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FOOD AND FEEDING HABITIS OF THE CARP *LABEO CALBASU* HAM. IN NORTH INDIAN WATERS

POKARM I ODŻYWIANIE SIĘ *LABEO CALBASU* HAM. W WODACH PÓŁNOCNYCH INDII

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Labeo calbasu (Ham.) was found to be a bottom dwelling illophagic fish. The food of the fish consisted of decayed organic matter, mollus, diatoms, plant matter, green-algae, blue-green algae and zooplankton. The fish was selective in feeding. Juveniles showed a positive selection for zooplanktonic organisms. The adult showed a negative selection for the zooplankton and a positive selection for decayed organic matter and molluscs. The increased feeding intensity of the fish coresponded to a period of maximum available food in the habitat. Maturation of gonads also influenced the feeding intensity of the fish. Post spawning feeding intensity was found to be maximum.

INTRODUCTION

The literature on the food and feeding habits of some Indian fresh water is available viz., *Labeo rohita* (Sarbhi, 1939; Das and Moitra, 1955a, 1955b; Vasist, 1960, Khan and Siddiqui, 1973; *Catla catla* (Natarajan and Jhingran, 1963); major carps (Mookherjee and Ghose, 1945); *Ophicephalus punctatus*, *Barbus stigma* and *Callichrous bimaculatus* (Qayyum and Qasim, 1964a, 1964b and 1964c), *Mystus seenghala* (Saigal, 1964), *Labeo bata* and *Labeo gonius*

(Chatterji, 1974) *Labeo calbasu* (Mookherjee et al., 1947; Das and Moitra, 1955a and 1955b) and *Puntius sarana* (Khumar and Siddiqui, 1984). Inspite of considerable importance of *L. calbasu* as a food fish little is known about the diet of this species. The present paper deals with studies on its annual food composition, seasonal variantion in food, food selection and intensity of feeding in relation to season, size and sexual cycle od the fish. Attempts have also been made to investigate the feeding variations in between juvenile and adult fishes.

MATERIAL AND METHODS

The material consisted of the examination of gut contents of 3034 fishes obtained from the three rivers namely, the Ganga, the Yamuna, the Kali and reservoir (Keetham) for a period of three years from August 1980 to September 1983. The details of the number of juvenile, adult, male and female with the size range in each environment is given in the table 1.

Table 1

Showing number of juvenile/Adult of male and female fishes and size-ranges, obtained from different environments

Source	Latitute	Longitude	Number of fishes				Size-Range
			Male		Female		
			Juvenile	Adult	Juvenile	Adult	mm
R. Ganga	27° - 29° N	78° - 82° E	62	260	45	394	100 - 640
R. Yamuna	28° N	77° E	77	289	52	412	100 - 625
R. Kali	27°15′ - 29°20′ N	77°45′ - 79° E	69	251	45	342	98 - 615
K. Reservoir	27°13′ N	77°57′ E	50	290	8	358	90 - 610

The total lenght of the fish of each environment was measured to determine the size group of the fish. The fish were weighed nearest to 0. Olg. Maturity of the gonads were ascertained according to the scheme given by Qayyum and Qasim (1964a) in order to determine the intensity of feeding in relation to sex and sexual cycle. The gust of the fish were taken outfrom oesophagus to the last part of intestine. The gut contents were weighed and preserved in 5% formalin.

All the food contents were removed into petridish containing a known quantity of water. They were thoroughly mixed and were examined under the binocular/microscope. The relative abundance of each food item was expressed as percentage of total number of food items in the sample. The food items were identified upto generic/species level as fas as possible.

Food preference of 114 juvenile and 593 adult fishes of the river Kali were

investigated. The electivity index (E) of the different major groups of the food items of juvenile and adult fish were determined by the following formula:

$$E = \frac{r_i - p_i}{r_i + p_i}$$ Ivlev (1961)

Where r_i = the relative content of any ingredient in the ration expressed as percentage of the total gut contents and p_i = the relative walue of the same ingradient in the food complex of the environment.

The intensity of feeding was determined by gastro-somatic index i. e. gut expreseed as percentage of body weight.

RESULTS

Observations on the organs of feeding, their structural modifiction, mouth, lips, buccal cavity, gill-rackers and gut showed that *L. calbasu* can be classified as an 'illiophagic' i. e. bottom feeder. The gut content analysis of the fish revealed that fish is an omnivotous, feeding on a large variety of food items viz., decayed organic matter, mollusc, diatoms, plant matter, green alagae and blue-green algae.

FOOD COMPOSITION

Figure 1b showed that decayed organic matter and mollusc were the main food items of theadult fishes. Diatoms, plant matter, green algae and blue-green algae were of second ary importance as diet of the fish. In juveniles zooplankton, diatoms and algal matter were found to be the main food along with other secondary food items like plant matter and decayed organic matter. These food items in the gut of the fish were invariably found along with the sand and mud. This indicated that food was consumed from the bottom zones.

