*J. mar. biol. Ass. India,* 1996, **38** (1 & 2) : 58 – 62

# FOOD AND FEEDING HABITS OF THE BIG-EYED MOJARRA, *GERRES MACRACANTHUS* BLEEKER OF THE PALK BAY AND THE GULF OF MANNAR

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ABSTRACT

Gut contents of *Gerres macracanthus* from the Palk Bay and the Gulf of Mannar landed by trawl net at Rameswaram and Mandapam were analysed. A total of 1,602 fishes from the Palk Bay and 102 fishes from the Gulf of Mannar were examined for stomach content analyses. The points method was followed in the present study. The frequency of various components in the food has been estimated by occurrence method and expressed in percentages. Polychaetes were the most common food item followed by *Penaeus semisulcatus, Parapenaeopsis tennella and Metapenaeus affinis,* in the order of abundance. Much difference could not be noted in the food components of the fishes occurring in the Gulf of Mannar and the Palk Bay.

## INTRODUCTION

THE MOJARRAS, also known as silver-biddies, of the family Garreidae are caught in limited quantities by the artisanal and trawler units along the Indian coasts. These fishes abound in shallow coastal waters and also found to ascend estuaries and brackishwaters.

Among the silver-biddies, *Gerres macracanthus* Bleeker enjoys a new distributional record in Indian waters as reported from the Palk Bay and the Gulf of Mannar (Venkataraman and Badrudeen, 1977). Catch estimation studies during 1970-'72 show that the silver-biddies formed an average of 4 kg in the trawler landings at Rameswaram and Mandapam of which nearly 40% comprised of *G. macracanthus*.

Observations on the food and feeding habits of silver-biddies from Indian waters are limited to a few species only (Rao, 1968, 1970; Patnaik, 1971). In the present study the findings on the food and feeding habits of *G. macracanthus* during the period 1970-'72 are dealt with.

The authors are extremely grateful to Dr. P. S. B. R. James, Ex-Director, Central Marine Fisheries Research Institute, Kochi for his encouragement. The authors also owe their gratitude to Dr. K. S. Sathyanarayana Rao, Madras Research Centre of CMFRI, Madras for critically going through the manuscript and offering valuable suggestions for the improvement of the text.

## MATERIAL AND METHODS

The samples for the study were collected from the fish landing centres along the Palk Bay and the Gulf of Mannar. Collection of samples from the landing centres of the Gulf of Mannar area were limited only to a few months during the period as the fishing units were not operated in the remaining part of the year due to adverse weather conditions. As the two regions exhibited different ecological characteristics, the samples were analysed separately and the results presented.

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With a view to estimate the volumetric method of feeding habits, the points method of Swynnerton and Worthington (1940) modified by Hynes (1950) was followed in the present study. The frequency of various components in the food of the species was estimated by the occurrence method (Natarajan and Jhingran, 1961) and the same was expressed in percentages. A total of 1,602 fishes from the Palk Bay and 102 fishes from the Gulf of Mannar were examined to study the food and feeding habits of the species and the results are discussed briefly.

## OBSERVATIONS

Monthwise pooled data of the estimated gut points during the period indicate maximum average points per stomach in December (32.9) followed by June (32.5), March (30.3) and January (30.0) whereas the minimum points obtained was in April and November, 21.4 and 21.7 respectively (Table 1).

TABLE 1. *The points obtained by the stomachs and points per stomach in* Gerres macracanthus *during 1970-'72*

| Months | No. of specimens examined | No. of specimens with food | Total points | Average points per stomach |
|---|---|---|---|---|
| May | 139 | 124 | 3,460 | 27.9 |
| June | 183 | 166 | 5,400 | 32.5 |
| July | 130 | 108 | 3,140 | 29.1 |
| August | 168 | 159 | 4,350 | 27.4 |
| September | 150 | 125 | 3,065 | 24.5 |
| October | 150 | 125 | 3,065 | 24.5 |
| November | 41 | 35 | 760 | 21.7 |
| December | 38 | 38 | 1,250 | 32.9 |
| January | 50 | 27 | 810 | 30.0 |
| February | 78 | 59 | 1,515 | 25.7 |
| March | 132 | 86 | 2,605 | 30.3 |
| April | 178 | 161 | 3,440 | 21.4 |
| Total | 1,437 | 1,213 | — | — |
| % | — | 84.4 | — | — |
| Average | — | — | — | 27.3 |

The study also showed that 84.4% of fishes examined were in moderately fed condition.

