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History of Mashaser Fishes of India

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ABSTRACT-

In the Garhwal Himalayan region, many big and small hydroelectric power plants are established for power generation. These power plants are beneficial as well as harmful in many ways for the fragile environment of Himalayan region. Diminishing fossil fuel resources and looming water shortages are focusing alternation on the potential for multi-purpose usage of the national surface, water resources. As the government plans to undertake a large number of runoff the river schemes and storage darns in the near future, it becomes highly necessary that the environmental, social and economic impacts of such project are assessed and highlighted, so the inferences could be drawn for our on-going and future projects.

Key Words: *Fluvial, Diminishing fossil, Potential, Inferences.*

Introduction-

Population structure is also influenced by co-action between individual within and between species. Co-action may either be beneficial to the participants, cooperation (Allee *et a/.,* 1949, Allee 1949 & 1951), or harmful, disoperation. Many of these co-actions act to regulate density or, along with climate, cause fluctuation or even more drastic changes in number of individuals from time to time. Favorable environment may lead to greater survival, while adverse could result in increased mortality. This would eventually influence the age composition since mortality can be high only in larval stages or in older individuals.

The status of sympatric population of mahseer fishes are reflected in their population size and age structure. Among the various factors, the population size is regulated by competition, an adequate supply of food, the space and other resources necessary for existence and reproduction of mahseer species. Studies, such as present one are important as they help in understanding how the closely related fish species co-exist in same environment of more interest is how the population of sympatric mahseer species maintain themselves in Ganga river. The nature of river may also influence the population structure and it is quite possible

that streams with different gradients and discharges may influence the population in a different manner.

The population size is structured by natality and mortality rates, which eventually is the sum total of abiotic stress and biotic interactions. The shape of the mortality curves varies greatly with years and species. In many cases, most of the deaths occur in the spawn or free embryo stage while in others they occur in larval or fry stages. Some species show a considerable and variable number of deaths among the adults. Each species is adapted to a certain range of death rates. The mortality that a population can withstand is inversely related to the exposure to predator and parasites, also, the fecundity tends to be higher and more labile when natural mortality is high. Abiotic conditions usually can produce large number of death only when their changes lie outside the limits to which the species is adapted, as most frequently occurs at the biological limits to the range of the species.

The spawning population of a species with a Jong life cycle consists of many age groups. A population consisting of few age groups is adapted to rapid changes in numbers. Such a species usually exists on a variable food base and with a relatively high exposure to predators. The numbers fall rapidly under poor conditions. On the other hand, such a species is also adapted to more stale spawning conditions than a population with a many age groups, for a poor year-class at once affects the total numbers in the population when the life cycle is short and so fluctuations in year class strength have a pronounced effect on the breeding population. The population structure may vary greatly, which is not accidental but an adaptive response. The adaptation provides a rapid increase in numbers when the food supply improves, the population density influencing the fecundity during breeding seasons.

The sex ratio in the spawning population and in the various age and size groups varies with the species, reflecting the relationship of that species to its environment. The sex structure is also adaptive to the food supply, which thereby influences the reproductive rate and the variability of the offspring (Makeeva and Nikolskii 1965). The sex structure is very important to the reproduction of a population, and consequently there are mechanism for adjusting this structure to any changes, and specially changes in food supply. The last is itself dependent on the population density, so that the sex ratio naturally reflects the density. There is thus little doubt that fish have a variety of mechanisms for the adjustment of the sex ratio, but many instances of altered ratios cannot be explained in terms of enhanced mortality or differences in maturation (Nikolskii 1980).

The fish eco-biological studies also give original data on habit and habitat, sexual dimorphism, sexual maturity, catchable size, spawning period, spawning sites, normal fluctuation in year classes, population size distribution, fish production from catch data and experiments on natural breeding. Some other minor aspects of fish ecology and biology for proper management and fish production are also significantly contributed in sustainable riverine ecosystem. *All* these studies are essential to obtain a rational fishery of a particular species in a

water body. This year to year knowledge on mahseer and its biological aspects will help to evaluate the condition of natural stocks in Ganga river. The present scientific study regarding the biology of the mahseer specially population dynamics, feeding habits, changes the spawning and migratory behavior, fish habitat distortion, and suggestive conservation measures would be provide a baseline to improve the present status to mahseer population in Ganga River at Garhwal region.

The unabated downward trend in commercial as well as sport fishing catches of mahseer can be curtailed by a continuous rehabilitation programme on a mass scale and conservation by enforcing the prevailing legislation strictly. The rehabilitation programme would require intensive production of stocking materials (fry and fingerlings) for planting in the perennial water e.g. streams, lakes, rivers. Since conservation and rehabilitation of threatened fishes, Himalayan mahseer is a sport game fish play a vital role in subsistence fishery resources for Uttarakhand as well as of national importance. The production of stocking material through artificial propagation of mahseer species and ranching in their natural habitats is the only solution to save mahseer germplasm from extinction.

