

Food Preferences of Juvenile *Schizothorax niger* Heckel

Huveda Jeelani Khan and A. R. Yousuf

Centre of Research for Development, The University of Kashmir, Srinagar – 190 006,
Jammu & Kashmir, India

ABSTRACT

The present study revealed that the juvenile *Schizothorax niger* Heckel starts feeding about 14 days after hatching, and having attained a length of about 10mm. Its food was mainly composed of animal matter (c. 85%). While *Chaoborus* larva (Insecta) and *Graptoleberis* (Cladocera) were the main food items, copepods, rotifers, nematodes, insect wings and appendages contributed a very small proportion of the food. The little plant matter included diatoms and green algae. Presence of *Chaoborus* and *Graptoleberis*, which are characteristic of littoral zone, and absence of smaller organisms like rotifers indicates the Juvenile fish to be a sight- feeder.

Keywords: *Schizothorax*, juvenile, feeding, lakes, Kashmir

INTRODUCTION

The Schizothoracinae are inhabitants of highland waters of Central Asia, where from they are said to have reached the aquatic habitats of Kashmir (Das & Subla, 1963). The genus *Schizothorax* Heckel (Family Cyprinidae: Subfamily Schizothoracinae), commonly called snow trout or Himalayan trout, comprises many species that inhabit freshwater habitats of Central Asia from Turkamenistan and Eastern Persia in the west to the far reaches of the Mekong and Yangtze-kiang in the east (Nikolskii, 1963).

Most species of *Schizothorax* in the valley of Kashmir inhabit lotic as well as lentic habitats and show breeding migrations towards the upper reaches of the various Cold water streams. However, *Schizothorax niger* Heckel (Fig. 2) is a truly lacustrine fish and inhabits the flatland lakes of the valley like the Dal, Anchar, Manasbal, Wular, etc., where it forms an important component of the capture fishery resource. The fish does not undergo any breeding migration and spawns in the shallow peripheral areas of the lakes in areas having sandy or gravelly bottom with springs oozing from underneath.

During the last several decades, a gradual fall has been observed in the population of all the schizothoracine fish in the valley due to destruction of their habitat as a result of human interference within and in the neighborhood of aquatic habitats. *S. niger*, being inhabitant of lentic habitats, which have been under great stress due to pollution, has been particularly affected. To preserve this important

endemic fish of the valley it is essential to develop methodology necessary for its culture. However, before taking any culture program in hand one needs to have a thorough knowledge of biology and ecology of the fish. Some biological and ecological aspects of this species have already been reported (Yousuf & Pandit, 1992; Pandit *et al.*, 1992; Yousuf *et al.*, 1992; Yousuf, 1996). In the present article the food and feeding habits of the fish during early stages of its life are discussed.

MATERIAL AND METHODS

For determining the time taken by the hatched larva in consuming the yolk sac and start external feeding, brood fish were stripped and the eggs fertilized. The fertilized eggs were reared in the laboratory. Fertilized eggs were also collected from the breeding grounds of the fish in Dal lake. For analyzing the gut contents juvenile fish were collected from their natural habitat, i. e., Dal, Anchar and Manasbal lakes, with the help of a small hand net and immediately preserved in 4% formalin and carried to the laboratory. In the laboratory, the specimens were wiped dry with blotting paper before recording their length to the nearest mm. Each specimen was dissected with the help of fine needles under a stereoscope so as to expose its alimentary canal. The gut was stretched out and its total length noted on a simple millimeter scale. The food contents inside the gut were collected after dissecting it with the help of fine needles. The gut contents, after proper preservation, were identified with the help of standard taxonomic works on phytoplankton, zooplankton and benthos (Smith, 1950; Edmondson, 1959; Pennak, 1978; Michael and Sharma, 1978). Methodology used for the determination of contribution of different food items was in accordance with Hynes (1950), Natarajan and Jhingran (1961), Spataru *et al.* (1980), Downing and Rigler (1984) and Wanganeo and Wanganeo (1991).

RESULTS

The present study revealed that the fry started external feeding when the yolk was completely consumed. This occurred about 14 days after hatching. At this time the length of the larva was about 10mm. The feeding habits of the fry were studied in detail from this size to the size of 27mm (Fig.2). The data obtained on the food of the juvenile fish of 10 – 27 mm size are also presented in Table 1. Food of the juvenile *S. niger* was observed to be composed mainly of animal matter, particularly in the smaller sizes. However, in juveniles above 17 mm in length a small proportion of food was also contributed by plant matter. It was found that during this period their food was mainly contributed by insect larvae, cladocerans, copepods, rotifers, nematodes, insect wings and appendages (animal food) and diatoms, green algae and other macrophytic matter (plant food).

