



Mahseer: A Bioindicator Teleost

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Author's contribution

The sole author designed, analysed, interpreted and prepared the manuscript.

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ABSTRACT

Mahseers, known as the king of rivers, are among the largest carp and a valuable group of freshwater fish in Asia. The word Mahseer has its origins in Bengal; the two root words, Maha, mean greatness and Seer, means mouth or head; literally, it means having a strong and large head. The range of these fish is across the entire Indian subcontinent. There are four genera of Mahseer, viz., *Tor*, *Neolissochilus*, *Naziritor*, and *Parator*, available across the world. Out of the 47 species of Mahseer that exist in the world, India is home to fifteen. They are game fish as well as commercially important and highly esteemed food fish. Mahseer fetches a high market price. But all the Mahseer carps belonging to all genera and species are under serious threat due to various anthropogenic activities. Mahseer is a sensitive species that can barely tolerate a modified water environment. It is a bioindicator organism. The population of Mahseer has seriously declined due to the degradation of the ecological conditions of aquatic systems, indiscriminate fishing of broodstock and juveniles, adverse impacts of river valley projects, industrial and human pollution, use of explosives, poisons, and electrofishing by poachers, the introduction of exotic species, and population pressures on resources. Rejuvenating the freshwater bodies and in-situ conservation are needed for replenishing the declining population of Mahseer. The Tata power plant at Lonavla developed standard techniques of Mahseer breeding through decades of study. Till date, it has produced in excess of 10 million fingerlings of Mahseer and distributed them all over India. Its findings on breeding methods have proved valuable and have even been replicated in several Mahseer breeding facilities across the country.

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1. INTRODUCTION

Mahseer, known as the "king of rivers," are among the largest scale carp and a valuable group of freshwater fish in Asia. The term Mahseer is derived from the Bengali words Maha, which means greatness, and Seer, which means mouth or head; literally, it means having a strong and large head. "Mahseer is the common name used for the genera *Tor*, *Neolissochilus*, *Naziritor*, and *Parator* in the family Cyprinidae (carps). The name is, however, more often restricted to members of the genus *Tor*. The range of these fish is from Vietnam in the east and China in the north, through Laos, Cambodia, Thailand, Malaysia, Brunei, and Indonesia, and across southern Asia, including the countries of India, Nepal, Bhutan, and Bangladesh within the Indian Peninsula" [1].

"In India, many states have adopted mahseer as their state fish. Arunachal Pradesh, Himachal Pradesh, Jammu and Kashmir, and Uttarakhand all have the golden mahseer, Nagaland has the "chocolate mahseer", *Neolissochilus hexagonolepis*, as their state fish; and Odisha has the fish known as 'Mahanadi mahseer', *Tor mosal mahanadicus*, as its state fish. The southern state of Karnataka is considering changing its state fish from Carnatic carp to the IUCN Red Listed Critically Endangered *Tor remadevii*" [2].

"Researchers working at sites from the Harappan era or Indus Valley civilization found collections of pottery decorated with fish motifs as well as fish bones left in midden pits. Hora describes his interpretation of each of the species depicted on the painted pots, which include most of the species common today in the Indus basin, including mahseer. It has been suggested that this is the first known instance of mahseer being 'revered' or singled out from other fish species as 'God's fish'. Many of the most detailed descriptions of Mahseer begin to appear during the British colonisation of India, in particular, during the British Raj of 1857–1947. Many of those stationed in India enjoyed angling for Mahseer, which they compared to the thrill of catching a salmon 'back home'. Indeed, Henry Sullivan Thomas, author of one of the first books on angling in the colonies, said, "The Mahseer shows more sport for its size than a salmon." They also produced guidebooks and penned letters to sporting journals such as The Field and

Fishing Gazette. Mahseer is an excellent game fish, as well as a commercially important and highly esteemed food fish. Mahseers fetch a high market price, and are potential candidate species for aquaculture" [3].

2. MORPHOLOGY

"The head is slightly shorter than the depth; the dorsal profile is more sharply arched than the ventral profile; and the lips are thick and fleshy, with a continuous labial fold across the lower jaw. The mouth is small, and the gape does not extend below the eyes. The snout is pointed; the jaws are about the same length; there are two pairs of barbels, maxillary ones slightly longer than rostral ones but shorter than the eye; the interorbital space is flat; the dorsal fin is opposite or slightly ahead of the ventral fin; smooth dorsal spine shorter than body depth; pectoral reaching pelvis as long as head, excluding snout; pelvis shorter and not reaching caudal-fin base when laid flat; caudal deeply forked; lateral line complete Predorsal scales are 9. There is a well-developed scaly appendage in the axil of each pelvic fin. Coloration: Silvery green or greyish green dorsally, with pinkish sides replaced by greenish gold above and light olive green below, the lower fin being reddish yellow. The maximum size is 152.0 cm". [4].

2.1 Systematic Position

- Phylum: - *Vertebrata*
- Subphylum: - *Craniata*
- Superclass: - *Gnathostomata*
- Series: - *Pisces*
- Class: - *Teleostomi*
- Subclass: - *Actinopterygii*
- Order: - *Cypriniformes*
- Division: - *Cyprini*
- Suborder: - *Cyprinoidei*
- Family: - *Cyprinidae*
- Genus: - *Tor/ Neolissochilus/ Naziritor/ Parator* [4]

2.2 Habitat and Distribution

"Mahseers inhabit the rivers and freshwater lakes of South and Southeast Asian countries. In India, the group is well distributed, right from the Himalayas up to the rivers of the Western Ghats. Most of the species belong to the genus *Tor*" [5].