OBJECTIVES OF THE STUDY

The unabated downward trend in commercial as well as sport fishing catches of mahseer can be curtailed by a continuous rehabilitation programme on a mass scale and conservation by enforcing the prevailing legislation strictly. The rehabilitation programme would require intensive production of stocking materials (fry and fingerlings) for planting in the perennial water e.g. streams, lakes, rivers. Since conservation and rehabilitation of threatened fishes, Himalayan mahseer is a sport game fish play a vital role in subsistence fishery resources for Uttarakhand as well as of national importance. The production of stocking material through artificial propagation of mahseer species and ranching in their natural habitats is the only solution to save mahseer germplasm from extinction.

ASSUMPTION

The status of sympatric population of mahseer fishes are reflected in their population size and age structure. Among the various factors, the population size is regulated by competition, an adequate supply of food, the space and other resources necessary for existence and reproduction of mahseer species. Studies, such as present one are important as they help in understanding how the closely related fish species co-exist in same environment of more interest is how the population of sympatric mahseer species maintain themselves in Ganga river. The nature of river may also influence the population structure and it is quite possible that streams with different gradients and discharges may influence the population in a different manner.

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RESEARCH METHODOLOGY-

Survey method is used by the research scholar according to need and requirement of the topic.

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To make studies on the population dynamics of mahseer fishes, *Tor tor* & *Tor putitora* in Ganga river at Garhwal region. The methods adopted in investigating for various biological aspects are based on standards evolved in different research laboratories both in India and abroad. Whenever necessary, the methodology was modified to suit the field conditions. The scientific observations on the biology of mahseer in Ganga river were carried out by dividing the Ganga river stretch into three sampling zones namely, upper stretch of Ganga river at Devprayag, Down stretch of Ganga river from Devprayag to Byasi Ghat and Riverine stretch of Ganga river from Biyasi Ghat to Shivpuri (Rishikesh).

METEOROLOGICAL PARAMETERS

The meteorological data, i.e. maximum and minimum air and water temperature, relative humidity and rainfall have been collected from the State Irrigation Meteorological Research Laboratory, State Forest Department and Central Water Commission at Devparag and Rishikesh. The meterological parameters observed with the help of digital instruments during the field visits on sampling periods.

FISH DIVERSITY AND CATCH COMPOSITION

The mahseer fishes, *Tor tor* and *Tor putitora* were collected seasonally during March 2006 to February 2, 2009 from different sampling zones of Ganga river. The fish catch samples were obtained from local fish market, fisherman and anglers. The use of cast net was found very common to land the mahseer (small size), while gill nets in addition to hooks were by rod lines

used to land the larger size of mahseer. The fishes were taken to laboratory in fresh condition for further investigation and analysis. The catch composition and per unit effort was estimated applying following method.

$$\text{Catch per unit effort (CPUE)} = \frac{\text{Total weight of fish catch}}{\text{Number of ersons} \times \text{hrs. of fishing}}$$

The fish samples were preserved in 5% formaline solutions and identified according to Day (1878, 1879), Gunther *et al.*, (1959), Menon (1962), Badola and Pant (1973), Jayaram (1987) and Sehgal (1992).

PHYSICO-CHEMICAL AND BIOLOGICAL FACTORS

The physico-chemical and biological characteristics of the riverine water on spawning grounds were determined according to Welch (1948), Edmondson (1959), Needham and Needham (1966) and APHA (1995). The abiotic and biotic parameters have an idea of the optimum conditions required for successful spawning in natural conditions. Some physico-chemical parameters viz., water temperature, turbidity, dissolved oxygen, pH, conductivity; TDS, Free C02 and Alkalinity were analyzed. The details of measurements of different physico-chemical parameters as follows:

(A) Water temperature: Water temperature was recorded with the help of (±1°C) centigrade thermometer.

(B) pH : pH is the negative $\log_{10}$ of the Hydrogen ion concentration in a solution. The pH value is expressed as the negative ion of [H+] concentration. pH of water sample was analyzed by pH meter (portable) made by Hanna instruments.

