

Project ID: 13963-2

**Threat Identification and Population
Assessment of *Neolissochilus*
Hexastichus- An Endemic Mahseer Fish
in North-East India Vis-À-Vis
Conservation Actions**



**2nd RSG
Final Technical Report**

1. An exhibition stall was installed for two days of the First ever Arunachal Meen Mohatsav 2013 held on 21-22 Nov. 2013 at Indira Gandhi Park, Itanagar.

The festival was organized by the Directorate of Fisheries, govt. of Arunachal Pradesh to popularize the importance of fish resources and to aware the impact of anthropogenic threats in the natural resources. There were a total of 42 stalls in the festival.

Different posters and reading materials were displayed to the visitors of various categories. Interaction with visitors including Chief Minister, Fishery Minister and other top officials has greatly highlighted the Mahseer Conservation efforts under the Rufford project. Wide range of visitors including school children to farmers have gathered in the festival for two days. The team leader was awarded with a memento for the Mahseer conservation campaign under the Rufford project. The team leader has also written an article in the souvenir book of the festival.



Photo: Inauguration of the festival by the Chief Minister of Arunachal Pradesh



Photo: Our stall named as Mahseer conservation by Rufford



Photo: Meen Mahotsav emphasized Mahseer in a display



Photo: Visitors interacting with team leader during visit in the stall.



Photo: CM, Arunachal Pradesh is leaving the stall after discussion with team leader



Photo: Visitors in the quest of knowledge on Mahseer (above & below)





Photo: Team leader is receiving the award for Mahseer conservation activity under the Rufford program



- 2. Awareness about different threats in river bodies: Different awareness program were held with the villagers, youths of local NGOs, and the students reading in the class V to Viii. The school teachers as well as the local villagers were so keen to hold such programs. The students have gained knowledge and have shown willingness to take responsibility for nature conservation activities in future.**

The knowledge materials have greatly enriched the students and the educated youths. The team leader and the resource persons have spoken on such occasions which attracted the audience. We could cover mostly the areas on the river bank for such program, however, such program in and around the district locality is urgent. A leading daily newspaper in the region has covered the details of the activity which is available online at the link below.
<http://www.assamtimes.org/node/12282>



Photo: Students participating in the awareness program



Photo: Release of posters and reading materials during the awareness program



Photo: Resource person deliberating in the awareness program



Photo: Village gaon bura distributing the posters to students

3. Characteristic identification of breeding grounds and potential habitats of mahseer seed resource:

Physical survey in the rivers led to identify the micro habitats inhabited by the fries of Mahseer. Mahseer supposed to breed twice in a year, first during February and second during September. Although, we could not identify any seed during February to March season, but we could successfully identify the seeds as well as their congregation sites during September to October season. We trained the people, living along the river line, about the microhabitat requirements of the mahseer at early life stage. We practically demonstrated them how to identify the fries of mahseer.

Importantly, the mahseer fishes exhibit a phase of breeding in the late summer period mostly in the upper reaches of streams. The fries of mahseer settle in the shallow habitats particularly near the bank of the streams. As soon as the summer retreats, the water in the streams starts immediate recession so much so that some pits and pockets in the streams get disconnected from the main streams. Unfortunately, thousands of early fries of mahseer which left in such pits and pockets undergo predation and culminate to large scale mortality also due to drying up of water in such pockets. This is a serious issue and needs attention for rescuing such fries for rehabilitating them in safe system.

Unfortunately, the quarrying activities at some sites have destroyed such habitats. Such quarrying also affected the surrounding area particularly the downstream where no any seed of mahseer encountered. This knowledge of bad impact of quarrying has greatly evoked the local youths who have come forward with a view to appeal to the administration to declare ban of quarrying in some selected sites where the mahseer seeds are presently available.



Photo: Catch and collection of seeds of mahseer to rescue them (above & below)



Photo: Intelligent way of collecting seeds of mahseer (above & below)



4. Linkage with local stake holders and broodstock development:

We have developed good collaboration with two prominent NGOs in the locality in order to develop the brood stock of the species in captivity. Under the second RSG, seeds of mahseer have been stocked in Dibrari Lake in Haflong which will be taken care by WAIMIJING and in the farm of Jasingfa Aqua Tourism and Resort at Nagaon. In due course, the brooders will be ready for artificial breeding trial. Importantly, a national level workshop for two days is going to be held in Assam on 22-23 Dec, 2014 organized by the Directorate of Coldwater Fisheries research (ICAR), which invited the team leader to present a talk on issues of mahseer conservation in northeast India.