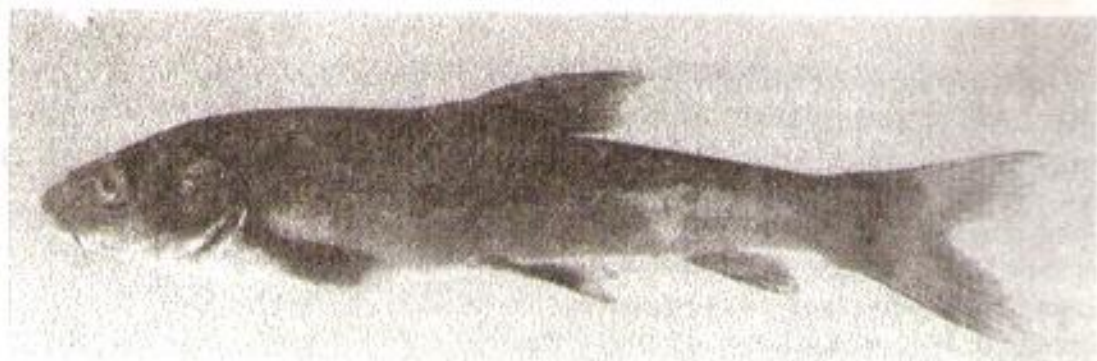


Fig. 1. *Schizothorax niger* Heckel

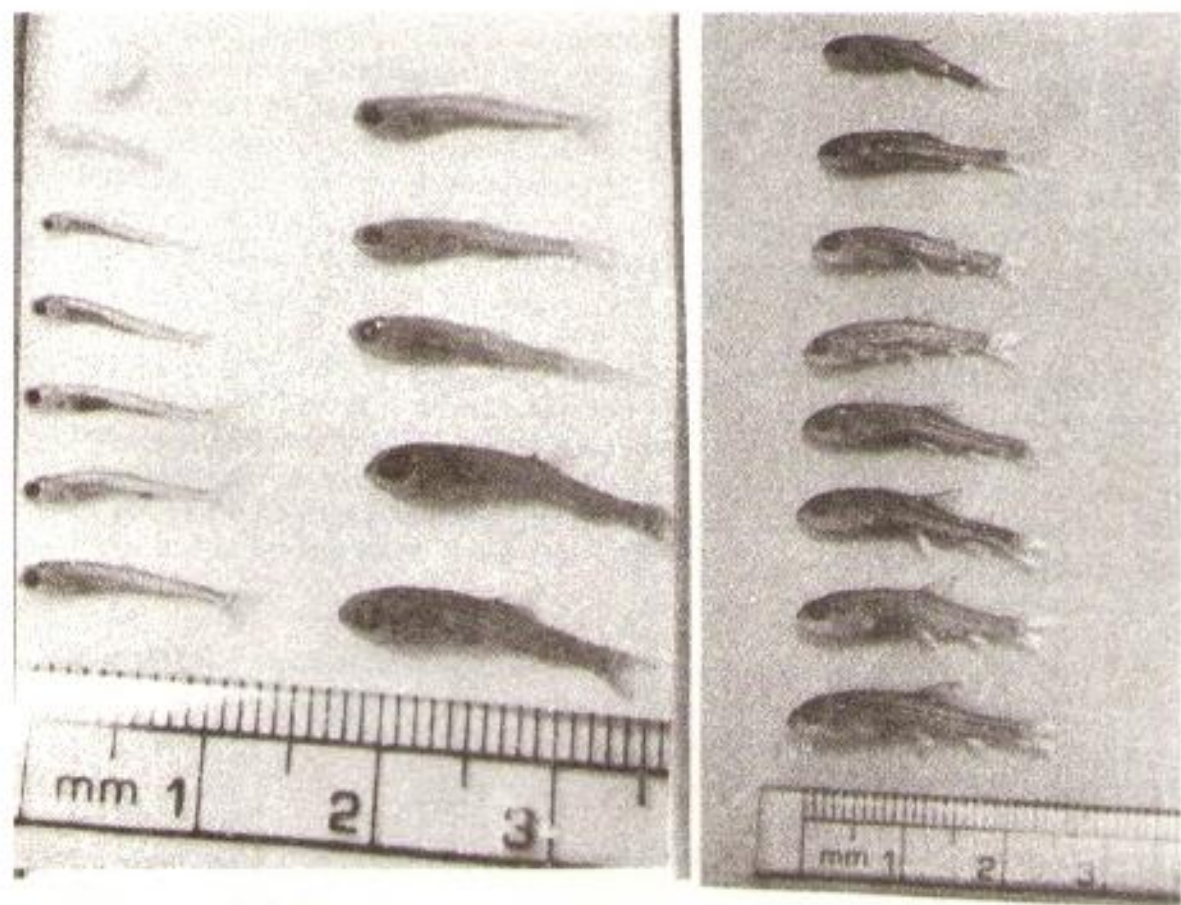


Fig. 2. Juvenile stages of *S. niger* up to a length of 27mm.

As is evident from the data given in Table 1, the 10mm -16mm long fry fed only on animal matter, which was contributed by insect larvae, cladocerans and copepods. In 10 mm and 11mm size groups only *Chaoborus* (insect larva) and *Graptoleberis* (Cladocera) were found. Cladocerans constituted about 14% of their food and *Chaoborus* larva constituted about 86% in case of 10mm group, while in 11mm group 93% of food was contributed by *Chaoborus* and 6% by *Graptoleberis*. In 12mm, however, copepods were added to the food, but again *Chaoborus* dominated the two, contributing approximately 88% of the food. In 13mm size group no copepods were found and only *Chaoborus* and *Graptoleberis* were found, contributing 88% and 12% of the food respectively. Up to 16 mm size group *Chaoborus* dominated the food.

From 17mm onwards the gut contents of the fry contained plant matter (though in very low quantities). Diatoms, green and blue-green algae and macrophytic tissues represented the plant matter in the gut contents. In 17mm group, desmids (*Closterium*) were found in addition to *Chaoborus* and *Graptoleberis* and from this stage onwards insect wings and appendages were also noticed. It was also found that from this size onwards *Graptoleberis* dominated the food. Macrophytic matter was found present from 18mm size group onwards though in total it formed only 4% of the food of these juveniles.

