

All *Tor* are not the same!

Status and challenges for stocking of mahseer in India

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Why stock fish?

Compensation

mitigate a disturbance to the environment from human activities

Maintenance

compensate for recruitment overfishing

Enhancement

maintain fisheries productivity at the highest possible level

Conservation

retain or replenish stocks of a species threatened with extinction



Review

Is hatchery stocking a help or harm?

Evidence, limitations and future directions in ecological and genetic surveys

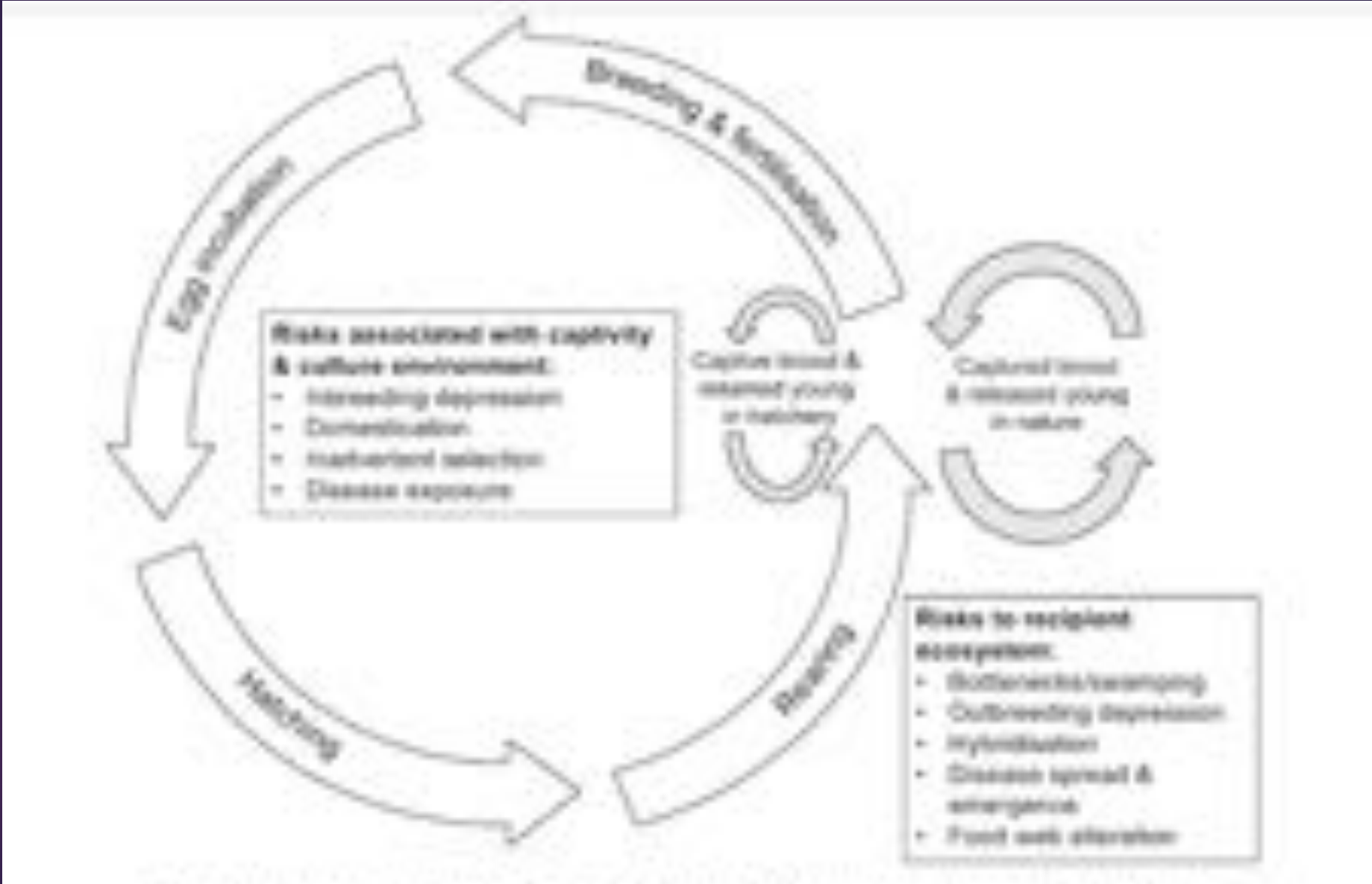
[Hitoshi Araki](#)*, Corinne Schmid

Summary of 266 peer-reviewed papers published in the last 50 years, which describe empirical case studies on ecology and genetics of hatchery stocks and their effects on stock enhancement.

Negative effects of hatchery rearing evident in many species

Few studies provided direct evidence for enhanced wild stock due to hatchery stocking, or suggested a positive effect of hatchery rearing in terms of the fitness of individuals after release.

David Philipp (Paro 2018 Plenary) – experiences with Salmon and Steelhead Trout



Mahseer – key knowledge gaps

How many **species**?

What are their **distribution** limits?

Are populations **declining**?

Quantitative vs. anecdotal **evidence**

What are the **ecological** requirements?

Impacts of **specific** threats?

A general consensus that populations of most mahseer species occurring in South Asia are declining

Humpbacked mahseer, *Tor remadevii* – Critically Endangered

Golden mahseer, *Tor putitora* – Endangered

Deccan mahseer, *Tor khudree* – Endangered

Malabar mahseer, *Tor malabaricus* – Endangered

Barak mahseer, *Tor barakae* – Near Threatened



Mosal mahseer, *Tor mosal* – Data Deficient

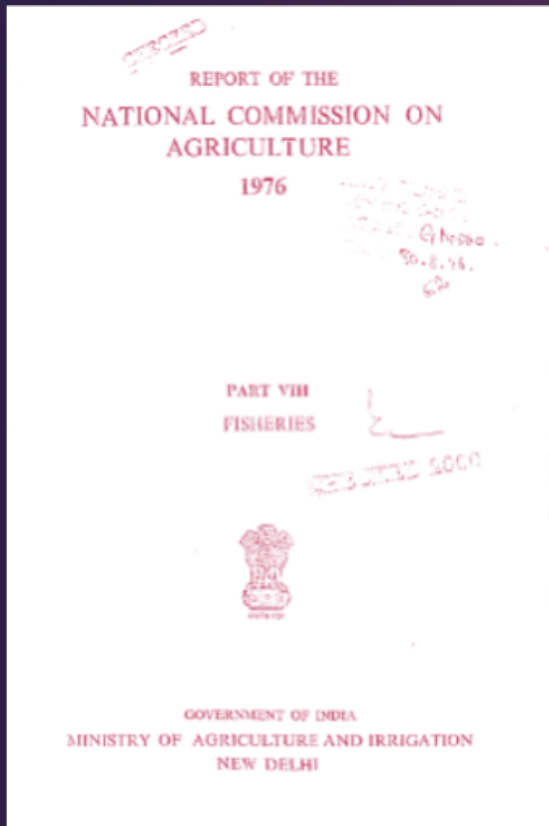
Tor mahseer, *Tor tor* – Data Deficient



Major mahseer hatcheries in India



Where it all began.....



“general decline in mahseer fishery in India due to indiscriminate fishing of brood and juvenile fish and the adverse effect of the river valley projects; extensive survey and detailed biological investigation on this alarming situation is required”

Mahseer Hatchery 1 – private





©Tata Power





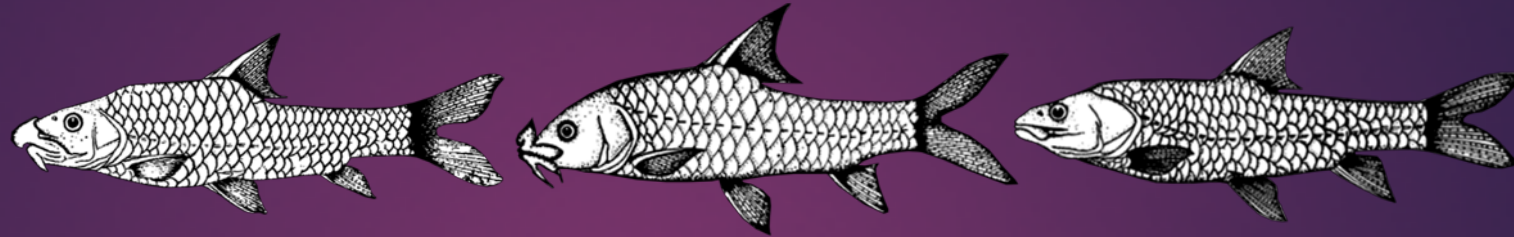
<https://www.tatapower.com/mahseer/act-for-mahseer.aspx>

Breeding of four species, *Tor khudree*, *T. putitora*, *T. tor* and 'Tor mussullah'

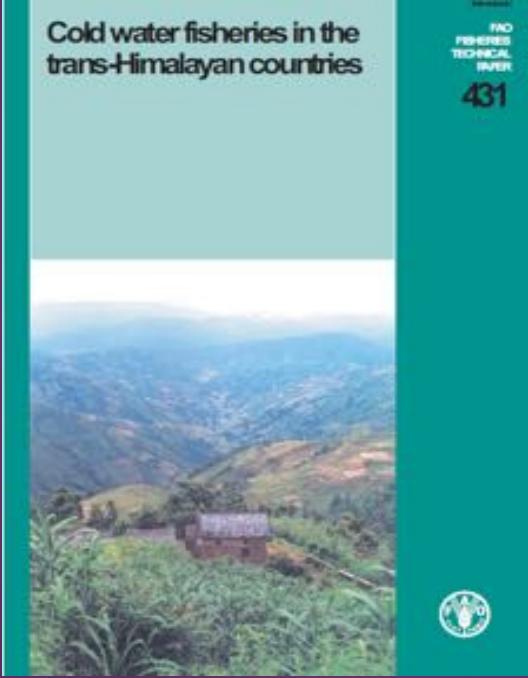
>10 million fingerlings bred and released since the 1970s

Capacity of 300,000 to 400,000 fingerlings/year

India's Mahseer 'Ark' – Walvan Reservoir



The one that got away? 'Frankenstein mahseer'



Mahseer breeding and conservation and possibilities of commercial culture. The Indian experience. (by Ogale, S.N.)

