Body long and slender, subcylindrical to slightly compressed. Dorsal-fin origin at about midbody level or behind it. Dorsal adipose fin present or absent. Pectoral fins lateral. Pelvic fins insertion from well in front of dorsal-fin origin to below last dorsal-fin ray or slightly behind it. Anal-fin base equal to or shorter than caudal peduncle length. Parietals large, usually meeting along mid-line. Frontals not fused. Mesocoracoid absent. Well-developed physoclistous swim-bladder. Mouth small, maxilla not reaching behind front margin of eye. Teeth absent from maxilla, premaxilla and tongue, but present on vomer, palatines and dentaries. Scales large, cycloid and deciduous. Lateral-line scales larger than body scales and extend onto caudal fin. Head scaleless. Branchiostegal rays 3–4. Vertebrae 35–50 (excluding *Xenophthalmichthys*).

Three genera and 16 species, distributed in all oceans from the sub-Arctic to the sub-Antarctic; one genus represented in the Southern Ocean. In recognizing Microstomatidae, I follow a recent analysis of interrelationships within the suborder Argentinoidei by Ahlstrom *et al.* (1984).

Genus ***Nansenia*** Jordan & Evermann, 1896

Dorsal adipose fin present above anal fin. Pelvic fins inserted behind dorsal-fin origin. Predorsal length less than 61% SL. Epi- and mesopelagic fishes, but sometimes found in the benthopelagic zone of continental and insular slopes (Kawaguchi & Butler 1984). Distribution as for family. Recent revision by Kawaguchi & Butler (1984). Thirteen species, 1 in our area. Methods follow Gon (1987a).

Nansenia antarctica Kawaguchi & Butler, 1984
Fig. 1

Nansenia antarctica Kawaguchi & Butler, 1984: 8, fig. 7 (55°57′S, 159°23′W). Holotype: LACM 10875.

Diagnosis: D 9–10; A 9–10; P 12–14; V 9–10 (excluding short spine sometimes found anterior to first pelvic-fin ray); LL 48–49; GR (10–14) + (21–30); pyloric caeca 7–8; vertebrae 48–50; branchiostegal rays 3. Body depth at pectoral-fin base 8.9–11.4, at pelvic-fin insertion 10.4–13.3 and at anal-fin origin 14.0–15.7 in SL. Body width 0.8–1.0 in its depth. Head length 4.1–4.9 and head depth at level of preopercle edge 8.6–10.4 in SL. Snout length 5.5–7.3 and eye diameter 2.1–2.6 in HL. Caudal peduncle depth 2.1–2.9 in its length and the length 7.3–8.7 in SL. Anal-fin base 1.5–1.9 in caudal peduncle length. Distances from snout to dorsal-fin origin 2.1–2.2, to pelvic-fin insertion 1.8–2.0, and to anal-fin origin 1.2–1.3 in SL. Suborbital bones well ossified and cover the whole cheek.

Colour: In alcohol, body pale brown with dark lining of body cavity showing through its thin walls. Opercle and snout darker than body, but cheek pale. All fins pale. Peritoneum and stomach dark brown, intestine pale. Mouth cavity and gill chamber dark.

Otoliths

Diagnostic features: The elongate and sagittate shape, the elongate sulcus acusticus with a distinctly constricted collum in association with the large proximally broad and distally slender but rounded rostrum.

Note: The geometric shape of the otolith and the shape of the rostrum of the otolith of *Nansenia* is markedly different from those of the *Bathylagus* species.

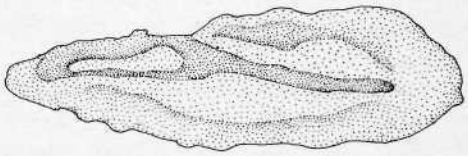


Fig. 2. Representative otolith of *N. antarctica*; fish length 103 mm SL

Distribution: Probably circum-Antarctic in sub-Antarctic water. The lack of records from most of the Indian and the south-east Atlantic Ocean sectors is probably due to insufficient sampling. The catch data of the specimens of *N. antarctica* studied by Kawaguchi & Butler (1984) give no indication of the true depth range of this species as the gear (open nets) was towed between the surface and more than 5,000 m. Depth records of the specimens used in this study showed a much shallower range of 485–1,020 m.

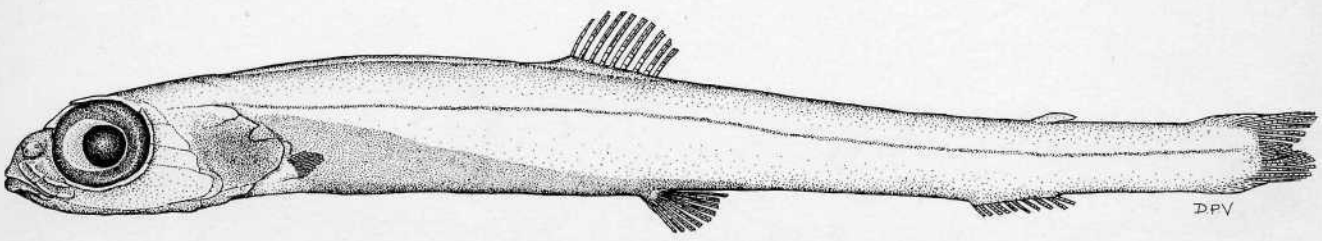
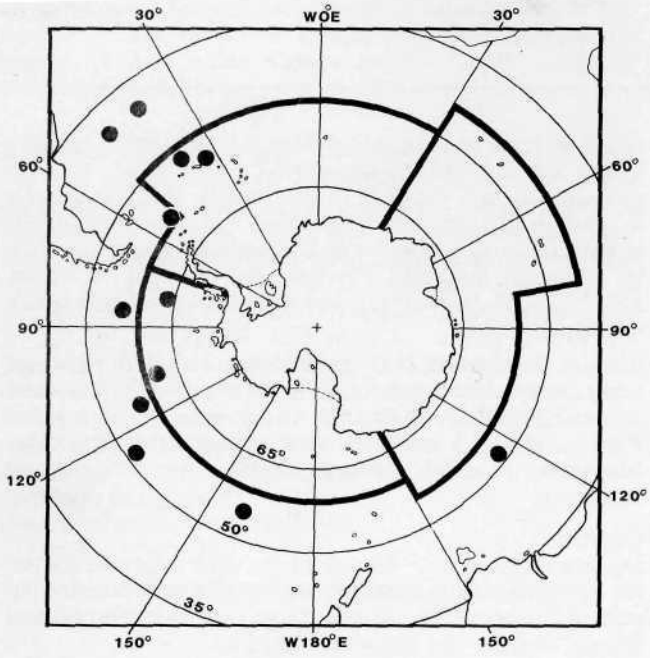


Fig. 1. *Nansenia antarctica* BAS 831406, 108 mm SL (56°06′S, 37°22′W)



Distribution of *N. antarctica*

Remarks: In addition to allometric growth of the caudal peduncle in *N. antarctica* (Kawaguchi & Butler 1984), the head length in specimens smaller than 110 mm SL was 4.1–4.4 in SL, but proportionally smaller (4.4–4.9) in larger specimens.

Although adults are easily separated, a difficulty may arise in distinguishing juveniles of *N. antarctica* from those of Southern Ocean *Bathylagus* species. Young of both groups resemble each other in general morphology and often lose their scales and much of their scale pockets in the trawls. However, in all Southern Ocean *Bathylagus* there are only 2 branchiostegal rays, the anal-fin base is longer than the caudal peduncle, the number of anal-fin rays is 15–24, and the number of pyloric caeca is usually 3–6. A mouth structure similar to *Bathylagus* suggests feeding on small, soft-bodied zooplankton. Better ossification of superficial cephalic bones and firmer body musculature indicate existence in shallower depths than Southern Ocean *Bathylagus*.

Attains about 22 cm SL.

Body long and compressed; in some species, body relatively deep in front, tapering to a narrow caudal peduncle. Head moderate to small; snout short and blunt; eyes large, never tubular. Supraorbital bones well developed and suborbital bones weakly developed. Mouth small; no teeth on upper jaw or tongue; vomer and palatines with 1 row of spaced, small, conical teeth; dentary with a single row of close-set, small triangular teeth fused to the bone. No spines in fins; dorsal fin at about midbody length; anal fin on posterior third or fourth of body; pectoral fins near ventral surface of body; pelvic fins inserted under dorsal fin or slightly behind it; adipose fin present. Scales large, cycloid and deciduous; lateral line complete. Gill membranes united and gill opening restricted in some species at level of upper pectoral-fin base or slightly above it; gill rakers long and triangular, leaflike; pseudobranch well developed. Branchiostegal rays 2. Pyloric caeca 3–12. Swim-bladder absent. Frontals not fused; parietals separated; postcleithra and mesocoracoid absent. Photophores absent. Anus in front of anal-fin origin. The larvae of some species with stalked eyes.

Meso- to bathypelagic fishes in all oceans. Some species were recorded from the surface to 1,500 m and may perform vertical migrations. Zooplankton grazers. World-wide 8 genera (Kobyliansky 1986), 1 in the Southern Ocean. Nowhere commercially exploited. Although fur seals in the Bering Sea feed on *Bathylagus*, bathylagid fishes have not been reported from stomach contents of Antarctic animals. At least 2 species of seals, Weddell and Elephant seals, and 2 species of penguins, King and Emperor, are capable of diving to depths where these fish may be found.

Taxonomic revisions, mostly on regional basis, were done by Norman (1930), Blache (1964), Cohen (1964), Rass & Kashkina (1967), Kobyliansky (1985, 1986) and Gon (1987a). Gorelova & Kobyliansky (1985) reported on the feeding habits of selected species.

Genus ***Bathylagus*** Günther, 1878

Caudal peduncle shorter than length of anal-fin base. Gill opening restricted at level of upper pectoral-fin base. Dorsal-fin origin anterior to or at midbody length. Pyloric caeca 3–6. Weak ridges radiating from center of opercle and fingerlike projections on rear edge of opercle absent. Orbitosphenoid well developed. Basisphenoid, metapterygoid and mesocoracoid poorly developed or absent (Kobylianski 1986). Seven valid species, 3 in the Southern Ocean. The key and species accounts below are based on Gon (1987a).

KEY TO SPECIES
(for specimens larger than 100 mm SL)

1a Vertebrae 43–48; GR 24–30; LSS 37–43; eye diameter 2.0–2.8 in HL. 2
1b Vertebrae 48–52; GR 26–36; LSS 31–38; eye diameter 1.8–2.4 in HL; body depth at A origin 7.4–11.1 in SL. . . . . *B. antarcticus*
2a Vertebrae 43–47; A 15–20; caudal peduncle length 1.3–2.5 in A base; peduncle depth 1.3–1.8 in its length; body depth at A origin 9.0–14.0; distance between P and V bases (measured horizontally) 4.0–4.2 in SL. . . . . *B. gracilis*
2b Vertebrae 46–48; A 20–24; caudal peduncle length 2.2–4.1 in A base; peduncle depth 0.8–1.2 in its length; body depth at A origin 6.9–8.6; distance between P and V bases 2.9–3.9 in SL. . . . . *B. tenuis*

Bathylagus antarcticus Günther, 1878
Fig. 1; Pl. 1, Fig. 2

Bathylagus antarcticus Günther, 1878: 248 (53°55′S, 108°35′E). Holotype: BMNH 1887.12.7.230.

Bathylagus glacialis Regan, 1913: 231, pl. 9, fig. 2 (68°25′S, 27°10′W; 68°32′S, 12°49′W; 71°50′S, 23°30′W; 71°22′S, 16°34′W; 71°32′S, 17°15′W).

Bathylagus gracilis (*non* Lönnberg): Andriashev, 1959: 4.

Bathylagus gracilis (*non* Lönnberg): Lisovenko *et al.*, 1986: 216.

Bathylagus sp. Krefft, 1958: 251; Kock, 1982: 98, 108.

Diagnosis: Data in parentheses refer to fishes 48–165 mm SL (n=59); otherwise, data refer to specimens larger than 100 mm SL. D 8–11; A 16–24; P 9–12; V 8–9; GR 26–36; LSS 31–38; pyloric caeca 3–5; vertebrae 48–52. Body elongate and compressed, deep in front of dorsal fin and somewhat more slender behind it. Depth of head at preopercle 5.2–6.9 (5.2–8.9), depth of body at pectoral-fin base 4.4–6.7 (4.4–8.6) and at anal-fin origin 7.4–11.1 (7.4–15.5), and head length 4.0–5.6 (3.9–4.8) in SL. Eye diameter 1.8–2.4 (1.4–2.5) in HL. Maxilla reaching under anterior margin of eye. Gill opening restricted to lower quarter or third of head. Predorsal distance 2.0–2.3 (2.0–2.3) and length of anal-fin base 5.4–6.8 (4.2–7.0) in SL. Caudal peduncle length 10.2–12.6 (8.4–15.9) in SL and its depth 1.2–1.6 (1.0–2.0) in the length. Pelvic fins inserted closer to pectoral fin, midway between pectoral and anal fins or closer to the latter, depending on size of specimen.

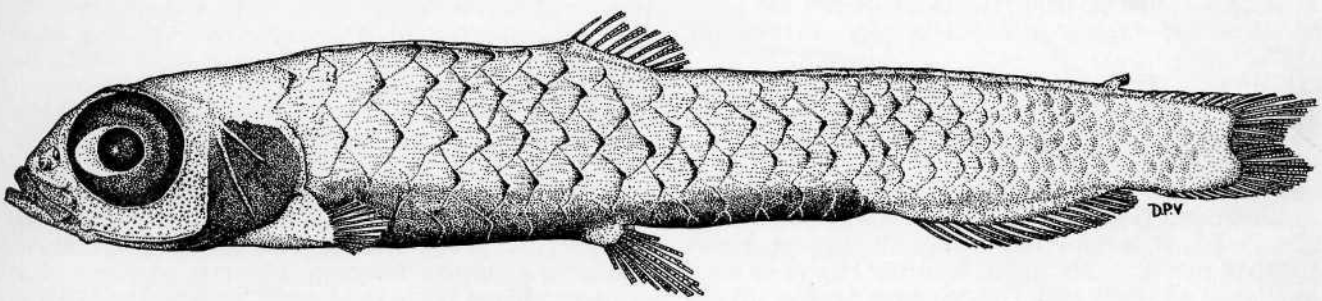


Fig. 1. *Bathylagus antarcticus* RUSI 22662, 107.3 mm SL, male (62°01.7′S, 57°57.7′E)

COLOUR: In live fish, upper part of body and tail pale blue; lower half of body from opercle to anal-fin origin dark, metallic blue to black. Snout and jaws dark, but cheek paler; lining of lower half of orbit iridescent blue. Rear margin of scale pockets dark. Body, head and fins sometimes covered with small dark spots which may be larger on the cheek. Fins dusky.

In alcohol, pattern remains the same. The general colour may change from yellow to brown, depending on period in preservative; dark blue areas turn to dark brown or black. Intestine pale; peritoneum, mouth and gill chamber dark.

Otoliths

DIAGNOSTIC FEATURES: The ovate shape, rounded posteriorly, extremely pointed anteriorly, and medio-laterally thin; sulcus acusticus ostial to ostio-pseudocaudal and homosulcoid; ostium only present on dorsal face of rostrum; rostrum distinctly elongate, prominent and pointed distally; rostrum measures 33.57 ± 6.31% (range 25–42.86) in total otolith length; antirostrum usually absent, if present then minute and rounded distally.

Intraspecific variation: The antirostrum is either present or absent and the sculpture of the anterodorsal margin varies from sinuate, dentate to lobed.

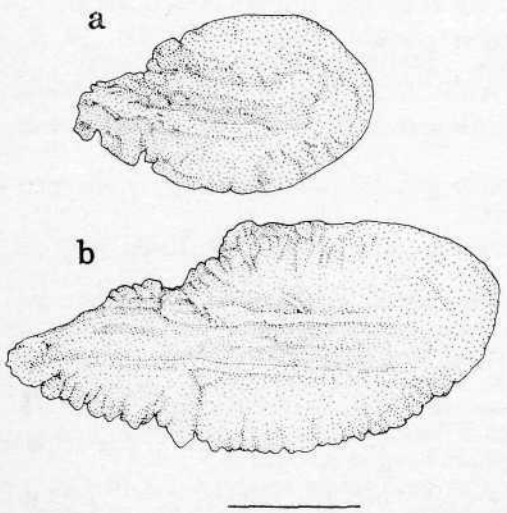
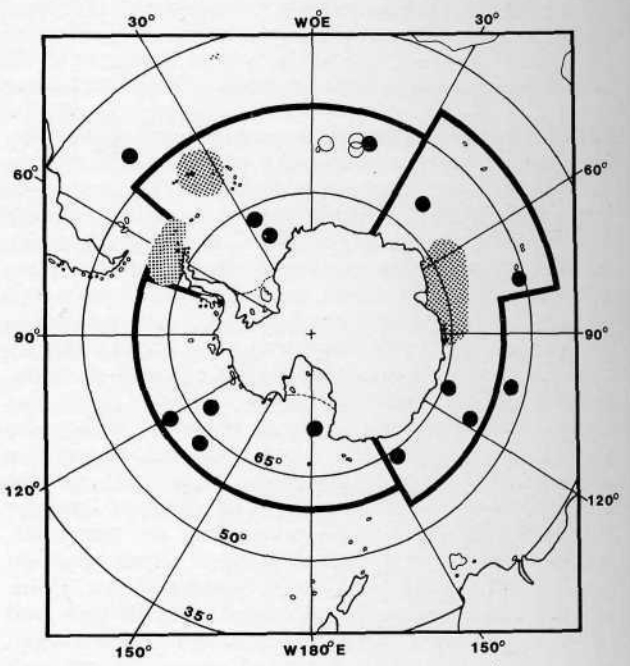


Fig. 2. Representative otoliths of *B. antarcticus*; fish lengths: (a) 85 mm and (b) 140 mm SL

Distribution: Circum-Antarctic and southern Atlantic, Indian and Pacific oceans (Norman 1937b; Cohen 1986a). Specimens of *B. antarcticus* were caught between the surface and about 4,000 m.

Remarks: *Bathylagus antarcticus* is closely related to *B. gracilis* (see key above for differences) and *B. pacificus* Gilbert, 1890. The latter species has fewer vertebrae (45–48) and pectoral-fin rays (8–10) (Gon 1987a).

Norman's (1930) series of *Discovery* specimens of *B. antarcticus* are of special interest. He reported 7 specimens from 3 different stations. Of these, the specimen from Station 71 (BMNH 1930.1.12.36), labelled as *B. benedicti* was originally identified as *B. antarcticus* (A. Wheeler *pers. comm.*), but was re-identified as *B. tenuis* (Gon 1987a). The large specimen (BMNH 1930.1.12.37) and at least the largest of the 3 small ones (BMNH 1930.1.12.38) from Station 101 are probably *B. bericoides*. Of the 2 specimens from Station 151 (BMNH 1930.1.12.39–40), one is B. *antarcticus* and



Distribution of *B. antarcticus*

the other was lost (A. Wheeler *pers. comm.*); another specimen from this station (BMNH 1930.1.12.44), originally labelled as *B. benedicti* was correctly reidentified possibly by Norman, as *B. antarcticus*. A specimen from Station 169 (BMNH 1930.1.12.48) was reported by Norman (1930) as *B. euryops* but was redetermined as *B. antarcticus* at a later stage, possibly when he worked on the fishes of B.A.N.Z. Expedition (Norman 1937b). In addition, in a footnote at the end of his account on *B. glacialis*, Norman (1930: 295) stated that of the 2 syntypes held in the British Museum collection 1 is *B. euryops*. I have examined these syntypes, both of which proved to be *B. antarcticus*. Norman (1930) apparently based his identification on the relatively low number of anal-fin rays of the syntypes (17 and 18). However, both specimens have counts of 50 vertebrae and 31 gill rakers, typical of *B. antarcticus* whereas *B. euryops* has 44–48 vertebrae and 24–28 gill rakers (Gon 1987a).

The *Bathylagus* larvae included in the type series of *Stylophthalmus paradoxus* (Brauer 1902, 1906) are *B. antarcticus*. They are likely to be the specimens listed by Brauer (1906) from 3 Southern Ocean localities (shown as open circles in map). *S. paradoxus* of Pappenheim (1914) is also this species. For a more detailed discussion see Remarks of *Idiacanthus atlanticus* (Stomiidae) below.

Studies on the feeding (Gorelova & Kobyliansky 1985) and reproduction (Lisovenko *et al.* 1986) of *B. gracilis* south of the Antarctic circle most probably refer to *B. antarcticus*, the only bathylagid species found in these latitudes (Gon 1987a). Euphausiids comprised 46% by weight of the food consumed by *B. antarcticus*. Appendicularians, polychaetes and copepods were less important in terms of weight, but were found in more stomachs than other items (Gorelova & Kobyliansky 1985). Males (maximum 14 cm SL) are smaller than females (maximum 17 cm SL) and mature at a smaller size (8.8 cm versus 11.2 cm SL). Ripe eggs are about 1.8–2.0 mm in diameter. Relative fecundity increases with size; ripe eggs numbered 228 in an 11 cm SL specimen and 1300 in a 16 cm SL fish. Spawning probably occurs 3–4 times a year (Lisovenko *et al.* 1986).

Bathylagus gracilis Lönnberg, 1905
Fig. 3

Bathylagus gracilis Lönnberg, 1905a: 762; 1905b: 68 (49°56′S, 49°56′W). Syntype: NRM SYD 1902 265.4197.

Bathylagus euryops (*non* Goode & Bean): var. *latifrons* Lönnberg, 1905b: 67. (49°56′S, 49°56′W).

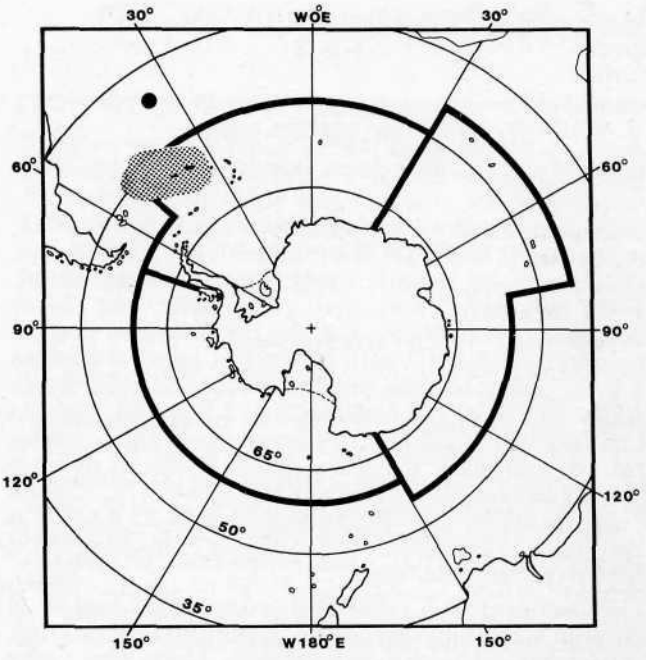
Bathylagus antarcticus (*non* Günther): Lisovenko *et al.*, 1986: 216.

Diagnosis: Data in parentheses refer to fishes 55–217 mm SL (n=18); otherwise, data refer to specimens larger than 100 mm SL. D 9–11; A 15–20; P 8–10; V 8–9; GR 24–29; LSS 38–43; pyloric caeca 3–6 (1 with 9); vertebrae 43–47. Body elongate and compressed, the anterior half deep and robust and the posterior half considerably more slender. Depth of head at preopercle 5.5–7.1 (5.5–8.0), depth of body at pectoral-fin base 4.6–6.8 (4.6–9.1), depth of body at anal-fin origin 9.1–14.0 (9.1–17.8), and head length 4.0–4.8 (4.0–4.8) in SL. Eye diameter 2.0–2.7 (2.0–2.7) in HL. Maxilla reaching slightly beyond anterior margin of eye. Gill opening restricted to lowest quarter of head. Predorsal distance 2.0–2.2 (2.0–2.3) and length of anal-fin base 5.6–7.9 (5.1–7.9) in SL. Caudal peduncle length 10.5–13.8 (10.5–13.8) in SL and its depth 1.3–1.8 (1.3–1.8) in the length. Pelvic fins inserted closer to anal-fin origin than to pectoral-fin base.

Colour: In alcohol, generally brown, abdomen dark brown to black. Body and head covered with diffuse pigment that sometimes forms minute dark spots. Operculum and snout dark, cheek paler. Mouth and gill chamber dark. Fins dusky and sometimes spotted. Peritoneum black and intestine pale.

Distribution: Scotia Sea, south-west Atlantic Ocean and south-east Pacific Ocean. *B. gracilis* were caught at various depths between the surface and 2,700 m.

Remarks: *Bathylagus gracilis* is closely related to *B. antarcticus* (see key for differences), but more so to *B. pacificus*. Counts (on 20 specimens) and measurements (on 8 specimens 73.8–163.3 mm) of *B. pacificus* from the North Pacific Ocean and Bering Sea, and the data published by Rass & Kashkina (1967) were compared to *B. gracilis*. Most of the counts for these 2 taxa were in complete agreement, except for a slightly wider range in *B. pacificus* for the dorsal-fin rays (8–11), anal-fin rays (15–21), pectoral- and pelvic-fin rays (7–10), as well as a range of 37–42 lateral-line scales (Rass & Kashkina 1967). The number of gill rakers, however, has a much wider range in *B. pacificus* (25–34). The measurements were also in agreement between the 2 species.



Distribution of *B. gracilis*

On one hand, the agreement in the measurements and most of the counts indicates a possible synonymy. On the other hand, the wider range of the gill raker counts in *B. pacificus* as well as an apparent difference in the maximum size attained by these species opposes such synonymy. The maximum size measured was 217 mm SL for *B. gracilis* and 170 mm SL for *B. pacificus*.

As in the case of *B. antarcticus*, Norman's (1930) *Discovery* series of *B. gracilis* contained more than 1 species. The Southern Ocean specimens collected by the *William Scoresby*, Station 303 (BMNH 1930.1.12.34) and 307 (BMNH 1930.1.12.35) and at least 1 specimen from Station 151 (BMNH 1930.1.12.31–33) were re-identified as *B. antarcticus*. The specimens from Station 76 (BMNH 1930.1.12.29–30), outside the Southern Ocean, are provisionally regarded as *B. gracilis* but also agree with *B. pacificus*.

It should be noted that Lönnberg (1905a, b) published 2 descriptions of *B. gracilis* n. sp. with conflicting locality data. However, in a footnote in the earlier, original description Lönnberg (1905a) stated that the locality data may have to be changed as the scientific account of the observations had not yet been completed. The corrected localities were included in the second description, in the complete report on the fishes collected during the Swedish South Polar expedition (Lönnberg 1905b).

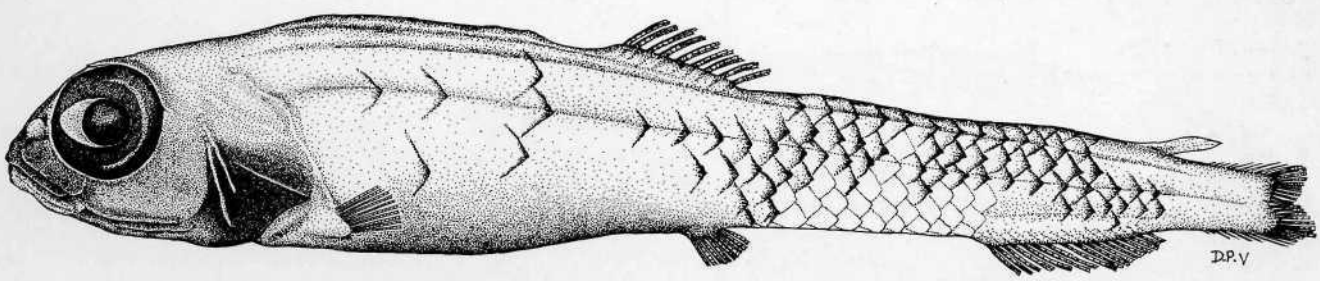


Fig. 3. *Bathylagus gracilis* ISH 421/76, 217 mm SL, female (51°05.5′S, 39°56.5′W)

Bathylagus tenuis Kobyliansky, 1986
Fig. 4

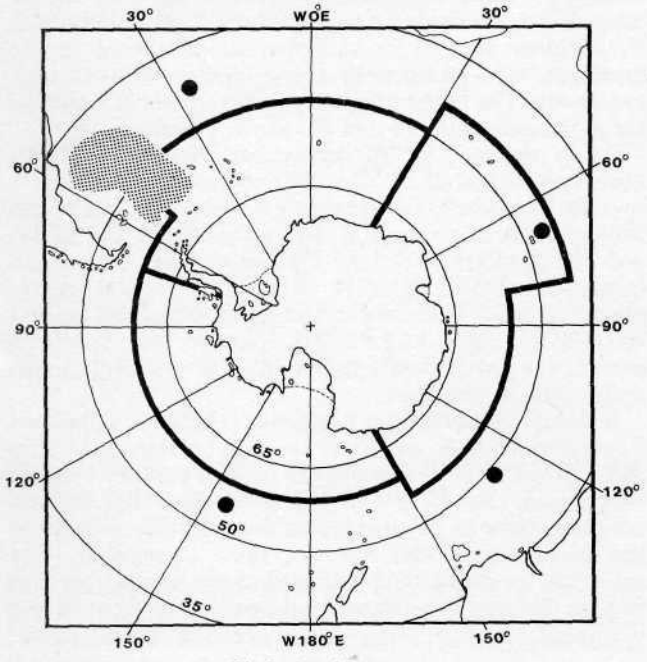
Bathylagus tenuis Kobyliansky, 1986: 40, fig. 20a (40°17′ S, 50°01′ W). Holotype: MMSU 16695.

Bathylagus antarcticus (*non* Günther): Norman, 1930: 276 (in part).

Diagnosis: Based on 12 fishes 48–165 mm SL. D 9–11; A 20–24; P 8–10; V 8–9; LSS 37–41; GR (7–9)+(16–21)=24–30; pyloric caeca 4–6; vertebrae 46–48. Body relatively short and compressed, the depth decreasing gradually towards the tail. Depth of head at preopercle 5.5–6.4, depth of body at pectoral-fin base 4.6–5.7 and at anal-fin origin 7.0–8.6, and head length 4.1–4.8 in SL. Eye diameter 2.1–2.5 in HL. Maxilla reaching under anterior margin of pupil. Gill opening restricted to lower quarter of head. Predorsal distance 2.0–2.2 and length of anal-fin base 4.4–6.0 in SL. Caudal peduncle length 13.4–19.2 in SL and its depth 0.8–1.2 in the length. Pelvic fins inserted closer to anal-fin origin than to pectoral-fin base.

Colour: In alcohol, generally brown, head and body covered with small, dark spots. Snout and opercle dark, cheek pale. Abdomen dark brown to black. Fins dusky and spotted. Scale pockets pale purple with dark rear edge. Mouth cavity and gill chamber dark; gill arch and gill rakers dusky. Peritoneum black and intestine pale.

Distribution: Scotia Sea, central South Pacific Ocean and south-east Atlantic Ocean. *B. tenuis* were caught at various depths between the surface and 2,600 m.



Distribution of *B. tenuis*

Remarks: Despite the apparent similarity in shape, *Bathylagus tenuis* is not closely related to either *B. antarcticus* or *B. gracilis*. Nevertheless, the morphometric characters of *B. tenuis* show a higher degree of resemblance to *B. antarcticus*. Regressions, against SL, of vertical measurements (depth of head, body and caudal peduncle) of both species closely follow each other, while *B. gracilis* shows a different growth pattern. The regression of peduncle length for *B. tenuis*, however, is separated from both other species thus making it a key character for identification (Gon 1987a). The situation is reversed with regard to meristic characters. *B. tenuis* is closer to *B. gracilis* in its counts of vertebrae, pyloric caeca, gill rakers and lateral scale series. In addition, a marked difference was observed in the shape of the opercle between *B. tenuis* and the other 2 species (Fig. 5). A comparison of *B. tenuis* with the data given by Cohen (1964) for *B. euryops* Goode & Bean, 1896, suggests a close relationship between these species.

Biology unknown. Attains 16.0 cm SL.

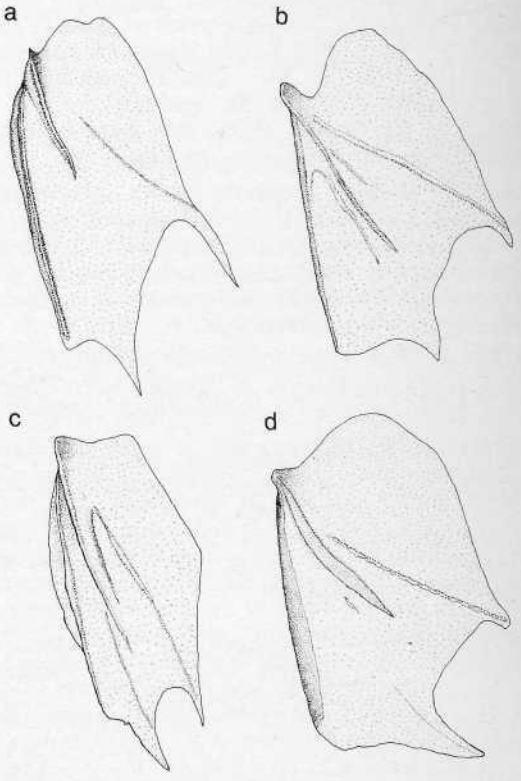


Fig. 5. Opercular bones of some *Bathylagus* species: a) *antarcticus;* b) *gracilis;* c) *tenuis;* d) *pacificus*

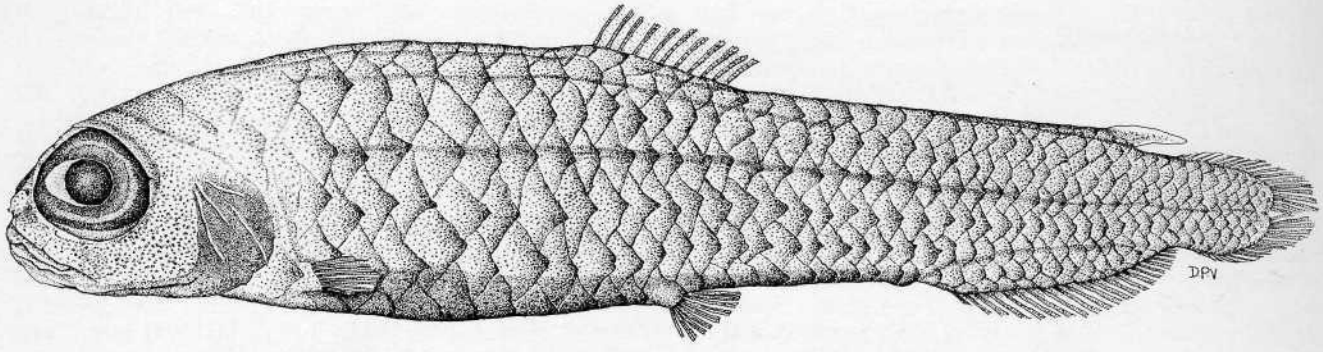


Fig. 4. *Bathylagus tenuis* ISH 377/76, 138 mm SL, female (54°07′S, 39°59′W)

Body elongate and compressed. Eye small to large. Barbel absent. Mouth large, with small teeth in both jaws; enlarged teeth may be present, usually on upper jaw, but large canines or fangs absent. Teeth present or absent on vomer, palatines pterygoids and tongue. Maxilla reaching far beyond eye. Premaxilla less than half length of toothed section of maxilla. Gill rakers well developed. Pseudobranch present or absent. Scales, when present, large, cycloid and deciduous. Pelvic fins abdominal. Pectoral fins situated low on body side. Position of dorsal, anal and pelvic fins in relation to each other variable. Anal-fin base longer than dorsal-fin base. Dorsal adipose fin present or absent, ventral one absent. SO photophores present or absent. Serial photophores discrete, in 1 or 2 lengthwise rows and 8 or more BR photophores (except *Cyclothone obscura*). OA photophores ending at or anterior to anal-fin origin. Less than 25 AC photophores. No photophores on isthmus.

Following Ahlstrom *et al.* (1984), Gonostomatidae is viewed here as containing 4 genera, *Bonapartia, Gonostoma, Margrethia* and *Cyclothone*. The former 3 genera are grouped by a specialized metamorphosis and photophore development (Ahlstrom 1974). *Cyclothone* apparently shares with these genera autapomorphies of jaws and associated muscles (Fink 1984) and the primitive type Beta photophores. Ahlstrom *et al.* (1984) hypothesized that *Cyclothone* may have lost the specialized photophore development known to occur in the first 3 genera through paedomorphosis.

About 21 species of mostly small meso- to bathypelagic (200–3,500 m during day) fishes distributed worldwide. Some species perform diel vertical migration. During metamorphosis larvae sink from the near surface to greater depths, thus forming vertical stratification by size during day hours. Some species with great abundance form sound scattering layers. Zooplankton grazers. Intrafamilial and ordinal relationships were recently discussed by Fink (1984, 1985) and Ahlstrom *et al.* (1984). Recent revisions of genera were done by Mukhacheva (1972, 1974, 1976), Kobayashi (1973) and Parin (1982). One genus represented in Southern Ocean.

Genus ***Cyclothone*** Goode & Bean, 1883

Dorsal adipose fin absent. Dorsal- and anal-fin origins opposite each other. Pelvic fin inserted in front of dorsal-fin origin. Anus at mid-distance between pelvic-fin insertion and anal-fin origin or nearer the former. Eye minute, its diameter smaller than snout length. Tongue toothless. Vomerine teeth usually present. Pseudobranch absent. SO photophores absent. Females larger than males. Photophore distribution is shown in Fig. 1.

Cyclothone is cosmopolitan from sub-Arctic to Antarctic waters. Species of this genus have progenetic tendencies (Marshall 1984). Limited diel vertical migration performed by at least 1 species (Willis & Pearcy 1982). About 12 species, of which at least 4 in our area. Recent revisions by Kobayashi (1973) and Mukhacheva (1974). Regional taxonomic treatment by Badcock (1982, 1984a) and Schafer *et al.* (1986).

Remarks: The presence of *C. microdon* in the Southern Ocean was reported by a number of past Antarctic expeditions. Considering that *Cyclothone* taxonomy was set on a firm footing only in recent years (Kobayashi 1973; Mukhacheva 1974), the inadequate descriptions provided by early Southern Ocean ichthyologists prevent verification of their identifications. In addition, *Cyclothone* spp. collected during BIOMASS still await identification to species. Consequently, it is impossible at this time to determine patterns of distribution in the Southern Ocean with certainty.

