

On the brink status of the world's largest and most threatened mahseer, *Tor remadevii*



MAHSEER TRUST
RIVERS - FISH - PEOPLE

V.K. Anoop, Adrian Pinder & Rajeev Raghavan
Kerala University of Fisheries and Ocean Studies (KUFOS), Kochi, India
Mahseer Trust, Dorset, United Kingdom

The humpbacked mahseer, *Tor remadevii*



Largest known mahseer growing in > 1.5m and > 50kg



54kg specimen from the Kabini tributary of the Cauvery (van Ingen 1921)



No proper scientific identity (name) till 2018 – *Tor remadevii*



Endemic to the Cauvery River in peninsular India



Most threatened *Tor* species in the world – only species assessed as CR



No scientific interest in the species for over 150 years

Vol. 28: 11–17, 2015
doi: 10.1054/esr.12345

ENDANGERED SPECIES RESEARCH
Endang Species Res

Published online May 13

OPEN ACCESS

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

Adrian C. Pinder^{1,2,*}, Rajeev Raghavan^{1,3,4}, J. Robert Britton²

¹Mahseer Trust, c/o The Freshwater Biological Association, East Stoke River Laboratory, Wareham, Dorset BH20 6BB, UK
²Faculty of Science and Technology, Bournemouth University, Fern Barrow, Poole, Dorset BH12 5BB, UK
³Conservation Research Group (CRG), St Albert's College, Kochi, Kerala, 682 018, Kerala, India
⁴Laboratory of Systematics, Ecology and Conservation, Zoo Outreach Organization (ZOO), Coimbatore, 641 035, Tamil Nadu, India

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, Cooke 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-Sea 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

*Corresponding author: apinder@bournemouth.ac.uk

© The authors 2015. Open Access under Creative Commons by Attribution License. Use, distribution and reproduction are unrestricted. Authors and original publication must be credited.
Publisher: John Wiley & Sons, Ltd.

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

ADRIAN C. PINDER^{1,2,*}, RAJEEV RAGHAVAN^{1,3,4} and J. ROBERT BRITTON²

¹Mahseer Trust, c/o The Freshwater Biological Association, East Stoke River Laboratory, Wareham, Dorset, UK
²Faculty of Science and Technology, Bournemouth University, Fern Barrow, Poole, Dorset, UK
³Conservation Research Group (CRG), St Albert's College, Kochi, Kerala, India
⁴Laboratory of Systematics, Ecology and Conservation, Zoo Outreach Organization (ZOO), Coimbatore, Tamil Nadu, India

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 Gulbore, 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.

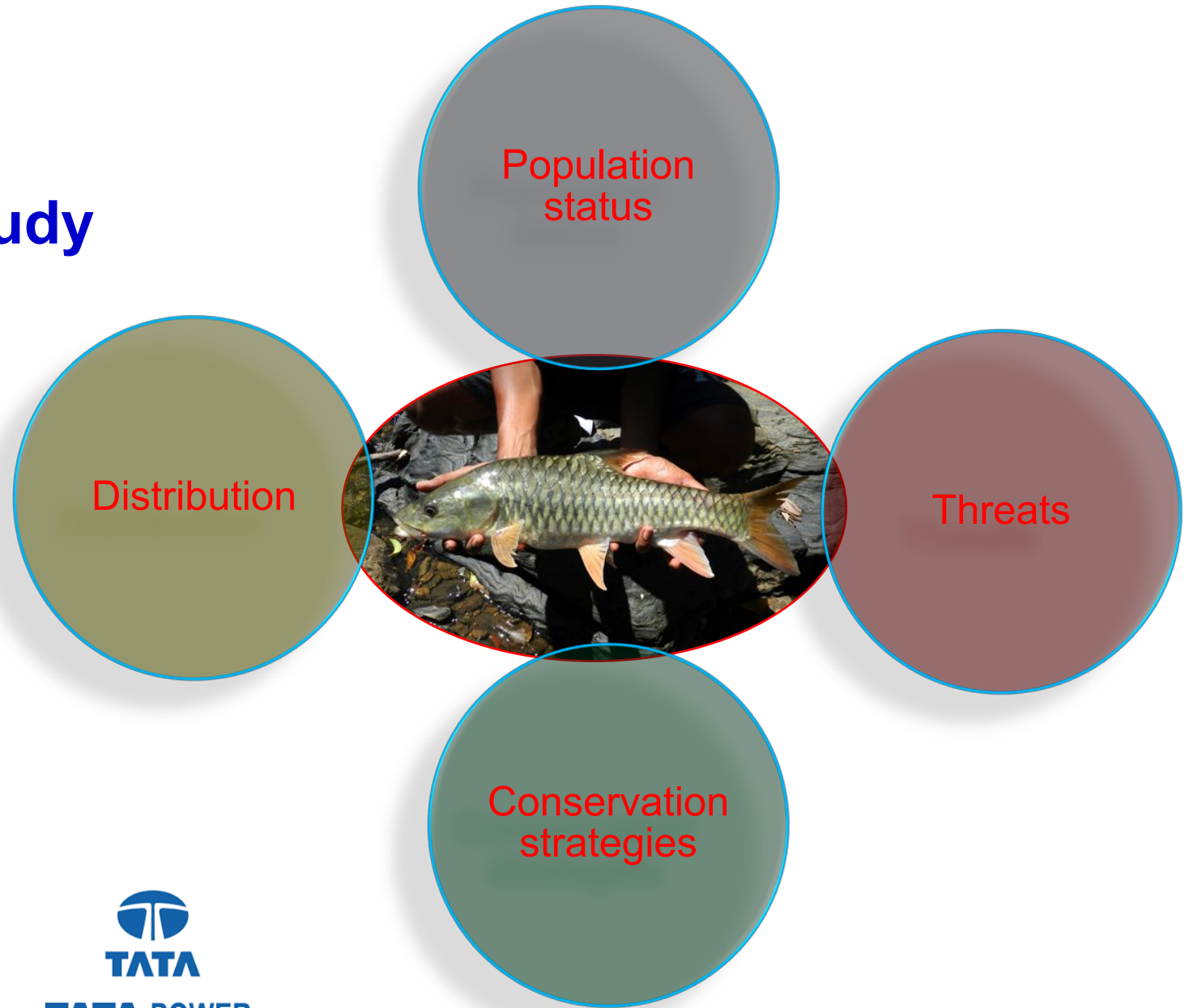
Received 28 April 2014; Revised 9 September 2014; Accepted 8 November 2014

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

*Correspondence to: Adrian Pinder, Mahseer Trust, c/o The Freshwater Biological Association, East Stoke River Laboratory, Wareham, Dorset, BH20 6BB, UK. E-mail: apinder@bournemouth.ac.uk

Copyright © 2014 John Wiley & Sons, Ltd.