A – FOOD OF ADULTS

Following food items were recognised during the gut analysis of the adult fishes:

DECAYED ORGANIC MATTER The second decayed organic matter formed the main item of the diet of the fish occurring throughout the year in consoderable proportion. The decayed organic matter formed 44.08%, 45.20%, 46.09% and 70.72% of the total food intake of the river Ganga, Yamuna, Kali

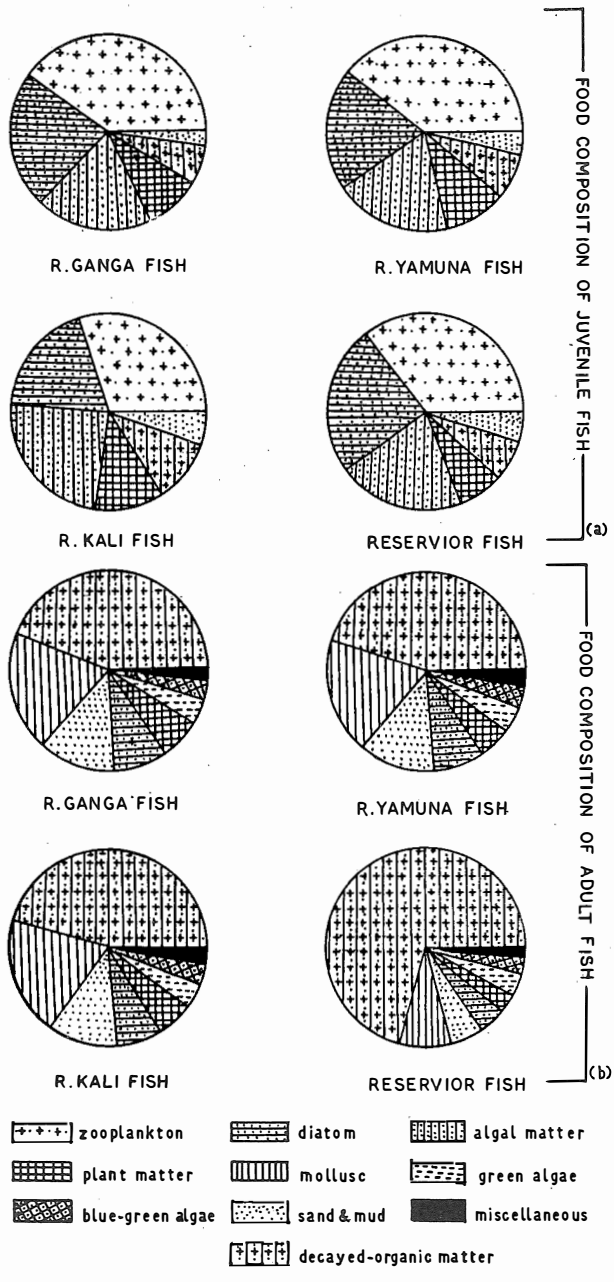

Fig. 1 Annual food composition of juveniles (a) and adults (b) of *L. calbasu* of the different environments

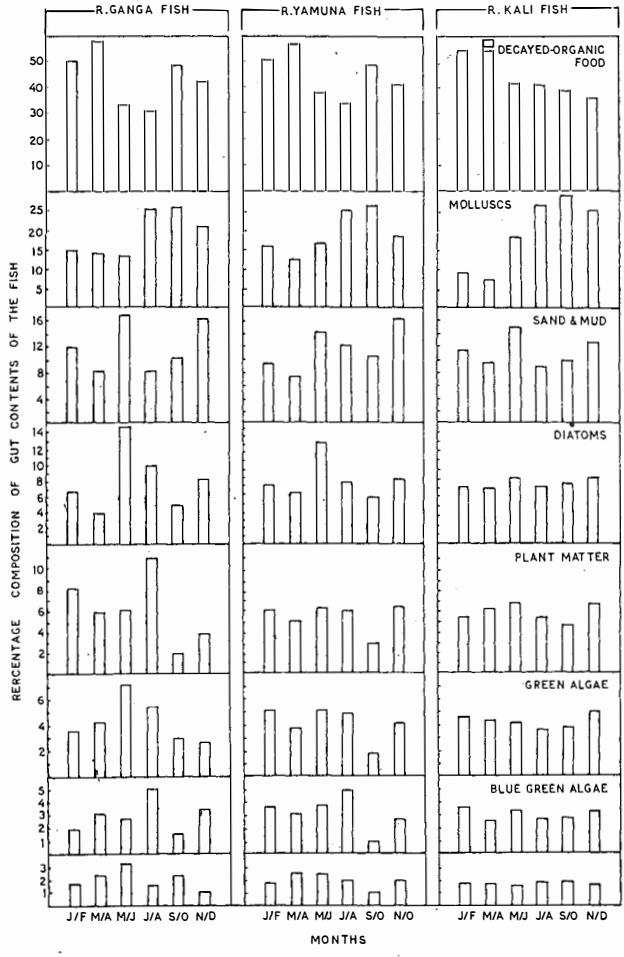

Fig. 2 Seasonal variation in the percentage composition of food of adult *L. calbasu* of the riverine environments

and reservoir fishes respectively. Figure 2 showed that decayed organic matters were found in large quantities in January, February, April, September and October. Their presence was moderate in November and December. Comparatively small quantities of this food item were found in the Summer.

