



**Proposed branding of riverine catfish species (Bachwa) in Bihar:
Analysis of its potential negative impacts on
biodiversity conservation and fisheries management**



**Technical Report submitted to the
Department of Animal and Fisheries Resources, Bihar**

**By
Nachiket Kelkar^{1*} and Subhasis Dey^{2,3}**

¹ Ashoka Trust for Research in Ecology and the Environment, Royal Enclave,
Srirampura, Jakkur PO, Bangalore 560064, Karnataka, India.

² Kanchi Sahu Lane, Badi Khanjirpur, Bhagalpur, Bihar 812001, India.

³ Wildlife Institute of India-CAMPA River Dolphin Project, Kahalgaon, Bihar, India.

Correspondence: Nachiket Kelkar. Email: rainmaker.nsk@gmail.com

Citation: Kelkar, N. & Dey, S. (2020) Proposed branding of riverine catfish species (Bachwa) in Bihar: analysis of its potential negative impacts on biodiversity conservation and fisheries management. Technical Report submitted to the Directorate of Fisheries, Animal and Fisheries Resources Department, Bihar, India, 26 p.

Cover image: A catch dominated by Bachwa (*Clupisoma garua*) catfishes from the Ganga River at Patna, Bihar. Photo credit: Subhasis Dey.

Note: This technical report is a voluntary contribution from both authors, in their capacity as scientist-citizens. The views expressed do not necessarily reflect the positions of their institutions.

Summary

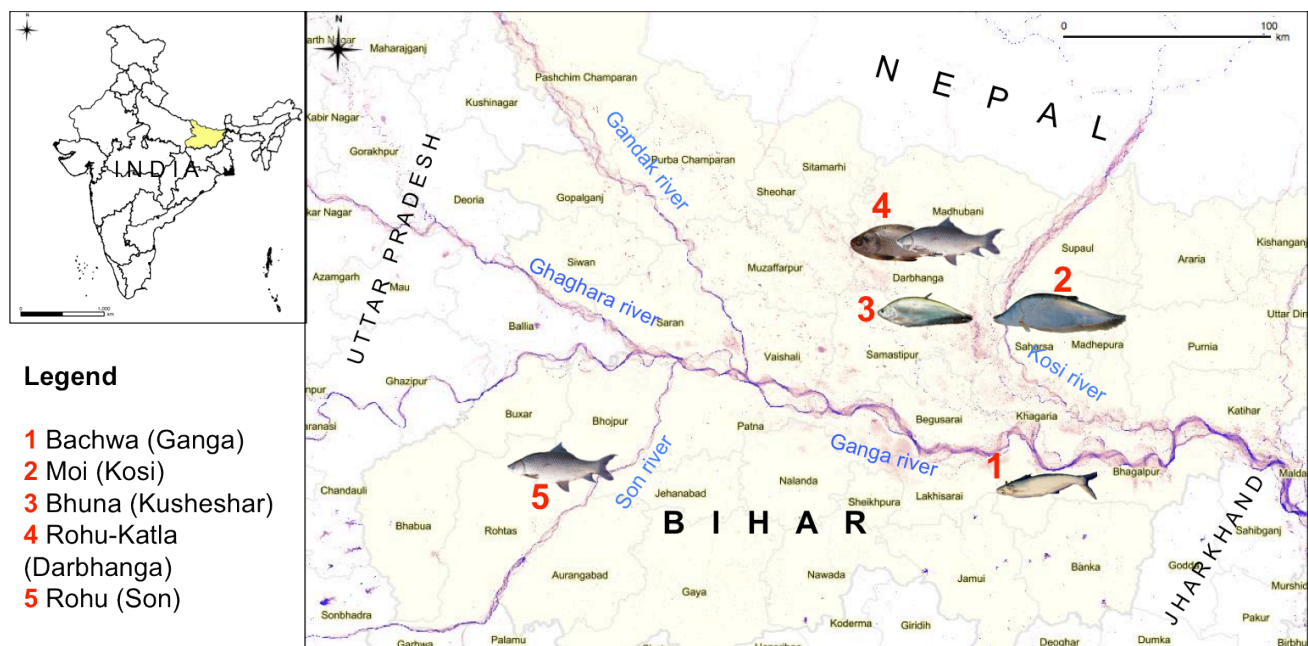
The effectiveness of place branding for value addition and improved pricing of fish species, usually done to benefit small-scale fishers in developing countries, is pivoted on a range of institutional, social, and ecological factors. The recent plan proposed by the Bihar State Department of Animal and Fish Resources has suggested place branding of fish species from different rivers of the Gangetic plains in the state. This plan's motive of bringing direct profits to local fishers is well intended, but needs to account for the fact that in Bihar, riverine capture fisheries are open-access and with weak institutional control, and witness long-term conflicts over access to fishing areas. Importantly, the selection of some fish species for branding and its consequences can threaten endangered biodiversity, such as the Ganges River Dolphin, India's National Aquatic Animal. This report explains in detail why the plan to brand the "Bachwa" fish from the Ganga River, is likely to have potentially damaging effects on biodiversity conservation efforts and fisheries management. We also suggest that the plan for the branding of Bachwa fish should be cancelled. We recommend some alternatives that may be considered in future plans for place branding of riverine fish species.

Introduction

In May 2020, the Bihar State Department of Animal Husbandry and Fisheries Resources proposed a scheme for the branding of fishery catches from different rivers in Bihar's Gangetic plains¹. This branding plan comes on the back of recent policy for branding of makhana, litchi, and honey, which are produced in Bihar. In an important move, a package of INR 10,000 crore for Makhana has also been announced^{2,3}. The stated rationale behind the plans for branding fish species is to provide direct benefits to fishers and fish farmers, enhance incomes, and upgrade and secure value-chains for freshwater fisheries and small-scale aquaculture. For Bihar, place branding of fish species is a novel and bold idea, which is focussed on local market demands and associated benefits to fishers. Under the proposed scheme, catches of five species of fish from specific regions of the state will be branded. These include 1) Rohu-Katla from Darbhanga, 2) Rohu from Son, 3)

Moi from Kosi, 4) Bhuna from Kusheshwar Sthan, and 5) Bachwa from Ganga (Figure 1). Of these, the branding of Rohu (*Labeo rohita*) and Katla (*Gibelion catla*) from Darbhanga, and Rohu from Son is most likely to be for farmed pond fish, and may even be a good idea to boost the incomes and profits of small-scale aquaculture farmers, as the scheme envisions. That leaves the riverine fish species that are to be branded: which include Moi from Kosi, Bhuna from Kusheshwarsthan, and Bachwa from the Ganga. The Moi (*Chitala chitala*) and Bhuna (*Notopterus notopterus*) are featherback species of the family Notopteridae. They also possess characteristics that might enable some sustained production from enhanced fisheries systems (i.e. capture + culture combined). These species are not strictly riverine and have high “culturable potential” (Mitra et al. 2018). The *Bachwa* or *Clupisoma garua* (Siluriformes: Ailiidae) is a common river catfish found across the Ganga River (see Gupta & Banerjee 2016, for information on the species), and the focus of our report’s analysis and recommendations.

Figure 1. Fish species selected for branding in May 2020, in Bihar.



The success of fish branding will be pivoted on acknowledging the many complex social and ecological factors influencing the governance of river-floodplain capture fisheries in Bihar today. In our report, our analysis indicates that the proposed branding plans remain limited in terms of recognizing the importance of: 1) institutional structures and inter-relationships underlying existing capture fishery value-chains, 2) conflicts over fishing rights and access to fishing areas, and 3) potential negative ecological consequences on fisheries and biodiversity in Bihar’s Gangetic plains. First, we review the economic logics and market outlook with regard to value addition through branding of fish catches, in general. We identify some key social, institutional, and ecological drivers that can enable or constrain the success of branding in small-scale fisheries systems in particular.

Second, we show how place branding in Bihar, even with its well-intended aims, still needs to engage critically with some institutional limitations in the governance of “free” river-floodplain fisheries in Bihar. At present, the branding plans seem to focus only on market demand and returns. Third, we show that branding plans need to engage with persistent conflicts over fishing rights and access in Bihar’s river-floodplains. Fourth, we show that selecting “Bachwa from the Ganga” as a place brand would have potential negative consequences on the sustainability and resilience of river-floodplain fisheries, and could weaken the prospects for the conservation of the endangered Ganges River Dolphin, India’s National Aquatic Animal, of which Bihar holds the largest population for any Indian state. Our report primarily concerns itself with these issues.

