

FISHING FOR SCRAP



*Sustaining river fisheries and biodiversity in the face of
ecosystem degradation and poverty in the Gangetic basin*

A summary report on the status of river fisheries:

Causes of decline, conflicts and potential alternatives

Submitted to the Committee Officer, Committee of Agriculture branch, Lok Sabha

Secretariat, Parliament House Annexe, New Delhi 110001.

by

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Cover photo: Large fishes are hardly found in our rivers today. Fishing of small fishes can seriously affect fish recruitment and lead to large-scale fisheries collapse.

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Disclaimer: This report is a brief summary of original research carried out by Mr. Nachiket Kelkar in 2011-2012. Set in the framework of resource conflicts over river fisheries, it is based on interview data and fish market catch studies, and is divided into three sections: a) Background, b) Methods and Results & c) Recommendations. Any queries may be directly addressed to the author. The information provided in the report only represent the notions of fisher folk across the states of Rajasthan, Uttar Pradesh, Madhya Pradesh, Bihar and West Bengal, and in no way has the author tried to interpret or apply these views in any different ways. The opinions expressed by the author are restricted to the recommendations section of the study, but must be seen as opinions that filter fisher perceptions through critical ecologically validated screens.

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Background

The state of the water

The Ganges River basin is home to over 500 million people, severely dependent on the floodplain rivers that comprise its expanse, for food, shelter and livelihoods. Apart from being the lifeline of production systems across northern and eastern India, the Gangetic basin is an ecologically sensitive freshwater region. Widespread habitat degradation, largely from industrial and domestic pollution, redistribution of water, modification of sediment and nutrient fluxes by engineering projects such as dams, barrages and canals, excessive and wasteful offtake by irrigated agriculture and industries alike, and resource overexploitation (by fisheries, agriculture or industry) have had major consequences for the unique biodiversity of the Ganges and its tributaries. As a consequence, substantial reduction and destruction has occurred, in the magnitude and quality of ecosystem services that these rivers offer. The human domination of the floodplain riverscapes in the Gangetic basin has come around to indirectly affect humanity in multiple, unforeseen, perverse ways. The people dependent on the Gangetic basin, while being among the densest human populations, are also among the poorest in the world.

River fisheries trends

River fisheries have been an important livelihood for millions of people across India since time-immemorial. Freshwater ecosystem services and biodiversity have been severely degraded today, by multiple local and landscape-level anthropogenic impacts, and the future of rivers and their vast resources is in peril. The Gangetic basin is one of the most human-dominated large riverscapes in the world, and facing serious threats from water abstraction and dam-based developments, habitat degradation, water pollution and resource extraction. The destruction of riverine

biodiversity has also in its turn led to massive socio-economic impacts on stakeholders directly dependent on the rivers for their basic needs. In particular, owing to a shared ecology with that of riverine biota, river fisheries in India stand today on the brink of unviability and collapse. The conceptual framework of resource conflicts seeks to revisit origins and mechanisms of perceptions of conflict in fisher folk (with natural vagaries, with the government, with other people/institutions or with biodiversity) in order to understand the major needs and conditional requirements of river fishers.

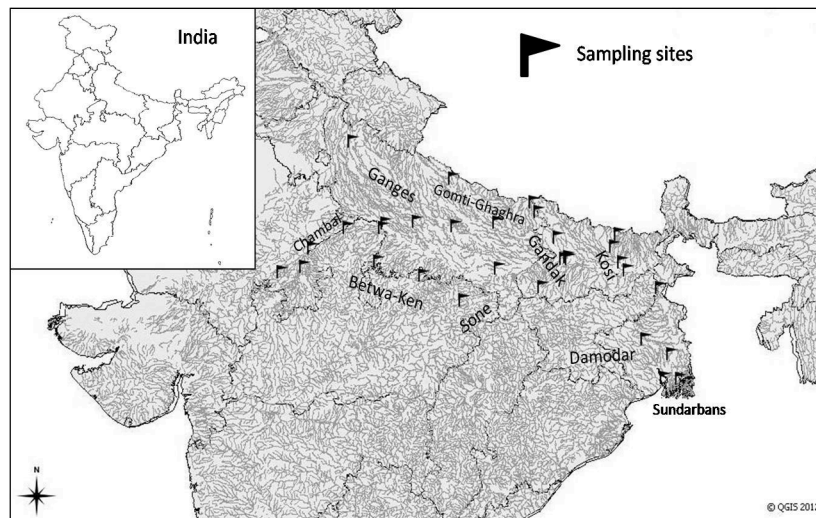


Overexploitative fishing.

Fluid tenures on the water

The large floodplain riverscapes of the Gangetic basin are highly dynamic in terms of geomorphological and hydrological features. Being geologically young sediment flows from the Himalayas, they show high seasonality and flooding within an year, and the channel courses of these rivers vary highly across years and at multiple time scales. In such a situation, drawing or clearly defining boundaries of

tenure, ownership or even use rights or conduct becomes very tricky. This is a situation removed from terrestrial agriculture or pond-based aquaculture, where at least, the boundaries and domain of property rights and access are clear and demarcated. River fisheries today face the major challenge of ill-defined rights to fish in rivers, and this leads to highly-strung conflicts with both the government-controlled river segments (e.g. Protected Areas such as the National Chambal Sanctuary or the Vikramshila Gangetic Dolphin Sanctuary, or industrial productivity belts and NTPC areas) and of course, with private contract owned river segments for fishing. Defining fishing rights needs to involve, in the natural state of river dynamism, a multi-pronged, adaptive approach. Who fishes where and when, how many people fish in an area, what times of the year can they fish and how much, is all defined by user rights. As ever changing the river continues to flow, the more uncertain rights become, and lead further to overlapping and competing interests clashing over river water. These types of conflict typically occur in farming zones where fishers have to go fishing sometimes, as the river course changes. It is now becoming increasingly clear that the solution to this problem cannot be an engineering solution, by building embankments to contain river flooding, but by having flexible systems of fisheries management vis-a-vis alternative livelihoods for fishers during the flood season in the least. Definition of settlement, fishing and other usufruct rights for fisher communities is necessary across the Gangetic basin.



