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Food and Feeding Habits of the Gangetic Anchovy (*Setipinna phasa*)

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ABSTRACT

Freshwater anchovy, *Setipinna phasa*, were collected from river Ganga and Hooghly estuary. It is predacious in nature. Dietary composition, intensity of feeding, and its variation with season, size, and maturity stages were studied. Relative length of gut (RLG) indices indicated the absence of any major shift from basically carnivorous orientation of the fish during its various life stages. Insects and crustaceans were the main food of adults, while annelids and insects were eaten by juveniles. Adult individuals of river Ganga consumed more food in winter than summer and rainy seasons, while the food intake in adult specimens of Hooghly estuary was greater during summer compared to winter and rainy season. Dentition, gill raker, strongly built stomach, and short intestine, beside other characteristics, are related to its feeding habits.

Introduction

The freshwater anchovy, *Setipinna phasa*, locally known as 'patra', is an economically important teleostean fish found in fresh and brackish waters of India and other countries such as Bangladesh and Burma. Jones and Menon (1952) reported that it abounds in all the deltaic branches of Ganga river system. The species is a major item in artisanal catches in the Hooghly estuary and Ganga river system at Allahabad–Varanasi region during November–March. The fish is quite palatable as a table fish and nutritious too. Despite its abundance, palatability, and consumer demand, no scientific culture of this fish has been carried out due to paucity of information on biology of this fish. Jhingran (1961) studied the maturity and fecundity of this fish, while De and Mitra (1981) investigated the fecundity of closely related species *Setipinna taty*. Keeping in mind the paucity of information on the biology of this species, the present study focusing on the food and feeding habits of *S. phasa* is undertaken.

Materials and Methods

The specimens of *S. phasa* ranging between 60–340 mm in size were collected on monthly basis by using cast and drag nets from river (Ganga) and estuary (Hooghly) of St. Ravidas Nagar Bhadohi District and Kolkata respectively for 12 months. Each sample Comprised 20–30 fish. Total length of each fish was measured by using fish measuring board to nearest 0.1 mm, and their weight was recorded on an electric balance sensitive up to 0.001 g. The fish were sexed and divided into six length groups of 50 mm class interval. Gonad condition was examined, and the stage of maturation was determined. Relative length of gut (RLG) (alimentary canal length expressed as percentage of body length) and gastro somatic index (GSI) (gut weight expressed as percentage of body weight) were computed to study the feeding habits and intensity of feeding respectively. For the analysis of gut contents, methods like the frequency of occurrence, numerical counts, and gravimetric methods as summarized by Lagler (1956) were applied. Qualitative analysis (identification of prey items in the gut contents) formed the basis for all relative quantitative assessments. For this purpose, the prey items were identified and categorized according to their systematic status.

Results and Discussion

Laterally compressed body, well-developed dentition, elongated thick-walled stomach, and the short intestine together with the dominance of animal matter in the gut contents of *S. phasa* described its carnivorous and active predatory habits. The percentage of body width with respect to the total body length was 17.62 and 20.47 in river Ganga and Hooghly estuary respectively, resulting in a slender body suitable for its predatory habits. The number of gill raker varied between 22–24, which were widely spaced, elongated, and spiny. The nature of gill raker also supports the carnivorous nature of the fish. The gill raker is considered to be instrumental for sieving the small prey items such as insects, crustaceans etc., and also helpful in immobilizing the prey.

Relative Length of Gut (RLG)

The values of RLG for young and adult individuals of *S. phasa* are given in Table 1. Absence of any appreciable difference in this index (0.39–0.59±0.020) in young and adult individual indicated that the growth of *S. phasa* does not involve any major shift in their basically carnivorous orientation of the dietary habit. In view of the consistency in the gut length body length ratio over the entire size range of the fish inclusive of both juveniles and adults, it Was possible to express the relationship between gut length and body length through the equation: log gut length = 0.41292 + 1.41517 log body length (mm). The observed value of correlation coefficient 'r' being 0.945 showed a high degree of significant positive correlation ($p < 0.001$).

