over the medulla oblongata and is going up to urostyle. Ventro-lateral row is formed with stroke melanophores going along the myosepts of 4-64 myomeres. Every pigment stripe is formed as a rule by 3-4, more seldom - by 2 melanophores. Besides, a wide stripe of point melanophores parallel to the body surface is lying at the remainders of the dorsal fin fold. Some melanophores are available on a lower edge of the gut. Melanophores are accumulated along the upper part of the rectum and on the throat.

Remarks. Larvae of the most of Melanostomiatidae species are not known yet, therefore, identification of larva even to the generic level is difficult. One can only note that the character of the pigmentation of this larva body (the availability of the dorsal and ventro-lateral rows of melanophores, the configuration, the size and the location of the pigment cells of these rows) coincides with the description given by Beebe and Crane (1939) to an adolescent 25 cm SL Echiostoma barbatum (= E.tanneri).

Chauliodontidae

Chauliodus sloani Block et Schëider

1 larvae, 25.0 mm SL (st.320).

Identification of the specimen is based on the description of Belyanina (1977). This species is widely distributed in the tropical and temperate waters of the World Ocean. It has been found in the Canadian waters on the Grand Bank and in the Laurentian Channel off the St.Pierre Bank (Leim, Scott, 1966). Larvae C.sloani have been recorded in the open areas of West-Northern Atlantic (Belyanina, 1977).

Synodontidae

Trachinocephalus myops (Forster)

1 larva, 19.7 mm SL (st. 345).

Description. The larva has a very elongated and faintly laterally compressed body (Fig.2). Preanal part of body is

much longer than the postanal one (PAL 74.6% SL). The rests of the fin fold are still kept along the body margins. Its head is very small (HL 11.7% SL). The larva has big eyes (ED 37.0% HL). The angle of the mouth reaches the vertical line passing through the midst of an eye. There are 6 teeth from every side of the upper and low jaws. 13 pterygiophores were formed into the anal fin. The caudal fin has 18 rays. No rays are observed in the pectoral fins. The myomeres number (56) corresponds to that one of vertebrae. There are 39 preanal myomeres and 17 postanal ones. Six pairs of large pigment spots having clear configuration (the third pair of spots is destroyed) along the upper part of the digestive tract. One very large melanophore is lying on a low edge of the post-anal section. The location of pigment spots (with the exception of the first one located before the base of the pectoral fin) relative the myomeres is as follows: the second spot is at the level of the 6-8 myomeres, the third one are at the level of the 12-14 myomeres, the fourth one - 19-23 myomeres, the fifth one - 26-28 myomeres, the six one - 34-38 myomeres. There is one melanophore in the ventral margin of the caudal part at 44-46 myomeres. Besides that, one stellate melanophore is lying behind every hemisphere of the midbrain. The bases of 1-16 rays of the caudal fin and adjacent to it part of the caudal peduncle, are pigmented intensively by small melanophores. This band has a crescent shape.

Remarks. The identification of larvae Synodontidae is difficult to be done before the formation of the pectoral and anal fins is completed. A described above larva has 6 preanal spots, 56 vertebrae and the rudiments of more than 12 rays of the anal fin, that is characteristic both to Synodus foetens (L.) and T.myops (Forster) larvae. According to data available (Mansueti, Hardy, 1967), larvae of the first species have no melanophores on their occiput and the lobe of the caudal fin has different pigmentation. Therefore, this larva should be related to T.myops, moreover that it corresponds to the des-

cription of non-formed larvae of this species (Rudomyetkina, 1980).

T.myops are widely distributed in the tropical waters of the World Ocean. In the Western North Atlantic this species has been found up Cape Cod (Anderson et al., 1966). Juveniles of this species have been reported from the shelf of the Nova Scotia (Markle et al., 1980), where they were brought with the Gulf Stream waters.

Notosudidae

Scopelosaurus sp.

1 larva, 17.8 mm SL (st. 374).

Discription. The larva body is long, narrow and slightly laterally compressed. The larva has 55 vertebrae, namely, 13 pre-anal ones, from anus up to the origin of the anal fin - 22 ones and from the origin anal fin up to the end of the body - 20 vertebrae. 15 rays are formed in the anal fin. 19 principal rays and 1 procurrent ones from below are available in the caudal fin. Rays are not formed in the other fins. The whole body is not pigmented for the exception of the caudal section. Small, slightly stellated melanophore is in the upper lobe of the caudal fin, the same melanophores are in the middle part of 9-11 rays of this fin (Fig.3).

Remarks. Four species of Scopelosaurus inhabit the western part of the North Atlantic, they are S.mauli, S.smithii, S.lipidus and S.argenteus, whose larvae are described by Bertelsen et al (1976). The larva described above distinguishes sharply from the larvae of the first three species by the character of its caudal pigmentation. It is close somewhat to S.argenteus larvae due to the availability of one pigment spot on the lobe of the caudal fin. But, larvae S.argenteus have no pigment on the rays of the caudal fin, which is found in our larva. Therefore, species of this larva is not cleared yet.

Scopelosaurus mauli Bertelsen, Krefft et Marshall

7 larvae: 6.5 mm SL, 11.0 mm SL, 18.5 mm SL (st.334); 7.5 mm SL (st. 335), 10.7 mm SL (st.320), 11.7 mm SL (st.333),

12.6 mm SL (st. 377).

S.mauli has been found in tropical and subtropical waters of the Western Atlantic, this species is the most abundant between 10° and 40°N (Bertelsen et al., 1976). Our larvae are caught between 40°30'N and 41°30'N, that is near the northern limit of this species distribution in the Atlantic Ocean.