Surveyed locations in the Gangetic basin.

Institutional control regimes

Fisheries, like most production systems, has also been controlled by various institutional arrangements that range from complete governmental control to encouragement of market interests via private contract systems, to free-for-all open access systems, and lately by co-management of such various interests, including the idea of fishery co-operatives. Across different rivers and states, these institutional regimes have undergone changes with respect to change in systems of land tenure, resource declines and governmental change or political dynamics. Some of the changes in resource offtake patterns have been governed also by religious-cultural dynamics between local stakeholders. The three vertices which bound the sample space between control and utilization are the government sector, private control and free fishing systems. Across most rivers in the Gangetic basin, land tenure or water tenure itself is an uncertain concept due to seasonal flooding and river channel dynamics. In the lower Gangetic floodplains, it is well known that floods redesign the entire mosaic of the landscape, reassigning, redeeming and redefining the boundaries of the fields, farms as well as fishing areas as the river itself. Uncertainty in water or

land tenure itself has historically been one of the major sources of resource conflicts across this region. As the government revenue departments directly control the displaced people and their affected lands, private control via contract systems, for either farmland or fisheries has to assert its market interests via auctioned tender systems. The establishment of private ownership of river resources often causes serious exploitation of the local fishers (often from traditional fishing castes and communities), who have to bear the brunt of inequality and oppression by private contractors. During 1987-1991, in Bihar, statewide agitations by fisher communities managed to overthrow river fishing from the machinations of contractors, and were the first time Panidari was abolished by the state. However, the fisheries guidelines were not as effective to define the boundaries of free fishing properly. At best, the understanding of these guidelines to fishers was rather vague, and the ‘freedom’ of fishing in rivers was not with any definitive responsibilities or rights or duties on anyone. The free-for-all open access system of river fishing in Bihar led to a rather counterintuitive consequence: now everyone, along with the ‘traditional fisher’ could come in and fish. Sure enough, much to the ire of fishers; farmers, Muslims, Brahmins, Bhumihars, government officials, all came to grab stakes on another hitherto untouched resource – fish. The contractors took their revenge on several fishers through high-profile fishery mafia and criminal elements, and the open access system became bloodied by wars for water flowing or still, and organized massacres of fishers became a common event. In this situation, it is clear that neither private control nor a completely open access system can sustain the ever-increasing demand for an ever-declining resource, such as fisheries, today. Community control for common-pool management of fisheries offers a potential alternative, but given the

limited overall success of community-based natural resource management in India, it remains to be executed carefully for river fisheries.

Protecting river fishers from criminal interests

Strict policing and monitoring of river fishing practices, especially for 1) destructive fishing techniques and mosquito-nets being used, 2) criminals and mafia gangs fishing with dynamite, poisoning of entire channels, beach seine nets, large dragnets, trawlers or other methods such as river dolphin oil must be brought to book, busted and heavy criminal charges imposed, 3) The riverfront should generally be kept secure of criminal or illegal activity (ranging from crimes against women, illicit liquor-brewing, harassment of fishers to illegal fishing practices). While the frequency of road robberies shows a promising decline after regular policing and better law and order in Bihar, riverfronts still need a basic level of security. Just the act of being able to securely fish without fear of mafia or pirates will be a great twin benefit for fishers: through reducing destructive fishing, and through saving their day's catch.

Providing social and material dignity through fisher rights

River fisher folk are part of a highly marginalized community on social (caste) and economic grounds. Traditional fisher castes have suffered heavily at the hands of privileged castes such as Brahmins and Bhumihars in Bihar, as well as many other intermediate castes in the hierarchy. They need to be economically mainstreamed through clearly defined fisher rights, and provided with an equal chance to improve their livelihoods.



Invasive Oreochromis dominate the Ganga and Yamuna fish catch at Allahabad.

Alternatives to river fisheries

As the challenges inherent in choosing one resource management regime over another are evident, fishers need to know about and discover alternative livelihoods on their own. The current scenario is one of escape and exodus from the poor returns and the shocking realities and dangers of fishing, be it under oppressive contractors who pay less wages, or free-for-all fishing where anyone can do anything they like to fish or fisherman. Today, fisher folk from Uttar Pradesh, Bihar and Bengal provide a large proportion of construction labor force across India. Others who stay behind take to even more menial jobs as rickshaw-pullers or servants. Some are forced to take to crime to be able to feed themselves. It is critical to recognize that fisher livelihoods need to be safeguarded or adapted to the problems of widespread ecological collapse

in fisheries. Fish farming through pond culture, although widespread in northern India, is practiced through contracts and it is essentially the same in terms of oppression. Also, feudal control once-established over ponds, more permanent structures than river segments, is very difficult to politically or socially oppose. The government interests lie in large-scale carp-culture based fisheries for the revenue the industry now generates with exemplary success in Andhra Pradesh and West Bengal. However, the social costs of private contracts are also very high. Overall, private contracts have acutely increased economic disparity within the river fisheries sector in northern India, giving rise to violent, armed conflict in recent times, massacres of fisher folk and retaliatory lynching. Pond-based culture fisheries undoubtedly have vast potential, provided their management is ecologically sound and socially equitable. Most fishers in the Gangetic basin are landless and cannot afford even the capital cost of digging a pond. Co-operative land leases for development of pond fisheries that are managed by family groups or settlements of fisher folk is an idea proposed by many fishers in the Kosi-lower Ganges belt.