Feeding Intensity in Relation to Season

Monthly values of GSI of *S. phasa* are given in Table 2. The adult individuals of *S. phasa* (160–220 mm) consumed more food during winter than summer and rainy seasons in river Ganga and during summer than rainy season and winter in Hooghly estuary. A pronounced feeding activity in the younger individuals of both sexes was observed in the month of September, while it was extremely low in the month of December. In adult female specimens, a high value of gastro somatic index for all size ranges was recorded in the month of January, but in these cases the low values of gastro somatic index varied with size. The lowest values for the size group 260–300 mm and 310–350 mm was observed in May and November respectively. A maximum number of empty guts were found during spawning season. The intensity of feeding declined during spawning season when the fish became ripe and was ready for spawning. Intrinsic factor in the form of the stress brought to bear on the alimentary canal of the fish by its developed gonad appeared to be causative factor on the decline in its feeding intensity. The occurrence of poor feeding in other fishes coinciding with their peak breeding has also been reported by Serajuddin et al. [13], Jhingran [4], Desai [2], Bhatnagar and Karamchandani [1], Wijeyaratne and Costa [14], and Khan et al. [6]. The low feeding intensity in the month of November and during June–July may be due to the non-availability of food organisms in the environment and the effect of certain abiotic factors such as temperature and turbidity.

Feeding Intensity in Relation to Maturity Stages

Feeding intensity of male and female *S. phasa* at different stages of their maturation is given in Fig. 1A-B. Maximum value of feeding intensity was observed in the gonad ripening stage (stage III), which is the third stage of sexual cycle. This suggested that at this stage the fish feed more voraciously because of a higher demand of food for the building up of gonads. Fish with medium gut fullness recorded in the present study in all months suggest that feeding was never discontinued. Khan et al. [6] and Serajuddin et al. [13] also reported the same type of feeding intensity in relation to the stage of maturity in *Mystus nemurus* and *Mastacembelus armatus* respectively.

Food Composition

Insects were the most preferred food organisms and dominated the diet of *S. phasa* throughout the year (Table 3). Other organisms according to their frequency of occurrence were crustaceans (prawn), teleostomi (*Puntius*), and annelids (earthworm). Aquatic vegetation and molluscs were found sporadically, which might have been swallowed accidentally while feeding voraciously on other preferred items.

According to the criteria proposed by Nikolsky [10], food organisms of *S. phasa* could be divided into three categories: insects and crustaceans as basic food for adults and insects and annelids as basic food for juveniles (Fig. 2). However, annelids and forage fish could be regarded as the secondary food for adults, while forage fish and crustaceans together constituted the secondary food for juveniles. Molluscs and aquatic vegetation could be regarded as incidental items for both adults as well as juveniles.

References

1. Bhatnagar, G. K., & Karamchandani, S. J. (1970). Food and feeding habits of *Labeo fimbriatus* (Bloch) in river Narbada near Hosangabad (M.P.). *Journal of Inland Fisheries Society of India*, 2, 30–50.
2. Desai, V. R. (1970). Studies on the fishery and biology of *Tor tor* (Ham.) from river Narbada. *Journal of Inland Fisheries Society of India*, 2, 101–112.
3. De, D. K., & Mitra, P. M. (1981). Studies on the fecundity of *Setipinna taty*. *Indian Journal of Fisheries*, 28, 272–275.
4. Jhingran, A. G. (1961). Studies on the maturity and fecundity of Gangetic anchovy *S. phasa* (Ham.). *Indian Journal of Fisheries*, 8, 291–311.
5. Jones, S., & Menon, P. M. G. (1952). Observations on the life history, bionomics and fishery of the Gangetic anchovy, *Setipinna phasa* (Ham.). *Journal of the Zoological Society of India*, 3, 323–333.
6. Khan, M. S., Ambak, M. A., & Mohsin, A. K. M. (1988). Food and feeding biology of a tropical catfish *Mystus nemurus* with reference to its functional morphology. *Indian Journal of Fisheries*, 35, 78–84.
7. Lagler, K. F. (1956). *Freshwater fishery biology* (421 pp.). Iowa: Wm. C. Brown Co., U.S.A.
8. Nikolsky, G. V. (1963). *The ecology of fishes*. London and New York: Academic Press.
9. Serajuddin, M., Khan, A. A., & Mustafa, S. (1998). Food and feeding habits of the spiny eel *Mastacembelus armatus*. *Asian Fisheries Science*, 11, 271–278.
10. Wijeyaratne, M. J. S., & Costa, H. H. (1988). The food, fecundity and gonadal maturity of *Valamugil cunnesisus* (Pisces, Mugilidae) in the Negambo Lagoon, Sri Lanka. *Indian Journal of Fisheries*, 35, 323–354.