Myctophidae

Hygophum macrochir (Günther)

1 larva, 5.7 mm SL (st.317).

Identification was based on the description of Moser and Ahlstrom (1974). H.macrochir is a tropical species, more numerous in the eastern areas of the Atlantic Ocean compared the western ones. Data given by Nafpaktitis et al. (1977) show that this species is not reported in the Western Atlantic north to Bahamas Islands. Larvae distribution is unknown in the Atlantic Ocean. Our larva was caught far beyond the range of the adult habitat.

Hygophum hygomi (Lütken)

8 larvae: 4.2 mm SL, 8.5 mm SL (st.333), 3.5 mm SL, 4.0 mm SL (st.335), 4.8 mm SL (st.343), 5.25 mm SL (st.330), 5.5 mm SL (st.317), 6.4 mm SL (st.360).

Larvae H.hygomi are described firstly by Tåning (1918). Data on larvae morphology can be found in Moser and Ahlstrom (1974) and Pertseva-Ostroumova (1974). H.hymoni is a temperate-semisubtropical species (Nafpaktitis et al., 1977). Data on larvae distribution in the Western North Atlantic are absent. Larvae have been caught near the north-western limit of this species distribution in the Western Atlantic.

Hygophum reinhardtii (Lütken)

1 juvenile, 24.5 mm SL (st.359).

H.reinhardtii is a questionable bipolar subtropical species (Nafpaktitis et al., 1977). The juvenile apparently represent a northern range-record for the species.

Benthosema glaciale (Reinhardt)

2 juveniles: 13.0 mm SL (st. 333) and 22.0 mm SL (st.352).

B.glaciale is a subpolar-temperate species and probably the most abundant of the North Atlantic mictophids (Nafpaktitis et al., 1977).

Diogenichthys atlanticus (Tåning)

2 larvae: 4.9 mm SL (st.377), 8.5 mm SL (st.330) and 1 juvenile - 21.5 mm SL (st.311).

Larvae of this species are decribed in details by Moser and Ahlstrom (1970). D.atlanticus is common for the North-West Atlantic, but this is unevenly distributed tropical-subtropical species (Nafpaktitis et al., 1977). Data on the distribution of larvae in the North-West Atlantic are absent. Our specimens are caught at the northern range for D.atlanticus.

Myctophum nitidulum Garman

1 larva, 6.7 mm SL (st.318).

Identification was based on description of Moser and Ahlstrom (1970). M.nitidulum is a tropical-subtropical species (Nafpaktitis et al., 1977). It occurs south of Nova Scotia in the North-West Atlantic. Larvae have been found in the Georges Bank area (Joakimsson, 1978).

Myctophum selenops Tåning

1 larva, 9.7 mm SL (st.334).

Description. D 14, A 18; P 17, V 8, vertebrae 34 (13+21).

The larva has a high body (BD - 28.9%SL), (Fig.4). The larva eye has a mass conical choroid tissue pigmented along the whole length. Its head is deep and large (HL - 33.0% SL). The upper profile of the head is a concave one. Its mouth is large and has conical teeth. There are 12 large teeth on each side of the upper jaw . There are 16 teeth on each side of lower jaw, the most of them are small ones and only 3, 4, 6 and 12 teeth beginning from a symphysis are larger than the other ones. The length of the maxillare is 62.5% HL. There are photophores Br_2 and D_n. The anus opens behind the middle of the body (PAL 63.0% SL). All fins are formed completely. The first ray

of the dorsal fin is much shorter than the other ones, and the last two rays are very close to each other. The origin of the anal fin is under 8-9 rays of the dorsal fin. There are 33 rays in the caudal fin on the whole, of them 19 are principal ones and 7 procurrent rays are from its upper and lower sides. Only the head and the pectoral fins are pigmented. 5 small melanophores are at the point of the upper jaw, 6 ones on its left part - on its right part. There is 1 melanophore in the middle part of the upper jaw from its each side before the point of choroid appendix. A small melanofore is over an olfactory capsule. A black pigment is accumulated under acoustic capsule. A small pigment cell is in front of the forebrain. The melanophores are in front of the lobes of the middle brain and on the gill cover as well. One branched melanophore is visible through under the upper part of the gill cover. A large melanophore is seen on the base of the pectoral fin. Small melanophores are near the base of the most of the pectoral fin rays.

Remarks. Larvae identical with our one from the Indian and Pacific Oceans were described by Pertseva-Ostroumova (1974) and referred to Gonichthys barnesi Whitley? But, it is erroneously to relate them to the genus Gonichthys, as the species of this genus have much greater number of vertebrae (40-41 against 34-36). These larvae have a great similarity with those of Myctophum selenops described by Moser and Ahlstrom (1974). But, there are differencies between them in the pigmentation of their jaws, this allows to relate the above given larva to this species tentatively. Some larvae of this group taken from the Pacific and Indian Oceans were tentatively referred to M.selenops by Pertseva-Ostroumova (1974). Judging from data by Moser and Ahlstrom (1974), these larvae should be related to M.obtusirostre Tåning.

Notolychnus valdiviae (Brauer)

1 prejuvenile, 13.9 mm SL (st. 378).

N.valdiviae is a tropical-subtropical species. According to Nafpaktitis et al. (1977) it was recorded in the Canadian

zone of the Gulf Stream.

Diaphus rafinesquii (Cocco)

3 larvae: 4.7 mm SL (st.315), 5.5 mm SL (st.335), 5.6 m SL (st.320).

Larvae D.rafinesquii are described by Tåning (1918). This species is widely distributed in the North Atlantic between 20° and 50°N (Nafpaktitis, 1968). Larvae of D.rafinesquii were not recorded in the area of investigations earlier.

