CHAPTER I

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The fish fauna of Kashmir attracts research workers, as it is different in its origin, evolution and ecological distribution, from that of other regions of India. It is also important for its influence on the economy of the state, forming a cheap protein food for 80 to 86% poor population of Kashmir.

The valley of Kashmir is a bowl surrounded on all sides by high mountains, due to which its ichthyofauna has been segregated even from its two allied regions e.g. Jammu on its southern side and Ladakh on the northern. In the valley, therefore we have mostly those fishes which are either local and endemic or introduced and exotic.

The local and endemic fishes of Kashmir from phylogenetic, palaeontological and geographical considerations (HORA 1964, DAS 1963, 64, 65) are found to be of Central Asiatic origin. They include the endemic species of fishes of the genera Schizothorax, Schizothorax, Pseudobarbus, Schizothoraxopsis (DAS 1964), Diplochus, Schizothorax, Glyphostomum, Rotiia and Nemachilus. The exotic fishes consist of five species of the genera Salmo, Cyprinus and Gambuna (DAS 1964); while the fishes in the valley of Indian origin are only Crossochilus latius Punjabiensis, Labeo dero, Carchacotyla, Barbus conchonius and Tortor (DAS 1964).

2. Fisheries.

For the conservation fisheries in Kashmir it is necessary to manage the propagation of the old species and the introduction of the new ones, without distributing the natural biological balance. Fishing is a major profession in Kashmir. Besides, the common methods of fishing with various types of nets e.g. ---
Khuchhshigihal, Gurun Ghal, dipnet, cast net etc. and there is an interesting fishing peculiar to Kashmir fishermen. This is locally known as *Saa*. There are about 35 to 41 boatmen fishing together in same area at one time. One boat is kept at the centre and of the remaining number half is arranged on either side of it in a line. The central boatman will not cast his nets, *rushing* movements. The other parties follow him and cast all their nets together, a beautiful sight to look at. The *saas* is performed either early in the morning or in the evenings. They say that largest catches are made by this method.

A fisherman catches about 20 to 30 lbs. of fish daily on average. But the catch rate is up to 40 to 50 lbs. after rains or disturbance of water by other means. During winter the daily catch rates are low.

The Government of Kashmir State has established a full-fledged "Fisheries Department" with the Director Fisheries as its head. The main functions of this department are:-

1. To see fishermen obey the rules of fishing;
2. To introduce new and varieties of fishes;
3. To construct hatcheries and culture and preserve game fishes;
4. To teach fishermen new methods of fishing; to provide them subsidies;
5. To provide them subsidies for making nets and boats.

At present the following data are available from the hatcheries Fishery Department regarding *saas* and fish culture:-

1. Total number of trout hatcheries is 7.
2. Minor carp nurseries are 4.
3. Minor carp has been introduced in the following waters:-

A. **Kashmir Province**

Ahansar, Manasbal, Dal-lake, Chalbug, Mokarsar, Monibug ---
Only a few workers have reported on the fecundity of fresh water fishes, and that also without any reference to Kashmir fishes. The only attempt in comparative fecundity is that of Bas (1964) comparing the fecundity of some fresh water fishes of India with Cyprinus carchiopectus of Kashmir.

The introduction of one exotic fish into Kashmir, i.e., the carp (Cyprinus carpio) has disturbed the natural biological balance of endemic fishes of Kashmir. It has been observed during personal collections, as also by checking the records of the fisherman's collections, that there are only 20 to 30° indigenous fishes in a catch while the rest (70 to 80%) consists of the carp. This condition has been found to prevail on account of the difference in comparative fecundity between the mirror carp and the endemic fishes. The balance between these fishes can be maintained only by the introduction of induced spawning.

The low survival of fresh water fishes is caused on account of greater rates of mortality during the embryonic, larval and post larval stages, due to competition, for food in confined waters, as also variable ecological conditions when compared with marine conditions.

3. Breeding habits of fresh water fishes.

The fresh water fishes of India usually breed during the monsoon season i.e., from 1st week of July to the last week of September.
These three months of the rainy season are the peak periods of spawning of most of the Indian fishes. However, the period is bound to differ in various regions and years because the rains may not be uniform in all places and years. Besides favourable external factors, there are internal capacities like the ability to spawn and vitality of the individuals which govern the breeding habits. Due to inherent factors, some fishes breed in spring (Nemachilus etc.) others in summer (corps) some in autumn (copy) and still other in winter (Trout).