Tata Power Company Ltd, Lonavla - 410401 Dist.Pune, Maharashtra, India

ABSTRACT

Mahseers (Tor sp.) have been a legendary sport fish of India with a very high table value. Mahseer, at one time considered to be of single species, is now represented by six valid species distributed all over India. Despite their abundance, at one time mahseer were reported to be declining in size and numbers and were feared to be in danger of extinction in some parts of the country. Unfortunately their catches have dwindled considerably due to illegal methods of fishing, habitat deterioration and introduction of exotic species. Studies on their feeding and spawning habits, eggs, larval development and especially the methods of artificial propagation have progressed in recent years. Breeding of four major species of mahseer, *T. khushree*, *T. mousulata*, *T. tor* and *T. putitora*, by collecting the brooders from the breeding grounds and then stripping them is possible. In the effort to conserve mahseer resources artificial propagation of the fish by stripping the spawners is not always possible unless they are dependably obtainable from natural waters. To overcome this difficulty mahseer fingerlings of all the species can be raised to maturity in captivity (small ponds) by following improved aquacultural practices. Breeding of four major species of mahseer, with and without hypophyisation, in brood fish ponds using manipulation of water flow, exercise and high protein pelletized diet has also been successful. Stripping the ripe fish becomes necessary and for convenience and surely, two doses of pituitary extract or a single dose of ovaprimovotide is desirable. The Tata Power Company's mahseer hatchery is simple but most successful and can be replicated in remote centers. Approximately 500 000 eggs are collected and fertilized every year by using different methods. Over 11 million fry/fingerlings have been produced in the last 30 years. Cross breeding of mahseer species and producing F1 and F2 generations was also successful. Mahseer breeding is no longer in its infancy but the commercial culture is. The breeding successes have raised new hopes for the prospects of mahseer fishery. However there exists the need to intensify these efforts by undertaking large-scale regular cage culture and a mahseer seed ranching programme. Fry and fingerlings of major species are being distributed to many states of India and to angling associations in the country by the Tata Power Company as a measure of rehabilitation and conservation. Transport by air of eggs of mahseer in moist cotton has been successful. There is growing awareness about the need to conserve mahseer and there is ample scope for advancement in certain areas. The technique of cryopreservation of mahseer milt has been successfully developed and gene banking of endangered mahseer is technically feasible. Efforts on the induction of triploidy and gynogenesis in mahseer using heat shock treatment for manipulation of sex ratio are in progress. This paper reviews the present status and potential of further mahseer fishery development.

1. INTRODUCTION

Mahseer is acclaimed as a world famous, outstanding game and food fish of India. As a sport fish, it provides unparalleled recreation to anglers from all over the world, better than salmon. It is known as tiger in waters, because of the fight it musters to wriggle off the hook. In the past mahseer formed a substantial natural fishery in the major riverine and lacustrine ecosystems of India. In commercial fisheries it occupies an important position for its good quality. For the fishermen mahseer is of considerable importance because of its large size, its a finny fish, it is easily exterminated and fetches the highest market price in north and northeast of India.

“Rate of growth is similar or slightly better than pure strains but the hybrids are more active and agile”

The great Indian mahseer conservation effort

Forbes Magazine Lists Web Specials Thought Leadership

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Saving the mighty and endangered mahseer

In sleepy Lonavla, Tata Power is doing much more than generating electricity

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Bringing back the mahseer

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Tata Power acts for a fish called Mahseer

The mahseer breeding programme has entered its 42nd year and includes three out of six valid species, according to Tata Power

Last Published: Wed, Aug 12 2015, 06:20 PM IST

The Indian EXPRESS
Tuesday, November 20th 2015

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Maharashtra govt steps up efforts to save freshwater tiger

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Conservation project helps revive Mahseer in rivers

The great Indian mahseer muddle!

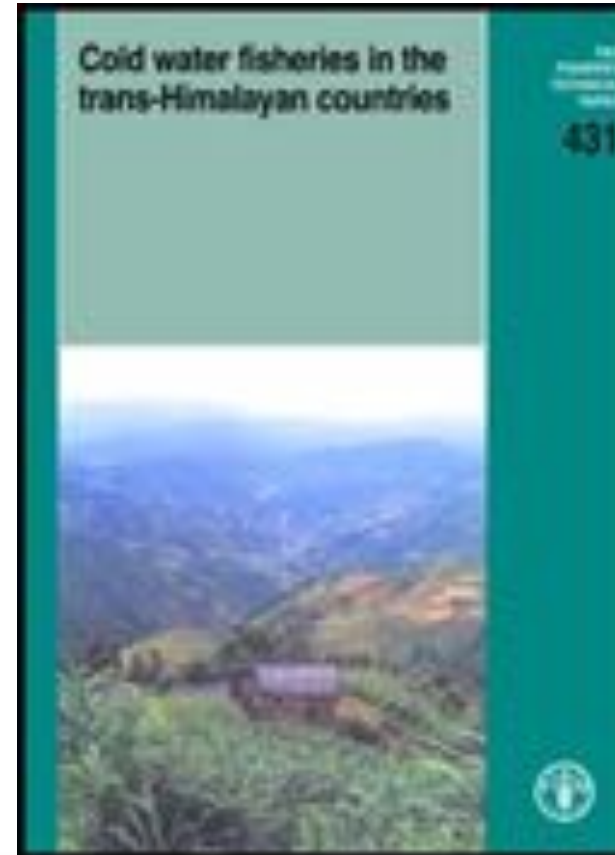
Thirty years+ of disorganized and unscientific stocking and translocations of mahseer in India (and abroad)

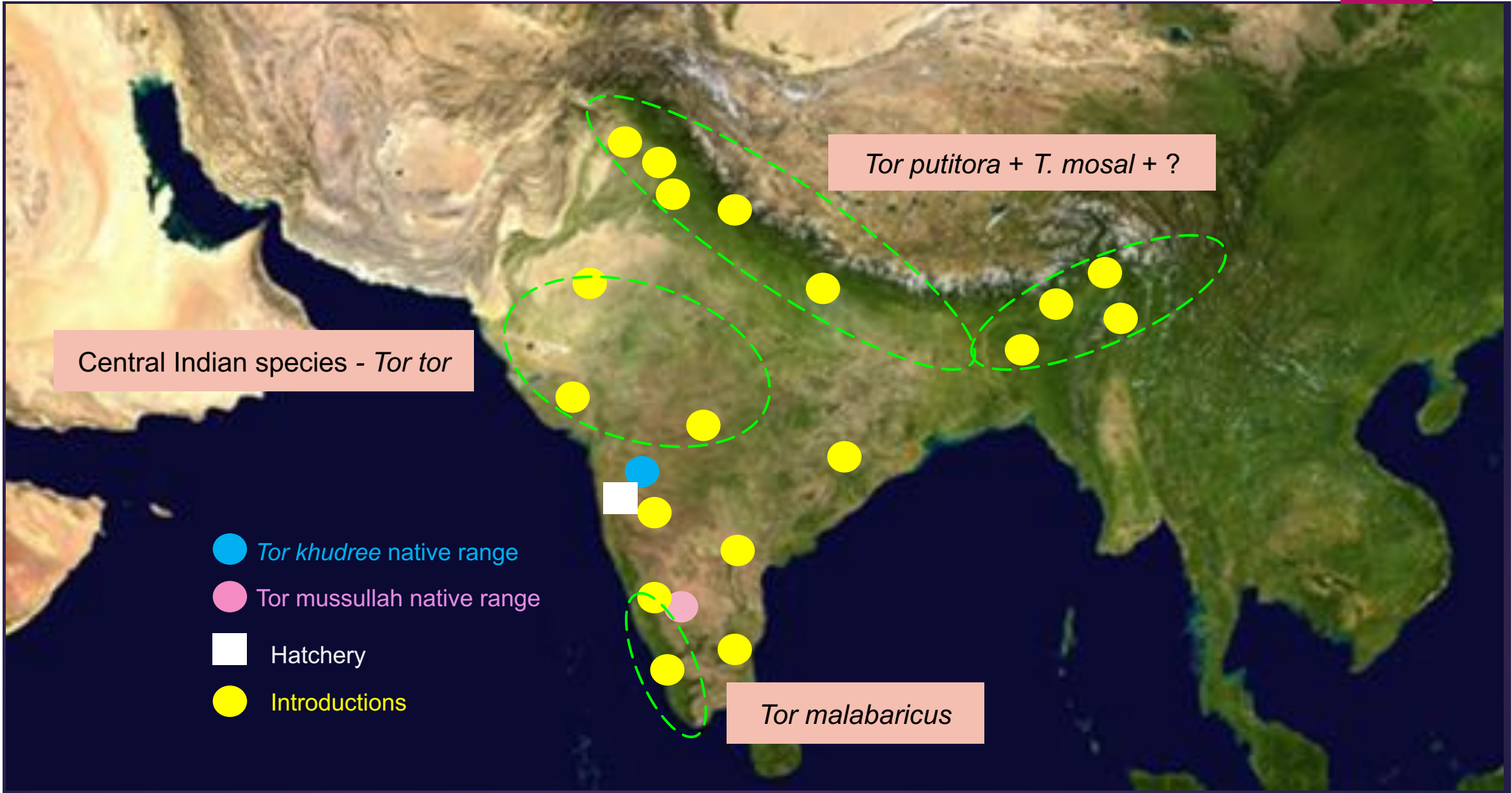
Between the 1970s and the year 2000, 7 million+ fingerlings of *Tor khudree* and 'Tor mussullah' gifted to state and national governments, fisheries agencies and angling/sport fishing associations (Ogale 2000, 2002) - both within, and outside the native range of the species involved.

