

MESOPELAGIC FISHES COLLECTED WITH 10-FOOT IKPT
IN THE INDIAN SECTOR OF THE ANTARCTIC OCEAN
AND ITS NEIGHBORING WATERS DURING
THE JARE-28 CRUISE, 1987

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Abstract: During the JARE-28 cruise in the Indian sector of the Antarctic Ocean and its adjacent waters, mesopelagic fishes were collected by 10-foot IKPT at 8 stations of which 5 were located in the Antarctic, one was in the Subantarctic and 2 were in the Subtropical waters. The fishes were referred to 21 families and more than 50 species. In the Subtropical waters, fishes of the Gonostomatidae were the most abundant (85.5% of fishes caught in the Subtropical water). On the contrary, fishes of the Myctophidae tended to be numerically dominant in the Antarctic water (45.0% of fishes collected in the Antarctic water). Species compositions of catches were slightly different among three regions, the Antarctic, Subantarctic and Subtropical waters. Especially the distributions of 15 species of myctophids were clearly separable into four types.

1. Introduction

The mesopelagic fishes of the Antarctic Ocean and its neighboring waters have been studied by several authors (LÖNNBERG, 1905; NORMAN, 1930; ANDRIASHEV, 1962, 1965; BUSSING and BUSSING, 1965; PARIN *et al.*, 1974; MCGINNIS, 1982; MIYA *et al.*, 1986; TABETA and KOMAKI, 1986; GON, 1988). The importance of trophic relationships between pelagic fishes and euphausiids has also been pointed out (WILLIAMS, 1985). However, most studies have concentrated on the distribution pattern of particular groups of fishes or on fishes collected from the relatively narrow areas. Therefore, it was thought advisable to report some aspects of species composition and abundance of mesopelagic fishes collected from the different water masses, the Antarctic, Subantarctic and Subtropical waters, across the Antarctic Convergence.

2. Method and Stations

Fishes were collected with an open 10-foot Issacs-Kidd Midwater Trawl (net length 16 m; mesh aperture 0.5 mm) on board the Icebreaker SHIRASE during the JARE-28 cruise. The net was towed obliquely by paying out 3000 m of cable at a speed of 2-3

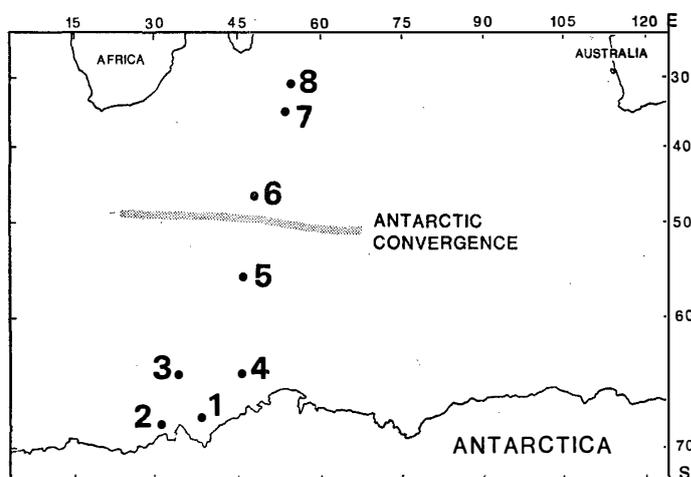


Fig. 1. Position and station numbers of the 10-foot IKPT sampling during the JARE-28 cruise in 1987.

Table 1. Collecting data for the 10-foot IKPT during the JARE-28 cruise in the Indian sector of the Southern Ocean.

Station No.	Date	Locality	Maximum depth (m)	Bottom depth (m)
1	87-02-04	68°20.5' S, 38°19.1' E	1100-1400	1985-3200
2	87-02-05	68°31.4' S, 30°37.2' E	650- 780	2460-2600
3	87-02-24	65°03.3' S, 34°41.6' E	750- 930	1800-4000
4	87-02-26	64°56.1' S, 45°09.6' E	850-1130	not recorded
5	87-03-04	56°18.7' S, 45°09.8' E	700-1025	4859
6	87-03-07	47°42.1' S, 47°03.0' E	700- 880	3158
7	87-03-10	34°58.8' S, 53°24.3' E	850	3750-4000
8	87-03-11	30°58.5' S, 54°07.9' E	930	3900-4000

kn from the surface to a maximum depths of 120 to 1400 m at 10 localities. Because of the small mesh size, the net is called the trawl as the IKPT (Issacs-Kidd Plankton Trawl). All tows were made during daytime. Fishes were caught at 8 localities (Fig. 1 and Table 1). At the southern 6 stations (Stns. 1-6), about an hour's additional horizontal tow was also carried out after 3000 m of cable paid. Station 6 and Stns. 7 and 8 are located in the Subantarctic and the Subtropical waters, respectively. The remaining 5 stations (Stns. 1-5) are situated in the Antarctic water. All the specimens were fixed in 10% formalin on board the SHIRASE.

