

# Food and Feeding Habits of *Glossogobius giuris* in Chalakudy River, Southern Western Ghats, India

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## ABSTRACT

Study on the food and feeding habits is important in the management and life cycle analysis of fishes. *Glossogobius giuris*, an important food fish, supports a good fishery in the downstream part of Chalakudy River- a global biodiversity hotspot. Even though it is basically an estuarine fish, it occurs quite frequently in fresh waters too. Analysis of gut content of fishes is the best and most direct way of investigating their food habits. The food and feeding habits of this fish have been closely followed for one year. The fish samples were collected monthly from Chalakudy River using gill nets. It is observed that the feeding profile of the fish includes teleost fishes, crustaceans, molluscus, semi digested particles, insects, algae and miscellaneous items. The present investigation of the food and feeding habits of *G. giuris* reveals that it is a carnivorous, predatory and bottom feeding fish showing cannibalism.

**Keywords:** *Glossogobius giuris*, goby, Chalakudy River, feeding habit, carnivore

## I. INTRODUCTION

*Glossogobius giuris* (Hamilton 1822) belongs to the family Gobiidae of order perciformes commonly known as Goby and locally known as *poolan*. It is a commercially important fish growing to considerable size. Because of its exceptional taste, low fat and high protein content, the fish is preferred well in the diet of people in South Asia (Ahmed et al. 1984, Islam and Joadder 2005). It is bottom dwelling fish with a wide distribution in the freshwater and estuaries habitats of India, Bangladesh, Pakistan and Myanmar (Doha 1974). The domestic as well as international market of *G. giuris* has increased several times than the previous years in Italy, India, Burma, Nepal and France (Pillay 1990). The available information on the food and feeding habits of *G. giuris* is very limited. Extensive studies on gobioid fishes throughout the world had been reported by Chesalin et al. (2004), Borek and Sapota (2005) and La Mesa et al. (2005). Tandon (1962) studied the feeding biology of this species in the river Ganga. Bhowmick (1965) made a detailed study of the food and feeding habits of *G. giuris* from Hoogly estuary, West Bengal, India. Geevarghese (1976) carried out a preliminary

study of the feeding biology of *G. giuris* from Veli Lake, Kerala, India. River Chalakudy, is the fifth longest and one of the highest biodiversity laden river originates and flows through the Western Ghats, South India, one of the 34 global biodiversity hotspots of the world (Bossuyt et al. 2004, Ajithkumar et al.1999). There is no information available till date on the feeding nature of *G. giuris* from any of the Western Ghat rivers. The aim of the study was to determine the feeding analysis of *G. giuris* in Chalakudy River of Kerala, India in order to provide useful information for the fisheries management and conservation.

## II. METHODS AND MATERIAL

Monthly fish samples were collected from April 2012 to March 2013 from Chalakudy River, Kerala, Southern India using gill nets. A total of 161 specimens comprising 71 males and 90 females having a length range of 81 to 225 mm were collected. After collection the fish were preserved in ice and transformed to the laboratory where they were identified using standard literature (Jayaram 1999, Talwar and Jhingran 1991). The fishes were sorted sex-wise and total length

(TL) and the total body weight (W) were measured. The fishes were dissected out and the stomachs were weighed to the nearest gm. The gut contents were examined under a stereomicroscope (x10) and the food items were identified, weighted and counted. The percentage occurrence of various gut contents was analyzed by frequency of occurrence method (Hynes 1950). By visual examination, the percentage volumes of gut contents were estimated following point method (Pillay 1952). To estimate the dominant food items, results of occurrence and point method have been combined to yield the Index of Preponderance (Natarajan and Jhingran 1962)

$$I = (V_i O_i / \sum V_i O_i) \times 100$$

where,  $V_i$  and  $O_i$  are percentage volume and percentage occurrence of a particular food item in the fish gut, respectively. The feeding intensity or the degree of feeding is related with season, maturity, spawning and availability of food materials. It was determined by calculating the gastro-somatic index (GSI) on a monthly basis for both male and female individuals using the method adopted by Desai (1970).

$$GSI = (\text{Weight of the gut} / \text{Total weight of the fish}) \times 100$$