2.3 Breeding

"The Mahseer is a large cyprinid (belonging to the carp family) and is recognized by its large scales, which number 25 to 28 along the lateral line with two pairs of barbels. The males are identified by their long pectoral fins and have been known to reach a length of 2.7 meters and weigh well over 100 lbs. The species is migratory; moving upstream during rains. It prefers clean, fast flowing and well oxygenated waters and has a much lower fecundity rate (fewer eggs per kg of body weight) than most carps. It requires gravelly or sandy stream beds to breed and can migrate considerable distances in search of suitable breeding grounds. Females mature when they are 30 cm in length, while males mature at 25 cm. Courtship is a long process where males get attracted to a spawning female, whom they pursue vigorously. When the female finds a suitable place to lay her eggs, the males swim around her and fertilize the orange-coloured eggs. April to September is normally the spawning period, but younger fish are known to spawn earlier. Mahseer are omnivorous. They have voracious appetites, and their diet includes a wide range of algae, crustaceans, insects, other small fish, and also fruits that fall from trees, etc. They also readily take a wide range of natural and artificial lures" [6].

2.4 Bioindicator

"A bioindicator is any species (an indicator species) or group of species whose function, population, or status can reveal the qualitative status of the environment. Mahseer are highly dependent on the quality of the environment in which they have evolved. A slight change in the attributes of the environment can lead to the elimination of the surviving Mahseer. The Mahseer fish acts as an indicator of ecosystem health because it is essentially a rheophilic species that inhabits hill streams with a rocky, and stony substrate. With its prime requirement being pristine natural waters, Mahseer is a sensitive species that can barely tolerate a modified water environment. This is evident from the decrease in its size (length) recorded over the last century, size composition (predominance of young, immature individuals), and reduced share in the catch (as low as 5% from 40–50%) from its distribution ranges. The presence of Mahseer is an indicator of a healthy riverine ecosystem, making it important as a flagship species. Out of the 47 species of Mahseer that

exist in the world, India is home to fifteen. *Tor remadevi* is one of the newest species identified, while *Tor moyarensis*, confined to the Moyar River of Tamil Nadu, is reported to be another" [7].

Tor species found in India:

Tor putitora [4] Endangered
Tor tor [4] Near Threatened
Tor khudree (Sykes, 1839) Endangered
Tor progneius (Mc Clelland, 1839) Near Threatened
Tor kulkarnii (Menon, 1992) Endangered
Tor barakae (Arunkumar & Basudha, 2003) Data insufficient
Tor macrolepis (Heckel, 1838) Not Evaluated
Tor remadevi (Madhusoodana Kurup & Radhakrishnan, 2011)* Not Evaluated
Neolissochilus hexagonolepis (Mc Clelland, 1839) Near Threatened
Naziritor chelynoidea (McClelland, 1839) Vulnerable
Neolissochilus hexastichus (McClelland, 1839) Near Threatened
Neolissochilus dukai (Day, 1878) Data deficient
Neolissochilus hexastichus (Mc Clelland, 1839) Near Threatened
Neolissochilus spinulosus (Mc Clelland, 1845) Data insufficient
Neolissochilus wynaadensis (Day, 1873) Critically Endangered [7]

2.5 Causes of Depletion

The exponential increase in human population is the root cause of the loss of biodiversity and the depletion of natural resources. Much has already been said regarding the depletion of Mahseer. The major possible factors for the depletion of Mahseer stocks are:

- Degradation of ecological conditions in aquatic systems
- Indiscriminate fishing of broodstock and juveniles
- Impacts of river valley projects
- Industrial and human pollution
- The use of explosives, poisons, and electrofishing by poachers
- Introduction of exotic species
- Population pressures on resources

"The above-mentioned factors, combined with human greed, are responsible for the reckless damage to this priceless national heritage" [8].



Fig. 1. Photographs of Mahseer fish [9-12]

2.6 Conservation by Tata Power under CSR

The declining trend in Mahseer populations necessitated immediate action to ensure their in-situ conservation and rejuvenation in natural waters. The Maharashtra fisheries department approached the Tata Power Plant in Lonavla for assistance in saving the endangered Mahseer. The Mahseer project was then started in the 1970s at Lonavla. Standard techniques for Mahseer breeding have been established over decades of study. Till date, it has produced in excess of 10 million fingerlings of Mahseer and distributed them all over India. Its findings on breeding methods have proved valuable and have even been replicated in several Mahseer breeding facilities across the country.

3. DISCUSSION AND CONCLUSION

Mahseer fish is our national heritage, and it is our prime duty to conserve this attractive fish. The decline in the Mahseer population is a major source of concern. The Indian Fisheries Department must increase the number of sessions for training prospective aquaculturists involved in Mahseer breeding. More Mahseer breeding centres must be established. Newer Mahseer breeding techniques must be developed by scientists across the globe, and conferences and seminars must be conducted for the common layman to introduce them to this

important fish. And a census of this fish must be taken periodically to know its status. More and more artificially bred Mahseer must be introduced into our natural freshwater bodies. And above all, our freshwater bodies must be made pollution-free, as then only all these efforts will bear fruit.

COMPETING INTERESTS

Author has declared that no competing interests exist.

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