This study explores the problems faced by river fisheries today in the context of ecological, socio-economic, political and cultural outcomes of resource declines and endangered, conflicted fisheries.

Methods and Results

Methods

In this study I review the status of river fisheries decline in the Gangetic basin and attempt a large-scale quantification of perceived socio-cultural, economic, political and ecological factors behind the decline. Chiefly from the perspective of fisheries conflicts, I attempt to track the origins, mechanisms and consequences of conflicts over 17 rivers across 5 states, representing a basin area of approximately

600,000 km². Semi-structured interviews and group discussions with local fisher folk, fisher settlements, fish sellers, contractors and key informants (n = 372 in 59 groups) were used to collect data on fishing effort, location, management practices, institutional control, factors responsible for and estimated trends and magnitude of fisheries decline, conflict perceptions, economic losses to conflict, and potential solutions to sustain fisher livelihoods (see Appendix 1). In addition, I collected fish catch data from fish vendors, markets and fish baskets with fishermen, to record species composition, size-structure of catch, nets used and effort undertaken. Species composition and size-class data were used as proxy variables to rank the condition of fisheries across different rivers. In addition, specific data were collected on the increase or decrease in different species of fish in rivers, based on fisher perceptions.



Interviewing fishers at the Ganges-Gandak confluence near Sonpur, Bihar

Results

Across states

Overall education level of fishers was found to be extremely poor (mean = 2.78 years, SD = 2.93, range = 0 to 12) which indicates that most fishers were either uneducated or had been schooled only until the 7th standard. In addition, many had fishing as their

only job, and were landless (57%). Almost 40% worked as construction laborers or rickshaw pullers. Between 40 to 80% fishers across the different groups interviewed had completely left fishing and were working as labor force in Mumbai, Delhi, Chandigarh, Ahmedabad, Kolkata, Bangalore, Hyderabad, Chennai and other major towns and cities in central, western and south India. Fishers covered considerable distances for fishing every day (especially in Bihar and West Bengal; mean = 7.5 km, mean hours spent = 11 hrs per day). Fishery societies were either absent or not functioning in 63% of cases. Fishers earned, on average, between INR 1500/- to 3000/- per month but almost 91.5 % saved less than 1000 INR per month. Fishers estimated an average decline of 78.5% (range = 30 to 99%) in river fish catch over the last 10 years. About 75% people mentioned low water availability and stoppage of fish migratory routes by dams and barrages as a major cause for fish declines. Of these, almost 45% (from eastern and northern UP, and Bihar) singled out the Farakka barrage as the main problem for fisheries decline.

Table 1. Major reasons for fish decline, problems while fishing, solutions and expectations perceived by fishers across the Gangetic basin.

Reasons for fish decline	Problems while fishing	Solutions for stopping fish declines	Expectations of fishers from government schemes
Dams and barrages, low water flow (Farakka barrage) = 75%	Boat/gear availability = 20%	Contract fishing = 20.3%	Boats = 27.2% Nets = 30%
Overfishing = 59%	Criminal and government officials grabbing fish catch = 58%	Free fishing = 13.6%	Technical know-how about pond aquaculture = 20%
River channel poisoning = 42% Destructive fishing = 67% Use of mosquito-nets = 40%	Exclusion from fishing areas by landlords = 30.4%	Community-based fisheries management = 27.1%	Water in the river = 60%
Pollution and mass fishkill = 33%	Contractor / mafia oppression = 40.6%	Pond fishing to replace river fishing = 37.3%	Lifting of barrage gates = 28.6%
Poverty = 30%	Free fishing and entry of other castes = 50.7%	Community-based pond aquaculture = 23.8%	Security in fishing = 42.9%
Free fishing system =	Poor fish catch =	Alternative livelihoods	Free fishing = 18.6%,

27.2%	75.4%	= 59.3%	Contract fishing = 18.6%
Contract fishing system = 16%	Pollution = 29%	Seed rivers with fish = 33.9%	Land leases for community-based pond aquaculture = 20%
Protected Areas (lack of access) = 20%	Government restrictions = 49.3%	Improve water flow = 72.9%	Access / user rights = 58.6%
Invasive fishes = 16%	River animals causing losses to fish / nets = 22%	Reduce pollution = 33.9%	Permits and I-cards to bona fide fishers = 34.3%
Poor fish recruitment and reduction in fish sizes caught = 65%		Security from criminals = 54.2%	Lifting of 3-month ban on monsoon fishing = 20%
River erosion, flooding and channel movements = 38%		Ban destructive fishing = 74.6% Ban mosquito-nets = 49.2%	Dole/loan = 48.6%
		Stop dams = 32.2% Break/lift barrage gates = 27.1%	Alternative livelihoods = 44.3%
		Flood control = 40.7%, stop river erosion and movement = 50.9%	
		Stop flood control through dams = 25.4%	
		Ban river poisoning = 42.4%	
		Provide clear rights and access = 74.6%	

Overall, 66% fishers mentioned that fish sizes caught had reduced heavily, while 87% said that mesh sizes of nets they used had undergone reduction in the last 10 years. All fishers said that fish prices had increased dramatically, to the tune of 4 to 6 times.