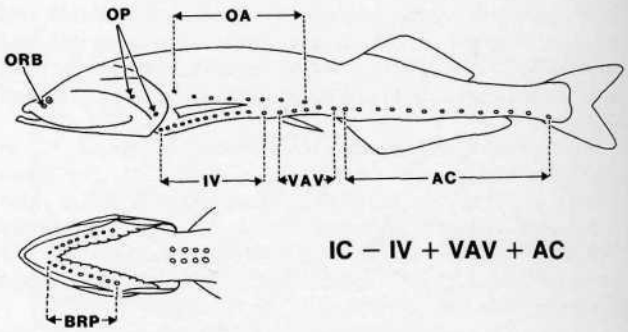


Fig. 1. Photophores of the genus *Cyclothone*. ORB—photophores associated with eye and positioned anteroventrally to orbit. OP—photophores on opercle. BRP—photophores on branchiostegal membrane. OA—complete lateral series, from behind opercle to anal-fin origin. IV—ventral series, from isthmus to pelvic-(ventral-) fin insertion. VAV—ventral series, from pelvic- (ventral-) fin insertion to anal-fin origin. AC—photophores of the ventral series from anal-fin origin to caudal-fin base. IC—complete ventral series, from isthmus to caudal-fin base.

KEY TO SPECIES

1a Gill filaments free or fused basally, forming a narrow flap, equally wide along cerato- and hypobranchials of first gill arch (Fig. 2a) 2

1b Gill filaments of hypobranchial of first gill arch fused, forming a broad flap distinctly wider than that of ceratobranchial (Fig. 2b) 3

2a Teeth on rear part of maxilla large, strongly curved forward; no smaller teeth separating large ones; pyloric caeca 3..... *C. acclinidens*

2b Teeth on posterior part of maxilla only slightly curved forward and large ones separated by smaller teeth; pyloric caeca 4 ..... *C. pallida*

3a Total GR 18–23; GR on hypobranchial of first gill arch 4–5; OA photophores 8–9 4

3b Total GR 15–18; GR on hypobranchial of first gill arch 3; OA photophores 7 ..... *C. braueri*

4a Pigment of branchiostegal membrane uniform and may be only slightly darker along rays and margins (Fig. 3a); pyloric caeca 3 (rarely 4); area between posterior end of body cavity and anal-fin origin dark ..... *C. microdon*

4b Pigment of branchiostegal membrane (relatively large spots) concentrated along rays and margins or in a wide band along middle of membrane (Fig. 3b); pyloric caeca 4; area between posterior end of body cavity and anal-fin origin pale..... *C. pseudopallida*

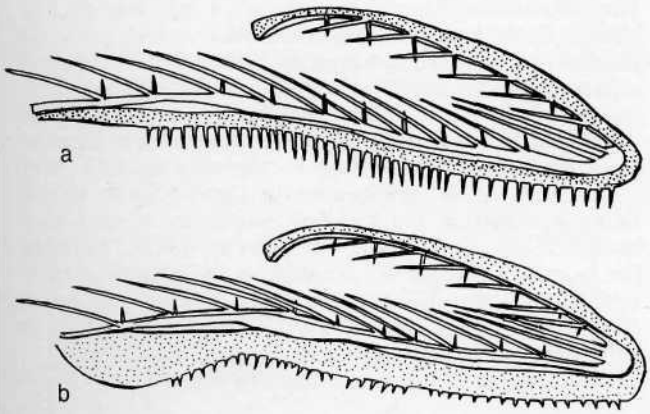


Fig. 2. Gill filaments (stippled) on first gill arch (left side) of Southern Ocean *Cyclothone*: a. *acclinidens* and *pallida*; b. *braueri, microdon* and *pseudopallida*.

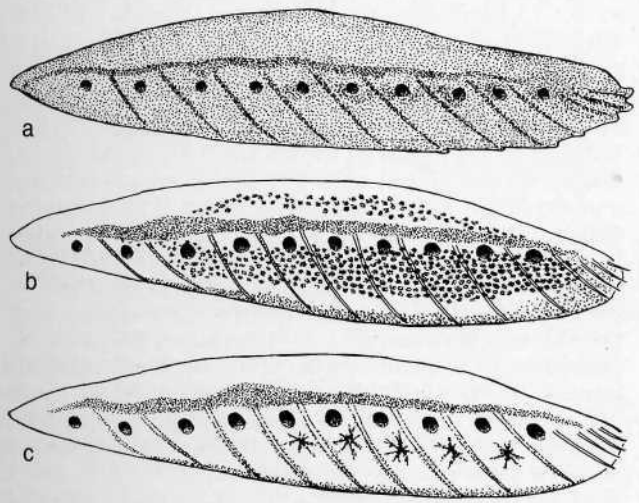


Fig. 3. Pigment pattern of the branchiostegal membrane (ventrolateral view of left side) of Southern Ocean *Cyclothone*: a. *acclinidens, microdon* and *pallida*; b. *pseudopallida*; and c. *braueri*.

Cyclothone acclinidens Garman, 1899
Fig. 5

Cyclothone acclinidens Garman, 1899: 247, pl. J, fig. 4, Gulf of Panama? Syntype: USNM 120400.

Diagnosis: D 13–15; A 18–20; P 8–10; V 5–6; GR 21–25; branchiostegal rays 13–15; vertebrae 30–32; pyloric caeca 3. Photophores: ORB 1; OP 2; BR 9–11; OA 8–9; IV 12–14; VAV 4–5; AC 14–17. Origin of dorsal and anal fins opposite each other or the former is slightly in advance. Anus at mid-distance between pelvic-fin bases and anal-fin origin or slightly closer to the former, usually between second and third VAV photophores.

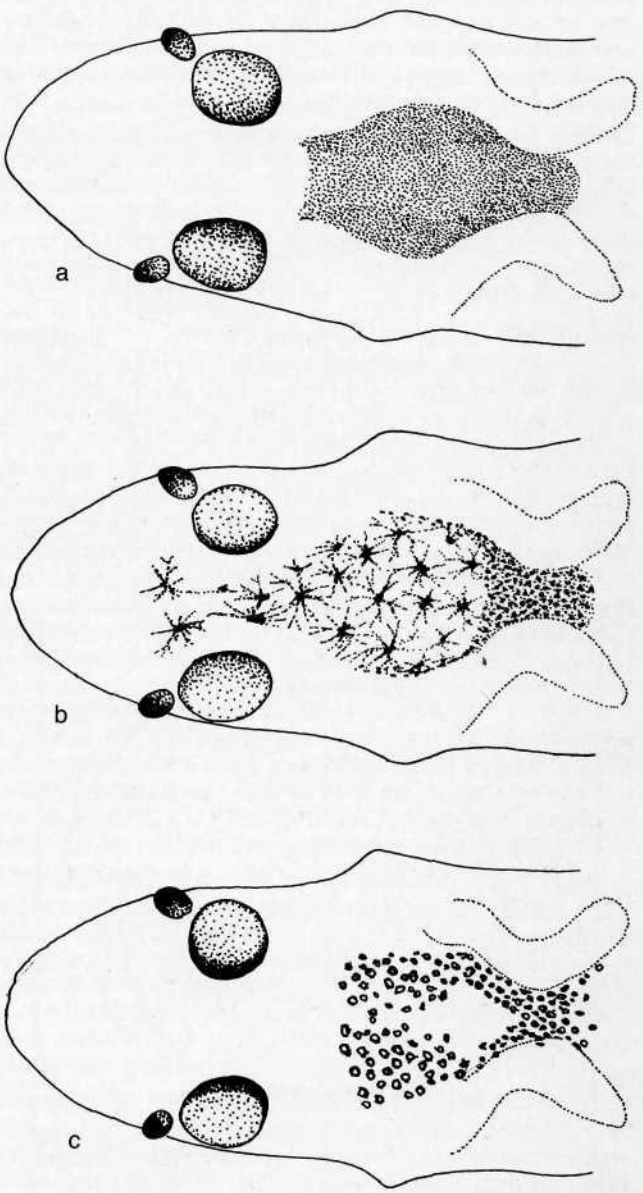


Fig. 4. Pigment pattern of the meningeal membrane (dorsal view) of Southern Ocean *Cyclothone*: a. *acclinidens, microdon* and *pallida*; b. *braueri*; and c. *pseudopallida*.

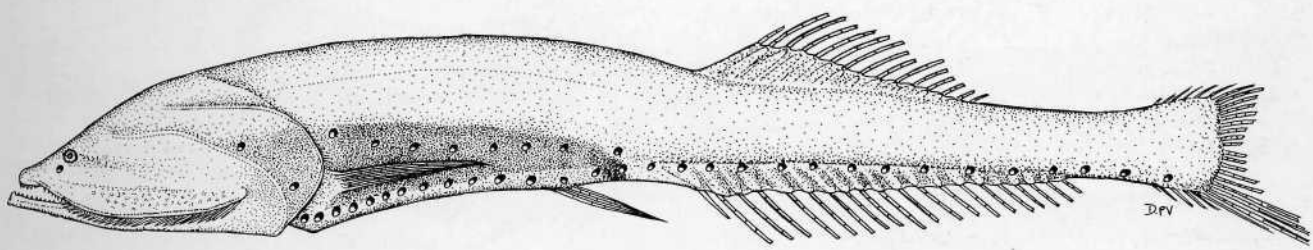
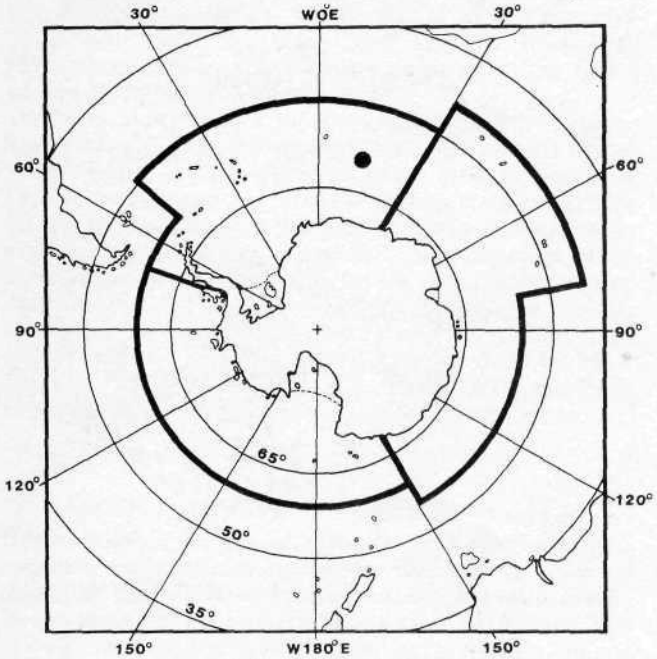


Fig. 5. *Cyclothone acclinidens* LACM 10222, 32 mm SL, Peru-Chile Trench (33°33′S, 72°45′W)

Premaxillary teeth even. Gill filaments free to base or fused basally into a narrow strip equally wide along cerato- and hypobranchial of first gill arch (Fig. 2a). No gill raker at angle of first arch. Gill rakers on hypobranchial of first arch 5–6. First OA photophore slightly elevated. Last 1 or 2 OA photophores separated from anterior ones by a larger gap and placed behind level of pelvic-fin insertion. Two AC photophores between last anal-fin ray and first procurrent caudal-fin ray. Supra- and infracaudal luminescent gland well developed. The former appearing as a thick mass of pale tissue reaching forward to rear end of dorsal-fin base.

Colour: In alcohol, light to dark brown with concentration of pigment on head, nape and abdomen. Dark, subcutaneous patches sometimes visible between anal- and dorsal-fin pterygiophores. Area between rear end of body cavity and anal-fin origin pale. Pigment of branchiostegal membrane and membrane underlying occipital area diffuse (Figs. 3c and 4a respectively).

Distribution: Tropical and subtropical in all major oceans, but may occur in reduced numbers in the temperate eastern North Atlantic Ocean. In the Southern Ocean, a single specimen was captured by the *Valdivia* Expedition (Brauer 1906) in the Atlantic Ocean sector near Bouvet Island (56°30′ S, 14°29′ E). The depth of the capture is not stated, but apparently was below 520 m (Brauer 1906). In areas north of the Southern Ocean juveniles and adults were found between 300–1,200 m (Badcock 1984; Schaefer *et al.* 1986).



Distribution of *C. acclinidens*

Remarks: In addition to the characters given in the key above, *C. acclinidens* differs from its other congeners in the Southern Ocean in having a distinct, well-developed supracaudal luminescent gland. Mukhacheva (1964) described the supracaudal gland of *C. pallida* as well-developed. However, it is not as distinct and massive as in *C. acclinidens*.

Inclusion of *C. acclinidens* in the Southern Ocean fauna is based on the *Valdivia* specimen, which I have not been able to examine. As this capture was far from the normal range of *C. acclinidens,* misidentification is possible though unlikely due to the distinct features of this species. Whether *C. acclinidens* is a resident of sub-Antarctic waters still remains to be confirmed.

Males attains 36 mm and females about 65 mm SL.

Cyclothone braueri Jespersen & Tåning, 1926
Fig. 6

Cyclothone braueri Jespersen & Tåning, 1926: 7, figs. 4, 6, 7, Mediterranean. Syntypes: ZMUC P207585-P207678.

Diagnosis: D 12–15; A 18–20; P 9–10; V 6–7; GR (5–6)+(10–12) = 15–18; branchiostegal rays 12–14; vertebrae 30–32; pyloric caeca 3. Photophores: ORB 1; OP 2; BR 8–10; OA 7; IV 12–13; VAV 4; AC 13–15. Origin of dorsal and anal fins opposite each other or anal-fin origin slightly in advance. Anus at about quarter distance between pelvic-fin base and anal-fin origin behind the former. No enlarged teeth on premaxilla. Gill filaments along hypobranchial of first arch fused basally, forming a broad flap with a convex distal margin (Fig. 2b). Three gill rakers on hypobranchial of first arch. No gill raker at angle of first arch. Photophores relatively large. First OA elevated to slightly above level of dorsal OP. Anterior pair of VAV close together, both in front of anus. One AC photophore between last anal-fin ray and first procurrent caudal-fin ray.

Colour: In alcohol, pale with star-shaped melanophores mostly on back and top of head. Pigment on branchiostegal membrane concentrated mainly along rays and on margin. Stellate melanophores frequently present between posterior branchiostegal rays (Fig. 3c). Membrane underlying occipital region with no pigment or with few distinct stellate melanophores in its anterior section (Fig. 4b). Peritoneum black and clearly shows through body wall. Area between rear end of body cavity and anal-fin origin pale.

Distribution: Tropical and subtropical Atlantic, Indian, western and eastern South Pacific oceans, and Mediterranean Sea (Mukhacheva 1974); also in the temperate North Atlantic Ocean, as far as 66°N (Badcock 1984a).

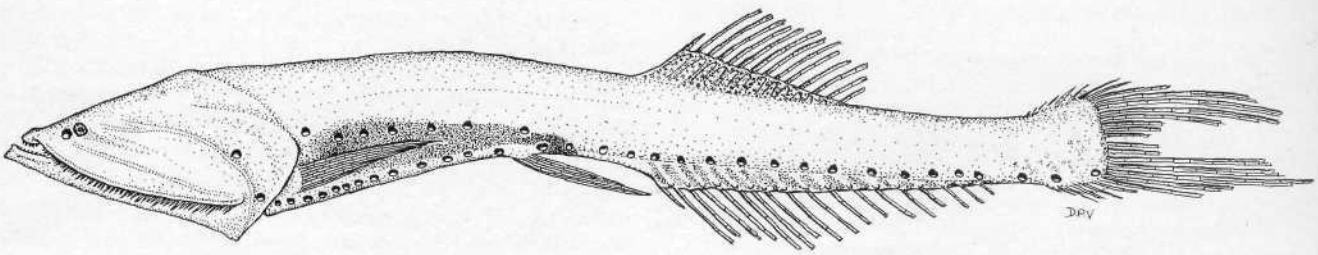
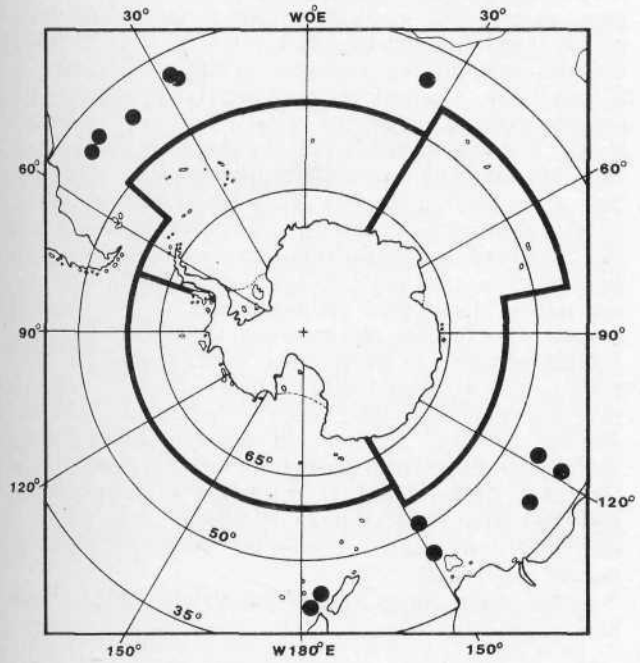


Fig. 6. *Cyclothone braueri* LACM 10198, 28.7 mm SL, Peru-Chile Trench (7°47.5′S, 81°23′W)

Not reported yet from our area, but known from sub-Antarctic water south of Australia (Miya *et al.* 1986). Vertically, adults and juveniles were collected in tows between 200–900 m (Badcock 1984a; Schaefer *et al.* 1986). Larvae and postlarvae were caught between the surface and 600 m, depending on the degree of development, with the more developed in deeper water.



Distribution of *C. braueri*

Remarks: Apart from the characters given in the key above, *Cyclothone pseudopallida* differs from *C. braueri* in having many distinct punctate melanophores on the anterior part of the membrane underlying the occipital region (Fig. 4c). The biology of *C. braueri* in sub-Antarctic water is unknown. Breeding populations near New Zealand (30°S) were investigated by Spanovskaya & Grigorash (1978). Sexual maturity was reached at 17–20 mm length. Males outnumbered females in the 15–22 mm size group and females outnumbered males in the 23–30 mm size group. In aggregations of fishes close to spawning, however, the sex ratio was nearly 1:1. Ovaries contained eggs of various sizes, the largest being 0.5 mm. The number of eggs per ovary pair was highly variable, 170–671, and positively correlated with increasing body length. In the north Atlantic Ocean (30°–60°N) Badcock (1984a) observed higher fecundity, up to 900 eggs per ovary pair and noted that fecundity increased in higher latitudes. Marshall (1984), based on the data of Badcock & Merrett (1976) concluded that *C. braueri* is semelparous and has a life span of 1 year. Feeds on small zooplankton, mostly copepods.

Males attain 26 mm and females about 38 mm SL.

Cyclothone microdon (Günther, 1878)
Fig. 7

Gonostoma microdon Günther, 1878: 187, Atlantic and Pacific (precise locality unknown). Syntypes: BMNH 1887.12.7.164–171; BMNH 1887.12.7.173–178 (another jar labelled 1887.?.?.?. is possibly 1887.12.7.172; J. Chambers pers. comm.)

Cyclothone lusca Goode & Bean, 1883: 221.

Neostoma quadrioculatum Vaillant, 1888b: 99, pl. 8, fig. 2, Gulf of Gascogne.

Diagnosis: D 12–15; A 17–20; P 8–10; V 5–6; GR (6–8)+(13–15) = 19–23; branchiostegal rays 12–15; vertebrae 31–33; pyloric caeca 3–4 (usually 3). Photophores: ORB 1; OP 2; BR 9–10; OA 8–9; IV 12–14; VAV 4–5; AC 13–15. Origin of dorsal and anal fins opposite each other, or dorsal-fin origin slightly in advance. Anus closer to pelvic-fin base than to anal-fin origin, usually between second and third VAV photophores. Premaxillary teeth uneven, usually in single row, but sometimes in 2 irregular rows. Gill filaments along hypobranchial of first arch fused basally, forming a broad flap with a convex distal margin (Fig. 2b). Gill rakers on hypobranchial of first arch 4–5. No gill raker at angle of first arch. Anterior 2 or 3 OA photophores elevated, first one highest but below level of dorsal OP photophore. Last 1 or 2 OA photophores separated from anterior OA photophores by a large gap and situated behind level of pelvic-fin insertion. VAV photophores more or less evenly spaced. One, rarely 2, AC photophores between last anal-fin ray and first procurrent caudal-fin ray.

Colour: In alcohol, dark brown to nearly black. Pigment on branchiostegal membrane evenly spread so that there are no distinctly pale areas (Fig. 3a). Membrane underlying occipital region evenly pigmented, sometimes with a few ill-defined darker spots (Fig. 4a). Peritoneum dark and does not normally show through body wall. Stomach dark and intestine pale. Area between rear end of body cavity and anal-fin origin dark.

Distribution: Atlantic Ocean and southern parts of Indian and Pacific oceans (Mukhacheva 1964, 1974). Probably circum-Antarctic between the Antarctic Polar Front and the Antarctic continental shelf (see Remarks

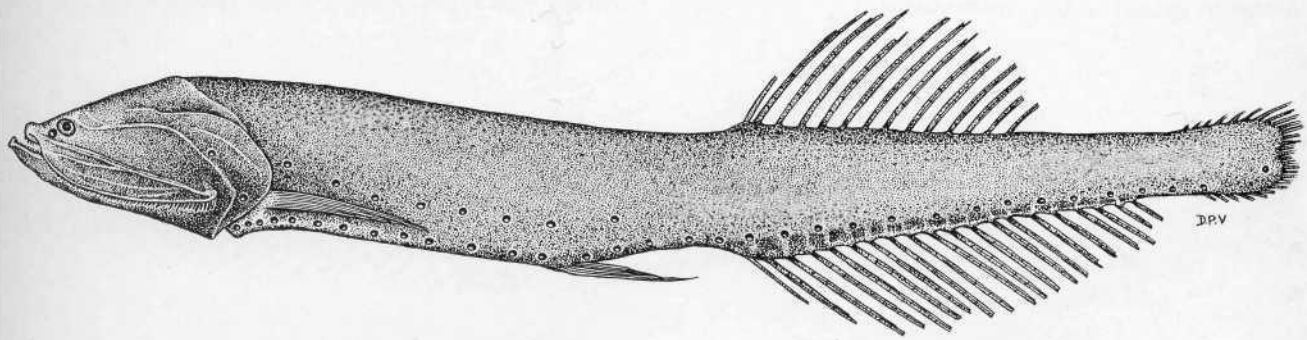
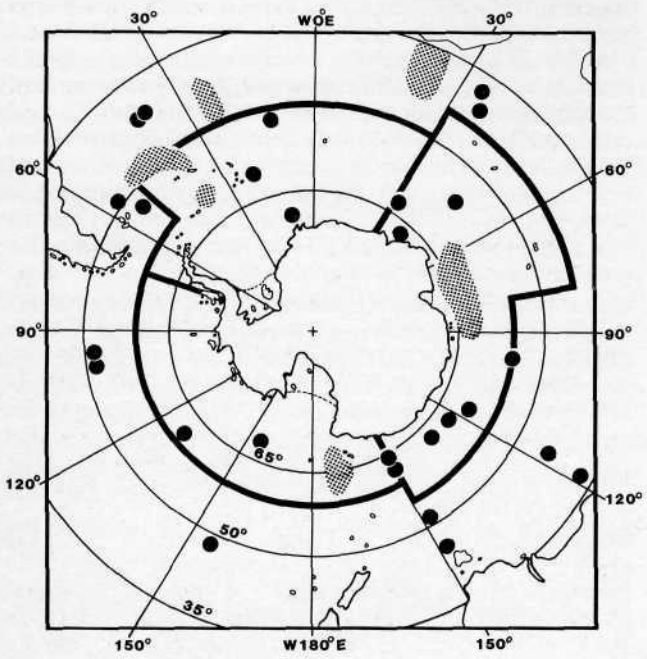


Fig. 7. *Cyclothone microdon* ADH S85/293–297, 52 mm SL (63°00.8′S, 67°57.4′E)



Distribution of *C. microdon*

below). Vertically, larvae near surface, postlarvae at 400–800 m with depth increasing with size, and juveniles and adults at 500–3,000 m, but the range is likely to vary geographically.

Remarks: A number of characters of Southern Ocean *C. microdon* showed variation not reported for this species in other areas (Mukhacheva 1964, 1974; Badcock 1982, 1984a; Schaefer *et al.* 1986). These include pyloric caeca (6.6% with 4 vs 3 in other areas), and counts of dorsal-fin rays (5% with 12 vs 13–15 in other areas) and pectoral-fin rays (6.5% with 8 vs 9–10 in other areas). The normal position of the anus is slightly in front of the third VAV photophore and the genital pore is usually close behind this photophore. In some specimens examined during this study, both openings were found slightly forward so that the anus was close behind the second VAV photophore and the genital opening was in front of the third VAV photophore. Variation in the position of the anus and genital opening has also been found in *C. pallida* from the western North Pacific Ocean (Kawaguchi 1971). Thus, the use of the number of VAV photophores anterior to the genital pores as a diagnostic character in species identification (Badcock 1982) should be exercised with caution. One specimen had distinct punctate pigment on the branchiostegal membrane and the membrane underlying the occipital region. However, the pigment spots on the branchiostegal membrane were evenly spread so that no distinct unpigmented areas were evident on the membrane. In all its other characters this specimen agreed with *C. microdon*.

Cyclothone microdon reaches maturity at about 30–35 mm SL. In comparing populations between 35°–65°S in the western Pacific Ocean, Spanovskaya & Lapin (1981) found that maximum size and mean length of sampled fishes increased with latitude. At 35°S most of the sample was in the range of 26–42 mm SL and at 65°S most of the specimens were 48–60 mm SL. Most interesting was the observation that the fishes of the latter sample had underdeveloped gonads which could not be sexed. Spanovskaya & Lapin (1981) hypothesized that the high Antarctic latitudes form a "sterile zone" for *C. microdon*. Underdeveloped gonads apparently were not observed in specimens collected at 55°S or farther north. The implication is that the Antarctic Polar Front may be acting as a reproductive barrier for *C. microdon*. The material used in this study (Indian Ocean sector only) agrees with the findings of Spanovskaya & Lapin (1981) regarding length frequency distribution. It does not, however, support the idea of a sterile zone. In specimens larger than 45 mm (most of the sample) gonads were mature and enlarged, though not ripe, and no difficulties were experienced in sexing the fish. The state of gonad development (stages III & V) suggests that spawning may take place at the end of summer-autumn months. Protandrous sex reversal has been observed in fishes from the eastern North Atlantic Ocean (Badcock 1984a, 1986). *C. microdon* is the most common species of *Cyclothone* in the Indian Ocean sector of the Southern Ocean. Feeds on small zooplankton, mostly copepods.

Males attain about 50 mm and females about 72 mm SL.

Cyclothone pallida Brauer, 1902
Fig. 8

Cyclothone pallida Brauer, 1902: 281, Atlantic and Indian oceans. Holotype: probably in ZMB; this species is based on a single 5 cm SL specimen of the *Valdivia* Expedition, station 207; a 47 mm SL specimen from station 207 is present at ZMB but not registered as type (H.-J. Paepke, pers. comm.)

Cyclothone canina Gilbert, 1905: 604, pl. 71, fig. 2, vicinity of Kauai, Hawaiian Islands.

Diagnosis: D 12–15; A 16–19; P 9–11; V 6–7; GR 22–25; branchiostegal rays 13–15; vertebrae 31–33; pyloric caeca 4. Photophores: ORB 1; OP 2; BR 9–11; OA 8–9; IV 13; VAV 4–5; AC 14–15. Origin of dorsal and anal fins opposite each other or the former is slightly in advance. Anus closer to pelvic-fin base than to anal-fin origin, usually between second and third VAV photophores. Premaxillary teeth uneven, with at least 1 tooth, the fourth, much larger. Gill filaments fused basally into a narrow strip of equal width along entire length of cerato- and hypobranchial of first gill arch (Fig. 3a). Gill

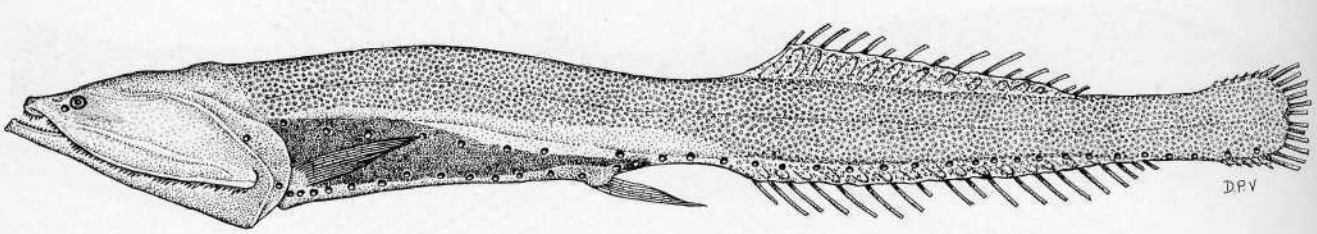
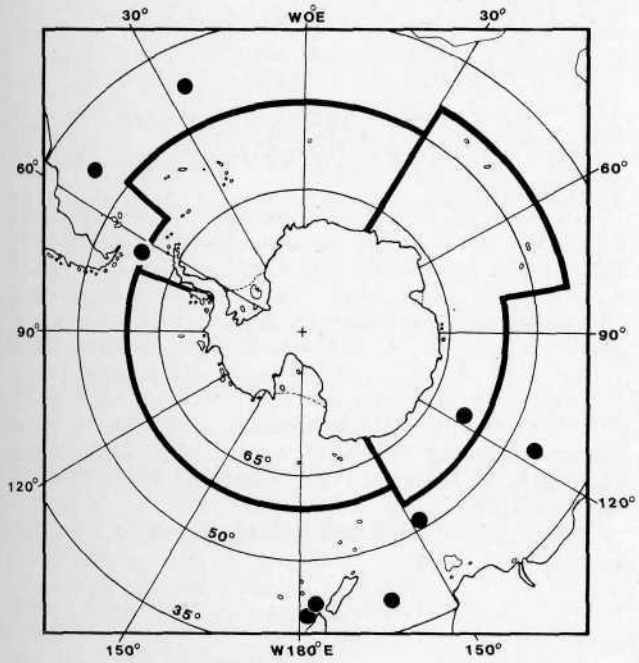


Fig. 8. *Cyclothone pallida* LACM 10359–2, 66.6 mm SL, Drake Passage

rakers on hypobranchial of first arch 4–5. No gill raker at angle of first arch. First 2 OA photophores slightly elevated. Posterior 1 or 2 OA photophores separated from anterior OA photophores by a large gap and situated behind level of pelvic-fin insertion. Two, rarely 3, AC photophores between last anal-fin ray and first procurrent caudal-fin ray.

Colour: In alcohol, pale to dark brown, covered with small, black spots mostly on head and sides of body; pale area present anterior to anal-fin origin. Dorsal- and anal-fin rays usually dark, but sometimes lightly speckled. Pigment on branchiostegal membrane diffuse, without distinctly pale areas (Fig. 3a). Membrane underlying occipital region evenly pigmented (Fig. 4a), often extending to posterior margin of eye or slightly in front of it, to pineal body. Internasal area dark, though usually skin absent due to net damage. Peritoneum dark, sometimes visible through ventral body wall. Area between rear end of body cavity and anal-fin origin pale or with light pigmentation.

Distribution: Tropical to temperate waters of 3 major oceans. Southern Ocean captures in the Indian Ocean sector south of Australia (Miya *et al.* 1986). Vertically, juveniles and adults were collected in tows between 400–1,300 m, but with evident geographical variation in depth range (Badcock & Merret 1977; Maynard 1982; Miya & Nemoto 1987). Occurrence in the Southern Ocean, south of the Antarctic Polar Front, is probably incidental.



Distribution of *C. pallida*

Remarks: Variation in the position of the anus and genital pore was observed by Kawaguchi (1971) and Badcock (1982). The most common condition is with the anus just behind level of second VAV photophore and the genital pore immediately in front of third VAV photophore. Occasionally, the anus is moved forward, and has one VAV photophore anteriorly, or backward closer to the third VAV photophore. In the latter case, the genital pore has 3 VAV photophores in front of it. *C. pallida* closely resembles *C. microdon* in colour and size. In addition to the characters given in the key, *C. pallida* differs from *C. microdon* in having a longer caudal peduncle (11.2–15.4 vs 10.8–12.0% SL), relatively larger photohpores (Mukhacheva 1964), and the pale area in front of anal-fin origin. Another, closely related species is the tropical *C. parapallida* Badcock, 1982, which has fewer gill rakers (21, rarely 22–23); no pigment spots on internasal area; unpigmented dorsal- and anal-fin rays; and meningeal pigment that does not extend to the posterior margin of the eye (see Badcock 1982 for full discussion of the differences). See also remarks for *C. pseudopallida*.

Biology in the Southern Ocean unknown. In Japanese waters, *C. pallida* reaches sexual maturity at 3–4 years and is probably iteroparous (Miya & Nemoto 1987). Females mature at 40–45 mm SL and males at 30–35 mm SL. Fecundity apparently varies geographically. Egg counts ranged between 1,840–2,797 in fishes collected in Japanese waters (Miya & Nemoto 1987), whereas in fishes from the Hawaiian Islands it was 1,251–1,454 (Maynard 1982).

Males attain 48 mm and females about 75 mm SL.

Cyclothone pseudopallida Mukhacheva, 1964
Fig. 9

Cyclothone pseudopallida Mukhacheva, 1964: 104, fig. 7a (38°34′N, 144°18′E). Holotype: ZIN 37444.

Diagnosis: D 13–14; A 18–20; P 9–10; V 6; GR (5–6)+(12–13) = 17–19; branchiostegal rays 12–14; vertebrae 30–33; pyloric caeca 4. Photophores: ORB 1; OP 2; BR 9–10; OA 8; IV 13; VAV 5; AC 14–16. Origin of dorsal and anal fins opposite each other or the latter slightly in advance. Anus closer to pelvic-fin base than to anal-fin origin, usually between second and third VAV photophores. Premaxillary teeth uneven. Gill filaments fused into a broad flap with a convex distal margin along hypobranchial of first gill arch (Fig. 2b). No gill raker at angle of first arch. Four gill rakers on hypobranchial of first arch. First OA photophore elevated. Last OA photophore separated from anterior ones by a gap somewhat larger than space between anterior photophores and placed behind level of pelvic-fin insertion.

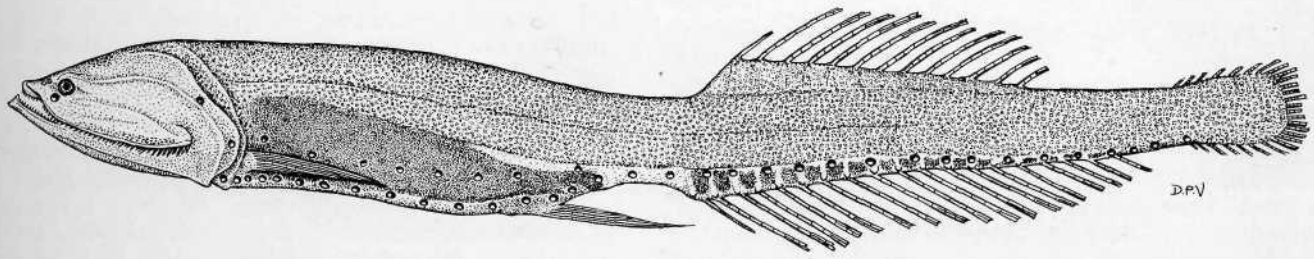
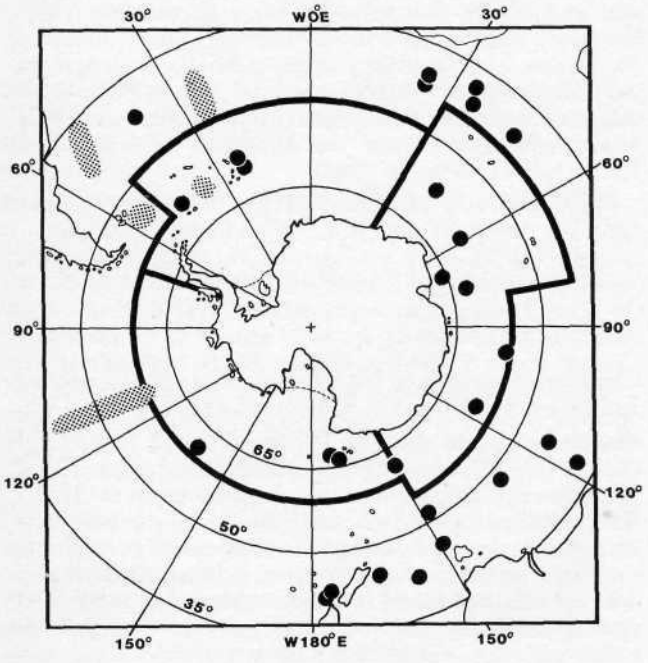


Fig. 9. *Cyclothone pseudopallida* ADH ex-S85/0013–0027, 42 mm SL (66°00.2′S, 67°58.1′E)

Two, rarely 3, AC photophores between last anal-fin ray and first procurrent caudal-fin ray.

Colour: In alcohol, ground colour pale. Body covered with relatively large and well defined pigment spots (not necessarily round), except for a narrow, continuous pale zone from above middle of body cavity to lower caudal-fin base. Head mostly pale. Peritoneum dark and showing through wall of body cavity. Area between rear end of body cavity and anal-fin origin unpigmented. Dark subcutaneous patches between anal-fin pterygiophores. These patches may become larger posteriorly, merging with each other under rear anal-fin rays and continue to anterior procurrent caudal-fin rays. Branchiostegal membrane with punctate dark spots except for an area between anterior-most rays and above (proximal to) BR photophores (Fig. 3b). Posterior, narrow part of membrane underlying occipital area usually with diffuse pigment, but sometimes with small, distinct spots. Anterior, v-shaped area of this membrane with larger, punctate pigment spots (Fig. 4c).

