

Indian Journal of Fisheries 38 (2) : 97-102, June 1991

## Threadfin bream fishery and biology of *Nemipterus japonicus* off Veraval

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Received : 4 February 1991

### ABSTRACT

The annual average threadfin bream landings from 50 252 trawl units was 1 928.5 tonnes in Veraval during April 1987 — March 1990. The catch per unit effort was high during December - March. *Nemipterus japonicus*, which formed 82.6% of the threadfin bream landings, matured at 180 mm total length. The von Bertalanffy growth parameters were  $K = 0.733$ ,  $t_{\infty} = -0.1167$  and  $L_{\infty} = 337$  mm. *N. japonicus* preferred to feed on crustaceans especially *Aceles* spp.

Studies on the threadfin breams of west coast of India are very few (Kuthalingam 1966, Vinci and Nair 1974, Vinci 1983). The present study on the threadfin bream fishery and on a few aspects of biology of *Nemipterus japonicus* (Bloch) off Veraval is abeginning towards understanding the threadfin bream resource in the northwest coast of India.

### MATERIALS AND METHODS

Data on catch and effort of commercial trawlers operating from Veraval were collected for 18 days in a month during April 1987-March 1990. However, the total period during which the data were collected was of 8V<sub>2</sub> months in a year as every year from June to middle of September all trawling operations are suspended in the region. As the annual effort of trawls and landings of threadfin

breams did not vary much during the 3-year period from April 1987 to March 1990, the data collected were pooled and annual average effort and catch calculated. The data were weighted for monthly values. Data on total length (measured from tip of snout to up of lower caudal lobe), weight, sex and stage of maturity, and stomach contents were obtained from fresh specimens of *N. japonicus* collected regularly from the landing centre. The data obtained on each observation day were raised to the day's catch based on the eye estimation of the day's catch (in Kg) at the landing centre. The day's catch were further raised to get monthly length composition of catch.

For determining the length at first maturity, females of *N. japonicus* (N = 733) ranging from 65 to 275 mm in total length collected during December 1987 to December 1989 were considered. Females in stage II and above of maturation were taken as mature. In each 10 mm length group, the number of mature females was noted and scaled to percentage.

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For determining the spawning size, only females (N = 650) above the length at first maturity were considered. The number of mature females of corresponding months of the study period were pooled and the monthly percentage frequency distribution worked out.

For length weight relationship a sample of 203 females of 75-275 mm total length and 236 males of 75-245 mm was used. The relationship was calculated separately for both the sexes by the method of least squares using the formula,  $\log W = \log a + b \log L$ , where W, weight (g); L, length (mm) and a, b, are constants.

For estimating growth a total of 1 648 specimens of *N. japonicus* of 70-309 mm length were measured during December 1987-March 1990 and the modes in the length frequency distribution of each month were plotted. The parameters of growth were estimated using von Bertalanffy equation. The values of K,  $L_{\infty}$  and  $t_0$  were estimated from the Ford-Walford plot (Ford 1933, Walford 1946) of  $l_{t+1}$  against  $l_t$  on the basis of length attained at intervals of 3 months. The stomach of 435 individuals of *N. japonicus* ranging from 115-285 mm was analysed during 1989. The

stomach contents in the fish was analysed based on the eye estimation with respect to quantity, viz. empty, half-full and full, and by gravimetric analysis the percentage occurrences of various species was estimated (Jhingran *et al.* 1969).

RESULTS AND DISCUSSION

Fishery

The annual average effort of private trawlers operated off Veraval was 50 252 units (Table 1). The annual average threadfin bream landings was 1 928.5 tonnes and the catch per unit effort (CPUE) was 38.4 kg. The threadfin breams formed 3.7% of total trawl catch and the maximum landings was in March. Though there was no definite month-wise pattern in threadfin bream landings, the CPUE was higher during December-March than the other trawling months.

The threadfin bream fishery was constituted by 3 species viz. *N. japonicus*, *N. mesoprion* and *N. delagoae*. *N. japonicus* formed 82.6% of the landings and dominated the catch during all the trawling months (Table 2). *A. delagoae* occurred only during November and December.