Catch with a price, but no value?

Overall, the state of fish catches clearly showed heavy declines in size-class composition and community structure. Overall, pond-cultured carps and catfishes from Andhra Pradesh and West Bengal dominate the markets across the entire Gangetic basin (making up for 70-95% of the sold fish catch). This scene adequately informs us that imports sustain the fish markets especially in MP, UP, Bihar, further marginalizing river fisher livelihoods. Within river fisheries, almost 90% fishers reported serious declines (> 80-90%) in the most prized commercial carps Rohu *Labeo rohita*, Katla *Catla catla* and Mrigal *Cirrhinus mrigala*. The decline in carps and even large catfishes in many areas has led to increase of trash species such as small barbs, small catfishes and gobies.

Table 2. Trends in commercial fish species: extinctions and large-scale declines.

Commercially valuable fish species	Local name(s)	Reasons cited
Extinct almost entirely across range		Farakka barrage, major dams and barrages along rivers, and along the Nepal border, decline in freshwater flows, pollution, overfishing, trawling nets that exploit larvae of clupeid fishes
Hilsa <i>Tenualosa ilisha</i> (Clupeidae)	Hilsa, Ilish	
Mahseer <i>Tor tor</i> , <i>T. putitora</i> (Cyprinidae)	Mandras, Mansaar, Mahseer	
Eel <i>Anguilla benghalensis</i> (Anguillidae)	Banbir, Baamacchh, Banbouchh	
Yellow Belonda <i>Mystus menoda</i> (Bagridae)	Benoda, Belonda	
Freshwater stingray <i>Pastinachus sephen</i> (Dasyatidae)	Sankuch, Saukchi	
Giant Catfish <i>Pangasius pangasius</i> (Pangasiidae)	Jaysar, Yasal, Pangaas	
<i>Silonia silondia</i> (Siluridae)	Sillan, Siland	
Freshwater prawns <i>Macrobrachium rosenbergii</i> , <i>M. nobilis</i>	Gurla, Gorla, Jhangud, Jhinga, Godra	
Sawfish <i>Anoxypristis cuspidata</i> , <i>Pristis zijsron</i> (Pristidae)	Chirunimaachh	
Ghorchelwa <i>Securicula gora</i> (Cyprinidae)	Ghorchelwa, Gora	
Ilisha sp. (Clupeidae)	Chandana Ilish	
Fishes with serious declines (=>70%)		Dams and barrages blocking fish movements, pollution, use of poisons and destructive nets such as mosquito-nets and beach-seine nets, overfishing, loss of river vegetation, reduction in flows and river depth
Katla <i>Catla catla</i>	Bhakur, Katla	
Rohu <i>Labeo rohita</i>	Rohu, Rui	
Mrigal <i>Cirrhinus mrigala</i>	Mirka, Mirgal, Naini	
Jalkapoor <i>Clupisoma garrua</i>	Jalkapoor, Gahrwa bachwa	
Boal <i>Wallago attu</i>	Boal, Buari, Buar	
Black Pomfret, Chinese Pomfret <i>Pampus</i> sp.	Rupchanda, Pamplet	
Knifefish <i>Chitala chitala</i>	Chital, Moi	
<i>Heteropneustes fossilis</i>	Singhi	

<i>Sicamugil cascasia</i>	Khaksi	
<i>Bagarius bagarius</i>	Baghar, Gounchh	
Johnius sps.	Bhola, Bholwa	
<i>Notopterus notopterus</i>	Pathra	
<i>Cirrhinus reba</i>	Raiya	
Snakeheads especially <i>Channa marulius</i>	Garai, Soul	
Fishes with low to moderate decline (20-50%)		
<i>Aspidopariya morar</i>	Pihor, Hardi, Gardi	Reduction in flows, destructive fishing, overfishing, bank habitat degradation, pollution, trawling, dams and barrages
<i>Salmostoma bacaila</i>	Chelwa	
<i>Labeo calbasu</i>	Kalbos, Karonti	
<i>Labeo gonius</i>	Kursa	
<i>Rita rita</i>	Ritha, Ghegla	
Sperata aor, S. seenghala	Ar, Aria, Tengda, Dheegar	
<i>Ailia coila</i>	Sutri	
<i>Eutropichthys vacha</i>	Vacha, Bachwa	
<i>Labeo angra</i> , <i>Labeo bata</i>	Gardi, Chepua, Bata	
Xenentodon cancila	Kawwalol, Totamaachh, Kankila	
Rhinomugil corsula	Natera, Udan, Arwari	
Mastacembelus armatus, M. pancalus	Baam, Bami, Gen, Gainchi	
<i>Anabas testudineus</i>	Kawai	
Mystus sp. (Bagridae)	Palwa	
Ompok sp. (Siluridae)	Pabda, Popta, Laanchh	
Trichiurus savala (Trichiuridae)	Ribbonfish	
Fishes increased, and commonly available through pond culture (* indicates invasive species that must be controlled)		
<i>Oreochromis nilotica*</i> , <i>Oreochromis mossambica*</i>	Tilapi, Jalebi, Tilpia	Pond culture introductions of these fishes have led to risky ecological invasions into natural water-bodies, such as wetlands and rivers. These fishes are very dangerous and causing declines in native fishes.
Common Carp*, Chinese Carp* <i>Cyprinus carpio</i>	Chinese	
Silver Carp*, Grass Carp*, Bighead Carp* <i>Ctenopharyngodon sp.</i> , <i>Hypophthalmichthys sp.</i>	Gilasi, Biket, Silbhar etc. (derived names)	
Red-bellied Pacu* <i>Pygocentrus nattereri</i>	Rupchand	
<i>Pangasionodon hypophthalmus*</i>	Talab ka Pangas	

Between states

Table 3. States and their fisheries management regimes.