Kaveri Mission Humpback mahseer study

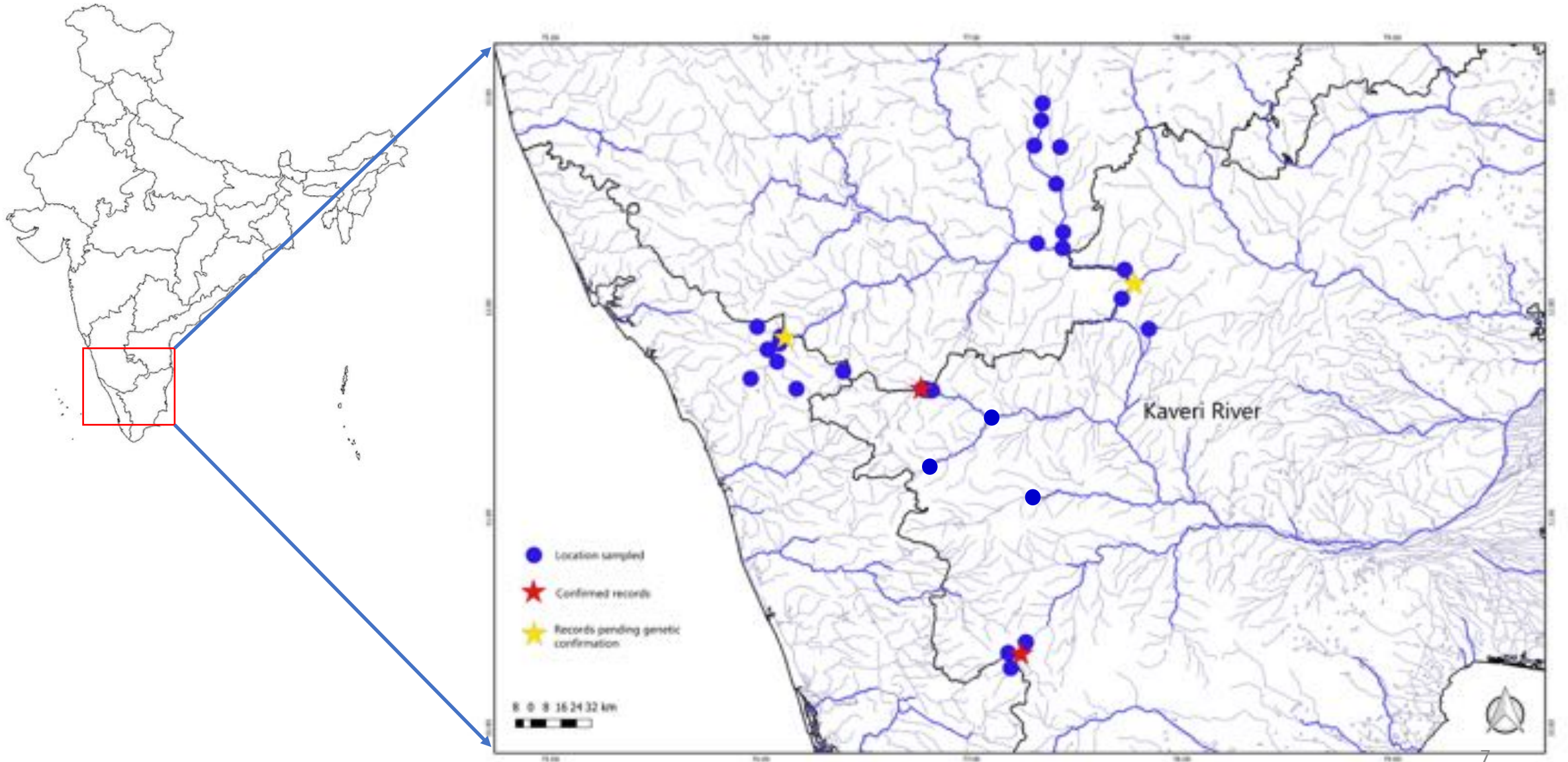


Field work (experimental fishing, market-based surveys and local ecological knowledge)

Tributary	Month of Sampling
Moyar	February 2018
Bhavani	March 2018
Pambar/Chinnar	April 2018
Kabini	May 2018
Arakavathy	June 2018
Cauvery	September 2018

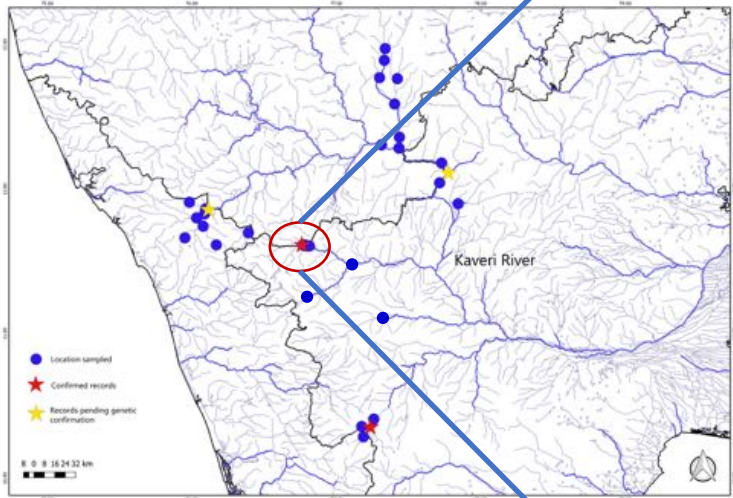


Extensive sampling in the Cauvery and all its tributaries from April to September 2018



Moyar tributary – 20 km (7 days)

Thengumarhada, Vellimeenkadavu, Mangalapatti, Therukudi, Kulukkathatta, Bidhurakandi and Venmeenkuzhi





Major observations (field and local knowledge)

- Presence of two species of mahseer, Humpbacked (*Tor remadevii*) and the Blue-finned (*Tor sp.*)
- Local knowledge indicate that the size of the fish caught has come down drastically in the last 25 years
- Longevity of the humpbacked mahseer has been suggested to be 30+ years
- Humpbacked mahseer prefers fruits from the riparian vegetation (locally known as 'Nagamaram') – they are used as a lure to catch the fish