Value addition, branding, and certifications in capture fisheries of developing countries

In this section, we provide a background to the conventional rationale for branding of fish production, to contextualize the proposed plans. Value chain development and value addition of fisheries products are promoted as market mechanisms to increase fishery revenues, profits, incomes, and social welfare benefits to fishers (Ganesh Kumar et al. 2010). Branding of marketed fish catches, often done with place-based brands on fish species, is a common way of direct value addition, with benefits expected to reach fishers directly (Ganesh Kumar et al. 2010, Ponte et al. 2014, Messely et al. 2014). Branding promotes local competitiveness and allows participating fishers to gain a greater market share (Messely et al. 2014). It can also enhance fishers’ investments to capture particular species or sizes of fish and sell them at assured and regulated prices, with premiums and incentives involved (Wakamatsu & Wakamatsu 2017). With suitable institutional arrangements for effective governance, branding can improve terms of fair trade and connect fishers with markets, capital, and essential services (Grunert et al. 2004, Bailey et al. 2016).

The success of the outcomes and prospects of branding depends on a range of economic, institutional, socio-political, cultural, and ecological factors. However, it is observed in general that the prime mover of branding decisions is a focus on market outcomes, mostly on increasing market demand, but not on building institutional capacity, or social or environmental outcomes (Trienekens 2011, Mol & Osterveer 2015). Branding initiatives attempt to provide fishers with access to capital and services, but often might not recognize the role of informal trade networks, such as fisher-middlemen-trader relations (Allison et al. 2016, Bailey et al. 2016). In developing regions, market value addition mechanisms or branding policies may be implemented without adequate attention to political (local and state-fisher power relations), social (inequality, discrimination), and institutional variables influencing governance of capture fisheries on the ground (Stratoudakis et al. 2015). Small-scale fisheries are often informally or semi-formally managed under open-access regimes, and concerns of access, conflicts over fishing rights, and distribution of fishery benefits are crucial to address (Campling et al. 2012, Messely et al. 2014, Allison et al. 2016). In open-access (free) fisheries, overcapacity and resource rent dissipation are common problems (Homans & Wilen

2000). In such cases, deploying branding policies without adequate attention to institutional capacity can prove complicated and possibly ineffective in terms of social equity (Trienekens et al. 2011, Wentink et al. 2017). This is critical, because economic incentives can alter the nature of fisheries, by transforming “local” and “food-important” subsistence-driven fishery livelihoods into regional and market-driven enterprises (Bush 1996, Feagan 2007). Clearly, there are trade-offs as well as synergies in deciding to upgrade fisheries by balancing food security and nutrition objectives with livelihoods and ecological sustainability (Hall et al. 2012).

Ethical concerns are central to addressing these trade-offs (Hall et al. 2012, Lam & Pitcher 2012). There have been cases where an open-access fishery could move to profitable and well-managed culture fisheries (e.g. see Kluger et al. 2019), but institutional support and community involvement were critical to this transition. Further, aquaculture fisheries may be easier to include in branding and value addition schemes, because of their definite market linkages, higher market share, and well-defined rights, as compared to capture fisheries (Young et al. 1999, Asche et al. 2001). The role of local institutions and community-based governance for fisheries management also matters as much as top-down state or private control (Kosamu 2015, Wentink et al. 2017), especially in developing regions (Allison et al. 2016, Stratoudakis et al. 2015). Apart from markets, institutions, and communities, branding decisions are made based on cultural variables that may sustain market demand and maintain productive fisheries (see Forristal & Lehto 2009). Additionally, in many small-scale freshwater fisheries in Asia, issues of fishing rights and human rights are deeply entwined (Ratner et al. 2014). But there may be a tenuous link between economic benefits that branding might bring to fishers, and the security of fishers’ human rights in terms of protection from discrimination of all kinds.

For many such conjoined environmental and social objectives, certification of capture fisheries has become an allied area of policy interest, and linked to value addition or branding schemes. Certification of fishery products can also promote sustainable fisheries or aquaculture (Bush et al. 2013) by incentivizing fishers towards specific practices. The best-known fishery certification program is that of the Marine Stewardship Council (MSC; www.msc.org), and has also been applied to freshwater lake and river fisheries (e.g. in Sweden⁵). There are divergent views on MSC certification. According to Ponte (2012), the MSC has failed to ensure positive environmental outcomes. The MSC, it is argued, has generated interest for labels than for their relevance. Thus, certification schemes may fall into what has been termed an “Accountability Trap” (Park & Kramarz 2019), where creating accountability measures ends up becoming more important than harnessing the benefits of accountability for efficient and equitable environmental governance. Further, the MSC seems to have certified more large-scale fisheries than small-scale fisheries, even though the latter get represented more in their promotional materials (Le Manach et al. 2020). Thus, environmental branding or labelling, as well as market-oriented branding, may see similar outcomes, where the interest in the “brand” might overcome the actual motivations for the branding.

So far, branding plans for freshwater fisheries in South Asia have been constrained by the low quality of export products, and insufficient supply with seasonally fluctuating volumes (Ponte et al. 2014). For instance, in Bangladesh, branding interventions have mostly been through improvements in fish processing methods (Ponte et al. 2014, Begum et al. 2018). However, many studies found that certification or other value addition schemes have not really changed the scenario where fishers are often exploited due to lack of capital, and asymmetric trader-fisher relations (Bailey et al. 2015). Often, measures taken for certification or branding have involved fishing regulations, which have led to the poorest of fishers may have borne the greatest costs of certifications and labels (Porrás et al. 2017). Thus, market-oriented policies for small-scale capture fisheries in developing countries may not be able to achieve success in terms of sustainable and socially just fisheries development. A holistic approach towards branding holds relevance today, given the growing trend towards branding in regional and national fisheries policy and planning.

Recently, the Central Inland Fisheries Research Institute has discussed MSC certification for freshwater fisheries and pond aquaculture in India⁶. Bihar's announcement of plans for place branding its fish species follows in this broad trend. In terms of precedents, the branding of makhana crop (*Euryale ferox*) production has been an important aspect of discussion in Bihar's development policies. Minten et al. (2012) studied the processes and outcomes of makhana value addition and value chain development in Bihar. For makhana, the success of value addition, branding, and connections of producers to markets and certification schemes depended strongly on institutional governance mechanisms that ensured conditions for secure production (e.g. law and order, property rights, infrastructure, longer leases, etc.). They also found that in the absence of traceability of producers (due to lack of information on brand packing), there were limited mechanisms to ensure quality control and improvements based on consumer feedbacks. But the primary challenges to realize the benefits of makhana value chains to producers were related to institutional limitations and gaps in state support to producers. On a similar track, **we show below that some checks are in order before implementing the proposed branding plans for fish.**

Problems with place branding of riverine fish in Bihar

Bihar's riverine fisheries are "open-access"

Bihar follows a scheme for free fishing or "*nishulk shikaarmahi*" in flowing waters across the state, vide fisheries department notification 39191/892 dated 22nd April 1991, through which fishers fishing in flowing waters of rivers, are exempt from paying any fees or revenues to the state. Under this scheme, fishing in the main channels of rivers, side-channel inlets called *kol*, and floodplain impoundments or *dhab*, is permitted free for all. This scheme is of great significance in its history – as it came in response to a long-fought social movement by fishers in Bihar in the 1980s⁷. Fishers demanded that the state put an end to the practice of *Panidari* or privately owned fisheries on river *jalkars* (leased fishing areas) and make the river free for fishing to all traditional and marginalized

fishing castes (details in Choudhary et al. 2014, Kelkar 2014). Under the prevailing *Panidari* system, a few landowning families held proprietary rights to fisheries, as per grants received in the Mughal period, of which the most incredible example existed on the Ganga River in the Bhagalpur district. In 1991, the then state government of Bihar granted free fishing access to fishers in all rivers, community rights were not settled as per locality of fishing areas and fisher settlements. This essentially left the river fisheries in a common pool resource regime, with almost no barriers to entry into and exit from river fishing. As the new free regime does not contribute revenue to the fisheries department, fishery department officials are usually not engaged with fiscal channels in riverine fisheries (Narayanan 2016; authors' own observations). The main intervention of the fisheries departments and divisions in riverine capture fisheries is to allocate auction-leases to contracting bidders for *jalkars* inside floodplain inlets. The duration of these leases has been one year, though it is going to be increased soon. Apart from this involvement, the prime focus of the department is on pond-based aquaculture fisheries. Cooperative members can bid for fishing rights in ponds where fish can be cultured and harvested. Cooperatives have enjoyed some success in managing aquaculture fisheries, according to the diverse schemes running under COFFED-Bihar. However, **the effectiveness of cooperatives regarding matters of riverine capture fisheries has been highly limited. In this situation, it is difficult to imagine how the proposed place branding for river fish species may or may not work. In the existing free fishing regime, the new incentive of higher prices could cause a sudden spurt of individual investments in fishing effort and competition, with potentially negative consequences for fish stocks.**