3. Results

A total of 2820 specimens belonging to more than 20 families were caught. Among them a total of 42 species were identified and at least 11 unidentified species were recognized. In specimens referable to the Bathylagidae, Gonostomatidae, Photichthyidae, Stomiidae, Paralepididae, Myctophidae, and Oneirodidae, unidentified fishes have still remained. Two forms of anguilliform larvae have not also been identified yet. Table 2 shows the occurrences and counts of the fishes collected.

Among the 21 families identified, the Myctophidae contained the most species (15 species) and the Sternoptychidae (5 species) was the next. Fishes of the Gonostomatidae were the most numerous (72.2% of the total catch), followed by myctophids (17.2%).

From the 5 stations located in the Antarctic water, a total of 231 specimens belonging to 15 species were collected, which constituted 8.2% of the number of total catch. The Myctophidae dominated the fish catches in the Antarctic water (45.0% of the number of fishes caught in the Antarctic water), and the Bathylagidae was the second in abundance (29.0%). In the Myctophidae, *Electrona antarctica* was the most abundant species (33.3%), and *Bathylagus antarcticus* and *Notolepis coatsi* were also common in fish catches in the Antarctic water (28.6% and 13.0% respectively). The above three species appeared at all stations in the Antarctic water. *Cyclothone microdon* and *Gymnoscopelus opisthopterus* were also common in the Antarctic water and found at all stations in the Antarctic water except Stn. 2. Fishes found only in the catches in the Antarctic water were the following 8 species; *Ba. antarcticus*, *Scopelosaurus hamiltoni*, *Electrona antarctica*, *G. opisthopterus*, *Muraenolepis* sp., *Cynomacurus piriei*, *Macrourus holotrachys* and *Artedidraco* sp. Notothenioid fishes are well known endemic species in the Antarctic Ocean; however, only one juvenile referable to the genus *Artedidraco* was collected at Stn. 2.

Station 6 was situated just north of the Antarctic Convergence, and thought to be located in the Subantarctic water. At this station, a total of 368 specimens belonging to more than 15 species (including 4 identified species) were caught. The most numerically dominant family in the catch of Stn. 6 was the Myctophidae (60.1% of the number of fishes caught at Stn. 6), and the Gonostomatidae was the second in abundance (35.1%). Five species, *Borostomias antarcticus*, *Benthalbella macropinna*, *Lampanyctus achirus*, *Protomyctophum parallelum* and *Protomyctophum tenisoni*, were recorded only from Stn. 6.

At the northernmost two stations, Stns. 7 and 8, located in the Subtropical water, a total of 2221 specimens (78.8% of the number of the total catch) referable to more than 33 species were obtained. The most numerically dominant fish group in the catches in the Subtropical water was the Gonostomatidae (85.5% of catches at Stns. 7 and 8), followed by myctophids (7.2%) and photichthyids (3.1%). Among the 21 families found in the research, the following ten families, the Nemichthyidae, Nettastomatidae, Sternoptychidae, Photichthyidae, Chauliodontidae, Idiacanthidae, Evermannellidae, Ceratiidae, Oneirodidae and Melamphaidae, and 26 (or 27) species of fishes were recorded only from the Subtropical water (Stns. 7 and 8). However, a total number of fishes belonging to the above-mentioned ten families was only 148 specimens which composed 6.7% of the total catch of Stns. 7 and 8.

4. Discussion

Judging from the occurrences and counts of species at 8 stations, the three species, *Ba. antarcticus*, *N. coatsi* and *E. antarctica*, are considered to be the most common in the Antarctic mesopelagic waters. *N. coatsi* and *E. antarctica* are also frequently caught along with the Antarctic krill, *Euphausia superba* (REMBISZEWSKI *et al.*, 1978; KOCK, 1982; WILLIAMS, 1985). In contrast with the above-mentioned two species, *Ba.*

Table 3. Classification of distribution patterns of the myctophid fishes caught with 10-foot IKPT during the JARE-28 cruise.