Table 1: Relative length of gut (RLG) of *Setipinna phasa* in different length groups

Total length of fish (cm)	No. of observations	Relative gut index
06–10	18	0.39 ± 0.033
11–15	31	0.41 ± 0.026
16–20	33	0.47 ± 0.009
21–25	10	0.53 ± 0.021
26–30	28	0.59 ± 0.019
31–35	16	0.56 ± 0.013

Table 2: Gastro somatic index (GSI) of *S. phasa* in different season

Size range of sex																		
Months	**(6–10cm)**			**(11–15cm)**			**(16–20cm)**			**(21–25cm)**			**(26–30cm)**			**(31–35cm) M**		
	M	**F**	**C**	**M**	**F**	**C**	**M**	**F**	**C**	**M**	**F**	**C**	**M**	**F**	**C**	**M**	**F**	**C**
January	2.3	1.8	2.1	3.1	3.5	3.2	4.3	3.2	3.5	3.0	3.8	3.2	3.1	3.4	3.2	2.1	3.7	3.2
February	1.9	1.3	1.4	2.2	2.8	2.4	2.1	1.8	2.0	2.9	2.5	2.6	2.1	2.7	2.5	2.2	2.6	2.3
March	1.3	1.8	1.6	2.1	1.9	2.0	3.2	2.1	2.6	2.5	1.8	1.9	2.6	2.4	2.5	3.1	2.7	2.9
April	1.8	2.3	1.9	2.3	1.8	2.0	2.4	1.6	1.8	1.8	1.5	1.6	2.7	2.6	2.4	2.9	2.4	2.6
May	1.4	1.8	1.5	1.9	2.3	2.1	1.9	1.6	1.8	1.6	1.8	1.6	1.8	1.6	1.6	2.2	1.9	2.0
June	2.6	2.1	2.2	2.9	3.2	3.1	2.3	2.4	2.4	3.4	3.2	3.2	2.9	2.6	2.7	2.0	1.7	1.6
July	2.3	1.1	1.8	3.0	3.6	3.2	2.5	2.6	2.6	3.4	2.8	2.9	2.4	2.7	2.2	1.9	1.6	1.6
August	1.8	2.1	1.9	2.8	1.9	2.3	4.6	2.9	3.2	3.3	2.9	2.8	2.9	3.1	2.8	2.1	2.7	2.4
September	3.2	1.8	2.4	2.2	2.9	2.4	3.9	2.6	3.2	3.6	3.2	3.2	2.6	2.5	2.3	2.2	1.9	2.4
October	2.9	2.3	2.6	2.1	2.6	2.2	2.2	2.0	2.2	2.1	1.6	2.0	1.7	1.9	1.6	2.0	2.8	2.3
November	2.5	1.8	2.1	1.6	1.9	1.7	2.3	1.9	2.1	2.1	1.8	1.9	2.8	2.3	2.6	2.6	1.6	2.5
December	1.8	2.3	1.9	2.8	2.1	2.4	1.9	1.4	1.6	1.6	1.4	1.6	2.7	3.7	3.0	2.6	1.8	2.2
Mean	2.1	1.8	1.9	2.4	2.5	2.4	2.6	2.3	2.3	2.5	2.4	2.4	2.7	2.4	2.2	2.3	2.2	2.2
SE (±)	±0.16	±0.13	±0.14	±0.21	±0.19	±0.20	±0.29	±0.26	±0.27	±0.13	±0.09	±0.11	±0.26	±0.31	±0.28	±0.14	±0.16	±0.15

Note:

- M = Male
- F = Female
- C = Combined (Male & Female)
- SE = Standard Error

Table 3: Food items of *S. phasa*

Food Items	Numerical Count (%)	Frequency of Occurrence (%)	Gravimetric Index (%)
Insects • *Chaoborus* • *Hemiptera* • Chironomid larvae • Unidentified aquatic insects	72 04 Numerous 34	34.821 03.07 12.06 09.16	89.53 08.60 07.16 11.00
Crustaceans • Prawn • *Daphnia*	29 14	24.03 05.76	05.60 07.30
Teleostomi • *Puntius* • *Channa spp.* • Fish scale	06 11 28	16.31 09.43 13.03	22.63 41.32 00.69
Annelids • Earthworm	32	14.73	08.31
Molluscs • Gastropods	12	04.36	02.13
Detritus Digest matter		22.00	46.31
Aquatic Vegetation	-	04.73	07.36
Barbles	09	04.90	03.50

Fig. 1 (A) : Variation in the intensity of feeding with maturity stages of male *S. phasa*

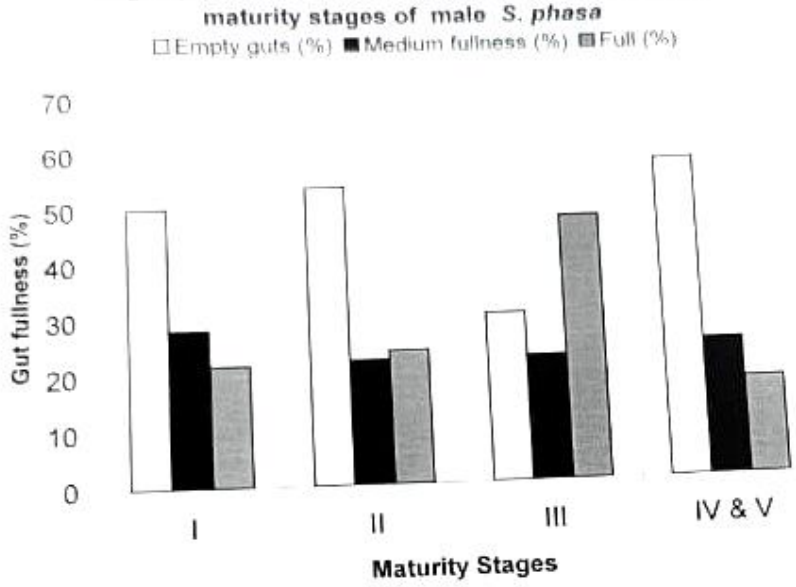
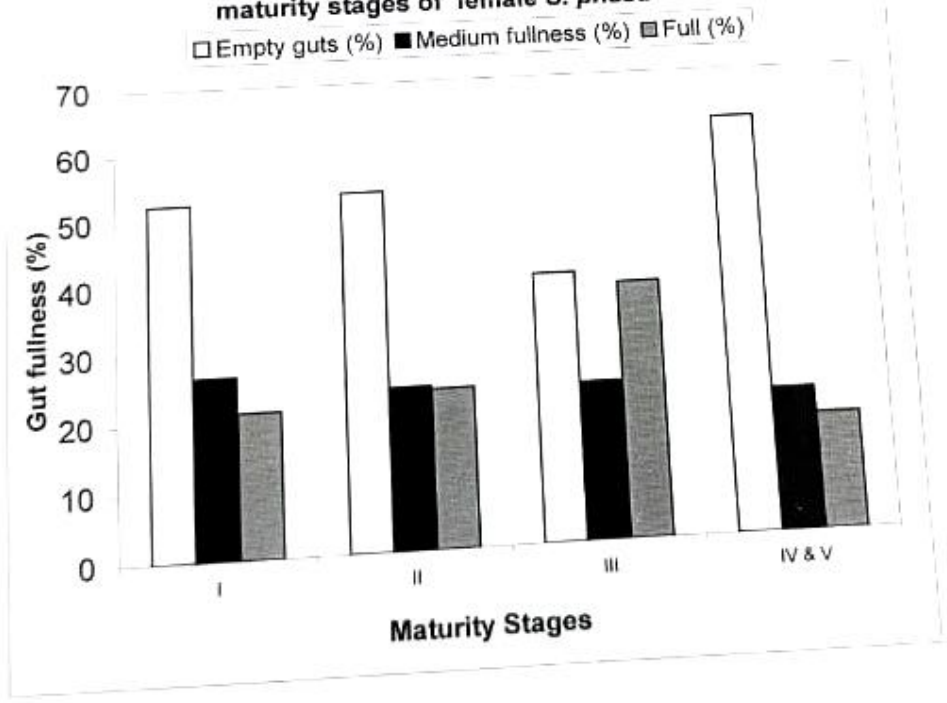