State	Rivers surveyed	Institutional regime regulating river fishing	Protected Areas	Intensity of pond-based aquaculture
Rajasthan	Chambal, Parbathy	Government / Private contracts	National Chambal Sanctuary	Moderate to High
Madhya Pradesh	Parbathy, Seep, Chambal, Betwa, Ken, Sone, Sind	Government / Private contracts	National Chambal Sanctuary	Low to Moderate
Uttar Pradesh	Chambal, Yamuna, Ken, Betwa, Sind, Ghaghra, Rapti,	Private contracts / free in some sections of the Ganga	Katerniaghat Wildlife Sanctuary	Low to Moderate

	Sharada, Sarjyu, Ganga			
Bihar	Gandak, Kosi, Sone, Ganga	Free fishing, except in dhab areas (floodplain wetlands that may or may not be connected to the rivers)	Vikramshila Gangetic Dolphin Sanctuary, Valmiki Tiger Reserve	Low
West Bengal	Damodar, Hooghly-Bhagirathi, Ganga, Gosaba, Matla, Sunderbans	A mixture of private contracts and free fishing, at taluka / district level though in the same river. In the Sunderbans, there is a complex mix of governmental control because of the PA, and free fishing surrounding it.	Sunderbans Tiger Reserve and Wildlife Sanctuary	High

Comparing broadly between states and institutional regimes (contract fishing, government restrictions on fishing and free-for-all fishing), the following important trends were observed:

1. Both contract systems (in UP) and free-for-all fishing (Bihar) led to heavy losses and insecurity to fishers, through conflicts with members of other castes or through contractor oppression. This urges a rethinking of both management systems. Also, in Bihar, people were found to lean towards bringing back contract systems, but in UP people wanted rivers to be freed for fishing. This is a cycle of perceptions that is likely to repeat over time without any meaningful solution. It also points out that fishers need to be exposed positively to alternative models of co-management of fisheries, through either co-operatives or local family-unit leases on pond culture. The situation of river fisheries is becoming increasingly endangered, and there needs to be alternative livelihoods in place that provide material dignity to fisher folk.
2. Contract fisheries management causes a lot of harm to river ecology (through seeding of rivers, or use of exploitative fishing); as do destructive fishing practices such as mosquito netting commonly done in free-for-all fisheries. Both systems seem neither socially acceptable nor economically viable. Given

the degraded state of river fish resources in the Gangetic basin, it may be advisable to look at systems where better community control on well-defined water bodies (e.g. tanks, wetlands, floodplain pools, oxbow lakes) is possible.

3. Fisheries in West Bengal use highly destructive fishing practices. However, multiple structures exist in West Bengal for fisheries (from sewage-water ponds, wetlands etc.) and if destructive fishing is regulated, it has the potential to improve its fisheries yields, aided by its already strong community-level sharing arrangements and functional fisheries societies.
4. Rajasthan and Madhya Pradesh have, apart from the Chambal (a 'Protected' river, other rivers that flow mostly through terrestrial protected areas. Fishing in the Chambal is well regulated by the Forest Departments but alternatives and fishing rights to fishers are not provided or defined yet. River fishing bans can easily translate into pond-based fish management. River fishing is relatively minor in Rajasthan, where pond culture is rapidly taking over. Madhya Pradesh has a more peculiar problem, wherein most rivers that meet the Yamuna after flowing northwards, have their forested catchments in MP. Many of these are important Protected Areas, and fishing needs to be totally disallowed near them, while utilizing the scope for pond culture in nearby settlements of fishers. Alternative livelihoods with pond-based fishing have to be discovered in all situations.
5. Conflict with wild river species (Mugger, Gharial, Ganges River dolphins, Saltwater crocodiles, Otters) was highest nearby Protected Areas such as National Chambal Sanctuary, Vikramshila Gangetic Dolphin Sanctuary, Katarniaghat WLS and Sunderbans Tiger Reserve. Fishing around these areas must be regulated and replaced with pond-based alternatives. Conflict with

river dolphins was very high in West Bengal in unprotected rivers too, and for conservation of dolphins fishing pressure needs to be reduced by modifying fishing methods. Conflict has been increasing everywhere because of shrinking resources that force animals and fishers into the same areas and after the same fish resources.

6. There is an urgent need for the government to review the status of fisheries across every single administrative unit in the five states mentioned here. This review must focus on a broader understanding of the river's ecology, changes in the river due to water abstraction and scarcity, and alternative fishers' approaches towards survival and sustained incomes.
7. We need to look at solutions at local scales, as each state has its unique set of problems. The state fisheries departments need to be directed by the Centre to address fisher livelihood issues, amidst the existing challenges of resource decline, social justice, wildlife conservation in rivers and so on. Ecological problems and management issues regarding fisheries resources are highlighted across states, and across management regimes in the graphs given below:



Urgent restoration of rivers is needed.