MOLLUSC Molluscs were the next preferred item of food of the adult fishes contributing annually at an average of 19.52% and 19.27% of total food intake of the river Ganga and Yamuna fishes respectively. While in the guts of the river Kali and reservoir fishes, molluscs cnotributed annually as 19.67% and 8.64% of the total food intake respectively. The shell were not fully digested and passed out as broken pieces of shell. The animal was fully digested and

absorbed and never seen in the rectal contents. Various forms of *Gastropoda* and *Pelecypoda* were recognised in its food contents. Gastropods were represented by *Viviparous bengalensis, Indoplanorbis exusteus, Gyraulus conveiusculus* (Hutton) and *Melanoides tuberculatus. Pelecypoda* were represented by *Piscidium clarkeanum* and *Parreysia courrugate, v. bengalensis* and *I. exusteus* which were the most abundant forms.

Molluscs were found in large quantities in the rainy season (July, August, September and October). Mollusca were moderately present in gut in the winter (November, December, January, February) and the summer (May and June).

SAND AND MUD Sand and mud particle formed 12.24%, 11.76%, 11.32% and 5.40% of the total gut contents of the river Ganga, Yamuna, Kali and reservoir fishes respectively. Large amount of sand and mud in the gut of the fish were found in May, June, November and December. In rest of the months of the year, sand and mud were found moderately. The occurence of sand and mud grains throughout the year in the gut confirmed the bottom feeding habit of the fish. The inclusion of the sand and mud in the gut was due to feeding of the decayed oraganic matter deposited over the sand and mud of the bottoms.

DIATOMS (*Bacillariophyceae*)

This item formed 8.34% and 8.24% of the total food intake of the river Ganga and Yamuna fish respectively. The river Kali and reservoir fishes fed on diatoms which contributed 7.73% and 4.75% of the total food intake respectively. Diatoms were the third preferred food of *L. calbasu* occurring in fair amount all the year round. The frequency of its occurrence was found to be more during May and June. From July onwards the diatoms declined and were minimum during March and April. The diatoms were represented by 16 genera namely – *Navicula, Amphora, Cyclotella, Nitzschia Diatoma, Gyrosigma, Cymbella, Fragilaria, Melosira, Synedra, Tabellaria, Eunotia, Gamphonema, Pinnularia, Surirella* and *Cocconeus. Navicula* was found to be dominated among all diatoms the period of study. Next to *Navicula* were *Amphora, Cyclotella* and *Nitzschia.* Some genera viz., *Pinnularia, Surirella* and *Coconeus* disappeared from the diet of the fish in the winter.

PLANT MATTER This food item was represented by portion of aquatic plants like *Hydrilla, Vallisneria* and *Najas* and portions of leaves and roots of unidentified plants. The plant matter cintributed annually at an average of 6.42%, 5.56%, 5.92% and 3.34% of total food intake by the river Ganga, Yamuna, Kali and reservoir fishes respectively. Plant matter was found throughout the year except in September and October when this item was rarely eaten by the fish. The rectal content showed the presence of this item proving that it was not completely digested.

GREEN ALGAE (*Chlorophyceae*) Green-algae constituted 4.35%. 4.43% 4.32% and 3.78% of the total food intake of *L. calbasu* of the river Ganga, Yamuna, Kali and the reservoir respectively. Green-alagae occurred all the year round and attained maximum percentage im May, June, July and August in the food of the river Ganga and Yamuna fish. However, the river Kali fish contained maximum percentage of the green-algae in November and December.

The green-algae comprised of 11 genera viz., *Spirogyra, Scenedemus, Ulothrix, Zygnema, Oedogonium, Cosmarium, Coelastrum, Mougeolia, Pediastrum, Selenastrum* and *Ankistrodesmus.* Of these *Spirogyra, Scenedemus, Ulothrix* and *Zygnema* were more frequent in the diet of the fish followed by *Oedogonium, Cosmarium, Coelastrum* and *Mougeolia, Selenastrum* and *Ankistrodesmus* were rarely eaten by the fish.

BLUE-GREEN ALGAE Blue-green algae were found all the year round contributing annually an average of 3.02% (in river Ganga), 3.49% (in river Yamuna), 3.12% (in river Kali) and 2.16% (in the reservoir) of the total food intake of the fish. This food item was represented by the genera: *Microcystic, Anabaena, Oscillatoria, Merismopodia, Phormidium* and *Rivularia.* Of these *Microcystic, Anabaena* and *Oscillatoria* were very frequent in occurrence, *Merismopodia* and *Phormidium* were moderate while *Rivularia* was rare.

