

# NOTES ON SOME ASPECTS OF THE FISHERY AND BIOLOGY OF *NEMIPTERUS JAPONICUS* (BLOCH) WITH SPECIAL REFERENCE TO FEEDING BEHAVIOUR

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The family Nemipteridae is represented by *Nemipterus japonicus* in the trawler catches off Mangalore. Locally known as "Rani fish" it forms one of the important offshore catches\* constituting 26.4%. There is practically no information available regarding the biology and fishery of this group of fishes. It is therefore attempted in the present account, to deal with the feeding habits, sex ratio and maturity stages, size groups, and depthwise distribution of this species.

## MATERIAL AND METHOD

Random samples were collected on board while trawling along some of the parallels close to the latitude 13° 50' between depths of 10 and 50 metres in the vicinity of Mangalore. This range of depth has been subdivided into smaller depth ranges of 10 meters and the data analysed accordingly. The stages of maturity were determined following the maturity scales fixed by the International Council for the Exploration of the Sea. Points (Numerical) method was adopted to obtain the percentage composition of the diet. 20-meter shrimp otter trawl with a cod-end mesh of 25 mm. was the gear employed throughout.

## FEEDING HABITS

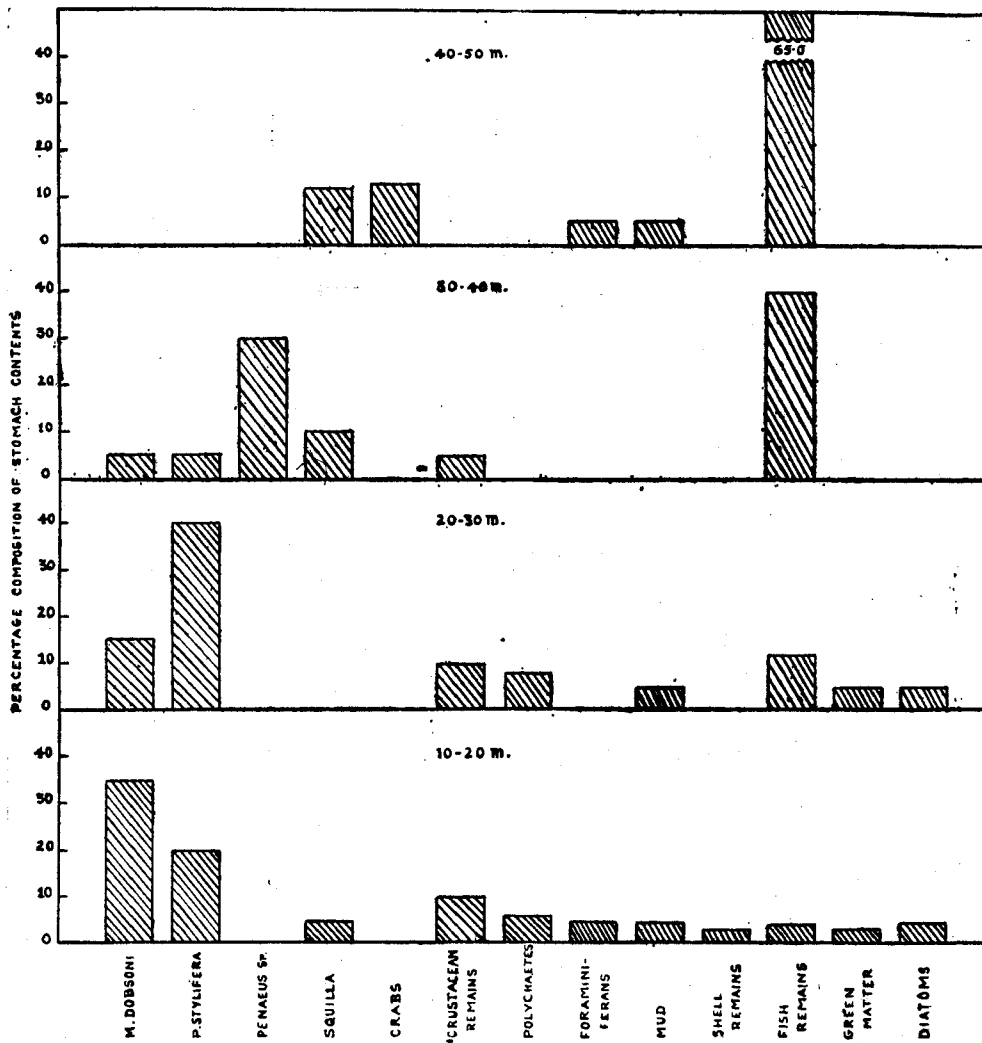
The material ranging from 5 to 25 cm. collected from April 1963 to April 1965 showed no seasonal variation in the feeding habits of the fish, whereas the data when analysed depth-wise indicated remarkable changes in the composition of the diet (Fig 1). This aspect is dealt with in detail in the following account.

