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Lanternfishes (Myctophidae) in Sri Lankan Waters

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Abstract

A total of 16 species of lanternfishes was identified off Sri Lanka from cruises with R.V. "Dr. Fridtjof Nansen" during 1979 and 1980. Three of these, *Benthosema pterotum*, *Bolinichthys longipes* and *Myctophum obtusirostrum*, were recorded for the first time in the area investigated. Other studies on myctophids indicate the presence of about 40 species off Sri Lanka and adjacent waters.

Introduction

The Indian Ocean has a fauna of lanternfishes which is rich both in number of species and in biomass (Gjøvsæter and Kawaguchi 1980). The fauna of deepsea fishes in general and lanternfishes (Fam. Myctophidae) in particular around Sri Lanka is not well known. Handbooks and catalogues of fishes from Sri Lanka mention only one lanternfish species, *Diaphus splendidus* (Deraniyagala 1952; Mendis 1954; Munro 1955).

The research vessel, "Dr. Fridtjof Nansen" operated off Sri Lanka in August and September 1978, in April-June 1979 and in January and February 1980 (Sætersdal and de Bruin 1978; Blindheim et al. 1979; Blindheim and Føyen 1980). The aim of the cruises was to study coastal fish resources, and the lanternfish was only a bycatch at a few stations. The present paper gives the results of these catches and reviews the existing data on lanternfishes off Sri Lanka and adjacent waters.

Materials and Methods

Samples were taken using a large pelagic trawl with an estimated mouth area of about 250 m². The mesh size in the forward part was about 200 mm (stretched) decreasing to about 9 mm in the codend. A description of the gear and the cruise tracks is given by Sætersdal and de Bruin (1978), Blindheim et al. (1979) and Blindheim and Føyn (1980).

Samples of lanternfish caught at four of the stations (Fig. 1) were preserved in a formaldehyde-seawater solution and taken to

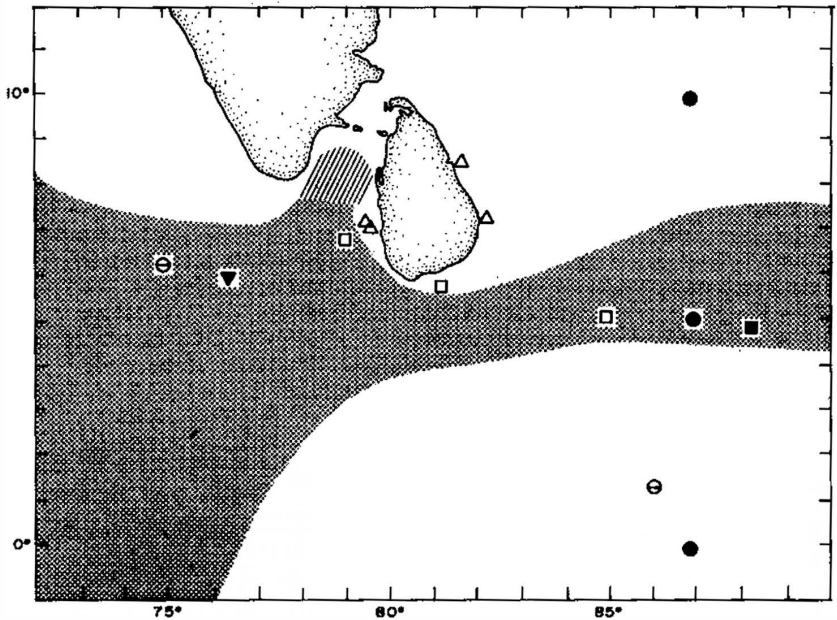


Fig. 1. Areas from which material for this study and others given in paper were obtained. Δ = present study, ∇ = Bolin (1946), \square = Bradbury et al. (1971), \bullet = Kawaguchi and Shimizu (1978), $///$ = Munasinghe (1977), \boxtimes = Nafpaktitis (1978), \blacksquare = Tåning (1932), \oplus = Voronina (1962). Locations of the stations from "Dr. Fridtjof Nansen" where lanternfish samples were obtained:

