

A FEW OBSERVATIONS ON THE TAXONOMY AND BIOLOGY OF *NEMIPTERUS DELAGOAE* SMITH FROM VIZHINJAM

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ABSTRACT

Specimens of *Nemipterus delagoae* Smith from Vizhinjam have a longer first pelvicfin ray, a slightly more body depth and a bigger snout than the specimens described by Smith (1939). There is no significant difference in the Regression coefficient between males and females and a common equation for length-weight relationship is fitted. The species is a carnivore feeding mainly on crustaceans, fishes molluscs and annelids.

INTRODUCTION

Nemipterus delagoae was first described by Smith (1939) as *Nemipterus mulloides* based on a single specimen collected from Delagoa bay, South Africa. Later, he (Smith 1941) re-identified it as a new species and named it *Nemipterus delagoae*. (See also Bleeker 1852.) This species was described from India at first based on one specimen from southwest coast by Rajagopalan et al (1975). Wongratna (1970) and Srinivasã Rao et al (1981) have reported its occurrence respectively in Andaman waters and east coast of India.

During the course of investigation on the fishery and biology of *Nemipterus* spp. at Vizhinjam (Lat. 8°22'30" N, Long. 76°56'15" S), the authors collected from hooks-and-line catches a number of *Nemipterus delagoae*, ranging from 99 mm to 298 mm in total length. A detailed description of this species (based on 44 specimens) is given in this paper, along with notes on length-weight relationship (400 specimens) and food and feeding habits (1388 specimens).

Colour was noted in fresh condition, but detailed studies on taxonomy were made on material preserved in 5% formalin. The total length in mm and weight in grams, sex and stage of maturity were recorded of specimens in fresh condition.

DESCRIPTION

NEMIPTERUS DELAGOAE SMITH

Nemipterus delagoae Smith 1941. *Trans. Roy. Soc. South Africa*. Vol. XXVIII.
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Meristic counts: D. X, 9; A. III, 7; V. 1, 5; C. 20; P. 15-16(15); Ll. 49; Ltr. 13-16(15). Seven gill rakers on lower margin of the anterior arch.

Measurements—In percentage of standard length: Head length 29.78-34.02 (31.90), maxilla length 11.05-14.44 (12.38), eye diameter (horizontal) 7.20-9.91 (8.29), snout 9.52-11.81 (10.68), interorbital 6.52-9.37 (8.15). Depth at dorsal origin 24.03-29.86 (27.16), depth at anal origin 20.19-26.38 (24.17). Caudal peduncle 7.77-11.84 (9.5), predorsal length 30.76-36.15 (33.10), prepectoral length 29.74-35.32 (32.07), pectoral fin 22.81-29.03 (25.16), prepelvic length 31.44-37.72 (35.37), pelvic fin 27.22-34.55 (31.74), preanal 55.67-67.27 (62.06), anal fin base 17.72-22.30 (20.74), dorsal fin base (spinous and soft dorsal together) 47.17-57.58 (53.57).

In percentage of head length: Maxilla 33.82-46.43 (38.84), eye 22.06-29.79 (26), snout 30.36-38.24 (33.5) and interorbital 20.00-29.17 (25.59).

The Coefficient of variation of the different characters under study ranged from 22.56% (eye diameter) to 30.49% (pelvic fin length). Rest of the characters did not show much variation from each other. Details are given below.

	Mean	Coefficient of variation
Standard length	163.56	26.97
Head length	52.20	26.99
Maxilla length	20.14	26.12
Eye diameter	13.34	22.56
Preorbital length	17.59	29.85
Interorbital width	13.32	28.15
Depth at dorsal origin	44.52	27.90
Depth at anal origin	39.66	28.59
Depth at caudal peduncle	15.32	23.56
Predorsal distance	53.62	26.15
Dorsal fin base	87.77	26.20
Preanal distance	101.54	27.04
Anal fin base	33.36	26.74
Prepectoral distance	52.52	27.27
Pectoral fin length	42.16	27.86
Prepelvic distance	57.98	27.82
Pelvic fin length	51.98	30.49
Caudal fin length	42.98	24.13