### III. RESULTS AND DISCUSSION

The gut contents of *G. giuris* have been grouped in to seven categories namely teleost fishes, crustaceans, semi digested particles, molluscs, insects, algae and miscellaneous items. The index of preponderance of various food items in males and females of *G. giuris* are presented in Figures 1 and 2. Teleost fishes were the most predominant food item from analysis of gut contents of *G. giuris*. It was comprised by fry of *G. giuris*, *Puntius sp*, *Mystus sp* etc. The crustaceans were the second dominant food item represented by shrimps and prawns (*Penaeus sp* and *Macrobranchium sp*), cladocerans (daphnia, moina, and bosmina) and crabs. Molluscs was represented a small amounts in the guts of the fish. Among insects, larvae and pupal stages of dragon fly nymphs, chironomids, dipterans and mosquitoes were observed. Fish scales, roots of aquatic vegetation, polychaete worms, sand, mud and unidentified fragments were characterized as miscellaneous food items. The present investigation of the food and feeding habits of *G. giuris* establishes it to

be a carnivores and predatory fish. The presence of sand and mud indicate a bottom feeding habit of the fish. Besides that the presence of crustaceans and molluscs in the gut contents confirmed that the fish is a bottom feeder. According to Rao et al (1998) fishes which feed on molluscs are bottom dwellers and a similar type of feeding was observed in *G. giuris*.

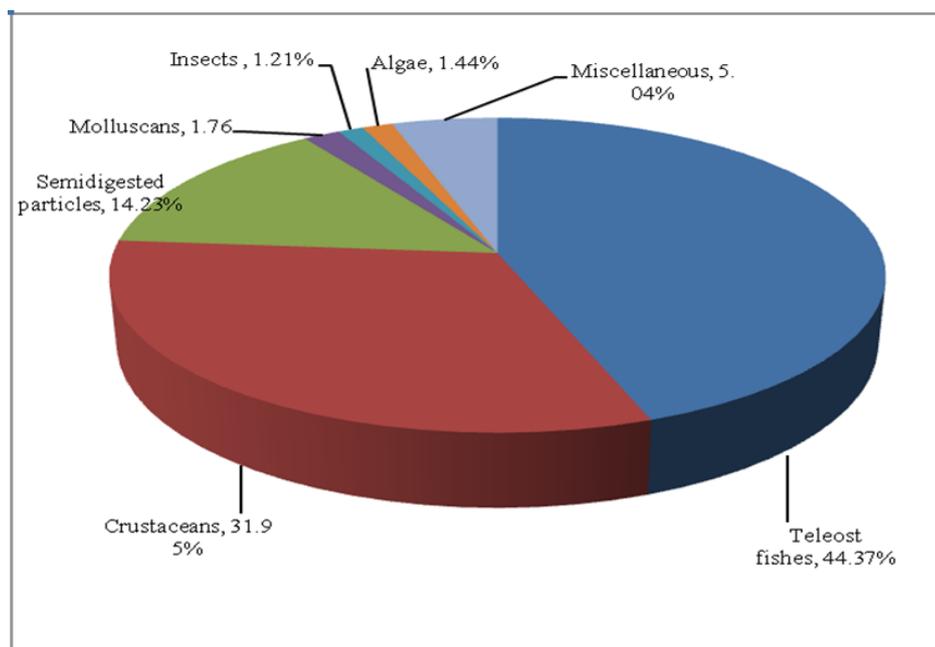
Hora (1935) reported that shrimps, crabs and insects formed the main food item of *G. giuris*. Alikunhi et al. (1951) stated that the adult fishes subsist on teleosts and the juveniles feed on aquatic insects and their larvae. Das and Moitra (1955) reported that *G. giuris* feeds on carp fry. According to his observation the juvenile fishes are mainly insectivorous while adults are piscivorous. Bhowmick (1965) observed that teleost fishes formed the major food contents in adults and crustaceans in the juveniles in Hooghly estuary, West Bengal. Natarajan et al. (1975) stated that juveniles of *G. giuris* are planktonic feeders but adults subsequently become carnivorous, consuming insect larvae and then turn predatory by feeding on fishes. According to Tandon (1962) the juveniles are mainly insectivorous while adults are piscivorous. Geevarghese (1976) recorded that *G. giuris* in Veli Lake as carnivorous, feeding mainly on fishes and crustaceans. Datta Munshi et al. (1990) have confirmed the piscivorous and cannibalistic nature of *G. giuris* in the river Ganga. Rao and Rao (2002) stated that juveniles are planktonic feeder and adults switch over to a carnivorous feeding pattern. Recently Dinesh and Roy (2009) reported that *G. giuris* is a predatory fish showing a preference for insect larvae, crustaceans and molluscs from Kharagpur lake. The cannibalistic nature of this species has been reported by Bhowmick (1965) in Hooghly estuary, Srivastava and Desai (1979) in Rihand reservoir and Datta Munshi et al. (1990) in river Ganga. The intake of young ones of its own kind by *G. giuris* seems to be not accidental but intentional since no adverse conditions like limitation of food or space were prevailing in the Chalakudy river, strongly supporting the argument of Shrivastava and Desai (1979).