(a) 10—20 meters depth: 175 specimens ranging from 5 to 20 cm. were collected and the results of the stomach analysis showed that *Metapenaeus dobsoni* and *Parapenaeopsis stylifera* formed the bulk of the food, of which

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\*M.V. *Tarpon*, Govt. of India fishing trawler.



*M. dobsoni* dominated constituting 35%. Other crustacean items were represented by *Penaeus* spp., appendages of copepods and crabs. Tubes of the tubedwelling polychaetes were found in the stomach. Mud mixed with shell pieces and foraminiferan remains were also recorded. Partly digested fish remains belonging to *Thrissocles* and *Dussumieria* were also present. Diatoms and algae were represented by species of *Coscinodiscus* and *Trichodesmium* respectively.

(b) 20—30 meters depth: Stomachs of a total of 202 fishes measuring 9—24 cm. were analysed. *Parapenaeopsis stylifera* formed the bulk of the diet,

constituting 40%. However, *Metapenaeus dobsoni* were also recorded. *Penaeus indicus* and *P. carinatus* were found in small quantities along with other crustacean appendages. Polychaetes belonging to the family Maldanidae and Glyceridae were also noted. Teleostean food items belonging to the genera *Sardinella* and *Sciaena* were also found in the stomach and since they were in a partly digested condition specific identification could not be made. Mud mixed with green matter was also seen along with the food contents. The diatoms were identified as *Chaetoceros*, *Thalassiothrix* and *Rhizosolenia*.

(c) 30—40 meters depth: 168 fishes were analysed and they measured between 13 and 24 cm. Fish food formed the bulk of the diet constituting 40.0%. Species of *Clupea*, *Engraulis*, *Thrissocles*, *Dussumieria*, *Leiognathus* and *Cynoglossus* were the most frequent items of diet of which 30% was constituted by clupeids. The preponderance of clupeids in the stomach suggests that this fish has preference to this group of fishes. The clupeids were represented by *Kowala coval*, *Sardinella longiceps*, *S. fimbriata*, *Opisthopterus tardoore* and *Thrissocles mystax*. The next important items of diet was *Penaeus* spp. of which *P. indicus* dominated. The other crustacean food was represented by *Squilla mantis*, *Squilla holoschista*, *Parapenaeopsis stylifera* and *Metapenaeus dobsoni*. Green matter mixed with other items of food was also noticed.

(d) 40—50 meters depth: Analysis of the stomach contents of 148 specimens ranging from 10 to 24 cm. revealed that these fishes fed mainly on teleostean food constituting 65%. About 75% of the stomach was exclusively filled with *Nemipterus japonicus*, *Squilla holoschista* and *S. mantis*. Crabs (*Charybdis annulata*, *Neptunus pelagicus*) and their appendages mud mixed with the radiolarians, tintinnids and dinoflagellates were also noticed.

#### SEX RATIO AND MATURITY

The details of the sex ratio and maturity stages of the fishes collected at different depths are presented in Table I. Of the 1,290 individuals analysed the sex of 338 specimens could not be distinguished, 568 fishes were males and the rest were females. It is also evident from the Table that males dominated the catches in all the depth ranges except in 40—50 meters where the proportion of females was found to be more.