MISCELLANEOUS FOOD ITEMS Miscellaneous food comprised of zooplankton, protozonas, rotifers, cladocerans, dipteran larvae, crustacean remains and fish eggs. These items were present in negligible quantities all the year round in fishes of all the environments.

B– FOOD OF JUVENILES

Figure 1a shows the annual food composition of the juveniles of *L. calbasu.* The food of juveniles of the river Ganga fish composed of zooplanktons, diatoms, algal matter, plant matter and decayed organic matter contributing 40.50%, 22.50%, 19.41%, 8.64% and 6.80% of the total food intake respectively. The juveniles of the river Yamuna fish fed on zoplanktons, 39.50%; diatoms, 20.30%; algal matter, 18.45%; plant matter, 10.76% and decayed organic matter, 7.53% of the total food intake. The food composition of the juveniles of the river Kali fish consisted of 30.35% of zooplanktons, 19.04% of diatoms, 23.62% of algal matter, 7.62% of plant matter, and 7.02% of decayed organic matters. The juveniles of the reservoir fishes fed on zooplankton, algal matter, plant matter and decayed organic matter which cintributed as 35.65%, 25.24%, 20.30%, 7.62% and 7.02% of the total food intake of the fish respectively.

The above mentioned results showed that there was a marked difference in the preference of food between the juveniles and adults fishes. The zooplanktons was a preferred food in juveniles, were found to be an insignificant food item of the adults whereas the decayed organic matter which ranked fifth in juveniles was observed to be the most preferred food in the adults.

FOOD SELECTION

Figure 3 showed that *L. calbasu* was definitely selective in its feeding. In juveniles a strong positive selection was observed for zooplanktonic organism, diatoms and some plant matter. The most preferred zooplanktonic organisms

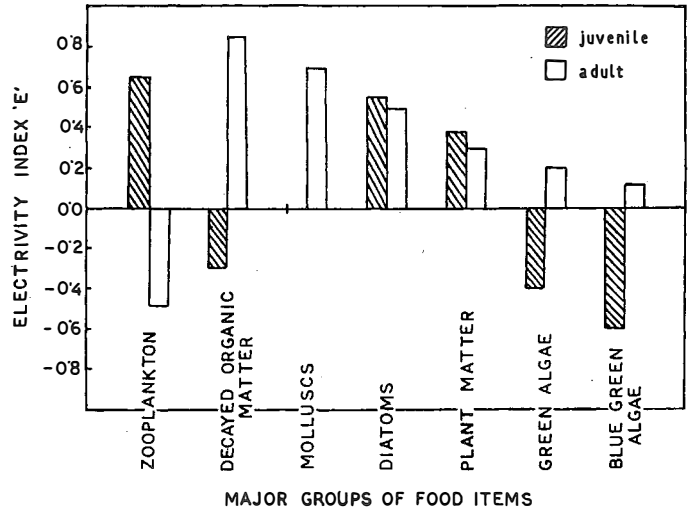

Fig. 3 Electivity index E of *L.calbasu* of the river Kali

were protozoans, crustaceans and rotifers. Of the crustaceans, there was a strong preference for *Daphnia* and *Cyclops*. One of the rotifers *Keretalla sp.* was consumed heavily. The percentage of other food items like algal matter (Green-algae and bluegreen-algae) and decayed organic matter were very small in the diet as compared to their occurrence in the environment and consequently values of 'E' were always negative. The value of electivity index of molluscs was obtained to be '0' showing a complete absence of any selection for this food item in juveniles.

In adults, a strong negative selection was observed for the zooplankton. The electivity index was positively higher for decayed organic matter and molluscs. Diatoms and plant matter were next to decayed organic matter and molluscs. Diatoms and plant matter were eaten fairly well in comparison to algal matter, i. e. green-algae and blue-green algae.

VARIATION OF FOOD IN-TAKE WITH SEX

No significant differences were observed in the food composition of the male and the female fishes.

SEASONAL VARIATION IN INTENSITY OF FEEDING

Figure 4 showed that the values of gastro-somatic indices were inversely proportional to the percentage of empty guts of the fish. Minimum intensity of