Colour: In fresh condition the upper half of the body pink and lower half silvery. Four to six yellow longitudinal bands below the lateral line. Head pink. V-shaped brown mark on the nape pointing towards snout in big specimens, both males and females. Dorsal pink with a narrow orange margin followed by a blue band. Pelvic milky-white with yellowish axillary scales. Pectoral pink. Anal with two to four longitudinal greenish yellow bands; in small specimens only two bands present, but with increase in size bands also split and in big specimens four clear bands present. Caudal fin pinkish with yellowish broad bands on the middle of each lobe.

Distribution: Delagoa Bay to Beira along the east coast of south Africa and coasts of India.

LENGTH-WEIGHT RELATIONSHIP

Altogether 400 specimens (200 males and 200 females) were examined for this study. Males ranged in total length from 103 mm to 298 mm and females from 130 mm to 295 mm.

The relationships obtained by using the formula $\log W = \log a + b \log L$ for males and females separately were;

$$\text{Males: } \log W = -4.894391 + 2.969385 \log L$$

$$\text{Females: } \log W = -4.675841 + 2.881551 \log L$$

The results of the test of identity of the above straight lines are presented in Table 1.

Since there is no significant difference in the Regression lines between males and females, the data for both the sexes were pooled and a common equation for length-weight relationship was fitted as

$$\log W = -4.891125 + 2.972582 \log L$$

FOOD AND FEEDING

Preserved stomachs of a total of 1388 specimens of *N. delagoae* were examined for food and feeding studies. The degree of distension of stomachs was recorded depending on their relative fullness, in the following categories: (1) Empty, (2) $\frac{1}{2}$ Full, (3) $\frac{1}{3}$ Full, (4) $\frac{2}{3}$ Full, (5) Full and (6) Gorged. The percentage occurrence of various distensions of the stomachs to the total number of stomachs was compared with the monthly average volume to arrive at the intensity of feeding. The volumetric method (Hynes 1950) was adopted for the qualitative analysis of food contents. Specimens with gorged, full and $\frac{2}{3}$ -full stomachs were considered to have actively fed, whereas those with half-full as moderately fed and with $\frac{1}{2}$ -full as poorly fed.

TABLE 1. Test of identity of Regression lines.

Sex	No.	Σx	Σy	raw sums			df	corrected sums			df	$\Sigma y^2 - \frac{(\Sigma xy)^2}{\Sigma x^2}$
				Σx^2	Σy^2	Σxy		Σx^2	Σy^2	Σxy		
Male	200	447.9923	351.3838	1006.7609	650.4062	796.8122	199	3.2754	33.0533	9.7260	198	4.1728
Female	200	455.0845	376.6363	1036.2068	715.3020	859.0159	199	0.6973	6.0275	2.0092	198	0.2382
										Total	396	4.4110
Total	400	903.0768	728.0201	2042.9677	1365.7082	1655.8281	398	4.0984	40.6750	12.1829	398	4.4601
										Difference	2	0.0491

Source of variation	d.f.	ANOVA			Remarks
		s.s.	m.s.	f	
Between sexes	2	0.0491	0.0246	2.2162	From 'F' tables F (2,396) at 5% level is greater than 3.02. Hence the calculated F value of 2.2162 is not significant at 5% level.
Within sexes	396	4.4110	0.0111		

Condition of feed

Empty stomachs (925 Nos.) occurred in very high percentage (66.64%) of the 1388 stomachs examined (Table 2). It was noticed that the percentage occurrence of empty stomachs varied from month to month. The empty stomachs if excluded, a higher percentage of actively fed fishes occurred throughout the year except in March. Fishes with moderately fed stomachs dominated over actively fed only in March.