ANNEX 2

Semi-fingerlings and fingerlings of *Tor khudree* and *Tor mussafah* have been given gratis to the following State Governments, agencies and angling associations

NAME	QUANTITY
Lack PDR (south-east Asia)	1 500
Government of Maharashtra	5 10 000
Government of Karnataka	1 70 000
Government of Jammu and Kashmir and Council of Scientific and Industrial Research	12 000
Government of Haryana	50 000
Government of Punjab	5 000
Government of Orissa	8 000
Government of Goa	5 000
Government of Manipur	5 000
Government of Rajasthan	10 000
Government of Gujarat	10 000
Government of Andhra Pradesh	15 000
Government of Sikkim	5 000
Government of Himachal Pradesh	10 000
Maharashtra State Angling Association	40 000
Wildlife Association of South India	10 000
Coorg Wildlife Sanctuary	15 000
Kanyakumari Sanctuary of Tamil Nadu	15 000
Orissa Steel Plant	2 000
Tata Engineering and Locomotive Co. Ltd	70 000
College of Fisheries, Mangalore	25 000
National Defence Academy, Khadakvasli	2 000
Central Inland Fisheries Research Institute, Barrackpore	2 000
Assistant Director of Fisheries, Madikeri	10 000
Fish Farmers Development Agency, Yadevuri, Mysore	30 000
Naras Hotels Pvt. Ltd. Parahel, Purne District	20 000
Indo-German Reserve Project (Kerala)	15 000
M. P. SCIENCE & Technology, Bhopal	5 000
M. P. Matya Itana Sangh, Bhopal	5 000
Parma Wild life Sanctuary	10 000
TOTAL	1 123 800





Tor khudree fry transported to Laos demonstrating the possibility of long distance transportation (Kulkarni 1988); **stocked in the Mekong** (Ogale 2002)



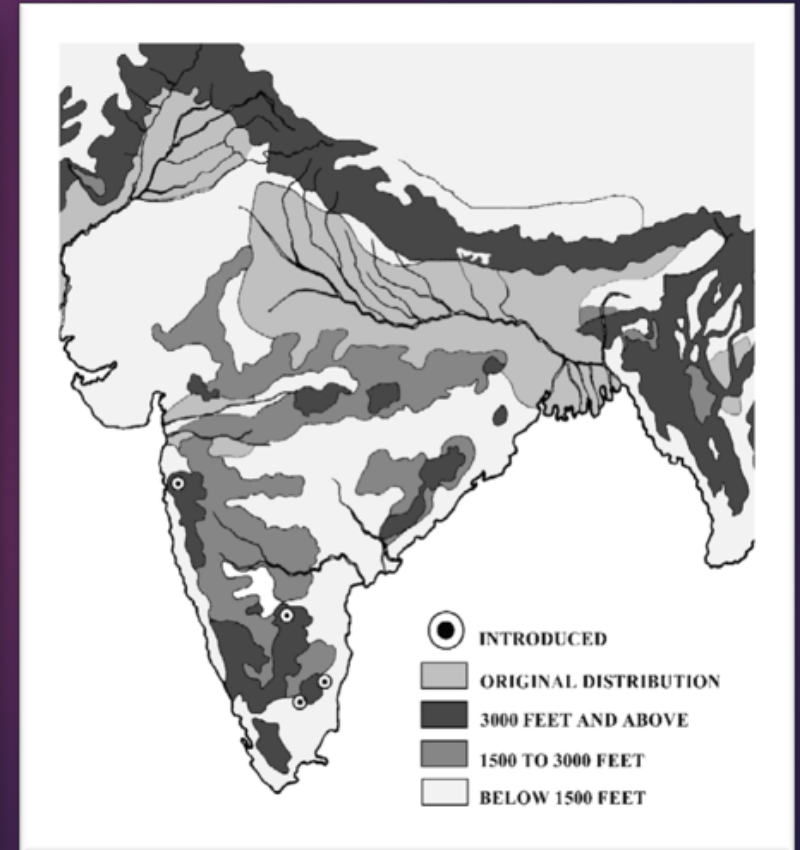
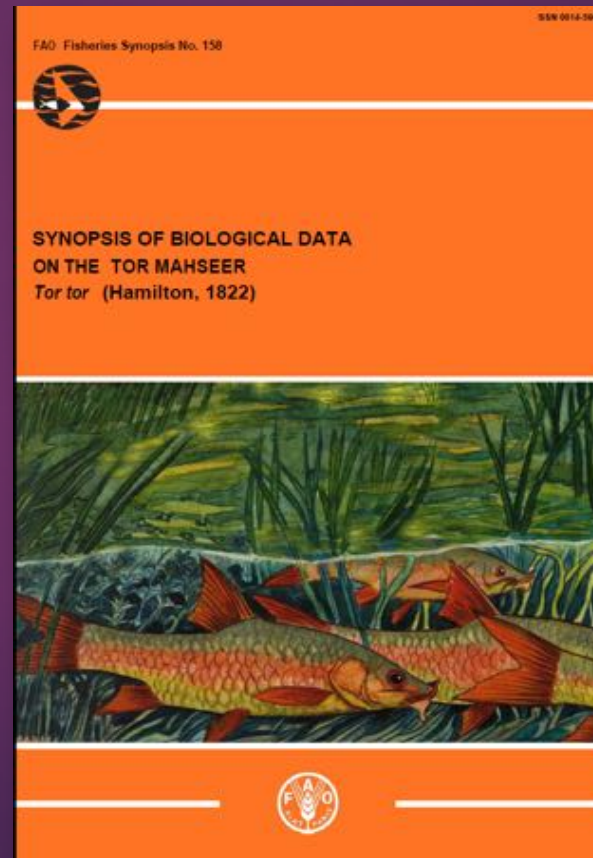
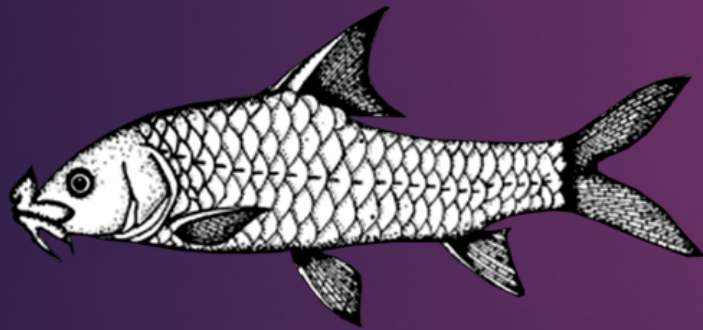
Golden mahseer, *Tor putitora*



217,300 golden mahseer seeds produced during 1995 to 2001
but where did they go?

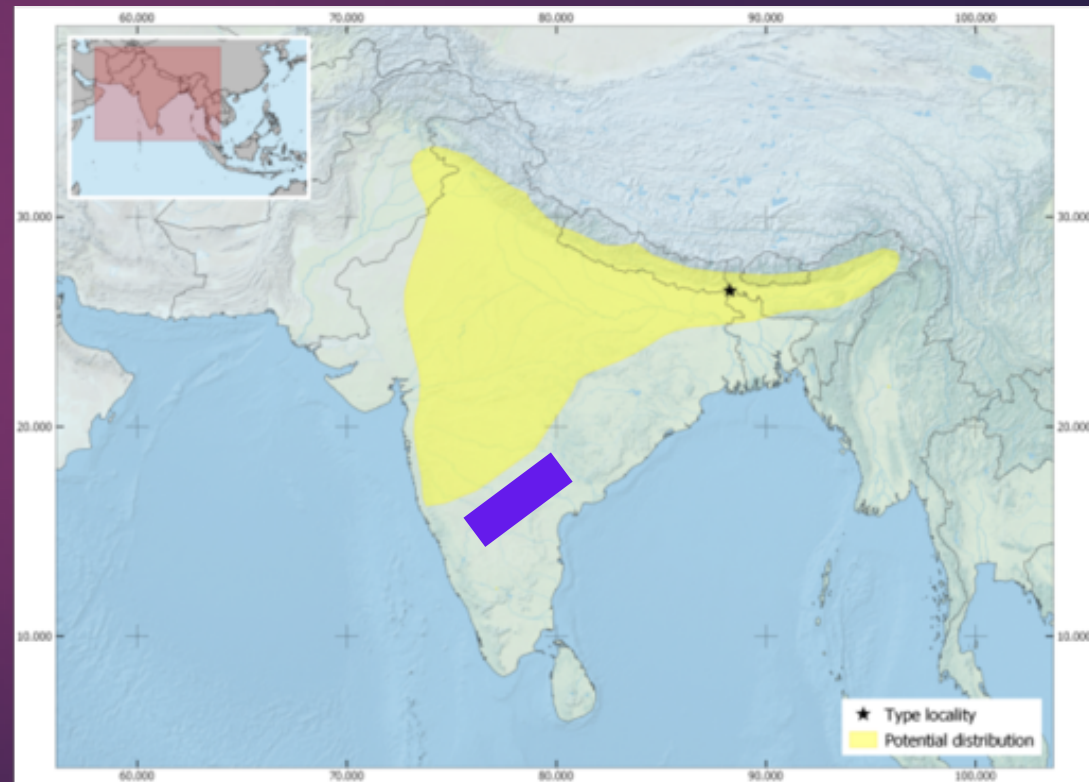
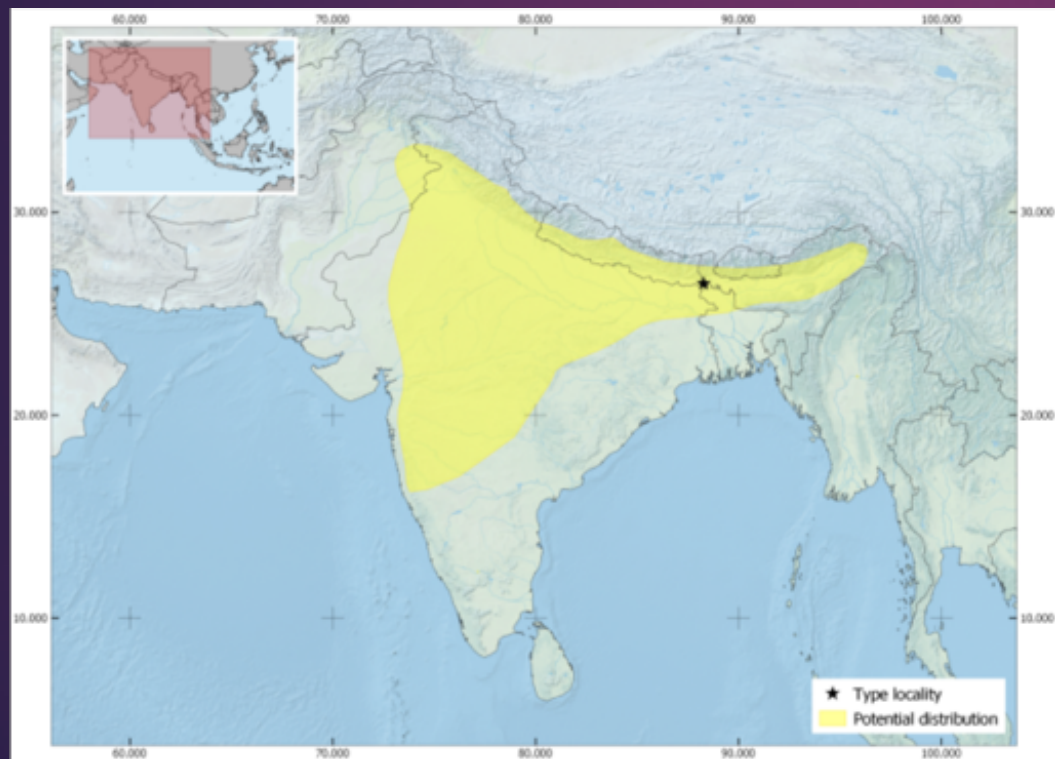