Institutional limitations and conflicts over fishing rights and access

Although river fishing appears free for all at first glance, the ground reality is that the control of river-floodplain fisheries by anti-social elements, through crime-based means, has been increasing (Kelkar, 2018). Fishers living by the river fish under constant fear of locally powerful 'bosses', who claim fish under their territories and also advance contractors who obtain leases to inlet *jalkars* (leased fishing areas) every year for intensive fishing. In many areas of the Ganga river-floodplains around Bhagalpur, Munger, and adjoining upstream and downstream areas, organized gangs control fisheries (Kelkar 2014). This has been a serious issue that has seen numerous cases of physical assault and murder of several fishers since the 1980s, and has also been well documented (Sharma 2006). **Fishermen fishing in these areas, mainly due to the locations of their settlements, often have to pay rents to these bosses and gangs to access fishing grounds, even in a 'free fishery'.** In this conflict-prone environment, how does branding of fish fit in? In some cases, access of fishers to markets and the nature of fishing practices (usually fishing by mosquito nets, seines, etc.) are also influenced by the presence and patronage of mafia gangs. Additionally, a general and consistent trend of stock depletion of riverine fish may have intensified competition between different groups trying to control fisheries, according to fishers along the

Ganga. Therefore, **many gangs are further pressurizing the system by supporting intensive fishing. We therefore submit that branding incentives are likely to inadvertently end up legitimizing the control of such groups and affect the core principle and rationale of the branding scheme, which is that of ensuring direct benefits to fishers.**

Existing markets, supply chains, and fisher-trader relationships

River fishers typically sell daily catches directly to local or nearby town markets, or sell to retail vendors, who sell catches further to town markets. From the town markets, fish catches are sorted and supplied to regional wholesale or hub markets such as Siliguri, Maldah, Farakka, or Kolkata (with Siliguri being the major sink). **We have seen that fish markets (retail and wholesale) have become increasingly fragmented in the last 20 years.** Market fragmentation has occurred due to the expansion of infrastructure and connectivity (urban sprawl and road networks). In addition, it has been due to conflicts between different groups of fishers using gillnets on the one hand, and mosquito-nets and fish traps on the other (see Kelkar 2018 for details). Due to these trends, new fish collection marts and despatch points are rapidly emerging along river-floodplains. This is a marked departure from earlier days, when all catches would converge at local wholesale markets and despatched to regional hub markets by fewer traders (especially to Siliguri, Farakka, Maldah, Murshidabad, and Kolkata). **With the boom in new marts, implementation of branding and pricing plans is likely to become difficult, especially as market information becomes more imperfect. How branding would sustain or develop an increasingly scattering fish trade supply chain is an open question.**

With the splitting of markets, we see local power players, including both powerful gangs, contractors, and traders, making investments by lending money to local fishers, for family matters, occasional ceremonial functions, to purchase nets, or repair boats, or use it for other fishing-related tasks. Usually, these amounts are loaned against high interest rates, which cause high indebtedness among fishers to lenders. Already under debt, river-based fishers may be suspicious of entering contracts with new government schemes, where direct benefits to fishers may cause conflict with lenders, and even increase indebtedness if lenders appropriate the market channels to supply branded fish, at the cost of fishers' direct incomes and benefits.

Why branding of “Bachwa from the Ganga” can have potentially damaging effects on biodiversity conservation

Place branding in relation to river fish supply and consumer demand profiles in Bihar

Along the Ganga in Bihar, the name Bachwa commonly refers to the Ailiid catfish *Clupisoma garua* (also called Gehrua Bachwa). The term Bachwa is generic and may also be used for related species like *Eutropichthys vacha* (Sugwa Bachwa). *Eutropichthys* is believed to be good for eating,

but *Clupisoma* is at best an average fish for the common buyer. So the **inclusion of the Bachwa for place branding does not seem to be based on any particular culinary or cultural preferences that might trigger major demand**. If we look at the consumer segments within Bihar and in adjacent regions, Bachwa is eaten in Bihar with a lukewarm level of preference at best, but treated as a low- or medium-quality fish in West Bengal and Assam, where the biggest demand for Bihar's river fish exists today. **Bachwa is also not much preferred in dried fish markets in Bengal or Assam. So, it is not clear how place branding and value addition might help change demand profiles.**

At present, about 60% of river fish catches in Bihar are marketed to wholesale centres like Siliguri and Kolkata, from smaller local markets. In Siliguri, the demand is particularly high for small-sized fishes, which come from mosquito nets, seine nets, and small gillnets, and also for larger fishes captured in gillnets. Small fish are sold both in fresh fish and dried-fish markets. It is an important low-value chain that is poorly acknowledged. The remaining 40% or so are locally purchased and consumed. River carps and carplets (e.g. *Cabdio*) remain the most preferred, followed by species such as *Chitala chitala* (which has also been selected for branding in Bihar), and large catfishes *Sperata* and *Wallago*. Among catfishes, oil-rich species (*Wallago*, *Rita*, *Eutropichthys*, *Clupisoma*) are preferred by specific consumer segments, especially by Muslims and some Bengali consumers, in addition to major carps.

Potential effects of branding on fisheries production, sustainability and resilience

Our own long-term monitoring data on catch and effort of Bachwa for almost 20 years, from Bhagalpur and Kahalgaon (see Dey et al. 2020 for details), show some interesting trends.

Importantly, *Clupisoma* yields do not show any clear trend of increase or decrease over the last 20 years, but *Eutropichthys* yields have reduced (Figures 2-3). Yield fluctuations of both species also seem to closely track the strength of river flood-pulses (Figure 3). We also find that **inflation-corrected prices** for *Clupisoma* and *Eutropichthys*, at **an inflation rate of 3.61%** on fish within food consumer price indices, **have remained stable from 2010 to 2017-18**. This trend is consistent with the relatively stable seasonal catches of both species. From these observations, we predict that place branding of *Clupisoma garua* is likely to lead to significant increases in selling prices per kg to fishers from both wholesale and retail markets. **Size-dependent selling prices of summer catches (INR 200-270 per kg) are significantly higher than post-monsoon catches (INR 80-170 per kg).**

Modifications in fishing behaviour, with competitive price premiums and value addition becoming accessible to fishers, might lead to overcapacity as well as targeted single-species fishing. This can become a problem, because river-floodplain capture fisheries of the Ganga are multi-species, multi-gear fisheries. **Studies have demonstrated that higher diversity of fish species improves catch returns per fisher, in open-access fisheries, as opposed to single-**

species regulated fisheries (Kasulo & Perrings 2005). In multi-gear and multi-species capture fisheries, the **diversity of catches can buffer fishermen's incomes against environmental uncertainties and market fluctuations** (Robinson et al. 2020). Multi-species fisheries switching to single-species target fisheries might see short-term increases in profits or incomes, but also face negative impacts on stocks and yields. Such a transition can negatively affect the situation in Bihar's open-access fisheries if brand price incentives increase for particular species through branding. This calls for focusing equal attention on low-value for direct benefits to producers in tropical fisheries, and not just on high-value species in regional markets (Béné et al. 2010). For example, Thanh Loc et al. (2010) demonstrate that for the most marginalized fishers in the Mekong Delta, **low-value chains are more stable and less vulnerable to market fluctuations, even though they provide low incomes**. On the other hand, high-value chains yield higher, but very uncertain incomes to fishers. So, diversified low and high-value chains and trade need to be secured in tropical river-floodplain fisheries (Thanh Loc et al. 2010).

Figure 2. Total monthly yields of *Clupisoma garua* (Gehrui Bachwa) and *Eutropichthys vacha* (Sugwa Bachwa) from Bhagalpur landing and market areas (2000-2020). *Clupisoma* shows stable yields, with a major increase in yields in 2016-17, while *Eutropichthys* shows a decline.