TABLE 2. *Percentage occurrence of the stomachs of Nemipterus delagoae Smith in various degrees of fullness from February 1980 to January 1981.*

	Empty	1/4 Full	1/2 Full	3/4 Full	Full	Gorged	Sample numbers
1980							
Feb	81.43	—	5.72	—	10	2.66	70
Mar	77.54	2.17	15.94	0.72	3.63	—	138
Apr	71.96	—	9.59	0.74	17.71	—	271
May	64.71	14.71	5.88	2.94	11.76	—	34
Jun	75	—	8.33	—	16.67	—	24
Jul	90	—	—	—	10	—	10
Sep	52.50	5.00	5.00	—	37.5	—	40
Oct	74.73	0.61	7.98	2.45	14.73	—	163
Nov	49.04	9.55	14.65	0.64	23.57	2.55	157
Dec	52.61	6.09	17.39	2.17	16.09	5.65	230
1981							
Jan	70.52	3.98	5.18	0.80	15.94	3.59	251
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Total Nos.	925	50	147	16	222	28	1388
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%	66.64	3.60	10.60	1.15	15.99	2.09	

Fluctuations in feeding intensity were also studied based on actual volumes of stomach content. The average volume of food per fish, when empty stomachs are included, ranged from 0.1 ml in March to 0.90 ml in September (Table 3). But when empty stomachs are excluded, the averages ranged from 0.44 ml during March to 1.88 ml during September. In March the total length of the fish ranged from 101 mm to 200 mm with mode at 121 mm to 160 mm, which are mostly immature fishes. But in September the total length of the fish ranged from 181 mm to 260 mm with mode at 121 mm to 250 mm, which is dominated by mature fishes.

TABLE 3. Monthly average volume of stomach contents of *Nemipterus delagoae* from February 1980 to January 1981.

	Including empty stomachs (ml)	Excluding empty stomachs (ml)	Total No. of fish
1980			
Feb	0.20	0.93	70
Mar	0.10	0.44	138
Apr	0.27	0.93	271
May	0.18	0.50	34
Jun	0.39	1.57	24
Jul	—	—	10
Aug	—	—	—
Sep	0.90	1.88	40
Oct	0.28	1.09	163
Nov	0.68	1.33	157
Dec	0.56	1.18	230
1981			
Jan	0.25	0.84	251
Average for the year and Total	0.38	1.09	1388

The food mainly consisted of crustaceans, juveniles of fishes, molluscs and annelids (Table 4).

Crustaceans: Crustaceans formed the dominant food components, their volumetric contribution being 74.48%, consisting mainly of prawns, crabs, *Squilla* and Hippa.

(a) **Prawns:** prawns ranked highest among the food organisms and were present throughout the year. Its percentage volume for the whole period of study was 29.44. The highest consumption of prawns occurred during February (65%) and the lowest during September, after which there was a gradual increase. The main species recorded was *Metapenaeus dobsoni*, which occurred throughout the year. *M. monoceros* was recorded rarely.

(b) **Crabs:** crabs ranked next to prawns and formed 23.39% of total volume. Its highest percentage of 70.21 was recorded during June and lowest 5.84 during March. Crabs occurred in the stomachs in large numbers when prawns were few, and *vice versa*.

(c) *Squilla*: *squilla* contributed 11.14% of the total volume of the food. Maximum value of 35.75% was recorded during September when it ranked first among all the food items. The lowest percentage of 3.65 was recorded during March.

TABLE 4. Percentage of occurrence of main food items of *Nemipterus delagoae*.