Diaphus sp.

1 larva, 6.1 mm SL (st.317)

The structure and the pigmentation of the larva is similar to those of D.rafinesquii, but, it distinguishes from them by the availability of 4 melanophores (instead of 2 ones) located parallel to the edge of the caudal lobe on the caudal rays.

Bolinichthys indicus (Nafpaktitis et Nafpaktitis)

1 juvenile, 13.5 mm SL (st.343).

Although B.indicus is classed as a bipolar subtropical species, it occurs also in significant numbers in the temperate provinces of the open North Atlantic (Nafpaktitis et al.,1977).

Ceratoscopelus maderensis (Lowe)

4 larvae: 7.5 mm SL (st.317), 7.6 mm SL (st.323), 8.1 mm SL and 9.7 mm SL (st.320).

C.maderensis larvae are described by Tåning (1918). C.maderensis a temperate-semisubtropical species (Nafpaktitis et al., 1977). Larvae of this species have been observed in the Georges Bank area (Joakimsson, 1978). 50°N, Ireland (Bolin, 1959), and Cape Breton (Leim and Scott, 1966).

Ceratoscopelus warmingii (Lütken)

A fry, 20.7 mm SL (st.360).

C.warmingii is a tropical-subtropical species. This species is an usual for a boreal Slope waters, where it is brought with warm Gulf Stream eddies (Nafpaktitis et al.,1977).

Paralepididae

Notolepis rissoi krøyeri (Lütken)

3 larvae: 7.0 mm SL (st. 310), 9.5 mm SL (st.377) and 13.6 mmSL (st.358)

Larvae of N.rissoi krøyeri are described by Ege (1930). This species is widely distributed in the North Atlantic. Data on the distribution of larvae, juveniles and adult are summed by Nafen (1966).

Scomberesocidae

Scomberesox saurus (Walbaum)

1 egg, diameter of egg - 2.35 mm at III-IV stages of development, the embryo covers 2/3 of the yolk sac (st.333).

Eggs and larvae of the North-Atlantic saury are described by Nesterov and Shiganova (1976). These authors report that in winter-spring period the northern limit of S.saurus eggs and larvae distribution corresponds greatly to the isotherm 16.5°C on the surface of the Northern Atlantic. Occurrence of this egg at 40°30'N represents probably one of northern range records for the eggs of S.saurus.

Bregmacerotidae

Bregmaceros macclellandi Thompson

2 larvae: 4.7 mm SL (st.326) and 7.6 mm SL (st.335).

Identification was based on the description of Belyanina (1974). In the Western North Atlantic this species is distributed up to 40°N (D'Ancona, Cavinato, 1965). Larvae of B.macclellandi were not earlier recorded in the Canadian zone of the Gulf Stream.

Macrouridae

1 larva, 1.44 mm HL (st.326). Genus? Species?

Description. Branchiostegal rays 7, V 6. The preanal part of the body is deep*, post-anal part is thin and long (Fig.5). The anus is opening at the level of 10-11 myomeres. The jaws are bearing small uniformal teeth. There are 11-12 teeth from

*/ The larva was injured - its tail tip was broken off, the lateral part of its abdominal cavity from the left side of the body was destroyed, only a right ventral fin was observed.

each side of the upper jaw and 14 teeth from every side of the lower jaw. The right ventral fin has 6 rays, of them, the 3rd and 4th ones are longer than the other rays. Other fins are not formed. The upper part of the head and the postorbital area are covered by the diffused black pigment. The upper part of its peritoneum is intensively pigmented. There are some pigment accumulations near the below edge of cleithrum and in the anterior part of the ventral fin base. One can observe three enough large melanophores in the back part of the post-anal section, namely, two melanophores on the upper body margin and one - on its lower margin.

Remarks. The larva described above has 7 branchiostegal rays. The same number of rays was found to the species of 11 Macrourid genera (Marshall, Iwamoto, 1973), the majority of them inhabit subtropical and tropical waters. 6 Macrourid species are reported from the Canagian Atlantic, they are Trachyrhynchus murrayi, Coelorhynchus carminatus, Macrourus berglax, Coryphaenoides rupestris, Malacocephalus occidentalis and Nezumia bairdii (Leim, Scott, 1966), of them only last two ones have 7 branchiostegal rays.

Let us assume the described above larva extruded from an egg spawned off Nova Scotia or New England, and, it was not drifted from the subtropical zone, this larva can be referred either to M.occidentalis or to N.bairdii. This larva has 6 rays in the ventral fin. M.occidentalis has 8 rays and N.bairdii - 7 (raraly 6) ones in their ventral fins correspondingly (Marshall, Iwamoto, 1973). Therefore the described above larva may be referred very tentatively to N.bairdii.

Scorpaenidae

Scorpaena sp.?

1 larva, 7.5 mm SL (st.317)

Judging from data of Moser et al. (1977), one can suppose that the larva belongs apperently to Scorpaena. But, the identification is difficult to be done due to the larva bad condition.

Labridae

1 larva, 5.5 mm SL (st. 328). Genus? Species?

Description. D 21, A 14, P 12, vertebrae 26(8+18).

Body is deep and markedly laterally compressed (Fig.6), the maximum body height is 32.6% SL. The anus is opened slightly behind the middle of the body (PAL 59.0% SL). The head is large (HL 34.6% SL). The upper profile of the snout is concave. The mouth is small. Dorsal and anal fins are long, the rays number is definite into them. The pectoral fins are fan-shaped. The rudiments of the ventral fins are under the base of these fins. The total number of rays in the caudal fin 26 including the procurrent ones. The intestine forms a loop, the air bladder is transparent over it. The larva body is not at all pigmented. There are only small melanophores between the first and the third rays of the dorsal fin.