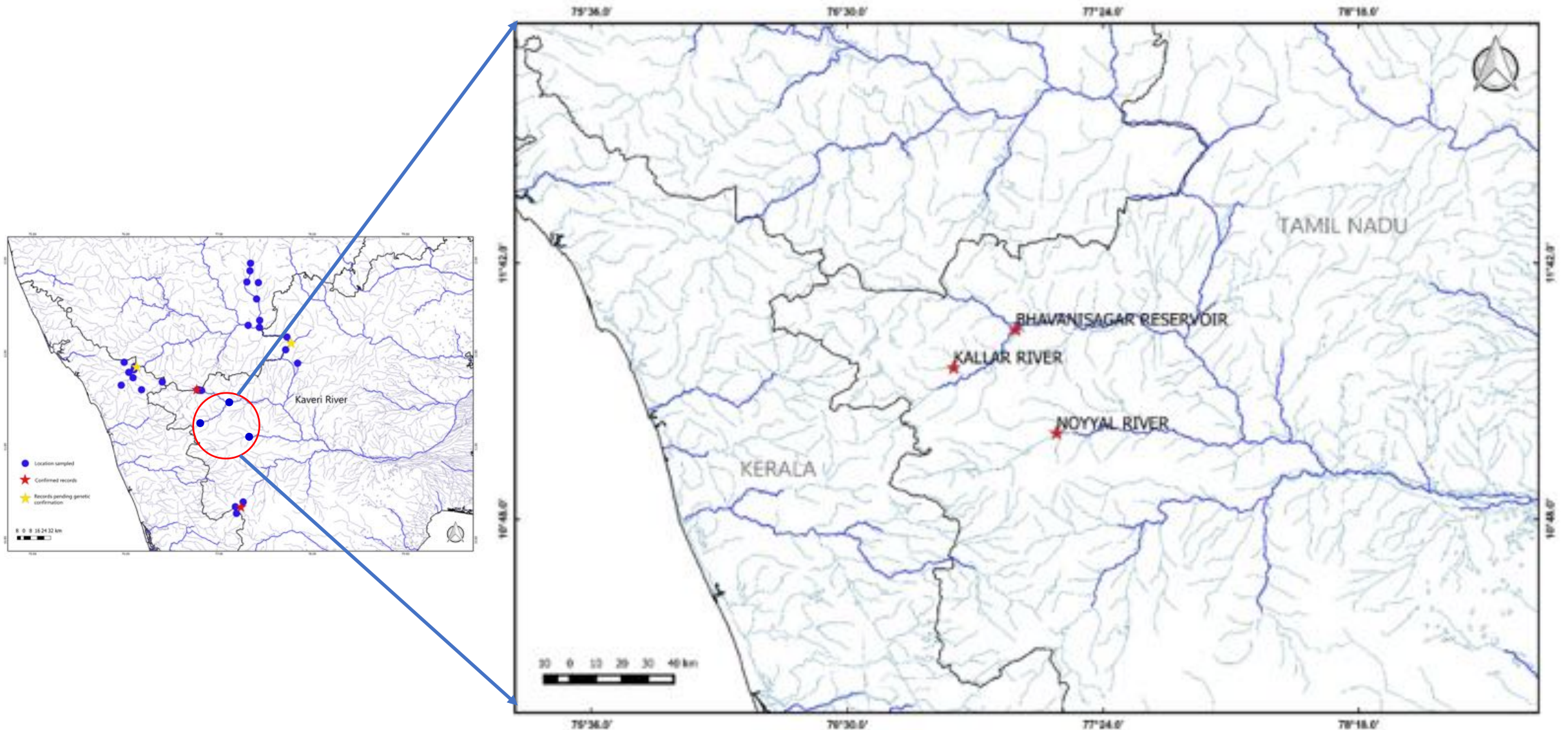


Threats in the habitat

- Illegal fishing during local temple festivals
- Sedimentation (due to frequent release of water from upstream dams)

Bhavani tributary –13 days

11km of the Noyyal river, 10 kms of the Kallar River and the main reservoir in Bhavani Sagar





Major observations (field and local knowledge)

- 8-10 unidentified juvenile mahseers were observed in-situ in the Kallar River but could not be caught despite best efforts
- Humpback was known to have been caught from the reservoir during the 1990s
- Humpback is seen during the monsoon and fish up to 8kg (average of 4-8kg) are caught every year during the monsoon in the Bhavanisagar dam
- 20 fishers with 15+ years of experience in the Noyyal revealed that no mahseer has ever been caught in the River, Noyyal is virtually dry and used as a washing ground for vehicles as well as for dumping waste including plastic