Among plant matter *Closterium* constituted 11% of the total food and dominated the food of plant nature. They were recorded from about 27% of the guts studied. Diatoms (Bacillariophyceae) were found only in 5.2% of guts examined and contributed 0.52% of the food. The genera found were *Fragilaria*, *Cocconeis* and *Anomoeoneis*. Myxophyceae were recorded in still lesser number of guts (3.5% of guts analysed) and formed only 0.18% of the food. Main genera found were *Oscillatoria* and *Spirulina*.

Among animal food, rotifers and nematodes played insignificant role, forming only 0.55% and 0.12% of the food respectively. Greater occurrence of *Chaoborus* larva, *Graptoleberis* and, to some extent, *Cyclops* in the gut of the juveniles revealed their choice for these food organisms.

DISCUSSION

Feeding is one of the most important processes of life and all the biological systems of an organism are dependent directly or indirectly upon it. Fishes have diverse feeding habits in close association with their habitats as well as needs. Many

Table 1. Percentage composition of the food of the juvenile *Schizothorax niger* Heckel.

Length	Percentage Composition of various food items									
	Fish	Cladocera	Insect Larva	Copepods	Insect remains	Rotifers	Nematodes	Green Algae	Diatoms	Blue-green Algae
	10 mm	13.7	86.2	-	-	-	-	-	-	-
11mm	6.6	93.3	-	-	-	-	-	-	-	-
12mm	8.6	87.9	3.4	-	-	-	-	-	-	-
13mm	12	88	-	-	-	-	-	-	-	-
14mm	14.2	83.9	1.7	-	-	-	-	-	-	-
15mm	25.9	74	-	-	-	-	-	-	-	-
16mm	60	38.1	1.7	-	-	-	-	-	-	-
17mm	82.9	10.6	3.3	0.8	-	-	2.3	-	-	-
18mm	37.2	36.3	8.1	-	0.9	-	16.3	-	-	0.9
19mm	35.5	22.5	5.5	0.5	3	-	31.5	-	-	-
20mm	45.5	16.3	1.2	0.6	0.7	-	33.6	2.4	-	-
21mm	50	36.9	6.9	1.5	1.5	-	2.3	-	-	-
22mm	34.1	28.2	12.7	0.3	1.9	-	22	0.3	-	-
23mm	59.8	25.8	3.5	1.5	-	0.5	8.6	-	-	-
24mm	33.5	41.6	13	5.9	-	1.7	2.9	0.5	-	-
25mm	50.8	37.1	6	3	-	-	1.2	1.8	-	-
26mm	53.6	36.7	4.4	2.2	-	-	2.2	0.7	-	-
27mm	47.1	22.4	13.2	-	-	-	16.6	0.5	-	-