The most of Labridae inhabit subtropical and tropical waters. The early stages of their development are not practically studied, therefore, the identification of this larva is difficult to be done even up to the genus level.

Scaridae

? Nicholsina usta (Valenciennes)

4 larvae: 6.4 SL (st.327), 7.5 mm SL (st.310), 8.1 mm SL (st.333) and 8.3 mm SL (st.330).

Description. D IX-X, 9-10; A II, 10-11, P 12, vertebrae 25(9+16).

The larva of 7.5 mm SL (8.8 mm TL) is not very deep (BD 17.3% SL), it is laterally compressed (Fig.7). The anus is located approximately in the middle of the body (PAL 52.0%SL). The head is small (HL 24.0% SL). The tip of the lower jaw is advanced forward. Eyes are oval shaped. The eye sizes are 0.35 x 0.55 mm. There is a mass choroid tissue underlying the eye pigmented by branched melanophores. Dorsal fin is long, it has 10 spinose and 9 soft rays (DX, 9). Anal fin has 13 rays, the first two ones are spinose (A II, 11). The last ray

of the anal fin is under the last ray of the dorsal fin. There are 27 rays in the caudal fin, of them, 14 are the principal ones an 13 are the procurrent rays. The pectoral fin has 12 rays. The number of vertebrae is 25 (9+16). The intestine is curved slightly in its middle part. The rectum is short and is going from the former section almost under a right angle. A small air bludder is in the back part of the abdominal cavity over the intestine. The back half of the air bladder together with the rectum are covered by melanophores from above, their accumulation has the shape of the net cap. There is a row of 13 clearly shaped melanophores along the ventral part of the post-anal section. Besides, there are point melanophores at the end of a lower jaw and one melanophore is under the base of its pectoral fin.

Remarks. Larvae studied have 9 abdominal and 16 caudal vertebrae, that is characteristic to three genera of Scaridae inhabiting the Western North Atlantic (Schultz, 1958), namely, Sparisoma, Cryptotomus and Nicholsina. Species of these genera have similar meristic features that makes it difficult the larvae identification. It should be noted that our larvae are greatly similar to those Cryptotomus ustus described by Regan (1916), and later by Aboussouan (1969) by their shape of the body, pigmentation and meristic features.While identifying larvae Regan (1916) supposed that they can be referred not to C.ustus, but, to some species nearly related to it. Therefore, larvae described above would be refer to Nicholsina usta (= Cryptotomus ustus) tentatively.

Callionymidae

Callionymus himantophorus Goode et Bean

1 larva, 6.0 mm SL (7.5 mm TL) (st.327).

Description. D IV, 10; A 9, P 20, V I,5; vertebrae 21(8+13).

The larva has a massive body (Fig.8). The head is large (HL 36.6% SL), it is compressed in the dorso-ventral direction.

Eyes are large (ED 36, 4% HL), the distance between eyes is narrow (Fig.9). The anus is located somewhat behind the middle of the body (PAL 55% SL). The air bladder can be seen in the upper part of its abdominal cavity. There is a large, strongly bifurcated spine on the preopercle. The first three spinose rays of the dorsal fin are brought together, and the fourth one (broken) is lying slightly further from them. The first ray of the anal fin is at the level of the third soft ray of the dorsal fin. The pectoral fins have massive bases. The bases of the ventral fins are lying under them. The first ray of the ventral fin is represented by a short spine, other 5 rays of this fin are soft and long. There are 10 principal and 5 procurrent rays (3 above and 2 below) in the caudal fin. The body is pigmented by brown pigment cells. The upper part of the body is mainly pigmented, the lower part of the body is pigmented only in the ventral rays section. The upper part of the head is intensively pigmented. The pigment accumulations form a peculiar design over the hemispheres of the midbrain. This design is partially repeated behind the brain over the upper section of the peritoneum, it is transparent through its dorsal tissues (Fig.9). Besides, the pigment cells are observed along the anterior margin of the second spinose ray of the dorsal fin. One pigment cell is seen at the upper edge of the lobe of the left pectoral fin and two cells - on the lobe of the right pectoral fin.

Remarks. Larvae Callionymus inhabiting the West Atlantic were not described. The availability of strongly bifurcated spine on the preopercle of the larva described above, as well as the number of rays in the dorsal and anal fins, that all corresponds to C.himantrophorus (Jordan, Evermann, 1896).

Callionymus bairdi Jordan?

1 larva, 5.1 mm SL (st. 310).

Description. D III-IV, 8-9; VI, 4-5; vertebrae 20-21.

The body is pigmented by brown branched pigment cells. The upper part of the head and trunk are evenly pigmented by

scattered cells. 5-6 rows of chromatophores going from the trunk to the caudal fin are distributed over the caudal section. 3-4 rows of the same cells are lying along the ventral margin of the postanal section. All rays of ventral fins are short, strongly pigmented along the whole length.

Remarks. Larva distinguishes from that described above by the availability of the pigment on the ventral margin of the postanal part of the body and the lack of any pigment design at the upper part of the head and the trunk. This larva would be related to C.bairdi according to the number of soft rays in the dorsal fin. But, our identification is a tentative one, as the larva preopercle spines are not yet developped, that does not allow to identify the species level.

Gobiidae

1 larva, 6.45 mm SL (st.313). Genus? Species?