Table 1. Average monthly catch and catch rate of threadfin breams from private trawlers in Veraval during April 1987-March 1990 (data pooled)

Month	Units	Catch (t)	CPUE (kg/unil)	% in total landings
April	5 693	217.7	38.2	4.2
May	6 810	107.5	15.8	2.3
June	229	0.0	0.0	0.0
July	0	0.0	0.0	0.0
August	0	0.0	0.0	0.0
September	3 240	39.3	12.1	2.1
October	6 845	278.5	40.7	3.3
November	6 388	166.9	26.1	2.3
December	5 473	277.1	50.6	4.1
January	5 197	270.1	52.0	4.6
February	4 481	224.1	50.0	5.3
March	5 896	347.3	58.9	4.2
Total	50 252	1 928.5	38.4	3.7

Table 2. Average monthly species composition (%) of threadfin brems from private trawlers in Veraval during April 1987-March 1990 (data pooled)

Month	<i>Nemipterus japonicus</i>	<i>Nemipterus mesoprion</i>	<i>Nemipterus delagoae</i>
Apr	93.7	6.3	0.0
May	86.1	13.9	0.0
June	—	—	—
July	—	—	—
Aug	—	—	—
Sep	87.5	12.5	0.0
Oct	93.4	6.5	0.0
Nov	77.9	18.7	3.4
Dec	78.4	6.9	14.7
Jan	73.8	26.2	0.0
Feb	83.7	16.3	0.0
Mar	77.1	23.0	0.0
Pooled	82.6	15.0	2.4

Table 3. Monthly frequency (%) of different maturity stages of adult *Nemipterus japonicus* females (data from December 1987-1989 pooled)

Month	Sample size	Maturation stages (%)		
		II	III and IV	V and VI
Apr	65	42.4	47.3	10.3
May	71	68.3	31.7	0.0
June	—	—	—	—
July	—	—	—	—
Aug	—	—	—	—
Sep	—	—	—	—
Oct	80	39.7	32.5	27.8
Nov	70	36.7	55.0	8.3
Dec	117	43.6	31.9	24.5
Jan	103	50.6	40.7	8.7
Feb	65	28.5	39.5	32.0
Mar	79	24.3	36.7	39.0

#### Biology of *Nemipterus japonicus*

**Length at first maturity :** Percentage of mature females at different length is given in Fig. 1. Fish above 160 mm had mature ovary; 50% of fish were mature at 180 mm which may be considered as the length at first maturity of female *N. japonicus*. However, Krishnamoorthy (1971), Murty (1984) and Vivekanandan and James (1986) had observed the length at first maturity of female *N. japonicus*

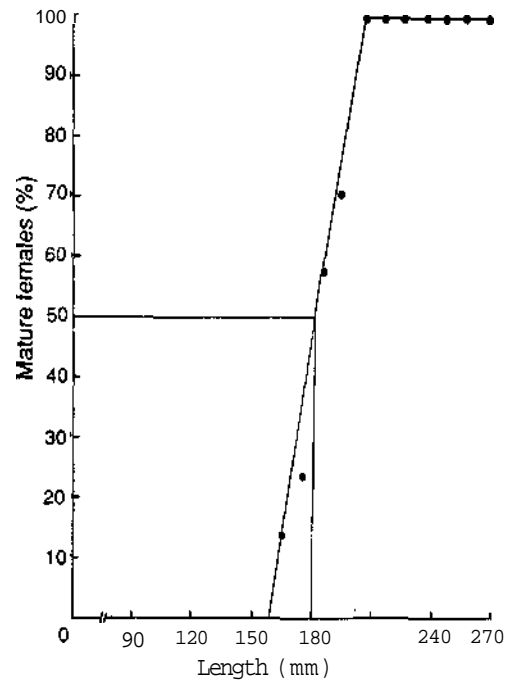


Fig. 1. Frequency Of mature females (%) of *Nemipterus japonicus* in relation to length.

as 165 mm (stage V and above), 125 mm (stage III - IV) and 145 mm (stage III and above), respectively, which were comparatively lower than the present findings. This however, can be attributed to the geographical and hydrological condition existing in the east, southeast and northwest coast.