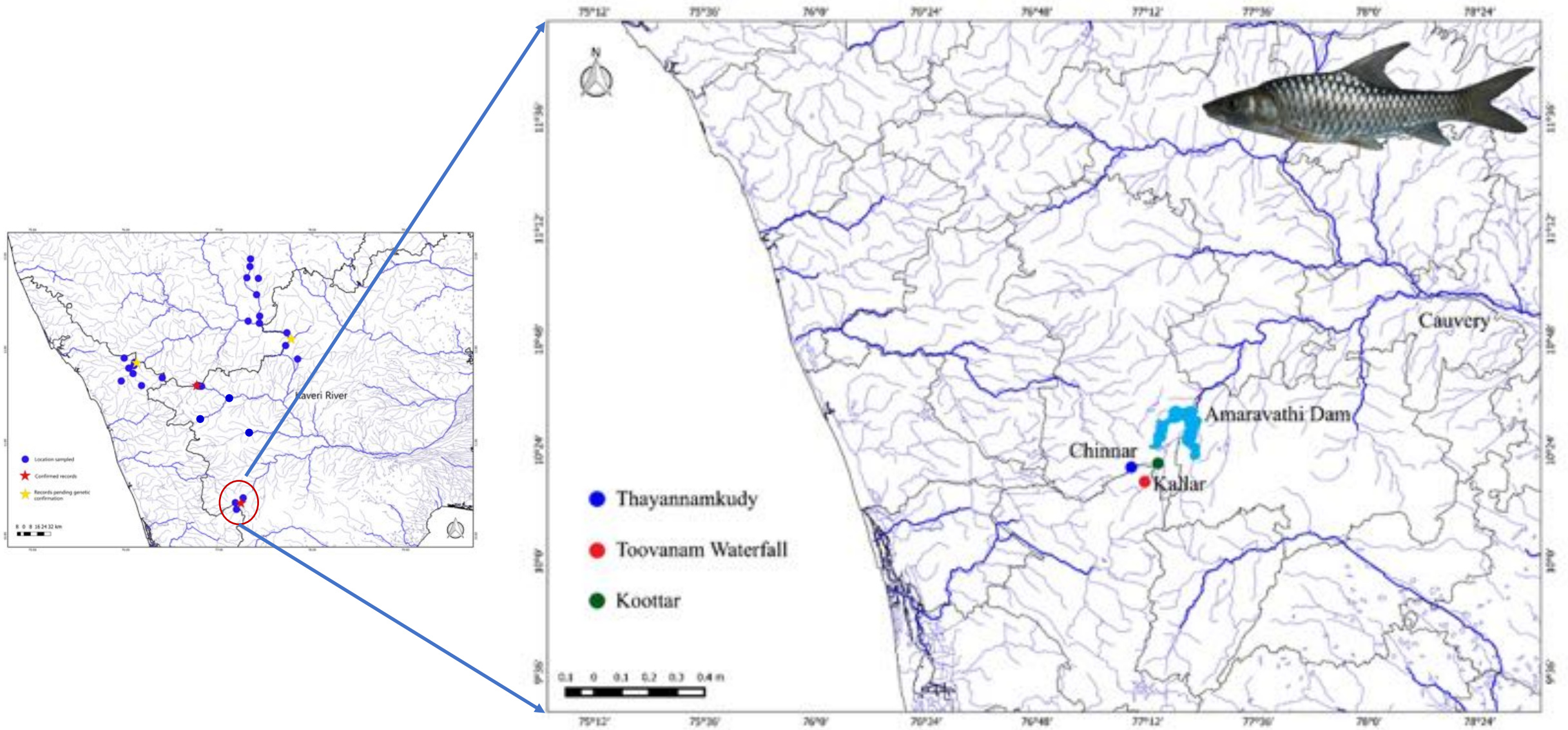
Threats in the habitat



- Illegal fishing using destructive gears.
- Noyyal is heavily polluted by every possible anthropogenic waste.
- Exotic species

Pambar/Chinnar tributary – 25 km (12 days) – Type locality

Thoovanam, Champakkadukudy, Koottar, Thayannamkudi, Amaravathi dam and catchment







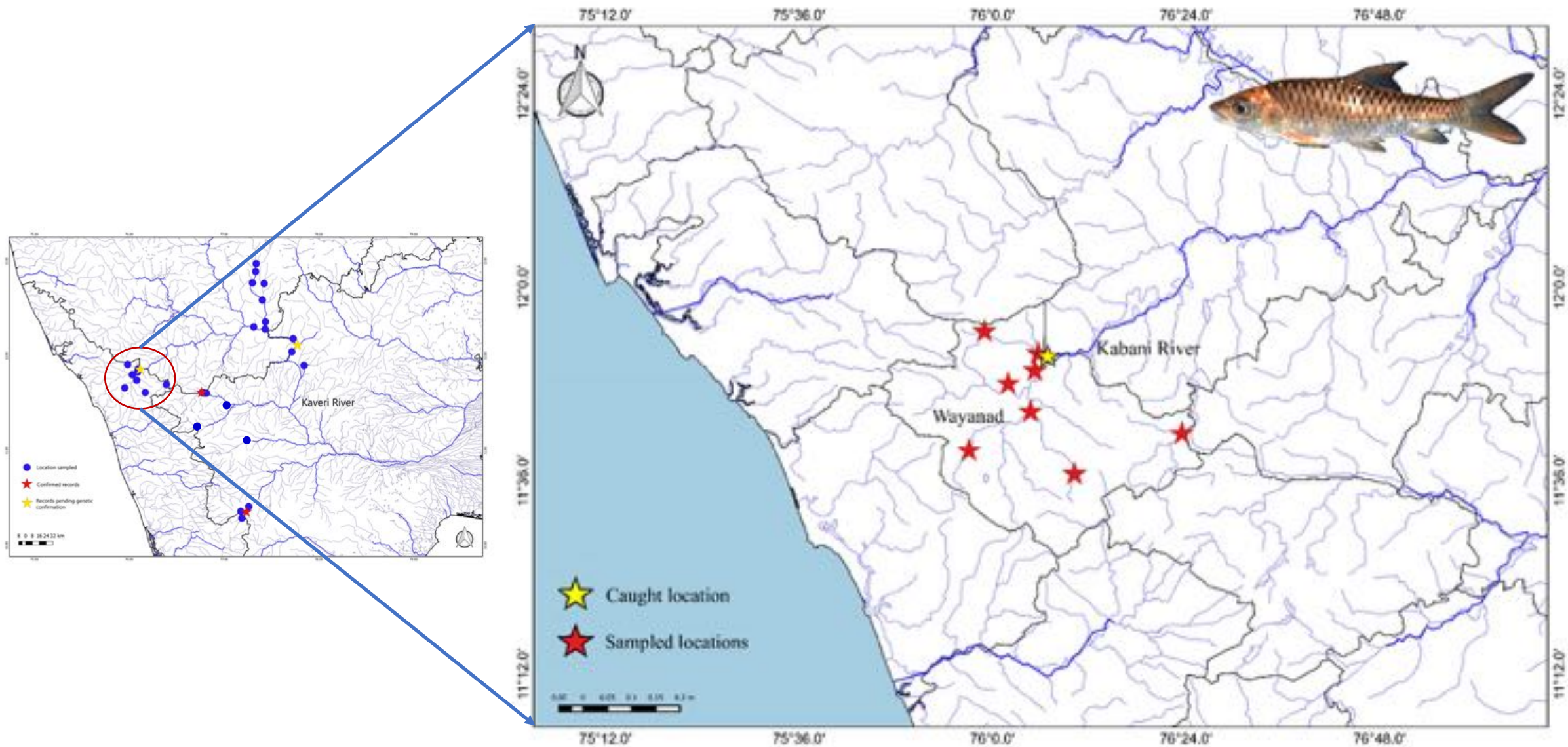
Major observations (field and local knowledge)

- Maximum size of the *T. remadevii* that was caught in the Pambar was around 20kg
- Fish breeds during the monsoon when there is flooding in the main channel. The fish according to local fishers, move to upper regions of the river to find good pools without heavy water flow for breeding.
- Most of the fish are silvery in colour but in the high flow season, the fish gets darker in appearance – reasons not known
- Mahseer were very common in the reservoir at least 20 years ago- the largest size caught from the reservoir was 12kg which was eight years ago- needs to be verified through sampling in the monsoon.