Based on the fullness of stomachs, percentages of well-fed and poorly-fed conditions in different months during 1970-'71 and 1971-'72 were estimated (Table 2). The studies revealed that fishes with well-fed stomachs were predominant during April-September in the first year and May-August in the subsequent year indicating the monthly average of 57.3 and 50.0% respectively. It was estimated from the observations that the monthly average of poor-fed stomachs was 42.7% in 1970-'71 while the incidence was 50.0% in 1971-'72.

TABLE 2. *Percentage of well-fed and poorly-fed stomachs in* Gerres macracanthus *during 1970-'72.*

| Months | Well-fed | Poorly-fed | Well-fed | Poorly-fed |
|---|---|---|---|---|
| | 1970-'71 | | 1971-'72 | |
| May | 51.4 | 48.6 | 76.0 | 24.0 |
| June | 93.1 | 6.9 | 74.8 | 25.2 |
| July | 82.0 | 18.0 | 51.7 | 48.3 |
| August | 71.4 | 28.6 | 66.1 | 33.9 |
| September | 89.8 | 10.2 | 43.6 | 56.4 |
| October | 45.9 | 54.1 | 43.3 | 56.7 |
| November | 33.3 | 66.7 | 29.4 | 70.6 |
| December | 35.0 | 65.0 | 44.4 | 55.6 |
| January | 21.7 | 78.3 | 37.0 | 63.0 |
| February | 40.0 | 60.0 | 50.9 | 49.1 |
| March | 36.4 | 63.6 | 40.9 | 59.1 |
| April | 87.7 | 12.3 | 41.2 | 60.8 |
| Average | 57.3 | 42.7 | 50.0 | 50.0 |

Twelve identifiable food components could be observed in the stomach of *G. macracanthus*, the monthly percentage occurrence of which are shown in Table 3.

TABLE 3. *Percentage occurrence of different food elements of* Gerres macracanthus *during different months of the period 1970-'72 from the Palk Bay and the Gulf of Mannar*