RESULTS & FINDINGS-

1) The meristic characters have observed as lateral line scale and transverse scale in both the species of mahseer. The lateral line scale counts have observed some differentiation in number as 24 - 28 in *Tor putitora* and 20- 27 in *Tor tor*. Two pairs of rostrals barbels and maxillary barbels were found in the species of mahseer.
2) The age and growth of the mahseer species have calculated by scale and operculum method. False rings have been recorded in scales and operculum due to low feeding rate in spawning period. Only two year age group and above than have clear false rings in scales and operculum of the mahseer, *Tor tor* and *Tor putitora.* The back calculation showed a linear relationship between total length of fish and scale radii along with the total length of fish and operculum width. By the present observations a separate formula for age determination given for *Tor tor* and *Tor putitora* separately for upstream and downstream of Ganga river.
3) The condition factors as standard formula $K = Wx10^5/L^3$ indicated high condition factor (2.076 – 1.649) and lowest value (0.671 – 0.921) in summer and winter season respectively observed in *Tor tor.* As while in *Tor putitora,* the highest condition factor 1.741 and lowest value 0.793 were observed in summer season and winter season respectively. The

condition factors were highest in breeding season and its values further decreased in breeding season and its values further decrease in winters (post spawning period) followed by condition minus gonads. The values of K have shown as indicators of the peak activity of the gonads during the summer and rainy seasons, marks as separate breeding seasons in two peaks for the mahseer species, *Tor putitora* and *Tor tor.*

4) In *Tor putitora,* the gut has contained 50% animal matter found in upper stretch and the gut of *Tor putitora*, 42.79% animal matter occurs of the middle stretch. The food and feeding analysis of *Tor tor* have indicated the highest plant matter 80.73 % in the gut of *Tor tor* occurs in upper stretch as compared with the value of plant matter 59.59 % in the gut of *Tor tor* occurs in middle stretch and 60.30 plant materials was occurred in lower stretch. The presence of plant and animal matter percentage have indicated that *Tor pulitora* preferred mostly animal matter and *Tor lor* preferred mostly plant matter in upper, middle and lower stretches in the Ganga river.
5) The sex ratio of the mahseer fish in river Ganga river have shown as the ratio of female and male of *Tor tor* have observed 1:2.20 in upper stretch, 1:1.42 in middle stretch and 1:1.12 in lower stretch. The male specimens of the *Tor tor* were found 65.12% in rainy season. The sex ratio of female and male of *Tor putitora* have observed 1:2.66 in upper stretch, 1:1.57 in middle stretch and 1:1.73 in lower stretch. The male specimens of *Tor putitora* were found 75.83 % in rainy season in Ganga river.
6) The physico- chemical parameters and biotic characteristics of the river water have indicated as a seasonal fluctuation trends. The present results revealed that the water temperature ranged 18.55°C- 26.07°C, pH ranged as 7.2 – 8.5 , from upper stretch to lower stretch, turbidity ranged as 6-1061 NTU and dissolved oxygen ranged as 7.2-12.6 mg/1 were observed, while the phytoplanktons (1421- 1380 mg/1) and biological productivity (Net productivity as 0.2– 0.442, Community respiration as 0.507 – 0.3 and Net production efficiency% 69.34–27.64%) were calculated, The mahseer fishes preferred the more clear water, low water temperature, relatively high oxygen value and good feeding substratum during spawning and breeding seasons.
7) The regular field observations have showed that mahseer fishes laying their eggs in phases as in April - May and secondly in July- September indicating two main breeding seasons i.e. pre summer and rainy season. The sizes of the collected fertilized eggs from the different spawning sites were recorded 2.8 -3.0 mm in April - May and 2.9- 3.2 mm in rainy breeding season.
8) Spawning habits of maliseer were observed as very close observations during early morning and evening hours on the selected spawning sites as courtship, chasing by male specimens and rapid movement by the caudal region of the female during the spawning process. No parental care is taken either by male or female specimen of the mahseer on natural spawning grounds in Ganga river ecosystem.

9) An effort as "in situ "conservation programme through natural developmental process of the collected fertilized eggs of the mahseer were tried in water flow hatchery system under control condition. The incubation period varied from 99.0–110 hrs. during breeding months of July, August and September, the depending upon the water temperature (19.6- 21.6^{0}C) prevailing in hatching trough/trays. The average percentage of hatching ranged 85.1–95.7. The newly hatched hatchling measured 8.2–9.5 nun in total length. Cumulative% of survival of swimming fry recorded 60.0 – 90.0 after feeding supplementary feed for one month After 30-40 days mahseer fries attained a good growth by feeding of proteinous diets and changed into fingerlings as fish seed stocking material in natw-al riverine system.

10) Dw-ing the study period , weekly riverine shoreline survey work have shown a lot of destructive fishing methods were operated by local fisherman , anglers and local laboures as common practices through dynamiting, hammering, electric shocks, bleaching powders , cast, gill nets and use of ichthyotoxic, plants extract to catch maximum fishes from Ganga river and its tributaries.

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