WAIMIJING being the prime collaborator of the project has developed linkage with other smaller group of NGOs in the locality to carry forward the Mahseer conservation program. We are trying to link up with the potential anglers in the region to form an association.

The government officials like, District Fishery Development Officer of the Dima Hasao District has already assured his assistance in Mahseer Conservation Program in the hill district. More collaboration with the Law enforcement agencies is urgent for the cause.



Photo: Gathering by the high officials in Haflong and the executive members of WAIMIJING. Team leader is elaborating the work under the program (below)



Photo: Stocking of seeds of mahseer in Dibrari Lake by DFDO (above) and District magistrate (below)





Photo: Stocking of seeds in Jasingfa Aqua Tourism and Resort Nagaon



SOME ISSUES OF MAHSEER CONSERVATION IN NORTHEAST INDIA

- ✓ Protection of mahseer habitat to allow them attain large size
- ✓ Prevention of destructive fishing, like, indiscriminate fishing, poisoning in fish habitat
- ✓ Promotion of mahseer angling tourism
- ✓ Application of catch and release principle of angling sport
- ✓ Development of hosting facilities for tourist anglers
- ✓ Tying up of cultural-tourism with angling-tourism
- ✓ River protection is important, in order to develop Angling tourism, a good stock of large mahseer has to be established
- ✓ Introduction in safe ecosystem is important, like ranching of Mahseer in reservoirs and lakes
- ✓ Awareness to youth & children is important

Read more about Mahseer:

http://www.rufford.org/projects/boni_amin_laskar
http://www.rufford.org/projects/boni_amin_laskar.php
<http://www.mahseertrust.org>

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MAHSEER CONSERVATION CAMPAIGN



As a part activity of the second grant under Rufford Small Grants for Nature Conservation funded by The Rufford Foundation, London, UK

By Dr. Boni Amin Laskar

In collaboration with



WAIMUING

Hafong, Dima-Hasoo District, Assam



Photo: Knowledge material distributed to participants (front & back)

WHAT IS MAHSEER

Mahseer is a very popular name refers to a group of large growing fishes belonging to Cyprinidae. Characteristically, the scales of these fishes are larger compare to any other carps. The edges of the scales are golden/ coppery along the middle horizontal line in some species. Mahseer fishes fall under two genera, viz., *Tor* (Gray, 1834) and *Neolissochilus* (Rainboth, 1985). They are the most important sport fishes, known for angling tourism, and are distributed from the Indus river basin in Pakistan to Borneo. Few large size species were recorded about 40 kg at the catch time. In general, the size of 5 – 10 kg at catch is mostly available.

Two important Mahseer, viz., Golden Mahseer *Tor putitora* and Chocolate Mahseer *Neolissochilus hexagonolepis* have been declared as STATE FISH of Arunachal Pradesh and Nagaland respectively. One very important Mahseer, viz., *Neolissochilus hexastichus* (McClelland, 1839) is reported endemic in Assam. Two other less known species are *Tor barakae* and *Tor mosal*.

STATUS OF MAHSEER

There are about ten valid species of Mahseer in India. Northeast India harbours five species; of them one *N. hexastichus* is endemic. Mahseer fishes are rapidly declining in nature both in number and size. Almost all the species of Mahseer in India have been categorized as threatened in the wild. Three species are recorded as data deficient in IUCN. The ecological limiting factors like water temperature, dissolved oxygen, and biological features like poor fecundity, significantly less sex ratio of female to male, etc. are among the other causes of declining of their population in nature. Mahseer have been brought to the brink of extinction in nature due to various anthropogenic activities like habitat destruction, indiscriminate harvest, illegal fishing practice, etc.

HABITAT OF MAHSEER

The Mahseer fishes inhabit and reproduce in coldwater (temperature range of 10-25°C) zones in rivers. They mostly dwell within 10-2 degree slope (steep to gentle) in rivers having high flow of water. In the Mahseer habitat, the level of dissolved oxygen remains always high (minimum 6 mg/L) due to continuous agitation and bubbling.

In a river, there may remain multiple species of Mahseer, also diverse size classes; which is possible because of inter-specific and inter-age niche differences. But, the existence of big size of Mahseer depends primarily on the availability of deep storage of water in the form of many in-stream pools; so that during recession period, the big Mahseer would shelter in deep water. The Mahseer are seasonal migratory fish and migrate upward for reproduction, during August.