Description. DV,11; A 11; vertebrae 24(9+15). The body is narrow (BD 16.1%SL), pressed from the sides (Fig.10). The anus is in the middle of the body (PAL 50.5% SL).The head is long and narrow (HL 21.3% SL). The tip of the lower jaw is strongly projected in front of the tip of the upper jaw. The caudal fin has 14 principal rays and 7 procurrent ones from above and below. The air bladder is large and lying under 5-10 myomeres. Exclusively a lower part of the body is pigmented. Large pigment accumulations underlying its vertebrae from below are distributed along the myosepta of the first 17 myomeres. The upper part of the air bladder is strongly pigmented. Several melanophores are under the edge of 3-10 postanal myomeres. Melanophores are also on the myosepta 3-6 of the postanal myomeres, they are lying on the body surface. The tip of the lower jaw is intensively pigmented. Besides, three melanophores are transparent under the brain.

Remarks. This larva distinguished from the larvae of Gobiosoma and Microgobius described by Hildebrand and Cable (1930). It refers to one of the subtropical or tropical species of gobies with small number of rays in the dorsal fin, whose

larvae are not known yet. Therefore, the larva identification lower than at the family level is not possible yet.

Gempylidae

Diplospinus multistriatus Maul

1 larva, 4.7 mm SL (st.320).

Larvae D.multistriatus were firstly described by Voss (1954) as Gempylus "A" (Parin, 1967). They have been already found in the Canadian zone of the Gulf Stream (Evseenko, Serebryakov, 1974).

Trichiuridae

Benthodesmus elongatus simonyi (Steindachner)

1 larva, 20.3 mm SL (st. 326).

Description. D XL VII, 91+, in total 138+; A II, 87+; P 12, V I, 1.

The larva has a very elongated, laterally compressed and narrow body (Fig.11). The head is large (HL 19.7% SL; ED 18.5% HL). Dorsal fin is long, distinctively divided on spinose and soft parts. The length of the base of the spinose part is slightly shorter than the length of the base of the soft part. The anal fin has two spinose rays, whose bases are located under 2-4 soft rays of dorsal fin. The second spine has a smooth edge turned to the first spine, from which two plates are going serrated along their edges. The anus is located under the second soft ray of the dorsal fin (PAL 60.3% SL). It should be noted that the process of the soft rays formation into the dorsal, anal ans caudal fins is not completed yet. The ventral fins are localized behind the posterior margin of the pectoral fins bases, they are represented by one long strong spine serrated at its back edge and by one short soft ray. The mouth is large. There is one large fang in the anterior part from every side of the upper jaw. The second small fang turned inside follow the large one from both sides. 9 small teeth follow them further. There are one large fang and 10-12 small teeth in the anterior part of the lower jaw from every side. There is one nostril in front of each eye.

A continuous row of melanophores is going along the dorsal margin of the body, it begins above the forebrain and finishes under the 72 soft ray of the dorsal fin. There is just the same row of melanophores going along the ventral margin of the body from the base of the anal spines up to 39th ray of the anal fin; futher, the row becomes interrupted and the last melanofore, the greatest one from this row, is in the base of 68-70 rays of the anal fin. Dense concentration of a black pigment covers the anterior part of the intestine loop . The rest part of the intestine and the abdominal cavity are enough evenly pigmented by large melanophores. Besides, a dense melanophore concentration is lying before the eyes; some pigment cells are behind the eys and on the praemaxillare. A continuous row of small melanophores is going along a side surface of a lower jaw.

Remarks. Larvae B.elongatus simonyi have not been earlier described. The referring of the larva described above to this species is beyond doubt, as it has a lot of features proper to B.elongatus simanyi (the number of spinose rays in the dorsal fin, the peculiarities of the ventral rays and the anal spines location) (Parin, Bekker, 1972).

The area of B.elogatus simonyi distribution is restricted by waters of the North Atlantic (Parin, Bekker, 1972).

Paralichthidae

Citharichthys gymnorhinus Gutherz et Blackman

1 larva, 3.6 mm SL (st.343).

Larvae C.gymnorhinus are described by Tucker (1978) and Dowd (1978). C.gynmorhinus was firstly reported off Florida Keys, Bahamas, Hispaniola, Puerto Rico, Tabago and off Columbia, Panama and Nicaragua (Guther, Blackman, 1970), some later it was found on the Florida Shelf, off Cuba, the Virgin Islands, Venezuela and Guyana (Topp, Hoff, 1972). Larvae of this species in the open areas of the Western North Atlantic have not been earlier observed.

Bothidae

Bothus ocellatus (Agassiz)

8 larvae: 4.0 and 5.5 mm SL (st.343), 5.5 mm SL (st.320), 6.0mm SL (st.313), 9.0 mm SL (st.330), 9.4 mm SL (st.374). 9.5 mm SL (st.312) and 13.0 mm SL (st. 316).

Among larvae caught, two one being 9.4 mm SL and 13.0 mmSL have 26 caudal vertebrae, the other ones - 25 caudal myomeres/ vertebrae. According to data by Jutare (1962), all larvae refer to B.ocellatus. This species is widely distributed beyond the shelf waters of the North America at its early stages of development. The larvae are found mainly in the zones of the Gulf Stream eddies (Evseenko, 1976). The carrying out of larvae beyond the shelf can occur during the formation of the cyclonic "cold" rings of the Gulf Stream, which consist of the slope waters into its central part, and their recovery to the shelf - with water of anticyclonic rings of the Gulf Stream (Evseenko, in press).

Cynoglossidae

Symphurus sp.

1 larva: 11.7 mm SL (st.316).

It is difficult to determine the larva species due to a strong injury of its head section and dorsal fin. The pigment pattern of this larva are similar to those of S.plaguisa larvae (Olney, Grant, 1976).