ACKNOWLEDGEMENTS

The data used for this article were procured during the tenure of ICAR sponsored research project No. 4(10)/94 - ASR - I dt. 09.01.1995 sanctioned to the second author. The authors are grateful to Dr. N. A. Jan, Commissioner Fisheries, J & K Government and Mr. S. D. Sohaf and Mr. Shoukat Ali, Deputy Directors and other Officers of the Department of Fisheries for help in the field collections.

REFERENCES

- Bahuguna, S. N. and Singh, H. R. 1981. Food and feeding habits of a hill stream fish *Glyp-tothorax pectinotermum* (McCll.). *Indian J. Animal Sci.* **51**: 964 - 67.
- Bahuguna, S. N. and Singh, H. R. . 1984. Food and feeding habits with gross morphology of the alimentary tract of a hill stream fish, *Barilius vagra* (Ham.). *J. Anim. Morph. Physiol.* **31**: 183 - 87.
- Casas, J. M. and Paz, J. 1996. Recent changes in the feeding of cod (*Gadus morhua*) off the Flemish Cap, New Foundland, 1989 - 1993. *IC'S J. Marine Sci.* **53**: 750 - 756.
- Das, S. M. and Subla, B. A. 1963. The Ichthyofauna of Kashmir Part I. History, topography, origin, ecology and general distribution. *Ichthyologica* **2**: 87 - 106.
- Das, S. M. and Moitra, S. K. 1955. Feedings habits of a few fishes of U. P. *Current Sci.* **24**: 417.
- Dasgupta, M. 1990. A study on the food and feeding habits of mahseer *Tor tor* (Ham.). *Indian J. Fish.* **37**: 297 - 304.
- Downing, J. A. and Riglar, F. H. 1984. *A Manual on Methods for the Assessment of Secondary Productivity of Freshwaters*. IBP Hand Book No. 17, Blackwell Sci. Pub. London.
- Duray, M. N., Estudillo, C. B. and Alpasan, L. G. 1997. Larval rearing of the groups *Epiplatys suillus* under laboratory conditions. *Aquaculture* **150**: 63 - 76.

- Dutta, S. P. S. 1991. Food and feeding habits of *Rasbora rasbora* (ham.) inhabiting Gadigarh stream, Jammu. *Geobios New Reports*, **10**: 135 - 37.
- Dutta, S. P. S. 1992. Food and feeding habits of *Esomus danrica* (Ham.) inhabiting Gadigarh stream, Jammu. *J. Hydrobiol.* **8**: 25 - 27.
- Edmondson, W. T. 1959. *Freshwater Biology*. John Wiley & Sons, N. Y.
- Gupta, S. S. and Subla, B. A. 1985. Embryonic and larval development of *Schizothorax curvifrons* Heckel as observed in the laboratory. *Indian J. Fish.* **32**: 101 - 111.
- Hynes, H. N. B. 1950. The food of freshwater sticklebacks (*Gasterosteus aculeatus* and *Pygosteus pungitius*) with a review of the methods used in the studies of the food of fishes. *J. Animal Ecol.* **19**: 36 - 58.
- Jan, N. A. and Das, S. M. 1970. Qualitative and quantitative studies on the food of eight fish species of Kashmir. *Ichthyologica* **10**: 20 - 26.
- Jan, N. A. and Das, S. M. 1971. Studies on the food and seasonal variation in four fishes of Kashmir valley. *Kashmir Sci.* **8**: 102 - 107
- Jyoti, M. K. and Malhotra, Y. R. 1975. Seasonal variation in feeding of *Nemacheilus kashmiriensis* Hora. *Matsya* **1**: 53 - 58.
- Malhotra, Y. R. 1970. Studies on the seasonal changes in the ovary of *Schizothorax niger* Heckel from Dal lake in Kashmir. *Jap. J. Ichthyology* **17**: 110 - 117.
- Michael, R. G. and Sharma, B. K. 1978. *Fauna of India and adjacent countries: Indian Cladocera*. Zool. Surv. India.
- Natarajan, A. V. and Jhingran, A. G. 1961. Index of Preponderance - a method of grading the food elements in the stomach analysis of fishes. *Indian J. Fish.* **8**: 54 - 59.
- Nautiyal, P. and Lal, M. S. 1984. Food and feeding habits of fingerlings and juveniles of mahseer (*Tor putitora* (Ham.)) in Nayar river. *J. Bomb. Nat. Hist. Soc.* **81**: 642 - 47.
- Nikolskii, G. V. 1963. *The Ecology of Fishes*. Academic Press, London