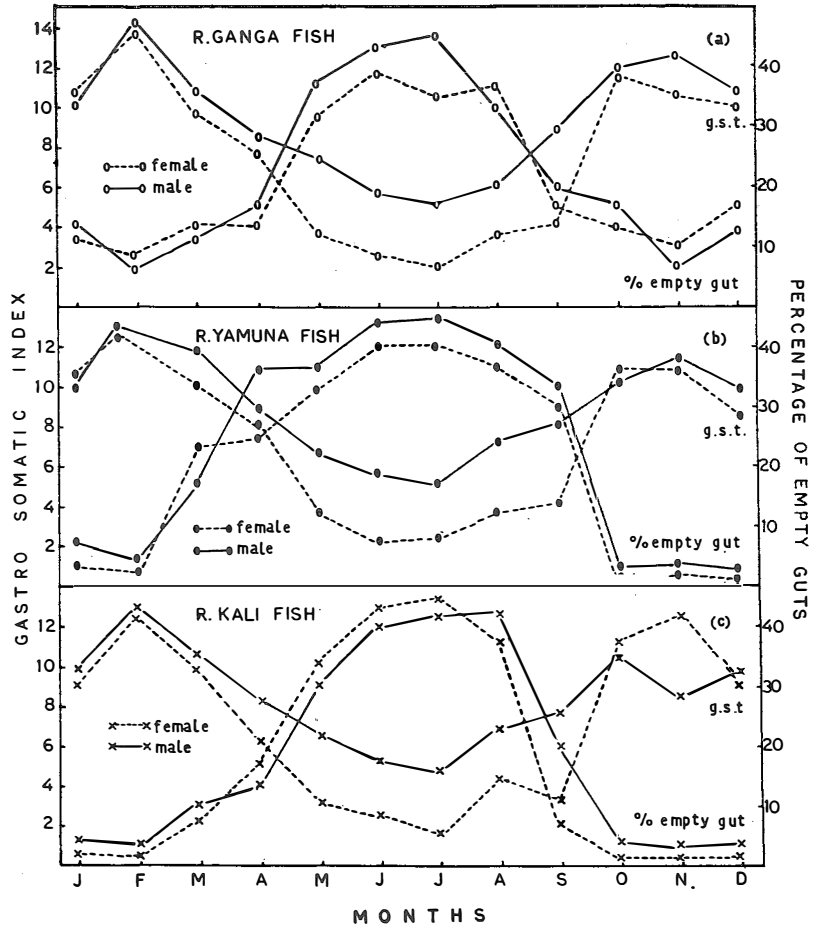

Fig. 4 Seasonal variations in the intensity of feeding of *L.calbasu* of the riverine environments

feeding was observed during monsoon months (June to September) and most of the gut either contained little food or were empty. The feeding activity increased in October and active feeding was recorded up to February . From March onwards the feeding intensity declined and reduced to its lowest level during the monsoon months.

INTENSITY OF FEEDING IN RELATION TO SIZE

The figure 5 showed that the intensity of feeding decreased with increasing size of the fish. High intensity of feeding was observed up to the size-group of

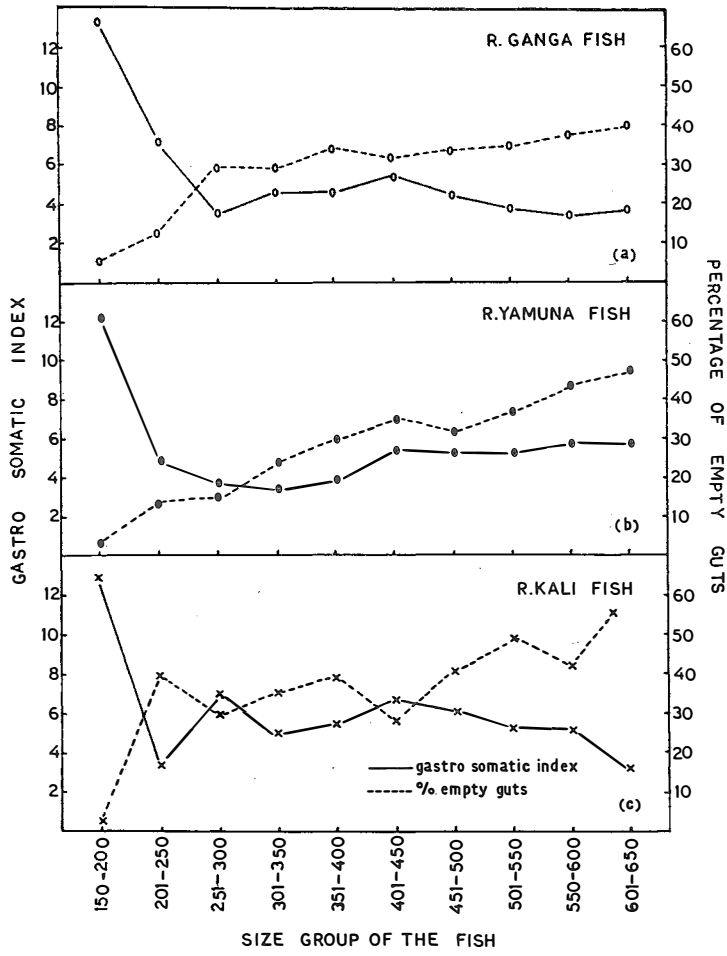

Fig. 5 Variation in the intensity of feeding with the size of *L.calbasu* of the riverine environments

200 mm of the total length of the fish. Thereafter the intensity of feeding was found to be moderate.

INTENSITY OF FEEDING IN RELATION TO SEXUAL CYCLE

Figure 6 showed that in both the sexes of the fish, the intensity of feeding was higher in immature fishes (Stage I). Intense feeding was also recorded in maturing and ripening (Stage II and stage II) fishes. The ripe fishes (Stage IV) consumed lees amount of the food. Consequently, the ripe fishes showed a low feeding intensity.