Symphurus larvae were not earlier observed in the open sea areas of the Western North Atlantic. But, the availability of larvae and juveniles of one of the species of this genus - S.minor on the Nova Scotia Shelf (Markle et al., 1980) testifies quite obviously to the drift of the soles larvae from the southern areas with the Gulf Stream waters.

Antennariidae

Histrio histrio (Linnaeus)

2 larvae: 2.25 mm SL (st. 329) and 2.75 mm SL (st.328).

The larvae H.histrio are described by Adams (1960). This

species is distributed in the tropical waters of the North Atlantic and the Indo-Pacific (Schultz, 1957).

It is penetrating with the Gulf Stream waters northwards to Georges Bank and even further in the Western North Atlantic (Bigelow, Schroeder, 1953; Leim, Scott, 1966). Data on the distribution of larvae are absent.

Antennarius sp.

2 larvae: 3.7 mm SL (st.336) and 4.0 mm SL (st.343).

Description. 3.7 mm SL (D 10-11+, A7, P 11, C 9); 4.0mm SL (D 10+, A 7, P 11, C 9).

The body is almost a ball-like, slightly pressed from its sides in the caudal section, it is enough evenly covered by large bifur-cated spines. The mouth is large. Small teeth are observed on the lower jaw. Eyes are large, round. The gill slit opens under the base of the pectoral fin as a round pore. The both larvae have the rudiments of the ventral fins. Only soft rays were formed in dorsal fin. The whole body is densely covered by branched brown pigment cells. They concentrated intensively under the upper part of the peritoneum.

Remarks. The larvae are very similar to thos Antennarius sp., 5.0 and 5.5 mm SL from the Indian Ocean (Tsokur, 1972) by their body shape, proportions and pigmentation, and by their spines shape, sizes and location on the body. The formation of the dorsal fin is not finished yet in the larvae described above, therefore, their identification is difficult to be done up to the species level. The difficulty of their identification is also aggravated due to the fact that the paper by Tsokur (1972) mentioned above is yet the only one in the field of characteristic of this fish larvae inhabiting the subtropical and tropical waters of the Atlantic Ocean.

Conclusion

In the autumn-winter period, the ichthyoplankton was represented by 23 families in the Canadian zone of the Gulf

Stream. Those are larvae of 15 subtropical and tropical families mainly of the shelf fish: Congridae, Synodontidae, Bregmacerotidae, Macrouridae, Scorpaenidae, Labridae, Scaridae, Callionymidae, Gobiidae, Gempylidae, Trichiuridae, Paralichthidae, Bothidae, Cynoglossidae, Antennariidae; and larvae of 7 families of deep-water fish: Gonostomatidae, Sternoptychidae, Melanostomiatidae, Chauliodontidae, Notosudidae, Myctophidae, Paralepidae and an egg Scomberesocidae. Larvae of most species of these families are found in the Canadian zone of the Gulf Stream for the first time. Myctophid larvae were the most abundant and were represented in numerous samples. The quantity of the ichthyoplankton taken is extremely poor, the most of its species are represented by several specimens. It should be taken into account that eggs in the ichthyoplankton are almost lack, only one egg Scomberesox saurus was found.

The comparison of the data on larvae distribution with the current structure during the survey period (Noskov et al.,1977) shows that the most of larvae have been caught in the Gulf Stream anticyclonic meander with the axis passing along 62°W.

Larvae of fish inhabiting the Nova Scotian Shelf are completely absent in the ichthyoplankton of this area. This is explained both by a week carrying out of the shelf fish larvae to the Gulf Stream zone and by the death of those larvae due to a great difference in the temperature of the Shelf and the Gulf Stream waters (about 10-15°C) according to data on the hydrological conditions during the survey (Noskov et al, 1977).

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Appendix

List of stations, where the ichthyoplankton was found. Stations were accomplished by RTM "Belogorsk, 14.XI.-2.XII.1974

No. of station	Date	Station positions	
		N lat.	W long
310	14.XI.1974	41°30'	65°00'
311	-"-	40°59'	65°00'
312	15.XI.1974	40°30'	65°00'
313	-"-	40°00'	65°00'
314	-"-	39°30'	65°00'
315	-"-	39°00'	65°00'
316	-"-	38°30'	65°00'
317	16.XI.1974	39°00'	64°00'
318	-"-	39°30'	64°00'
319	-"-	40°00'	64°00'
320	-"-	40°30'	64°00'
323	17.XI.1974	42°47'	64°00'
326	18.XI.1974	41°30'	63°00'
327	-"-	41°00'	63°00'
328	-"-	40°30'	63°00'
329	19.XI.1974	40°00'	63°00'
330	-"-	39°30'	63°00'
331	-"-	39°45'	62°00'
332	-"-	40°00'	62°00'
333	20.XI.1974	40°30'	62°00'
334	-"-	41°00'	62°00'
335	-"-	41°30'	62°00'
336	-"-	41°59'	61°59'
341	22.XI.1974	42°00'	61°00'
342	-"-	41°30'	61°00'
343	-"-	41°00'	61°00'
348	25.XI.1974	41°00'	60°00'
352	-"-	43°10'	60°00'
358	28.XI.1974	42°00'	59°00'
359	-"-	41°30'	59°00'
360	29.XI.1974	41°00'	59°00'
362	-"-	40°30'	58°00'
363	-"-	41°00'	58°00'
373	01.XII.1974	43°30'	57°00'
374	02.XII.1974	43°00'	57°00'
377	-"-	41°30'	57°00'
378	-"-	41°00'	57°00'
379	-"-	40°30'	57°00'