| Months | No. of fish examined | Food elements | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Polychaetes | Prawns | Copepods | Amphipods | Bivalves | Crabs | Echiuroids | Diatoms | Detritus | Fish scales | Sand grains | Digested matter | Others |
| **Palk Bay** | | | | | | | | | | | | | | |
| 1970 May | 35 | 13.2 | 26.3 | 6.6 | 3.3 | 4.3 | 5.3 | — | 2.6 | 9.5 | — | 10.6 | 13.1 | 5.2 |
| Jun. | 72 | 26.0 | 16.8 | 5.8 | 7.0 | — | 1.6 | — | 11.0 | 20.2 | — | 11.6 | — | — |
| Jul. | 39 | 22.5 | 32.5 | 5.0 | 16.3 | 5.0 | — | — | 6.4 | 12.3 | — | — | — | — |
| Aug. | 56 | 40.2 | 6.3 | — | — | 12.5 | 2.0 | — | — | — | — | 6.3 | 29.7 | 8.0 |
| Sep. | 49 | 37.6 | 16.1 | 10.8 | — | 4.3 | — | 9.7 | 5.4 | 11.8 | — | 4.3 | — | — |
| Oct. | 37 | 39.1 | 19.4 | — | 15.2 | — | 10.9 | 4.5 | — | — | — | — | 10.9 | — |
| Nov. | 204 | 38.9 | — | — | — | — | — | — | — | 15.3 | — | — | 45.8 | — |
| Dec. | 20 | 50.0 | — | — | — | — | — | — | 16.7 | 8.3 | — | — | 25.0 | — |
| 1971 Jan. | 23 | 37.5 | — | — | 37.5 | — | — | 25.0 | — | — | — | — | — | — |
| Feb. | 25 | 38.1 | 19.1 | — | 4.8 | — | 5.3 | 14.3 | — | — | — | 4.8 | 9.5 | 4.1 |
| Mar. | 66 | 25.3 | 15.2 | 5.1 | 13.1 | 2.5 | 2.5 | — | — | 6.1 | — | 8.1 | 20.2 | 1.9 |
| Apr. | 81 | 32.2 | 9.4 | 1.0 | 1.9 | — | 4.3 | — | 2.4 | 10.1 | — | 14.4 | 19.7 | 4.6 |
| May | 104 | 39.3 | 8.6 | — | 3.1 | — | — | — | 13.1 | 5.6 | — | 9.4 | 20.9 | — |
| Jun. | 111 | 33.6 | 20.3 | — | 2.5 | — | 6.0 | — | 2.5 | 1.9 | 1.0 | 13.9 | 13.9 | 4.4 |
| Jul. | 91 | 17.1 | 9.3 | — | — | 11.7 | 3.0 | — | 8.2 | 11.7 | 1.4 | 16.0 | 18.2 | 3.4 |
| Aug. | 112 | 24.6 | 7.7 | 3.2 | 2.4 | 2.0 | 5.2 | — | 6.7 | 14.4 | — | 13.6 | 15.0 | 5.2 |
| Sep. | 101 | 26.0 | 5.9 | — | 3.7 | 3.2 | 2.3 | — | 3.2 | 12.2 | 4.6 | 17.8 | 20.1 | 1.0 |
| Oct. | 90 | 22.8 | 11.6 | 4.8 | — | — | — | 3.2 | 2.0 | 6.9 | 7.9 | 17.5 | 23.3 | — |
| Nov. | 17 | 36.4 | 2.0 | 2.3 | — | — | 4.3 | — | — | 15.8 | — | 6.8 | 29.4 | 3.0 |
| Dec. | 18 | 28.3 | 18.0 | — | — | — | 4.0 | — | 5.0 | 5.0 | — | 16.7 | 20.0 | 3.0 |
| 1972 Jan. | 35 | 31.0 | 7.0 | — | — | — | — | — | 12.6 | 12.7 | 14.1 | 11.3 | 11.3 | — |
| Feb. | 53 | 42.0 | 6.3 | — | — | | — | | | 3.6 | 3.6 | 10.6 | 33.9 | — |
| Mar. | 66 | 27.6 | 18.8 | — | 2.0 | — | 5.0 | — | | 2.8 | 10.0 | 9.5 | 24.3 | — |
| Apr. | 97 | 31.5 | 12.0 | — | — | — | — | — | — | 12.7 | 8.0 | 5.2 | 26.6 | 4.0 |
| **Gulf of Mannar** | | | | | | | | | | | | | | |
| 1971 Nov. | 44 | 42.5 | — | 7.6 | — | — | 3.0 | — | 4.5 | 7.6 | 4.5 | 13.6 | 16.7 | — |
| Dec. | 38 | 27.2 | 12.6 | 4.9 | 18.5 | — | 5.8 | — | — | 3.8 | — | 5.8 | 21.4 | — |
| 1972 Jan. | 16 | 42.1 | 10.5 | — | — | 15.8 | — | — | — | — | 7.9 | 15.8 | 7.9 | — |
| Feb. | 4 | 50.0 | — | — | — | — | — | — | — | — | — | — | 50.0 | — |

The studies indicated that in the fishes from the Palk Bay the most predominant food was polychaete worms of the genus *Nereis* and *Dioptera* with the percentage occurrence varying between 13.2 and 50.0 and was fed by the fish throughout the year. Next in importance were prawns comprising mainly of *Penaeus semisulcatus, Parapenaeopsis tenella* and *Metapenaeus affinis* in the order of abundance, the percentage occurrence of which varied from 2.0 to 32.5. The amphipods and the copepods of the genus *Acartia* and *Calanopia* were fed by the fishes in most of the months indicating 1.9-37.5% and 1.0-10.8% respectively in their occurrence. The predominant bivalve food component consisted of *Donax faba, Paphia malabarica* and *Mesodesma glabratum* in the order of abundance ranging in percentage occurrence between 2.0 and 12.5. *Portunus, Thalamita, Charybdis* and *Philyroglobosa* were the important crabs fed by *G. macracanthus* and the percentage fluctuated from 1.6 to 10.9.

The diatoms mainly *Coscinodiscus, Pleurosigma, Thalassiothrix* and *Navicula* were observed in the food contents especially during April-October with the percentage varying between 2.0 and 16.7. The detritus formed of clumps of mud and clay pellets were present in almost all the months especially during May, '71 - April, '72. High incidence of unidentifiable digested matter was observed in the stomach contents examined in most of the months and the percentage of the same ranged from 9.5 to 45.8. Least abundant items such as caprellids, *Acetes*, protozoans and radiolarians were grouped as 'others' representing 1.0-8.0% in the food during some months. Much difference could not be noted in the food components of the fishes occurring in the Gulf of Mannar area and the Palk Bay excepting the total absence of echuiroids in the stomach contents of fishes from the former.