The food preferences of males and females were similar with variations in the magnitude of different food items consumed. The monthly fluctuations in the index of preponderance values in males and females are presented in Tables 1 and 2. It could be noticed that the percentage composition of different food items varied in different months according to their availability and the food

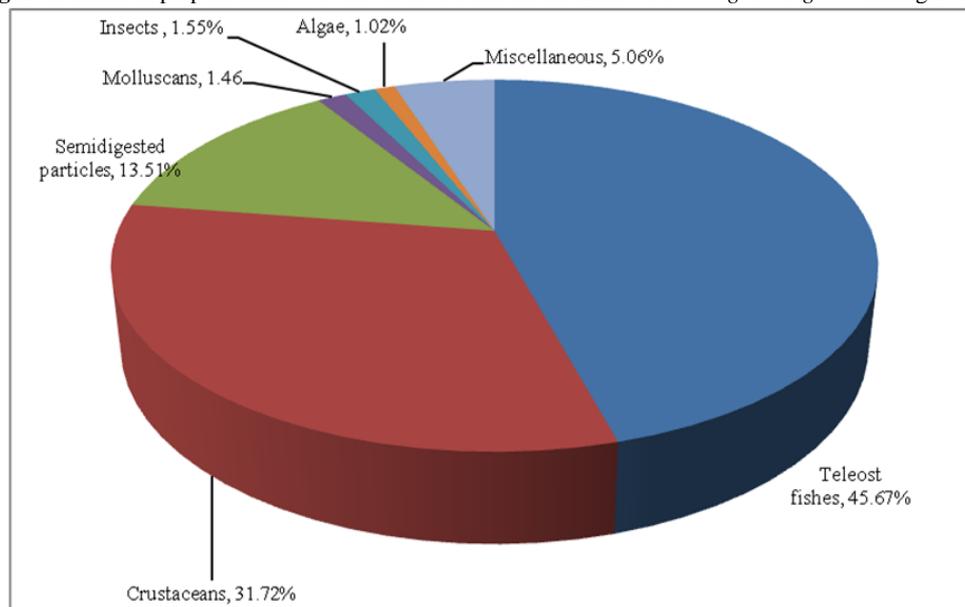
preference of the fish. Teleost fishes formed the dominant food item throughout the year in males and females with its highest occurrence in March (51.61) in contrast to a minimum in August (32.65) in males and in females the value ranges from 34.78 (July) to 54.01 (March). The index value of crustaceans in males ranged between 22.58 in March and 51.06 in July. In females the index value ranged between 23.76 to 51.17 for crustaceans. Semi digested particles formed a good portion of the diet during all months and its contribution in males and females varied from 8.16 in August to 20.51 in April and 6.53 in July to 22.70 in December respectively. The index value of molluscs was high in

May (3.70) in males and April (3.27) in females. Miscellaneous food items varied from 0.62 (May) to 10.81 (October) in males and 1.74 (August) to 9.68 (October) in females.

The observation on feeding intensity was based on gastroscopic index (GSI) taken on monthly basis and the results have been summarized in Fig 3. It ranged from 1.15 to 3 in males and 1.12 to 3 in females. In males, a sharp increase in GSI could be noted from January onwards and registered a peak value of 3 in March. In females, the GSI gradually increased from 2.1 in December and peaked to 3 in February.



**Figure 1.** Index of preponderance of various food items in the males of *Glossogobius giuris* during 2011-12



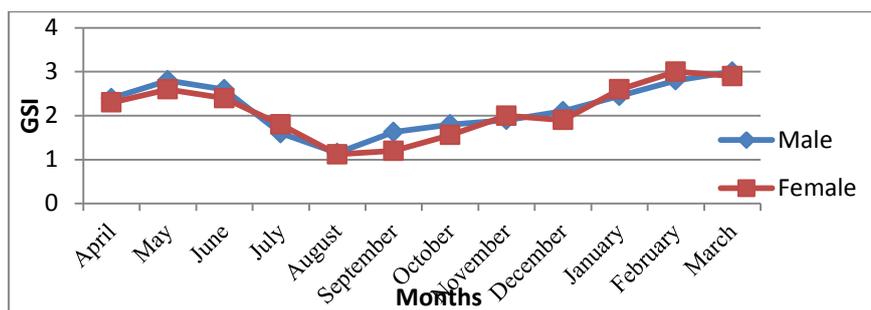
**Figure 2.** Index of preponderance of various food items in the females of *Glossogobius giuris* during 2011-12