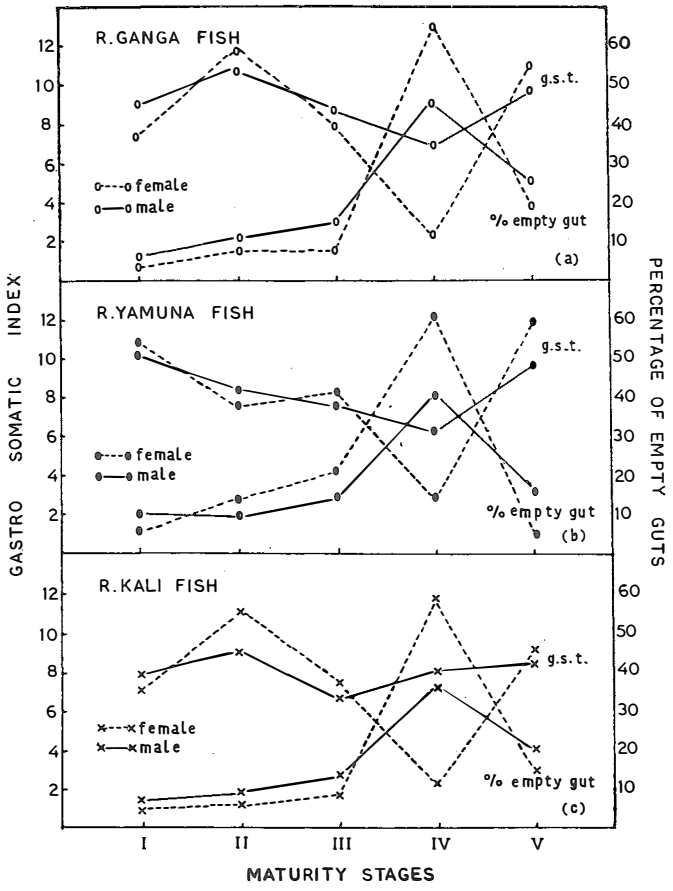

Fig. 6 Variation in the intensity of feeding with maturity stages of *L. calbasu* of the reverine environments

The intake of food subject to significant variations from season to season. The variation to a large extent seems to be connected with breeding season of the fishes.

INTENSITY OF FEEDING IN RELATION TO SEX

A marked difference was observed in the feeding intensity of the two sexes during the spawning period of the fish. The intensity of feeding in males was higher than in the females during the spawning months. As a whole feeding was found better in males throughout the year than in females. It may be because more intensive sexual stress in the females than that of the males.

DISCUSSION

The occerrence of decayed organic matter, molluscs, diatoms, plant matter, green algae, blue-green algae, protozoans, rotifers, clodoceran, dipteran larvae and crustacean remains in the gut of *L. calbasu* indicated that this species feeds on a large variety of food items. It was noted that the fishes gorged their guts with decayed organic matter, molluscs and diatoms. Other food items eaten by the fishes were plant matter, green algae and blue algae. Protozonas, rotifers cladocerans, dipteran larvae and crustaceans were regarded as occassional food of the fish. The present studies on the food of *L. calbasu* strongly suggested that fish is an omnivorous. The presence of sand and mud in the gut of these fishes furnishes evidence about their feeding at the bottom. It is in the line with observations earlier made by Mookherjee et al. (1947), who grouped this fish along with *Cirrhinus mrigala* and called it omnivorous as they found some molluscs and crustacean in its gut contents. Alikunhi (1952) found decayed organic matters in its gut. Das and Moitra (1955a) classified it herbivorous as they could not find any mollusc, though few crustaceans were observed. However, in thr present studies both molluscs and crustaceans were present in gut of the fish. Pathak (1975) clasified this fish as an omnivorous and he got no mollusc in its gut contents.

Larkin (1956) while commenting on the vague of the fish fauna of the ecological zones in fresh-water environment, stated tha a sharp demarcation of the fish fauna within these zones it not possible. He also concluded that fresh-water communities would seem to be characterised by more breadth than heigt – the pyramid of food chain – a compexity in horizontal organisation. Therefore it becomes quite difficult to conclude whether *L. calbasu* feeds at one zone or other. It may be because the sharp demarcation of zones becomes difficult in shallow rivers and the fish can explore all the zones vertically very easily. Similar conclusion gas been made for *L. bata* by Chatterji (1974).

The ralative occurrence of different food organisms varied from month to month. Such variation appeared due to varied production or supply of the food items in the environment. The occurrence of decayed organic matter in the gut of the fish was recorded throughout the year and its total percentage remained always higher than any other food item.

The appearance of molluscs in the gut of the fish was quite high monsoon months and incoming flood water appears to be the main source of molluscs. The percentage of molluscs comparatively low during the winter. The recruitment of molluscs took place during the monsoon months. Higher percentage of occurrence of molluscs in the environment reflected like-wise in the gut of the fish.