IMPORTANCE OF MAHSEER

Mahseers are important game fishes of India. They are considered as the most sought-after fish by anglers from all over the world because of the superlative fighting and sporting qualities they provide when angled. Mahseers take bait avidly, preferably live bait. Various kinds of hooks and angling aspects are suggested by anglers, and documented in diaries dates back to the British period in India.

Mahseers are important primary consumers and feed on nekton including small fish occasionally. Due to their growth capacity to large size, the Mahseer dominantly feed upon algae, submerged group of plants, Litters & other vegetative parts of riparian origin and leaves & twigs of overhanging peripheral shrubs, etc. Hence Mahseer help in controlling their overgrowth and infestation. Secondly, control over trophic level is ruled by Mahseer. Thus, mahseers are important as key to balance food web and maintain ecosystem, source of amusement from largeness & colourfulness, sport from thrills in angling, economic livelihood based on Mahseer Angling tourism.

Mahseer are comparable as key stone species. Mahseer inhabiting zones are important breeding sites for recruitment of many other small to large fishes having both food and ornamental demand. If Mahseer are protected and conserved in a fair length of river (covering natural spawning ground), a large number of other small to large fish species would be indirectly protected and conserved and their recruitment in the downstream would be increased. Above all, Mahseer based angling tourism is a sleeping giant industry for NE India.

Photo: Knowledge material distributed to participants (inner pages)



Photo: Poster published in A3 size to distribute to participants and villagers

Some issues of mahseer conservation in northeast India

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Abstract:

Mahseer fishes are important resources for alternative economic livelihood of river bank settlers through mahseer angling tourism besides their importance in maintaining balance in ecosystem. However, at present trend in northeast India, mahseer are only valued as food. In the process of treating fish as food only, one fish once it reaches market undergoes consumption paying a return of its virtual value for the single time. On the other hand, tourism based angling adopt catch and release practice, where one fish fetch several times until it is injured badly. So, the establishment of tourism based angling seems to be the best way for convincing people's

participation in conservation action. Further, strategic conservation activities have to go a long way in northeast India involving all stakeholders and a top down approach. This paper describes some issues of mahseer conservation in northeast India.

Introduction:

Northeast India is situated in diverse landscape comprising of both Himalayan and non-Himalayan uplands and is bestowed with panoramic aquatic bodies. Aquatic bodies in the hill regions in India are always appraised for their aesthetic values. In northeast India, there are many upland lakes and rivers having aesthetic values that harbour fishes having all-round qualities serving as human food, anglers' desire, and hobbyists' aquarium keeping. There are diverse fish groups in uplands principally being utilized for meeting increased consumer demand as food. In the process of treating fish as food only, one fish once it reaches market undergoes consumption paying a return of its virtual value for the time. In northeast, there is declining trend of entire biodiversity. In context to fish, there is alarming declining trend of size of fish so much so that large growing fishes do not get opportunity to attain their adequate size due to pressure from indiscriminate total harvesting. A few large growing groups of cyprinid fishes may attain 25-30 Kg, but, frequently found size in the present days ranges between 3-5 Kg. There are other various anthropogenic threats on the aquatic ecosystems, most devastating is the poisoning and dynamiting in the headwaters and the streams therein. Although such practices of fish harvest have been declared illegal, yet unless mass awareness is generated and fruitful strategy not employed, such practices will continue to aggravate.

There is urgent need of awareness to local stakeholders, covering different age groups, and strategic people's participation in order to reduce the threats to mahseer fishes in natural water bodies. In the context, the concept of recreational fishery is valued. There are handsome of game fish resources in northeast, viz., mahseer, some catfishes, and exotic trout's in certain isolated upland lakes. Mahseer is a very popular name for certain group of fishes. Mahseer is the charismatic freshwater aquatic fish mega fauna as they are the largest among the Cyprinids. Mahseer is important in the head water stream ecosystem where they occupy wide range of food web due to wide diet breadth including occasional carnivorous feeding habit. Thus, mahseer is responsible for balancing the ecological pyramids. Mahseer in Asia is regarded as the famous fish for angling sport and mostly liked by

anglers all over the world who considered superlative sporting quality of mahseer over the European Salmon. The thrills and sport involved in snaring of India Mahseer is evident since very past, that has been documented in many famous records like “The rods in India” by Thomas H. S. In 1873, “Anglers’ Handbook of India” by Lacy G. H. And Cretin E.in 1905, and “Circumventing the Mahseer and other sporting fish in India and Burma” by Mcdonald A. Sr. J.in 1948.