Tor mahseer, *Tor tor*



Distributional records of Tor mahseer *Tor tor* (Hamilton, 1822) from Southern India

By K. K. Lal, R. K. Singh, A. Pandey, B. K. Gupta, V. Mohindra, P. Punia, S. Dhawan, J. Verma,
L. K. Tyagi, P. Khare and J. K. Jena



1975-2010



Stocking carried out in the absence of an appreciation for the genetic, phenotypic and ecological differences that typically occur among natural populations of *Tor* mahseer



Transfers resulted from an ignorance of any genetic level structure between donor and recipient populations

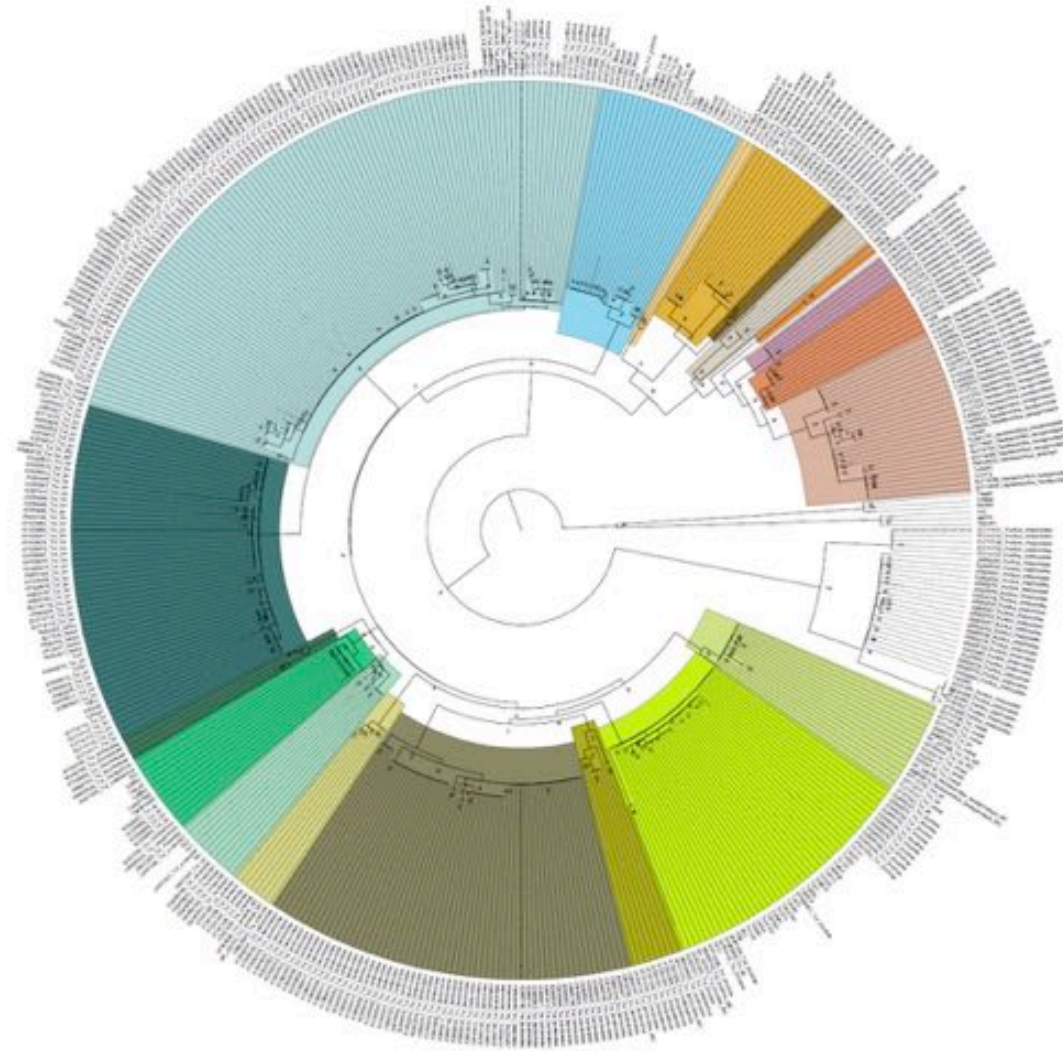
2010 - till date



Improved information on species and population level genetics – particularly of the humpbacked mahseer and golden mahseer

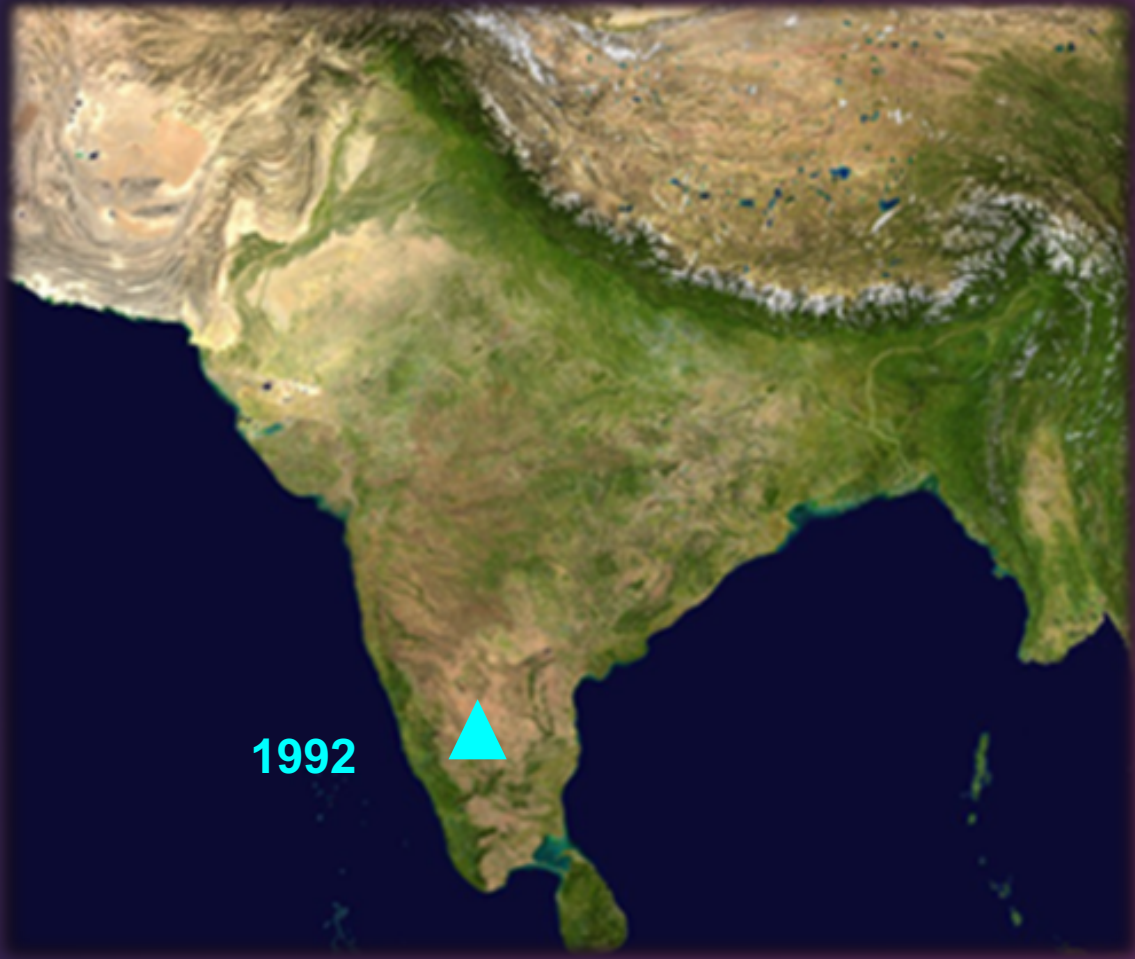


High profile publications highlighting the implications of misinformed stocking on population decline of endemic species – e.g. humpbacked mahseer



Mahseer Hatchery 2 – Fisheries Department







The Last White Hunter



©WASI



Little regard for evidence based conservation

AQUATIC CONSERVATION: MARINE AND FRESHWATER ECOSYSTEMS

Aquatic Conserv: Mar Freshw Ecosyst 25: 829–838 (2015)

Published online 22 December 2014 in Wiley Online Library
(wileyonlinelibrary.com). DOI: 10.1002/aqc.2543

Efficacy of angler catch data as a population and conservation monitoring tool for the flagship Mahseer fishes (*Tor spp.*) of Southern India

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ABSTRACT

1. Mahseer (*Tor spp.*) are flagship fishes in South Asian rivers. Their populations are threatened through poaching and habitat disturbance, yet they are highly prized game fishes due to their large size, appearance and sporting qualities. The international recreational angling community has frequently been cited as playing a vital role in conserving these fishes while also providing economic benefit to poor rural communities.