With a view to study the variations of feeding habits in different size groups of *G. macracanthus*, three size ranges *viz.*, 45-90 mm, 90-135 mm and 135-160 mm were selected representing 0+ year old, 1+ year old and 2+ year old of fishes and the pooled data on the average volumetric percentage of different food components for the above size ranges were examined (Table 4). The observations revealed that within the various size groups, the frequency in the intake of polychaetes and prawns were more or less the same, but the incidence of amphipods, diatoms and detritus matter were more in 90-135 mm and 135-160 mm groups

TABLE 4. *Average volumetric percentage of different food components in three size ranges of* Gerres macracanthus *during the period 1970-'72, along the Palk Bay and the Gulf of Mannar area*

| Food components | Size ranges (mm)/ Palk Bay | | | Gulf of Mannar | | |
|---|---|---|---|---|---|---|
| | 45-90 | 90-135 | 135-160 | 45-90 | 90-135 | 135-160 |
| 1. Polychaetes | 52.0 | 52.0 | 47.3 | — | 61.0 | 66.0 |
| 2. Prawns | 12.9 | 10.3 | 11.4 | — | 5.0 | 11.1 |
| 3. Copepods | 0.8 | 1.0 | 1.0 | — | 1.8 | 1.0 |
| 4. Amphipods | 1.5 | 3.1 | 2.6 | — | 5.8 | 1.7 |
| 5. Bivalves | — | 2.0 | 2.9 | — | 7.0 | 4.2 |
| 6. Crabs | 1.4 | 1.1 | — | — | 3.0 | — |
| 7. Echuiroids | — | 1.3 | 6.5 | — | — | — |
| 8. Diatoms | 1.5 | 2.3 | 2.7 | — | 1.0 | — |
| 9. Detritus | 1.8 | 4.4 | 5.0 | — | 2.3 | — |
| 10. Fish scales | 0.8 | 1.5 | 1.1 | — | 2.4 | 1.5 |
| 11. Sand grains | 6.8 | 5.1 | 5.0 | — | 4.1 | 1.0 |
| 12. Digested matter | 19.2 | 13.3 | 11.7 | — | 9.0 | 12.5 |
| 13. 'Others' | 1.3 | 2.6 | 2.8 | — | — | — |

of fishes. Among the food components, bivalves and echiuroids were totally absent in the stomach contents of fish of the smaller size range of 45-90 mm.

Fish below 90 mm were absent in the collections from the Gulf of Mannar area and the analyses of the available samples revealed that the polychaetes were predominant in the diet as has been the case in the samples from the Palk Bay area.

## DISCUSSION

*Gerres macracanthus* is essentially a bottom feeder as observed from its feeding habits. The polychaete worms which abound in the sandy and rocky habitats of the fish were the dominant food item of this species. The soft muddy nature of the coastal Palk Bay region also indicated the presence of echuiroids as judged from the food of fishes and was consumed mainly by the larger fish thus exhibiting a selectivity of feeds among various size groups. The presence of echuiroids from the digested matter of fishes is easily recognisable by the presence of its golden setae and the proboscis. The study indicates that young fishes of 45-90 mm size resorted more to column feeding as evident from the high percentage frequency of copepods and lesser intensity of detritus, bivalves and fish scales. Different feeding habits by the younger and the older fishes at the column water and at the bttom respectively have been reported in the studies of various fishes along the Indian coasts (Bapat, *et al.*, 1952; Kuthalingam, 1958; Patnaik, 1971).

It has been observed during the course of this study that the advanced stages of maturity of *G. macracanthus* were in the size range of 110-160 mm with spawning extending from October to April with a peak during January - March. During the period of maturation of the species, the feeding intensity was high and there was a distinct slackening of feeding during the intense spawning period. The high percentage of poorly-fed stomachs during October - March in 1971-'72 supports this view. The present study is concomitant with the earlier findings on the food and feeding habits of a few marine fishes from the Indian coasts (Radhakrishnan, 1957; Rao, 1968; Thomas, 1969).

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