Habitats of mahseer:

The mahseer are the denizen in the cool water streams in the hills and survive within a narrow range of ecological factors. They mostly remain within 10-2 degree slope (steep to gentle). In the steep region, the substratum is comprised predominantly of boulders, rocks, and cobbles; while, in gentle slope region, the substratum composition becomes cobbles, pebbles, gravels, and sands. In the Mahseer habitat, the level of dissolved oxygen remains always high due to continuous agitation and bubbling of Coldwater. So, the Mahseer fishes are used to live in water having high level of dissolved oxygen (minimum 6 mg/L). In a river, there may remain multiple species of Mahseer, also diverse size classes; which is possible because of inter-specific and inter-age niche differences. But, the existence of big size of Mahseer depends primarily on the availability of deep storage of water in the form of many in-stream pools. During recession period, the big Mahseer would shelter in deep water. The Mahseer are also known as seasonal migratory fish, as they migrate upward for reproduction. During August, the brooder Mahseer migrate much up in the river, sometimes in the tributaries in search of shallow water having pebbles and gravels as substratum and exhibit breeding at the ground conducive for spawning. Thus, there are strict habitat requirement of Mahseer which comprises cold water temperature, high level of dissolved oxygen, habitat heterogeneity with occurrence of in-stream pools/ deep storage of water, ground conducive for spawning, etc. Hence, due to various constraints, the availability of habitats for Mahseer fishes are less, causing their restricted occurrence in certain river segments in India.

Importantly, the mahseer fishes exhibit a phase of breeding in the late summer period mostly in the upper reaches of streams. The fries of mahseer settle in the shallow habitats particularly near the bank of the streams. As soon as the summer retreats, the water in the streams starts immediate recession so much so that some pits and pockets in the streams get disconnected from the main streams. Unfortunately, thousands of early fries

of mahseer which left in such pits and pockets undergo predation and culminate to large scale mortality also due to drying up of water in such pockets. This is a serious issue and needs attention for rescuing such fries for rehabilitating them in safe system.

The movement of mahseer through the downstream in the plains is limited due to their requirement of narrow range of different physico-chemical factors of water. Over a long period of time, the habitats of mahseer have been shrinking sharply since very past due to climate change and the change in land use pattern. Thus, the mahseer habitats became very much scattered in some hill regions including in northeast India. Consequently, the populations of mahseer in some hilly regions became isolated and the mass breeding among inter population of mahseer is restricted. For example, the streams cascading down the hills of Dima Hasao district of Assam, viz., the river Kopili and the river Diyung, first join with each other and then confluence with the river Brahmaputra after travelling a considerably long distance in the plain zone. Down the hills, the river conditions become potentially unfavourable for mahseer and thus act as concomitant barrier to migration of such fishes.

Species composition in northeast India:

In India, there are reports of 10 valid species of Mahseer belonging to genus *Tor* and some species under genus *Neolissochilus*. As far as the habitat requirement of mahseer is concerned, the species composition in different river basins is different. The river drainages in northeast India fall into three principal river basins, viz., the Brahmaputra, the Barak, and the Kaladan. The issue of habitat shrinking as described above is very much prominent in northeast India and is a serious issue. For example, the river Diyung in Dima Hasao district of Assam, during a recent survey, was found to be inhabited by an important species of mahseer, viz., *Neolissochilus hexastichus*, which is not encountered by us elsewhere, and perhaps not present in any other stream in the north-eastern region. Thus, the *N. hexastichus* is surviving with a small population in the said region which is perhaps its last stronghold. Although more survey on the occurrence of this species in other locality is urgent. Further, *Tor barakae* described from River Barak in Manipur (Arunkumar and Basudha, 2003) is considered as endemic in the Barak basin. However, until re-evaluated for its taxonomic validity it seems to be a synonym of *Tor mosal* which was previously recorded from Barak basin and later considered as a Burmese species. Possible presences of Mahseer in northeast

India are *Tor putitora*, *T. tor*, *T. barakae*, *T. mosal*, *Neolissochilus hexagonolepis*, and *N. hexastichus*. In a recent study, *Tor progeneius* has been designated as a junior synonym of *Tor putitora* and *N. hexastichus* has been claimed as a valid species and resurrected from synonymy with *Tor tor* (Laskar et. al. 2013). The record of *Tor tor* from northeast Indian rivers is also not very convincing and warrant strategic study.