Distribution pattern	Species	Station No.							
		1	2	3	4	5	6	7	8
1	<i>Electrona antarctica</i>	*	*	*	*	*			
	<i>Gymnoscopelus opisthopterus</i>	*		*	*	*			
2	<i>Gymnoscopelus braueri</i>					*	*		
	<i>Krefflichthys anderssoni</i>					*	*		
	<i>Protomyctophum bolini</i>					*	*		
3	<i>Lampanyctus achirus</i>						*		
	<i>Protomyctophum parallelum</i>						*		
	<i>Protomyctophum tenisoni</i>						*		
4	<i>Benthoosema suborbitale</i>							*	
	<i>Bolinichthys indicus</i>								*
	<i>Ceratoscopelus warmingii</i>								*
	<i>Gonichthys barnesi</i>							*	
	<i>Hygophum hygomii</i>							*	
	<i>Lampanyctus pusillus</i>							*	*
	<i>Lobianchia dofleini</i>							*	

antarcticus was not usually found in fishes caught along with the krill. Larvae of *Ba. antarcticus* with tubular eyes were sometimes collected near the surface (YEFREMENKO, 1979; GON, 1988), and larger juveniles and young never appeared in the krill swarms. Differences in occurrence of these species seem to depend mainly on the differences of vertical distributions among species.

Distribution patterns of 15 species of myctophids identified can be classified into four types as follows: (1) endemic to the Antarctic water; (2) distributed in the northern part of the Antarctic water and the Subantarctic water; (3) distributed in the Subantarctic water; (4) distributed in the Subtropical waters (Table 3). *E. antarctica* and *G. opisthopterus* show the pattern of Type 1. Species representing the Type 2 distribution pattern are *Krefflichthys anderssoni*, *Protomyctophum bolini* and *Gymnoscopelus braueri*. *Protomyctophum parallelum*, *Protomyctophum tenisoni* and *Lampanyctus achirus* were found only in the Subantarctic water in this survey and belonged to Type 3. The rest 7 species, *Benthoosema suborbitale*, *Bolinichthys indicus*, *Ceratoscopelus warmingii*, *Gonichthys barnesi*, *Hygophum hygomii*, *Lampanyctus pusillus* and *Lobianchia dofleini*, have never been recorded south of the Antarctic Convergence and represented the pattern of Type 4.

Similar classifications of distribution patterns of myctophids were provided by ANDRIASHEV (1962), MCGINNIS (1982) and MIYA *et al.* (1986). MCGINNIS (1982) proposed 5 patterns of distribution based on the extensive surveys around the Antarctic continent. Type 4 in the present study seems to include two different distribution patterns proposed by MCGINNIS (1982). Our distribution pattern of the myctophids is derived from the collections of fishes caught only in the western Indian Ocean and related areas of the Antarctic Ocean. Therefore, some differences in classification of distribution patterns exist between that proposed MCGINNIS (1982) and of present study.

For example, MCGINNIS (1982) classified *K. anderssoni* and *G. braueri* as species basically restricted to the Antarctic waters in spite of the northern records near the Subtropical Convergence. The rest of myctophids of the present collection show typical distribution patterns as reported by the previous works. The similar distribution patterns exist in other pelagic fish groups: the Paralepididae (POST, 1978; KOCK, 1982), Scopelarchidae (BUSSING and BUSSING, 1966; JOHNSON, 1974, 1982), Notosudidae (BERTELSEN *et al.*, 1976) and Oneirodidae (PIETSCH, 1974).

Although one hour's horizontal tow was omitted at the northern two station (Stns. 7 and 8 in the Subtropical water), the fish catches at the two stations accounted for about 80% of the total number and included more than 60% of species. On the other hand, less than 30% of species and only about 8% of individuals of the total catch were obtained at the 5 stations located in the Antarctic water. These results show that the mesopelagic fauna of the Antarctic water is considerably poor than that of the Subtropical water. Differences in species composition and abundance of fishes recognized among the three waters were apparently affected by the changes of the oceanographic conditions between the north and south of the Antarctic Convergence.

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