Population Dynamics of *Nemipterus japonicus* from the Northern Arabian Sea, Pakistan

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Abstract

Catch-per-effort and length-frequency data on threadfin bream *Nemipterus japonicus* (Nemipteridae) supplied by the staff of the R/V Dr. Fridtjof Nansen, covering the period September 1983 to June 1984, were analyzed using the NANPACK and Compleat ELEFAN softwares.

The seasonal, zonal and depth-wise distribution of *N. japonicus* is presented and discussed and the growth parameters L_∞ and K that were estimated are compared with estimates from other areas of the Indo-Pacific.

Introduction

The fishes of the family Nemipteridae, popularly known as threadfin bream or *katti* and *kolonto* by the local fishers, are an important group of demersal fish both in terms of their commercial value as well as relative abundance. *Nemipterus japonicus* is one of the important species and a relatively large nemipterid with a maximum size of 25 to 30 cm (Bianchi 1985). These are caught mainly in bottom trawls. *N. japonicus* forms large schools and are excellent foodfish but in Pakistan the catches include considerable quantity of small-sized individuals landed as trash fish used for fishmeal (NCA 1988).

Eggleston (1972) found that *N. japonicus* occurs from very shallow water to a maximum of about 50 m. Weber and Jothy (1977) reported similar distributions off Sabah and Sarawak, Eastern Malaysia. Isa (1988) considers it an inshore species. Weber and Jothy (1977) estimated mortality rates based on numbers in successive size (age) groups. Based on their data, Pauly (1978) estimated the growth parameters of *N. japonicus* from the northern coast of Borneo. Other works on the biology of threadfin bream are those of Hoda (1976, 1981), Krishnamoorthi (1971), Lee (1975) and Pauly and Sann Aung (1984).

Materials and Methods

The catch and length-frequency data analyzed here were collected by R/V Dr.Fridtjof Nansen during surveys off Pakistan from September 1983 to June 1984. The research vessel is a 150-foot combined stern trawler/purse seiner with a speed of 13 knots. The gear is a 96-foot head-line demersal shrimp trawl rigged to capture demersal fishes also. A total of 193 single haul/stations were covered during this survey (Nakken 1983).

The catch data were analyzed using the NANPACK software developed and supplied by the Institute of Marine Research, Bergen, Norway. For the present

Table 1. Details of different zones (fishing grounds) in Pakistani coastal waters.

Feature	Zone I	Zone II	Zone III	Zone IV
Longitude (E)	61.34 - 64.00	64.01 - 66.00	66.01 - 66.59	66.01 - 67.59
Latitude (N)	24.46 - 25.15	24.59 - 25.17	24.01 - 25.16	23.01 - 23.58
Main cities and landing centers	Pasni, Gawadar, Jiwani	Ormara, E. Astola Isl.	Karachi, Sonmiani	Shah-Bunder, Keti-Bunder
Bottom type	Rocky	Rocky	Muddy	Muddy
Shelf width (km)	15 - 50	15 - 50	50 - 100	50 - 100
Other features	Capes and Bays present. Delta absent. No major river present.		Creeks present, inflow of freshwater from R. Indus; large deltaic region.	
Total stations Sept. 1983	17	14	12	14
Total stations Jan.-Feb. 1984	24	22	25	24
Total stations June 1984	08	10	12	11

Table 2. Length-frequency data on *Nemipterus japonicus* sampled off Pakistan by R/V Dr. Fridtjof Nansen.

Length (cm)	Sept. 83	Jan. 84	June 84
6.5	-	4	1
7.5	1	15	1
8.5	0	41	3
9.5	0	38	3
10.5	2	63	8
11.5	4	26	37
12.5	7	15	64
13.5	8	5	39
14.5	16	6	56
15.5	49	16	69
16.5	60	41	48
17.5	37	65	34
18.5	42	58	20
19.5	51	51	37
20.5	31	63	29
21.5	51	21	32
22.5	38	23	20
23.5	53	17	14
24.5	51	25	10
25.5	45	18	8
26.5	17	5	0
27.5	2	1	0
28.5	2	3	1
29.5	2	2	2
30.5	2	-	-
Sum	571	622	536

Results and Discussion

The available catch data pertain to the months of September (57 stations), January (95 stations) and June (41 samples). Table 3 shows that mean catch, percentage of total catch and total catch of *N. japonicus* are highest in June and September and lowest in January, during the northeast monsoon. In Zone IV, in September, the mean catch rate was very high (300 kg·hour^{-1}) as compared to 158 kg·hour^{-1} in June in same area. However, in terms of percentage of total catch it is 41.5% in June and only 2.73% in September. The differences in catches in Zones I, II, III and IV are probably due to shelf width, shoreline topography and bottom type (Table 1). The catches are high in June during the southwest monsoon. Upwelling of cold, nutrient rich, low oxygen waters occurs year-round, but is stronger during the southwest monsoon; in the Northern Arabian Sea, this greatly affects the distribution and migration of fish (Bianchi 1985).