The occurrence of diatoms, plant motter, green-algae and blue-green-algae in the gut of the fish was recorded throughout the year. The consumption of

the green algae was always higher than blue-green algae. The percentage of a particular species diatoms or algal matter tended to be maximum at the time of its high production. This appears due to succession of speciec within the population.

It may be concluded that the occurrence if different type of the food items in gut contents of the fish in different minths od year depends on their availability rather than selection by the fish. *L. calbasu* is a non-migratory fish and remains in one habitat throughout its life and has to adopt the food, available in the river during all seasons of the year. The more readily available the food organism, the more it is taken by the fish.

A marked difference in oerference of food has been observed between zhe juvenile and adult fishes. The zooplankton were the most preferred food item in juvenile but they were found to be an insignificant food item in adults. On the other hand, the decayed organic matter which tanked fifth in juveniles, was observed to be the most preferred food in the adults. The fishes are known to change their feeding habit as they grow. Nikolsky (1963) suggested that variation in the composition of the food with age and size is a substatial adoptation towards increasing the range of food supply of population by enabling the species as a whole to assimilate a variety of food. Alikunhi (1952) and Mitra and Mahapatra (1956) after experimental studies on the feeding of fry of major carps concluded that fry fed mainly on zooplankton and and avoided phytoplankton. Khan and Siddiqui (1973) also found zooplankton as the dominant food of fry and fingerlings of major carps (*L. rohita, C. mrigala* and *C. catla*) and as the fishes grew, it gradually changed its food from zooplankton to phytoplankton in the first two species while the latter remained primarily a zooplankton feeder.

It has been observed that *L. calbasu* definitely feeds selectively. The selection of food items takes place at two stages of the life, at first stage (juveniles) they selected zooplanktons while in second stage (adults) they selected decayed organic matter snd molluscs. Juveniles were found to consume protozoans, rotifers cladoceran and crustaceans while they were avoided by the adult fishes . Among phhytoplankton smaller forms of algae like *Navicula, Scenedesmus* and Cyclotella were preferred by the juveniles while filamentous algae like *Spirogyra, Zygnema* and *Ulothrix* were eaten mostly by the adult fishes. Juveniles fed heavily on *Daphnia, Cyclop* and *Keretella.* Molluscs were totally avoided by the juveniles while adults prederred molluscs and decayed organic matter. Among the algal matter blue-green algae were avoided over the green algae. The percentage of occurrence of green and blue-green algae was almost the same in all the environments, but the percentage of occurremce of green algae was higher than that of the blue-green algae in the gut of the fish. Ivlev (1961) suggested that the tendency of a particular animal to consume certain food items selectively in comparison to other, is determined by its

inherent properties. Prakash (1962) found in *Salmon* taht its food changes with its locality and time (season) and sometimes when the normal food was not available *Salmon* feed on alternate food. Bhatnagar and Karam-Chandani (1970) reported that *Labeo fambritus* fed on available food showing no preference for any particular type of food.

Khan and Siddiqui (1973) stated that there was a competition for food among the fingerling of *L. rohita, C. mrigala* and *C. catla* because all of them were found to feed on similar types of zooplankton and as they grew they changed their feeding habits. The feeding on zooplankton was for a short time and this change in the feeding habits may be judged in the light of Lacks (1945) statement that where a particular type of food is in short supply, then only one species will survive and under such condition each species turns to a different food and in this way there would be no competition.

The intensity of feeding of adult *L. calbasu* like other tropical fishes was affected by the maturation of their gonads. Low feeding from March upto June was due to development of gonads and during peak ripeness(June) the minimum food was consumed. Feeding intensity was also low during monsoon months. The rate of food intake incrased in the post monsoon month. Thus increase in the food intake can be associated with the stabilised condition of the environment when more food becomes available. The spent fishes consume more food to recover from the spawing exhacustion.

Suseelan and Somasekharan (1969) reported similar feeding rhythm in demersal fishes of Bombay. Khan (1972)and Chaterji(1974) also reported than fluctation in feeding intensity in the fishes took place due to maturation of their gonads.

The variations in the feeding intensity of both sexes of the fish were observed to be in the same pattern. However, the changes were more pronounced in female than the males. This may be because of the fact that more physiological stress is laid down on the females than in the males during spawning period of the fish. By and large, it may be said that as a whole feeding was better in males throughout the year than in the females.

REFERENCES

Alikunhi K. H., 1952: On the food of young carp fry. J. Zool. Soc. India, **4**: 77 - 84

Bhatnagar G. K. and **S. J. Karamchandani,** 1970: Food and feeding habits of Labeo fimbriatus (Bloch) in River Narvada near Hoshingabad (M. P.). J. Inland Fish. Soc. India. **2**: 30 - 50.

Chatterji A., 1974: Studies on the biology of some carps. Ph. D. Thesis, Aligarh Muslim University, Aligarh.