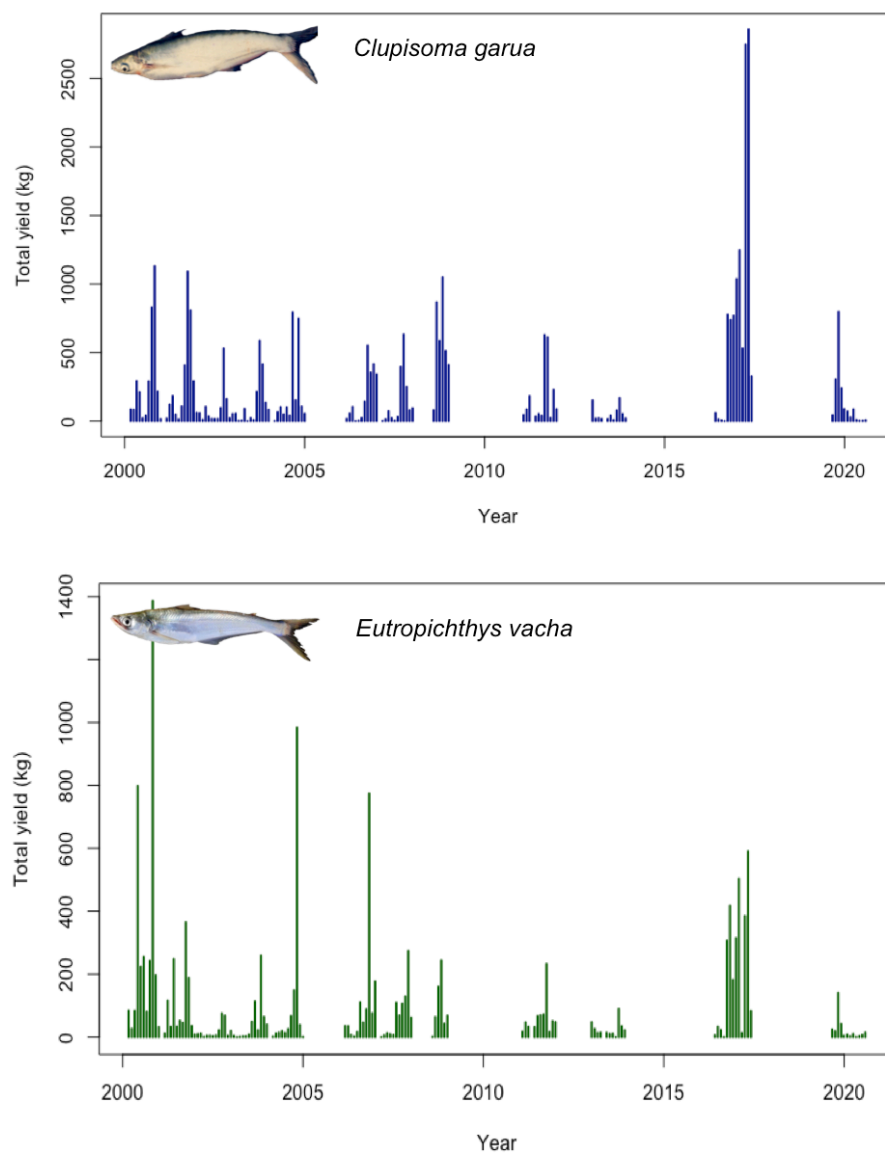
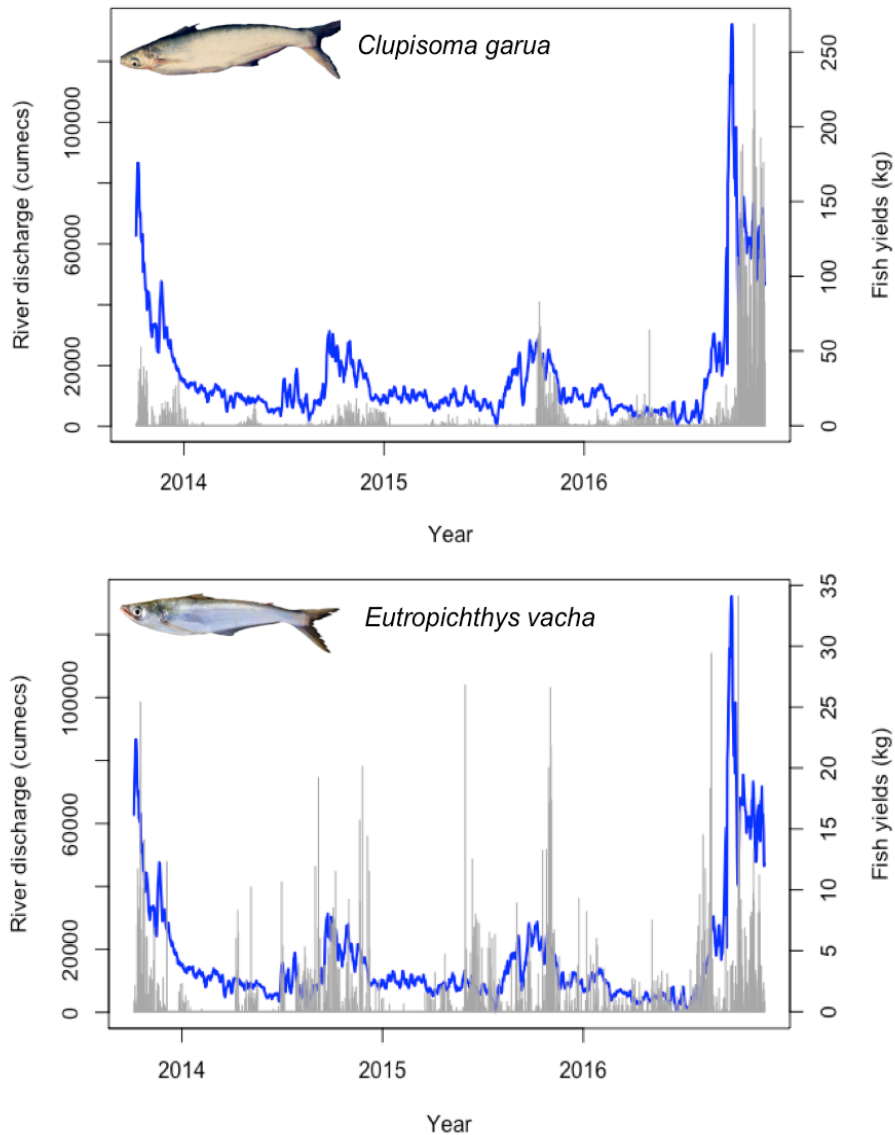


Figure 3. An index of daily total yields (gray bars) of *Clupisoma garua* and *Eutropichthys vacha* sold at the Kahalgaon market, Bhagalpur district, Bihar, between 2013 October and 2016 October. *Clupisoma* catches responded positively to the flood-pulse of river discharge (blue lines) in 2016-17. In contrast, *Eutropichthys* catches did not track the flood-pulse so closely.



Negative impacts of branding *Bachwa* on the conservation of Ganges River Dolphins

The *Bachwa* is fished with bait made from oil extracted from the blubber of the endangered Ganges River Dolphin (India's National Aquatic Animal), of which Bihar has the largest population (c. 1600), according to the Bihar Dolphin Census Survey conducted in 2018-19. The *Bachwa* is the prime target of this oil-bait fishery, which is a profitable but illegal method that continues to remain in use by fishermen in Bihar and elsewhere. In spite of the legal ban on hunting or killing river dolphins, the practice of oil-bait fishing continues in clandestine ways

and modified forms (Kolipakam et al. 2020). In the last two decades, targeted hunting of river dolphins in Bihar has likely reduced due to conservation outreach and a reduction in the number of active fishermen over the years (see Choudhary et al. 2006, Kelkar & Krishnaswamy 2014). However, accidental bycatch mortality in gillnets set by fishers still remains a non-trivial threat (Kelkar 2015, Kelkar & Dey 2020; see Image 1). With no sustained incentive to report such mortality to wildlife or fishery authorities, fishers often “salvage” the carcasses of entangled dead dolphins to retrieve blubber oil (Sinha 2002). In the post-monsoon period, the oil works as highly efficient bait when mixed with goat fat and other offal, to harvest large catches of Bachwa (details in Choudhary et al. 2006; Image 2). **These catches are made by dropping dolphin oil in the water along with the offal bait, used with hooks and lines** as well as by smearing on gillnets, although the latter practice is rarer (Image 2). Catches on hooks and lines can easily be up to 30-40 kg per boat in this time, for an operating time of 2-3 hours.

In the lean season, unusually high catches of Bachwa are landed occasionally, which raises the suspicion of dolphin oil being used in off-season periods, to ensure high catch (Figure 4). Yields of *Clupisoma* peak during the post-monsoon months of October and November (Figure 4). Seasonal variability and heterogeneity in fish production might cause end-user volatility in demand and can affect optimal branding returns (Grunert et al. 2004). Ironically, fishers may be able to overcome seasonal variability by resorting to illegal and anti-conservation practices. During October and November, fishing is predominantly done with hooks and lines, and at this time the illegal practice of using dolphin oil with offal bait is common. Anomalous high catches during spring and summer (Feb-April) might indicate illicit use of dolphin oil by fishers desperate for high catches. Due to the difference in selling price, sustained returns on branded Bachwa could be realized just with the use of dolphin oil. This could become a nightmare for river dolphin conservation.