**Table 1.** Monthly variation of index of preponderance values of male *Glossogobius giuris* during 2011-12

Months	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Average
<b>Food particles</b>													
Teleost fishes	41.03	48.15	38.21	34.04	32.65	45.11	48.65	47.52	50.40	47.06	47.95	51.61	44.37
Crustaceans	30.77	27.78	42.99	51.06	48.98	31.58	24.32	27.72	25.20	26.47	23.97	22.58	31.95
Semi digested particles	20.51	14.81	14.33	8.51	8.16	12.03	12.16	14.85	16.00	15.69	16.44	17.20	14.23
Molluscs	2.56	3.70	1.79	2.13	1.02	0.75	0.00	0.99	2.40	1.96	2.74	1.08	1.76
Insects	1.71	1.23	0.60	0.00	1.02	2.26	1.35	1.98	0.40	0.49	1.37	2.15	1.21
Algae	1.71	3.70	0.30	2.13	2.04	0.75	2.70	0.99	0.80	0.98	0.68	0.54	1.44
Miscellaneous	1.71	0.62	1.79	2.13	6.12	7.52	10.81	5.94	4.80	7.35	6.85	4.84	5.04

**Table 2.** Monthly variation of index of preponderance values of female *Glossogobius giuris* during 2011-12

Months	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Average
<b>Food particles</b>													
Teleost fishes	44.90	49.56	36.36	34.78	36.14	49.04	48.39	46.30	51.07	48.98	48.51	54.01	45.67
Crustaceans	28.57	28.32	42.42	52.17	49.70	30.65	24.19	30.87	18.91	24.49	23.76	26.58	31.72
Semi digested particles	16.33	13.27	15.15	6.52	9.04	10.73	12.90	12.86	22.70	15.31	13.86	13.50	13.51
Molluscs	3.27	1.77	1.52	1.09	1.13	0.77	1.61	1.93	1.89	0.68	0.99	0.84	1.46
Insects	2.45	1.77	0.76	1.09	1.13	0.77	1.61	1.29	1.89	2.04	2.97	0.84	1.55
Algae	0.82	1.77	0.76	1.09	1.13	1.15	1.61	0.32	1.89	0.34	0.99	0.42	1.02
Miscellaneous	3.67	3.54	3.03	3.26	1.74	6.90	9.68	6.43	1.65	8.16	8.91	3.80	5.06



**Figure 3.** Monthly variation in gastrostomac index of males and females of *Glossogobius giuris*

#### IV. CONCLUSION

The present investigation reveals that, *G. giuris* is a carnivores, predatory and bottom feeding fish showing cannibalism.

#### V. REFERENCES

[1] Ajithkumar, C.R., Remadevi, K., Thomas, R. and Biju, C.R. (1999) Fish fauna, abundance and distribution in Chalakudy river system, Kerala. J. Bombay Nat. Hist. Soc., 96(2): 244- 251.

[2] Ahmed, A.T.A., G. Mustafa and M.Z. Alam (1984) Biochemical composition of seven species of Gobi fish. J. Asiatic Soc. Bangladesh 10: 107-111.

[3] Alikunhi, K.H., G.L. Rao and P.K. Jacob (1951) Bionomics and development of *Glossogobius giuris* (Hamilton). J. Madras Univ. 21 (B): 238-248.

[4] Borek, K.W. and M.R. Sapota (2005) Breeding characteristics of the sand goby (*Pomatoschistus minutus*) one of the most abundant goby species in the coastal waters of the Gulf of Gdanska region (Southern Baltic Sea). Oceanological and Hydrobiological Studies, 34: 47-55.