Station no.	Date	Gear depth (m)	Position
1	29. 4. 79	45	07°08'N 79°29'E
2	26. 1. 80	45	07°06'N 79°36.5'E
3	6. 2. 80	30	08°26.8'N 81°33'E
4	18. 5. 79	70	07°17'N 81°59'E

the University of Bergen for identification. Counts of fin rays, gill rakers and photophores and measurements of morphometric characters (standard length, body depth, head length, head depth, caudal peduncle length, eye diameter, jaw length a.o) were made according to Nafpaktitis (1978). The use of names follows Paxton (1979).

Results and Discussion

A list of all recorded lanternfish is presented in Appendix 1.

A total of 16 species of lanternfish was identified from cruises with R.V. "Dr. Fridtjof Nansen" (Table 1). Three of these, *Benthoosema pterotum*, *Bolinichthys longipes* and *Myctophum obtusirostrum* were recorded for the first time in Sri Lankan waters. For *Hygophum proximum* and *Symbolophorus evermanni* previous observations are uncertain.

The distribution of *B. pterotum* is not well known, as it has frequently been confused with *B. fibulatum*. Looking at the general distribution of this species as presently known (i.e., Gjøvsæter and

Table 1. Lanternfishes caught during the cruises with R.V. "Dr. Fridtjof Nansen". The figures indicate the number of specimens examined.

	Station			
	1	2	3	4
<i>Benthoosema pterotum</i>			6	
<i>B. fibulatum</i>	4		25	3
<i>Bolinichthys longipes</i>	3			
<i>Ceratoscopelus warmingi</i>	1			
<i>D. garmani</i>	32	135	10	
<i>D. lobatus</i>			9	
<i>D. regani</i>	8			
<i>D. signatus</i>	13		32	
<i>D. thiollierei</i>	6	2	3	2
<i>Diogenichthys panurgus</i>	18			
<i>Hygophum proximum</i>	25	10		
<i>Lampanyctus macropterus</i>	15		38	20
<i>Myctophum nitidulum</i>	1	4		2
<i>M. spinosum</i>	8			43
<i>M. obtusirostrum</i> ?		46		
<i>Symbolophorus evermanni</i>	5	3		
Number of species identified	13	6	7	5

Kawaguchi 1980), it is likely to be found off Sri Lanka. *Bolinichthys longipes* is common in the western Indian Ocean and the Arabian Sea (Nafpaktitis and Nafpaktitis 1969; Gjøsaeter 1981) and therefore it is also likely to be found in Sri Lankan waters. The identification of *M. obtusirostrum* is uncertain, as it possesses some characters which are associated with *M. brachygnathum* (Bleeker 1856). The characters given by Nafpaktitis (1973) and Wisner (1976) therefore do not seem to be sufficient for a certain identification of these two species.

For *H. proximum* previous observations from Sri Lanka are uncertain, but Nafpaktitis and Nafpaktitis (1969) found it in the western Indian Ocean at similar latitudes. The specimens of *Symbolophorus* we found had somewhat lower gill raker counts than usual for *S. evermanni* (5+1+13 and 4+1+13 vs. 6[5-7]+1+14-16), but its other characteristics fit well with those given by Nafpaktitis and Nafpaktitis (1969) for this species.

Tåning (1932), in a study of lanternfishes from the Dana expeditions, described one new species, *Diaphus drachmanni*, from 4°44'N, 88°05'E (Fig. 1).

Bolin (1946) described lanternfishes from one station west of Sri Lanka (5°56'N, 76°22'E, Fig. 1). He described *M. lynchnobium*, *Diogenichthys panurgus* and *Lampanyctus fraser-brunneri* as new. According to Paxton (1979) *L. fraser-brunneri* is *Bolinichthys longipes* (Brauer), while the position of *M. lynchnobium* is uncertain. In addition he observed the following species (with synonyms according to Paxton [1979]): *Benthoosema fibulatum*, *Diaphus splendidus*, *D. regani*, *D. rafinesquii*, *Vestula valdiviae* = *Notolychnus valdiviae*, *Lampanyctus steinbecki* and *Lampanyctus stilbius* = *Bolinichthys photothorax*.