2. Owing to a lack of scientific data and the considerable challenges associated with monitoring fish populations in large monsoonal rivers, efforts to determine the long-term trends in their populations has focused on sport-fishing catch records. Here, catch data collected between 1998 and 2012 from Galibore, a former fishing camp on the River Cauvery, Karnataka, India, were analysed to determine the catch per unit effort (CPUE – by number and weight) as an indicator of relative fish abundance, along with the size structure of catches. This fishery operated a mandatory catch-and-release (C&R) policy, and provided the fish community with protection from illegal fishing.

3. Between 1998 and 2012, 23 620 hours fishing effort were applied to catch and release 6161 mahseer, ranging in size from 1 to 104 lbs (0.45–46.8 kg) in weight. Across the period, CPUE in number increased significantly over time with a concomitant decrease in CPUE by weight, revealing strong recruitment in the population and a shift in population size structure. This suggests a strong response to the C&R policy and the reduction in illegal fishing, indicating that conservation strategies focusing on the beneficial and negative aspects of exploitation can be successful in achieving positive outcomes.

4. These outputs from angler catch data provide insights into the mahseer population that were impossible to collect by any alternative method. They provide the most comprehensive analysis of a long-term dataset specific to any of the mahseer species across their entire geographical range and demonstrate the value of organised angling as a conservation monitoring tool to enhance biological data, and inform conservation and fishery management actions. Copyright © 2014 John Wiley & Sons, Ltd.

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KEY WORDS: angler logs; C&R; poaching; Western Ghats; stock protection; IUCN Red List; ecosystem services; population monitoring

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Published online May 13



The legendary hump-backed mahseer *Tor* sp. of India's River Cauvery: an endemic fish swimming towards extinction?

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ABSTRACT: The Western Ghats region of India is an area of exceptional freshwater biodiversity and endemism. Mahseer of the genus *Tor* are considered prized sport fishes of great cultural significance; nevertheless, they are threatened as a result of increasing anthropogenic stresses. In the River Cauvery, the mahseer community comprises a 'blue-finned' and an orange-finned, 'hump-backed' fish. Whilst it is not yet known whether these are distinct species or 2 different phenotypes, evidence suggests that the hump-backed phenotype is endemic to the river, whereas the blue-finned phenotype was introduced in the 1980s. Angler-catch data from a managed fishery on the River Cauvery, gathered between 1998 and 2012 and comprising 23 620 h of fishing effort, revealed that captured individuals ranged in size from 0.45 to 46.8 kg, with the blue-finned phenotype comprising 95% of all captured fish and the remainder being hump-backed. The catch per unit effort (CPUE) of the blue-finned phenotype significantly increased over the study period, while the mean weight of individual fish significantly declined. By contrast, the CPUE of the hump-backed phenotype declined significantly over the period, with individual mean weights significantly increasing. These data suggest a recent recruitment collapse in the hump-backed phenotype resulting in an ageing population that may be headed towards extinction. The introduced blue-finned phenotype, however, continues to recruit strongly, suggesting that the mahseer community of the River Cauvery has undergone considerable shifts in the last 30 yr.

KEY WORDS: Western Ghats · *Tor khudree* · *Tor mussullah* · Catch and release · Endemic · Recruitment · Recreational fisheries

INTRODUCTION

Freshwater ecosystems and their biodiversity remain among the most endangered and poorly protected resources on Earth (Millennium Ecosystem Assessment 2005, Dudgeon 2011, Cook et al. 2012), with almost 1 in 3 freshwater species facing a high risk of extinction (Collen et al. 2014). Of the 5785 species of freshwater fish assessed for their conservation

status by the IUCN, more than 36% are threatened, and over 60 species have gone extinct since 1500 (Carrizo et al. 2013).

The Western Ghats region of India, part of the Western Ghats–Sri Lanka Biodiversity Hotspot, is an area of exceptional freshwater biodiversity and endemism (Dahanukar et al. 2011, Raghavan et al. 2015). Nevertheless, approximately half of the region's endemic fish species are threatened with

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PLOS ONE

RESEARCH ARTICLE

Resolving the taxonomic enigma of the iconic game fish, the hump-backed mahseer from the Western Ghats biodiversity hotspot, India

Adrian C. Pinder^{1,2,*}, Arunachalam Marimelakan³, J. D. Marcus Knight⁴, Prasannan Krishnakutty⁵, J. Robert Britton¹, Siby Philip⁶, Neeleah Dahanukar^{7,8}, Rajeev Raghavan^{1,3,9}

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Abstract

Growing to lengths and weights exceeding 1.5 m and 45 kg, the hump-backed mahseer fish of the Western Ghats biodiversity hotspot, India, is an iconic, mega-faunal species that is globally recognized as a premier freshwater game fish. Despite reports of their high extinction risk, conservation approaches are currently constrained by their lack of valid taxonomic identity. Using an integrative approach, incorporating morphology, molecular analysis and historical photographs, this fish can now be revealed to be conspecific with *Tor remadevii*, a species lacking a common name, that was initially, but poorly, described in 2007 from the River Pambar, a tributary of the River Cauvery in Kerala. Currently known to be endemic and restricted to the River Cauvery basin in the Western Ghats, *T. remadevii* is distinguished from congeners by its prominent hump originating above the pre-opercle and extending to the origin of the dorsal fin, a well-developed mandible resulting in a terminal or slightly superior mouth position, and the dorsal orientation of the eyes. While body colouration varies (silver, bronze, greenish) and is not considered a reliable diagnostic character, orange coloration of the caudal fin (sometimes extending to all fins) is considered a consistent characteristic. Having been first brought to the attention of the scientific community in 1849, and the recreational angling (game fishing) community in 1873, it has taken over 150 years to finally provide this iconic fish with a valid scientific name. This taxonomic clarity should now assist development and delivery of urgent conservation actions commensurate with their extinction risk.



OPEN ACCESS

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Data Availability Statement: All data are available within the paper and supporting supplementary files. Genetic data (sequences) are deposited in NCBI GenBank (MG770022 to MG770050) and are available open-access. Morphometric data used in the study is available online on Figshare (<http://dx.doi.org/10.6084/m9.figshare.8000962>).

Funding: Field work was supported by the Mohammed Bin Zayed Species Conservation Fund (Project No 14258705) and Critical Ecosystem Partnership Fund – Western Ghats Small Grants

Stocking of non-native species and potential hybrids still continue.....



Genetically identical



©Darshan Pramod

15000 fish stocked in 2016

ಅಳಿವಿನಂಚಿನಲ್ಲಿರುವ ಮಹಶೀರ್ ಮೀನುಗಳ ಬಿತ್ತನೆ

ಹಾರಂಗಿ ಜಲಾಶಯದ ಹಿನ್ನೀರಿನ ಪ್ರದೇಶದಲ್ಲಿ ಮರಿಗಳನ್ನು ಬಿಡಲು ಸಿದ್ಧತೆ, ಈಗಾಗಲೇ 15 ಸಾವಿರ ಮರಿಗಳ ಉತ್ಪಾದನೆ

• ವಿಶ್ವೇಶ್ ಎಂ. ಭೂಕೃಷಿಯ ಮಹಿಳೆ

ಹಾರಂಗಿ ಜಲಾಶಯದ ಮೀನು ಉತ್ಪಾದನಾ ಘಟಕದಲ್ಲಿ ಅನುವಂಶೀಕೃತವಾದ ಮಹಶೀರ್ ಮೀನು ಮರಿಗಳನ್ನು ವ್ಯಕ್ತ ಮಾಡಲಾಗಿದ್ದು, ಈಗಾಗಲೇ 15 ಸಾವಿರ ಮರಿಗಳನ್ನು ಉತ್ಪಾದಿಸಲಾಗಿದೆ. ಅದರಂತೆ ಜಿಲ್ಲೆಯಲ್ಲಿ ಮಹಶೀರ್ ಮೀನು ಸಂಚರಿಸುವ ಪ್ರಾಥಮಿಕ ಮಟ್ಟದ ಮರಿಗಳ ಉತ್ಪಾದನೆ ಪ್ರದೇಶದಲ್ಲಿ ಮರಿಗಳನ್ನು ಬಿಡಲು ಸಿದ್ಧತೆಗೆ ಕಾರಣ.

ಈ ಸಮರ ಪಲ್ಲಯ ಮಹಶೀರ್ ಮೀನುಗಳ ಮರ ವ್ಯಾಪಕವಾದ ವಿಧಿ ಹೆಚ್ಚಾಗಿದ್ದು ಈಗಾಗಲೇ ಕೆಲವು ವ್ಯಾಪ್ತಿ 5,000 ಮೀನು ಮರಿಗಳನ್ನು ವಿತರಿಸಿ ಮಾಡಲಾಗಿದ್ದು ಅಲ್ಲಿಯವರೆಗೆ ಮಹಶೀರ್ ಮೀನು ಬೆಳೆಸಲಾಗುತ್ತಿದೆ. ಈಗಾಗಲೇ ಫಲಾನುಕೂಲವಾದ ಉತ್ಪಾದನೆ ಕೊಡಲು ಜಿಲ್ಲೆಯ ಹಾರಂಗಿ ಜಲಾಶಯದಲ್ಲಿ ಮತ್ತೆ ಈ ಅನುವಂಶೀಕೃತವಾದ ಮಹಶೀರ್ ಮೀನು ಬೆಳೆಸಲಾಗುತ್ತಿದೆ. ಫಲಾನುಕೂಲಿ ಮಾಡಿ ಸಹ ಉತ್ಪಾದಿಸುತ್ತಿದ್ದು ಹಾರಂಗಿಯಲ್ಲಿ ಸರ್ಕಾರ ಉತ್ಪಾದನೆ ಮಾಡುತ್ತಿರುವುದು ವಿಶೇಷ.



ಮಹಶೀರ್ ಮೀನು.