[5] Bhowmick, R.M. (1965) Studies on some aspects of the biology of *Glossogobius giuris* (Hamilton)

- with notes on the fishery in the Hooghly estuary. Proc. Indo – Pacific Fish. Coun 11(2): 99-115.
- [6] Bossuyt, F., Meegaskumbura, M., Beenaerts, N., Gover, D.J., Pethiyagoda, R., Roelants, K., Mannaert, A., Wilkinson, M., Bahir, M.M., Mamamendra-Arachchi, K., Ng, P.K.L., Schneider, J., Oommen, O.V., Milinkovitch, M.C (2004) Local endemism within the Western Ghats-Sri Lanka biodiversity hotspot. *Science* 306: 479–481.
- [7] Chesalin, M.N., G.V. Zuev and T.L. Chesalin (2004) Transparent goby *Aphiaminuta* (Gobiidae) in the pelagic zone of the Black Sea. *Journal of Ichthyology*, 44(8): 587-591.
- [8] Das, S.M. and S.K. Moitra (1955) Studies on the food of some common fishes of Uttar Pradesh, India. Part I. Proc. Natn. Acad. Sci., India, 25: 1-6.
- [9] Datta Munshi, J.S., O.N. Singh and D.K. Singh (1990) Food and feeding relation-ship of certain aquatic animals in Ganga ecosystem. *Trop. Ecol.*, 31 (2): 138-144.
- [10] Desai, V.R. (1970). Studies on fishery and biology of *Tor tor* (Ham.) from river Narmada.1. Food and feeding habits. *J. Inland Fish. Soc. India.*, 2:101-112.
- [11] Dinesh and S.P Roy (2009) Food and Feeding habits of some representative fishes of different trophic guilds of Kharagpur lake with a note on their role in energy harvest. *The Ecoscan* : 3 (1 & 2).
- [12] Doha, S (1974) Investigation into the biology of the gobi, *Glossogobius giuris* (Hamilton -Buchanan) Bangladesh J. Zool., 2: 95-106.
- [13] Geevarghese, C (1976) Studies on some aspects of the biology of *Glossogobius giuris* (Ham.) with a taxonomic note on six gobioid fishes occurring in and around Trivandrum. M.Phil Dissertation, Department of Aquatic Biology and Fisheries, Kerala University, pp: 90.
- [14] Jayaram KC (1999) The freshwater fishes of the Indian region. Narendra Publishing house, New Delhi, 509 pp.
- [15] Islam, M.N. and M.A.R. Joadder (2005) Seasonal variation of the proximate composition of freshwater gobi, *G. giuris* (Hamilton) from the river Padma Pakistan *J. of Biological Sci.*, 8(4): 532-536.
- [16] Hora, S.L (1935) Ecology and bionomics of the gobioid fishes of Gangetic delta. *Comptes Rendus. DN 12 C Congr. Inter National de Zoologie*: 841 – 863.
- [17] Hynes, H. B. N (1950) On the food of the freshwater sticklebacks (*Gastrosteus aculeatus* and *Pygosteus pungitius*) with a review of the methods used in the study of food fishes. *Journal of Animal Ecology*: 19,36–58.
- [18] La Mesa, E. Arneri, V. Caputo and M. Lylesias (2005) The transparent goby, *Aphiaminuta*. Review of Biology and fisheries of a paedomorphic European fish. *Reviews in Fish Biology and Fisheries* 15: 89-109.
- [19] Natarajan, A. V. and Jhingran, A. G. (1962) Index of Preponderance—a method of grading the food elements in the stomach analysis of fishes. *Indian Journal of Fisheries* 8, 54–59.
- [20] Natarajan, A.V., M. Ramakrishnaiah and M.A. Khan (1975) The food spectrum of trash fishes in relation to major carps in Konar and Tilaiyar reservoirs (Bihar). *J. Inland Fish. Soc. India*, VII: 65- 75.
- [21] Pillay, T. V. R (1952) A critique of the method of study of food fishes. *Journal of the Zoological Society of India*, 42: 185–200.
- [22] Pillay, T.V.R (1990) *Aquaculture: Principal and practices*. Blackwell Science Ltd., UK. pp: 575.2.
- [23] Rao L.M and Rao P.S (2002) Food and feeding habits of *Glossogobius giuris* from Gosthani estuary. *Indian J. Fish.* 49 (1): 35-40.
- [24] Shrivastava, N.P. and V.R. Desai (1979) A case of cannibalism observed in *Glossogobius giuris* (Hamilton) from Rihand reservoir (U.P.) *J. Inland Fish. Soc. India*, 11 (1): 134 -135.
- [25] Talwar P.K and Jhingran A.G (1991) *Inland fishes of India and adjacent countries*. Vol I & II, Oxford & IBH Publishing Co., Pvt. Ltd., New Delhi, 1158 pp.
- [26] Tandon, K.K (1962) Biology of *Channa punctatus* (Bloch) and *Glossogobius giuris* (Hamilton). *Res. Bull. Punjab Univ.*, 13 (III - IV): 257 - 262.