- The river is threatened by low water flow (in the Chinnar)
- Plastic pollution
- A temple located in the vicinity (also inside the protected area) – the Kattalai Mariamman Kovil hosts thousands of people during their annual festival and the food and plastic waste from the temple is directly emptied into the river.

Kabini tributary – 45 km (15 days)

Thirunelly, Begur, Bavali, Manthavady, Muthanga, Kuruva Island, Panamaram, Banasura Sagar Dam, Karapuzha Dam





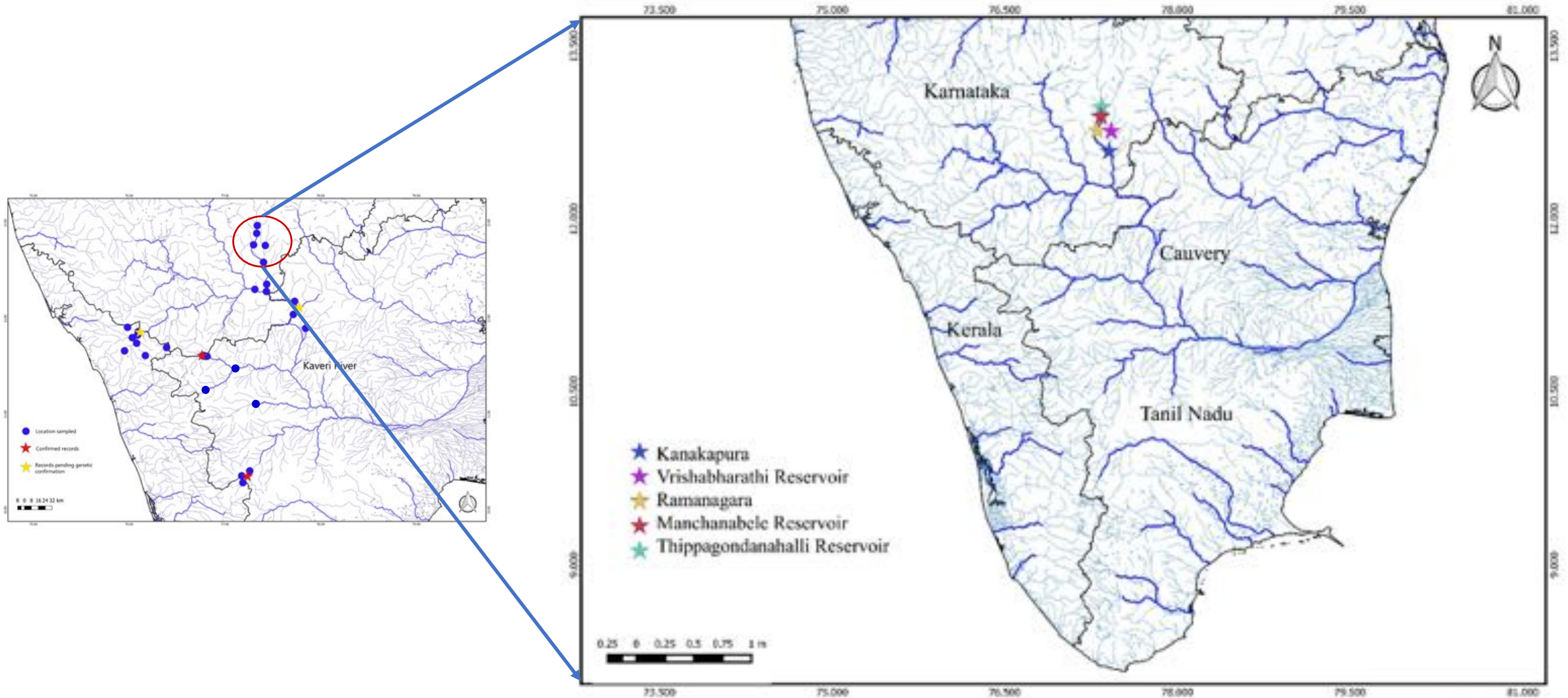
Major observations (field and local knowledge)

- Two juvenile specimens were collected (pending genetic confirmation)
- Current distribution of the humpbacked mahseer could be restricted to the Kalandhi tributary of the Kabini River (based on the result of present study)
- Around 50 years ago, Kabini sustained a good population of mahseer, and elder fishers regularly caught mahseer ~30 kg (quote: “mahseers to the size of a 5 feet man were common”)
- Based on local knowledge, both orange-finned (humpbacked) and blue-finned mahseer are present in the Kabini
- Mahseer do not reach local markets (except in monsoon when they are sometimes seen in the local market and sold for 300 INR/kg)

- Illegal fishing often using dynamites
- High voltage electrical shock
- Invasive fishes
- Check dams
- During summer, local people indiscriminately fish the pools using plant poisons

Arakavathy tributary –15 days - 80 km

Ramanagara, Thippagondanahalli Reservoir, Manchanabele Reservoir, Vrishabharathi Reservoir, Kanakapura





Major observations (field and local knowledge)

- 90% of the river basin (except the reservoirs) is dry and fully polluted
- All sewage and waste originating from villages, towns and small industries along the river basin is emptied directly without any treatment
- Majority of the riparian and terrestrial vegetation is comprised of invasive species
- Reservoirs are teeming with introduced and often invasive species like *Oreochromis mossambicus* and *O. niloticus*, and their hybrids, *Catla catla*, *Labeo rohita*, *Cirrhinus mrigala*, and *Gambusia affinis*.
- No fisherman (average age of 65) or member of the local community are aware of the mahseer and have never encountered the fish in the river or reservoir (based on photos of both juvenile and adult humpbacked and blue-finned mahseer shown to them)