Table 4 shows the distribution of *N. japonicus* in different depth zones and suggests that the optimum range for threadfin bream is between 50 and 100 m.

The estimates of the growth parameters L_∞ and K are given in Table 5, along with similar estimates from other areas of the Indo-Pacific. As might be seen, our value of the growth performance index $\phi' = \log_{10}K + 2\log_{10}L_\infty$ (Pauly and Munro 1984) is 2.58, well within the range of ϕ' values in Table 5.

Table 3. Analysis of catch data of *Nemipterus japonicus* in different zones/months in Pakistani waters.

	Zone I			Zone II			Zone III			Zone IV		
Item	Sept.	Jan.	June	Sept.	Jan.	June	Sept.	Jan.	June	Sept.	Jan.	June
No. of stations	17	24	8	14	22	10	12	25	12	14	24	11
No. of stations with *N. japonicus*	5	11	1	2	12	2	7	19	5	3	15	3
Total catch (kg·hour^{-1})	11,103	6,658	647	1,362	9,182	8,497	3,596	9,842	2,765	32,934	7,366	1,909
Catch of *N. japonicus*. (kg·hour^{-1})	78	296	208	46	231	21	593	785	1422	898	429	792
% of total catch	0.70	4.46	32.15	3.38	2.52	0.26	16.5	7.98	51.45	2.73	5.83	41.52
Mean catch (kg·hour^{-1})	15.62	26.97	208	23.04	19.26	10.85	84.77	41.34	284	299.6	28.62	158

study, we have identified and demarcated four fishing zones (Table 1).

The available length-frequency data (Table 2) were analyzed using the Compleat ELEFAN software (Gayanilo et al. 1988), which the author learned to use during a short visit to ICLARM in late 1989 (Iqbal 1989).

Finally, I wish to emphasize the preliminary nature of the analyses presented here, which rely on data supplied by a ship of opportunity, rather than emerging from continuous, Pakistan-based research program, for which facilities and funds are presently unavailable.

Table 4. Mean catch rate (kg·hour^{-1}) of *Nemipterus japonicus* at different depth zones during different seasons.[a]

Depth (m)	September southwest monsoon Temp. 28°C	January northeast monsoon Temp. 23°C	June southwest monsoon Temp. 29°C
0-19	0	11.3 (11)	0
20-29	0	6.2 (8)	10.8 (2)
30-39	13.6 (5)	27.0 (2)	0
40-59	49.5 (2)	40.4 (3)	0
50-99	155.9 (9)	47.2 (22)	152.3 (7)
100-200	46.0 (1)	32.2 (11)	339.3 (4)

[a]Numbers in brackets indicate numbers of stations.

Table 5. Growth parameter estimates of *Nemipterus japonicus* in various areas of the Indo-Pacific.

Areas	L_∞ (cm)	K (year^{-1})	ϕ'[a]	Remarks	Sources
India (Andhra-Orissa)	30.5	0.314	2.47	1964-1965	Krishnamoorthi (1971)
	20.9	0.648	2.45	1965-1966	Krishnamoorthi (1971)
	30.3	0.294	2.43	1966-1967	Krishnamoorthi (1971)
Hongkong	34.1	0.190	2.34	Females	Lee (1975)
	38.2	0.130	2.28	Males	Lee (1975)
Southern Burma	37.0	0.243	2.52	1979-1982	Pauly and Sann Aung (1984)
Northern Borneo, Malaysia	28.9	0.47	2.59		Pauly (1978), based on Weber and Jothy (1977)
Kedah State, Malaysia	31.4	0.55	2.73	1985	Isa (1988)
Pakistan	28.8	0.46	2.58	This study	

[a]$\phi' = \log_{10}K + 2\log L_\infty$ (Pauly and Munro 1984).

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