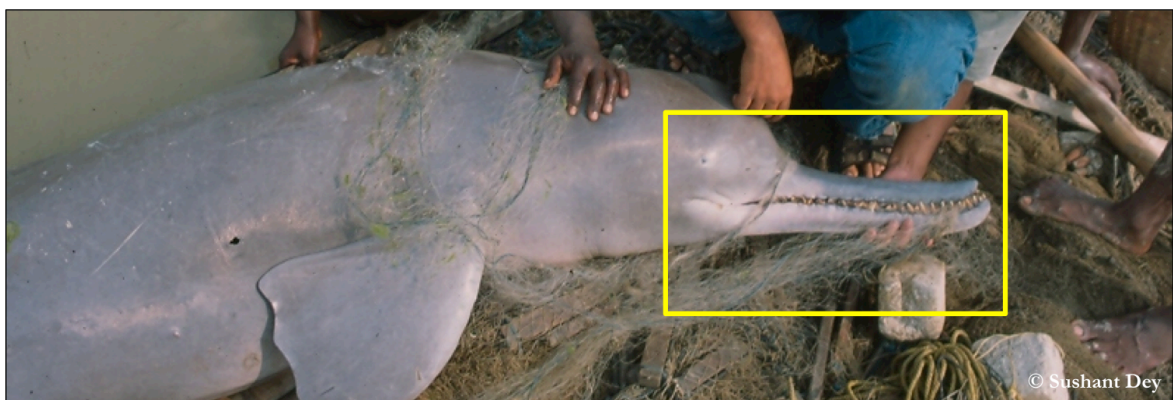


Image 1. Mortality due to bycatch, i.e. net entanglement in fishing nets, is one of the primary threats to the future survival of Ganges river dolphins. The yellow box shows the snout of an adult Ganges river dolphin entangled in a fishing net. This image was captured in 2006 at Bhagalpur, and is shown here for representational purposes only. Photo credit: Sushant Dey.



Image 2. The process of capturing Bachwa fish with the use of oil-baited hook-lines. (a) The setup of a fishing boat at Kahalgaon in Bihar fishing for Bachwa, which peaks in October-November. (b) Oil-bait prepared with chicken and goat offal is seen in a pot kept on the fishing boat. (c) Dolphin oil is dropped into the river along with the bait to attract Bachwa. (d) Hook-lines, or (e) gillnets are deployed near the oil-bait dropped, to capture the Bachwa fish coming to feed on the bait. (f) Bachwa catches in a fish marker. Photo credits: Nachiket Kelkar, Sushant Dey, Subhasis Dey. Fishers' face photographs are masked to retain their anonymity.

Higher price returns will likely encourage more targeted fishing of the species so that high catches are ensured. This can increase hook-line fishing for *Clupisoma* as compared to gillnets, and cause potential overharvesting, especially if dolphin oil is used. This can trigger a higher demand for dolphin oil through clandestine and informal trading networks between fishers, especially along the eastern Bihar-Jharkhand-West Bengal region, where dolphin oil extraction and trade is already common (authors' observations; and see: <https://www.conservationindia.org/articles/trade-in-dolphin-oil-and-body-parts-in-central-west-bengal>). In the absence of monitoring in most places, branding of Bachwa could even lead to greater targeted killing of dolphins for oil, and greater salvage of dolphins accidentally dying in gillnets. Fairly efficient alternatives to dolphin oil have been proposed since the 1990s (Mohan & Kunhi 1996, Sinha 2002), but their overall uptake by fishers is not known or even monitored (Kolipakam et al. 2020). Some fishers shared with us that even if they used fish scrap oil, or cod or shark oil, which have been suggested as alternatives, they would still have to add a little dolphin oil for the best catches of Bachwa. Thus, even with the use of alternatives, the use of dolphin oil may not completely stop. **Reports from fishers that we have heard, from the Bhagalpur region, suggest that catches obtained from dolphin oil are usually higher than with fish oil. In the last 20 years, no clear trends in catches obtained by the use of dolphin and fish oil are evident** (Figure 5). In all probability, the use of a combination of dolphin oil and fish oil (and also dalda and vegetable oil) to capture Bachwa and Sugwa fishes continues.

These changes could potentially undermine the conservation efforts for river dolphins in Bihar so far, that have managed to control, if not halt, targeted killing of river dolphins. Such undesirable shifts could aggravate conflicts between biodiversity and fisheries. They could also dent hope for meaningful involvement of local fishing groups in effective conservation awareness and outreach, and the continuity of incentives to foster honest reporting of bycatch mortality cases. Ultimately, these cascading impacts could threaten the survival of the Ganges river dolphin (India's National Aquatic Animal). In regions like Bhagalpur, these impacts could exacerbate existing tensions between fishermen and the forest department, over fishing rights and restrictions around the Vikramshila Gangetic Dolphin Sanctuary, a 65-70 km stretch of the Ganga River within the district (see Choudhary et al. 2006, 2014, Kelkar & Krishnaswamy 2014, Kelkar 2018). **With the above problems, the selection of the Bachwa fish for branding will be out of sync with biodiversity conservation efforts, which can undermine responsible capture fisheries management. Ecological considerations are vital here, and must be integrated into the proposed branding schemes.**

Figure 4. Monthly variation in yields of *Clupisoma garua*: the species is mostly caught during the post-monsoon season. Anomalous high catches in the dry-season (January to April) are very likely to be catches made with dolphin oil-bait.

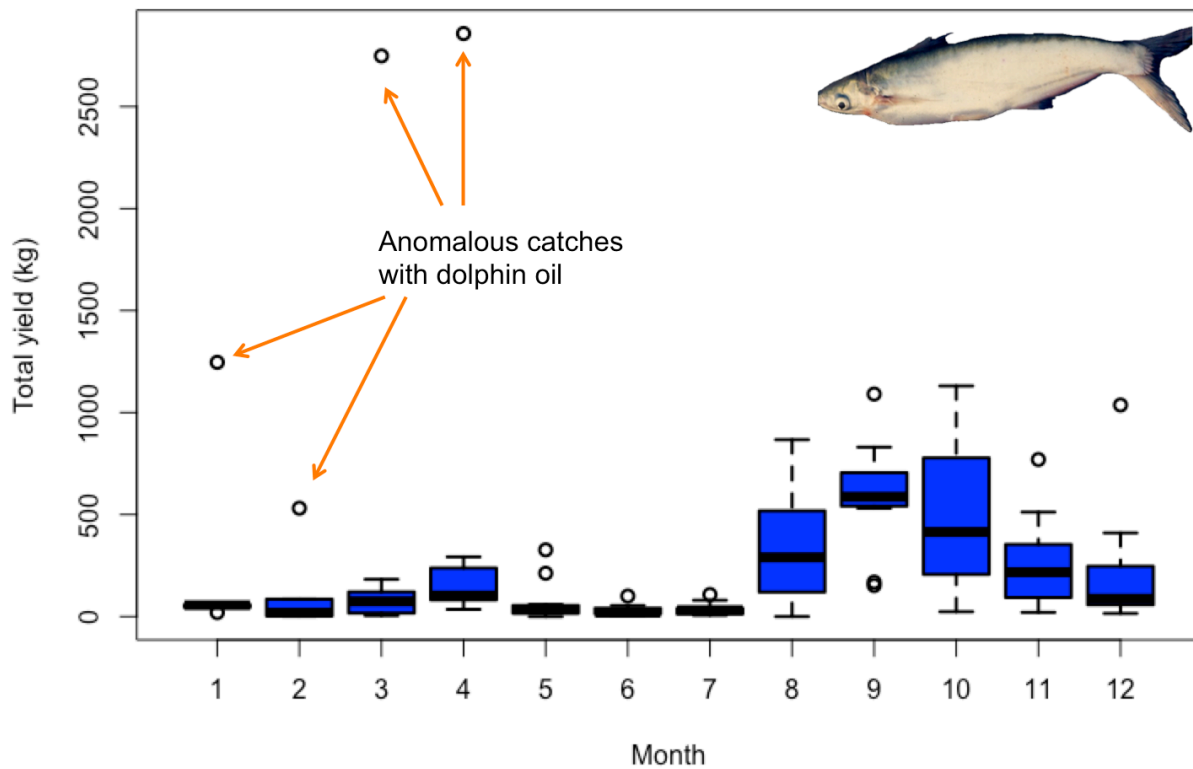
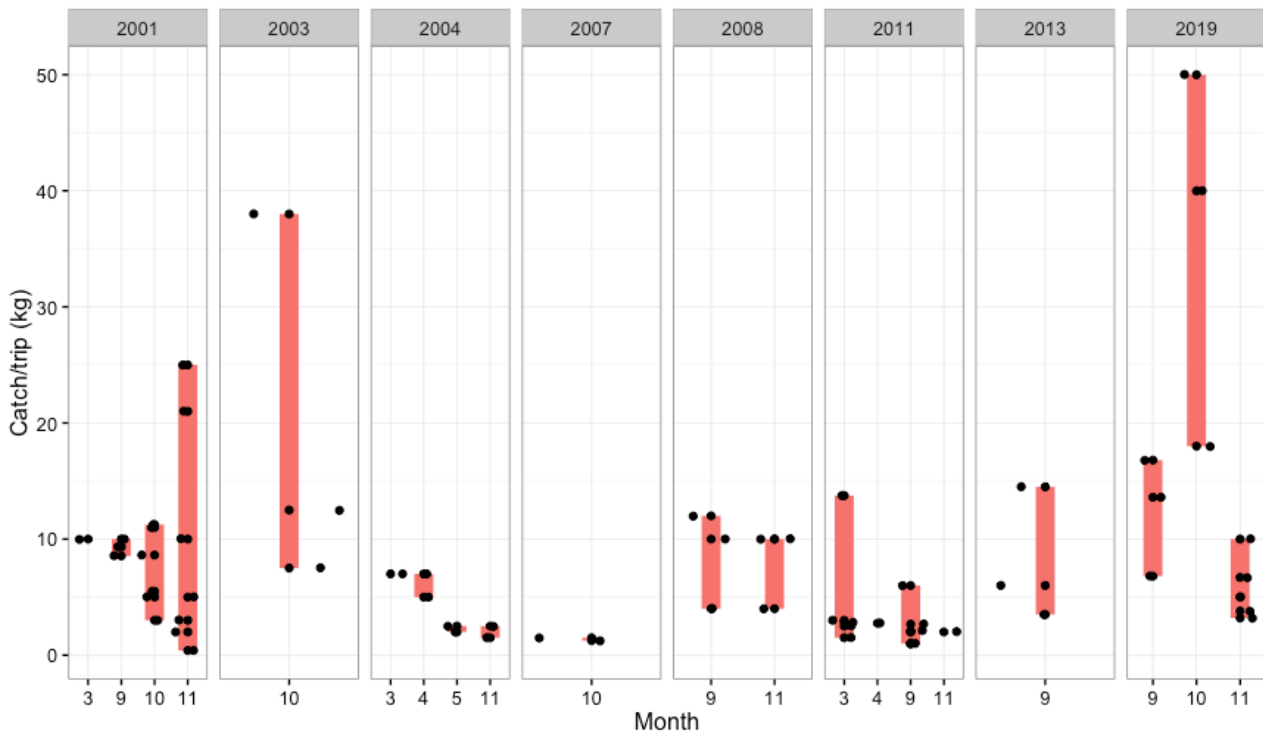