Distribution: Tropical to temperate in all 3 major oceans. In the Southern Ocean, between the Antarctic Polar Front and the Antarctic continental shelf of the Indian Ocean sector, near Balleny Islands, and the Scotia Sea. Vertically, adults in our area were captured in tows between 400–1,029 m. In other oceans, juveniles and adults were found at 300–900 m (Badcock 1984a; Schaefer *et al.* 1986). The 6 records south of Australia (open circles), refer to a closely related undescribed species, *C. sumiae* (Kobayashi 1973).



Distribution of *C. pseudopallida*

Remarks: Although the distance between the first and second VAV photophores is smaller than the distance between the second and third ones, it is nonetheless more than 60% of the latter. Consequently, the position of the anus, though clearly in the anterior half of the distance between pelvic-fin insertion and anal-fin origin, is not immediately behind the pelvic-fin bases (Badcock 1982). In fact, it is only slightly anterior to the position of the anus in *C. pallida* and *C. microdon*. Occasionally, the anus may be found just in front of the second VAV photophore, thus bringing the genital pore forward, to immediately behind second VAV photophore. However, the number of VAV photophores anterior to the genital pore is always 2. The most noticeable difference between the Antarctic material (Indian sector only) and descriptions from the Atlantic Ocean (Badcock 1982, 1984a) and South Africa (Schaefer *et al.* 1986) is in the pigmentation of the branchiostegal membrane which was restricted to the section between posteriormost rays in the non-Antarctic fishes. In addition, Atlantic and South African fishes had a smaller range of AC photophores (14–15) and one less AC photophore (1–2) between last anal-fin ray and first procurrent caudal-fin ray (Badcock 1984a; Schaefer *et al.* 1986). The photophores of *C. pseudopallida* are relatively larger than those of *C. pallida* and *C. microdon*, but smaller than *C. braueri* (Mukhacheva 1964). As I have not examined specimens of *C. sumiae* (Kobayashi 1973), it is possible that the Antarctic material mentioned above will prove to be this species.

The biology of *C. pseudopallida* in the Southern Ocean is unknown. The Antarctic specimens used in this study were individuals found within large catches of *C. microdon*. The fishes were collected in summer (January), they were sexually mature, with ovaries containing ripe eggs. A 42.0 mm SL female collected at 66 °S, 67 °58′ E had about 380 nearly ripe yellowish eggs. The mean egg diameter was 0.35 mm (in preservative). In other areas, *C. pseudopallida* was found to be iteroparous, releasing 300–1,500 eggs in a single spawning (Badcock & Merrett 1976; Maynard 1982; Miya & Nemoto 1986).

Males attain 43 mm and females 58 mm SL.

The family Paralepididae includes 2 subfamilies: Lestidiinae and Paralepidinae. Only species of the latter group have been reported from CCAMLR area. Species of the subfamily Paralepidinae are distinguished in having cycloid scales on the head and the body.

PARALEPIDINAE

Body elongate and slender, subcylindrical to laterally compressed. Unpaired fins without spines; 1 short dorsal fin, 8–11 rays, pelvic-fin rays I, 8, both set behind midpoint of body; anal-fin rays 20–35, its origin distinctly behind dorsal fin; pectoral-fin rays I,10–16, set low on body; principal caudal-fin rays 9+10; a dorsal adipose fin always present above last rays of anal fin. Branchiostegal rays 8. Vertebrae 60–89. Snout pointed; mouth terminal, the lower jaw projecting, with a non-ossified process. Two nostrils. Alternating fixed and depressible fang-like teeth on lower jaw, palatines and ectopterygoid (roof of mouth); premaxillary with 3–5 fangs at tip followed by small saw-like canines. Gill rakers reduced to teeth or spines in multiple series on a bony shield. Scales cycloid and easily shed. No light organs in Antarctic species. No swim-bladder. Hermaphroditic.

Four genera and 9 species of medium-sized fishes, ranging from 20 cm to over 50 cm SL. Three genera and 4 species in our area. Meso- to bathypelagic, swift swimming predators. No commercial importance. Recent taxonomic revisions by Rofen (1966a) and Post (1987). Regional treatment by Post (1985).

KEY TO GENERA

1a A 25–33 (rarely 24 in *N. annulata*); hind tip of maxilla below a vertical from nostrils; maximum size about 40 cm SL 2

1b A 20–24 (one *M. prionosa* has 25); hind tip of maxilla distinctly behind a vertical from nostrils; maximum size about 50 cm SL ..... *Magnisudis*

2a V in front of a vertical from first D ray; rim of opercle deeply notched between ends of thin, finger-like bony filaments (Fig. 1a) ..... *Notolepis*

2b V behind a vertical from last D ray; rim of opercle between ends of bony filaments slightly irregular but not notched (Fig. 1b) ..... *Arctozenus*

Genus *Arctozenus* Gill, 1864

Origin of pelvic fins distinctly behind a vertical from first dorsal-fin ray, usually below or behind last dorsal-fin ray. Base of adipose fin short, not longer than height of caudal peduncle. Lateral-line scales distinct, ending above posterior anal-fin rays. Posterior margin of operculum smooth or irregular (Fig. 1b). Upper jaw reaches to below nostrils. Monotypic.

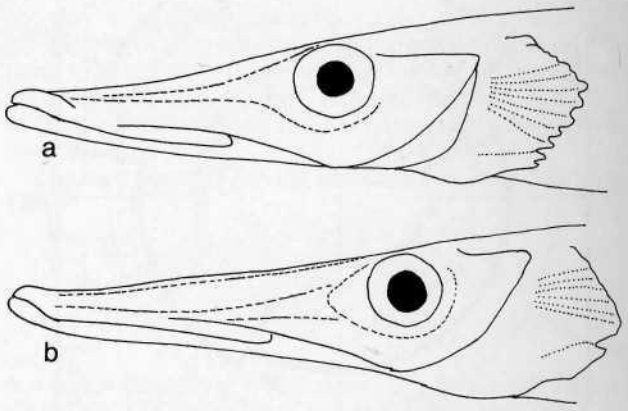


Fig. 1. The structure of the opercular posterior margin of (a) *N. coatsi*, and (b) *A. risso*.

Arctozenus risso (Bonaparte, 1840)
Fig. 2

Paralepis Risso Bonaparte, 1840: punt. (152) fasc. XXIX, Mediterranean. Holotype: Specimen lost; species based on description of Cuvier in Cuvier & Valenciennes (1829: 357; *Paralepis coregonoide*).

Diagnosis: Based on specimens taken south of 40°S. D 9–10; A 28–35; P I,10–11; GR 29–42; LL 59–67; vertebrae 80–83. Body depth 5.9–7.7%, head length 21.8–27.5%, and eye diameter 2.9–4.9%SL; head grows isometrically.

Colour: In life when fully scaled, generally silvery, but more greyish dorsally, lighter ventrally. Small, distinct black spots scattered along rear part of body. A black area at base of anterior anal-fin rays. Young specimens with at least 7 peritoneal sections, confluent in larger adolescents.

Distribution: World-wide from the Arctic to the Antarctic; most abundant in temperate waters. Probably pseudoceanic, spawning at continental slopes and on oceanic banks from northern through tropical to southern temperate waters. Records from the Southern Ocean probably refer to expatriated (i.e. sterile) specimens, at the southern margin of the geographical range of this species.

Remarks: Morphological features highly variable, being correlated to the water temperature in the spawning area (Post 1968). Range of vertebrae worldwide 75–85.

Biology unknown. Attains about 30 cm SL.

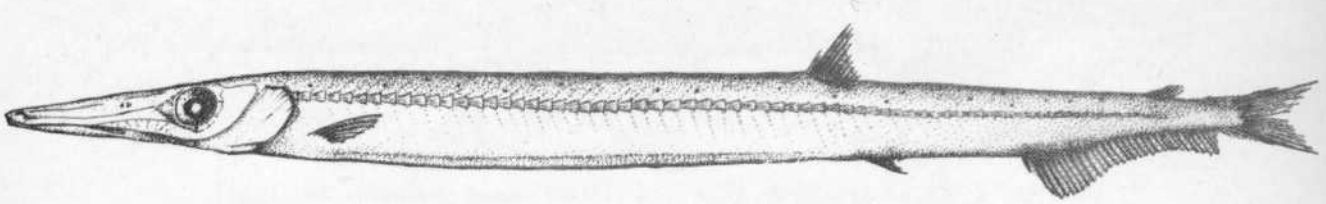
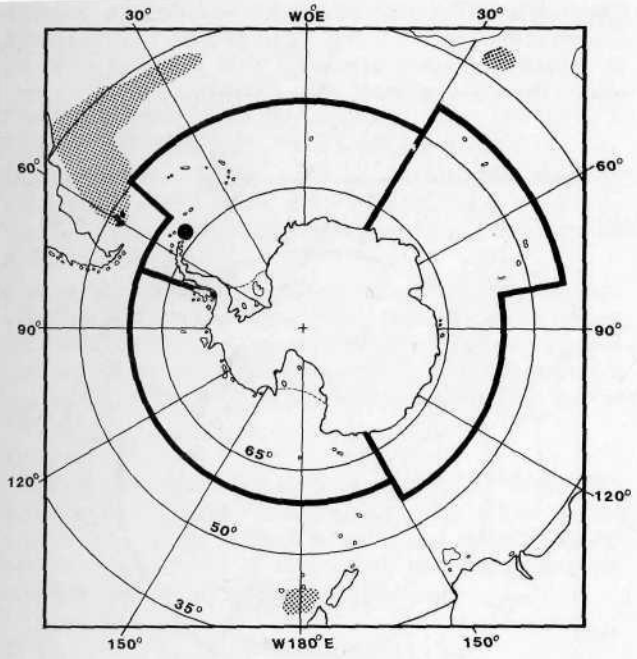


Fig. 2. *Arctozenus risso* ISH uncatalogued, 22 cm SL, Strait of Denmark



Distribution of *A. risso*

Genus ***Magnisudis*** Harry, 1953

Rather large and compact fishes. Body height about 10–13% and head length about 25% SL. Upper jaw extending far beyond nostrils, ending slightly before eye; anal fin far back on body, with 21–24 rays. Pectoral-fin rays I, 13–16; origin of pelvic fins below or slightly behind first dorsal-fin ray. Lateral line distinct, ending above posterior part of anal fin, visible part of scales higher than long on anterior part of body. Vertebrae 59–73. Three species, 1 in our area. Expatriated (i.e. sterile) specimens of *M. atlantica* may occasionally enter into CCAMLR area.

KEY TO SPECIES

1a Vertebrae 59–61; 4 peritoneal sections in juveniles (tropical Indian and Pacific oceans) ..... *M. indica*
1b Vertebrae 63–73; 3 peritoneal sections in juveniles 2
2a Vertebrae 63–67 (mainly Northern Hemisphere).. ....*M. atlantica*
2b Vertebrae 68–73 .....*M. prionosa*

Magnisudis prionosa (Rofen, 1963)

Fig. 3

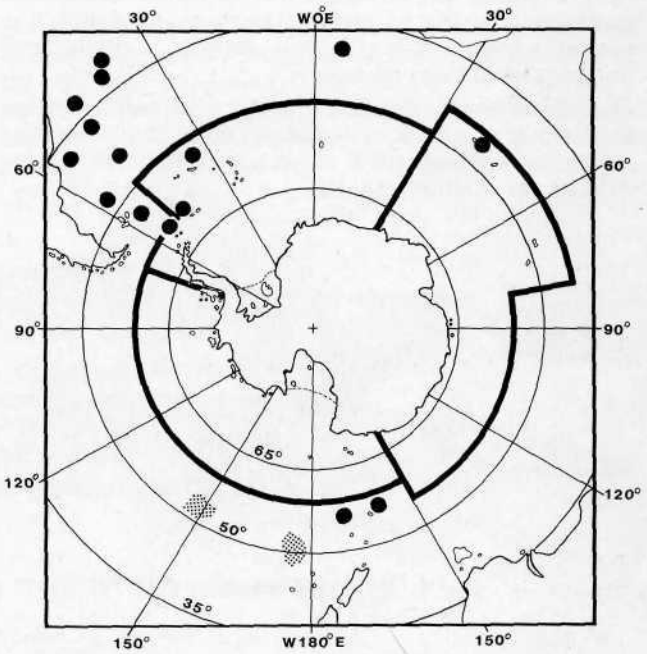
Paralepis atlantica prionosa Rofen, 1963: 1, Antarctica (from stomach of whale). Holotype: SU 55091.

Diagnosis: D 9–11; A 21–25 (usually 22–24); P I, 14–16; GR 30–42, highly variable and depending on age; LSS (above lateral line) 57–65; vertebrae 68–73 (urostyle excluded). Body depth about 9.8–12.5%, head length 21.1–32.5%, and eye diameter 3.3–5.9%SL, both showing allometric growth.

Colour: In life, silvery when fully scaled, but usually scales lost except for lateral line scales; dorsally brown to grey with a violet tinge, ventrally light; fins greyish to black. Juveniles light with black peritoneum shining through the transparent belly.

Distribution: Southern Hemisphere. Not recorded from the Indian Ocean sector, but Gon & Klages (1988) reported otoliths from stomachs of king penguins at the Prince Edward Islands. Probably circumglobal from about 20°S to Antarctica; spawning area between 20°S and 30°S. Southernmost record near to the ice border in the Atlantic Ocean sector, probably expatriated (sterile) specimens. Vertically, juveniles from near surface to about 200 m and adults down to 1,000 m, but mainly between 300–800 m.

Remarks: Biology unknown. Attains over 50 cm SL.



Distribution of *M. prionosa*

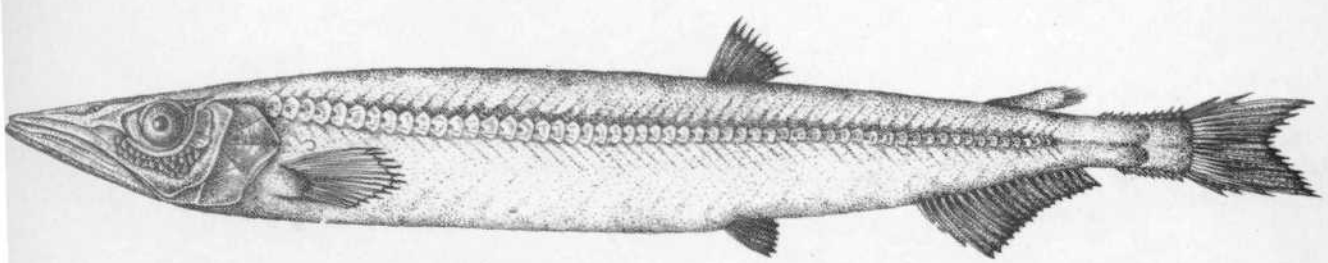


Fig. 3. *Magnisudis prionosa*? ISH 14/72, 41 cm SL, locality unknown

Genus *Notolepis* Dollo, 1908

Origin of pelvic fins distinctly in front of a vertical from first dorsal-fin ray. Base of adipose fin long, at least twice the height of caudal peduncle. Posterior margin of opercle deeply notched, forming a fan-like structure (Fig. 1a). Upper jaw reaches to below nostrils.

KEY TO SPECIES

1a LL ending above middle of A; LL scales inconspicuous, without dorsal and ventral extensions; gill chamber black ... . *N. coatsi*

1b LL ending at base of C; LL scales with long dorsal and ventral extensions; gill chamber pale..... *N. annulata*

Notolepis annulata Post, 1978

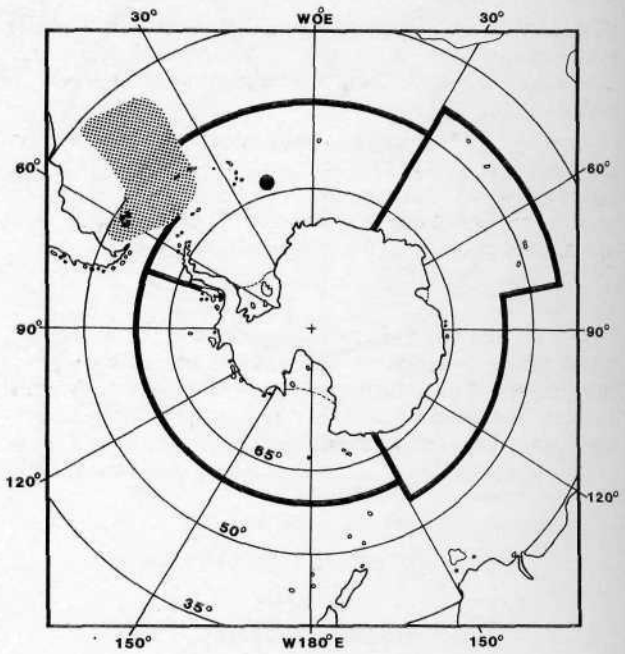
Fig. 4

Notolepis annulata Post, 1978: 10, fig. 2 (50°47′ S 50°01′ W). Holotype: ISH 779/76.

Diagnosis: D 8–10; A 23–28; P I,9–10; GR only in young specimens, adults have none; LL 75–86; vertebrae 74–83. Lateral line conspicuously modified: dorsal and ventral extensions of each scale reach to dorsal and ventral midline of body, thus forming a pattern of transverse striations on body.

Colour: Brownish in alcohol and greyish in life, with a continuous sequence of light and dark stripes. Young specimens yellowish with the black peritoneum shining through the abdominal wall.

Distribution: Known only from the western Atlantic Ocean, between 37°S and 72°S; probably circumglobal in Antarctic waters. Juveniles were captured at 45 m; adults from 550 to more than 2,000 m.



Distribution of *N. annulata*

Remarks: The dorsoventral extension of the lateral-line scales of *N. annulata* is a unique feature within the family. It has been interpreted as a special adaptation to detect fishes in krill swarms (Post 1978). *N. annulata* is polyphagous, feeding on krill and fishes.

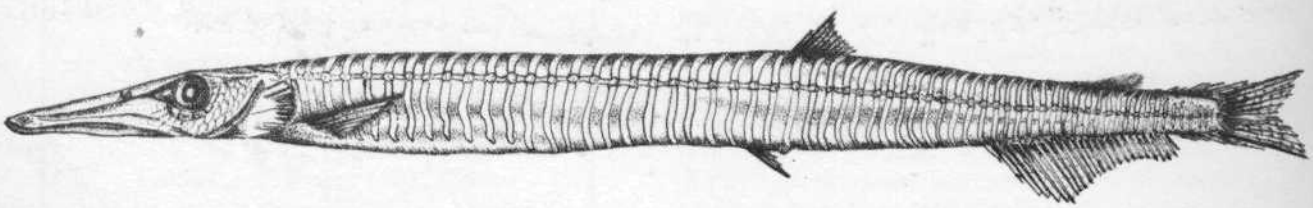


Fig. 4. *Notolepis annulata* ISH 793/76, 25 cm SL (42°57.9′S, 39°53.2′W) (from Post 1978)

Notolepis coatsi Dollo, 1908
Fig. 5

Notolepis coatsi Dollo, 1908: 60 (60°03′42″S 44°48′33″W). Holotype: NSMZ 1921.143.0331.

Diagnosis: D 8–10; A 26–29; P I,8–10; GR only in young specimens, adults have none; LL 65–69; vertebrae 86–89. Lateral line ending above middle of anal fin, its scales almost cryptic.

COLOUR: In alcohol, pale yellow except for some brownish to blackish areas at tip of snout around nostrils and at the bases of fins (skin usually missing). These dark areas and the totally black gill chamber, indicate that adults are heavily pigmented in life but lost their skin in the fishing gear.

Otoliths

DIAGNOSTIC FEATURES: The oval to rectangular shape, the fused cristae anterior to the cauda, the raised dorsal margin, the down turned antero- and posteroventral corners, the absence of the ostium and the prominent cauda and posterior colliculum.

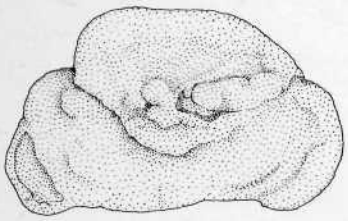
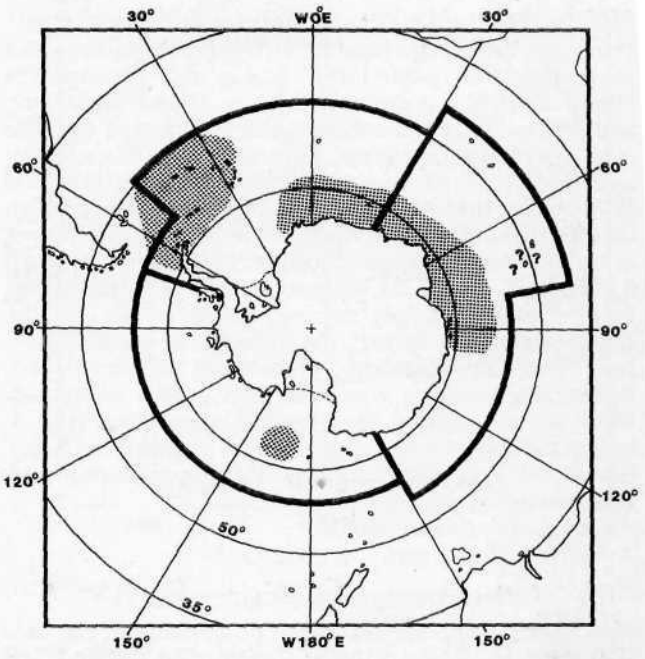


Fig. 6. Representative otolith of *N. coatsi*; fish length 26 cm SL; scale bar 1 mm

Distribution: Probably circumglobal in Antarctic pelagic waters. Vertically, from surface (holotype) to more than 2,000 m.



Distribution of *N. coatsi*

Remarks: *Notolepis coatsi* seems to feed exclusively on krill as no other prey items were found in the stomachs of the material examined (ISH fishes). Its distribution pattern is therefore likely to follow that of the krill.

Attains at least 38 cm SL.

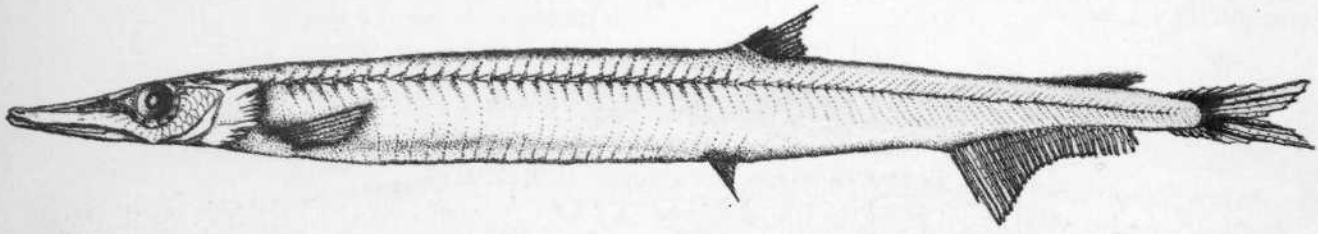


Fig. 5. *Notolepis coatsi* ISH 392/76, 38 cm SL (54°12′ S, 40°02′ W) (from Post 1978)

Body greatly elongated, compressed anteriorly (body depth just behind the head about 4 times its width), oval in cross-section posteriorly. Scales and photophores absent. Lateral line inconspicuous or absent. Head long and compressed (interorbital width less than or equal to orbit diameter). Jaws large, more than 10% SL; a row of enormous knife-like teeth on each palatine; teeth on jaws smaller than palatine teeth. Nostrils confluent, high on snout, about an orbit diameter in front of eye. Rayed dorsal fin absent; adipose dorsal fin well developed. Anal fin far back, under the adipose fin and near the caudal fin. Pelvic fins slightly behind middle of SL. No fin spines. Caudal fin forked, the lobes about equal. Vertebrae 78–83; epipleural and pleural ribs well-developed; intermuscular bones numerous and greatly elongated. Swim-bladder absent; skeleton poorly ossified. Gills 4; no gill rakers or teeth on gill arches; pseudobranch well developed. Branchiostegal rays 7, the membranes separate and not joined to isthmus.

A single genus and species.

Genus *Anotopterus* Zugmayer, 1911

Four nominal species have been described, but the data presented by Rofen (1966), Templeman (1970a) and Rembiszewski (1981) indicate a single, world-wide species.

Anotopterus pharao Zugmayer, 1911
Fig. 1

Anotopterus pharao Zugmayer, 1911: 13, off Portugal, Gettysburg Seamount (36°54′30″ N, 11°49′ W). Holotype: MOM 911154.

Eugnathosaurus vorax Regan, 1913: 234, fig. 1, off Coats Land (71°22′ S, 16°34′ W); head only, taken in a bottom trawl.

Anotopterus antarcticus Nybelin, 1946: 3, figs. 1–3, taken from the stomach of a whale caught in the Weddell Sea (62°S, 38°W).

Anotopterus arcticus Nybelin, 1946: 8, fig. 4, based on a head found in the stomach of a halibut, *Hippoglossus hippoglossus*, caught off the west coast of Greenland (64°25′ N, 53°30′ W).

Diagnosis: P 12–15; V 7–10; A 13–16; vertebrae 78–83. Greatest body depth 14.0–25.0 and head length 4.0–5.0 in SL. Eye diameter 5.6–7.3% HL. Two low dermal keels at base of caudal fin, not extending forward to below adipose fin.

Otoliths

DIAGNOSTIC FEATURES: The square to near discoid shape, the entire margin and the homomorph and prominent colliculi.

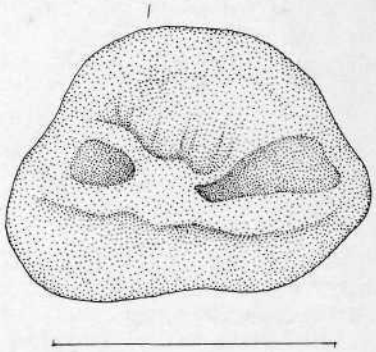


Fig. 2. Representative otolith of *A. pharao*; fish length unknown; scale bar = 1 mm.

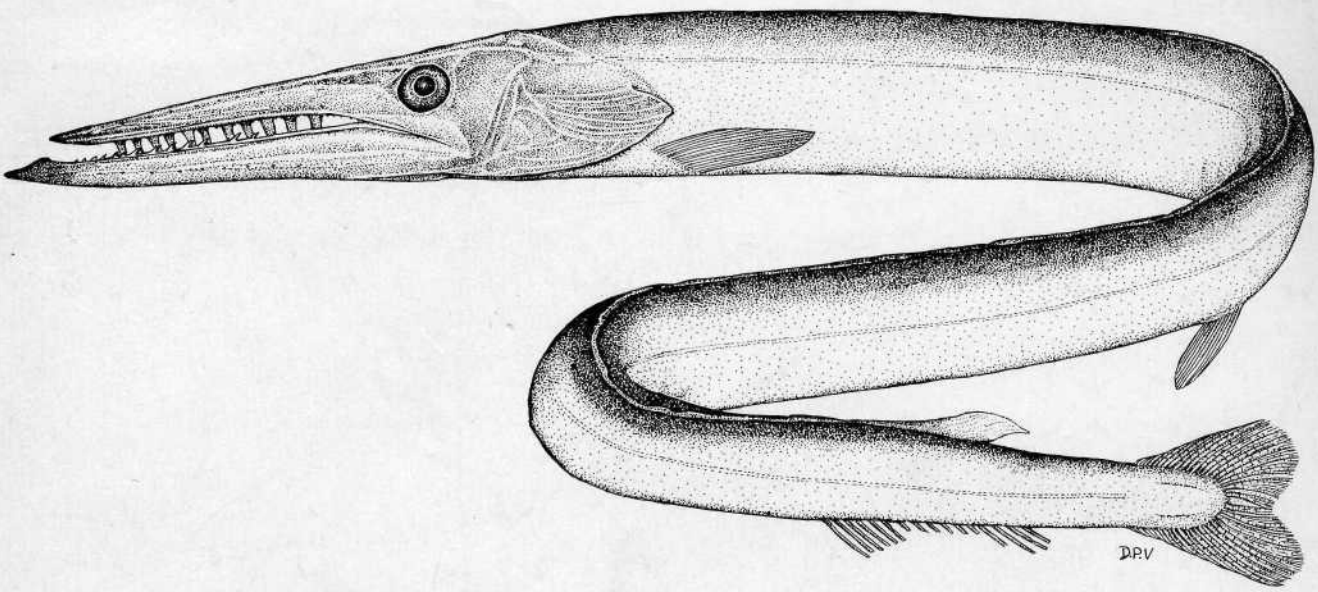


Fig. 1. *Anotopterus pharao*, CAS 26911, 98 cm SL, 25 miles west of Cape Mendocino, Humboldt, California.

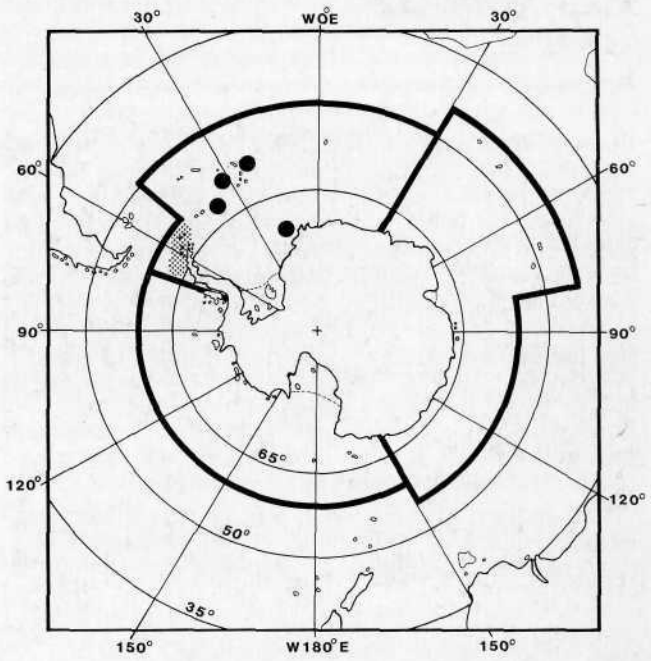
Distribution: A world-wide species occurring from polar to temperate waters. In the Southern Ocean, *Anotopterus* is known from the Scotia Sea, Weddell Sea, and off Coats Land (synonymy above and Rembiszewski 1981); it probably occurs all round the continent.

Remarks: *Anotopterus* is a member of the epipelagic ichthyofauna (Parin 1970), but during the daylight hours this species is usually found below 1,000 m. Its apparent rarity is likely due to the difficulty of capturing large epipelagic fishes with conventional gear.

The daggertooth is a large, piscivorous predator. Its distensible body wall and large stomach are capable of accommodating prey up to half its own length (Rofen 1966; Templeman 1970a). The formidable dentition is also indicative of an active fish predator.

Anotopterus is a synchronous hermaphrodite that undergoes a remarkable transformation—loss of teeth and atrophy of gut (stomach and intestine)—in conjunction with enlargement of the gonad (and ova) in preparation for spawning (Maul 1971). The only specimen that has been found with an enlarged gonad is a 77 cm SL fish caught off Madeira. Based on the absence of teeth, non-functional gut, and enormous gonad with large ova (0.9 mm), Maul (1971:13) concluded that the (once only) spawning of *Anotopterus* may represent the final stage in the life of this species.

Attains a length of at least 105 cm SL (Rembiszewski 1981).



Distribution of *A. pharao*

Zeus luna Gmelin, 1788: 1225, "Mari Normanniam alluente".

Lampris guttatus: Müller, 1806: 27, pl. 144.

Lampris lauta Lowe, 1841: 183, Madeira.

Diagnosis: D 48–55; A 33–42; P 20–25; V 13–17; GR 2+14; vertebrae 21+25. Body depth 1.5–1.6 and head length 2.7–3.1 in SL. Snout length 2.6–3.1, eye diameter 4.1–5.3, interorbital space 1.8–2.7 and upper jaw length (maxilla) 3.0–3.1 in HL. Body width 2.7–3.6 in body depth. Caudal peduncle depth 1.3–1.4 in its length and the length 9.1–10.5 in SL. Pectro-ventral distance (between vertical at origins of fins) 7.0–7.2, pectoral fin length 2.8–3.4 and pelvic fin length 2.3–2.5 in SL.

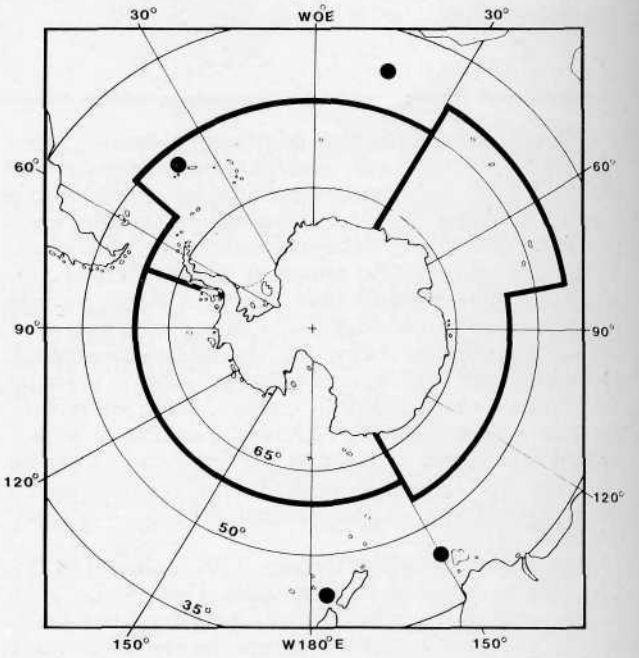
Colour: In life, body silvery-grey with reddish hue showing strongly above anal and pelvic fins. Body covered with large, pale spots, more crowded and numerous on its lower half. Tip of snout and jaws reddish. Fins bright orange with paler distal margins.

Distribution: Occurs in all oceans, including Mediterranean and Caribbean seas, from 140 to about 450 m. It appears to be absent from the Southern Ocean and the single capture near South Georgia (Parin & Kukuyev 1983) may be regarded as incidental.

Remarks: Early life history stages of *L. guttatus* were described by Oelschläger (1974) and Olney (1984). *L. guttatus* goes through radical morphological changes during its development. Most notable are the rapid increase in body depth and the decrease in length of pelvic and anterior dorsal-fin rays.

Excluding the South Georgia record, *Lampris guttatus* reaches its southernmost limit at about 42°S. However, the compilation of distribution records by Parin & Kukuyev (1983) shows that it occurs in sub-Arctic waters in the North Atlantic and Pacific oceans. This implies that the absence of *L. guttatus* from sub-Antarctic waters may be attributed to spatial habitat partitioning, possibly due to biotic factors and the high degree of specialisation of these species. *L. guttatus* feeds on squid and fish.

Attains 200 cm and 270 kg.



Distribution of *L. guttatus*

Lampris immaculatus Gilchrist, 1904
Southern opah

Fig. 2; Pl. 3, Fig. 1

Lampris immaculata Gilchrist, 1904: 4, pl. 22, False Bay, South Africa. Holotype: SAM 11765 (dried specimen).

Lampris guttatus (*non* Brünnich, 1788): Prut'ko, 1979: 140, Kerguelen Islands; Duhamel & Hureau, 1982: 74, Kerguelen Islands.

Diagnosis: D 49–56; A 32–40; P 21–24; V 12–15; GR 13–14; vertebrae 43. Body depth 1.9–2.3 and head length 2.9–3.6 in SL. Snout length 2.7–3.4, eye diameter 4.9–6.6 and interorbital space 1.9–2.4 in HL. Body

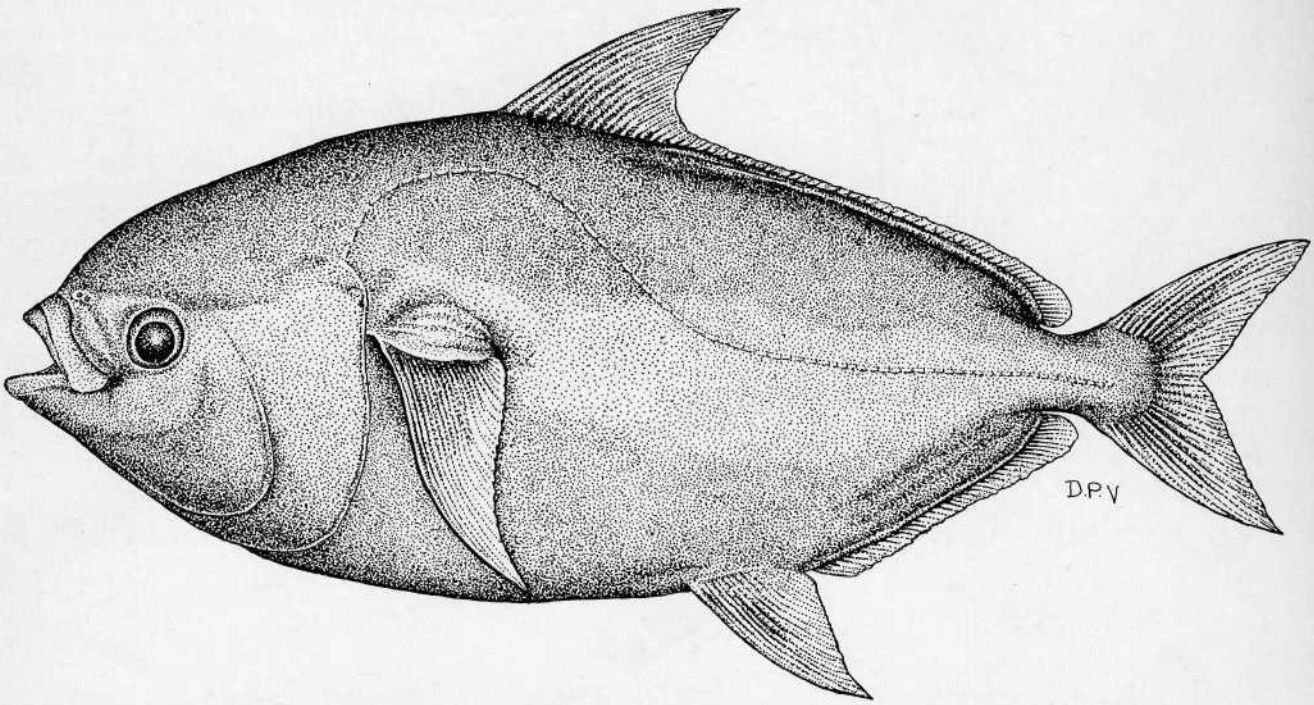


Fig. 2. *Lampris immaculatus*, 82 cm SL, Kerguelen Islands (from a slide by G. Duhamel published in Duhamel & Hureau 1982)

width 2.0–2.6 in its depth. Caudal peduncle depth 1.3–1.7 in its length and the length 8.2–9.6 in SL. Pectro-ventral distance 4.3–5.5, pectoral fin length 4.8–5.4 and pelvic fin length 4.1–6.6 in SL.