Das S. M. and **S. K. Moitra,** 1955a. Studies on the food of some common fishes of Uttar Pradesh Part I - The surface feeder, the mid-feeder and bottom feeder. Proc. Nat. Acad. Sci. India, **25**: 1 - 6.

Das S. M. and S. K. Moitra, 1955b: Studies on the food of common fishes of Uttar Pradesh. Part II – On the type of fish food in the variations in the relative length of the alimentary canal. Ibid, 26: 213-233.

Ivlev V. S., 1961: Experimental ecology of the feeding of fishes. Yale University Press, New Haven.

Khan R. A., 1972: Studies on the biology of some important major carps. Ph. D. Thesis, Aligarh Muslim University, Aligarh.

Khan R. A., and A. Q. Siddiqui, 1973: Studies on the age and growth of rohu, Labeo rohita (Ham.) from a pond (Moat) and rivers Ganga and Yamuna. Proc. Indian natn. sci. Acad., 39 (B): 582-597.

Khumar F. and M. S. Siddiqui, 1984: The food of Puntius sarana Ham. (Pisces: Cyprinidae) of the river Yamuna in north India. Proc. of IV All India Symposium of Environmental Biologists: 122-126.

Lack D. 1945: The ecology of closely related species with special reference to carmorant (Dhalaerocorax carbo) and shag (D. arislstotelis). J. Anim. Ecol.: 12-16.

Larkin P. A., 1956: Inter-specific competition and population control in freshwater fish. J..Fish. Res. Bd. Canada, 13 : 327-342.

Mitra S. N. and P. Mahapatra, 1956: On the role of zooplankton in the nutrition of carp fry. Indian J. Fish. 3: 299-310.

Mookherjee H. K. and S. N. Ghose, 1945: Food of major carps. Proc. Indian Sci. Congr., 32: 110.

Mookherjee H. K., S. Sn. Sengupta and P. K. Roy Choudhury, 1947: Food and its percentage composition of the common adult food fishes of Bengal. Sci. Cult., 12: 247-249.

Natarajan A. V. and A. G. Jhingran, 1963: On the biology of Catla catla from the river Jamuna. Proc. nat. Inst. Sci. India, 29: 326-355.

Nikolsky G. V., 1963: 'The Ecology of Fishes'. Academic Press, London and New York.

Pathak S. C., 1975: Length-weight relationship, condition factor and food study of *Labeo calbasu* (Ham.) from Loni reservoir. J. Inland Fish. Soc. India, 7: 58-64.

Prakash A., 1962: Seasonal changes in feeding in Coho and Chinook salmon in Southern British Columbia water. J. Fish. Res. Bd. Canada, 19: 851-866.

Qayyum A. and S. Z. Quasim, 1964a: Studies on the biology of some freshwater fishes. Part I – Ophicephalus punctatus Bloch, J. Bombay nat. Hist. Soc., 61: 74-98.

Qayyum A. and S. Z. Quasim, 1964b: Studies on the biology of some freshwater fishes. Part II – Barbus stigma (C. & V.) Ibid. 61:620-647.

Qayyum A. and S. Z. Quasim, 1964c: Studies on the biology of some freshwater fishes. Part III – Callichrous bimaculatus (Block). Ibid., 61: 627-650.

Saigal B. N., 1964: Studies on the fishery and biology of commercial cat fishes of the Ganga River System II maturity, spawning and food of Mystus (Osteobagrus) aor (Ham.), Indian J. Fish. 11: 1-44.

Sarbhi D. S., 1939: The alimentary canal of Labeo rohita (Ham.). J. Roy. Asiatic Soc. Bengal, Science, 5: 88-116.

Suseelan C. and K. V. Somasekharan Nair, 1969: Food and feeding habits of the demersal fishes off Bombay. Indian J. Fish, 16: 56-74.

Vasisht H. S., 1960: Food and feeding habits of the commercial fishes of the Punjab. Tes. Bull. Punjab Univ. 10: 65-72.

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POKARM I ODŻYWIANIE SIĘ *LABEO CALBASU* HAM. W WODACH PÓŁNOCNYCH INDII

STRESZCZENIE

Stwierdzono, że *L.calbasu* (Ham.) jest rybą denną. W skład jej pokarmu wchodziły: rozkładająca się materia organiczna, mięczaki, okrzemki, rośliny wodne, zielenice, sinice i zooplankton. Ryby te charakteryzowała selektywność w doborze pokarmu. Młode osobniki preferowały organizmy zooplanktonowe jako pokarm. Dorosłe, przy braku zainteresowania zooplanktonem, odżywiały się rozkładającą się materią organiczną i mięczakami. Zwiększona intensywność żerowania ryb zbiegała się w czasie z okresem największej dostępności pokarmu w środowisku bytowania.

Na intensywność żerowania ryb wpływał także stopień dojrzałości gonad. Największa intensywność żerowania charakteryzowała osobniki w okresie potarłowym.

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