Fig. 1. Perceived problems behind fish declines across states (1-3), and need for alternative livelihoods to fishers (4). RJ = Rajasthan, MP = Madhya Pradesh, UP = Uttar Pradesh, BR = Bihar, WB = West Bengal.

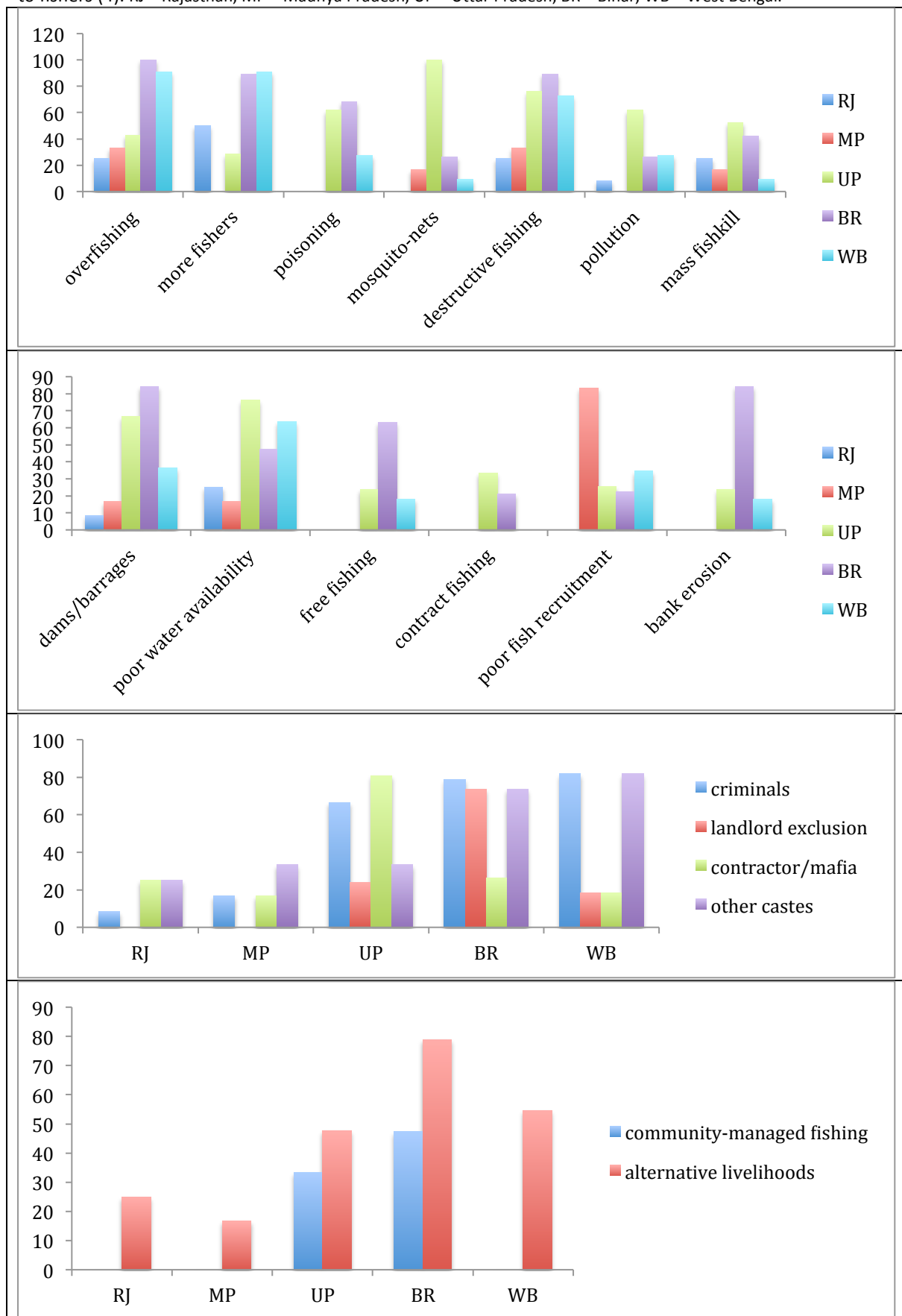
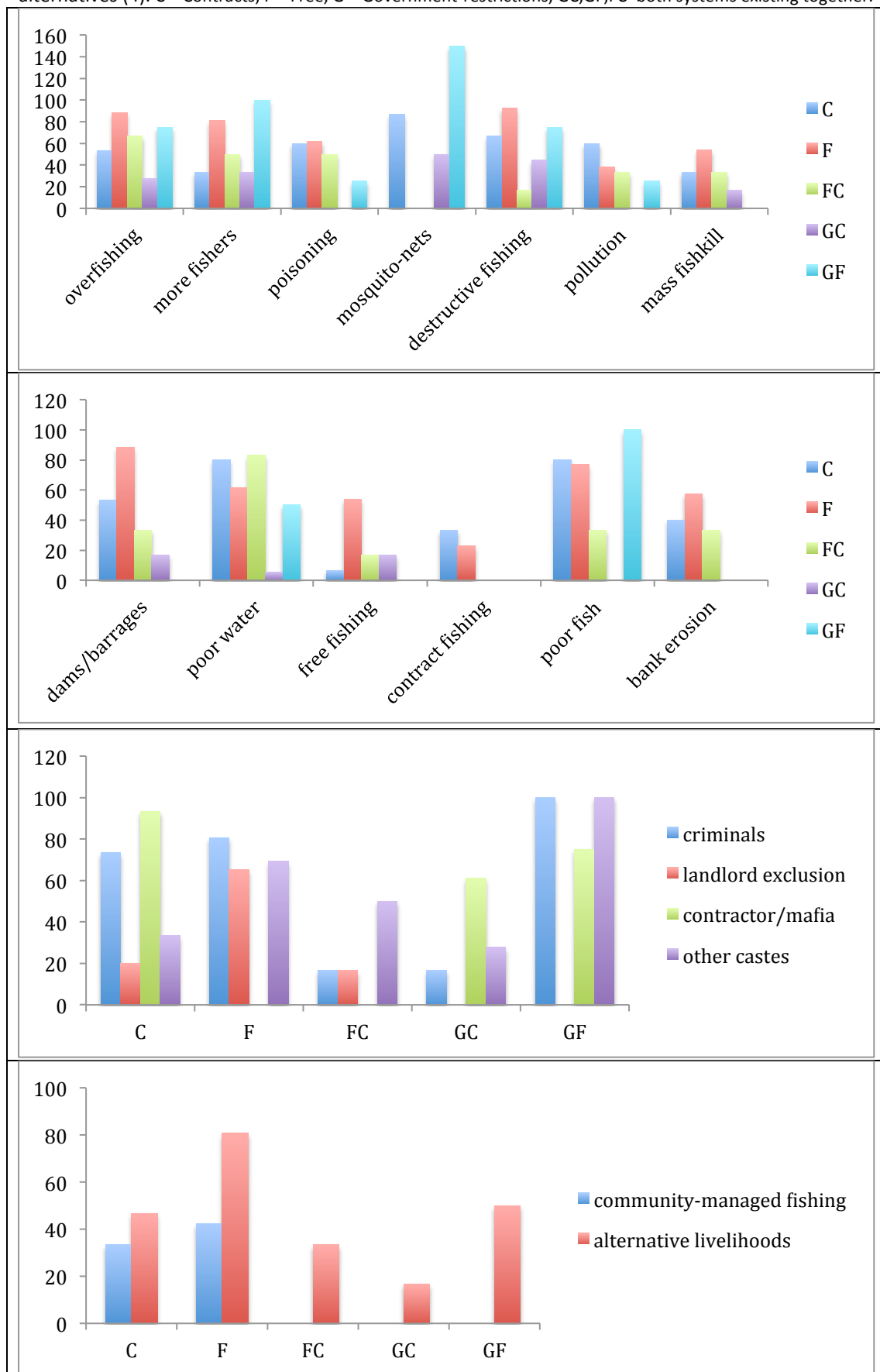