Figure 5. Trends in catches obtained by using dolphin oil and fish oil (usually used as a mixture) from 2001 to 2019 (authors' own data). From 2004 to 2011, it is likely that, either use of dolphin oil reduced, or became more clandestine and hidden. But we are sure that the use of fish oil picked up at this time, which might have led to a slight reduction in catches. Overall, major fluctuations are seen and it is not possible to ascertain that use of dolphin oil has actually reduced.



Conclusions, Alternatives, and Ways Forward

Our above observations and analyses raise important questions about the recent place branding plans by the Bihar government, given the institutional, political, and ecological contexts in which riverine capture fisheries are currently located. First and foremost, protracted conflicts in an free fisheries in river systems, with contested or undefined rights, do not seem to provide an enabling situation to optimize the benefits of place branding. We suggest that the state department focus attention on strengthening local institutions for community-based and cooperative fisheries development in riverine capture fisheries. We discuss place branding a little further in terms of the alternatives that may be available in the later section, by discussing opportunities and challenges involved in realizing the transformative potential of value addition for fisher beneficiaries. **From our ecological observations and predictions, we submit that the proposed place branding of “Bachwa from the Ganga” should be cancelled.** We suggest some alternative ways of value addition to the plans currently proposed by the Department of Animal and Fish Resources, Government of Bihar.

Strengthening local institutions for co-management of riverine capture fisheries

Fishery cooperatives are present across all administrative blocks in Bihar, but a range of factors has affected their efficient functioning (Narayanan 2016). With the emerging success of the COFFED in recent years, several schemes have been announced for pond-based fish culture, but precious little is there for capture fisheries in rivers. Co-operative management, we suggest, deserves an effort on part of district- and block-level fisheries departments to reach out to riverine fishers to discuss models that could support greater livelihood security along with benefits from market links (Foley & Havice 2016). In short, it is necessary to build the plinth before erecting the column. The present state of free fishing in rivers may not be sustainable or even socially just future for fishing communities in Bihar. At the ground level in Bihar's river fisheries, there is a great deal of pessimism and risk from controlling gangs, which have caused a systematic and continuing exit of fishermen from the fishery, with many having left even permanently. For the remaining fishers, there is severe desperation. So, even with an overall reduction in the number of active net-using fishing boats, the concentrated effort invested in nets in particular localities has intensified. More importantly, practices used in capture fisheries in Bihar's rivers are becoming increasingly sedentary, with the number of stationary and passive traps and shore-set gears growing, accompanied by a rapid decline in larger nets. These changes merit attention and engagement by the state machinery with the issue of riverine capture fisheries.

Acknowledging conflicts over fishing rights and access

Securing use and livelihood rights of fishers working in river systems needs to become an integral part of future management. At present, the demand for rights has dimensions of identity politics over caste and traditional entitlements to fish. Unfortunately, these demands may be difficult to translate into real benefits for fishers, or for the river and its biodiversity. It is crucial at this juncture that the insecurity in fishery-based livelihoods is acknowledged and addressed before schemes such as place branding of river fish species are initiated. Radical policy reform is needed to create a secure space for fishers to realize their rights without fear or corruption involved.

From challenges to opportunities: ideas for socially and ecologically sensitive branding

There is opportunity if place branding is implemented with the right institutional structures, market networks and support systems, and environmental/ecological safeguards, to rekindle a revival of fisheries in Bihar's rivers. If fishermen are able to accrue high value from the capture of a few assorted branded species, will they return to the river to fish, with some optimism? We believe, based on the last 20 years of our observations, that there is scope to encourage fishers to invest more, but in the right kind of fishing – where responsible biodiversity conservation is prioritized, and multi-species fish catches at optimal lengths are favoured. Species-specific, season-specific, and length-specific fishing rules can help avoid wanton capture of breeding fish as well as juvenile fish.

In this regard, branding should incentivize multi-species fishing with sustainable practices that also maximize productivity without affecting fish yields or stock status, and not single-species fishing. These changes will be in the interest of overall stability of yields and returns to fishers.

An out-of-the-box approach is needed where, if they must, local fisheries departments should identify variable and seasonal targets for branding. We can imagine a system of branding where the consumer is certain that the fish catch has been produced in a secure space without any threat to the fishers involved. This can constitute socially sensitive branding, wherein the fish supply chain, from the net to the plate, involves no injustice, and well-defined rights to fishers. The proposed scheme for place branding will remain too idealistic without realizing these aims. Our alternatives need to be radical to move policy planning towards some new possibilities. We suggest that if we move towards value addition for “ethical fisheries” (Lam & Pitcher 2012), riverine fisheries will automatically attain its real value and true potential. The concept of ethical fisheries is wide-ranging. It includes both ecosystem justice, e.g. precautionary management, adaptive management, fishing with practices fostering biodiversity conservation and environmental preservation; and social justice, e.g. participation and access to collaborative decision-making processes and democratic local institutions, economic equity, social dignity, and compensations and penalties for socio-environmental costs suffered (Lam & Pitcher 2012).

On the ecological side, we believe there is great opportunity to use eco-labelling approaches for value addition, than the presently ad hoc selection of species for place branding. Eco-labelling approaches have been under discussion in India, and the CEBPOL-NBA (2018) offers a nice potential framework for aligning biodiversity conservation and fisheries management goals. The recent policy push towards the Sustainable Development Goals can also be helpful. Even though the SDGs do not explicitly include freshwater fisheries, they include clean water and sanitation (SDG 6), and secure livelihoods, which can be values of small-scale riverine fisheries that can be enhanced. Bihar’s rivers are in a relatively better state than anywhere else in the Gangetic plains of India, which offers it a chance to invest more thinking for eco-labelling capture fisheries production. Eco-labelling could even convert the place-branding plan for species like Bachwa from a threat to an opportunity for dolphin conservation. For example, **brand value addition or premium pricing could be for Bachwa caught without the use of dolphin oil, or strictly with the use of alternative fish oil, which can incentivize fishers to move away from its use. Bachwa caught by dolphin oil, on the other hand, needs to be devalued.** This kind of devaluation will depend on testing fish samples for dolphin oil before they are put up as a brand on the market, for which systematic monitoring protocols for catches of Bachwa will be needed. Such changes can help diffuse the concentrated fishing effort on Bachwa, and also reduce cases of poaching or salvage of oil from carcasses of Ganges river dolphins entangled in nets.