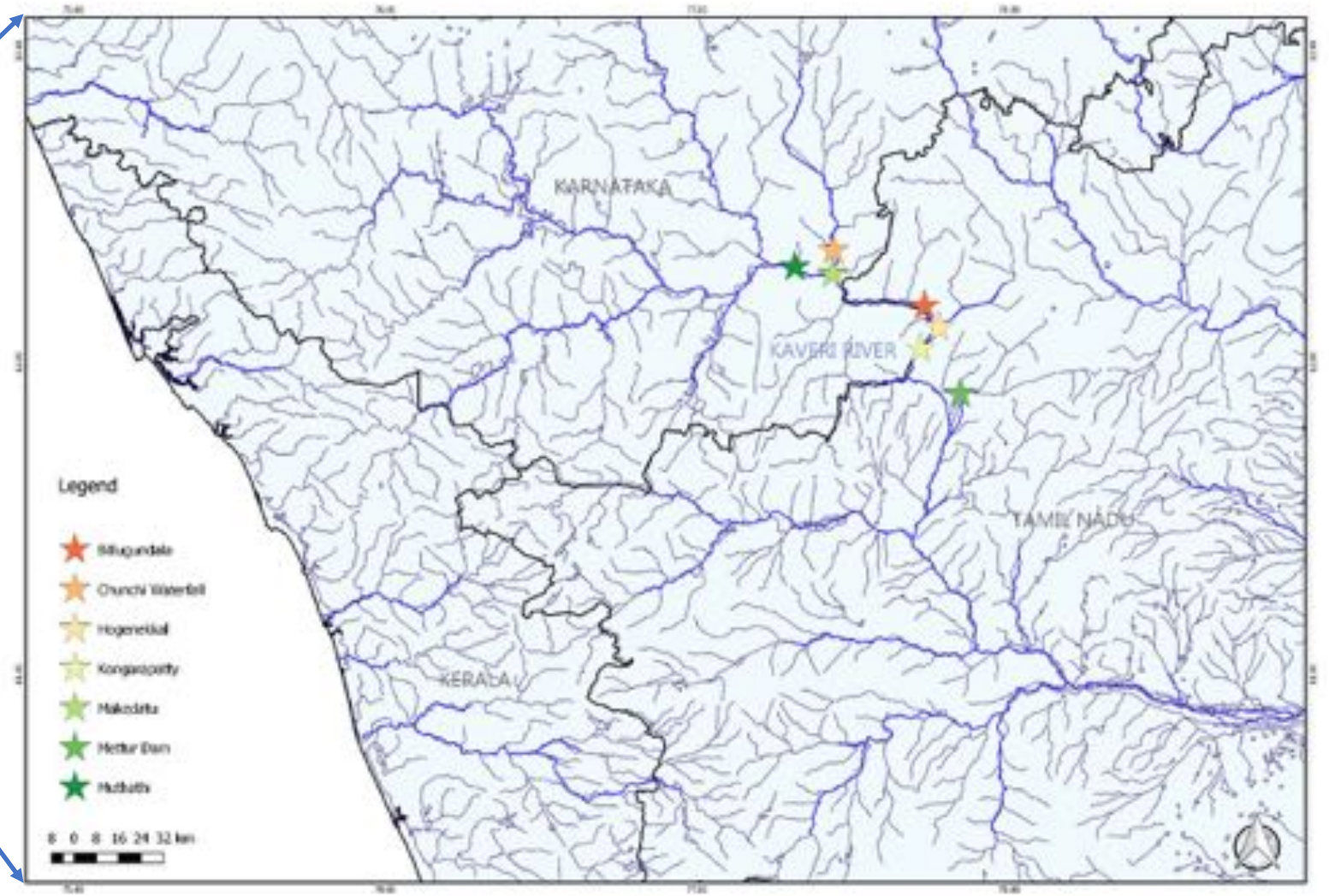
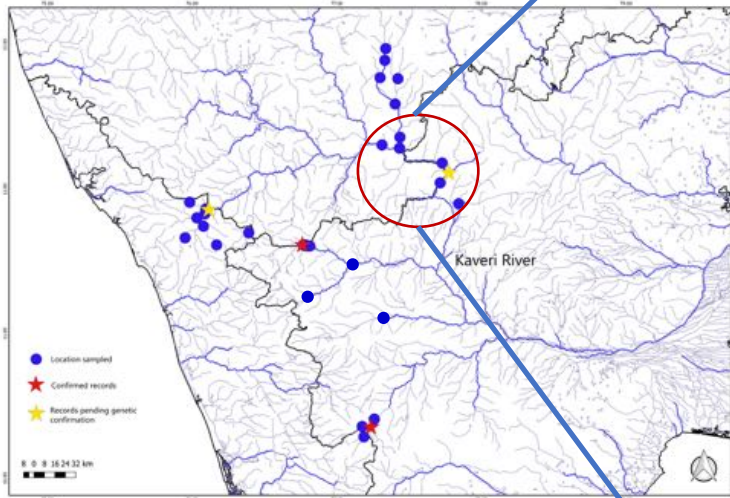
Threats in the habitat



- Heavily polluted by industrial waste
- Agro-based and human wastes
- Invasive fishes

Cauvery–20 days- 50 km

Mettur Dam, Hogenekkal, Muthathi , Makedatu, Bheemeshwari, Chuchi Falls





Major observations (field and local knowledge)

- Local knowledge of fishers suggest that Mettur dam had a good population of mahseer in the 1970s and 1980s
- Good population of mahseers (both blue-finned and humpbacked) exist in the Muthathi and Makedathu as observed from bank-side surveys. Experimental fishing could not be carried out because of the sites being inside a legally protected area.
- Maximum size of the fish caught from this area was around 150 cm and weighed ~50 kg (15 years ago) from Hogenekkal; juveniles were common and caught regularly.
- Since much of the area is protected, most fish that are caught do not reach markets

Threats in the habitat



- Exotic fish
- Illegal and rampant fishing often using unsustainable gears
- Hydropower dams in the upper reaches