Fig. 2. Perceived problems in fishing across different institutional regimes (1-3), and need for alternatives (4). C = Contracts, F = Free, G = Government-restrictions, GC,GF,FC=both systems existing together.



Recommendations

Table 3. 12-point recommendation based on fisher perceptions in the Gangetic basin.

Rank	Need	Recommendations
1	Water	Provide enough water, adequate natural flows in all rivers. Allow fish movements upriver, currently blocked by large dams and barrages. STOP new dams and mindless, high-cost, destructive and unsustainable engineering projects such as river interlinking.
2	Ban on destructive fishing practices	Curb destructive practices of fishing, especially mosquito-netting, poisoning, dynamite-fishing, trawling and beach-seine netting everywhere.
3	Poverty alleviation and social security	Fishers are in need of government dole or loans, technical know-how, permits and I-cards, housing, education and displacement packages. It is alleged that these benefits are hardly reaching them, although the allocations of funds reach farmers easily. Fishers need government security from criminals / mafia / anti-social elements / pirates that harass them and grab fish catch.
5	Define fisher rights and responsibilities	Clearly define fishing use and access rights across all riverscapes, provide clear guidelines on multi-objective management of fisheries amidst other economic activities
6	Reduce pollution and mass fish-kills	Urgent need to reduce the presently excessive river pollution, especially industrial but also domestic wastes.
7	Alternative livelihoods	River fisheries are currently in a state of ecosystem-level decline or collapse. Trash fishes have become the most common catch, replacing many commercially viable carps and catfishes. People require alternative livelihoods <i>in situ</i> , to check problems related to migration and exodus to work as construction laborers or rickshaw-pullers. Community-based, cooperative pond carp-culture fisheries seem highly promising. Other alternative livelihoods include working with river management authorities, conservation agencies, ecotourism, agriculture etc.
8	Fishery co-operatives	Focus on community-based management of river fisheries and help it develop in an ecologically friendly and sustainable manner. Replace the systems of private contracts and free-for-all fishing by power-equitable, social dignified resource-sharing arrangements
9	Ensure compliance of fishers towards biodiversity conservation and monitoring	Needs to be ensured through continued monitoring of fishing activity and behavior, including by-catch or hunting of species. This will help safeguard endangered wild species such as gharial, turtles, river dolphins, birds etc. This can also help the spread of exotic food fishes that are rapidly invading our rivers (the worst examples are <i>Tilapia</i> species, Chinese and Common Carps, and more recently, Red-bellied Piranha.
10	Use of Food Security Act, Rural Labor Program and NREGS	Can facilitate daily incomes by which fisheries losses could be offset; while also providing a solid community-level incentive to regulate and monitor fishing.
11	Restoration of native riverine fish communities	Very important given the huge decline in native carp species of high commercial value. Fisheries need to be protected not only by revival of stocks, facilitating better fish recruitment, but also by protecting fish breeding habitats from
12	Adaptive management of water tenure in fishing	Owing to natural uncertainty linked to flow regimes and channel course changes, new flexible systems of tenure in fisheries are required. Such systems would fit in well with providing a clear definition to fishing rights in any riverine stretch.