Realizing the maximum value of fish through branding: cost and price regulation issues

At present, the costliest river fish in Bihar are, going by the size-based pricing of large-bodied fishes, Aria (*Sperata* spp.), Moi (*Chitala chitala*), Rehu (*Labeo rohita*), Katla (*Gibelion catla*), Buari (*Wallago attu*), and Popta or Pabda (*Ompok* spp.). Of these, only Aria and Moi show relatively stable yields, while the others are either in decline or fluctuating rapidly (authors' own data). Some costly species like the catfish *Rita rita* are too localized to be widely marketable. The price range of these species, as per size, goes from INR 200 to 700 per kg. *Macrobrachium* shrimps are also part of this segment. The second rung of pricing includes most other catfishes: *Eutropichthys*, *Ailia*, *Mystus*, etc. fall in this range (INR 150 to 350).

We suggest a “cluster of species” approach that may fit well for ecologically low-impact branding. These include an assortment of the high-value species mentioned earlier, along with low- to mid-value fish species such as Pihor (*Cabdio morar*), Palwa (*Mystus*), Sutri (*Ailia*), and even Bachwa (*Clupisoma/Eutropichthys*) that are still fished in fair abundance in the Ganga. They are also preferred eating across a wide consumer base, but also with fairly stable stocks in the Ganga, and consistent market demand. Other potential candidates could have been Buari (*Wallago*) and Aria (*Sperata* spp.), and Kalbous (*Labeo calbasu*), which are high-value species and may be declining to a small extent, but are still fairly stable in yields, barring a decline in adult sizes. For high-value species in particular, fishing of optimal mid-range sizes of just matured fish needs to be incentivized through branding and legally supported, to protect both juveniles and breeders.

Ecologically sensitive branding of small-sized but preferred fish species will not only ensure sustained catches of these resilient fishes, but also confluence with important objectives of rural nutrition. Small Indigenous Food Fishes (SIFFs) are thought to be an important contributor to rural food security and nutrition, as per numerous CIFRI studies. At the same time, however, these SIFFs are caught mostly in fishing nets declared illegal by the Bihar Fisheries (Jalkar) Management Act (Kelkar & Dey 2020). This is a contradiction that needs to be worked to an advantage. If SIFFs are harvested near-maturity to protect immatures and breeding SIFFs, then existing market sinks, especially in West Bengal and Assam can yield higher value addition to SIFF producers in Bihar.

In conclusion, we reiterate that the scope for place branding is not non-existent, but needs creative and thoughtful ideas so that such branding is socially and ecologically sensitive, and not only planned based on market demand. We show the need for a closer look at the current state of institutions that can be enabled for effective fisheries governance, acknowledgment of current conflicts and gaps in fishing rights and access in riverine fisheries, the increasing threat of criminal control on river fisheries, and the impacts of sudden switches incentivizing targeted fishing of single species on fisheries sustainability, resilience, and biodiversity conservation. **We emphasize the need for interaction and regular dialogue between state departments and associated functionaries to carefully revisit the currently proposed place branding schemes for river fish in Bihar.** A summary of our recommendations is presented on page 20.

Summary of recommendations regarding branding plans for river fish species in Bihar

1. Bihar's river floodplain fishes are in a relatively better state than any other state in the Gangetic plains of India, and therefore, **eco-labelling, certification, and value addition for multiple river fish species, especially low-value and small indigenous fishes that provide consistent catches**, must be considered. **Some alternatives to the proposed species for branding have also been suggested.**
2. Bihar's rivers are fished under the "free fishing scheme", due to which it is difficult to ensure institutional controls on the impacts of branding of river fish. Due to the free access to fish, it is also seen that in many areas, contractors are able to alienate river fishers by force and usurp fishing areas with the help of local gangs. Such a situation can be adverse to the returns and benefits to fishers, from the proposed branding scheme. Therefore, **stronger and local co-operative and community-based institutions need to be set up for the effective governance and regulation of fishing effort, which can allow in sustainable, equitable, and responsible fisheries.**
3. Presently, fishery laws have minimum mesh size restrictions, which make the capture of many small fish species illegal. Here, there is scope to include more nuances with respect to fishery regulations. In this regard, **season-specific, length-specific, species-specific, and gear-specific restrictions on the capture of riverine fish need to be developed as fishing rules**, under the present Bihar Fisheries (Jalkar) Management Act, 2006, and under the section "Conservation of Aquatic Biodiversity" in the draft Fisheries Policy, 2015, with new amendments to the effect.
4. Bachwa catfish is often caught with the use of oil, which is extracted from the endangered Ganges river dolphin. Unfortunately, despite being illegal, this practice continues to be common, if not as much as before. Branding plans would increase the price of Bachwa, which might lead to more fishers resorting to this practice, to get higher catches. Therefore, **we suggest that Bachwa be removed from the list of species proposed for branding.**
5. If Bachwa must be included, eco-labelling approaches should be considered, whereby **Bachwa captured without the use of dolphin oil should be incentivized and given price premiums, whereas any Bachwa found to be captured with the use of dolphin oil should be devalued.** Accordingly, systematic monitoring protocols should be established. This can go a long way in reducing the threat of poaching and bycatch mortality and trade of Ganges river dolphin oil, and help in the conservation of this endangered species.

Notes and Links

1. News of Bihar's plans of place branding fish. <https://www.livehindustan.com/bihar/story-bihar-will-brand-rohu-katla-bachwa-and-moi-fishes-to-increase-demand-in-other-state%2040%20lakhs%20People%20Will%20Get%20Benefit-3221026.html>
2. https://hindi.news18.com/news/bihar/patna-government-of-bihar-will-brand-fish-quality-of-rohu-katla-bachwa-and-moi-fishes-to-sale-it-in-other-state-also-bramk-3124153.html?utm_source=social_share_article
3. <https://zeenews.india.com/hindi/india/bihar-jharkhand/branding-of-makhana-is-a-boon-for-bihar-1-lakh-crore-agricultural-package-sanjeevani-for-farmers-said-mangal-pandey/681919>
4. <https://www.newindianexpress.com/nation/2020/may/20/people-involved-in-makhana-production-hoping-to-see-better-days-in-bihar-2145671.html>
5. <https://www.msc.org/media-centre/press-releases/small-scale-swedish-freshwater-fishery-gains-international-recognition-through-msc>
6. India has only one example of a MSC-certified fishery, the Ashtamudi wetland in Kerala. Also see: <http://cifri.res.in/art246.html>.
7. Ganga Mukti Andolan. For details see Sharma (2006) and Kelkar & Krishnaswamy (2014).

References

- Asche, F., Bjørndal, T. & Young, J.A. (2001) Market interactions for aquaculture products. *Aquaculture Economics & Management*, 5:5-6, 303-318.
- Bailey M., Bush S., Oosterveer P., & Larastiti L. (2016) Fishers, fair trade, and finding middle ground. *Fisheries Research*, 182, 59-68.
- Begum, M., Sabur, S.A., Molla, M.M.U., & Barua, S. (2018) Value chain analysis of captured fish: a case of Dekhar Haor of Sunamganj district in Bangladesh. *Bangladesh Journal of Agriculture*, 41-43: 49-69.
- Béné, C., Lawton R., & Allison E.H. (2010) "Trade matters in the fight against poverty": narratives, perceptions, and (lack of) evidence in the case of fish trade in Africa. *World Development*, 38, 933–954.
- Bush, S.R. (1996) Scales and sales: changing social and spatial fish trading networks in the Siphandone fishery, Lao PDR. *Singapore Journal of Tropical Geography*, 25, 32-50.

Bush, S.R., B. Belton, D. Hall, P. Vandergeest, F. J. Murray, S., Ponte, P. Oosterveer, M. S. Islam, A. P. J. Mol, M. Hatanaka, F., Kruijssen, T. T. T. Ha, D. C. Little, R. Kusumawati. (2013) Certify Sustainable Aquaculture? *Science*, 341(6150), 1067-1068.

Campling L., Havice E., Penny M., Howard C., & Campling L. (2012) The political economy and ecology of capture fisheries: market dynamics, resource access and relations of exploitation and resistance. *Journal Of Agrarian Change*, 12, 177–203.

CEBPOL-NBA (2018) Mainstreaming biodiversity: inland fisheries and aquaculture: a key for food and nutritional security. Centre For Biodiversity Policy And Law, National Biodiversity Authority, Chennai, India, 42p.

Choudhary, S.K., Dey, S. & Kelkar, N. (2014) Locating fisheries and livelihood issues in river biodiversity conservation: Insights from long-term engagement with fisheries in the Vikramshila Gangetic Dolphin Sanctuary riverscape, Bihar, India. Proceedings of the IUCN Symposium on Riverine Biodiversity, Patna, India, 30 p.

Choudhary, S.K., Smith, B.D., Dey, S., Dey, S. & Prakash, S. (2006) Conservation and biomonitoring in the Vikramshila Gangetic Dolphin Sanctuary, Bihar, India. *Oryx* 40: 189–97.