	Prawn	Crab	<i>Hippa</i>	<i>Squilla</i>	Other crustaceans	<i>Loligo</i>	Fish
1980							
Feb	65	11.43	—	—	—	11.43	12.14
Mar	21.89	5.84	—	3.65	23.36	10.95	34.31
Apr	30.01	—	36.70	20.20	—	5.18	2.73
May	31.67	35	—	—	—	—	33.33
Jun	29.79	70.21	—	—	—	—	—
Jul	—	—	—	—	—	—	—
Aug	—	—	—	—	—	—	—
Sep	11.73	24.02	12.85	35.75	—	8.38	7.27
Oct	15.32	30.41	11.82	18.38	1.32	15.10	5.03
Nov	25.78	23.52	8.09	11.19	—	19.19	9.41
Dec	29.28	11.62	6.04	13.25	—	1.40	32.84
1981							
Jan	33.92	21.70	2.90	9.00	1.93	4.34	26.21
Annual %	29.44	23.39	7.85	11.14	2.66	7.6	16.33

(d) *Hippa*: *Hippa* formed 7.85% of the total volume of the food. This item occurred during April, when it ranked first by contributing 36.70%, and from September to January it ranged from 2.90% to 12.85%. Except in April it rarely was a major food item taken by the fish.

(e) *Other crustaceans*: crustaceans other than the above occurred only during three months, namely, March (23.36%), October (1.32%) and January (1.93%). During March it ranked second next to fishes when body parts and appendages of more than one species of crustaceans occurred.

Fishes: like prawns, fish occurred in the food contents almost throughout the year and accounted for 16.33% of the total. Their percentage was high during March (34.32), December (32.84) and January (26.21).

Altogether nine species of bony fishes occurred in the food items. Of these, *Stolephorus* spp. was dominant during almost all the months, while *Saurida*

spp. occurred mainly from November to January. Other species noticed rarely were sardines, *Trichiurus* spp., *Platycephalus* spp. *Thryssa* spp. *Cynoglossus* spp., eels and *Caranx* spp.

Molluscs: molluscs formed 8.58% of the total food components. This group was represented by *Loligo* spp. (7.6%), *Octopus* (0.61%), *Sepia* (0.23%) and the mussels (0.35%). *Loligo* occurred almost throughout the year while other molluscs were recorded occasionally. For *Loligo* highest percentage was recorded during November (19.19%) followed by 15.10% in October, 11.43% in February and 10.95% in March.

Polychaetes were noticed during April (5.18%), October (0.4%) and during November (0.56%).

DISCUSSION

Morphometric and meristic characters of specimens from Vizhinjam show some deviations from those given by Smith (1939), in having longer first pelvic-fin ray, slightly more body depth and bigger snout, compared to which fishes from Vishakhapatnam (Srinivasa Rao et al 1981) and specimen described by Rajagopalan et al (1975) have shorter head and less body depth. Scales in diagonal rows also showed variation. In other characters the present specimens agree well with the description given by Smith (1939) and Rajagopalan et al (1975).

Smith (1939) in his original description did not give four greenish yellow bands on anal fin but in the figure given later (1961) these lines have been shown. Juveniles of *Nemipterus delagoae* have in most of the instances only two yellow greenish bands on the anal fin, but with the increase in the length of the fish these two bands split and becomes four in adults. While a V-shaped brown mark on nape is present in adult fish, both males and females, juveniles have no such mark.

Kuthalingam (1965) studied the food and feeding habits of *Nemipterus japonicus* obtained from trawler catches off Mangalore. According to him *N. japonicus* feeds mainly on *Metapenaeus dobsoni* and *Parapenaeopsis stylifera*, of which the former dominates alongwith some species of fishes. He found the fish cannibalistic. Krishnamoorthi (1971) made detailed studies on food and feeding habits of *Nemipterus japonicus* collected from Andhra-Orissa coast. According to him the species is actively predaceous and possibly a sight-feeder, feeds in crustaceans, molluscs, annelids and echinoderms.

Present studies reveal that *Nemipterus delagoae* is a carnivore, feeds mainly on crustaceans, fishes, molluscs and annelids. No planktonic organisms in the food contents of this species was found, nor cannibalism was noticed.

Nemipterus spp. are caught mainly by hooks and lines at Vizhinjam operated during day. The presence of bottom-dwelling organisms like prawns,

crabs and *Squilla* clearly indicates that *N. delagoae* is mainly a bottom feeder. But occasionally, since feeding on pelagic fishes like *Stolephorus*, it becomes a column feeder.

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