ಮಾನ್ಯ ಹೆಚ್.ಎಸ್. ಶೆಟ್ಟಿ, ಜಿಲ್ಲಾ ಕೃಷಿ ಇಲಾಖೆಯ ಇನ್‌ಚಾರ್ಜ್ ಆಗಿದ್ದು ಸಿಬ್ಬಂದಿಯಿಂದ 15 ಸಾವಿರ ಮರಿಗಳನ್ನು ಬಿಡಲಾಗುತ್ತಿದೆ. ಜಿಲ್ಲೆಯ ಹಾರಂಗಿ ಜಲಾಶಯದಲ್ಲಿ ಉತ್ಪಾದಿಸಲಾಗಿದೆ. ಇಲ್ಲಿ 1 ಸಾವಿರ ಹಾಯ ಮೀನುಗಳನ್ನು ಬೆಳೆಸಲಾಗಿದೆ. ಈಗಾಗಲೇ ಮೈಸೂರು, ಹಾವೇರಿ, ಹಾರಂಗಿ, ಕೆಲವು ಜಿಲ್ಲೆಗಳ ಮೀನು ಬೆಳೆಸುವ ವಿಧಿ ಹೆಚ್ಚಾಗಿದ್ದು ಮೀನು ಮರಿಗಳನ್ನು ಬಿಡುವಂತೆ ಕೆಲವು ಜಿಲ್ಲೆಗಳಲ್ಲಿ ಮೀನುಗಳನ್ನು ಬಿಡುವಂತೆ ಜಿಲ್ಲಾ ಮೀನು ಬೆಳೆಸುವ ವಿಧಿ ಹೆಚ್ಚಾಗಿದೆ.

ಜಿಲ್ಲಾ ಕೃಷಿ ಇಲಾಖೆಯ ಹೆಚ್.ಎಸ್. ಶೆಟ್ಟಿ, ಜಿಲ್ಲಾ ಕೃಷಿ ಇಲಾಖೆಯ ಇನ್‌ಚಾರ್ಜ್ ಆಗಿದ್ದು ಸಿಬ್ಬಂದಿಯಿಂದ 15 ಸಾವಿರ ಮರಿಗಳನ್ನು ಬಿಡಲಾಗುತ್ತಿದೆ. ಜಿಲ್ಲೆಯ ಹಾರಂಗಿ ಜಲಾಶಯದಲ್ಲಿ ಉತ್ಪಾದಿಸಲಾಗಿದೆ. ಇಲ್ಲಿ 1 ಸಾವಿರ ಹಾಯ ಮೀನುಗಳನ್ನು ಬೆಳೆಸಲಾಗಿದೆ. ಈಗಾಗಲೇ ಮೈಸೂರು, ಹಾವೇರಿ, ಹಾರಂಗಿ, ಕೆಲವು ಜಿಲ್ಲೆಗಳ ಮೀನು ಬೆಳೆಸುವ ವಿಧಿ ಹೆಚ್ಚಾಗಿದ್ದು ಮೀನು ಮರಿಗಳನ್ನು ಬಿಡುವಂತೆ ಜಿಲ್ಲಾ ಮೀನು ಬೆಳೆಸುವ ವಿಧಿ ಹೆಚ್ಚಾಗಿದೆ.

ಅಂತರ: ಮಹಶೀರ್ ಮೀನು ಬಿಡಲಾಗುವ ಸ್ಥಳ ಮತ್ತು

ರೈತರಿಗೆ ವಿತರಣೆ ಇಲ್ಲ...

ಮಹಶೀರ್ ಮೀನು ಮರಿಗಳನ್ನು ವಿತರಿಸಿ ಮಾಡುವುದನ್ನು, ಮಹಶೀರ್ ಮೀನು ವ್ಯಕ್ತ ಮಾಡುವ ಮಹಶೀರ್ ಮೀನು ಮರಿಗಳನ್ನು ಮೈಸೂರು ಕೃಷಿ ಇಲಾಖೆಯಿಂದ ವಿತರಿಸಲಾಗಿದೆ. ಮಹಶೀರ್ ಮೀನು ಮರಿಗಳನ್ನು ವಿತರಿಸಲಾಗಿದೆ. ಮಹಶೀರ್ ಮೀನು ಮರಿಗಳನ್ನು ವಿತರಿಸಲಾಗಿದೆ.

ಜಿಲ್ಲೆಯ ವಿವಿಧೆಡೆಯೂ ಮೀನಿನ ಸಂಕಲನ

ಮಹಶೀರ್ ಮೀನು ಮರಿಗಳನ್ನು ವಿತರಿಸಲಾಗಿದೆ. ಮಹಶೀರ್ ಮೀನು ಮರಿಗಳನ್ನು ವಿತರಿಸಲಾಗಿದೆ. ಮಹಶೀರ್ ಮೀನು ಮರಿಗಳನ್ನು ವಿತರಿಸಲಾಗಿದೆ.



ಹಾರಂಗಿ ಮೀನು ಉತ್ಪಾದನಾ ಘಟಕದಲ್ಲಿ 15 ಸಾವಿರ ಮಹಶೀರ್ ಮೀನು ಮರಿಗಳನ್ನು ಬಿಡಲಾಗಿದೆ. ಈಗಾಗಲೇ 15 ಸಾವಿರ ಮರಿಗಳ ಉತ್ಪಾದನೆ.

• H. A. ಶೆಟ್ಟಿ, ಜಿಲ್ಲಾ ಕೃಷಿ ಇಲಾಖೆಯ ಇನ್‌ಚಾರ್ಜ್.

ಮಾನ್ಯ ಹೆಚ್.ಎಸ್. ಶೆಟ್ಟಿ, ಜಿಲ್ಲಾ ಕೃಷಿ ಇಲಾಖೆಯ ಇನ್‌ಚಾರ್ಜ್ ಆಗಿದ್ದು ಸಿಬ್ಬಂದಿಯಿಂದ 15 ಸಾವಿರ ಮರಿಗಳನ್ನು ಬಿಡಲಾಗುತ್ತಿದೆ. ಜಿಲ್ಲೆಯ ಹಾರಂಗಿ ಜಲಾಶಯದಲ್ಲಿ ಉತ್ಪಾದಿಸಲಾಗಿದೆ. ಇಲ್ಲಿ 1 ಸಾವಿರ ಹಾಯ ಮೀನುಗಳನ್ನು ಬೆಳೆಸಲಾಗಿದೆ.

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Mahseer Hatchery 3 Central Fisheries Research Institute





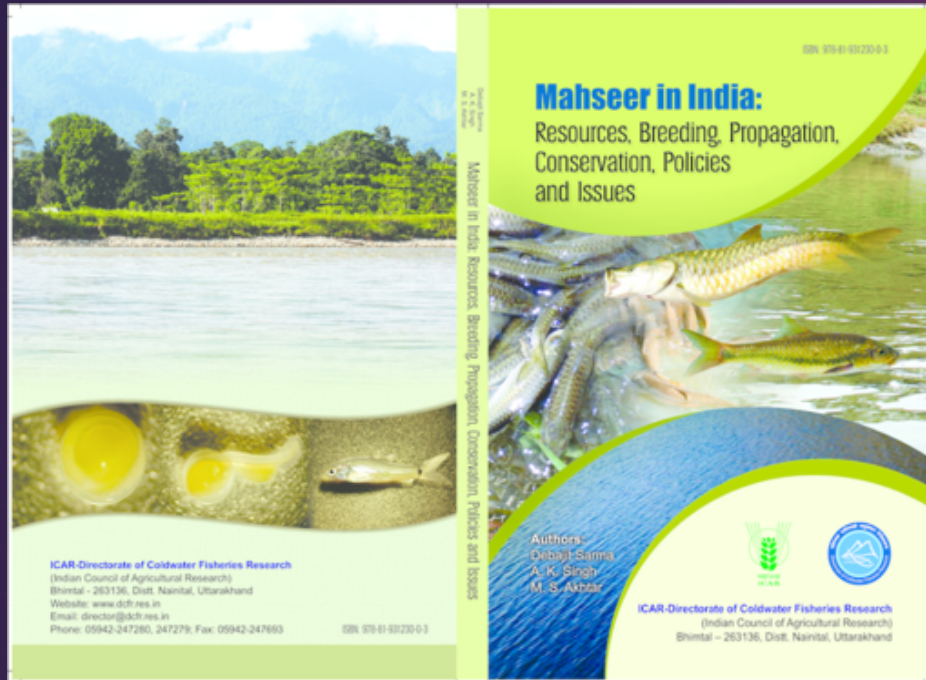
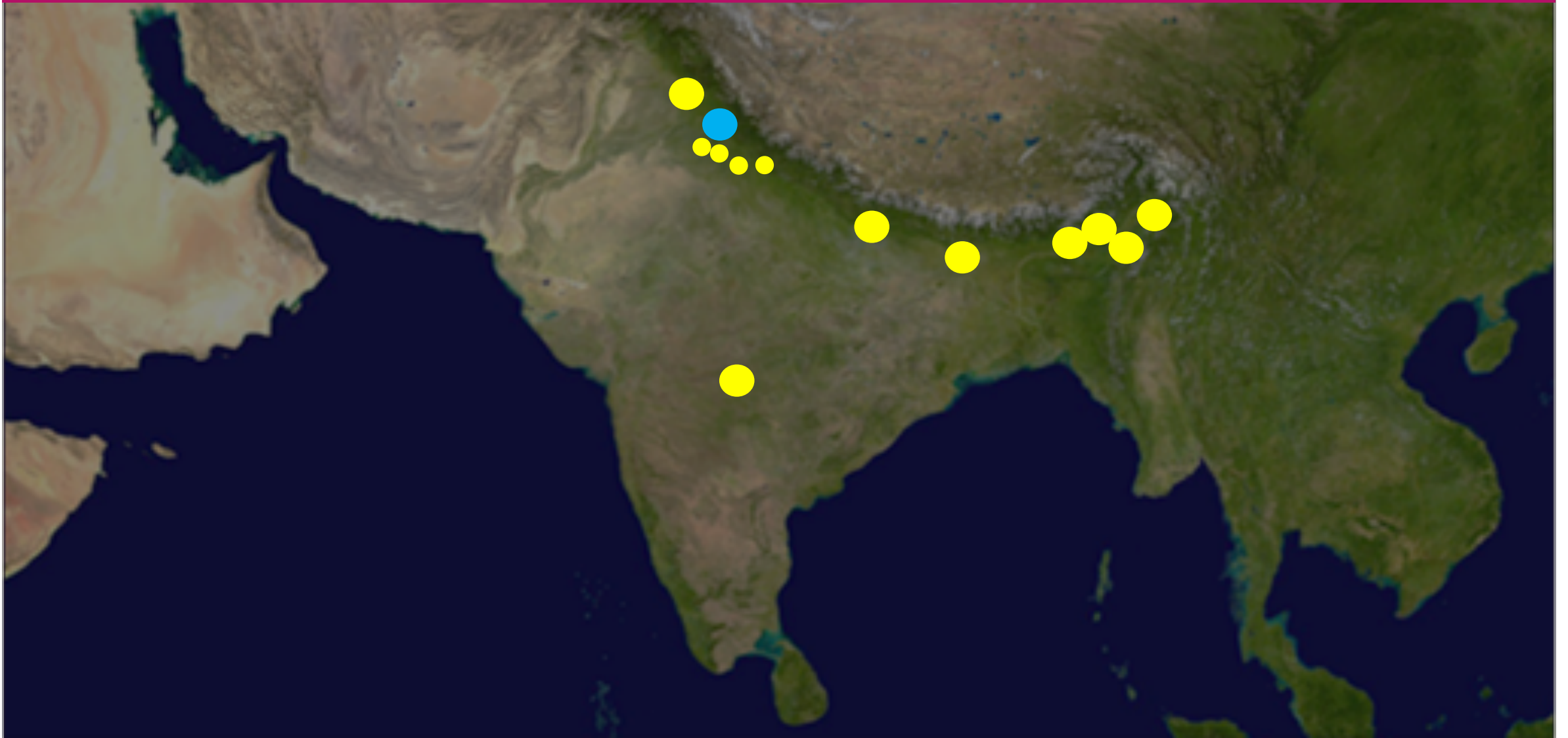