Voronina (1962) recorded mesopelagic fishes from one station east and one station west of Sri Lanka (Fig. 1). She found some *Diaphus* spp., *Notolychnus valdiviae* and *Lampanyctus* sp.

Nafpaktitis and Nafpaktitis (1969) studied the lanternfishes of the Indian Ocean based on cruises with R.V. "Anton Bruun", but none of their stations were within the area covered by this paper. Nafpaktitis (1978) looked at *Diaphus* spp. from the area shown in Fig. 1 based on materials from many sources. He observed the following species: *D. fragilis*, *D. garmani*, *D. lobatus*, *D. lucidus*, *D. lutkeni*, *D. parri*, *D. regani*, *D. splendidus*, *D. signatus*, *D.*

malayanus, *D. suborbitalis*, *D. diademophilus*, *D. thiollierei*, *D. fulgens* and *D. aliciae*.

Bradbury et al. (1971) reported on deepwater fishes from the R. V. "Te Vega" expedition. They took six stations near Sri Lanka (Fig. 1) and identified the following lanternfishes (with synonyms according to Paxton [1979]): *Hygophum (proximum ?)*, *Benthoosema fibulatum*, *Diogenichthys panurgus*, *Myctophum lychnobium*, *M. spinosum*, *M. asperum*, *M. nitidulum*, *Symbolophorus* sp., *Diaphus splendidus ?*, *D. garmani*, *D. regani*, *D. elucens = D. perspicillata*, *D. parri*, *D. (mollis ?)*, *D. kendalli = D. parri*, *D. lutkeni*, *D. glandulifer = D. suborbitalis*, *Notolychnus valdiviae*, *Lampanyctus macropterus*, *L. nobilis*, *L. niger*, *Lepidophanes pyrosobolus = Bolinichthys pyrosobolus* and *Ceratoscopelus warmingi*.

Munasinghe (1977) studied deepwater fishes from the Gulf of Mannar and adjacent waters based on catches from the Stern trawler, "Optimist" (Fig. 1). He reports on two lanternfish species *Diaphus elucens* and *Lampanyctus macropterus*. His description and figures of fishes leave some doubt about the species identification.

Kawaguchi and Shimizu (1978) studied lanternfishes of the genus *Diaphus* in the eastern Indian Ocean based on a cruise with R.V. "Hakuho Maru". They occupied three stations within the area shown in Fig. 1. At these stations eight species of *Diaphus* were caught: *D. lobatus*, *D. fragilis*, *D. lutkeni*, *D. regani*, *D. phillipsi*, *D. lucidus*, *D. splendidus* and *D. jenseni*.

Zoogeographically, Sri Lanka belongs to the tropical Indian Ocean. Rao and Madhupratrap (1986), reviewing biogeography of zooplankton in the Indian Ocean, found little evidence of any zoogeographical difference between the Arabian Sea and the Bay of Bengal. For mesopelagic fish the distribution is not sufficiently known to draw final conclusions, but probably the differences are rather small (Nafpaktitis 1978; Kawaguchi and Shimizu 1978).

Within the Arabian Sea there is an increase in the number of myctophid species as one goes southwards (Gjøvsæter 1981; Cohen 1986). Apparently this is also so in the Bay of Bengal (Unpubl. data from R.V. "Dr. Fridtjof Nansen"). The number of species in Sri Lankan waters is therefore expected to be high.

Our list of myctophids recorded from Sri Lanka and adjacent waters contains 41 species (Appendix 1). Around 90-100 species have been recorded in the Indian Ocean (Nafpaktitis and Nafpaktitis

1969; Kawaguchi and Shimizu 1978; Nafpaktitis 1978). Most species recorded by these authors occur in conditions similar to those off Sri Lanka, therefore it is most likely that the number of lanternfish species in Sri Lankan waters is higher than stated in the present paper.