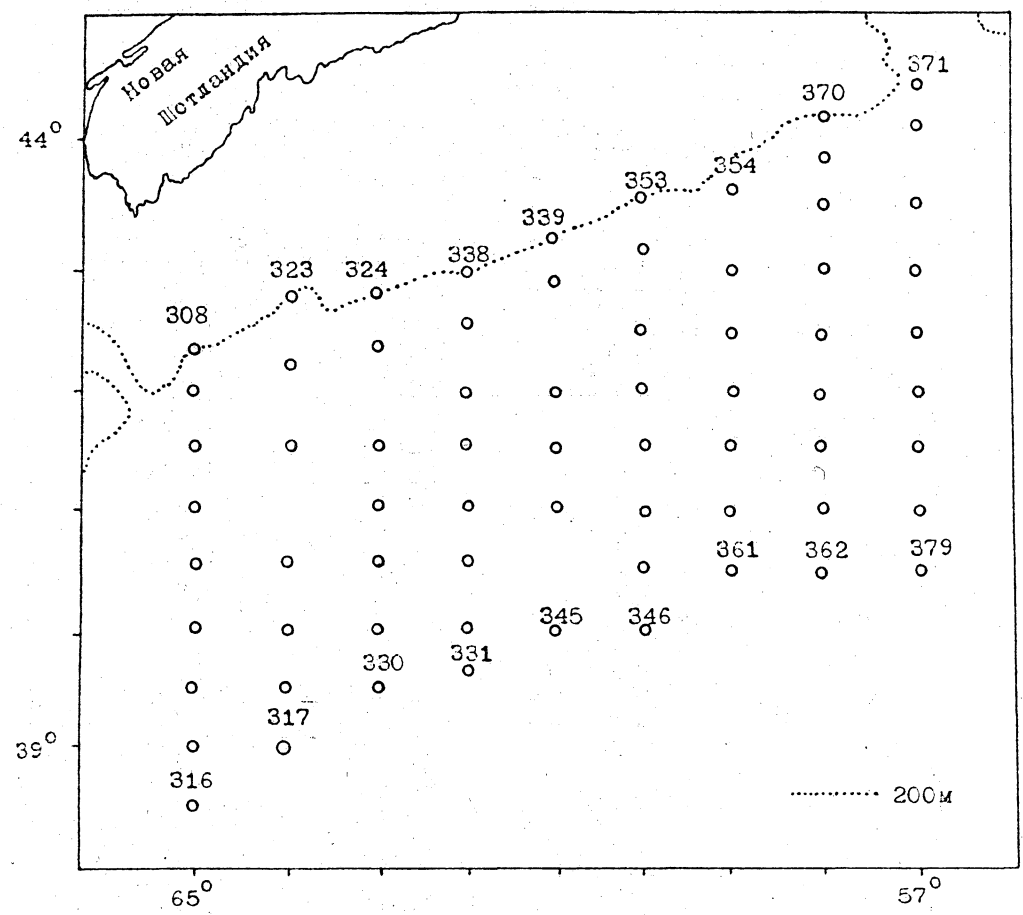


Fig.I. Locations and number of the ichthyoplankton stations completed by RTM "Belogorsk" in November-December, 1974.

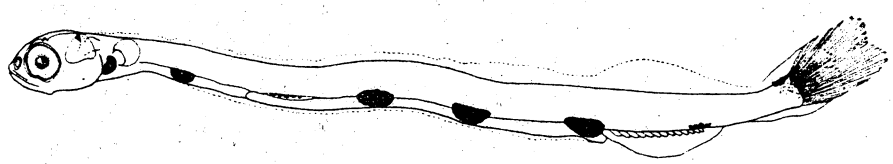


Fig.2. <u>Trachinocephalus myops</u> larva, 19.7 mm SL (st.343).

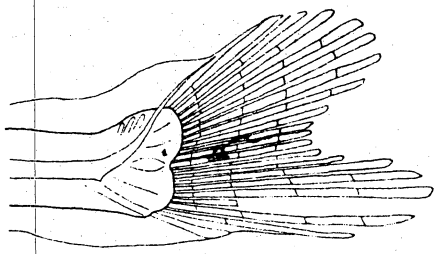


Fig.3. The caudal fin of the Scopelosaurus sp. larva, 17.8 mm SL (st.374).

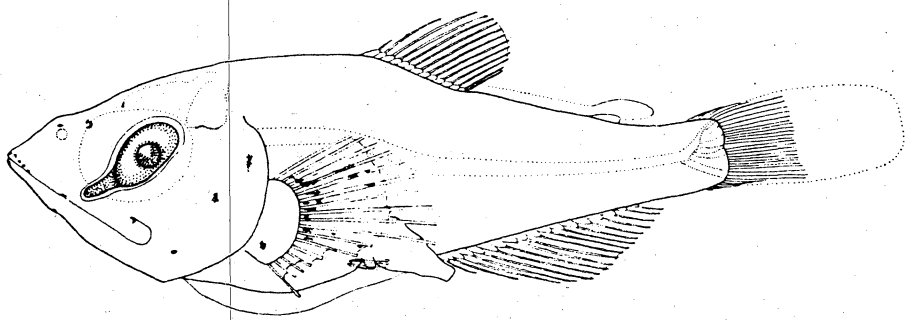


Fig.4. Myctophum selenops? larva, 9.7 mm SL (st.334).