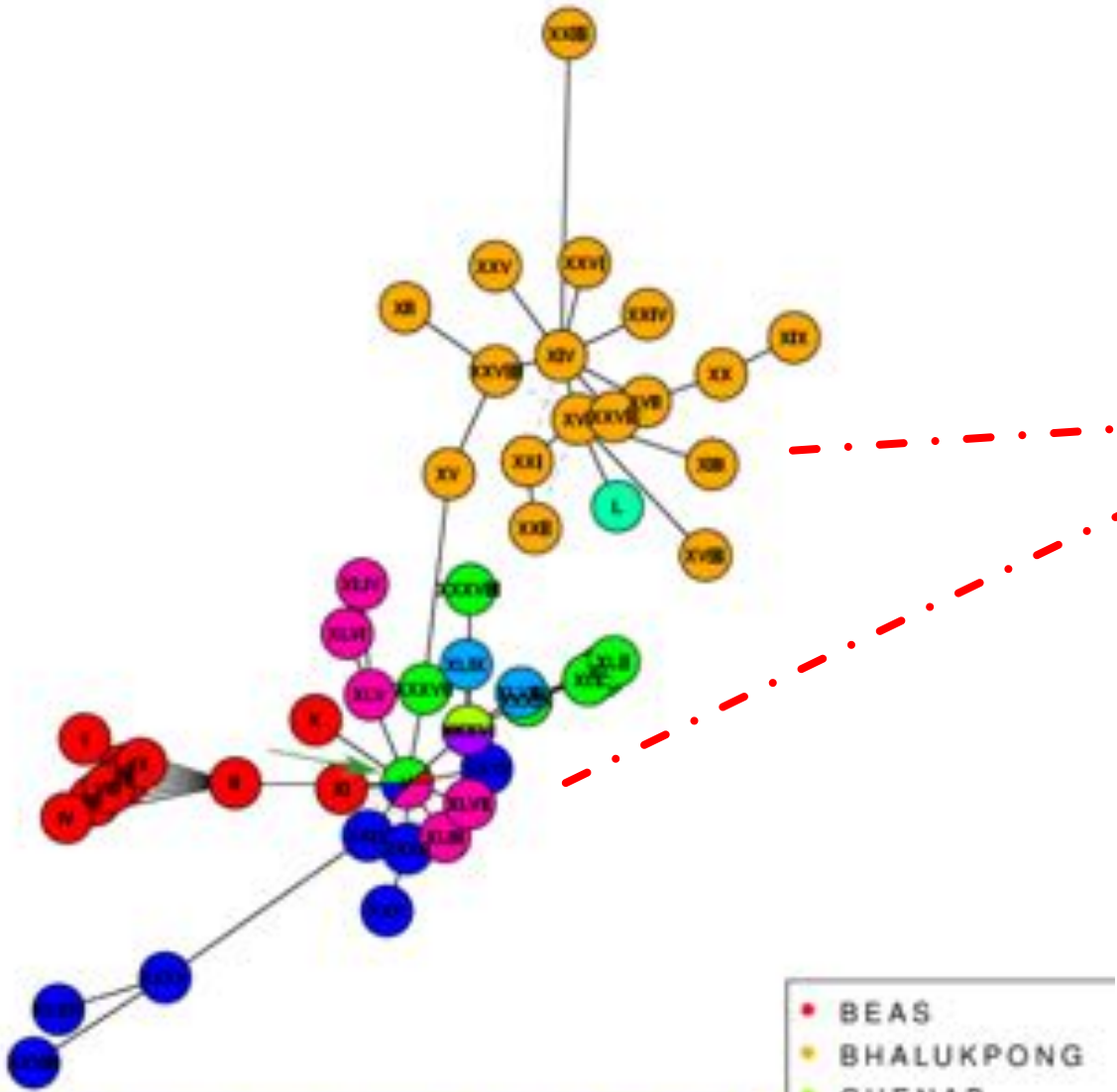
Fig. 12. Ranching of golden mahseer in Kosi River & Naukuchiatal Lake by DCFR

Table 2: Golden mahseer seed distribution by ICAR-DCFR

Year	Distributed to
2007-08	Supplied to Dept. of Fisheries, Distt. GTA Darjeeling, West Bengal; Released in Bhental lake
2008-09	Supplied to Dept. of Fisheries, Distt. GTA Darjeeling, West Bengal; Supplied to Dept. of Fisheries, Govt. of Sikkim; Released in Kharna Mahseer Reserve, Uttarakhand
2009-10	Supplied to Dept. of Fisheries, Dehradun, Govt. of Uttarakhand; Supplied to MP Fish Federation, Bhopal; Released in Bhental lake for rehabilitation.
2010-11	Supplied to Dept. of Fisheries, Govt. of Sikkim; Supplied to ICAR-NER, Banarasi; Stocked in Bhental lake for rehabilitation.
2011-12	Stocked in Mehao lake, Arunachal Pradesh; Supplied to MP Fish Federation, Bhopal; Supplied to College of Fisheries, Pantnagar, Uttarakhand; Supplied to Saffal Estate Association, Saffal, Nainital, Uttarakhand; Rearing in cages and ponds of DCFR
2012-13	Supplied to Dept. of Fisheries, Govt. of Sikkim; Supplied to Dept. of Fisheries, Govt. of Himachal Pradesh; Supplied to MP Fish Federation, Bhopal; Released in Bhental lake; Released in Dighai pakhari tank, Gawalhari, Assam; Rearing in cages and ponds of DCFR
2013-14	Supplied to College of Fisheries, Pantnagar, Uttarakhand; Ranching at Bhental lake and Naukuchiatal lake; Rearing in cages and ponds of DCFR
2014-15	Supplied to MP Fish Federation, Bhopal and Dept. of Fisheries, Distt. GTA Darjeeling, West Bengal; Stocked in Noremahir lake, Meghalaya; Released at Nainital lake; Released at Sarjatal lake and Kosi river, Karnnagar
2015-16	Supplied to MP Fish Federation, Bhopal; Dept. of Fisheries, Govt. of Bihar; Rearing in ponds of DCFR; Ranching at Baijnath Temple pond, Bageshwar, Uttarakhand.

2007-2016





I	II	III	IV	V	VI	VII	VIII	IX	X
1	4	1	1	30	1	1	1	1	1
XI	XII	XIII	XIV	XV	XVI	XVII	XVIII	XIX	XX
2	1	1	1	1	1	1	1	1	1
XXI	XXII	XXIII	XXIV	XXV	XXVI	XXVII	XXVIII	XXIX	XXX
1	1	1	1	1	1	1	1	9	1
XXXI	XXXII	XXXIII	XXXIV	XXXV	XXXVI	XXXVII	XXXVIII	XXXIX	XL
1	2	1	1	1	45	1	1	1	1
XLII	XLIII	XLIV	XLV	XLVI	XLVII	XLVIII	XLIX	1	1
1	1	1	1	1	1	1	1	1	1

- BEAS
- BHALUKPONG
- CHENAB
- LONAVALA
- NEP
- NL
- RAMNAGAR
- RAVI
- SUTLAJ

Identity of eastern and western populations – 2.9% genetic divergence in cytb (data not shown)

Hatchery samples have shared haplotypes with western Himalayan samples

Weaknesses of mahseer stocking programs in India



Failure to **evaluate the outcomes** of stocking (whatever success claimed is simply based on numbers of fish produced and stocked); hatcheries do not advocate evaluation



No information gathered on **long-term impacts** on ecosystem functioning and genetic integrity



Many **recipient ecosystems are degraded** and stocking activities are seen as a short-term option for the rehabilitation of the waterbody to increase fish production!



Genus matters species don't! No idea regarding **identity of the species** that are stocked.