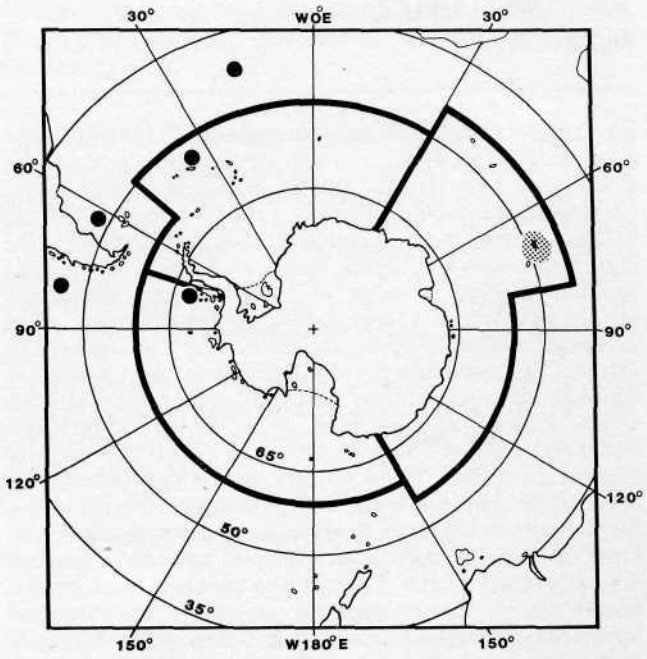
Colour: In life, body dark greyish-blue with metallic sheen above level of pectoral fin, grading into silvery-grey below it with reddish hue between lateral line, and anal and pelvic fins. Jaws and snout reddish. Fins bright orange with paler distal margins.

Distribution: Circumglobal in the Southern Hemisphere between 34 °S and the Antarctic Polar Front. One record from the Bellingshausen Sea (Parin & Kukuyev 1983). As most of the captures are between 40 °S and the Antarctic Polar Front, I agree with Parin & Kukuyev (1983) that *L. immaculatus* is essentially a sub-Antarctic species occasionally migrating farther north or south. Vertical distribution 50–485 m.

Remarks: In addition to differences in body depth, pectro-ventral, dorso-ventral and predorsal distances shown by Parin & Kukuyev (1983), *L. immaculatus* differs from *L. guttatus* in having shorter pectoral and pelvic fins (see above). Unusually high variation in pelvic-fin length seems to exist in *L. immaculatus*. The lower value given above was reported by Prut'ko (1979) for a 79.5 cm SL specimen and the higher value was found by Parin & Kukuyev (1983) for a 98 cm SL specimen.

Lampris immaculatus feeds on krill, squid and fish. Prut'ko (1979) found 18 specimens of the gempylid species *Paradiplospinus gracilis* 28.0–29.0 cm TL in the stomach of a single southern opah. Larvae unknown, but a 115 mm SL juvenile was described by Parin & Kukuyev (1983).

Attains about 100 cm SL and over 30 kg.



Distribution of *L. immaculatus*

FAMILY MYCTOPHIDAE

Lanternfishes

by P.A. HULLEY

Head and body compressed. Eyes large and lateral (dorsolateral in *Protomyctophum (Hierops)*). Mouth terminal (subterminal in *Centrobranchus, Gonichthys, Loweina*); jaws extending to or beyond vertical through posterior margin of eye; maxilla excluded from gape, expanded posteriorly and truncate. Jaw teeth numerous, small, and closely set in bands, those of inner rows sometimes slightly enlarged (some species with posterior teeth broad-based and hooked forward); vomer with a cluster of small teeth on each side; palatines with a close-set band or with 1 or 2 rows of enlarged, widely-spaced teeth; and mesopterygoids with a close-set patch of small teeth or a patch of widely-spaced, enlarged teeth. Branchiostegal rays usually 7–11. Gill rakers well developed, except in *Centrobranchus*. All fins lacking spines (a rudimentary spine at origin of dorsal and anal fins at uppermost pectoral ray and outermost pelvic ray); dorsal adipose fin present; anal-fin origin under or close behind dorsal-fin base; pelvic fins abdominal, with 8 principal rays, except in *Notolychnus* (6) and *Gonichthys* (7); caudal fin with 10 dorsal and 9 ventral principal rays. Scales cycloid or ctenoid, but easily lost except in some shallow-living species. Photophores (absent in *Taaningichthys paurolychnus*), arranged in distinct groups on head and trunk (Fig. 1); smaller "secondary" photophores on head, trunk and fins in some species. Luminous organs of various shapes and sizes on head or caudal peduncle, and at base of adipose fin in some species. Luminous patches or scales at bases of fins and different parts of body in some species.

Colour: Mainly brown to black in forms that lose their scales, but shallow-living species silvery-scaled; some species with metallic-green to metallic-blue scales.

Myctophids, which range in size from 20 mm to 300 mm SL, are widely distributed in the world's oceans in the mesopelagic and bathypelagic zones or in the pelagic and epibenthic faunas above continental shelf and slope regions. Mesopelagic and pseudoceanic species exhibit diurnal vertical migration to between the surface of the sea and 200 m depth at night, some showing size stratification with depth and some with adults and/or juveniles non-migratory. Bathypelagic species do not migrate vertically. Lanternfishes are mainly opportunistic feeders on copepods, amphipods, ostracods, euphausiids, chaetognaths, fish eggs, and fish larvae and juveniles.

Most myctophids are abundant, although a few species are rare. They represent a potentially important alternative fishery resource for the production of fish meal and fish oil. Some species from the Southern Ocean (*Gymnoscopelus* spp.) have been fished on a commercial basis; for human consumption the fishes are smoked.

More than 340 species have been described, but only about 250 species (in 30 genera) are currently recognised. Bekker (1983) has published a synthesis of the family on a global basis. Andriashev (1962) reviewed myctophid species found south of the Antarctic Convergence, and McGinnis (1982) studied the distribution of myctophids between 30 °S and the Antarctic continent. A key to the genera and a list of species recorded from or potentially occurring in the Southern Ocean have been given by Hulley (1985). A number of these species have not yet been taken within the limits of CCAMLR area and are therefore not included: *Diaphus meadi* Nafpaktitis, 1978; *Gonichthys barnesi* Whitley, 1943; *Hygophum hanseni* (Tåning, 1932); *Lampadena dea* Fraser-Brunner, 1949; *Lampadena notialis* Nafpaktitis & Paxton, 1968; *Lampadena speculigera* Goode & Bean, 1896; *Lampanyctus lepidolychnus* Bekker, 1967; *Loweina interrupta* (Tåning, 1928); *Metelectrona herwigi* Hulley, 1981; *Protomyctophum (Hierops) subparallelum* (Tåning, 1932). Since they are Bitemperate or South Temperate Pattern (Convergence) species (Hulley 1981), their occurrence in the northern region of the Indian Ocean sector of the Southern Ocean (45 °–50 °S, 30 °–80 °E) is anticipated.

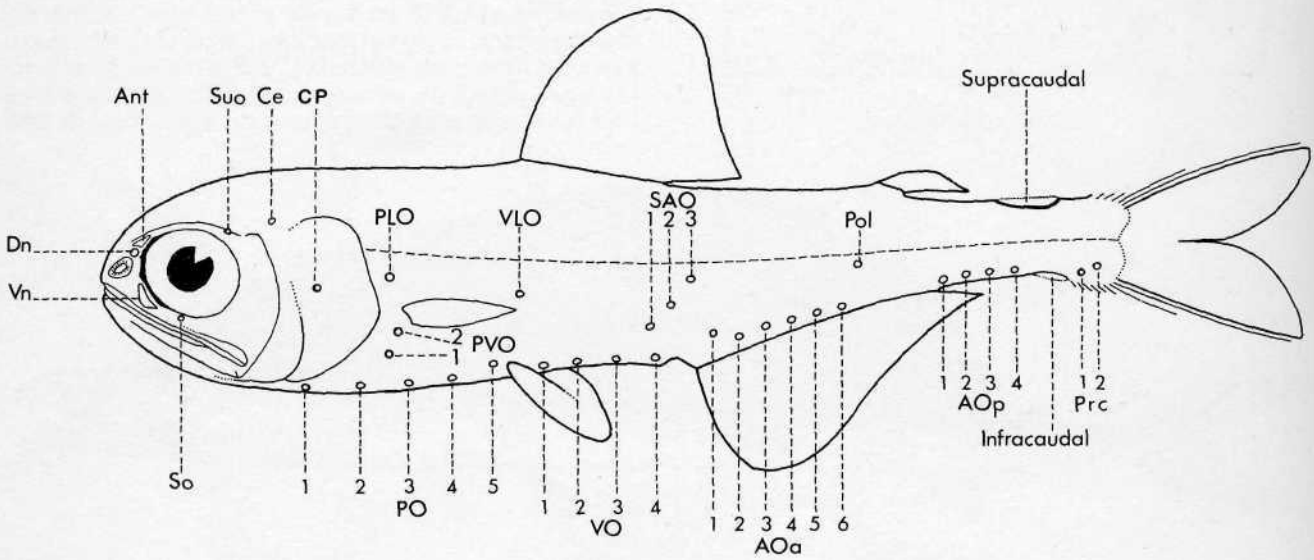


Fig. 1. Distribution and abbreviated terminology of luminous organs in myctophid fishes (based on Nafpaktitis *et al.* 1977)

KEY TO GENERA

1a Two Prc photophores. 2
1b More than 2 Prc photophores 6
2a PLO more than its diameter above upper base of pectoral fin; Pol present, AO series divided into AOa and AOp . . . . . .*Symbolophorus*
2b PLO more than its diameter below upper base of pectoral fin; Pol absent; AO series continuous, but AO photophores behind end of base of A fin may be depressed, forming "Pol" grouping 3
3a Body slender, with dorsal and ventral profiles almost parallel; PLO, PVO_1, PVO_2 on a horizontal line; 2 SAO; Prc_2 above anterior procurrent C ray, Prc_1 in front . . . . . .*Krefftichthys*
3b Dorsal and ventral profiles of body not parallel; PLO slightly above to well above PVO_1; 3 SAO; Prc_1 above anterior procurrent C ray, Prc_2 behind 4
4a PLO in front of and slightly higher than PVO_1; PLO, PVO_1, PVO_2 on somewhat angulate line . . . . . .*Protomyctophum*
4b PLO almost directly above PVO_1; PLO, PVO_1, PVO_2 forming a triangle. 5
5a VO_2 elevated; posterodorsal margin of opercle sharply rounded and serrate . . . . . .*Metelectrona*
5b VO series level or VO_2 only slightly raised; posterodorsal margin of opercle broadly rounded, without serrations . . . . . .*Electrona*
6a PO_1, PVO_1, PVO_2 on a straight, ascending, oblique line; VO_1, VO_2, VO_3 on a straight, ascending, oblique line . . . .*Diaphus*
6b PO_1, PVO_1, PVO_2 not on a straight, ascending, oblique line; VO_1, VO_2, VO_3 not on a straight, ascending, oblique line . .7
7a Supracaudal and infracaudal luminous glands large, singular, and bordered by heavy black pigment. . . . . .*Taaningichthys*
7b Supracaudal and infracaudal glands (when present) consisting of a series of overlapping, scale-like structures, not bordered by heavy black pigment 8
8a PO_4 highly elevated and anteriorly displaced to about above PO_3 . . . . . .*Lampanyctus*
8b PO_4 level with rest of that series. 9
9a Luminous scale-like structures midventrally between bases of V fins and anus present. . . . . .*Ceratoscopelus*
9b No luminous scale-like structures midventrally between bases of V fins and anus 10
10a VO_2 elevated; 12–14 A rays . . . . . .*Hintonia*
10b VO series level or only slightly arched; more than 17 A rays. 11
11a 3–7 primary cheek photophores; 3 Pol, forming a right angle; "secondary" photophores on head and body . . . . . .*Lampichthys*
11b Cheek photophores absent; 2 or 3 Pol, horizontal or in subvertical line with last AOa; no "secondary" photophores on head and body 12
12a AOa_1 abruptly elevated; 2 Pol in subvertical line with last AOa; 4 (or more) Prc. . . . . .*Gymnoscopelus*
12b AOa_1 not elevated; 2 (sometimes 3) Pol in a horizontal line; 3 Prc. . . . . .*Notoscopelus*

Genus *Ceratoscopelus* Günther, 1864

Maxilla extending well behind orbit. Pectoral fins large, extending beyond anal-fin origin. Vn present; 5 PO; 5 VO; AO series divided into AOa and AOp; 2 Pol; patches and scale-like structures of luminous tissue on trunk.

Three species, 1 of which is recorded from the Southern Ocean.

Ceratoscopelus warmingii (Lütken, 1892)
Fig. 2

Scopelus (Nyctophus) warmingii Lütken, 1892: 259, fig. 19 (32°06′N, 39°28′W). Holotype: ZMUC 39.

Lampanyctus polyphotis Beebe, 1932: 67, five miles south of Nonsuch Island, Bermuda.

Diagnosis: D 13–15; A 13–15; P 12–15; GR (3–5)+(9–12); AO (5–8)+(4–6).

Otoliths

DIAGNOSTIC FEATURES: The ovate shape, the ostial and homosulcoid sulcus acusticus and the typically myctophiform colliculi.

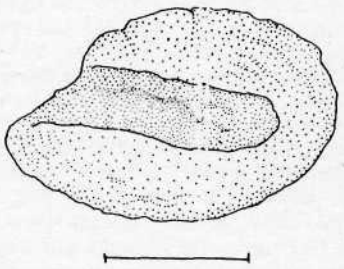


Fig. 3. Representative otolith of *C. warmingii*; fish length 34 mm SL; scale bar 1 mm.

Distribution: Generally, between 35°–42°N and 40°S (Atlantic), 20°N and 45°S (Indian), and tropical/subtropical Pacific, but less numerous in central gyres and absent from regions of low O_2-concentration (Bekker 1983). Mesopelagic: Broadly Tropical (Holoeury tropical) Pattern (Hulley 1981): 900 m (day), 25–200 m (night), with small juveniles non-migratory. In

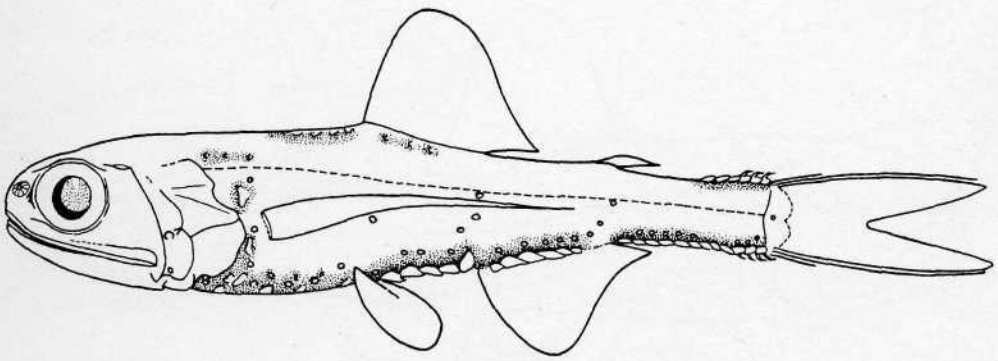
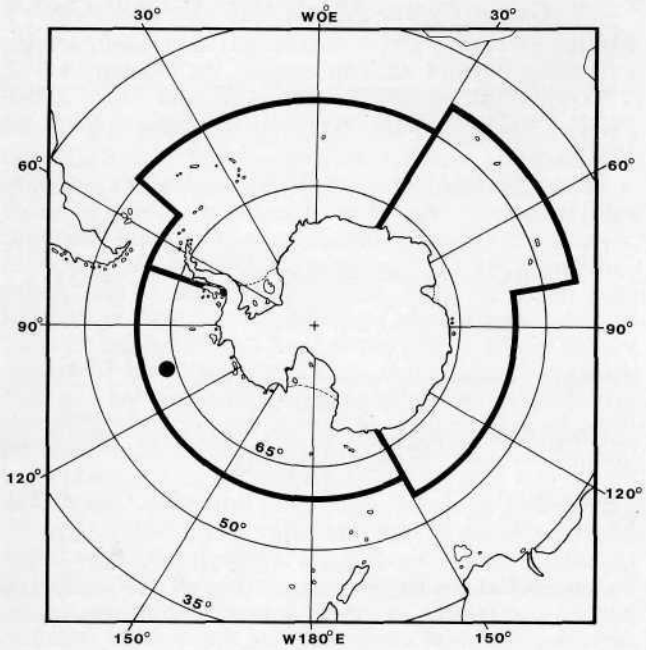


Fig. 2. *Ceratoscopelus warmingii*, 50 mm SL (from *Smiths' Sea Fishes*)



Distribution of *C. warmingii*

the Southern Ocean, recorded from 64°36′S, 108°52′W (Andriashev 1962).

Remarks: *C. warmingii* attains 81 mm SL, but it exhibits apparent sexual dimorphism in size at higher latitudes; females sexually mature from about 44 mm (North and Central Atlantic) and about 59 mm (western South Atlantic). Near Bermuda, the species has a one-year life cycle with a spring-autumn spawning period (Karnella 1983).

The larvae have been described by Shiganova (1977); Miller *et al.* (1979); and Belyanina (1982).

Genus ***Diaphus*** Eigenmann & Eigenmann, 1890

Maxilla not or only slightly expanded posteriorly, extending from slightly behind to well behind orbit. Pterotic spine sometimes well developed. At least 1 pair of sexually dimorphic, luminous glands on head; 5 PO; 5 VO; SAO series curved to strongly angulate; AO series divided into AOa and AOp; AOa_1 usually elevated, sometimes level; 1 Pol, sometimes continuous with AOa; 4 Prc. Supracaudal and infracaudal luminous glands absent; usually a luminous scale at PLO.

More than 60 species, of which 2 are recorded from the Southern Ocean.

KEY TO SPECIES

1a Head longer than deep; So present at ventral margin of orbit; AOa_1 slightly raised. . . . . *D. hudsoni*

1b Head about as long as deep; So absent; AOa_1 highly elevated . . . . . *D. ostenfeldi*

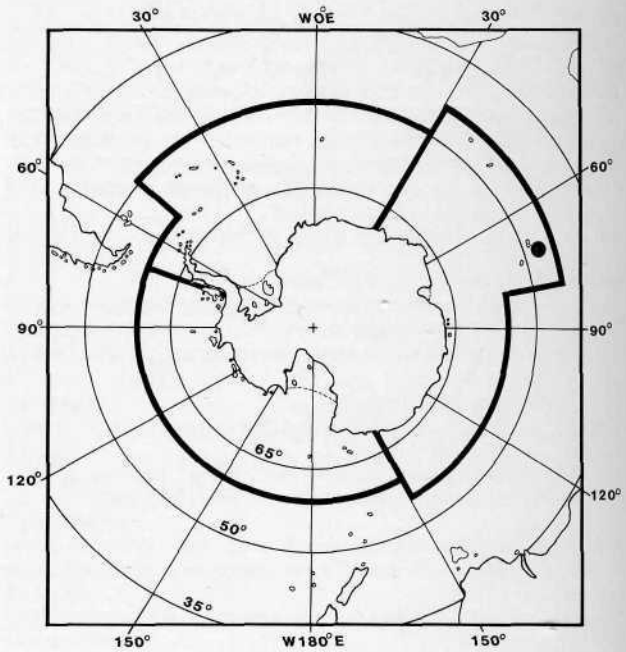
Diaphus hudsoni Zubrigg & Scott, 1976

Fig. 4

Diaphus hudsoni Zubrigg & Scott, 1976: 1539, figs. 1–2 (44°14′S, 42°43′W). Holotype: ROM 27569.

Diagnosis: D 13–15; A 12–14; P 10–12; GR (7–9)+(15–19); AO (4–6)+(4–6).

Distribution: Generally, circumglobal between STC and about 50°S, but with northern extensions in eastern



Distribution of *D. hudsoni*

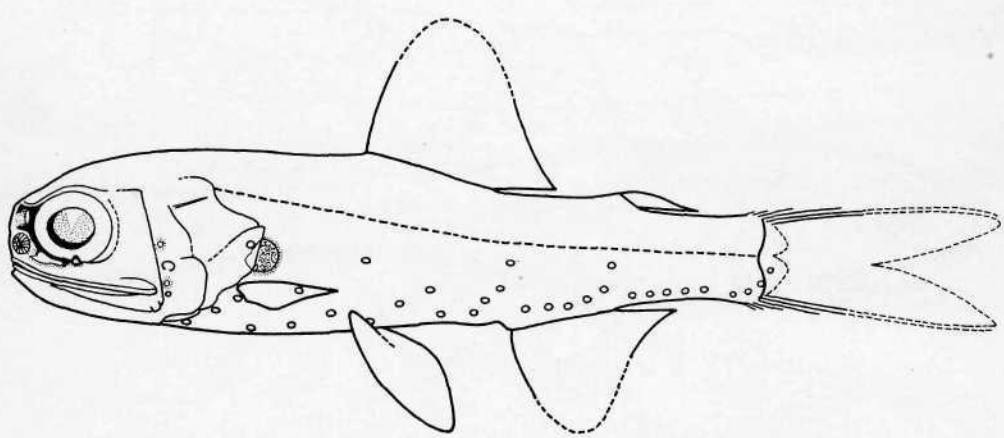


Fig. 4. *Diaphus hudsoni*, 30 mm SL (from *Smiths' Sea Fishes*)

boundary currents. Mesopelagic: South Temperate (Semi-subantarctic) Pattern (Hulley 1981): mainly below 250 m (night). In the Southern Ocean, recorded from 45°10′S, 69°12′E (Bekker 1984).

Remarks: *D. hudsoni* attains 84 mm SL and is sexually mature from about 54 mm SL.

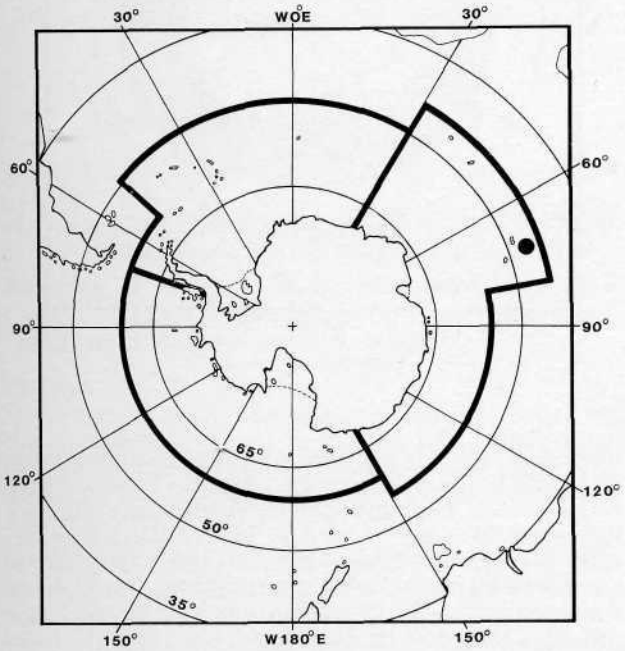
The larvae have been described by Olivar (1987).

Diaphus ostenfeldi Tåning, 1932
Fig. 5

Diaphus ostenfeldi Tåning, 1932: 143, fig. 15 (35°36′S, 171°52′E). Holotype: ZMUC P2329212.

Diagnosis: D 15–17; A 14–16; P 10–12; GR (8–10)+(15–18); AO (6–7)+(4–7).

Distribution: Generally, circumglobal in the region of the STC (35°–48°S). Mesopelagic: South Temperate (Convergence) Pattern (Hulley 1981): juveniles in upper 100 m (night), adults below about 160 m (night). In the Southern Ocean, recorded from 45°10′S, 69°12′E (Bekker 1984).



Distribution of *D. ostenfeldi*

Remarks: *D. ostenfeldi* attains 110 mm SL and is sexually mature from about 100 mm SL.

Genus ***Electrona*** Goode & Bean, 1896

Maxilla greatly expanded posteriorly, extending to or slightly beyond posterior margin of orbit. Anal-fin base longer than dorsal-fin base. Dn and Vn present; 5 PO; 4 VO; Pol absent, but AO series behind end of anal-fin base may be depressed.

Five species, of which 4 are recorded from the Southern Ocean.

KEY TO SPECIES

1a So on or slightly behind vertical through middle of orbit; SAO_3 nearer to SAO_2 than to LL ..... *E. carlsbergi*
1b So absent; SAO_3 nearer LL than to SAO_2 2
2a Total GR 16–20; PLO nearer to PVO_1 than to PVO_2; AO series level ..... *E. antarctica*
2b Total GR 21–31; PLO equidistant from PVO_1 and PVO_2; AO series with last 4–5 photophores depressed 3
3a Total GR 27–31; Prc_1–Prc_2 interspace less than one photophore diameter; PO_5 level with outer base of V fin; VLO usually nearer V base than to LL ..... *E. subaspera*
3b Total GR 21–24; Prc_1–Prc_2 interspace equal to or greater than one photophore diameter; PO_5 elevated, above level of outer base of V fin; VLO usually midway between V base and LL ..... *E. paucirastra*

Electrona antarctica (Günther, 1878)
Fig. 6

Scopelus antarcticus Günther, 1878: 184, Antarctic Ocean. Holotype: BMNH 1887.12.7.215.

Scopelus colletti Lütken, 1892: 249 (28°16′S, 97°30′W).

Diagnosis: D 14–16; A 19–22; P 11–13; GR (3–5)+(12–16); AO 17–19. Mature males with 5–7 separate,

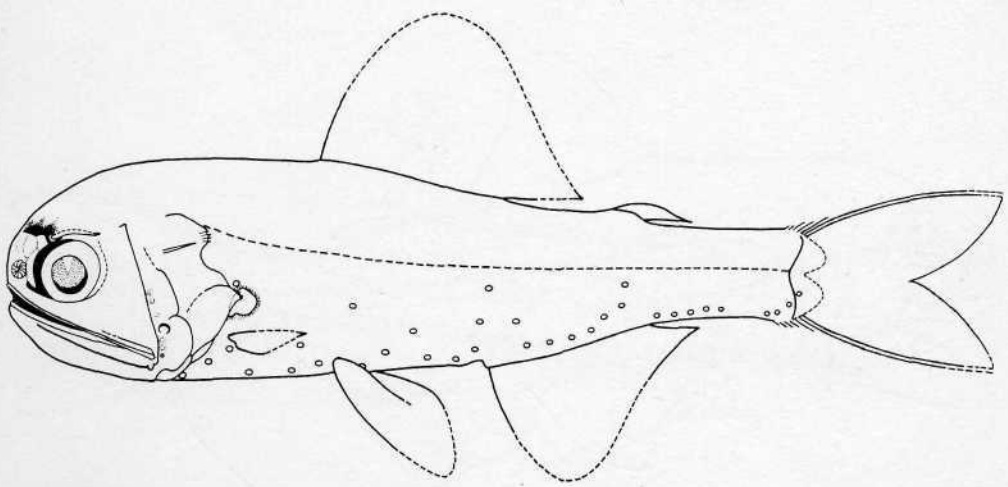


Fig. 5. *Diaphus ostenfeldi,* 35 mm SL (from *Smiths' Sea Fishes*)

supracaudal luminous glands; mature females with 4–6 separate, infracaudal luminous glands.

Otoliths

DIAGNOSTIC FEATURES: The dorso ventral reniform geometric shape, the homomorph colliculi in association with the pseudo-colliculum below the posterior colliculum and the homosulcoid sulcus acusticus.

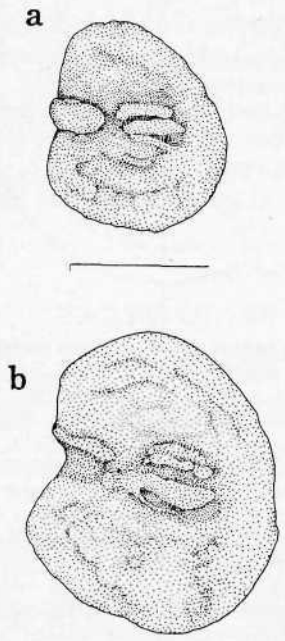
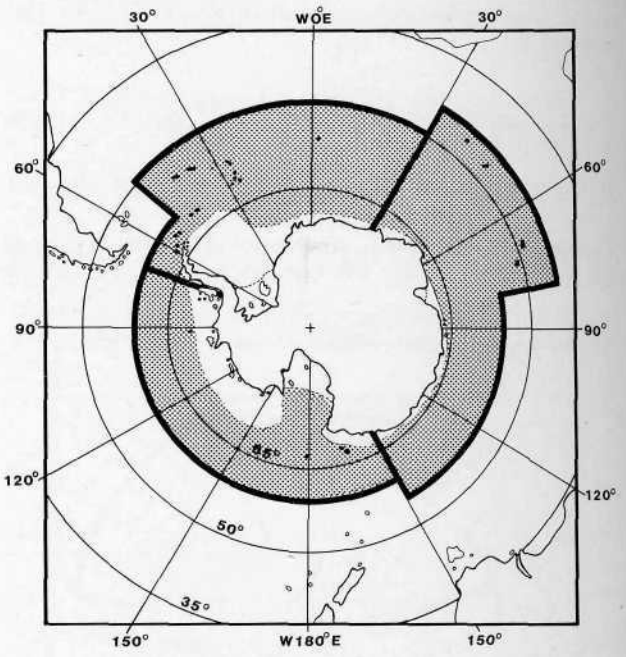


Fig. 7. Representative otoliths of *E. antarctica*; fish lengths: (a) 58 mm, (b) 87 mm SL; scale bar 1 mm

Distribution: Circumpolar south of APF, but absent from Ross Sea; adults only in higher latitudes (South Orkneys, South Shetlands, Peter I Island) and south of the Weddell-Scotia confluence, but adults and juveniles in region of South Sandwich Island, South Georgia and Bouvet (McGinnis 1982; Lubimova *et al.* 1983). Larvae throughout Scotia Sea (Efremenko 1978), in the Gerlache Strait (Mujica & Ascencio 1985) and the Indian Ocean sector (south of Kerguelen Islands to 66°33′S). Mesopelagic: Antarctic Pattern (Hulley 1981): south of the APF adults in upper 250 m (day), 50–100 m (night); occurs deeper northwards to 2,000 m at the STC. Upper limiting temperature of about 3 °C (Andriashev 1965).



Distribution of *E. antarctica*

Remarks: Probably the most common myctophid occurring south of the APF. Females are sexually mature from about 74 mm. Length-frequency distributions indicate a three-year life span (Rowedder 1979a). Batch spawner, with a peak in autumn-winter (Lisovenko 1980, as quoted by Lubimova *et al.* 1983). The diet of juveniles less than 60 mm SL comprises mainly copepods (*Metridia gerlachei, Euchaeta antarctica, Calanus propin-*

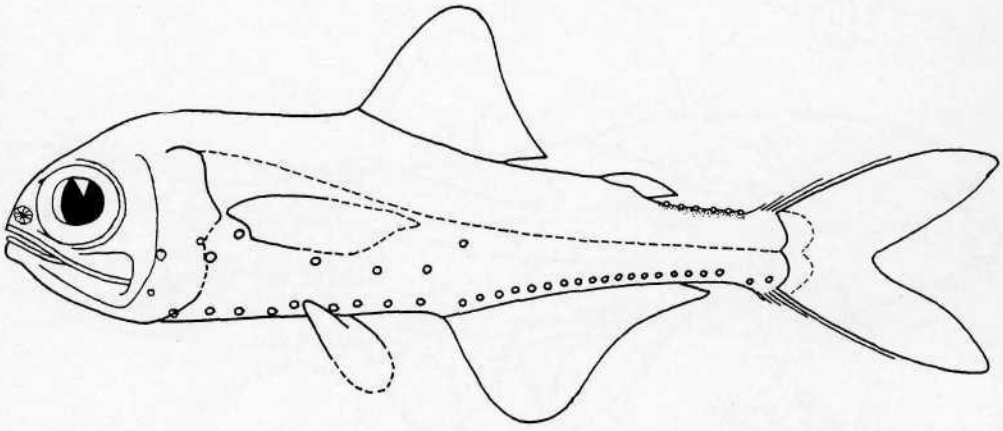


Fig. 6. *Electrona antarctica,* 60 mm SL (from *Smiths' Sea Fishes*)

quus, Calanoides acutus), with some euphausiids and hyperiids. Adults feed more on euphausiids (*Euphausia superba* (up to 50% by weight), *E. frigida, Thysanoessa macrura*), and also take polychaetes, chaetognaths, ostracods, amphipods (*Themisto gaudichaudii*), decapods, molluscs (*Clio pyramidata, Limacina helicina)* and juvenile fishes (Lubimova *et al.* 1983; Williams 1985b; Hopkins 1985).

Adult yearly food ration is about 20 times the body weight; no seasonal variation was detected, but decreased food intake occurs in gravid females (Rowedder 1979b). Oxygen consumption rates were determined by Torres *et al.* (1984). Reinhardt & Van Vleet (1986a, b) examined the lipid composition and pointed out that lipid storage, primarily as wax esters, occurs in intramuscular sacs. These esters are used for increased buoyancy and long term energy reserves.

Early life history stages were described by Pertseva-Ostroumova (1967), Efremenko (1972), Moser & Ahlstrom (1974), Belyanina & Kovalevskaya (1979), Moser *et al.* (1984), and Rasoanarivo & Aboussouan (1985).

Males attain 82 mm and females 103 mm SL.

Electrona carlsbergi (Tåning, 1932)
Fig. 8

Myctophum carlsbergi Tåning, 1932: 126, fig. 1 (44°40′S, 173°39′E). Holotype: ZMUC P2329224.

Diagnosis: D 13–15; A 18–20; P 12–13; GR (8–10)+ (19–25); AO 13–15. Both sexes with single, small supracaudal and infracaudal luminous glands.

Otoliths

DIAGNOSTIC FEATURES: The generally discoid shape, the slightly triangular ventral margin, the near equally-sized rostrum and antirostrum, the double anterior colliculum, the single posterior colliculum and the crenate caudal ridge below the posterior colliculum

Distribution: Generally circumglobal between STC and APF. Mesopelagic: South Temperate (Holosubantarctic) Pattern (Hulley 1981): upper 100 m and at surface south of 50°S, but below 550 m near STC. In the Atlantic Ocean sector from 50°–58°S, 15°–50°W and from 60°–62°S, 54°–58°W. In the Pacific Ocean sector from 60°–65°S, 80°–180°W and from 55°–60°S, 110°–150°E; and in the Indian Ocean sector 46°–63°S, 52°–80°E. Population structuring evident within the

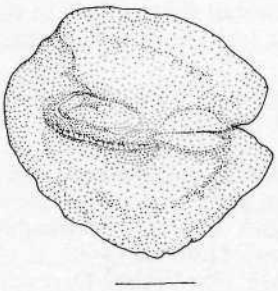
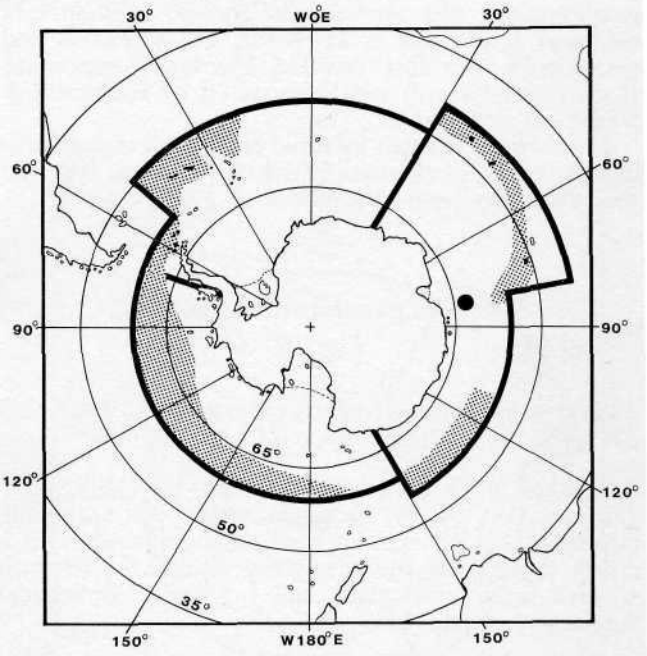


Fig. 9. Representative otolith of *E. carlsbergi*; fish length 88 mm TL; scale bar 1 mm



Distribution of *E. carlsbergi*

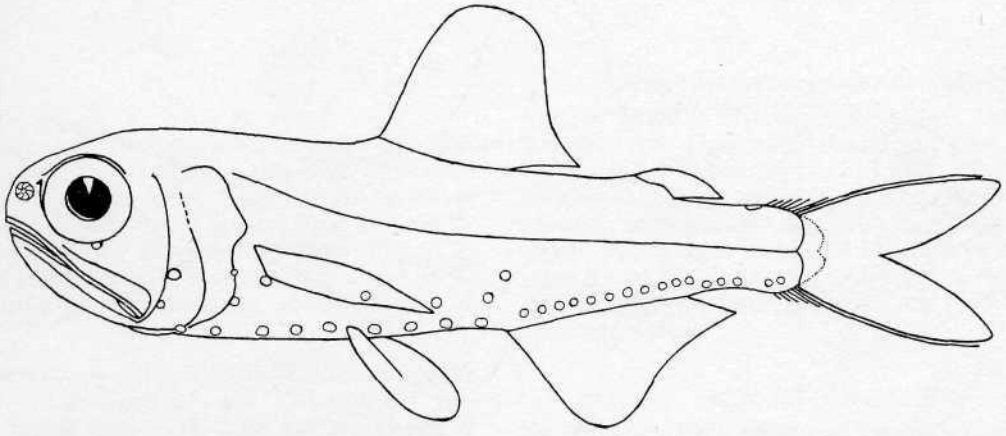


Fig. 8. *Electrona carlsbergi*, 75 mm SL (from *Smiths' Sea Fishes*)

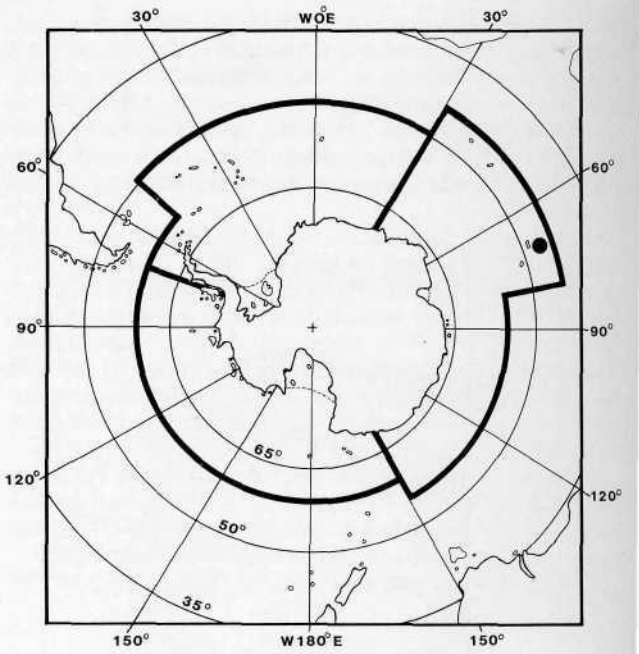
distributional range. Forms dense shoals, particularly in region of APF west of South Georgia and between APF and STC in upper 100–250 m, with catches consisting exclusively of adults (75–90 mm).