Strategic need of mahseer conservation in northeast India:

Almost all the species of mahseer have been facing threats in Indian waters. In northeast India, two species of mahseer viz., *Tor putitora* and *Neolissochilus hexagonolepis* have received the status of “state fish” of Arunachal Pradesh and Nagaland correspondingly. The state Assam has not yet declared any state fish. *N. hexastichus* (McClelland 1839) is the endemic Mahseer of Assam which is though recorded as Near Threatened in current IUCN Red List 2013, but seems to be more critically endangered due to its distribution area in Dima Hasao district (former NC Hills). Hence the state Assam may select this species to declare as the state fish. In fact, considering the many fold importance of Mahseer, Nepal has promoted the popularity of one of the Mahseer species as flagship in the form of postal stamp. There is need of thorough discussion for the possibility to consider our Indian Mahseer as flagship species.

Although in India, the Wildlife (Protection) Amendment Act, 2002 redefined the term ‘Animal’ including fishes, but, existing protected areas are not taking additional protection measure and scientific management for the freshwater fishes. On the backdrop of severe mortality of early fries in the river pockets due to recession of water, there is paramount demand of population rescuing/rehabilitation and restocking of mahseer in safe and suitable water bodies, especially Lake, for the establishment of germplasm as treasure trove. This would augment the conservation effort and allows long run conservation in the way of consequential recruitment in to connecting steams/ rivers through outlet after natural reproduction. In the process of stocking of mahseer in safe zone, the seeds of the indigenous mahseer are to be rescued from nearest streams. Simultaneously, it is the need of the hour to discuss on the issue of creating a designated mahseer sanctuary in northeast India. Mahseer zones are important breeding sites for recruitment of many other small to large fishes having both food and ornamental demand. Virtually, with the aim of mahseer harvest, innumerable biotic components including galaxy of beautiful small fishes are also ruined by the adoption of

illegal method of mahseer harvest. Mahseer are comparable as Key Stone species. Given that, Mahseer are protected and conserved in a fair length of river (covering natural spawning ground), a large number of other small to large fish species would be indirectly protected and conserved and their recruitment in the downstream would be increased.

Although, Mahseer angling has been in practice in many of the Asian countries, like, Nepal, Sri Lanka, Myanmar, Thailand, and Malaysia; but, mostly unsurpassed everywhere in the past. In recent, the tourism based angling of Mahseer is being encouraged as a tool to protect indiscriminate killing of mighty Mahseer and to allow sustainable utilization of bio resources. Subsequently, many angling-tourism agencies have come up and equipped with modern infrastructure to host and facilitate the local as well as foreign hobbyist anglers. India is not lagging behind other cosmopolitan agencies in earning revenue from this angling-tourism sector. There are established angling-tourism agencies in Himachal Pradesh, Uttarakhand, and Karnataka. The north-eastern states of India hold the potential of angling-tourism which is needed to be encouraged, while the Mahseer angling itineraries are needed to be determined and promoted. Mahseer based angling tourism is a sleeping giant Industry for northeast India. In order to develop Angling tourism, a good stock of large mahseer has to be established.

Case study:

The species *N. hexastichus* is described above as an important species because of its present status of distribution in a restricted locality. On the backdrop of its importance, a nature conservation project was sanctioned under the Rufford small grants project (second RSG) by the Rufford Foundation, London. As a part activity under the project, different reading materials and posters have been displayed and distributed to the river bank settlers as well as the participants in different awareness and interaction programs targeting the school going students in the class range of V to VIII and the villagers (<http://www.assamtimes.org/node/12282>). Importantly, under the program, some early fries of *hexastichus* mahseer have been rescued from river Diyung in Dima Hasao district, and stocked in captivity in order to raise brooders for future plan of artificial propagation. The seeds were collected in a week time from various pits and pockets in the river during the late October in this year. A total of 2700 seeds were collected in different batches and kept in a nursery hapa installed in the same river throughout the collection period.

Subsequently, the seeds were transported to Haflong in a big tumbler equipped with a set of battery operated aerator. A portion of the seeds were stocked in Dibrari Lake on 29th October, 2014 in collaboration with WAIMIJING- a local NGO in the district. Similarly, a portion of the seeds were stocked in a nursery pond in Jasingfa Aqua Tourism and Resort, Nagaon. The first author duly acknowledges the grant from the Rufford Foundation for the program.

Conclusion:

Issues like 1) consideration of mahseer as flagship species as well as state fish of Assam, 2) creation of protected area for Mahseer and 3) development of mahseer based angling tourism in northeast India are importantly needed to be discussed to evolve with suitable strategy for sustainable utilization and conservation of the mighty Mahseer vis-a-vis aquatic ecosystems in northeast India. Having in view the importance of mahseer resources in northeast India, a dedicated centre for the research and conservation of mahseer may be initiated in the region.