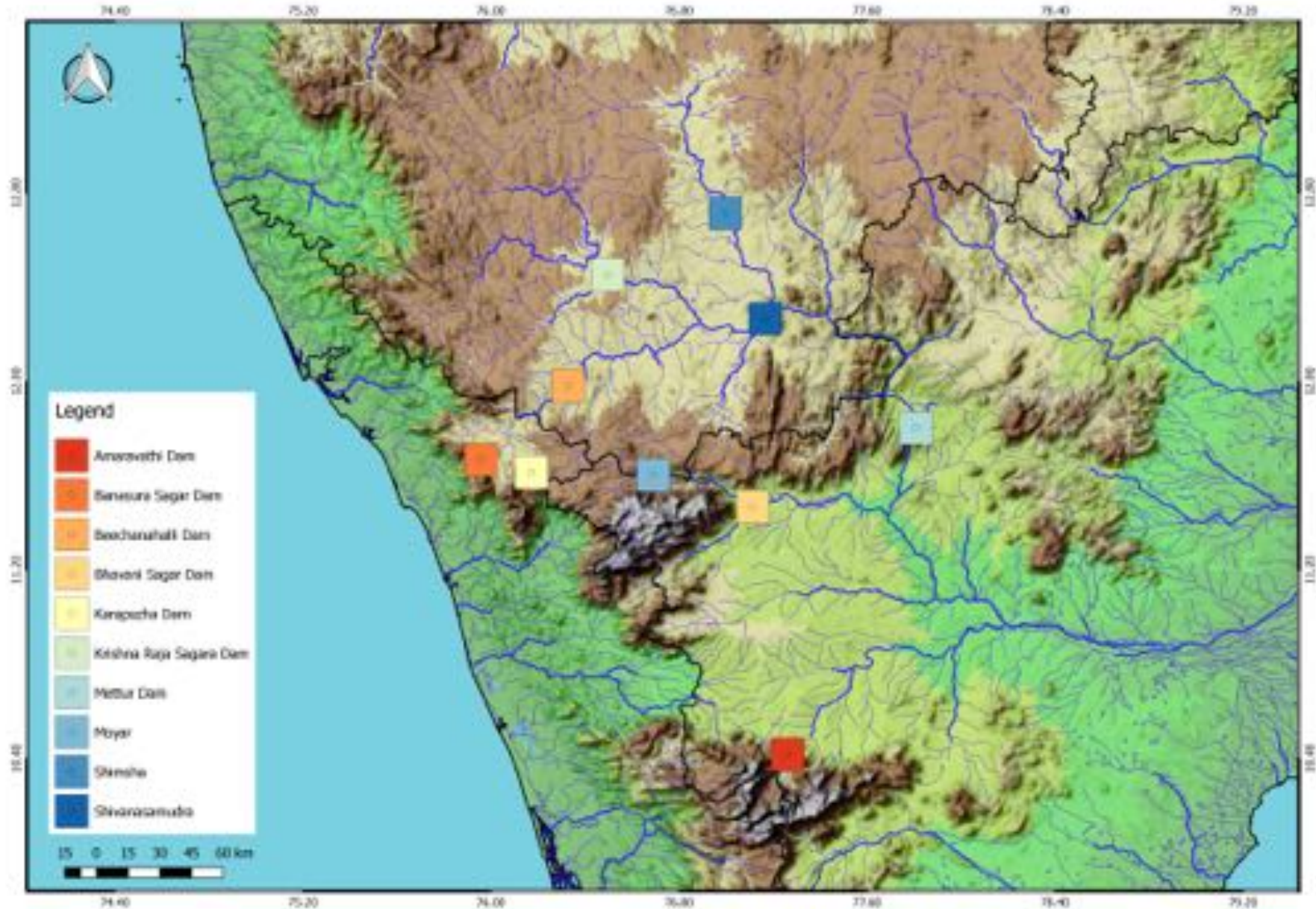
VIDEO



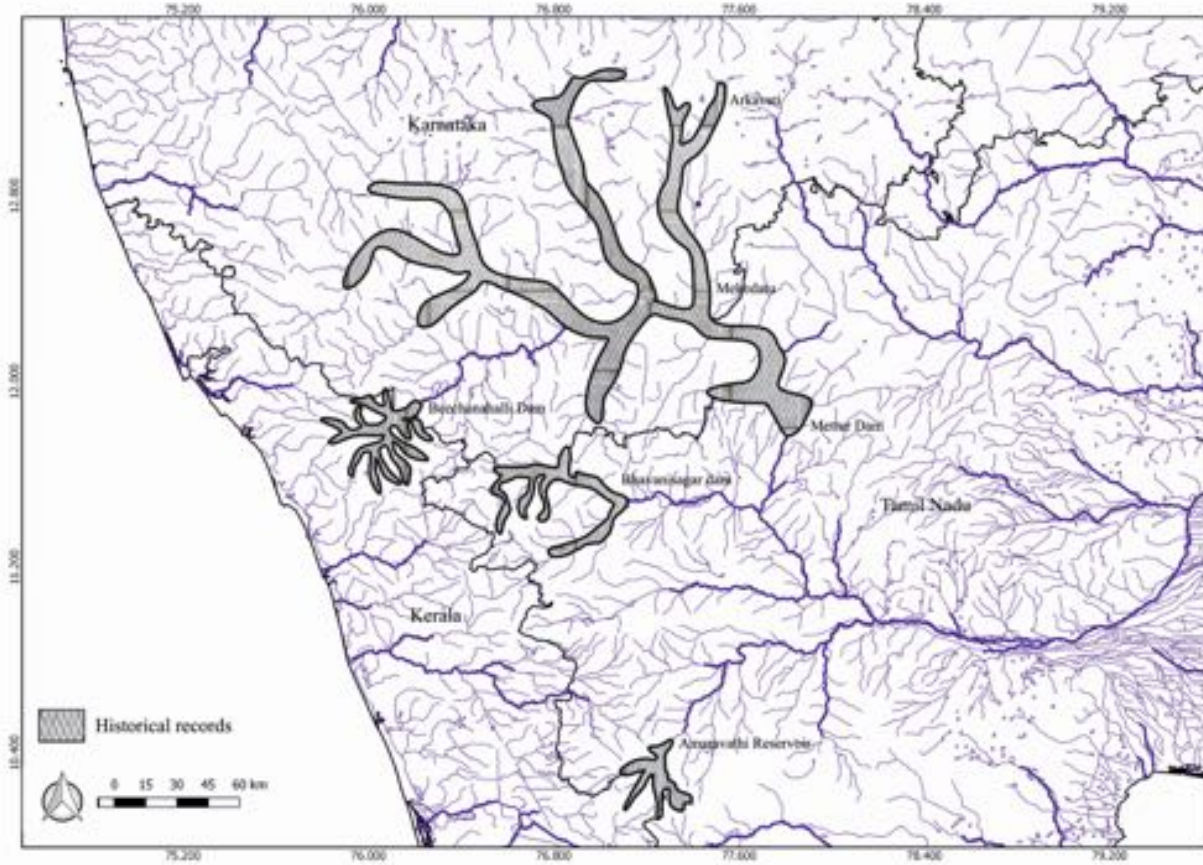
VIDEO



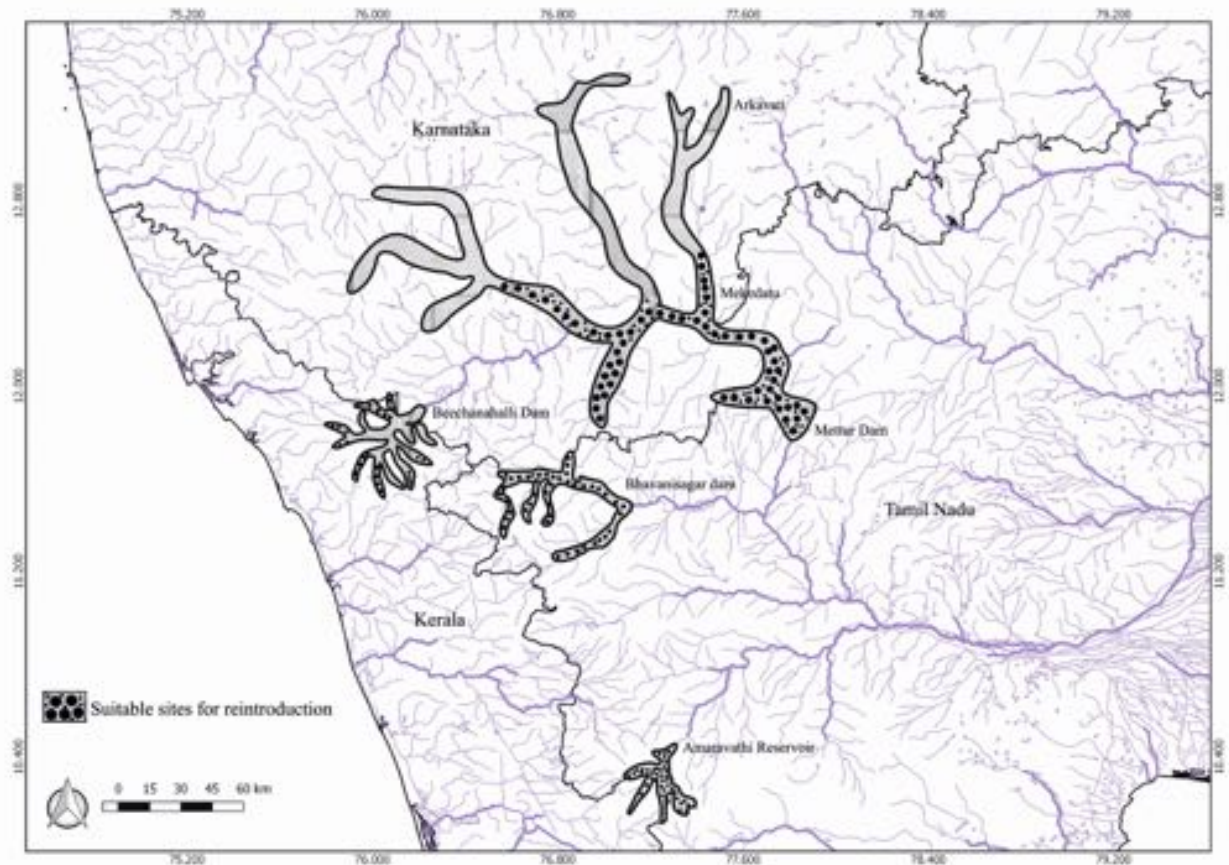
Major hydropower dams in the Cauvery River Basin



a) Historical distribution of the humpbacked mahseer in the Cauvery and b) areas suitable for reintroduction



(a)

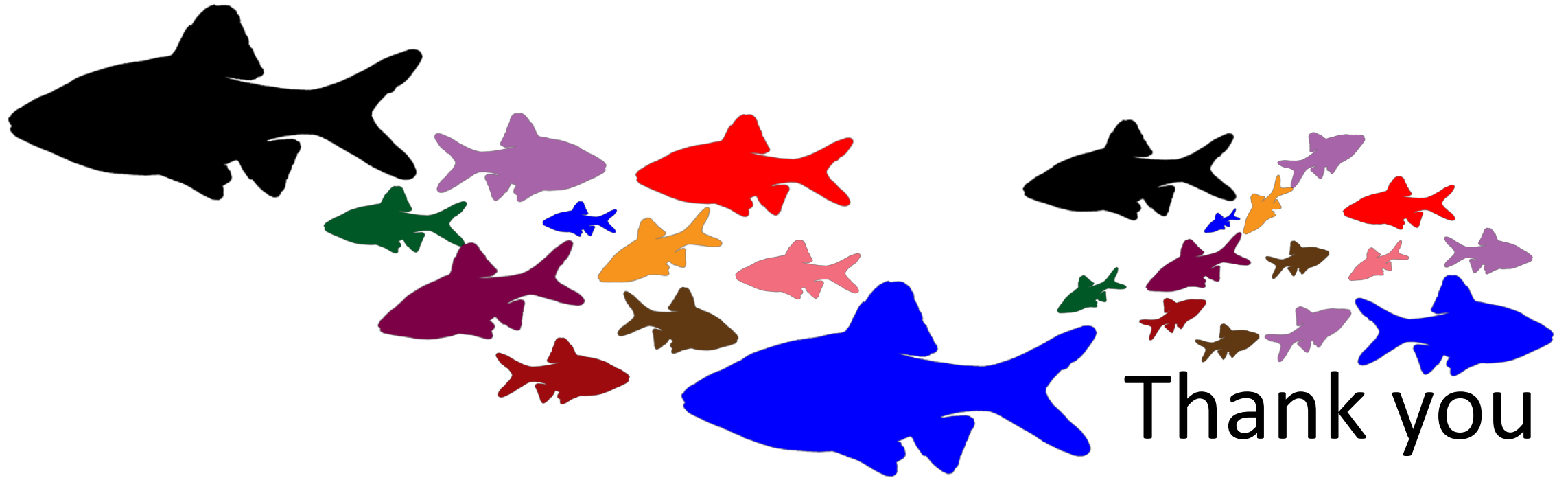


(b)

Future conservation needs and priorities

- **Site/area protection:** critical habitats in the Moyar, Bhavani and Kabini currently outside the PAs (Mudumalai, Sathyamangalam and Wayanad WLS) need to be managed with the help of local communities and conservation NGOs
- **Habitat protection:** protection of large pools in the Moyar, Bhavani and Kabini which may harbour large-sized individuals including potential broodstock.
- **Control of invasive and problematic species:** controlling introduction of Blue-finned mahseer and various hybrids originating from hatcheries; strong policies to make sure that no mahseer except the humpback are introduced; stop introduction of non-native species (Tilapia, African Catfish)

- **Ex-Situ Conservation/Captive breeding:** secure and responsible captive breeding program to be developed in the hatchery at Coorg (Harangi)
- **Management of fishery:** A combination of education and awareness, with fishery management plans should be initiated in the major areas where mahseer are known to be caught by local communities.



Thank you