Between 10 and 20 meters depth 71.2% of the fishes examined ranging from 5 to 8 cm. were in an indeterminate condition. Fishes measuring 9—12 cm. were in an immature stage and in the size group 13—16 cm., the majority was found to be in stage I. In the size range of 17—20 cm. the percentage of maturing specimens was found to be more. In the depth range of 20—30 meters, about 78% of the fishes examined measuring 17—20 cm. were in the maturing stage. Mature specimens were also recorded. 86% of the fishes ranging from 21 to

TABLE I

| Depth range<br>in metres | Total No. of<br>fish examined | Length range<br>in cm. | Sex Ratio     |      |        | Maturity stages* |     |     |     |
|--------------------------|-------------------------------|------------------------|---------------|------|--------|------------------|-----|-----|-----|
|                          |                               |                        | Indeterminate | Male | Female | I                | II  | III | IV  |
| 10-20                    | 320                           | 5-20                   | 248<br>(5-8)  | 50   | 22     | 60<br>(13-16)    | 12  | ..  | ..  |
| 20-30                    | 300                           | 9-20                   | 90            | 130  | 80     | 100              | 80  | 30  | ..  |
| 30-40                    | 360                           | 13-24                  | ..            | 268  | 92     | 60               | 100 | 168 | 32  |
| 40-50                    | 310                           | 13-24                  | ..            | 120  | 190    | 20               | 33  | 50  | 207 |

\* I immature    II maturing    III mature    IV fully mature

25 cm. in the 30—40 meters depth were found to be mature and the rest were observed to be in an advanced stage of maturity (stage IV).

Among the size group 21-25 cm., collected at 40—50 meters depth, more than 80% of these fishes were in an advanced stage of maturity. Spawners and spent fishes were not recorded in these depth ranges.

It is inferred from the data analysed and presented that the fishes move towards the deeper regions as they were becoming sexually mature. The fact that 80% of the fishes collected between depths of 40 and 50 meters were in an advanced stage of maturity and the absence of spawners and spent fishes suggest that the spawning ground of *Nemipterus japonicus* may be somewhere beyond 50 metres depth. Since fully mature specimens were collected during December and January, it is possible that the breeding takes place during January or February.

#### SIZE GROUPS AND DISTRIBUTION

A total of 1898 specimens was measured and the data obtained are presented in Table II to show the fluctuations of the fishes of the different size groups

TABLE II

| Depth range in metres/Length range in cm. | Percentage composition |      |       |       |       |       |       |
|---|------------------------|------|-------|-------|-------|-------|-------|
|   | 5-7                    | 8-10 | 11-13 | 14-16 | 17-19 | 20-22 | 23-25 |
| 10-20                                     | 33.0                   | 30.4 | 18.0  | 10.0  | 5.0   | ..    | ..    |
| 20-30                                     | ..                     | 20.0 | 18.8  | 20.2  | 42.0  | ..    | ..    |
| 30-40                                     | ..                     | ..   | 8.4   | 6.2   | 7.4   | 49.2  | 28.8  |
| 40-50                                     | ..                     | ..   | ..    | 4.0   | 5.2   | 28.4  | 62.4  |

collected from 10—50 meters depth. Seven size groups were classified ranging from 5 to 25 cm. with a length range of 3 cm. in each group.

It is seen that in the depth range of 10—20 meters, size groups 5—7 and 8—10 cm. dominated the catch constituting 33.0 and 30.4% respectively. The larger size groups were not recorded there. Length group 5—7 cm. was not reported in the depth of 20—30 meters whereas 17—19 cm. size group formed the bulk of the catch constituting 42.0%. The bigger size groups were not recorded in this depth range also. In the depth range of 30—40 meters, size groups 5—7 and 8—10 cm. were not noted and the bigger size groups 20—22 and

TABLE III

*Depthwise estimations of total catch, fishing effort and catch/hour in kg of Nemipterus japonicus from the year 1963-64 to 1964-65*