Fig. 1 (B) : Variation in the intensity of feeding with maturity stages of female *S. phasa*



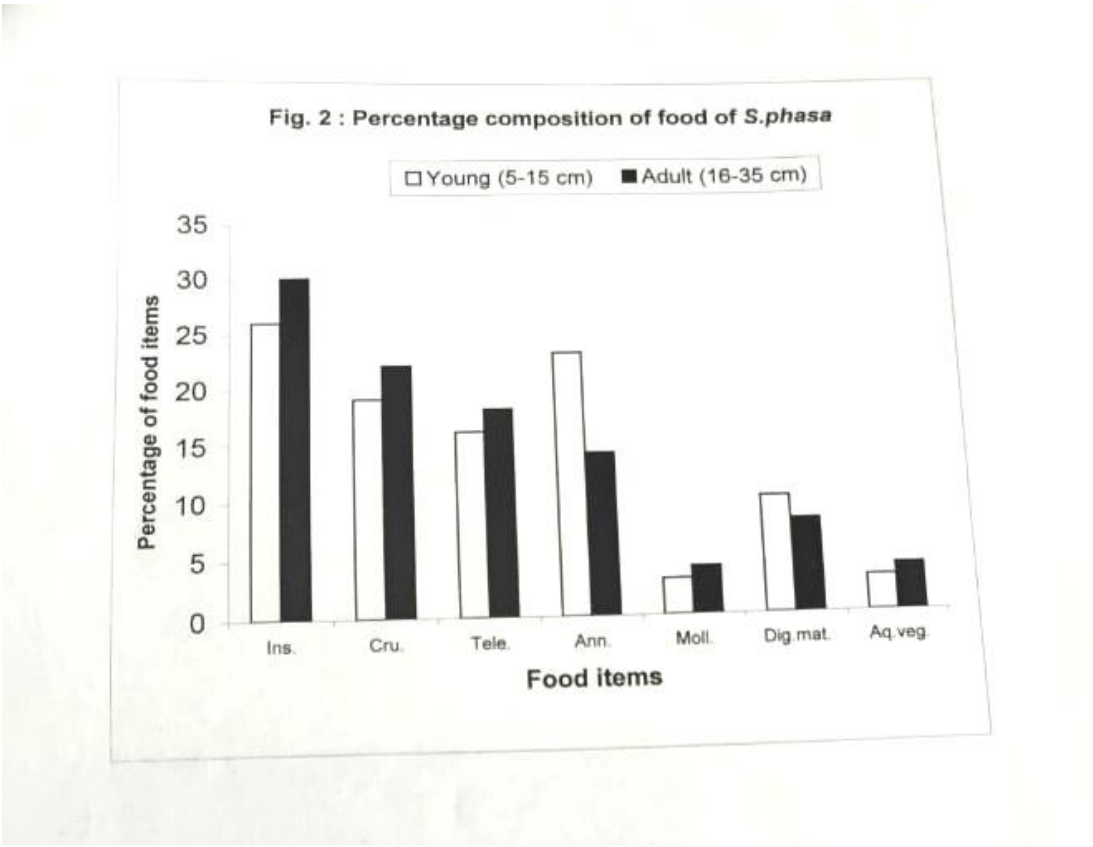


Fig. 2 : Percentage composition of food of S.phasa
Young (5-15 cm)
Adult (16-35 cm)
Percentage of food items
35
30
25
20
15
10
5
0
Ins.
Cru.
Tele.
Ann.
Moll.
Dig.mat.
Aq.veg.
Food items