The same holds good for the Kashmir fishes in general. These have definite breeding seasons which may alter from short periods to a few months, depending upon the special natural conditions e.g. rain, snow, severe winter etc. Some fishes of Kashmir also exhibit breeding migration e.g. Schizothamnus species. These migrate up to hill streams during their breeding season to spawn in ever-flowing waters. Some of these fishes also show secondary sexual characters e.g. nuptial glands, barbs, gaudy colorations etc. during the breeding seasons.

4. Embryonic development of fishes in India.

As in other vertebrates, in fishes also, following fertilisation there ensues a period of cleavage of the egg, resulting in an increasingly large number of blastomeres as the time goes on. This process of cell division gives rise to a multicellular blastula. The blastula, with further divisions and epibolic rearrangement of cells, becomes converted into a gastrula, followed by a stage called neurula, in which a definite head, trunk and tail may be distinguished. Although the plane of embryonic development appears to be a general one, there exists some specialisations in fishes. There is in the main marked concentration of the yolk, so that the protoplasm exists only as a thin plate the blastodisc upon it. The segmentation process is confined to this disc only and is named as mesoblastic discoidal type.
The duration of development in fishes is greatly influenced by external conditions such as temperature and illuminations, and internal conditions such as the amount of food available to the developing embryo, supplied in the egg while still in the ovary. Hatching of the larva varies from 12 to 60 hours in cyprinid fishes and up to 8 to 10 days in cat fishes. The lengthening of the embryonic period involves greater organs differentiation inside the egg, the highest mortality being during the gastrulation stage. Some fishes also show microecological relationships during the embryonic developmental period.

5. Larval Development of Fresh Water Fishes.

There is no special collected literature available on the larval development of the fresh water fishes of India. It is no exaggeration to say that almost throughout the stretch of the Indian-Pacific region there is scarcity a fish whose various post embryonic stages could be identified up to the beginning of the twentieth century.

Hatching is a momentous event in the life-history of a fish. It is very difficult to comprehend the extremely wide variations in the timings of this event even in related species. In oviparous fishes, the larval life commences with hatching while in viviparous fishes it starts while still inside the egg membrane. There may also be present cement glands. The larvae of the viviparous fishes obtain nourishment through the villi from the ovary, while those of oviparous ones from the attached yolk sac. The common features of the larval of fishes in general are thin cylindrical body or yolk sac, pigmented eyes, otic vesicles, a continuous medullary, definite large stillate melanophores and a pulsating heart. The blood in the heart may or may not be pigmented in the larva.
As the age increasing (in number of days) there is greater and greater differentiation of the organs. By appearance of new organs and reductions of yolk sac, the larvae are marching towards the goal of independent life, which involves functioning of fish gut and other organs. The duration of the larval development is also dependent both upon the specific characters and the environmental conditions. The duration of the larval life is from 13 to 17 days, while in Gambusia it is complete in 6 to 7 days.

The rate of mortality is also enormous during larval life. It was observed during larval life. It was observed that the largest mortalities occurred between the 5th and 10th day after hatching. Larval of most fresh water fishes when they start feeding, try to select suitable zooplankton from the environment. The scarcity of suitable food may be the cause of this large scale mortality. It has, therefore, become very important to find out some artificial food which can save this loss.


This stage begins with the onset of independent feeding of the larval stages. The yolk sac is completely absorbed, and the body shape is more or less like a fish. It is during this stage that the organogeny is completed. There is enormous growth of the exoskeleton material. The larvae are now definitely more viable.

The change from pro-larva to post larval stages may take a few weeks to some months. The post-larval also migrate to the original localities of their parents. These migrate back from upper streams, pools and ponds, to the large lakes and rivers as in Kashmir.

During the post larval development the organ-systems are fully functional. At the close of this stage, the myotomes are no longer evident externally as separate entities. The scales may be only rudimentary. After the formation of scales and pigmentation, the
juvenile resembles the adult in gross external appearance and is called the *fingerling*. This is so to say a replica of the adult, albeit smaller, slenderer and lacking adult pigmentation and mature gonads.