The Larger Picture

1. Natural Adequate River Flows

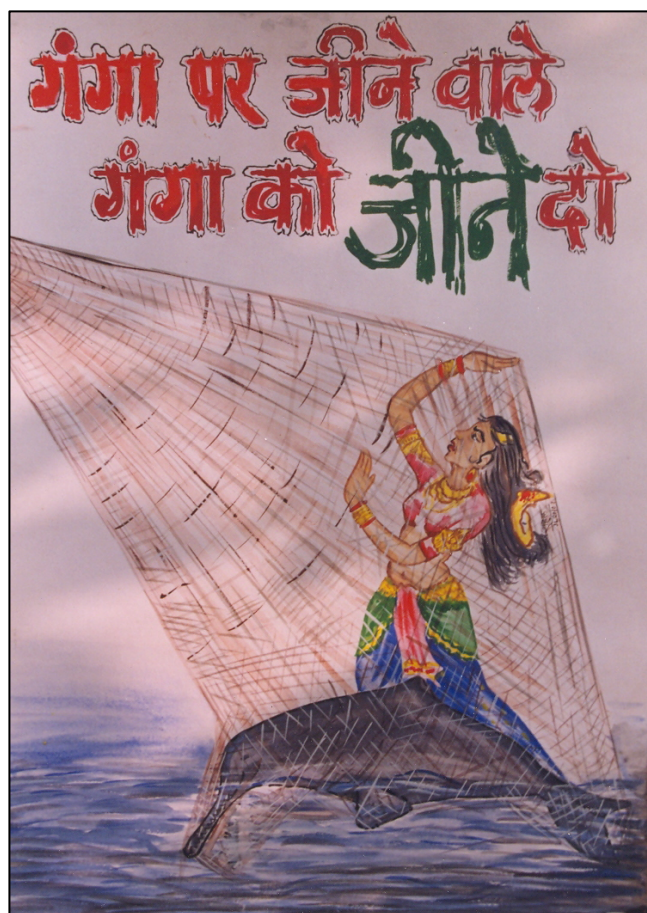
There is an urgent need to provide ecologically necessary, adequate and natural flow regimes in all rivers of the Gangetic basin. It follows that the impacts of a project such as river interlinking will prove disastrous for a whole section of people and their livelihoods, and must be scrapped. Dam, barrage, canal network and river basin authorities need to comply with guidelines provided by international and national assessments of net water requirements of people (for fisheries, agriculture and for biodiversity conservation). The rivers that need urgent attention in this respect are the Chambal, Yamuna, Ken, Betwa, Sone, Damodar, the Ganges at Farakka and Allahabad, Sharada, Ghaghra and all smaller rivers especially in Uttar Pradesh, Madhya Pradesh and Bihar. The main problem of fisheries today is that it lacks water in the dry-season. Releases from barrages need to be regularized and mimic natural patterns of flow variability. More water is needed for more fish catch, and less conflicts.



The Sone River in February. Where will the fishermen fish, where will fish live?

2. Ensuring compliance of fishers to biodiversity conservation

While traditional communities ought to receive their due with respect to alternative livelihoods, or in some cases, clearly defined fishing rights and tenurial or livelihood security in some form; there needs to be continued auditing of fishing practices from the point of view of ecological suitability. Net mesh-size restrictions exist in many states' fisheries laws, but there is hardly any compliance given the poor returns and small size-structure of fish populations available for fishing. In such cases, alternative livelihoods need to be looked into. In areas where river fishers may still continue fishing in rivers, they need to be subject to monitoring by local biodiversity bodies or NGOs regarding 1) Net mesh-sizes used, 2) Fishing in sensitive areas or regulated zones, 3) ban on use of destructive techniques such as dynamite fishing, seine netting, trawling, mosquito-nets or poisoning, 4) Introduction of exotic invasive food fishes into rivers, 5) Hunting of wildlife in rivers, especially turtles, gharials, Ganges river dolphins, smooth-coated otters, muggers, birds or any other species mentioned in the Wildlife Protection Act (1972, with amendments in 1991, 2002, 2006, 2011), 6) The density of people fishing in different areas. Fisher compliance to ecologically conducive practices can be incentivized through recognition and positive reinforcement via prizes in the form of technical know-how about improving the fishery status.



A poster appealing to fishers to protect river biodiversity. Courtesy: Sunil Choudhary (VBREC, Bhagalpur, Bihar).

In conclusion, it is urgent for any review of the ‘state of river fisheries in India’ to adopt a holistic viewpoint to fisheries management over the usual aims of ‘productivity’ and ‘sustainability’. To ensure productivity, we require major changes in the way our rivers are managed. To ensure sustainability, as I demonstrate in this report, we need alternative socio-economic arrangements that are more equitable and socially just. These are huge challenges to our polity and ask for redefining our currently failing systems and currently shortsighted priorities. Ecological restoration of degraded rivers, improving water flows and allowing dam gates to release naturally adequate discharges, is possible, and must be carried out rapidly at multiple spatial scales to allow fish survival, recruitment and reproduction to larger size-structures available for fishing. There needs to be some government control and provision of

security to the riverfront: fishing cannot be left to contractors or poor fishers alone. In developing fisheries, due consideration must be given to ecological and biodiversity concerns pertaining to our freshwater ecosystems as a whole.

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