Remarks: *Electrona carlsbergi* matures at about 83 mm. There is a slight sexual dimorphism in size and weight, males (90 mm; 12.1 g) are slightly smaller than females (96 mm; 14.6 g).

This species migrates from 80–140 m to the surface at about 18h00 with ascent rate of 0.5 m/minute; the descent rate is 1.8 m/minute (Zasel'sliy *et al.* 1985). *E. carlsbergi* forms the principal component of the Deep Scattering Layer in the Pacific sector (Linkowski 1983). It spawns at either end-of-winter/beginning-of-spring (August-September) (Lubimova *et al.* 1983) or late-spring/early-summer (November-December) (Zasel'sliy *et al.* 1985).

There are 2 feeding periods: an extended evening and shorter morning period. The diet consists of copepods (mainly *Rhincalanus gigas*), hyperiids (mainly *Themisto gaudichaudii)* and euphausiids (mainly *Thysanoessa macrura)* (Lubimova *et al.* 1983), but ostracods and gasteropods were also recorded. The lipid composition (75% trioxyglycerol) was investigated by Reinhardt & Van Vleet (1986a, b).

E. carlsbergi is eaten by squid and, to an insignificent degree, by fishes (Channichthyidae, *Notolepis* sp.) and procellariiform birds (Naumov *et al.* 1981).



Distribution of *E. paucirastra*

Electrona paucirastra Bolin, 1962
Fig. 10

Electrona paucirastra Bolin, *in* Andriashev, 1962: 280 (39°30′S, 71°16′E). Syntypes: ZIN 36765.

Diagnosis: D 13–15; A 20–21; P 14–16; GR (5–6)+ (15–18); AO 14–16, in single series but noticeably depressed behind anal-fin base. Mature males with a single, supracaudal luminous gland; mature females with a small supracaudal gland and 1–3 small, infracaudal luminous patches.

Distribution: Generally, circumglobal in region of STC (35°–48°S). Mesopelagic: South Temperate (Convergence) Pattern (Hulley 1981): from surface to 100 m (night). In the Southern Ocean, recorded from 45°10′S, 69°12′E (Bekker 1984).

Remarks: *E. paucirastra* attains 70 mm SL and is sexually mature from about 60 mm SL.

Electrona subaspera (Günther, 1864)
Fig. 11

?*Scopelus stellatus* Bennet, 1840: 288, Pacific Ocean off South America (43°S).

Scopelus (Dasyscopelus) subasper Günther, 1864: 411 (43°30′S, 123°00′E). Holotype: BMNH 1845.8.5.45.

Myctophum megalops Peters, 1865: 393, Cape Horn.

Diagnosis: D 13–15; A 20–22; P 13–16; GR (7–9)+ (18–22); AO 16–18, moderately depressed posterior to

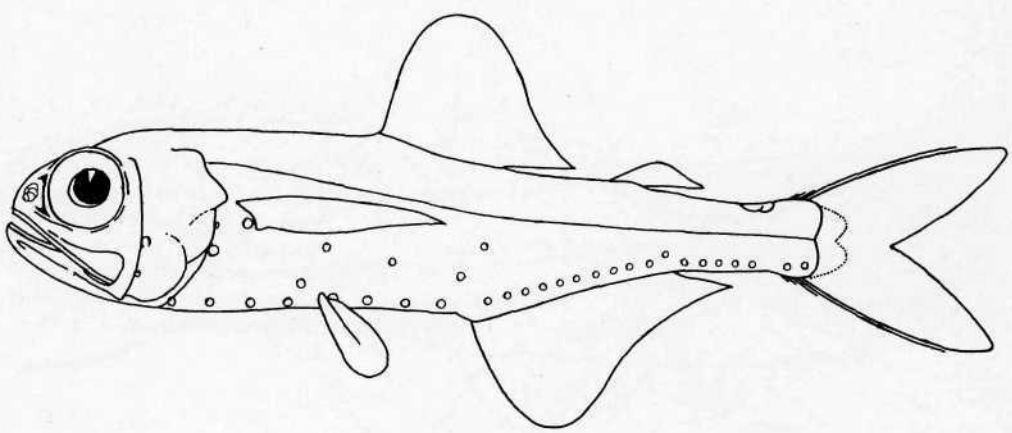


Fig. 10. *Electrona paucirastra*, 70 mm SL (from *Smiths' Sea Fishes*)

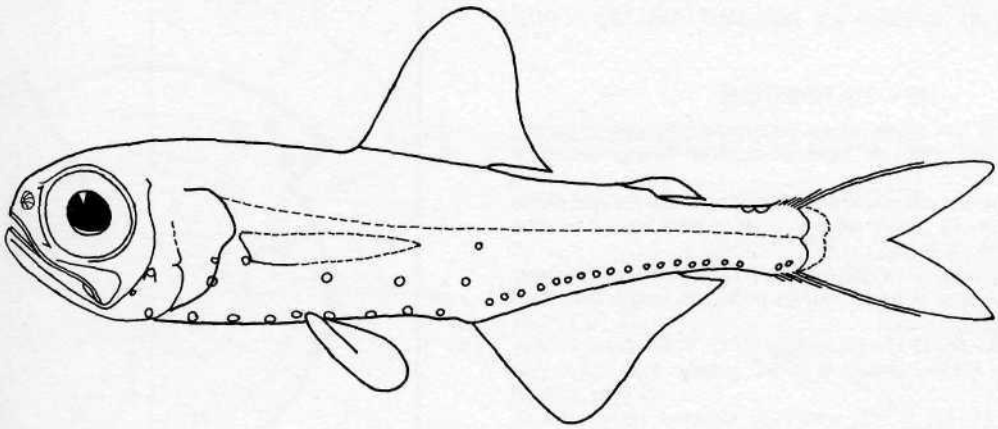


Fig. 11. *Electrona subaspera*, 50 mm SL (from *Smiths' Sea Fishes*)

anal-fin base. Mature males with 1–3 luminous scales supracaudally, forming gland; mature females with supracaudal and infracaudal luminous glands, variously arranged, occasionally with either supracaudal or infracaudal gland.

Otoliths

DIAGNOSTIC FEATURES: The discoid shape, the near homosulcoid sulcus acusticus, the typically myctophiform colliculi, the large anterior colliculum in comparison to the posterior colliculum, the pointed rostrum and the rounded antirostrum.

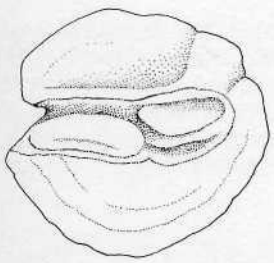
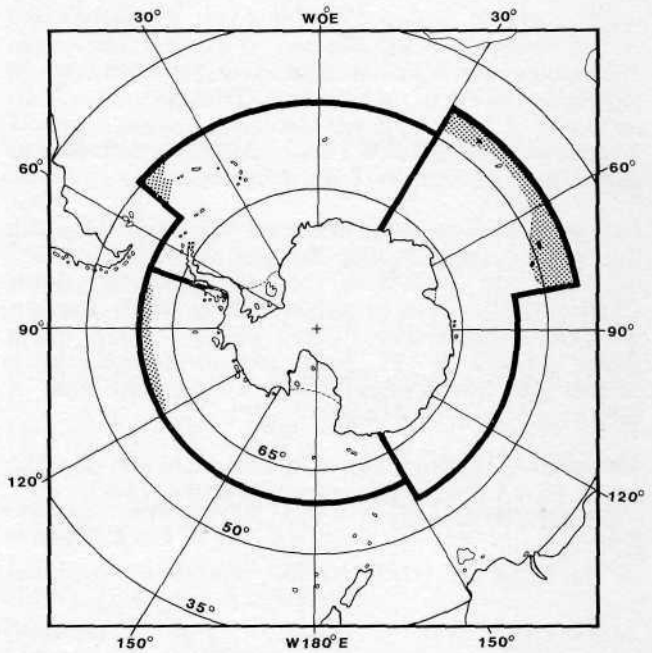


Fig. 12. Representative otolith of *E. subaspera*; fish length unknown

Distribution: Generally, circumglobal between the STC and the APF. Mesopelagic: South Temperate (Holosubantarctic) Pattern (Hulley 1981): from surface to 200 m (night). In the Atlantic Ocean sector from 51°–53°S, 40°–49°W, in the Indian Ocean sector from 47°–48°S, 70°–71°E, and in the Pacific Ocean sector at about 58°S, 145°W and south of 60°S between about 75°W and 120°W.

Remarks: *E. subaspera* was recorded from the stomachs of *Champsocephalus gunnari* and *Dissostichus eleginoides*. The larvae have been described by Moser & Ahlstrom (1974).

Attains 127 mm SL.



Distribution of *E. subaspera*

Genus ***Gymnoscopelus*** Günther, 1873

Maxilla slightly expanded posteriorly, extending well beyond orbit. Dorsal-fin base longer than anal-fin base. Dn and Vn well developed; 5–7 PO; 5–6 VO; AO series divided into AOa and AOp; 2 Pol; Prc series in 1 or 2 groups. Supracaudal and infracaudal glands absent; some species with irregularly-shaped patches of luminous tissue on body, especially below dorsal-fin base. Two subgenera, both of which are recorded from the Southern Ocean.

KEY TO SUBGENERA

1a PVO_1 and PVO_2 below level of upper end of P base ..... *Gymnoscopelus*

1b PVO_2 noticeably above level of P base ..... *Nasolychnus*

Subgenus *Gymnoscopelus* Günther, 1873

Four species, all of which are recorded from the Southern Ocean.

KEY TO SPECIES

1a Prc 6–9, the last never widely separated from rest of series; D 17–22, its origin in front of vertical through outer V bases. 2

1b Prc 4–5, the last usually widely separated from the rest of the series; D 14–17 (rarely 18), its origin a little behind vertical through outer V bases 3

2a Total GR 21–24; D 19–22; usually 5 PO; VLO about midway between LL and V base; caudal peduncle length less than upper jaw length. . . . . *G. (G.) bolini*

2b Total GR 30–36; D 17–19; usually 6 PO; VLO nearer V base than to LL; caudal peduncle length greater than upper jaw length . . . . . *G. (G.) nicholsi*

3a Total GR 21–25; 5 PO, with PO_3 elevated above rest of series; caudal peduncle length greater than upper jaw length; predorsal length 43–45% SL . . . . . *G. (G.) braueri*

3b Total GR 25–28; 6–7 PO, all level; caudal peduncle length less than upper jaw length; predorsal length 48–49% SL . . . . . *G. (G.) opisthopterus*

Gymnoscopelus (Gymnoscopelus) bolini Andriashev, 1962

Fig. 13

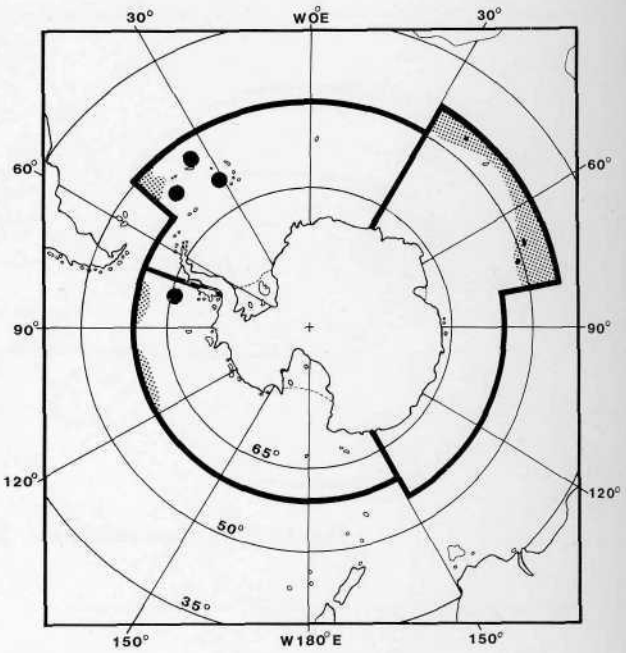
Gymnoscopelus bolini Andriashev, 1962: 272, fig. 34 (53°01'S, 109°30'W). Holotype: ZIN 36383.

Diagnosis: D 19–22; A 19–22; P 12–14; GR (6–7)+(14–17); AO (10–12)+(7–9); Prc 5–6.

Distribution: Generally, between APF and STC, with northern extension to about 38°S off Argentina, to 40°S off Chile and to 34°S in the eastern South Atlantic (Hulley 1989). Mesopelagic/epibenthic: South Temperate (Holosubantarctic) Pattern (Hulley 1981): upper 200 m in region of APF, but deeper northwards (night); known also from bottom trawls off the east coast of South Georgia (767–800 m).

Remarks: *G. bolini* matures at about 270 mm SL. The larvae have been described by Shiganova (1977).

Attains 280 mm SL.



Distribution of *G. (G.) bolini*

Gymnoscopelus (Gymnoscopelus) braueri (Lönnberg, 1905)

Fig. 14

Myctophum (Lampanyctus) braueri Lönnberg, 1905a: 764 (48°54'S, 51°40'W). Holotype: NRM SYD/1902265.4105.

Diagnosis: D 14–17; A 16–20; P 12–15; GR (6–7)+(15–19); AO (8–12)+(8–11); Prc (3–5) + 1.

Colour: Eye colour light blue when freshly caught.

Otoliths

Diagnostic features: The discoid shape, the ostial and homosulcoid sulcus acusticus, the entire margin and the near homomorph and typically myctophiform colliculi. Ontogeny: With an increase in fish size the general geometric shape of the otoliths changes from more dorso ventrally oval to discoid.

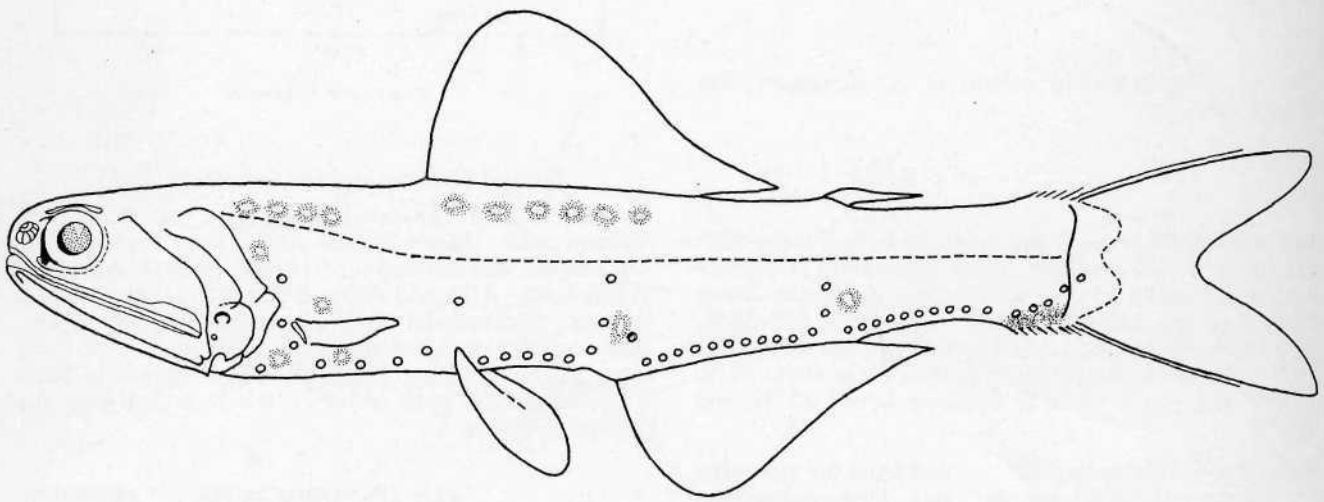


Fig. 13. *Gymnoscopelus (Gymnoscopelus) bolini*, 150 mm SL (from *Smiths' Sea Fishes*)

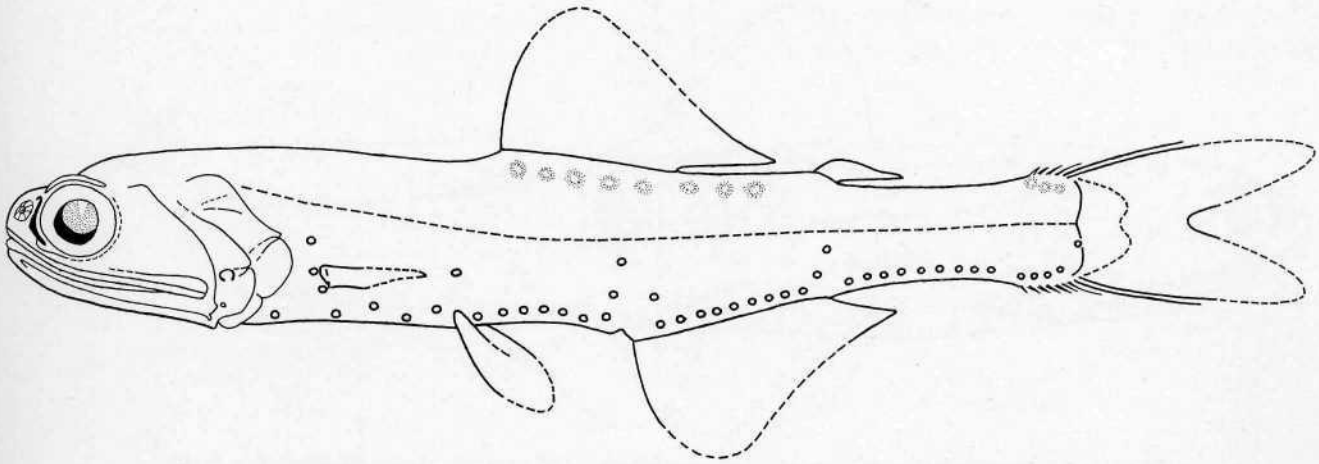


Fig. 14. *Gymnoscopelus (Gymnoscopelus) braueri*, 95 mm SL (from *Smiths' Sea Fishes*)

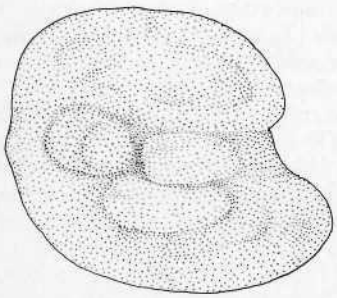
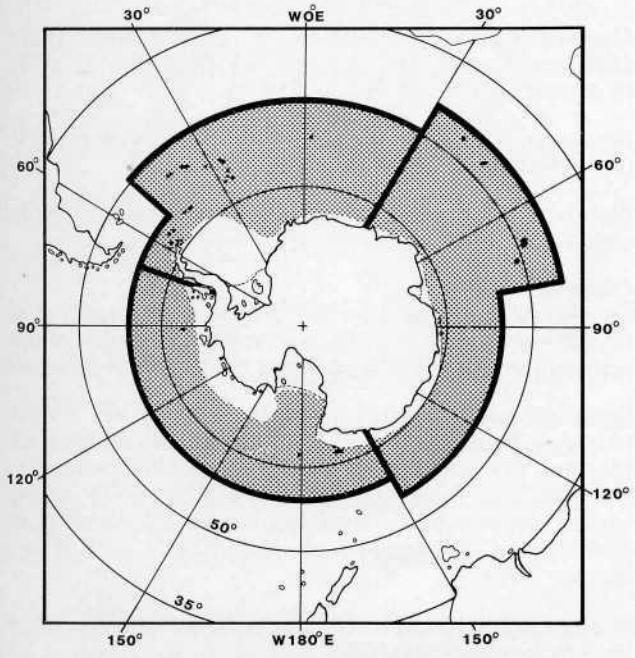


Fig. 15. Representative otolith of *G.* (*G.*) *braueri*; fish length 118 mm SL; scale bar 1 mm

Distribution: Generally, between the coasts of Antarctica and 33°S (south-western Atlantic Ocean sector), 46°S (Indian Ocean sector between 50°–71°E), and about 46°S (Pacific Ocean sector off Chile). Mesopelagic: Broadly Antarctic Pattern (Hulley 1981): upper 200 m (night) but deeper in region of STC. Upper limiting temperature of about 5°–6°C.



Distribution of *G. (G.) braueri*

Remarks: *G. braueri* matures at about 114 mm SL. It has been found in the stomach contents of *Dissostichus eleginoides*. As with *G. nicholsi,* the diet consists mainly of *Euphausia superba*; copepods (*Euchaeta antarctica, Rhincalanus gigas*), amphipods (*Primno macropa, Themisto gaudichaudii)* and the euphausiid *Thysanoessa macrura* were also recorded (Williams 1985b). One of the most common myctophids occurring south of the APF.

The larvae were described by Pertseva-Ostroumova (1964, 1977), Belyanina & Kovalevskaya (1979) and Efremenko (1983).

Attains 132 mm SL.

Gymnoscopelus (Gymnoscopelus) nicholsi (Gilbert, 1911)

Fig. 16

Gymnoscopelus aphya Günther, 1873: 91 (*nomen oblitum)* (55°S, 85°W).

Lampanyctus nicholsi Gilbert, 1911: 17, fig. 1 (47°S, 60°W). Holotype: AMNH 1919.

Diagnosis: D 17–19; A 19–21; P 13–15; GR (9–12)+(21–24); AO (9–12)+(6–9); Prc 5–8.

Otoliths

DIAGNOSTIC FEATURES: The virtually straight and entire dorsal margin, the dentate and bulbous ventral margin. The otoliths of *G. fraseri* and *G. nicholsi* are extremely similar in their general geometric shape. They are, however, easily distinguishable from each other by the sculpture of the margins, particularly the ventral margin.

Distribution: Generally, between Antarctica and 35°S (off Argentina), 47°S (Falkland Current region), and 47°–49°S (between 45°E and 71°E). Mesopelagic/epibenthic: Broadly Antarctic Pattern (Hulley 1981). South of the APF, adults in upper 250 m of open ocean and over continental shelves and oceanic banks (spring-summer) during day, migrating to 50–100 m at night, where catches of 200–300 kg have been obtained with a krill trawl (Lubimova *et al.* 1983). Taken in bottom trawls on shelf and slope areas of South Orkneys, South Shetlands and South Georgia in 350–700 m. Adult speci-

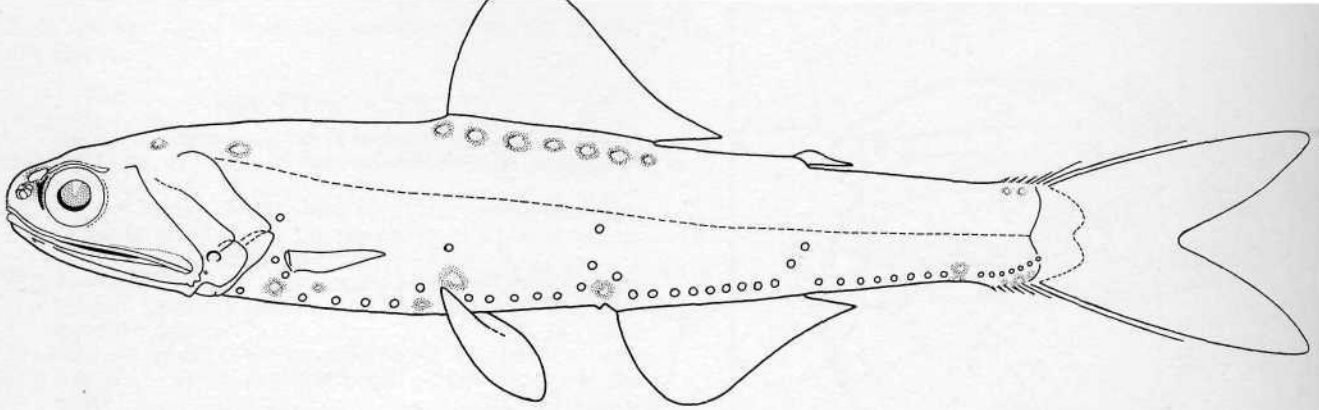


Fig. 16. *Gymnoscopelus (Gymnoscopelus) nicholsi*, 125 mm SL (from *Smiths' Sea Fishes*)

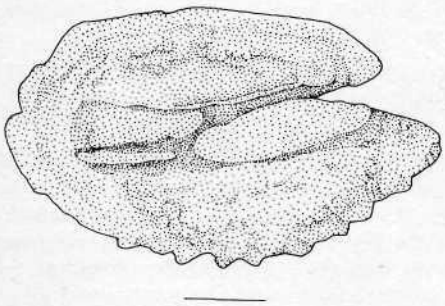


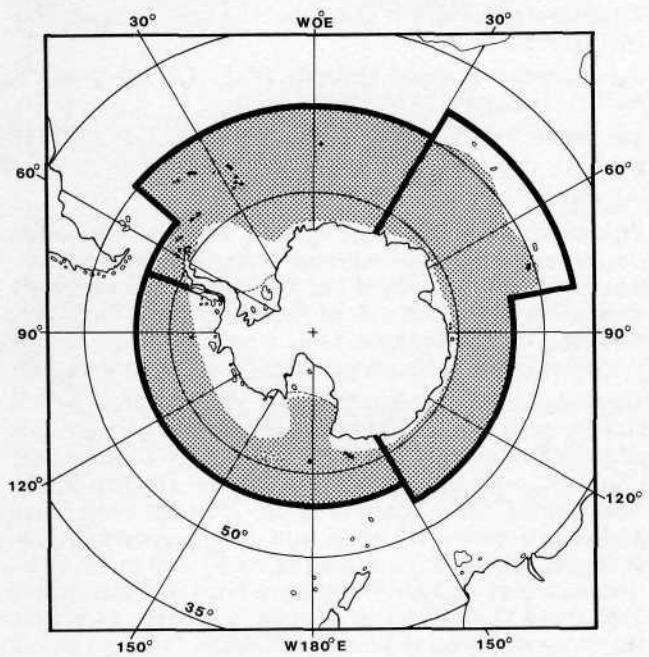
Fig. 17. Representative otolith of *G. (G.) nicholsi*; fish length 156 mm TL; scale bar 1 mm

mens only in high latitudes (South Orkneys, South Shetlands, Antarctic Peninsula); juveniles and adults in waters around South Georgia and central Scotia Sea.

Remarks: *G. nicholsi* matures from 160–180 mm (? total length). Length-frequency distributions of adults from different areas do not demonstrate distinct changes from year-to-year. The diet consists of euphausiids and euphausiid larvae, hyperiids, and mysids; *Euphausia superba* is an important diet item north of the South Shetland Islands (Takahashi 1983). In addition, Williams (1985b) has recorded the following food items: copepods (*Euchaeta antarctica, Rhincalanus gigas*), amphipods (*Primno macropa, Themisto gaudichaudii)* and euphausiids (*Thysanoessa macrura*). Lipid storage subcutaneously is extensive (Reinhardt & Van Vleet 1986b). *G. nicholsi* was found in the stomach contents of *Dissostichus eleginoides* (Duhamel & Hureau 1982).

The larvae have been described by Pertseva-Ostroumova (1964, 1977), Moser & Ahlstrom (1972), Belyanina & Kovalevskaya (1979), and Moser *et al.* (1984).

Attains 161 mm SL.



Distribution of *G. (G.) nicholsi*

Gymnoscopelus (Gymnoscopelus) opisthopterus Fraser-Brunner, 1949

Fig. 18

Gymnoscopelus opisthopterus Fraser-Brunner, 1949: 1094, text figure; 1102, fig. 13 (64°22.6′S, 106°33.3′E). Holotype: BMNH 1948.5.14.612.

Diagnosis: D 15–18; A 16–18; P 12–14; GR (7–9)+(16–20); AO (9–10)+(7–8); Prc (4)+1.

Colour: Eye colour chocolate-brown when freshly caught.

Otoliths

Diagnostic features: The generally dorso ventrally oval to rectangular shape, the typical myctophiform sulcus acusticus with prominent anterior and posterior colliculi.

Distribution: Circumpolar south of APF, but absent from southern and central regions of Ross and Weddell seas and extending to 40°S in Falkland Current region. Bathypelagic: Antarctic Pattern (Hulley 1981): adults usually deeper than 500 m, but larvae and juveniles in 66–200 m at temperatures of −0.18°C to 6.23°C (Efremenko 1978).

Remarks: The larvae of *G. opisthopterus* were described by Efremenko (1978, 1983).

Attains 162 mm SL.

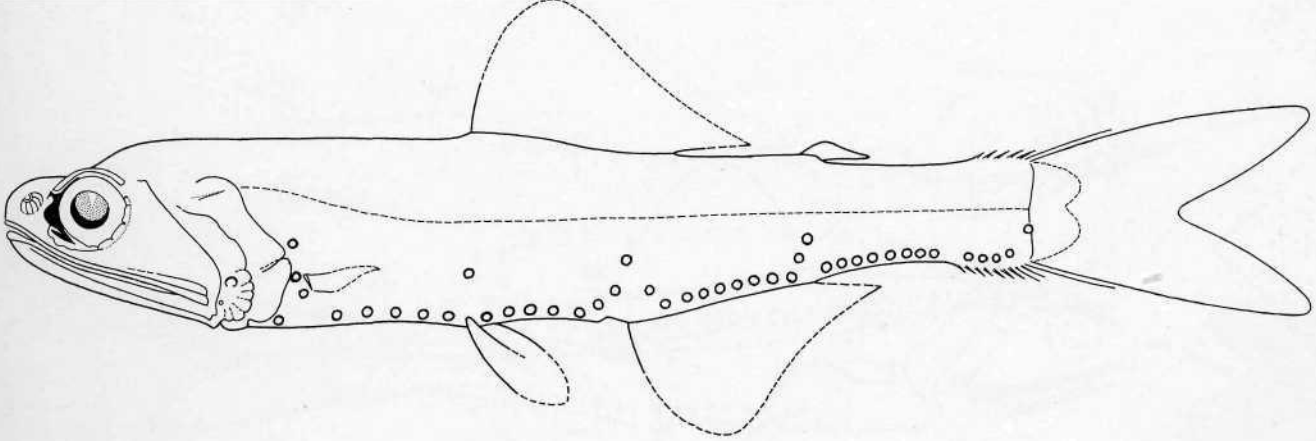


Fig. 18. *Gymnoscopelus (Gymnoscopelus) opisthopterus*, 130 mm SL (from *Smiths' Sea Fishes*)

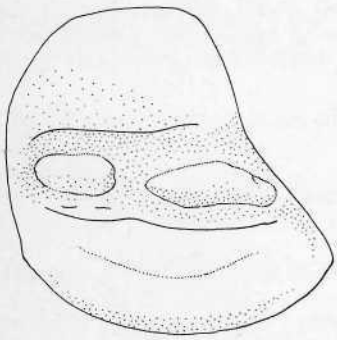
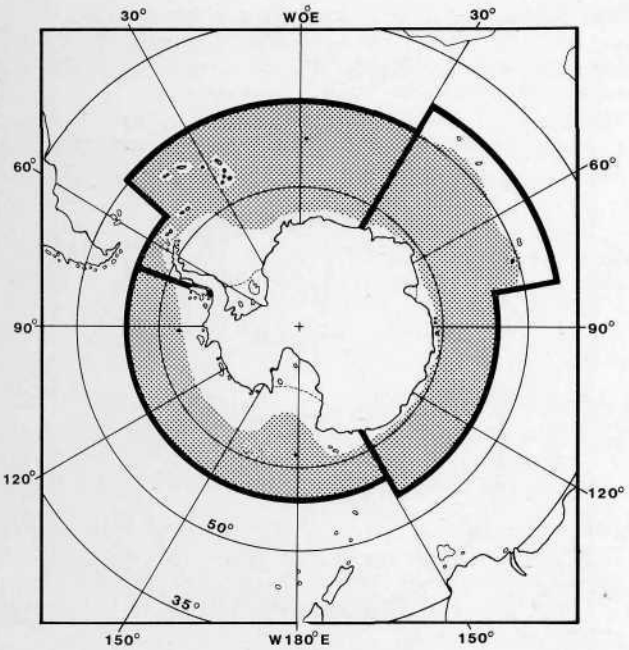


Fig. 19. Representative otolith of *G.* (*G.*) *opisthopterus*; fish length unknown



Distribution of *G. (G.) opisthopterus*

Subgenus ***Nasolychnus*** Smith, 1933

Four species, all of which are recorded from the Southern Ocean.

KEY TO SPECIES

1a Antorbital luminous tissue confined to upper half of orbit, never extending to anteroventral margin of eye, although black pigmented skin may do so.....*G. (N.) fraseri*

1b Antorbital luminous tissue extending below upper half of orbit to anteroventral margin of eye.....2

2a Distance VO_5–SAO_1 about 2 times distance SAO_1–SAO_2; total GR 25–31; eye well above upper lip, the vertical distance from upper lip to lower margin of eye at middle of orbit greater than length of P base.....*G. (N.) hintonoides*

2b Distance VO_5–SAO_1 about equal to distance SAO_1–SAO_2; total GR 30–36; vertical distance above upper lip at middle of eye equal to or less than length of P base.....3

3a Caudal peduncle length greater than upper jaw length; adipose-fin base about equal to 1 photophore-diameter; LL narrow, about equal to one photophore-diameter; tips of V rays heavily pigmented.....*G. (N.) piabilis*

3b Caudal peduncle length equal to or less than upper jaw length; adipose-fin base about equal to 2 photophore-diameters; LL about equal to 2 photophore-diameters; tips of V rays not pigmented.....*G. (N.) microlampas*

Gymnoscopelus (Nasolychnus) fraseri (Fraser-Brunner, 1931)

Fig. 20

Lampanyctus fraseri Fraser-Brunner, 1931: 224, fig. 4 (03°18′S, 05°17′E; type locality erroneous). Holotype: BMNH 1931.2.27.6.

Diagnosis: D 16–18; A 17–20; P 12–15; GR (7–9)+(17–20); AO (9–11)+(7–10); Prc (3–5)+1.

Otoliths

DIAGNOSTIC FEATURES: The ovate to oval shape, the straight dorsal margin, the associated bulbous ventral margin, the ostial and homosulcoid sulcus acusticus, and the large heteromorph colliculi.

Distribution: Mainly in the region of APF, but northwards to STC in Falkland Current region and at 45°E. Mesopelagic: South Temperate (Holosubantarctic) Pattern (Hulley 1981): upper 100 m (night). Upper limiting temperature 6°–8°C, lower limiting temperature 1.5°–2.0°C (Hulley 1981).

Remarks: *G. fraseri* matures at about 73 mm SL. Gravid females have been taken in June-August. This species has been caught in bottom trawls.

The larvae have been described by Pertseva-Ostroumova (1977).

Attains 88 mm SL.

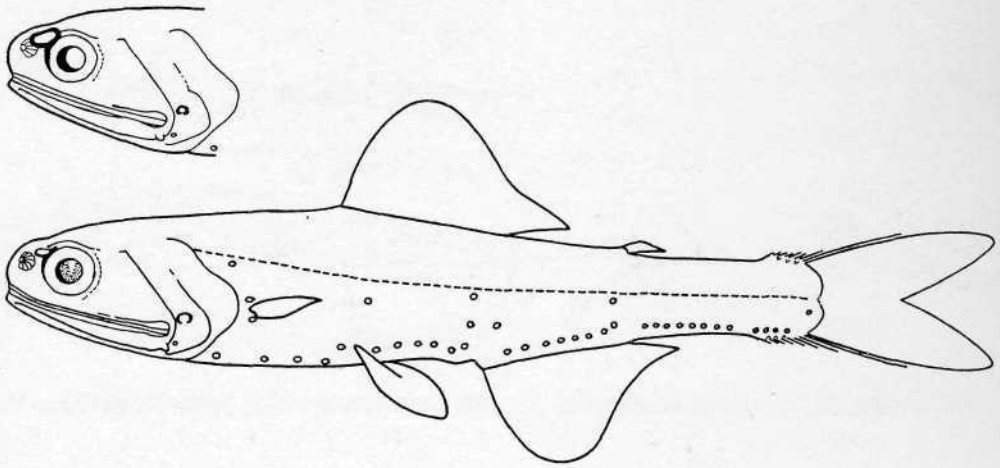


Fig. 20. *Gymnoscopelus (Nasolychnus) fraseri*, 75 mm SL (from *Smiths' Sea Fishes*). Inset figure shows variation in antorbital luminous tissue

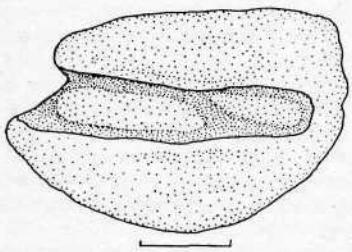


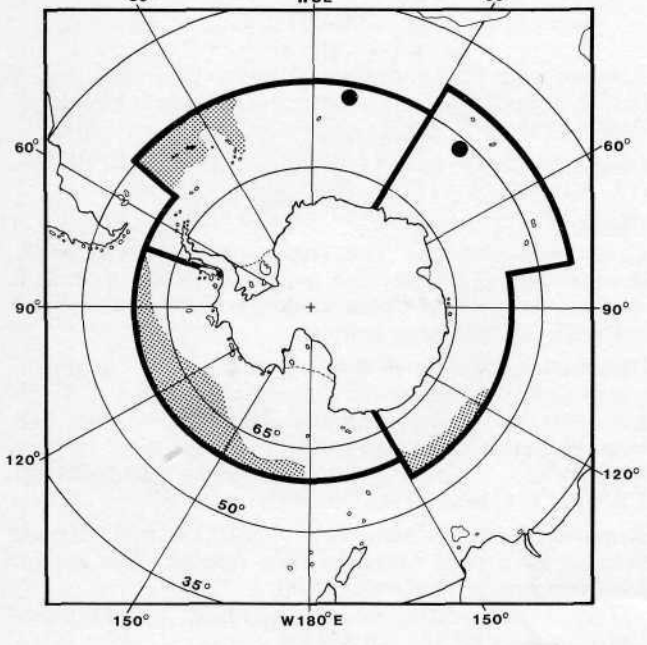
Fig. 21. Representative otolith of *G. (N.) fraseri*; fish length 77 mm SL, scale bar 1 mm

Gymnoscopelus (Nasolychnus) hintonoides
Hulley, 1981
Fig. 22

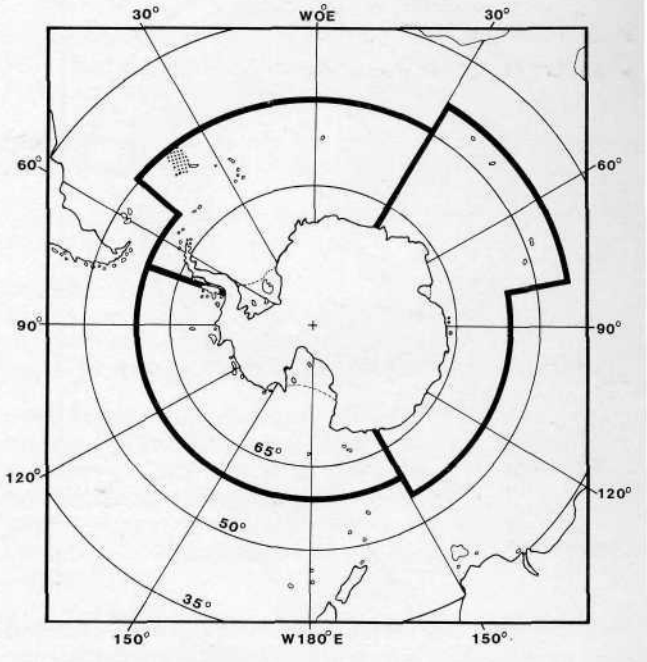
Gymnoscopelus (Nasolychnus) hintonoides Hulley, 1981: 262, figs. 125–126 (42°57.9′S, 39°53.2′W). Holotype: ISH 843/76a.