| Year    | Months | Depth range in meters |                         |            |       |                         |            |       |                         |            |       |                         |            |
|---------|--------|-----------------------|-------------------------|------------|-------|-------------------------|------------|-------|-------------------------|------------|-------|-------------------------|------------|
|         |        | 10-20                 |                         |            | 20-30 |                         |            | 30-40 |                         |            | 40-50 |                         |            |
|         |        | Catch                 | Fishing effort in hours | Catch/hour | Catch | Fishing effort in hours | Catch/hour | Catch | Fishing effort in hours | Catch/hour | Catch | Fishing effort in hours | Catch/hour |
| 1963-64 | April  | 284                   | 24·0                    | 11·8       | 298   | 20·0                    | 14·1       | 380   | 21·0                    | 18·1       | 150   | 13·0                    | 11·5       |
|         | May    | 182                   | 15·0                    | 12·1       | 294   | 10·0                    | 29·4       | 300   | 15·0                    | 20·0       | 190   | 6·0                     | 31·7       |
|         | Oct.   | ..                    | ..                      | ..         | 260   | 1·0                     | 60·0       | ..    | ..                      | ..         | ..    | ..                      | ..         |
|         | Nov.   | 684                   | 20·0                    | 34·2       | 100°  | 25·0                    | 40·0       | 1520  | 15·0                    | 101·3      | 260   | 10·0                    | 26·0       |
|         | Dec.   | 580                   | 26·0                    | 22·3       | 800   | 10·0                    | 80·0       | 1800  | 10·0                    | 180·0      | 200   | 11·0                    | 18·2       |
|         | Jan.   | 480                   | 4·0                     | 120·0      | 300   | 2·0                     | 150·0      | 700   | 2·0                     | 350·0      | ..    | ..                      | ..         |
|         | Feb.   | 300                   | ..                      | 300·0      | ..    | ..                      | ..         | ..    | ..                      | ..         | ..    | ..                      | ..         |
|         | March  | 250                   | 5·0                     | 5·0        | 252   | 5·0                     | 5·4        | 300   | 3·0                     | 100·0      | 200   | 2·40                    | 83·3       |
| 1964-65 | April  | 208                   | 50·0                    | 13·9       | 600   | 10·0                    | 60·0       | 1720  | 8·0                     | 90·0       | 320   | 10·0                    | 32·0       |
|         | May*   | 100                   | ..                      | ..         | 450   | ..                      | 45·0       | 1380  | 6·0                     | 63·3       | 220   | ..                      | ..         |
|         | Oct.   | ..                    | ..                      | ..         | ..    | ..                      | ..         | ..    | ..                      | ..         | ..    | ..                      | ..         |
|         | Nov.   | ..                    | ..                      | ..         | ..    | ..                      | ..         | ..    | ..                      | ..         | ..    | ..                      | ..         |
|         | Dec.   | 500                   | 4                       | 125·0      | ..    | ..                      | ..         | ..    | ..                      | ..         | ..    | ..                      | ..         |
|         | Jan.   | 900                   | 15·0                    | 60·0       | 950   | 10·0                    | 95·0       | 3000  | 10·0                    | 200·0      | 900   | 10·0                    | ..         |
|         | Feb.   | 800                   | 12·0                    | 66·6       | 1500  | 10·0                    | 150·0      | 2400  | 10·0                    | 140·0      | ..    | ..                      | ..         |
|         | March  | 300                   | 8·0                     | 37·5       | 500   | 8·0                     | 62·5       | 600   | 8·0                     | 75·0       | 220   | 8·0                     | ..         |

\* June to September no fishing.

23—25 cm. appeared for the first time, of which the former formed the main part constituting 49.2%. 23—25 cm. size group formed the major catches (62.4%) of the region 40—50 metres depth. Smaller size groups of 5—7, 8—10 and 11—13 cm. were not represented.

From the data analysed, the size distribution of these fishes can be summarised as follows. Concentration of fishes belonging to the smaller size groups was noted between 10 and 30 metres depth whereas abundant catches of larger size groups were observed in the depth range of 30—50 metres.

#### TOTAL YIELD

An estimated catch of 28,332.0 kg. was landed during the period April '63 to March '65 by M.V. *Tarpon* and a comparison of the total catch from the different depth ranges shows that the greater production in the year 1964-65 (Table III) was due to the increased catches from the area of 30—40 metres depth than from the other depth ranges. Examination of the fishing effort in the various depth ranges during the two years shows certain fluctuations in the fishing intensity. However in both the years the effort was very high in the area between depths of 30—40 metres.

#### SUMMARY

An attempt has been made to indicate the yield of *Nemipterus japonicus* and the fluctuations in relation to different depths off Mangalore. It is generally observed that the fishery was concentrated more between depths of 30 and 40 metres. Males dominated the catch in all the depth ranges except in 40—50 metres where the females were found to be more. Fully mature specimens were recorded between 40 and 50 metres depth. Analysis of the data on size groups and distribution revealed that smaller size groups were found more in the shallower region and larger size groups towards the deeper region. The stomach contents of the fishes examined showed marked variations in their feeding behaviour in relation to depth.

In 10—20 metres depth the fishes were found to feed mainly on *Metapenaeus dobsoni* and *Parapenaeopsis styliifera* of which the former dominated. In 30—40 metres depth the diet included teleosts besides crustaceans. In 40—50 metres depth, the fish was found to be cannibalistic.

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