**Spawning season :** Barring the non-fishing months, mature females occurred almost during all months with maximum occurrence during February and March (Table 3). The spawning season of *N. japonicus* may be considered as a prolonged one as suggested by Vivekanandan and James (1986).

**Length-weight relationship :** The regression equation for the 2 sexes are :

$$\text{Male: } \log W = -4.0595 + 2.6616 \log L ; r = 0.953$$

$$\text{Female: } \log W = -4.6173 + 2.9066 \log L ; r = 0.954$$

The significance of differences between corresponding a and b values of male and female were tested by Analysis of Covariance (Snedecor and Cochran 1967). The differences were not significant at 5% level, as reported by Vivekanandan and James (1984). Therefore, a common relationship was obtained by pooling the data :

$$\log W = -4.2570 + 2.7488 \log L ; r = 0.953, F = 3.470$$

*Growth* : By connecting the maximum number of modes, it was possible to obtain 4 growth curves (Fig. 2). The length attained at quarterly intervals read off from each curve (starting from the minimum modal length) were used to estimate von Bertalanffy parameters of growth. The values of K,  $L_M$  and  $t_0$  thus estimated were 0.733, 337mm and - 0.1167, respectively. The lengths were 188, 266, 303

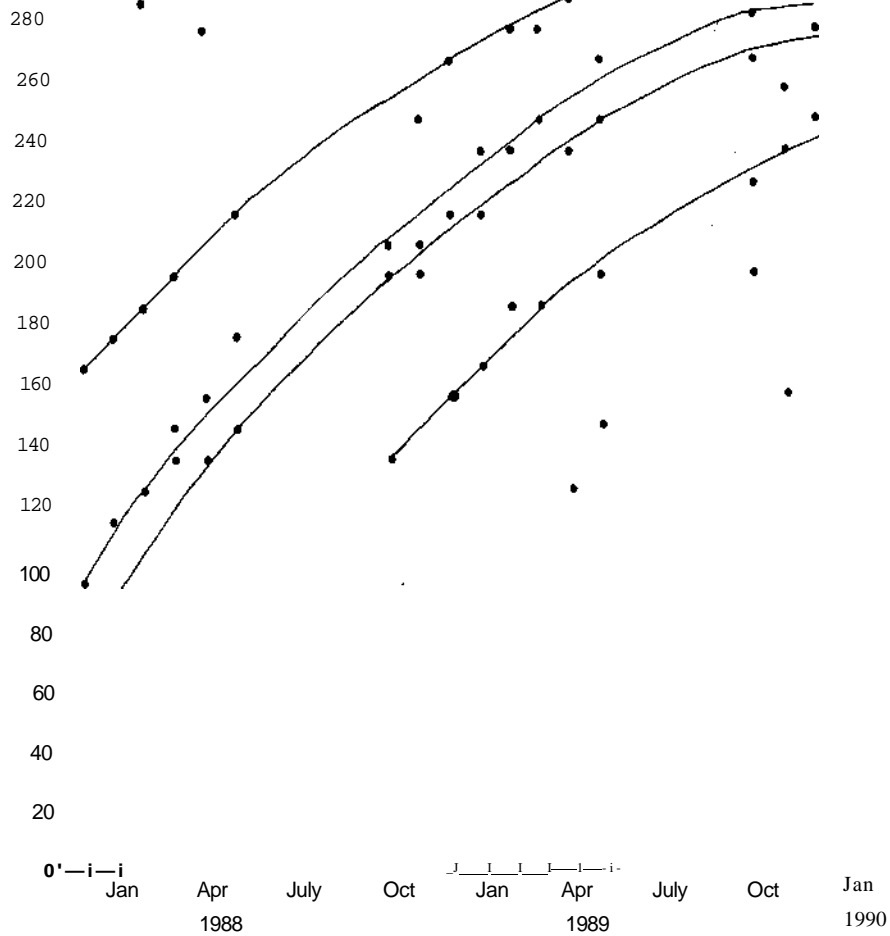


Fig. 2. Growth in length of *Nemipterus japonicus* on the basis of modal progression.

and 321 mm at the completion of 1,2,3 and 4 years, respectively (Fig. 3). The growth parameters estimated in the present study fell within the range of values compiled by Vivekanandan (1991) for *N. japonicus* inhabiting east and west coasts of India. However, comparing with the  $L_{\infty}$  off Vissikhatnam (305 mm), Kakinada (314 mm) and Madras coast (305 mm), the  $L_{\infty}$  off southwest coast tended to be higher (337 mm).