Diagnosis: D 17–19; A 17–20; P 12–15; GR (7–10)+(18–21); AO (8–11)+(6–10); Prc (3–4)+1.

Distribution: Generally, circumglobal between the STC and the APF. Mesopelagic: South Temperate (Holosubantarctic) Pattern (Hulley 1981): mainly below 800 m,



Distribution of *G. (N.) fraseri*



Distribution of *G. (N.) hintonoides*

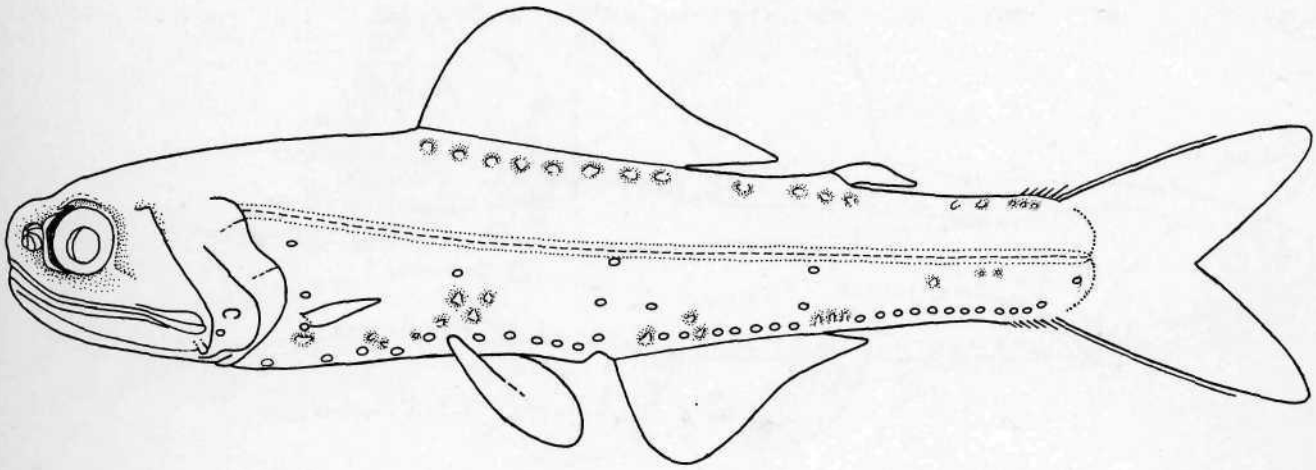


Fig. 22. *Gymnoscopelus (Nasolychnus) hintonoides*, 110 mm SL (from *Smiths' Sea Fishes*)

with shallowest depth of capture 328 m. Recorded from about 50°S to 54°S along 40°W; and between the STC and the APF at about 125°W (Bekker & Evseenko 1987).

Remarks: *G. hintonoides* matures at about 135 mm SL. It has been taken in bottom trawls.

Attains 140 mm SL.

Gymnoscopelus (Nasolychnus) microlampas Hulley, 1981

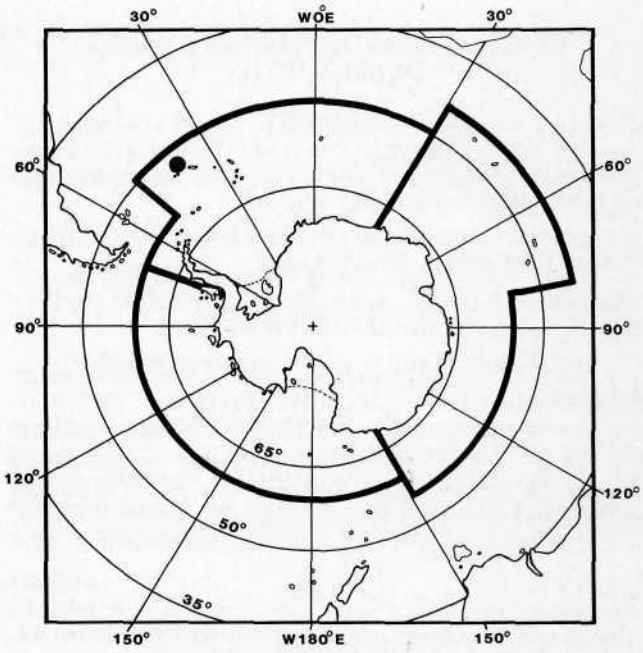
Fig. 23

Gymnoscopelus (Nasolychnus) microlampas Hulley, 1981: 226, figs. 125, 127 (41°46.6'S, 39°58.4'W). Holotype: ISH 551/76a.

Diagnosis: D 18–20; A 18–20; P 13–15; GR (9–11)+(21–24); AO (9–10)+(6–8); Prc (3–4)+1.

Distribution: Generally, circumglobal between STC and APF. Mesopelagic: South Temperate (Holosubantarctic) Pattern (Hulley 1981): below 210 m (night). Recorded from 54°07'S, 30°59'W (Hulley 1981).

Remarks: *G. microlampas* attains 117 mm SL.



Distribution of *G. N. microlampas*

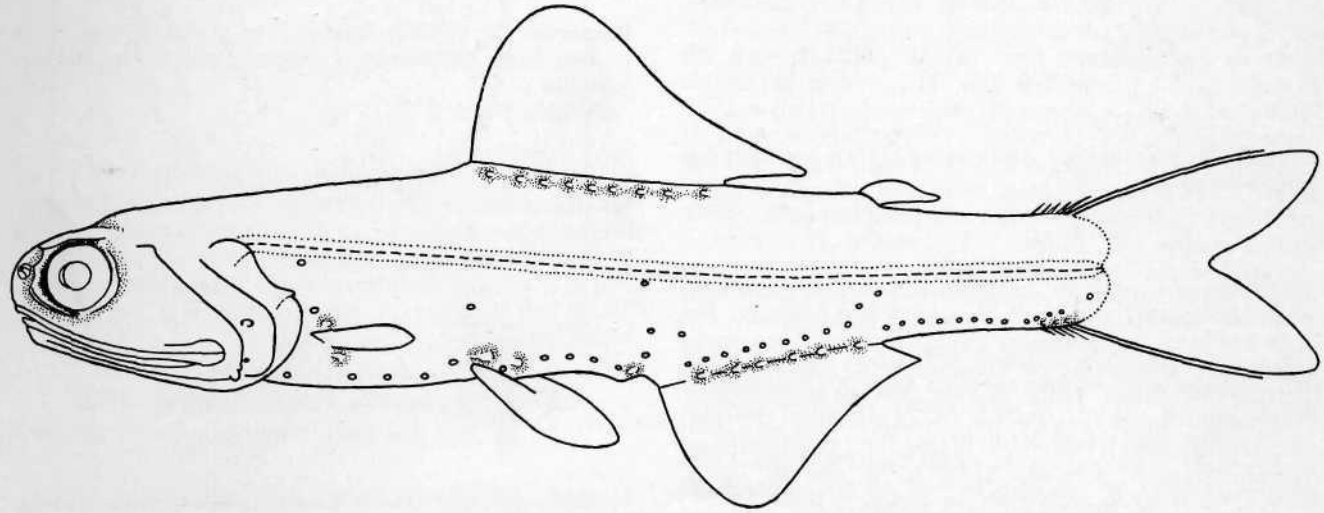


Fig. 23. *Gymnoscopelus (Nasolychnus) microlampas*, 110 mm SL (from *Smiths' Sea Fishes*)

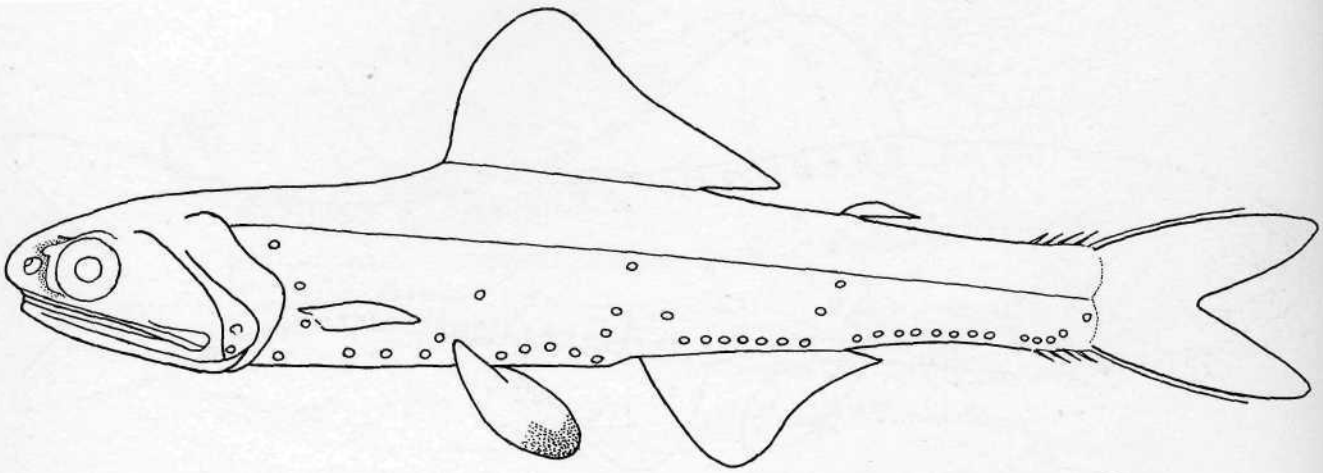


Fig. 24. *Gymnoscopelus (Nasolychnus) piabilis*, 105 mm SL (from *Smith's Sea Fishes*)

Gymnoscopelus (Nasolychnus) piabilis
(Whitley, 1931)
Fig. 24

Lampanyctus piabilis Whitley, 1931: 103, fig. 1, Macquarie Island. Holotype: AMS IA.504.

Myctophum (Nasolychnus) florentii Smith, 1933: 126, pl. 9, near Port Alfred, South Africa.

Diagnosis: D 18–20; A 16–19; P 12–14; GR (9–12)+(20–25); AO (7–10)+(7–10); Prc (3–5)+1.

Colour: Tips of P and C rays darkly pigmented.

Otoliths

Diagnostic features: The oval shape with the small but distinct notch in the posterior margin, the smooth dorsal margin and the dentate ventral margin, the homosulcoid sulcus acusticus, the large anterior and small posterior colliculum, and the distally pointed antirostrum.

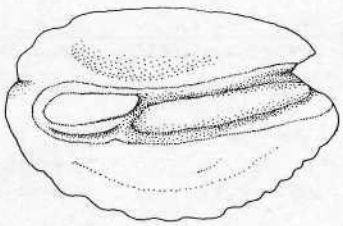
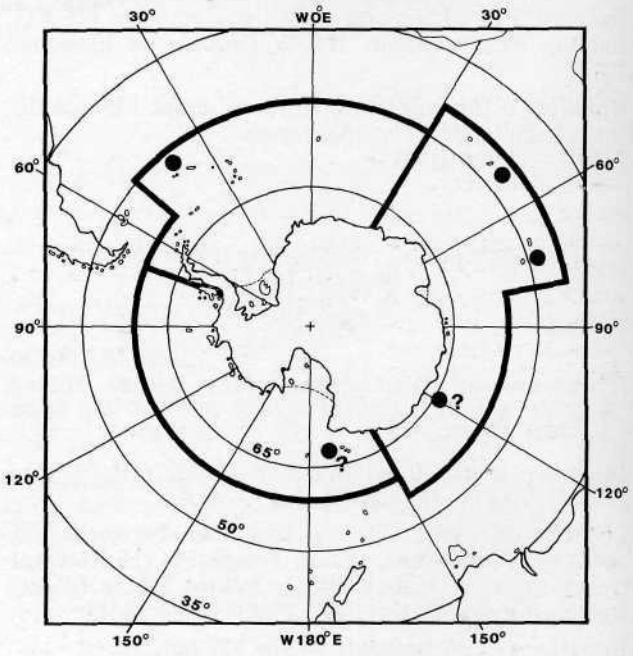


Fig. 25. Representative otolith of *G.* (*N.*) *piabilis*; fish length unknown

Distribution: Generally, between the STC and the APF (Atlantic Sector to south of Australia/New Zealand), but with northern extensions in eastern boundary currents; apparently absent in the sub-Antarctic region of the Pacific (McGinnis 1982; Bekker 1983). Mesopelagic/epibenthic: South Temperate (Semi-subantarctic) Pattern (Hulley 1981): below 100 m (night). In the Southern Ocean, recorded at about 51 °S, 40 °W and 46 °–48 °S, 51 °–71 °E. Two records given by Bekker (1983: fig. 89) from near the Antarctic Continent at about 120 °E and 170 °E may represent misidentifications.



Distribution of *G. (N.) piabilis*

Remarks: *G. piabilis* matures at about 99 mm. It is known from the stomach contents of *Dissostichus eleginoides*.

Attains 146 mm SL.

Genus ***Hintonia*** Fraser-Brunner, 1949

Maxilla extending beyond orbit. Dorsal-fin base slightly longer than anal-fin base. Dn and Vn present; 1 CP; 6 PO; 5 VO; AO series divided into AOa and AOp; 2 Pol; Prc in 2 groups; luminous tissue at cheek photophore, VLO and at base of dorsal, anal, and ventral fins. Monotypic.

Hintonia candens Fraser-Brunner, 1949
Fig. 26

Hintonia candens Fraser-Brunner, 1949: 1089, text-fig. 1104, pl. 18 (41°50′S, 00°01.7′E). Holotype: BMNH 1948.5.14.693.

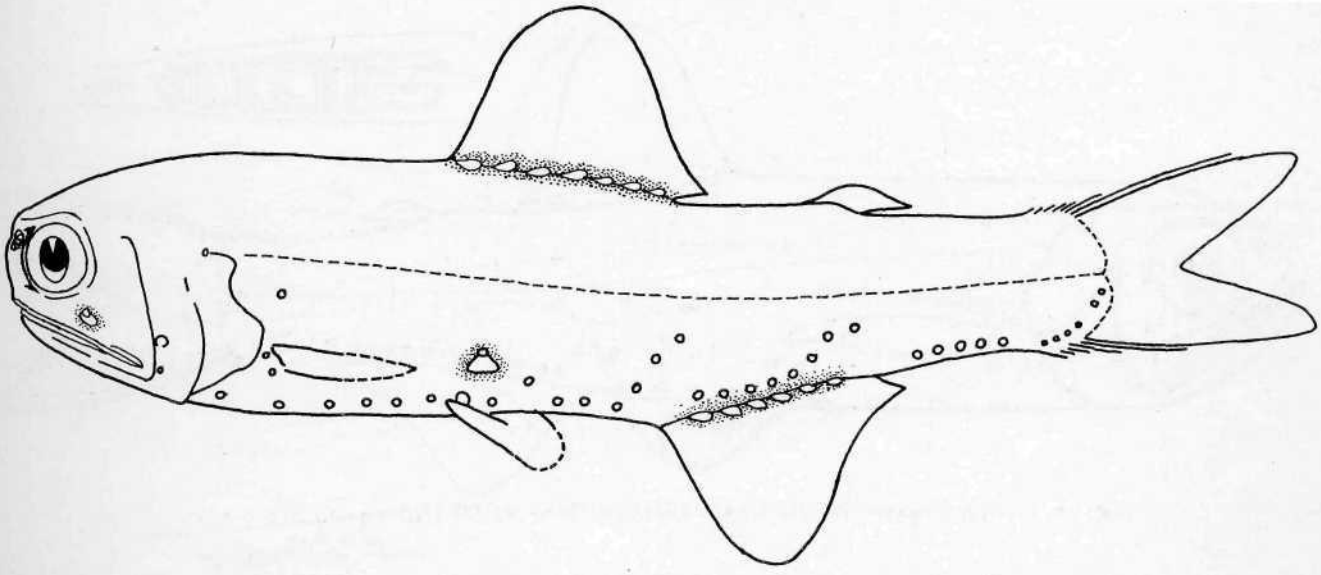
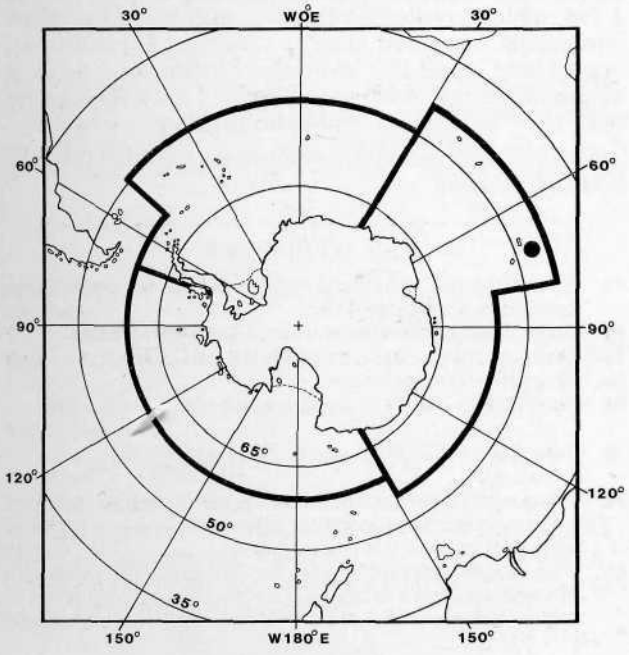


Fig. 26. *Hintonia candens*, 125 mm SL (from *Smiths' Sea Fishes*)

Diagnosis: D 14–16; A 12–14; P 13–15; GR (6–7)+(12–14); AO (5–7)+(5–6); Prc (3–4)+2.

Colour: Large golden-coloured luminous patch below cheek photophore.

Distribution: Generally, between about 40 °S and 50 °S. In the south-western Atlantic, the distribution can be correlated with 34.6‰ isohaline at 200 m. Mesopelagic: South Temperate (Convergence) Pattern (Hulley 1981): juveniles in upper 100 m (night), adults mainly below about 200 m (night). In the Southern Ocean, recorded from 45 °10′S, 69 °12′E (Bekker 1984).



Distribution of *H. candens*

Remarks: *H. candens* attains 130 mm SL.

Genus ***Krefftichthys*** Hulley, 1981

Maxilla greatly expanded posteriorly, extending to or a little behind vertical through posterior margin of orbit. Anal-fin base longer than dorsal-fin base. Dn absent; Vn poorly developed; 5 PO; 4 VO; 2 SAO almost horizontal. Monotypic.

Krefftichthys anderssoni (Lönnberg, 1905)

Fig. 27

Myctophum anderssoni Lönnberg, 1905a: 763 (48 °54′S, 51 °40′W). Lectotype: NRM SYD/1902265.3001; paralectotype: NRM SYD/1902265.3002.

Diagnosis: D 12–14; A 17–20; P 14–16; GR (6–8)+(19–22); AO 12–13. Mature males with 5–8 separate, individually complex, supracaudal glands; mature females with 2–4 separate, luminous glands infracaudally.

Otoliths

Diagnostic features: The discoid to sub-quadrate shape, the ostial and heterosulcoid sulcus acusticus, the distinctive myctophiform colliculi, plus the presence of a pseudo-colliculum in the cauda.

Distribution: Occurs throughout the region, from the Antarctic Divergence/Weddell-Scotia Confluence to the northern boundary limits, and further north in meridional currents: to 32 °–33 °S in Peruvian Current and to 34 °S in Falkland Current. Mesopelagic: Broadly Antarctic Pattern (Hulley 1981): upper 50–100 m (night) south of APF, but deeper (500–600 m) north of APF (Bekker 1983) and at depths greater than 1,000 m at STC (Hulley 1981). Also recorded from upper 200 m over Discovery Seamount (Lubimova *et al.* 1983). An upper limiting temperature of 2.6 °–5.6 °C has been postulated (Andriashev 1962; Hulley 1981). Known also from the STC zone of the south-west Indian Ocean (Bekker 1983).

Remarks: *K. anderssoni* matures at about 54 mm SL. The larvae occur in large quantities only north of the APF (Efremenko 1976). The diet in the Indian Ocean sector consists mainly of copepods (68% occurrence: *Calanoides acutus, Calanus propinquus*), with small euphausiids (50%: *Thysanoessa macrura* furcilia/adults) and amphipods (*Primno macropa, Hyperia* sp.) as alternatives (Williams 1985b), while in the Atlantic Ocean sector Rembiszewski *et al.* (1978) have recorded

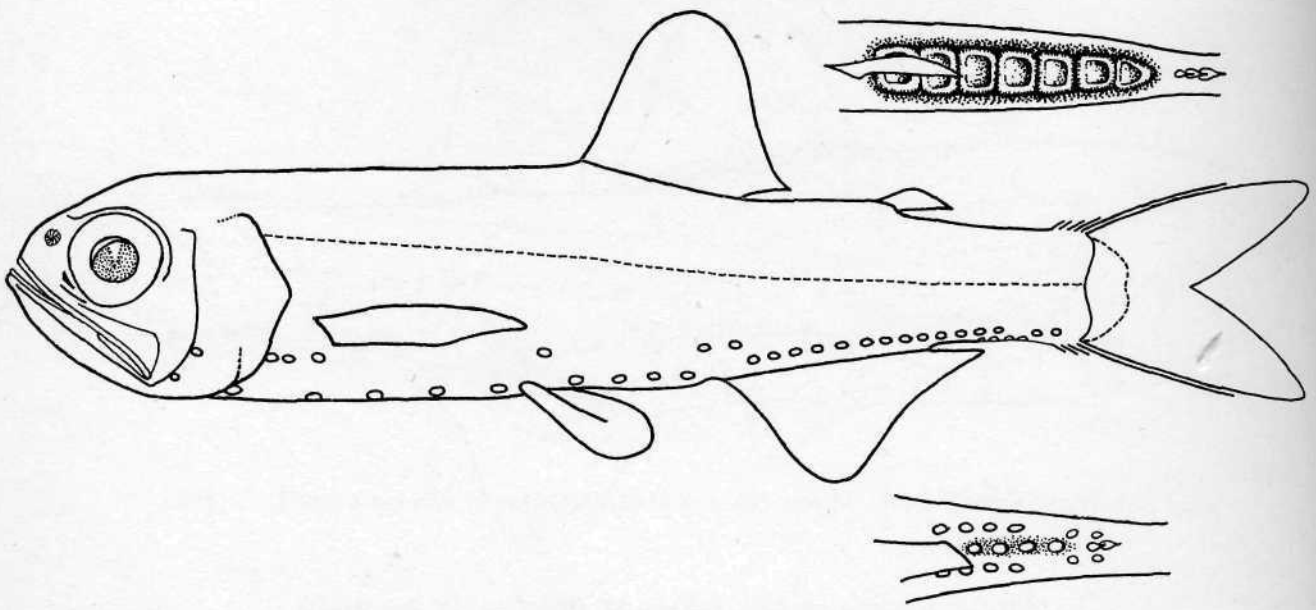


Fig. 27. *Krefftichthys anderssoni*, 55 mm SL (from *Smiths' Sea Fishes*)

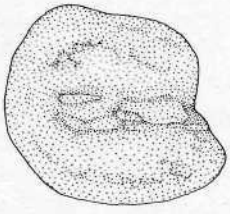
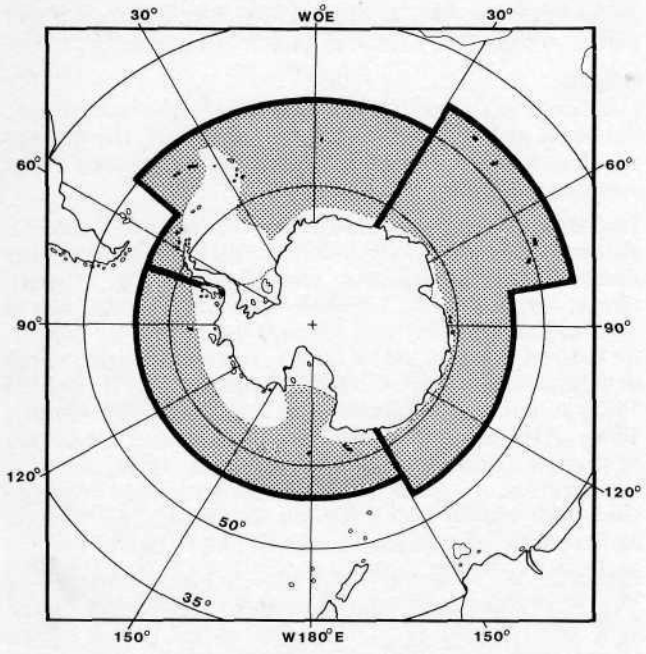


Fig. 28. Representative otolith of *K. anderssoni*; fish length 71 mm TL; scale bar 1 mm



Distribution of *K. anderssoni*

Euphausia superba in 68% of stomachs. *K. anderssoni* was found in the stomach contents of *Champsocephalus gunnari* (Duhamel & Hureau 1982).

The larvae have been described by Moser & Ahlstrom (1974), Efremenko (1976, 1983), Belyanina & Kovalevskaya (1979), and Moser *et al.* (1984).

Attains 71 mm SL.

Genus ***Lampanyctus*** Bonaparte, 1840

Maxilla slightly expanded posteriorly, extending well behind orbit. Anal-fin base longer than dorsal-fin base. Dn absent; Vn small; 5 PO; 4 (rarely 5) VO; 3 SAO, usually angulate; AO series divided into AOa and AOp; 2 Pol, oblique; 4 Prc. Both sexes with supracaudal and infracaudal luminous glands, consisting of numerous, overlapping, scale-like structures; luminous scale(s) at adipose-fin origin present or absent. Cheek photophore (CP) and "secondary" photophores in some species.

More than 35 species of which 5 are recorded from the Southern Ocean.

KEY TO SPECIES

1a Branchiostegal membrane with small serial photophores between branchiostegal rays. . . . . *L. australis*
1b Branchiostegal membrane without serial photophores 2
2a One or more photophores on cheek. 3
2b No photophores on cheek. 4
3a Total GR 24–30; AOa series level or only slightly arched . . . . . *L. macdonaldi*
3b Total GR 14–16; AOa^1 and/or AOa^2 depressed. . . . . *L. intricarius*
4a P fins weakly developed; Pol on or slightly before vertical at origin of adipose fin; origin of adipose fin well in advance of vertical at base of last A ray . . . . . *L. ater*
4b P fins absent (present in very small juveniles); Pol well in front of vertical at origin of adipose fin; origin of adipose fin on or slightly behind vertical at base of last A ray. . . . . *L. achirus*

Lampanyctus achirus Andriashev, 1962

Fig. 29

Lampanyctus achirus Andriashev, 1962: 256, fig. 27 (64°36′S, 108°52′W). Holotype: ZIN 36111.

Diagnosis: D 14–16; A 16–20; P absent in adults; GR (5–6)+(12–14); AO (6–8)+(7–9).

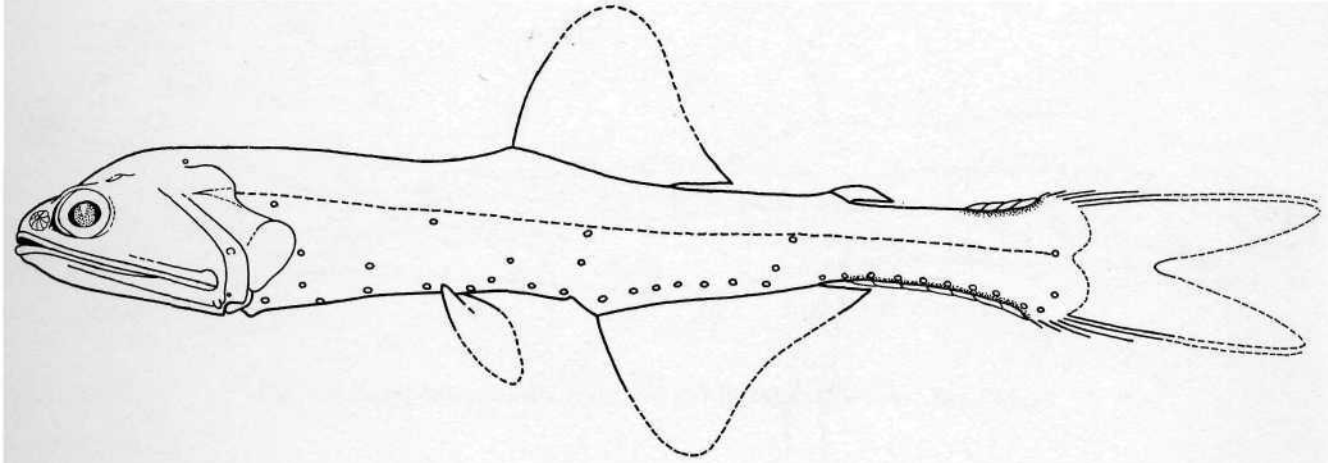


Fig. 29. *Lampanyctus achirus*, 70 mm SL (from *Smiths' Sea Fishes*)

Otoliths

DIAGNOSTIC FEATURES: Dorso-ventral rectangular shape with the mid-medially situated ostial and homosulcoid sulcus acusticus.

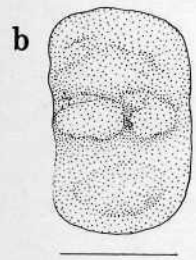


Fig. 30. Representative otolith of *L. achirus*; fish length 160 mm TL; scale bar 1 mm

Distribution: Circumglobal from the STC to south of the APF at Weddell-Scotia Confluence and northern reaches of Ross Sea, and with northern extensions to 21°S in meridional currents. Bathypelagic: South Temperate (Subantarctic) Pattern (Hulley 1981): usually below 500 m, shallower in upwelling regions.

Remarks: *L. achirus* matures at about 133 mm SL. The larvae have been described by Moser & Ahlstrom (1974) and Moser *et al.* (1984).

Attains 162 mm SL.

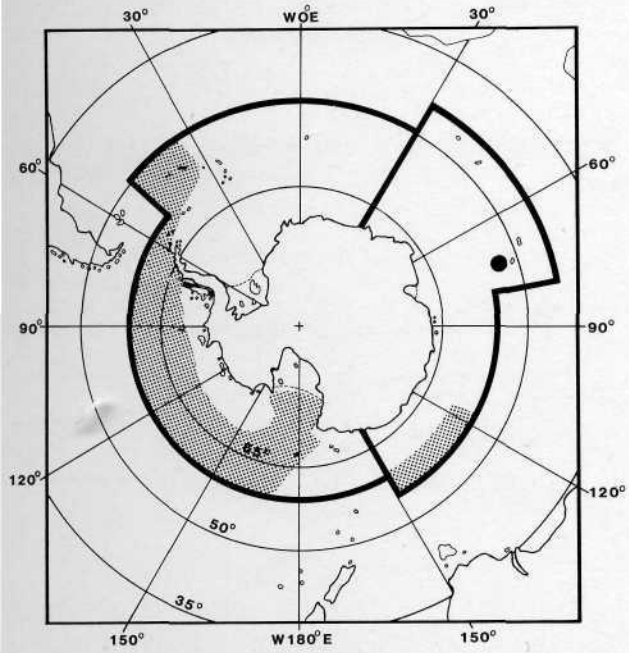
Lampanyctus ater Tåning, 1928

Fig. 31

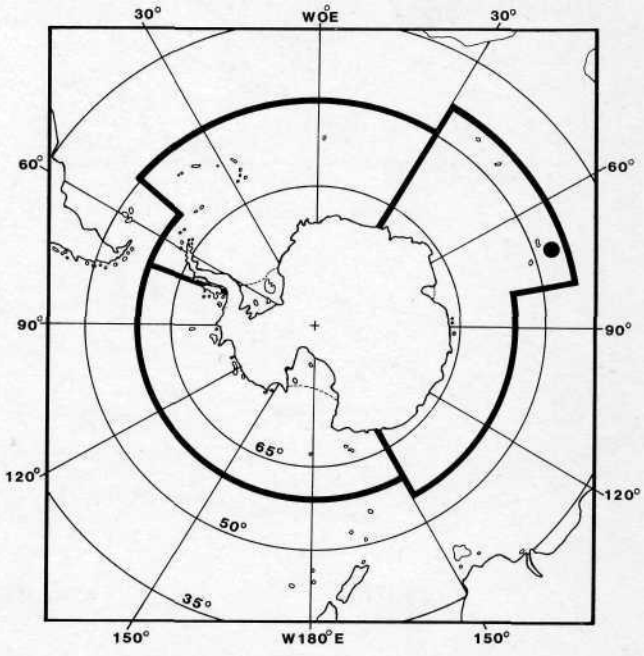
Lampanyctus ater Tåning, 1928: 67 (24°30′S, 80°00′W). Lectotype: ZMUC P2330212.

Diagnosis: D 14–16; A 16–20; P 11–12; GR (4–5)+(11–13); LL 36–39; AO (6–8)+(6–9).

Distribution: Generally, 58°–17°N and 15°–40°S (Atlantic), 12°–44°S (Indian), between Australia and New Zealand and in the Tasman Sea. Mesopelagic: Subtropical (Bisubtropical) Pattern (Hulley 1981): 550–750 m (day), 40–550 m (night). In the Southern Ocean, recorded from 45°10′S, 69°12′E (Bekker 1984).



Distribution of *L. achirus*



Distribution of *L. ater*

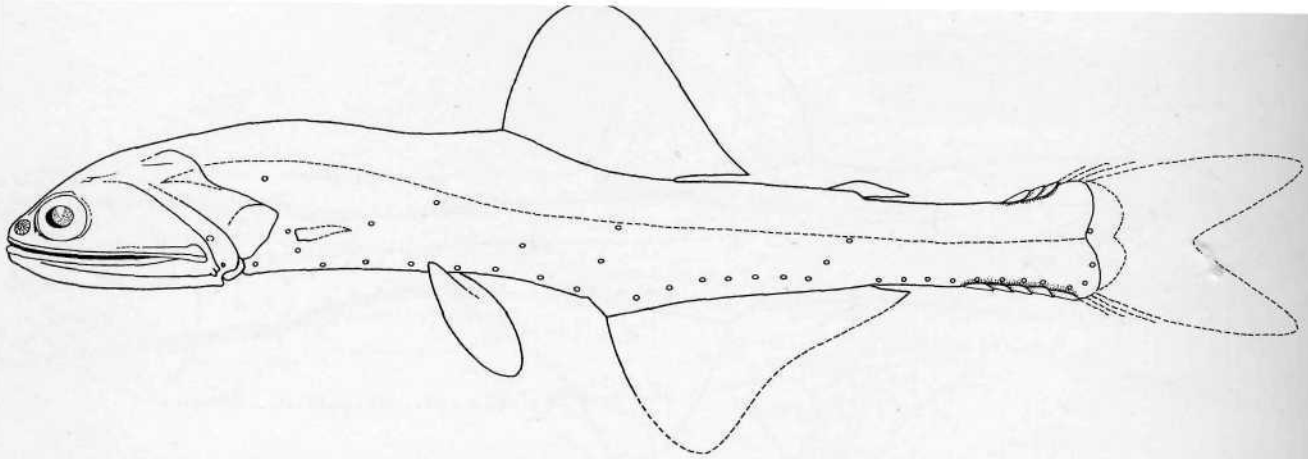


Fig. 31. *Lampanyctus ater*, 105 mm SL (from *Smiths' Sea Fishes*)

Remarks: *L. ater* attains 140 mm SL and is sexually mature from about 90 mm SL.

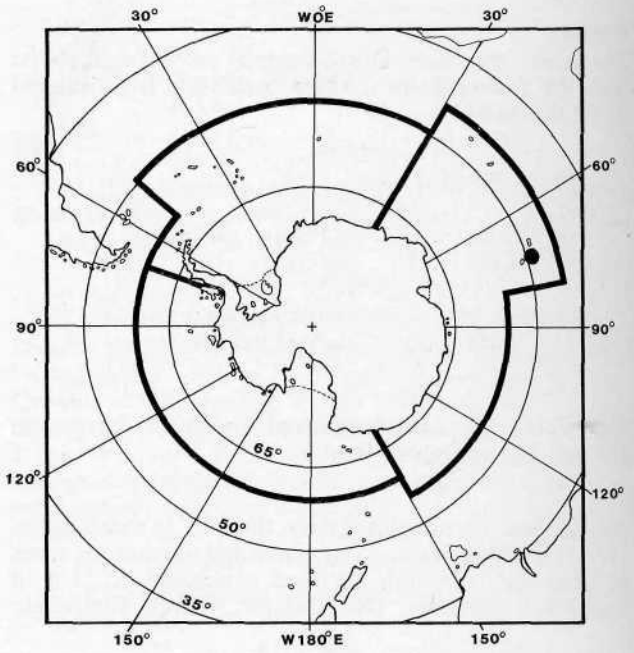
Lampanyctus australis Tåning, 1932
Fig. 32

Lampanyctus alatus australis Tåning, 1932: 145 (41°47′S, 176°55′E). Lectotype: ZMUC P2330216.