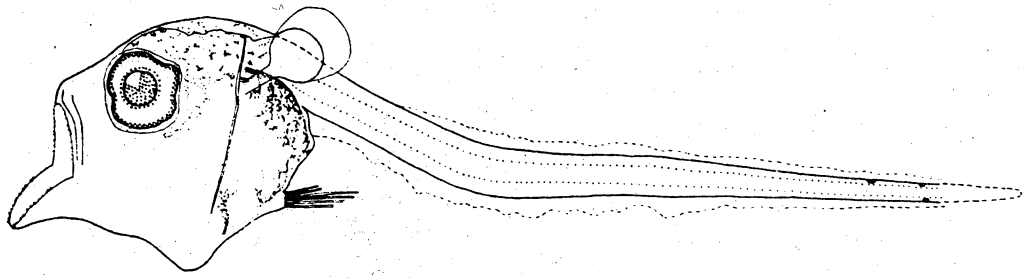


Fig. 5. Macrouridae larva, 1.44 HL (st.326).

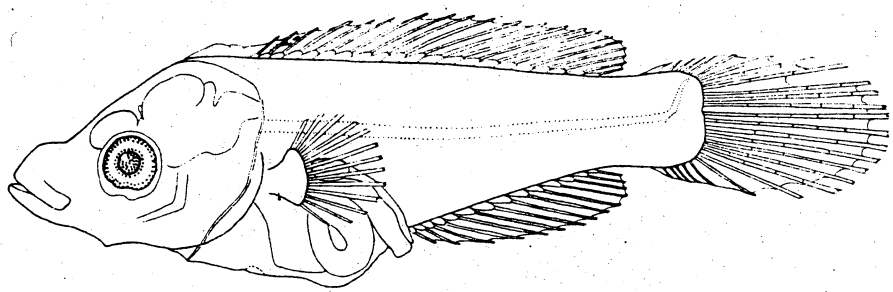


Fig.6. Labridae larva, 5.5 mm SL (st.328).

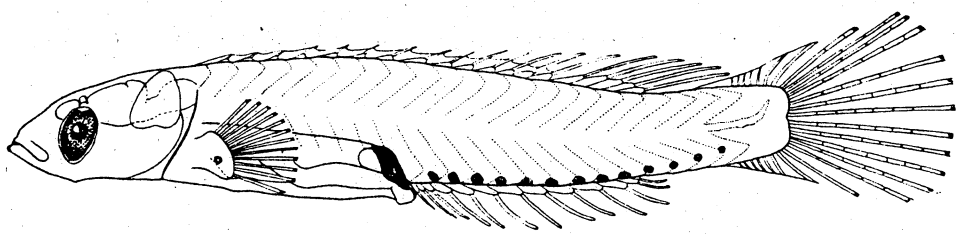


Fig.7.?Nicholsina usta larva , 7.5 mm SL (st.310).

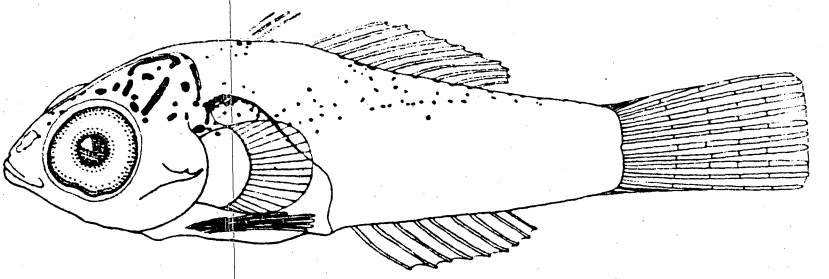


Fig.8. Callionymus himantophorus larva, 6.0 mm SL (st.327).

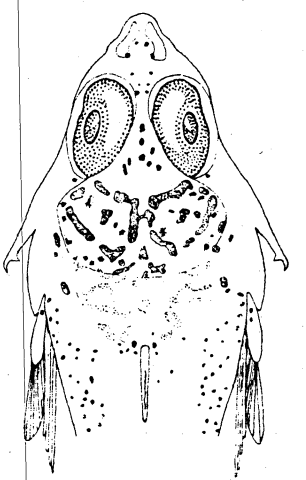


Fig.9. Head of C.himantophorus larva, 6.0 mm SL(from top).

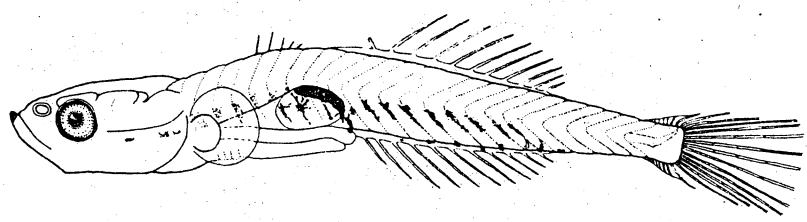
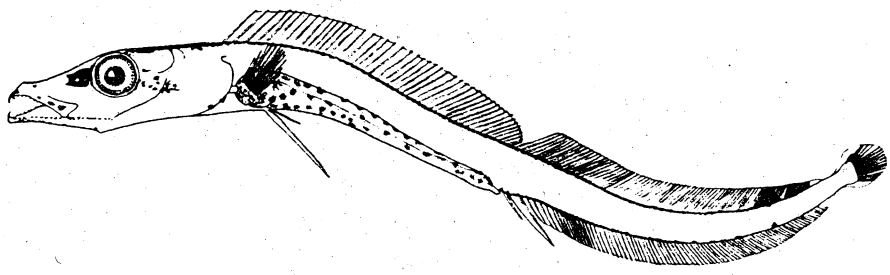


Fig.10. Gobiidae larva, 6.45 mm (st.313).



Fif.11. Benthodesmus elongatus simonyi larva,20.3mm SL (st.326).