Cooke, S.J., Allison E.H., Welcomme R.L., Cooke S.J., Allison E.H., Beard T.D., Arlinghaus R., Arthington A.H., Bartley D.M., Cowx I.G., Fuentevilla C., Leonard N.J., Lorenzen K., Lynch A.J., Nguyen V.M., Youn S., Taylor W.W., & Welcomme R.L. (2016) On the sustainability of inland fisheries: finding a future for the forgotten. *Ambio*, 45, 753-764.

Feagan R. (2007) The place of food: mapping out the “local” in local food systems. *Progress In Human Geography*, 31, 23.

Foley P. & Havice E. (2016) The rise of territorial eco-certifications: new politics of transnational sustainability governance in the fishery sector. *Geoforum*, 69, 24–33.

Forristal, L. & Lehto, X. (2009). Place branding with native species: Personality as a criterion. Place Branding and Public Diplomacy. 5. doi: 10.1057/pb.2009.16.

Ganesh Kumar, B., Ravisankar, T., Suresh, R., Bhatta, R., Vimala, D.D., Kumarana, M., Mahalakshmi, P., & Sivasakthi Devi, T. (2010) Lessons from Innovative Institutions in the Marketing of Fish and Fishery Products in India. *Agricultural Economics Research Review*, 23, 495–504.

- Gupta, S. & Banerjee, S. (2016) A note on *Clupisoma garua* (Hamilton, 1822), a freshwater catfish of Indian subcontinent (Teleostei: Siluriformes). *Iranian Journal of Ichthyology*, 3, 150–154.
- Grunert, K.G., Jeppesen, L.F., Jespersen, K.R., Sonne, A., & Young, J.A. (2004) Market orientation of value chains: a conceptual framework based on four case studies from the food industry. *European Journal Of Marketing*, 39, 428–455.
- Hall, S.J., Hilborn, R., Andrew, N.L., & Allison, E.H. (2012) Innovations in capture fisheries are an imperative for nutrition security in the developing world. *PNAS*, 110, 8393–8398.
- Homans, F.R. & Wilen, J.E. (2005) Markets and rent dissipation in regulated open access fisheries. *Journal of Environmental Economics and Management*, 49, 381–404.
- Kelkar, N. (2014) Two failed states: Politics, access and institutions in Gangetic river fisheries. *Current Conservation* 8.3: 25–31.
- Kelkar, N. 2015. *Strengthening the meaning of a freshwater protected area for the Ganges River Dolphin: looking within and beyond the Vikramshila Gangetic Dolphin Sanctuary, Bihar, India*. Final report submitted to the Small Cetacean Fund, International Whaling Commission (IWC), United Kingdom, 45 p.
- Kelkar, N. 2018. *The resource of tradition: changing identities and conservation conflicts in Gangetic fisheries*. In: Srinivasan, U., N. Velho. (eds.) *Conservation from the Margins*. Orient BlackSwan.
- Kelkar, N. & Dey, S. (2020) Mesh mash: legal fishing nets cause most bycatch mortality of endangered South Asian river dolphins. *Biological Conservation*, 252, 1008844.
- Kelkar, N., & J. Krishnaswamy. 2014. *Restoring the Ganga for its fauna and fisheries*. In: Madhusudan, M.D., Rangarajan, M., and Shahabuddin, G. (eds.) *Nature Without Borders*. Orient BlackSwan, India.
- Kasulo V. & Perrings C. (2005) Fishing down the value chain: biodiversity and access regimes in freshwater fisheries — the case of Malawi. *Ecological Economics*, 59, 106–114.
- Kolipakam, V., Singh, S., Ray, S., Prasad, L., Roy, K., Wakid, A., & Qureshi, Q. 2020. Evidence for the continued use of river dolphin oil for bait fishing and traditional medicine: implications for conservation. *Heliyon*. 6, e04690.
- Kosamu, I.B.M. (2015) Conditions for sustainability of small-scale fisheries in developing countries. *Fisheries Research*, 161, 365–373.

- Kluger, L.C., Taylor, M.H., Wolff, M., Stotz, W. & Mendo, J. (2019). From an open-access fishery to a regulated aquaculture business: the case of the most important Latin American bay scallop (*Argopecten purpuratus*). *Reviews in Aquaculture*, 11: 187-203.
- Lam, M.E., & Pitcher, T.J. (2012) The ethical dimensions of fisheries. *Current Opinion in Environmental Sustainability*, 4(3), 364-373.
- Le Manach, F., Jacquet, J.L., Bailey, M., Jouanneau, C., Nouvian, C. (2020) Small is beautiful, but large is certified: A comparison between fisheries the Marine Stewardship Council (MSC) features in its promotional materials and MSC- certified fisheries. *PLoS ONE* 15(5): e0231073.
- Messely L., Dessein J.& Rogge E. (2014) Behind the scenes of place branding: unraveling the selective nature of regional branding. *Tijdschrift Voor Economische En Sociale Geografie* 106: 291-306.
- Minten B., Singh K.M., & Sutradhar R. (2012) Branding and agricultural value chains in developing countries insights from Bihar, India. IFPRI Discussion Paper 01207, International Food Policy Research Institute, CGIAR, 23 P.
- Mitra, A., Mukhopadhyay, P.K., & Homechaudhuri, S (2018) An overview of biology and culture potentials of humped featherback *Chitala chitala* (Hamilton, 1822) – a new candidate for aquaculture diversification. *Reviews in Fisheries Science & Aquaculture*, 26(3), 371-380.
- Mohan, R.S.L. & Kunhi, K.V.M. (1996) Fish oils as alternative to river dolphin, *Platanista gangetica* (Lebeck) oil for fishing catfish *Clupisoma garua* in the River Ganges, India. *Journal of the Bombay Natural History Society*, 93, 86-88.
- Mol, A.P.J., & Oosterveer, P.J.M. (2015). Certification of markets, markets of certificates: tracing sustainability in global agro-food value chains. *Sustainability*, 7(9), 12258-12278.
- Narayanan, S. (2016) Inland fisheries, food security and poverty eradication: a case study of Bihar and West Bengal. ICSF Occasional Paper, International Collective in Support of Fishworkers, Chennai, 68 p.
- Park, S. & Kramarz, T. (2019) Global Environmental Governance and the Accountability Trap. MIT Press, 280 p.
- Ponte, S. (2012), The Marine Stewardship Council (MSC) and the making of a market for 'Sustainable Fish'. *Journal of Agrarian Change*, 12: 300-315. doi:[10.1111/j.1471-0366.2011.00345.x](https://doi.org/10.1111/j.1471-0366.2011.00345.x)

- Ponte S., Kelling I., Jespersen K.S., & Kruijssen F. (2014) The blue revolution in Asia: upgrading and governance in aquaculture value chains. *World Development*, 64, 52–64.
- Porras I., Mohammed E.Y., Ali L., Ali S., & Hossain B. (2017) Power, profits and payments for ecosystem services in Hilsa fisheries in Bangladesh: a value chain analysis. *Marine Policy*, 84, 60–68.
- Ratner B.D., Asgard B., & Allison E.H. (2014) Fishing for justice: Human rights , development , and fisheries sector reform. *Global Environmental Change*, 27, 120–130.
- Robinson, J.P.W., Robinson, J., Gerry, C., Govinden, R., & Graham, N.A.J. (2020) Diversification insulates fisher catch and revenue in heavily exploited tropical fisheries. *Science Advances*, 6, eaaz0587.
- Sharma, M. (2006) *Diara Diary*. In: Landscapes & Lives, Oxford University Press, p. 12-41.
- Sinha, R.K. (2002) An alternative to dolphin oil as a fish attractant in the Ganges River system: conservation of the Ganges River Dolphin. *Biological Conservation* 107: 253–257.
- Stratoudakis Y., Mcconney P., Duncan J., Ghofar A., Gitonga N., Mohamed K.S., Samoilys M., Symington K., & Bourillon L. (2015) Fisheries certification in the developing world: locks and keys or square pegs in round holes? *Fisheries Research*, 182, 39-49.
- Thanh Loc, T.V., Bush S.R., Sinh L.X., & Khiem N.T. (2010) High and low value fish chains in the mekong delta: challenges for livelihoods and governance. *Environment, Development And Sustainability*, 12, 889–908.
- Trienekens J.H. (2011) Agricultural value chains in developing countries a framework for analysis. *International Food And Agribusiness Management Review*, 14, 51–82.
- Wakamatsu, M.& Wakamatsu, H. (2017) The certification of small-scale fisheries. *Marine Policy*, 77, 97-103.
- Young, J.A., Brugere, C., & Muir, J.F. (1999) Green grow the fishes- oh? Environmental attributes in marketing aquaculture products. *Aquaculture Economics & Management*, 3:1, 7-17.