Diagnosis: D 12–14; A 17–19; P 13–15; GR (5–7)+(13–16); AO (6–9)+(6–9).

Distribution: Generally, circumglobal between 33°S and 44°S, but with northern extensions in eastern boundary currents. Mesopelagic: South Temperate (Convergence) Pattern (Hulley 1981): adults mainly below 500 m (night) but juveniles less than 80 mm in upper 100 m (night). In the Southern Ocean, recorded from 45°10′S, 69°12′E (Bekker 1984).

Remarks: *L. australis* matures at about 95 mm SL. Gravid females have been taken in June.
Attains 131 mm SL.



Distribution of *L. australis*

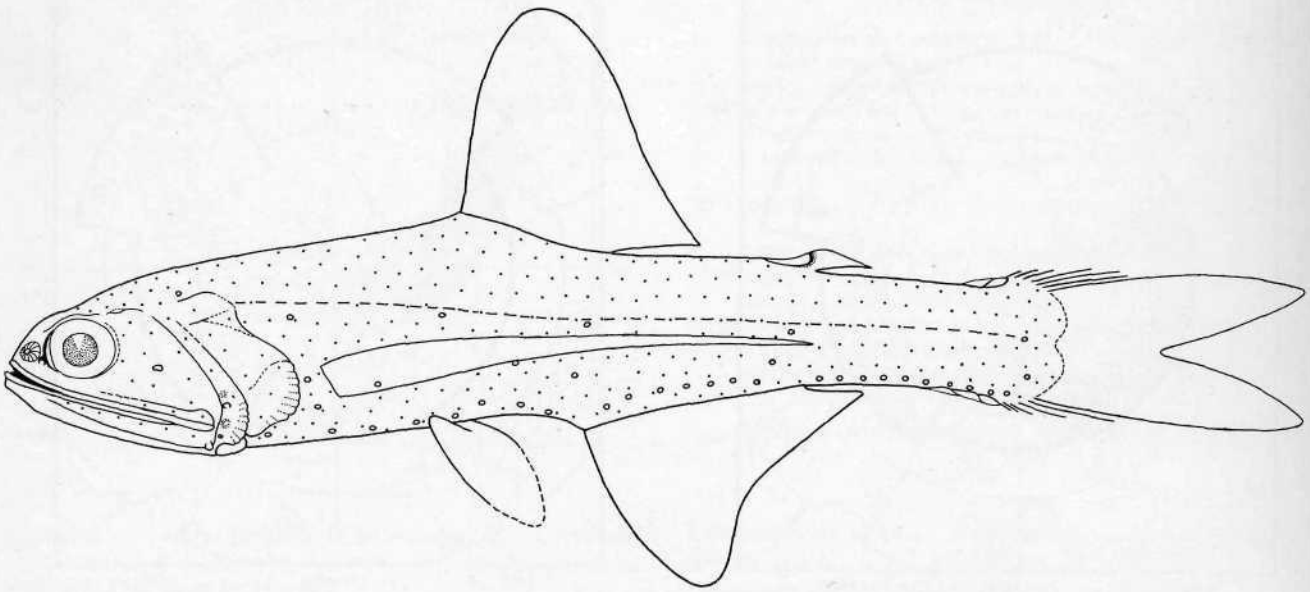


Fig. 32. *Lampanyctus australis*, 90 mm SL (from *Smiths' Sea Fishes*)

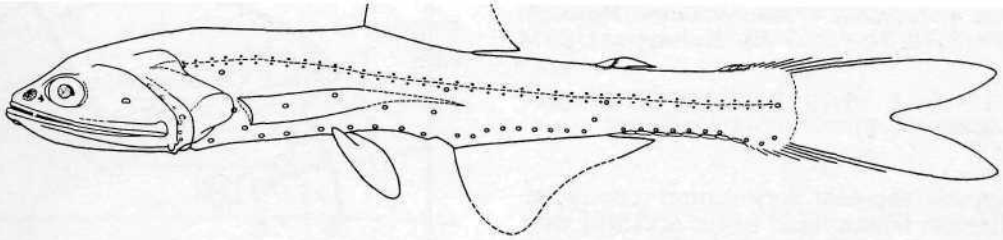


Fig. 33. *Lampanyctus intricarius*, 40 mm SL (from *Smiths' Sea Fishes*)

Lampanyctus intricarius Tåning, 1928
Fig. 33

Lampanyctus intricarius Tåning, 1928: 67 (38°10′N, 09°20′W). Lectotype: ZMUC P2330208.

Diagnosis: D 14–16; A 17–20; P 13–15; GR 4+(10–12); AO (8–10)+(7–9).

Otoliths

DIAGNOSTIC FEATURES: The oval to discoid shape, the ostial and homosulcoid sulcus acusticus, with no separation between ostium and cauda, the large ostium relative to the cauda (ca. 4×), the prominent pseudocolliculum, and the prominent and rounded rostrum.

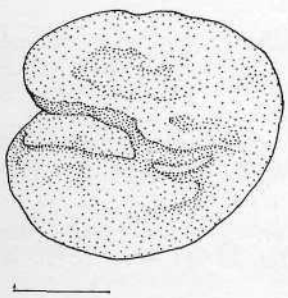
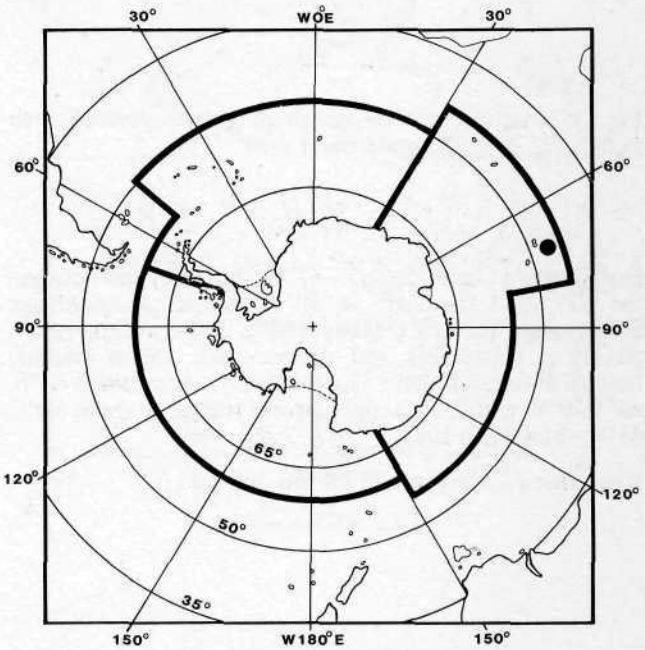


Fig. 34. Representative otolith of *L. intricarius*; fish length 163 mm SL; scale bar 1 mm

Distribution: Generally, 65°–32°N (North Atlantic) and in the STC zone in all three oceans, but with northern extensions to 18°S in eastern boundary currents. Mesopelagic: Bitemperate Pattern (Hulley 1981): 550–750 m (day) 40–550 m (night). In the Southern Ocean, recorded from 45°10′S, 69°12′E (Bekker 1984).

Remarks: *L. intricarius* attains 200 mm SL.



Distribution of *L. intricarius*

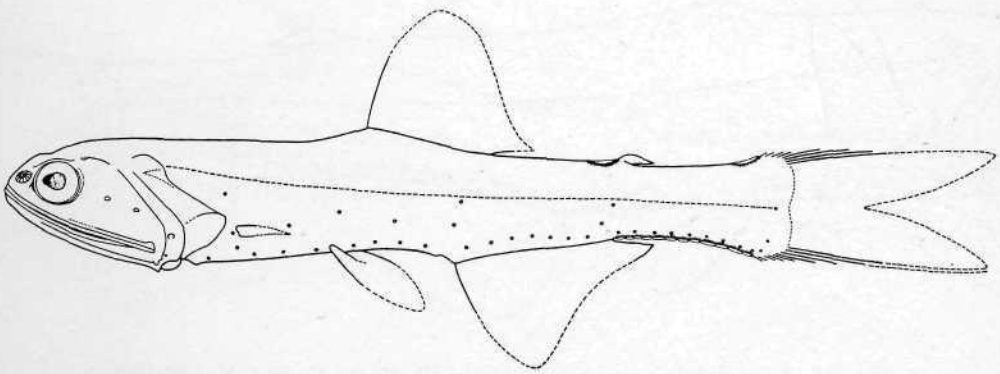


Fig. 35. *Lampanyctus macdonaldi*, 100 mm SL (from *Smiths' Sea Fishes*)

Lampanyctus macdonaldi (Goode & Bean, 1896)
Fig. 35

Nannobrachium macdonaldi Goode & Bean, 1896: 94, pl. 29, fig. 110 (39°48′N, 70°36′W). Holotype: USNM 39478.

Diagnosis: D 14–16; A 16–19; P 12–14; GR (8–10)+(16–21); AO (6–8)+(6–8).

Otoliths

DIAGNOSTIC FEATURES: The near dorsoventral rectangular shape, the ostial and homosulcoid sulcus acusticus with no distinction between ostium and cauda, the single colliculum and the absence of the rostrum, antirostrum and excisura ostii.

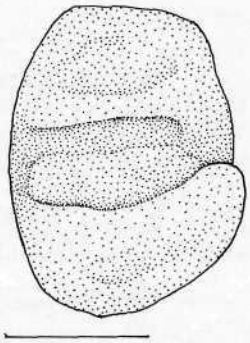
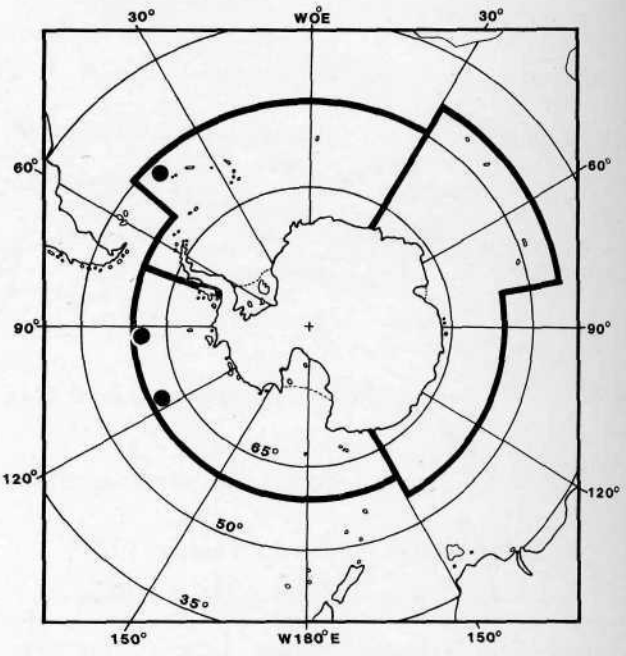


Fig. 36. Representative otolith of *L. macdonaldi*; fish length 122 mm SL; scale bar 1 mm

Distribution: Generally, 65°–47°N (Atlantic) and between the STC and the APF in all 3 sectors. Mesopelagic: Bitemperate Pattern (Hulley 1981): 550–1,000 m (day), 60–175 m (juveniles) and deeper than 250 m (adults) (night). In the Southern Ocean, recorded from 60°–63°S, 90°–120°W and in Falkland Current region at about 52°S, 43°W (McGinnis 1982).

Remarks: *L. macdonaldi* attains 160 mm SL.



Distribution of *L. macdonaldi*

Genus ***Lampichthys*** Fraser-Brunner, 1949

Maxilla slightly expanded posteriorly, extending well behind orbit. Anal-fin base slightly longer than dorsal-fin base. Dn and Vn present; 2–6 CP; 5 PO; 5 VO; SAO series markedly angulate; AO series divided into AOa and AOp; 3 Pol, forming right angle; "secondary" photophores on head and trunk; patches of luminous tissue of various shapes and sizes on body and 1 patch supracaudally. Monotypic.

Lampichthys procerus (Brauer, 1904)
Fig. 37

Myctophum (Lampanyctus) procerus Brauer, 1904: 402, fig. 9 (35°32′08″S, 18°20′01″E). Holotype(?): ZMB 17609.

Lampichthys rectangularis Fraser-Brunner, 1949: 1096, text-fig. 1003, fig. 14 (44°42′S, 53°32′W).

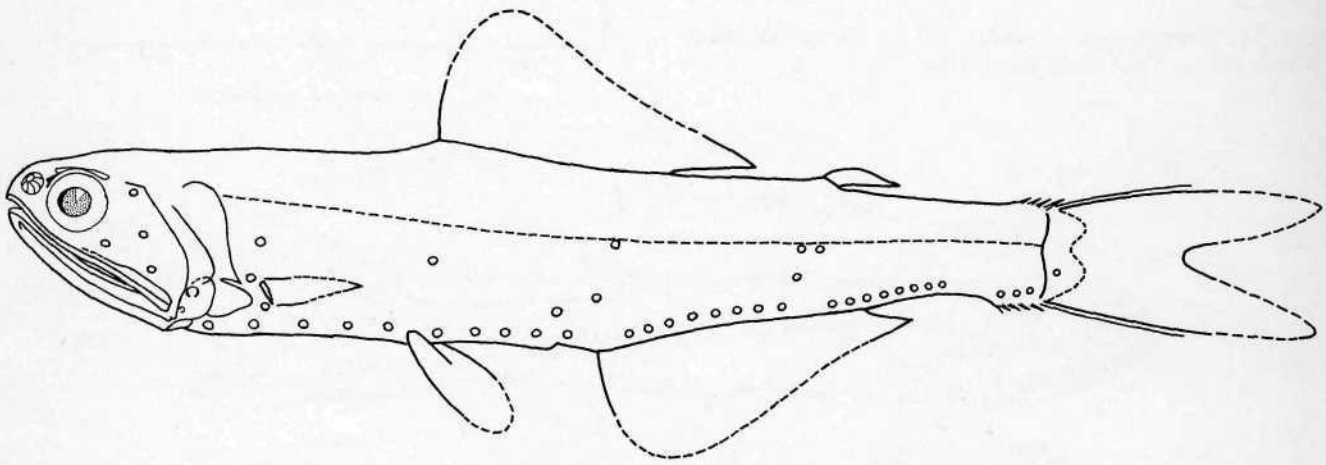
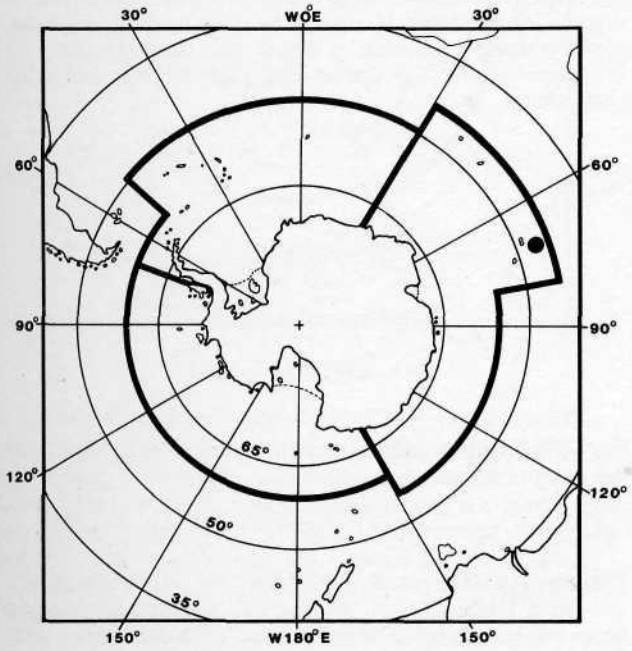


Fig. 37. *Lampichthys procerus*, 85 mm SL (from *Smiths' Sea Fishes*)

Lampichthys rutkovichi Linkowski, 1985: 319, figs. 1–2a (23°36′S, 06°13′E).

Diagnosis: D 16–18; A 21–23; P 13–15; GR (4–6)+(13–16); AO 8+8.

Distribution: Generally, in the STC zone in all 3 oceans, but with extensions into lower latitudes in eastern boundary currents. Mesopelagic: South Temperate (Convergence) Pattern (Hulley 1981): 700–1,200 m (day), 100–700 m (night). In the Southern Ocean, recorded from 45°10′S, 69°12′E (Bekker 1984).



Distribution of *L. procerus*

Remarks: *L. procerus* matures at about 80 mm SL. The larvae have been described by Moser & Ahlstrom (1972).

Attains 95 mm SL.

Genus ***Metelectrona*** Wisner, 1963

Maxilla greatly expanded posteriorly, extending to or only slightly behind vertical at posterior margin of orbit. Anal-fin base longer than dorsal-fin base. Dn and Vn present; 5 PO; 4 VO; SAO angulate; Pol absent, but AO series behind anal fin base markedly depressed, forming "Pol grouping". Both sexes with single luminous patch supracaudally and infracaudally.

Two species, of which 1 is recorded from the Southern Ocean.

Metelectrona ventralis (Bekker, 1963)

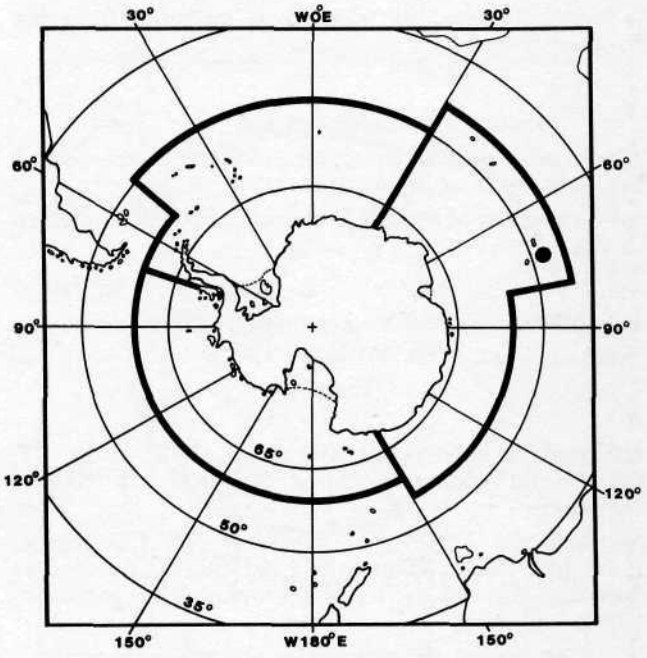
Fig. 38

Electrona ventralis Bekker, 1963: 26, fig. 5 (42°40′S, 39°07′W). Holotype: ZIN 36804.

Metelectrona ahlstromi Wisner, 1963: 25, fig. 1 (46°53′S, 179°48′W).

Diagnosis: D 13–15; A 20–22; P 14–16; GR (6–7)+(17–20); AO 13–17.

Distribution: Generally, circumglobal between 36° and 51°S. The most southerly records (50°40′S, 50°01′W;



Distribution of *M. ventralis*

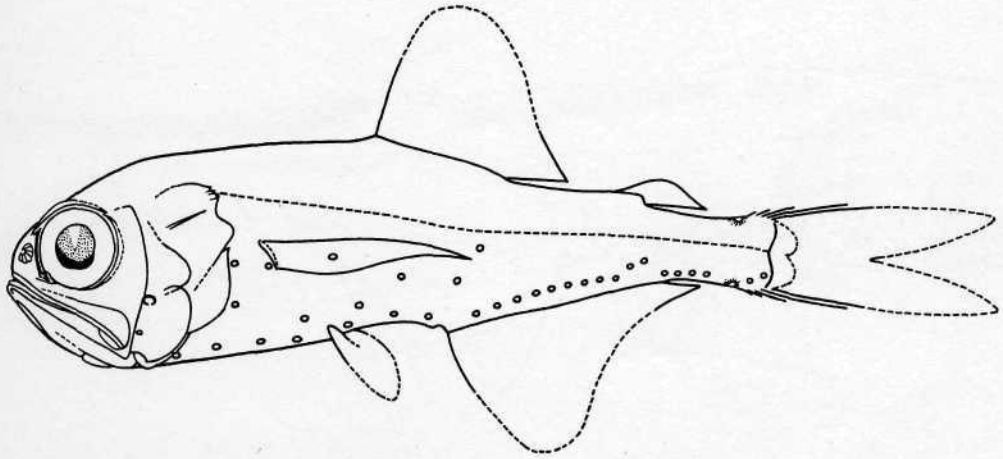


Fig. 38. *Metelectrona ventralis*, 40 mm SL (from *Smiths' Sea Fishes*)

47°50.6′S 40°00.8′W) in the south-west Atlantic lie outside the defined boundary limits. Mesopelagic: South Temperate (Semi-subantarctic) Pattern (Hulley 1981): from surface to 350 m (night). In the Southern Ocean, recorded only as stomach contents of fishes from 48°–50°S, 70°–71°E.

Remarks: *M. ventralis* matures at about 81 mm SL. It was found in the stomach contents of *Champsocephalus gunnari* and *Dissostichus eleginoides*.

Attains 107 mm SL.

Genus *Notoscopelus* Günther, 1864

Maxilla slightly expanded posteriorly, extending well past orbit. Dorsal-fin base longer than anal-fin base; pectoral fins short. Dn well developed; Vn small; 5 PO; 5 VO; SAO series obtusely angulate; AO series divided into AOa and AOp; 2 (sometimes 3) Pol, horizontally arranged; 2+1 Prc; large supracaudal luminous gland only in males; numerous patches of luminous tissue on trunk and at bases of procurrent caudal rays.

Two subgenera, of which 1 is recorded from the Southern Ocean.

Subgenus *Notoscopelus* Günther, 1864

Adult males with large supracaudal gland but without luminous tissue on cheek and above eye.

Five species, of which 1 is recorded from the Southern Ocean.

Notoscopelus (Notoscopelus) resplendens (Richardson, 1845)

Fig. 39

Lampanyctus resplendens Richardson, 1845: 42, pl. 27, figs. 16–18, no type locality. Syntypes (3): BMNH 1843.3.16.

Notoscopellus brachychier Eigenmann & Eigenmann, 1889: 126, Cortez Banks off California. (Emended to *Notoscopelus brachychir* Eigenmann & Eigenmann, 1890.)

Notoscopelus ejectus Waite, 1904: 150, Lord Howe Island.

Serpa hoffmanni Fowler, 1934: 282, fig. 43 (36°45′N, 74°28′39″W).

Diagnosis: D 21–24; A 18–20; P 11–13; GR (5–7)+(13–16); AO (7–9)+(4–7).

Otoliths

DIAGNOSTIC FEATURES: The oval shape, the ostial and homosulcoid sulcus acusticus, the entire dorsal margin, the slightly serrate ventral margin, the sinuate posterior margin, the extremely short and distally blunt rostrum, and the distinct colliculi of which the anterior colliculum is approximately 4 times the size of the posterior colliculum.

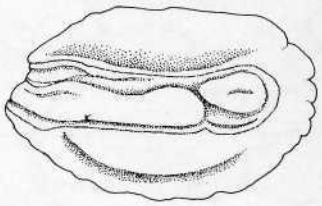


Fig. 40. Representative otolith of *N.* (*N.*) *resplendens*; fish length unknown

Distribution: Generally, 47°N to the STC (Atlantic), 24°–30°S (Indian), and 35°N–34°S (Pacific), but absent from western tropical Pacific and south-east Asian Seas (Bekker 1983). Mesopelagic: Broadly Tropical (Holoeurytropical) Pattern (Hulley 1981): 651–2,000 m (day), 50–300 m and at surface in cooler waters (night). In the Southern Ocean, recorded from 60°58′S, 48°05′W (Andriashev 1962).

Remarks: *N. resplendens* matures at about 66 mm. The larvae have been described by Moser & Ahlstrom (1972, 1974), Badcock & Merrett (1976), and Shiganova (1977).

Attains 95 mm SL.

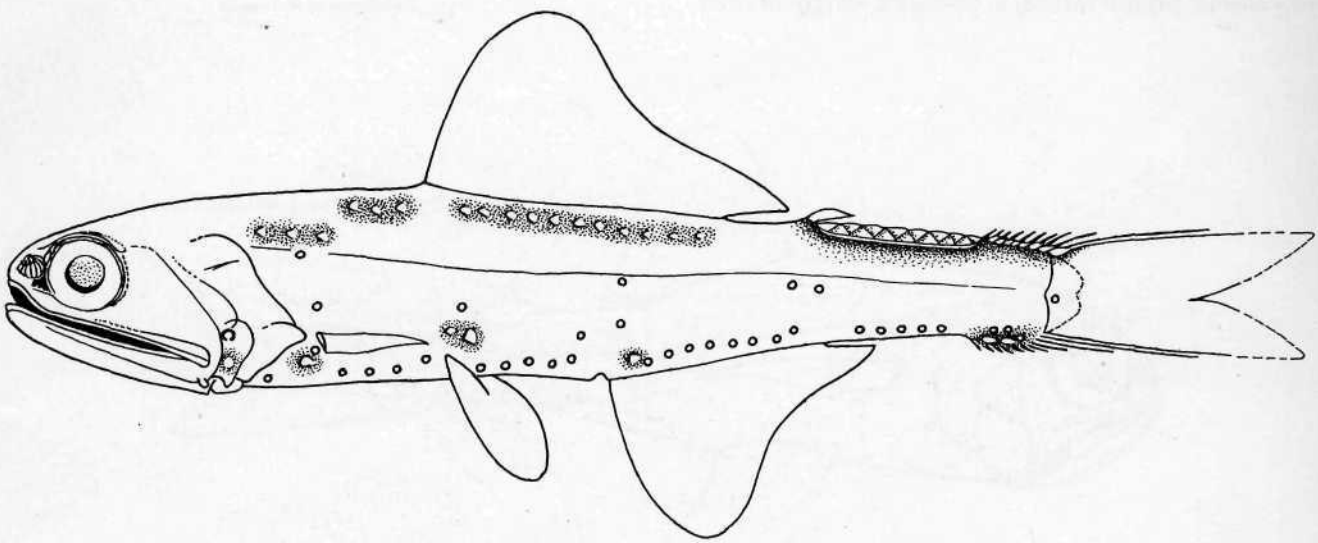
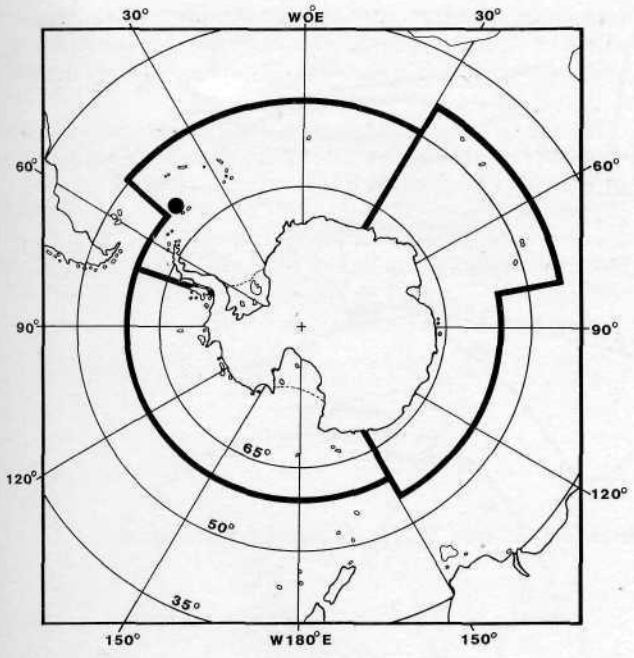


Fig. 39. *Notoscopelus (Notoscopelus) resplendens*, 60 mm SL (from *Smiths' Sea Fishes*)



Distribution of *N. (N.) resplendens*

Genus ***Protomyctophum*** Fraser-Brunner, 1949

Maxilla greatly expanded posteriorly, extending to or only slightly behind vertical through posterior margin of orbit. Anal-fin base longer than dorsal-fin base. Dn minute; Vn small; 5 PO; 4 VO; 3 SAO straight or weakly angulate; supracaudal and infracaudal glands present.

Two subgenera, both of which are recorded from the Southern Ocean.

KEY TO SUBGENERA

1a Eyes semi-telescopic; interorbital width less than expanded posterior end of maxilla ..... *Hierops*

1b Eyes normal; interorbital width greater than expanded end of maxilla ..... *Protomyctophum*

Subgenus ***Hierops*** Fraser-Brunner, 1949

Seven species, of which 1 is recorded from the Southern Ocean. *Protomyctophum (Hierops) subparallelum* (Tåning, 1932) has been recorded from just outside the northern boundary limit at 80°W (McGinnis 1982).

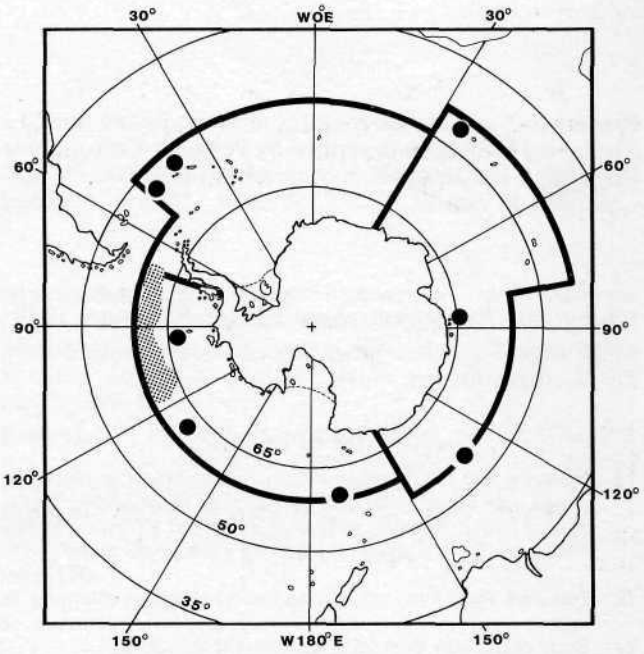
Protomyctophum (Hierops) parallelum (Lönnberg, 1905)

Fig. 41

Myctophum parallelum Lönnberg, 1905a: 764 (48°27′S, 42°36′W). Holotype: NRM SYD/1902261.3003.

Diagnosis: D 10–13; A 23–27; P 14–15; GR (3–4)+(13–15); AO 17–19. Mature males with single, large, supracaudal luminous gland, outlined in black pigment; mature females with 1–3 infracaudal, luminous scales.

Distribution: Generally circumglobal between the STC and the APF with extensions to 35°S (Australian Bight) and 32°S (off Argentina and Chile). Mesopelagic: South Temperate (Holosubantarctic) Pattern (Hulley 1981): 150–450 m (night), nyctoepipelagic at surface in Pacific (Bekker 1983). In the Southern Ocean, recorded at 53°18′S, 49°57′W and 45°25′S, 36°32′E (Hulley 1981, 1986b).



Distribution of *P. (H.) parallelum*

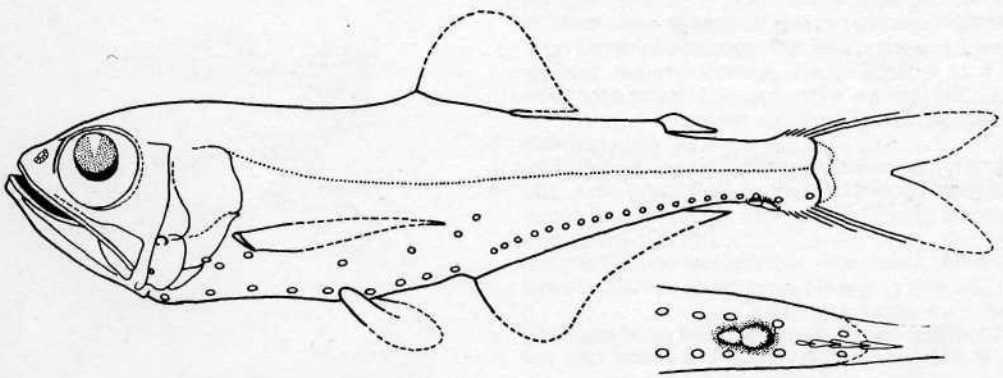


Fig. 41. *Protomyctophum (Hierops) parallelum*, 40 mm SL (from *Smiths' Sea Fishes*)

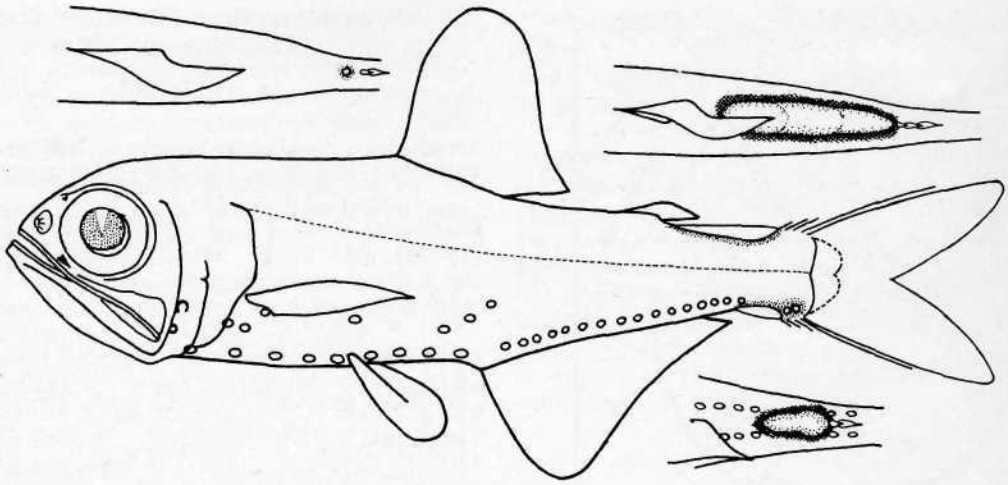


Fig. 42. *Protomyctophum (Protomyctophum) andriashevi*, 55 mm SL (from *Smiths' Sea Fishes*)

Remarks: *P. parallelum* matures at about 32–44 mm SL. The larvae have been described by Pertseva-Ostroumova (1967) and Belyanina & Kovalevskaya (1979).

Attains 50 mm SL.

Subgenus ***Protomyctophum*** Fraser-Brunner, 1949

More than 7 species. Seven species are recorded from the Southern Ocean.

KEY TO SPECIES

1a Distance Prc_1–Prc_2 greater than one photophore-diameter; males with single, medially constricted, black-edged supracaudal gland; females with 3–6 individual luminous scales infracaudally, or a single, coalesced infracaudal gland ..... *P. (P.) bolini*

1b Distance Prc_1–Prc_2 about one-half photophore-diameter or less 2

2a Body depth less than 25% SL (usually 21–23%) 3

2b Body depth greater than 25% SL (usually 26–30%) 4

3a Palatine teeth in anterior group only; length of posterior ventral expansion of maxilla about equal to length of distal margin of maxilla; males with supracaudal gland only, comprising 6–8 partially coalesced luminous scales; females with infracaudal gland only, comprising 4–6 separate, luminous patches ..... *P. (P.) tenisoni*

3b Teeth evenly spaced along entire length of palatine; length of posterior ventral expansion of maxilla greater than length of distal margin of maxilla; males with supracaudal gland only, comprising 5 or 6 black-edged, diamond-shaped, partially coalesced scales; females with infracaudal gland only, comprising 5–7 well-separated luminous patches ..... *P. (P.) choriodon*

4a Total GR 18–21; males with single, large, supracaudal gland, extending from procurrent caudal rays to adipose base, and small infracaudal gland; females with single, minute, supracaudal gland only ..... *P. (P.) andriashevi*

4b Total GR 22–28; males with supracaudal and infracaudal glands; females with or without supracaudal and infracaudal gland, or with infracaudal gland only 5

5a P rays 16–18; males with single supracaudal gland extending about 70% of distance between procurrent caudal rays and adipose base, and single (sometimes bifid) infracaudal gland; females with single small supracaudal gland and minute infracaudal gland ..... *P. (P.) gemmatum*

5b P rays 13–15; males with supracaudal and infracaudal glands; females with well-developed infracaudal gland only, or with well-developed supracaudal and infracaudal gland 6

6a Males with single supracaudal gland, extending about 60% of distance from procurrent C rays to adipose base, and infracaudal gland of 2–4 separate, indistinct, luminous scales, the posteriormost being the best developed; females with infracaudal gland only, comprising 2–4 separate, luminous scales; total GR 25–28 (rarely 24) ..... *P. (P.) normani*

6b Males with single supracaudal gland, extending about 50% of distance from procurrent C rays to adipose base, and single, coalesced infracaudal gland extending from procurrent C rays to A-fin base; females with single, minute, black-edged infracaudal gland; total GR 22–24 (rarely 25) ... *P. (P.) luciferum*

Protomyctophum (Protomyctophum) andriashevi Bekker, 1963

Fig. 42

Protomyctophum andriashevi Bekker, 1963: 19, fig. 2 (42°16′S, 39°00′W). Holotype: ZIN 36803.

Diagnosis: D 13–14; A 22–25; P 15–17; GR (4–5)+ (14–17); AO 15–17.

Otoliths

DIAGNOSTIC FEATURES: The generally discoid shape except for the prominent and rounded rostral projection, the

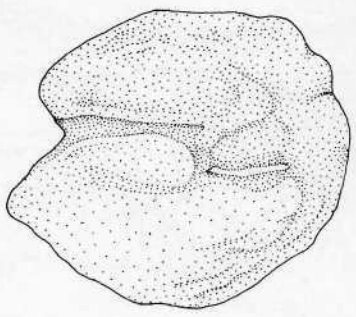
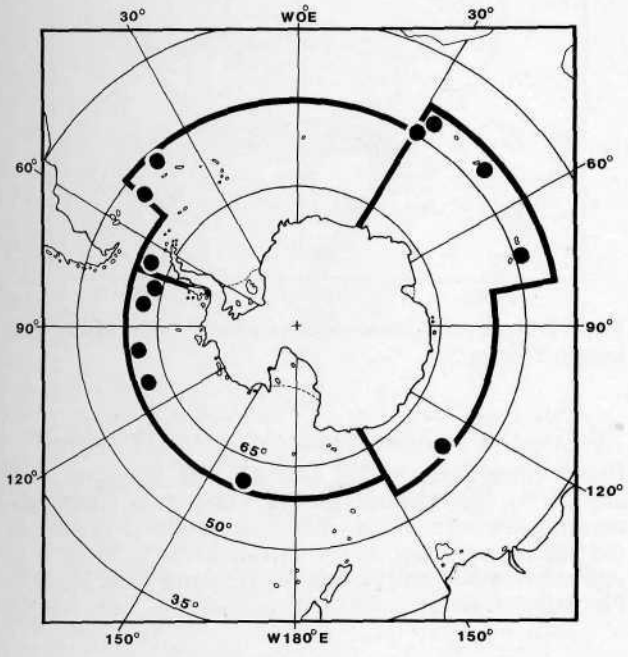


Fig. 43. Representative otolith of *P.* (*P.*) *andriashevi*; fish length 58 mm SL; scale bar 1 mm

oblique posteroventral margin, the ostio-pseudocaudal sulcus acusticus, the small ostium relative to the cauda, the typical myctophiform colliculi and the pseudocolliculum.