The samples from R.V. "Dr. Fridtjof Nansen" were all taken in neritic waters. However, a large part of the species caught (nearly 50%) are regarded as oceanic species (Hulley 1981; Merrett 1986; Kawaguchi and Shimizu 1978). These are: *Ceratoscopelus warmingi*, *Diaphus lobatus*, *D. regani*, *D. signatus*, *D. thiollierei*, *Diogenichthys panurgus*, *Hygophum proximum*, *Lampanyctus macropterus*. The remaining species should be classified as pseudo-oceanic species (sensu Hulley 1981). No epibenthic species were found in the current study.

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Appendix 1. List of lanternfishes recorded from Sri Lankan waters by Kawaguchi and Shimizu (1978) (K&S 78), Bradbury et al. (1970) (B&al. 70), Nafpaktitis (1978) (Nafp. 78), other sources (Oth), and from the cruises with R.V. "Dr. Fridtjof Nansen". (F.N.)

	K&S 78	B&al. 70	Nafp. 78	Oth.	F.N.
<i>Benthoosema pterotum</i> (Alcock 1891)					1
<i>B. fibulatum</i> (Gilbert and Cramer 1897)			1		1 1
<i>Bolinichthys longipes</i> (Brauer 1906)					1
<i>B. photothorax</i> Bolin 1939				1	
<i>B. pyrosobolus</i> (Alcock 1891)		1			
<i>Ceratoscopelus warmingi</i> (Lütken 1892)			1		1
<i>Diaphus aliciae</i> Fowler 1934			1		
<i>D. diademophilus</i> Nafpaktitis 1978			1		
<i>D. drachmanni</i> Tåning 1932				1	
<i>D. perspicillata</i> (Ogilby 1898)		1			
<i>D. fragilis</i> Tåning 1928	1		1		
<i>D. fulgens</i> (Brauer 1904)			1		
<i>D. garmani</i> Gilbert 1906		1	1		1
<i>D. jenseni</i> Tåning 1932	1				
<i>D. lobatus</i> Nafpaktitis 1978	1		1		1
<i>D. lucidus</i> (Goode and Bean 1896)	1		1		
<i>D. lutkeni</i> Brauer 1904	1	1	1		
<i>D. malayanus</i> Weber 1913			1		
<i>D. (mollis?)</i> Tåning 1928		1			
<i>D. parri</i> Tåning 1932		1	1		
<i>D. phillipsi</i> Fowler 1934	1				
<i>D. rafinesquii</i> (Cocco 1839)				1	
<i>D. regani</i> Tåning 1932	1	1	1	1	1
<i>D. signatus</i> Gilbert 1908			1		1
<i>D. splendidus</i> (Brauer 1904)	1		1	1	
<i>D. splendidus?</i>		1			
<i>D. suborbitalis</i> Weber 1913		1	1		
<i>D. thiollierei</i> Fowler 1934			1		1
<i>Diogenichthys panurgus</i> Bolin 1946		1			1
<i>Hygophum proximum</i> Bekker 1965					1
<i>Hygophum (proximum?)</i>		1			
<i>Lampanyctus niger</i> Günter 1887		1			
<i>L. nobilis</i> Tåning 1928		1			
<i>L. macropterus</i> (Brauer 1904)		1			1
<i>L. steinbecki</i> Bolin 1939				1	
<i>Myctophum asperum</i> Richardson 1845			1		
<i>M. nitidulum</i> Garman 1899		1			1
<i>M. spinosum</i> (Steindachner 1867)		1			1
<i>M. lychnobium</i> Bolin 1946		1			
<i>M. obtusirostrum</i> Tåning 1928?					1
<i>Notolychnus valdiviae</i> (Brauer 1904)		1		1	
<i>Symbolophorus evermanni</i> (Gilbert 1905)					1
<i>Symbolophorus</i> sp.		1			

Reference to original descriptions in Paxton (1979)