**Feeding:** The stomach content analysis showed that about 43 % of the individuals had empty stomach and 28% full stomach (Table 4). However, during March, May and October more than 50% of the individuals had empty stomach. High percentage of empty stomach fishes in this and in earlier studies (Vivekanandan 1990) was probably due to non-availability of preferred food items during certain months and/or regurgitation of freshly consumed and semi-digested food when the fish was caught.

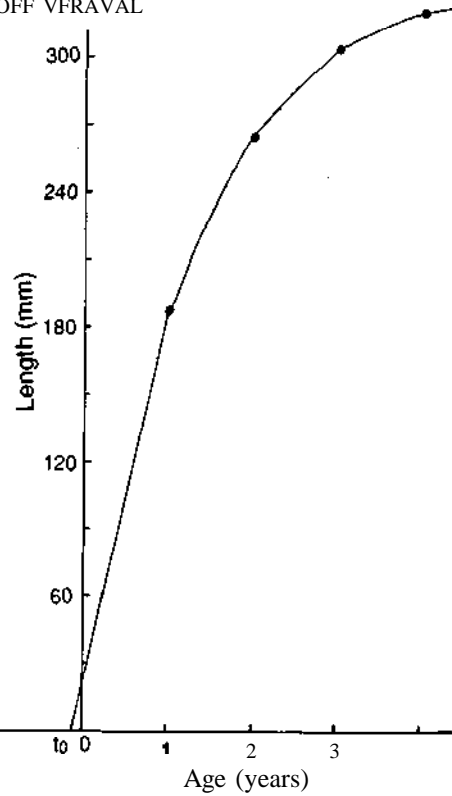


Fig. 3. von Bertalanffy growth curve for *Nemiplerus japonicus*.

Table 4. Stomach condition and food of *Nemiplerus japonicus* during 1989

Month	No. offish examined	Stomach condition (%)			Food organism (%) *					
		Empty	Half-full	Full	Aceles	Prawn	Crab	Loligo	Squid	Fish
January	100	47	27	28	28	9	5	5	0	7
February	43	28	31	41	30	11	19	9	0	2
March	45	53	26	21	11	11	5	4	5	7
April	54	39	26	35	17	7	11	7	3	25
May	41	52	37	11	3	2	4	4	0	3
June										
July										
August										
September										
October	40	55	31	14	0	20	2	0	0	0
November	41	38	44	18	9	17	0	0	0	0
December	67	32	24	44	47	1	0	1	0	0
Total	431	43	29	28	21	11	6	4	1	6

\* Represented as percentage of each food organism present in the stomach of total number of samples analysed

Analysis of the stomach contents identified *N. japonicus* as an exclusive carnivore preferring crustaceans. Kuthalingam (1966) and Vivekanandan (1990) also reported that *N. japonicus* preferred crustaceans. It was estimated that *Acetes* spp. were consumed by 21%, prawn by 11% and crab by 6% individuals. This preference could be indirectly assessed from Table 4 also. During the months of maximum consumption of *Acetes* (February and December), the percentage of full stomach individuals was also maximum whereas in the months of low consumption of *Acetes*, the percentage of empty stomach individuals was more than 50% (March, May and October). Detailed study is necessary to understand how far the abundance of *Acetes* influences the threadfin bream fishery.

#### ACKNOWLEDGEMENTS

We thank the Director, CMFRI, Cochin, for the facilities; Dr K Alagaraja, Principal Scientist, for the suggestions; and Shri H K Dhokia for technical assistance.

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