Distribution: Generally, circumglobal between the STC and the APF. Mesopelagic: South Temperate (Holosubantarctic) Pattern (Hulley 1981): 600 m (day), 50–200 m (night). Recorded from 53°18′S, 49°57′W and 51°05.5′S, 39°56.5′W in Atlantic Ocean sector (Hulley 1981), at 47°S, 31°E and 49°S, 71°E in Indian Ocean sector, and between 60°–65°S, 70°–165°W in Pacific Ocean sector.



Distribution of *P. (P.) andriashevi*

Remarks: *P. andriashevi* matures at about 47 mm SL. It was found in the stomach contents of *Champsocephalus gunnari*.

Attains 60 mm SL.

Protomyctophum (Protomyctophum) bolini (Fraser-Brunner, 1949)

Fig. 44

Electrona (Protomyctophum) bolini Fraser-Brunner, 1949: 1045, 1099, fig. 12 (in part) (45°18′S, 18°58′E). Holotype: BMNH 1948.5.14.1.

Diagnosis: D 12–14; A 23–26; P 14–16; GR (4–6)+(15–18); AO 17–18.

Otoliths

DIAGNOSTIC FEATURES: The dorsoventral oval shape, the entire margin, the absence of the crista superior, the heteromorph colliculi and the presence of a pseudocolliculum in association with the notch in the posterior margin.

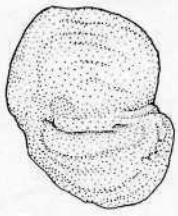


Fig. 45. Representative otolith of *P. (P.) bolini*; fish length 45 mm TL; scale bar 1 mm

Distribution: Circumpolar between Antarctic Divergence and northern boundary limits of region, and extending northwards to the STC zone. Mesopelagic: Broadly Antarctic Pattern (Hulley 1981): 608–728 m (day), 364–426 m (night).

Remarks: *P. bolini* matures at about 51 mm SL. The diet includes copepods and larval stages of krill, mainly calytopis and furcilia stages (Ascencio & Moreno 1983). Intramuscular lipid storage has been reported by Reinhardt & Van Vleet (1986a, b). This species was found in

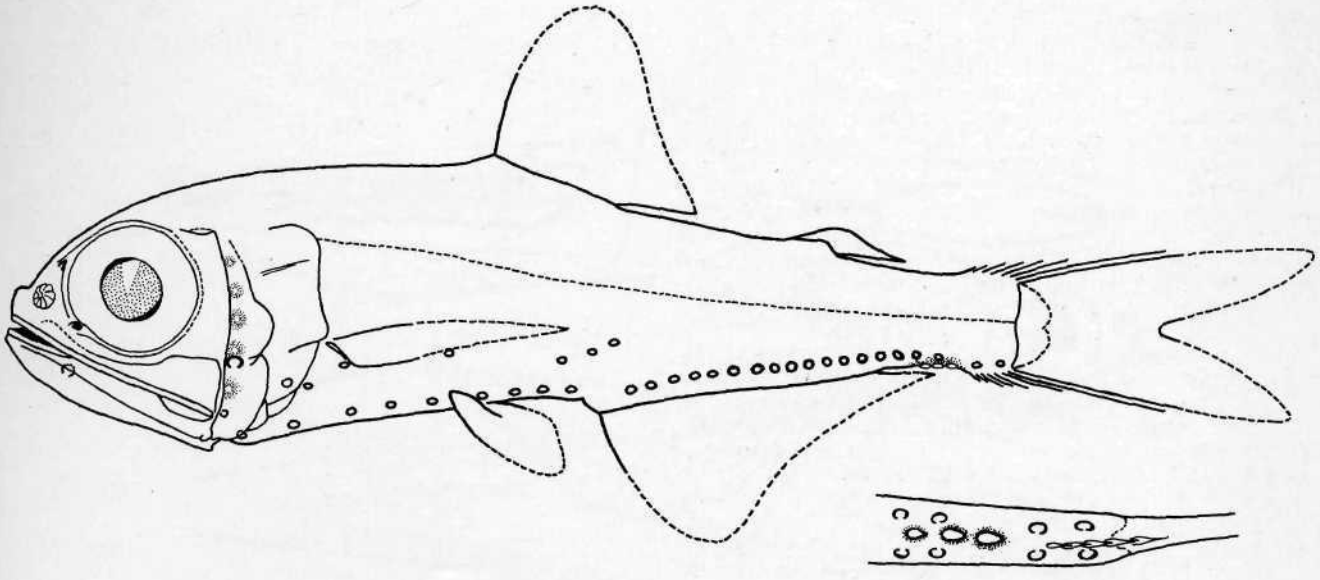
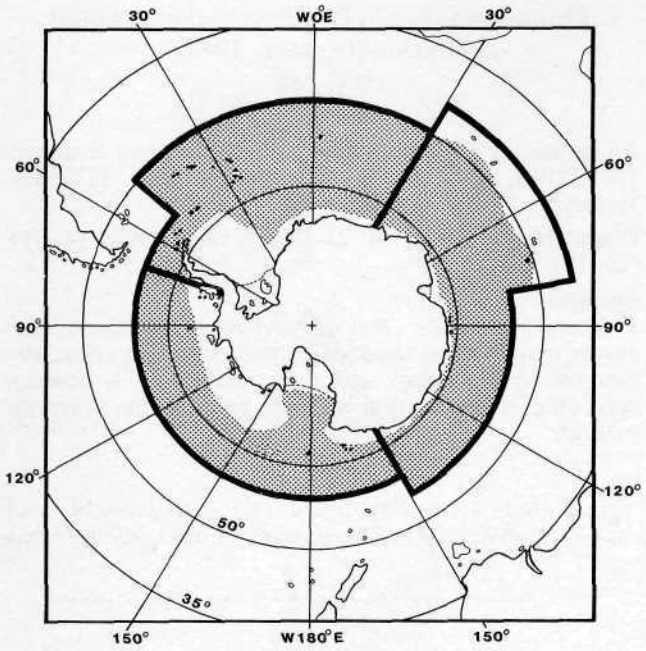


Fig. 44. *Protomyctophum (Protomyctophum) bolini*, 45 mm SL (from *Smiths' Sea Fishes*)



Distribution of *P. (P.) bolini*

the stomach contents of *Lepidonotothen squamifrons* (Duhamel & Hureau 1982).

The larvae have been described by Pertseva-Ostroumova (1967), and Belyanina & Kovalevskaya (1979).

Attains 67 mm SL.

Protomyctophum (Protomyctophum) choriodon Hulley, 1981

Fig. 46

Protomyctophum (Protomyctophum) choriodon Hulley, 1981: 20, figs. 10, 12 (35°47′S, 52°52′W). Holotype: ISH 1541/66a.

Diagnosis: D 12–14; A 22–25; P 14–16; GR (6–7)+(18–21); AO 15–17.

Otoliths

DIAGNOSTIC FEATURES: The near discoid shape with the slightly triangular ventral margin, the near-equally sized rostrum and antirostrum, the homosulcoid sulcus acusticus, and the presence of a pseudo-rostrum, pseudo-antirostrum and pseudo-excisura ostii.

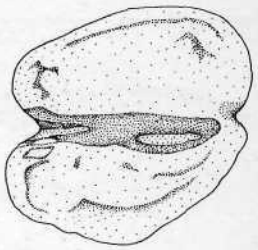


Fig. 47. Representative otolith of *P. (P.) choriodon*; fish length 76 mm SL

Distribution: Generally, circumglobal between 36°S and 51°S. Mesopelagic: South Temperate (Semi-subantarctic) Pattern (Hulley 1981): upper 100 m (night). In the Southern Ocean, recorded from 57°58′S, 50°00′W in Atlantic Ocean sector (Hulley 1981) and from 54°29′S, 74°00′E and 48°43′S, 70°58′E in Indian Ocean sector.

Remarks: *P. choriodon* matures at about 77 mm SL. It was found in the stomach contents of *Champsocephalus gunnari*.

Attains 95 mm SL.

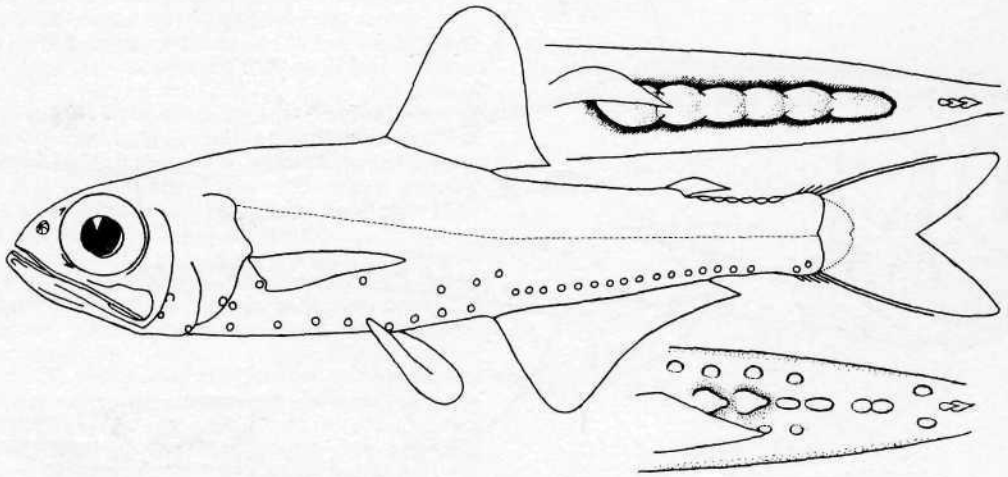
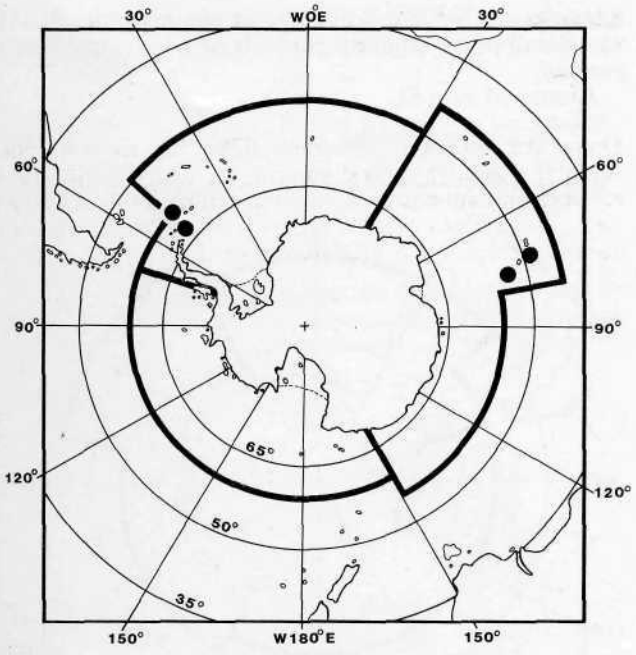


Fig. 46. *Protomyctophum (Protomyctophum) choriodon*, 80 mm SL (from *Smiths' Sea Fishes*)



Distribution of *P. P. choriodon*

Protomyctophum (Protomyctophum) gemmatum
Hulley, 1981
Fig. 48

Protomyctophum (Protomyctophum) gemmatum Hulley, 1981: 23, figs. 13, 14 (40°18′S, 35°07′W). Holotype: ISH 734/71a.

Diagnosis: D 12–14; A 22–25; P 16–18; GR (5–7)+(17–20); AO 15–17.

Otoliths

DIAGNOSTIC FEATURES: The generally discoid shape and entire margin, the slightly smaller ostium relative to the cauda, the prominent anterior colliculum, the poorly developed posterior colliculum but the well developed pseudo-colliculum, and the dorsally recurved and distally rounded rostrum.

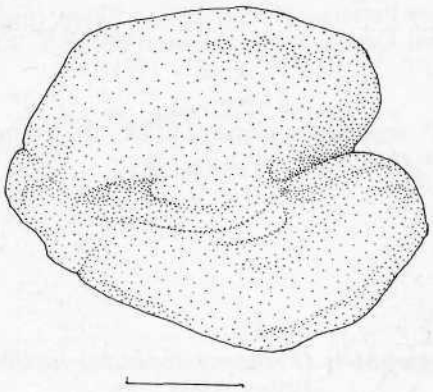
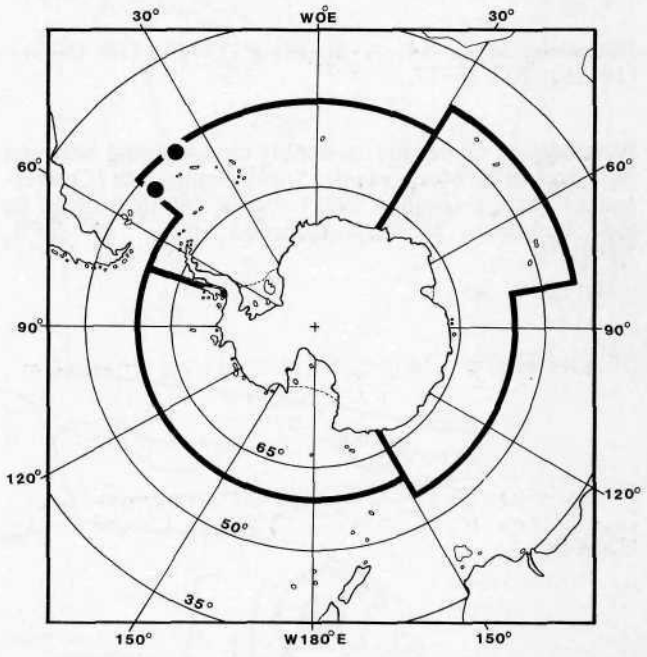


Fig. 49. Representative otolith of *P.* (*P.*) *gemmatum*; fish length 64 mm SL; scale bar 1 mm

Distribution: Generally, probably circumglobal between STC and APF. Mesopelagic: South Temperate (Holo-



Distribution of *P. (P.) gemmatum*

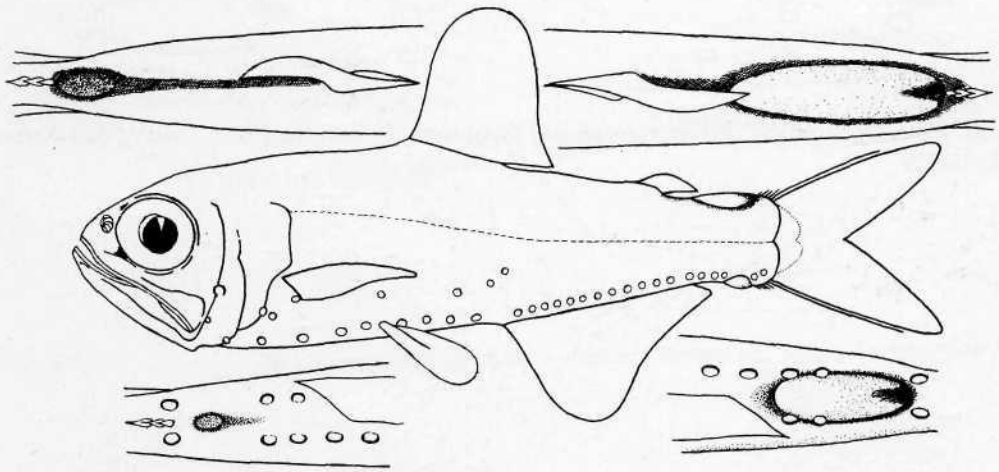


Fig. 48. *Protomyctophum (Protomyctophum) gemmatum*, 70 mm SL (from *Smiths' Sea Fishes*)

subantarctic) Pattern (Hulley 1981): 500 m (night). In the Southern Ocean, recorded from 53°18'S, 40°57'W and 51°05.5'S, 39°56.5'W (Hulley 1981).

Remarks: *P. gemmatum* matures at about 72 mm SL. Attains 86 mm SL.

Protomyctophum (Protomyctophum) luciferum
Hulley, 1981
Fig. 50

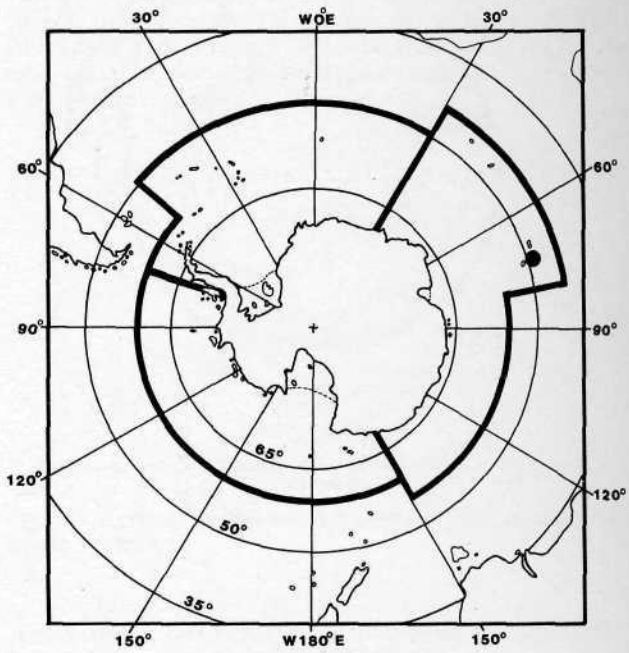
Protomyctophum (Protomyctophum) luciferum Hulley, 1981: 27, figs. 13, 15 (34°01'S, 47°39'W). Holotype: ISH 1564/68a.

Diagnosis: D 12–14; A 21–24; P 13–15; GR (5–6)+ (16–19); AO 15–17.

Distribution: Generally, probably circumglobal between 34°S and 48°S. Mesopelagic: South Temperate (Convergence) Pattern (Hulley 1981): below 140 m (night). In the Southern Ocean, recorded from 49°–50°S, 70°–71°E.

Remarks: *P. luciferum* matures at about 54 mm SL. It was found in the stomach contents of *Champsocephalus gunnari*.

Attains 61 mm SL.



Distribution of *P. (P.) luciferum*

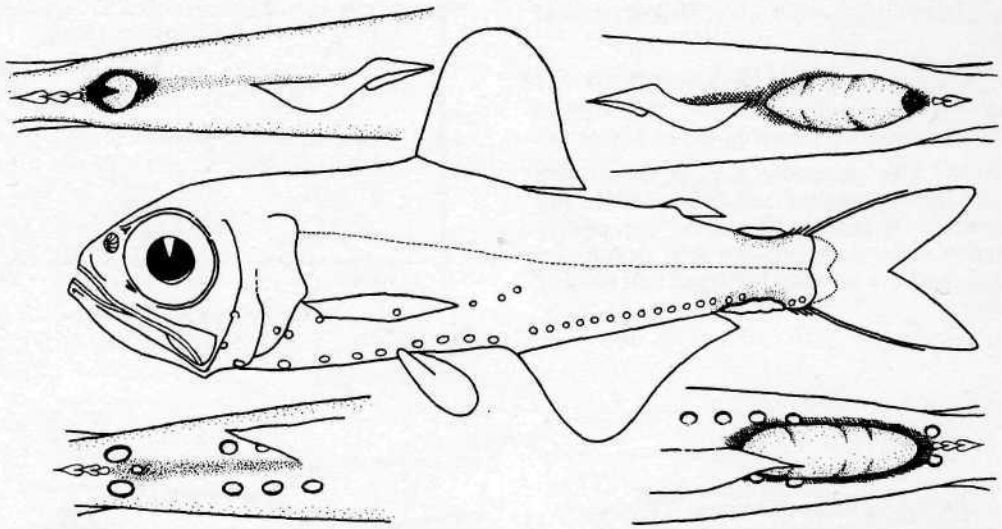


Fig. 50. *Protomyctophum (Protomyctophum) luciferum*, 55 mm SL (from *Smiths' Sea Fishes*)

Protomyctophum (Protomyctophum) normani
(Tåning, 1932)

Fig. 51

Myctophum normani Tåning, 1932: 127, fig. 2 (41°47′S, 176°55′E). Holotype: ZMUC P2329231.

Diagnosis: D 12–13; A 21–24; P 13–15; GR (5–7)+ (18–21); AO 15–17.

Otoliths

DIAGNOSTIC FEATURES: The generally discoid shape and the V-shaped ventral margin, in association with the typically myctophiform sulcus acusticus and colliculi.

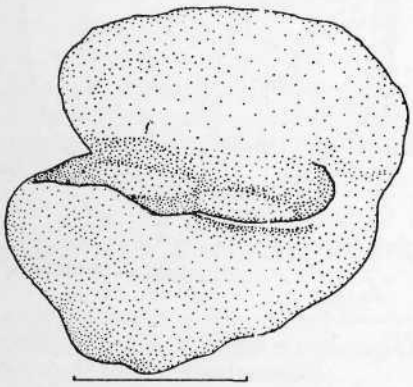
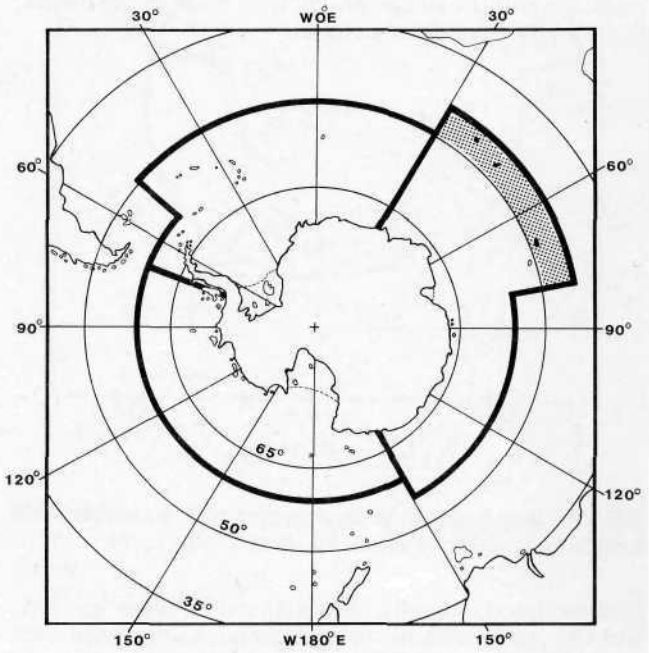


Fig. 52. Representative otolith of *P.* (*P.*) *normani*; fish length 70 mm SL; scale bar 1 mm

Distribution: Generally, circumglobal between 36°S and 43°S. Mesopelagic: South Temperate (Convergence) Pattern (Hulley 1981): upper 104 m (night). In the Southern Ocean, recorded from 45°10′S, 69°12′E (Bekker 1984) and 41°–48°S, 51°–71°E.

Remarks: *P. normani* matures at about 48 mm SL. It was found in the stomach contents of *Champsocephalus gunnari*.

The larvae have been described by Moser *et al.* (1984). Attains 56 mm SL.



Distribution of *P. (P.) normani*

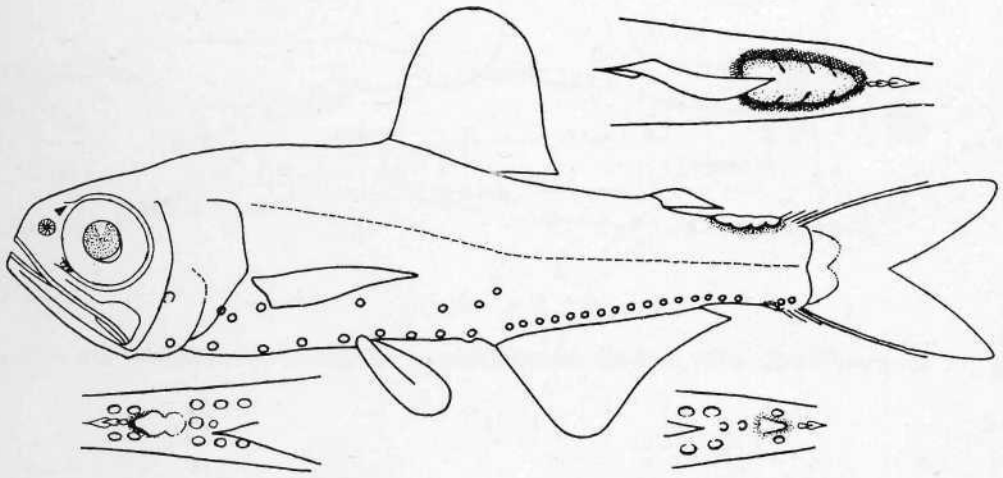


Fig. 51. *Protomyctophum (Protomyctophum) normani*, 50 mm SL (from *Smiths' Sea Fishes*)

Protomyctophum (Protomyctophum) tenisoni
(Norman, 1930)
Fig. 53

Myctophum tenisoni Norman, 1930: 321, fig. 27 (in part) (46°25′S, 15°30′E). Holotype: BMNH 1930.1.12.604.

Diagnosis: D 11–13; A 22–25; P 14–16; GR (5–7)+ (16–19); AO 16–19.

Otoliths

DIAGNOSTIC FEATURES: The typically myctophiform sulcus acusticus with homomorph colliculi and, in particular, the dorsally constricted collum.

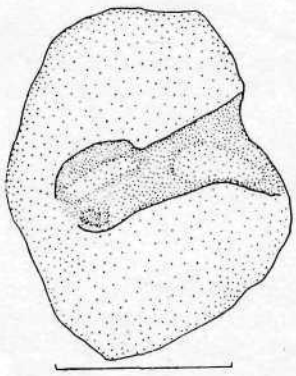
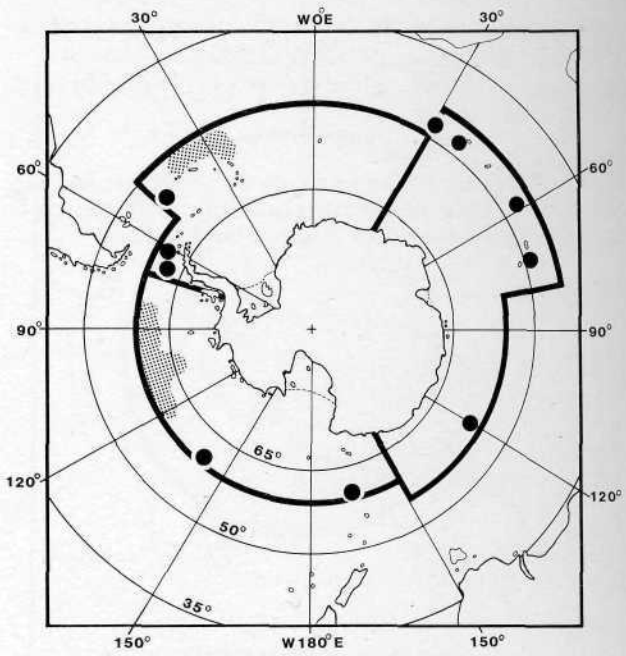


Fig. 54. Representative otolith of *P.* (*P.*) *tenisoni*; fish length 55 mm TL; scale bar 1 mm

Distribution: Generally, circumglobal between the STC and the APF, with northern boundary correlated with the 5°C isotherm at 200 m (Hulley 1981). Mesopelagic: Broadly Antarctic Pattern (Hulley 1981): upper 100–850 m (night). In region of the APF in all three ocean sectors.



Distribution of *P. (P.) tenisoni*

Remarks: *P. tenisoni* matures at about 45 mm SL. It was found in the stomach contents of *Champsocephalus gunnari*.

The larvae have been described by Moser *et al.* (1984). Attains 54 mm SL.

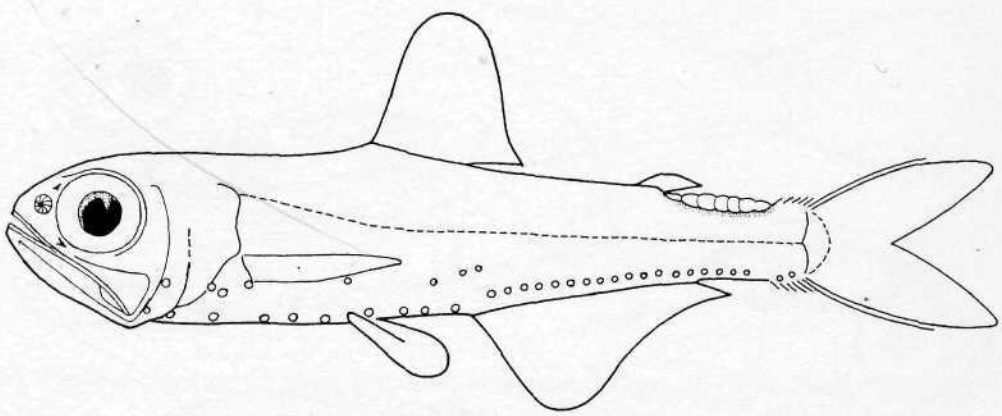


Fig. 53. *Protomyctophum (Protomyctophum) tenisoni*, 55 mm SL (from *Smiths' Sea Fishes*)

Genus *Symbolophorus* Bolin & Wisner, in Bolin, 1959

Maxilla moderately expanded posteriorly, extending well behind orbit. Anal-fin base longer than dorsal-fin base. Dn small; Vn larger; 5 PO; 4 VO; SAO series strongly angulate; AO series divided into AOa and AOp; 1 Pol. Supracaudal and/or infracaudal luminous glands present.

About 10 species, of which 1 is recorded from the Southern Ocean.

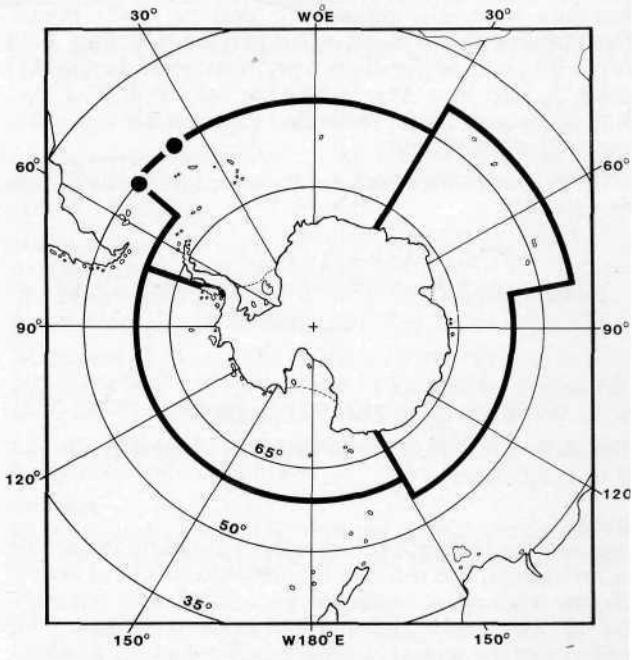
Symbolophorus boops (Richardson, 1845)
Fig. 55

Myctophum boops Richardson, 1845: 39, pl. 27, figs. 6–12, type locality erroneous—probably eastern South Atlantic. Syntype: BMNH 1948.1.12.1—specimen's status in doubt (Hulley 1981).

Diagnosis: D 13–15; A 20–23; P 12–14; GR (6–7) + (15–19); AO (7–9) + (6–8).

Colour: Pectoral fin with a darkly pigmented blotch; tips of caudal fin darkly pigmented.

Distribution: Not yet recorded in region as defined; 2 records (50°40′S, 50°01′W; 47°50.6′S, 40°00.8′W) just to the west and north of limits respectively. Mesopelagic: South Temperate (Semi-subantarctic) Pattern (Hulley 1981): nyctoepipelagic at surface.



Distribution of *S. boops*

Remarks: *S. boops* matures at about 114 mm SL. Th larvae have been described by Pertseva-Ostroumov (1974).

Attains 157 mm SL.

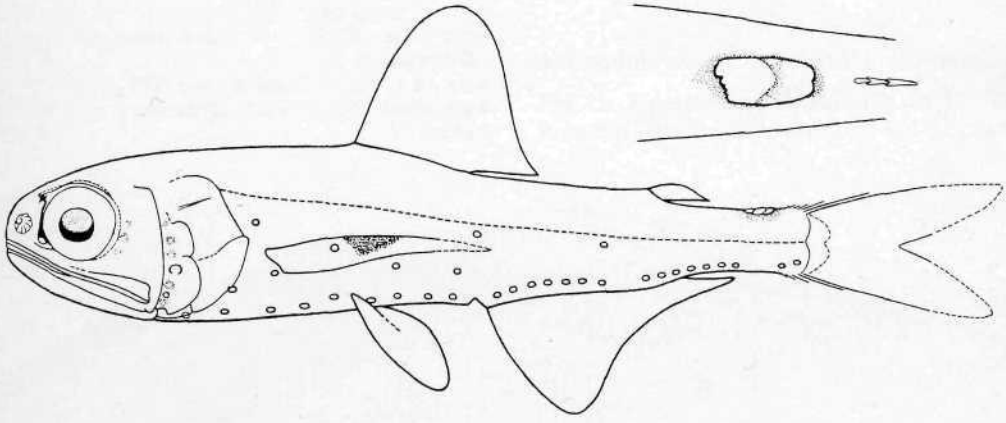


Fig. 55. *Symbolophorus boops*, 50 mm SL (from *Smiths' Sea Fishes*)

Genus *Taaningichthys* Bolin, 1959

Maxilla slightly expanded posteriorly, extending well past orbit. Anal-fin base equal to or slightly longer than dorsal-fin base. Dn absent; Vn present; body photophores present or absent; when present 5–7 PO; 3–10 VO; 1 SAO, at or slightly below horizontal septum; AO series divided into AOa and AOp; one Pol; 2+1 Prc. Both sexes with large, undivided supracaudal and infracaudal luminous gland.

Three species, of which 1 is recorded from the Southern Ocean.

Taaningichthys bathyphilus (Tåning, 1928)

Fig. 56

Lampadena bathyphila Tåning, 1928: 63 (25°11′N, 20°57′W). Lectotype: ZMUC P2329220.

Diagnosis: D 11–14; A 12–14; P 12–13; GR (3–4)+(8–10); AO (2–3)+1.

Otoliths

DIAGNOSTIC FEATURES: The ovate to rhomboidal shape, the entire margin, the ostial and homosulcoid sulcus acusticus, the large ostium and anterior colliculum in comparison to the cauda and the posterior colliculum, the presence of the typical myctophiform pseudo-colliculum, the short rostrum and the minute antirostrum.

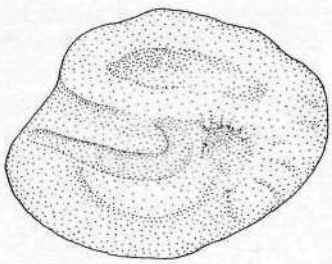
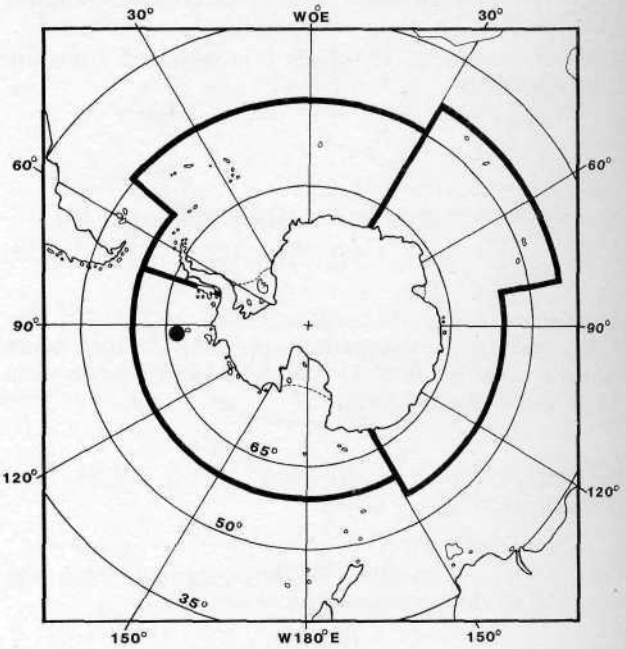


Fig. 57. Representative otolith of *T. bathyphilus*; fish length 73 mm SL; scale bar 1 mm

Distribution: Generally, widespread (43°N–40°S) in all 3 oceans. Bathypelagic: Widespread Pattern (Hulley 1981): below 675 m (night), shallowest depth of capture 400 m. In the Southern Ocean, recorded at about 67°S, 90°W (McGinnis 1982).



Distribution of *T. bathyphilus*

Remarks: *T. bathyphilus* matures at about 61 mm SL. Attains 80 mm SL.

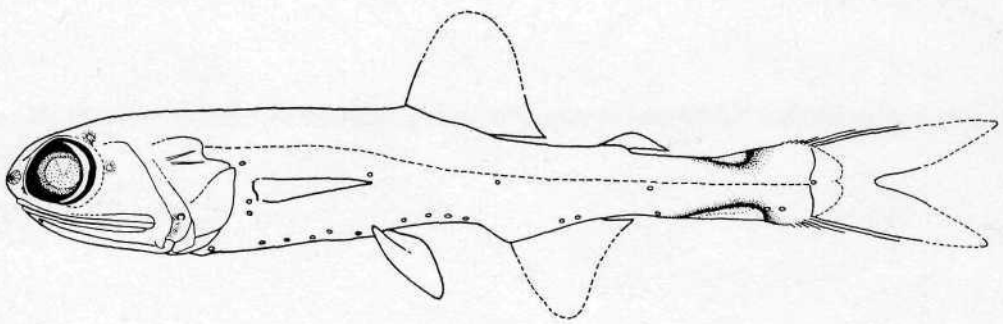


Fig. 56. *Taaningichthys bathyphilus*, 50 mm SL (from *Smiths' Sea Fishes*)