- Pandit, Anil, K., Yousuf, A. R., Balkhi, M. H. and Firdous, Gazala 1992. Morphometric study of a schizothoracine fish of Kashmir. p. 11-16. In: *Current Trends in Fish and Fishery Biology and Aquatic Ecology*, (A. R. Yousuf, M. K. Raina and M. Y. Qadri, eds.). Kash. Univ. Srinagar.
- Pathani, S. S. and Das, S. M. 1979. A note on food and feeding habits of common Kumaun fish *Puntius conchonus* (Ham.). *Environment India* 2: 105 - 6.
- Pennak, R. W. 1978. *Freshwater Invertebrates of United States*. John Wiley & Sons, London.
- Shekhar, C., Malhotra, Y. R. and Dutta, S. P. S. 1993. Food and feeding habits of *S. richardsonii* (Grey & Hard) inhabiting Neeru nallah, Baderwah, Jammu. *J. Indian Inst. Sci.* 73: 247 - 51.
- Smith, G. M. 1950. *Freshwater Algae of United States*. McGraw Hill Book Co., N. Y.
- Spataru, P., Hefher, B. and Halevy, A. 1980. The effect of the method of supplementary feed application on the feeding habits of carp (*Cyprinus carpio* L.) with regard to natural food in ponds. *Hydrobiol.* 72: 171 - 178.
- Subla, B. A. and Das, S. M. 1970. Studies on the feeding habits, the food and the seasonal fluctuations in feeding in nine Kashmir fishes. *Kashmir Sci.* 7: 25 - 44.
- Sunder, S., Kumar, K. and Raina, H. S. 1984. Food and feeding habits and length-weight relationship of *Cyprinus carpio specularis* Linnaeus of Dal Lake, Kashmir. *Indian J. Fish.* 31: 90 - 99.
- Wanganeo, A and Wanganeo, R. 1991. Algal population in valley lakes of Kashmir Himalaya. *Arch. Hydrobiol.* 12: 219 - 233.
- Yoshimatsu, T. and Kitayima, C. 1996. Effects of daily ration and feeding frequency of *Artemia* on the growth of mullet larvae. *Aquacultural Intern.* 4: 85 - 88.
- Yousuf, A. R. 1996. Fishery resources of Kashmir. p. 75 - 120. In: *Ecology, Environment and Energy*. (A. H. Khan and A. K. Pandit, eds.) Kashmir University, Srinagar.

- Yousuf, A. R. and Firdous, Gazala 1997. Food spectrum of crucian carp, *Carassius carassius* (Linnaeus) in Anchar lake, Kashmir. *Oriental Sci.* **2**: 35 - 40.
- Yousuf, A. R. and Firdous, G. 2001. Food spectrum of mirror carp in a deep mesotrophic Himalayan lake. *J. Res. Dev.* **1**: 60 - 67.
- Yousuf, A. R., Firdous, G., Balkhi, M. H. and Pandit, A. K. 1992. Studies on the length - weight relationship in some cyprinid fishes in Manasbal lake. p. 185 - 189. In: *Current Trends in Fish and Fishery Biology and Aquatic Ecology*. (Yousuf *et al*, eds.) Kashmir University, Srinagar.
- Yousuf, A. R., Firdous, G and Pandit, Anil K. 2001. Length - weight relationship in *Schizothorax niger* Heckel, an endemic lacustrine fish of Kashmir. *J. Res. Dev.* **1**: 54 - 59.
- Yousuf, A. R. and Pandit, Anil K. 1992. Breeding biology of *Schizothorax niger* Heckel: Fecundity. p. 55 - 62. In: *Current Trends in Fish and Fishery Biology and Aquatic Ecology*. (Yousuf *et al*, eds.) Kashmir University, Srinagar.
- Yousuf, A. R. and Pandit, A. K. 1996. Embryonic and post-embryonic development of *Schizothorax niger* Heckel. *Oriental Sci.* **1**: 67 - 74.