Rajasthan breeds endangered 'Mahaseer' fish

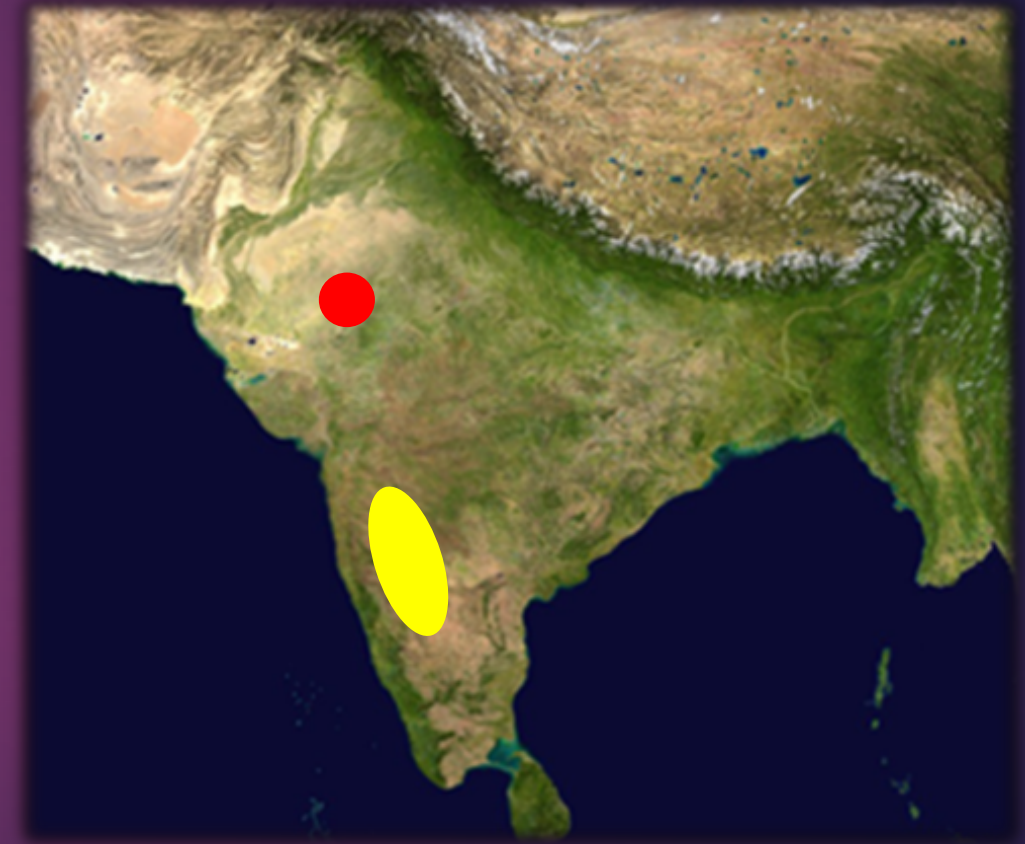
Geetha Suresh Pillai | TNV | Updated: Dec 8, 2016, 07:53 AM IST



UDAIPUR: After strenuous efforts of four years, the forest department has succeeded in breeding indigenous fish 'Mahaseer' in a hatchery in

spawn and its eggs hatch naturally while floating! As the Himachal government is raising 'Golden Mahaseer', Udaipur hatchery has produced 'Tor Khudree', a genre found in Cauvery river and its tributaries. Nearly 2,500 Mahaseers have come out of eggs recently.

"In 2012, we started by procuring 1,500 fries (hatchlings) from Tata Power's farm at Lonavala. We reared them to brooder stage by feeding them on special diet in the department's hatchery at Sajjanganh Biological Park and acclimatised them all these years to the local climatic conditions," Ismile Ali Durga, technical advisory of the project told TOI.





Roadmap for mahseer stocking in India



Fisheries research organization/University to coordinate mahseer stocking based on best management practices (IUCN guidelines)



Mahseer atlas of India - historic information; details of previous stocking, as well as population/management units (level of immigration between drainages a critical factor)



Eliminate all broodstock and juveniles held in hatcheries and captive rearing facilities!



Hatcheries to **seek the purpose of stocking** and information on species currently/historically present in the area to be stocked; need for continuous monitoring



Suggestions from the Paro Conference

Lessons for Pakistan



Hatcheries for the golden mahseer (*Tor putitora?* *Tor macrolepis?*) in Poonch (AJK) and Thana Malakand (Khyber Pakhtunkhwa)



Is there a need? – Conservation? Rec fishing?

Lessons for Nepal

Ranching mahseer (*Tor tor* and *Tor putitora*) in the running waters of Nepal. (by T.K. Shrestha)

Department of Fishery, Kirtipur, Kathmandu, Nepal

ABSTRACT

Mahseers (*Tor tor* and *Tor putitora*) have a potential for being ranched in rivers/artificial channels of Nepal and other countries of the Trans-Himalayan region. This is one of the hopes for rehabilitating mahseer stocks in rivers and to enhance them to a sustainable fishing level. It is proposed to spawn mahseer in artificial channels alongside streams and rivers, to be followed by releases of fry and fingerlings into streams and rivers for their downstream migration and feeding in the lower reaches of rivers. Protection of growing fish will be essential, especially of the mature stocks migrating upstream for breeding.

1. INTRODUCTION

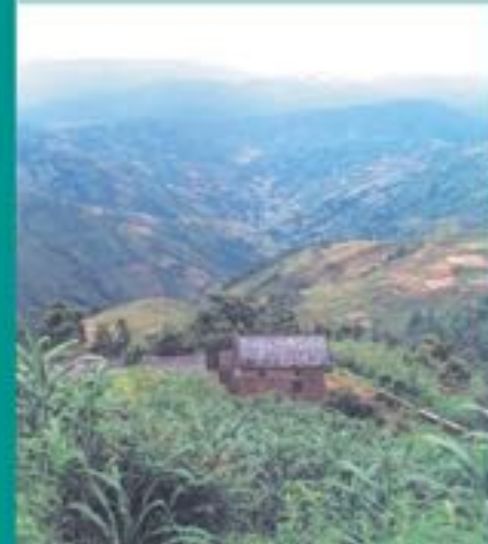
The mahseers (*Tor tor* and *Tor putitora*) are superior game fish of the cold water streams of Nepal. Few fishes of the mountain stream illustrate vagaries of human taste better than the mahseer. Their sporting attributes plus good public image provide a background for expanding recreational fisheries in the Himalayan waters. The mahseer fishery has declined much owing to ecological changes in waterways brought about by barrier effects of dams, inroads of pollution and harmful fishing practices. At many places river courses have changed and spawning beds were destroyed. Destruction of spawning beds and resultant failure of spawning affected seed and fry resources greatly. If the natural spawning of mahseers goes unmonitored, the valuable mahseer fishery resource of Nepal will become extinct. Mahseers do not breed in a closed system of impoundments although they can grow to maturity there. They need free-flowing turbulent water fed by melting snow. Their spawning beds must have good-sized pools and rapids, sand bars and gravel. In a closed system of pond water, all these basic habitat needs are not met, therefore, mahseers refuse to breed. In many pristine rivers of Nepal, spawning beds are destroyed by dams which can never be compensated. To evolve the original spawning beds takes a long time. But a new spawning channel or incubation channel can be created by habitat manipulation, which can be done by diverting an original river course or side channel at a desirable spot. In rivers of Nepal, such ideal channels are many and can be utilized with little effort. The channel so created may act as fish sanctuary or buffer zone or escape area and help to conserve upstream migrating spawners year after year. Along the diversion side, a river can be tamed so as to create a full-fledged riverine fish farm, where migratory stock of mahseer can be regularly ranched. This will greatly help to conserve fish seed resources and bring back depleted fish stocks to the original level of abundance.

6. MAHSEER RANCHING AND HABITAT IMPROVEMENT CONSIDERATIONS

Cold water fisheries in the trans-Himalayan countries

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431



Lessons for South East Asia



Breakthrough in the breeding of *T. tambroides* and *T. douaronensis* in Sarawak, East Malaysia (Ingram et al. 2005) and the technology now adopted in West Malaysia for commercial production of *T. tambroides*.



There are three lineages of *T. douaronensis* identified with high level of divergence: Borneo Island, Sumatra Island, and Mekong (NACA 2007)



Within Borneo Island, *T. douaronensis* from Sabah genetically different from rivers in Sarawak (NACA 2007)



But what is *Tor tambroides*, *T. douaronensis* and *T. tambra*? (Walton et al. 2015) and what are their distributional ranges? (IUCN Red List - douaronensis)

Lessons for Sri Lanka



No records of any introduction of mahseer from India or elsewhere



Lessons for Bhutan



No – to any offer for mahseer seeds from India's government research institutes or private hatcheries



Hatcheries and the hydropower sector in Bhutan



Need for establishing a national breeding program? Hatchery guidelines

Religion and stocking



Live release/mercy release or Tsethar



Significant concern in Bhutan – currently with exotic species (Gurung, 2012)

Everard, Pinder, Raghavan & Kataria (in press). Are well intended Buddhist practices an under appreciated threat to global freshwater biodiversity? *Aquatic Conservation: Marine and Freshwater Ecosystems*



Guidelines for Reintroductions and Other Conservation Translocations

Version 1.0

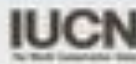


REINTRODUCTION AND TRANSLOCATION SPECIALIST GROUPS' TASK FORCE ON MOVING PLANTS AND ANIMALS FOR CONSERVATION PURPOSES



IUCN Guidelines for Re-introductions

Prepared by the IUCN SSC
Reintroduction Specialist Group



Conservation Letters

A journal of the Society for Conservation Biology

Open Access

POLICY PERSPECTIVES

IUCN Guidelines for Determining When and How Ex Situ Management Should Be Used in Species Conservation

Philip J.K. McGowan¹, Kathy Traylor-Holzer², & Kristin Leus^{3,4}

Evolutionary Applications

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Evolutionary Applications ISSN 1752-4571

PERSPECTIVE

Assessing the benefits and risks of translocations in changing environments: a genetic perspective

Andrew R. Weeks,¹ Carla M. Sgro,² Andrew G. Young,³ Richard Frankham,⁴ Nicki J. Mitchell,⁵ Kim A. Miller,² Margaret Byrne,⁶ David J. Coates,⁶ Mark D. B. Eldridge,⁷ Paul Sunnucks,² Martin F. Breed,⁸ Elizabeth A. James⁹ and Ary A. Hoffmann¹

Paro Declaration

**Position statement on mahseer stocking and reintroduction
(WWF/IUCN/FCF/Mahseer Trust/WII and other partners)**



Thank
You