FUTURE SCOPE OF SPORT FISHERIES DEVELOPMENT IN INDIA: A REVIEW

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Sport fishing is one of the most adventurous activities throughout the world. Most of the developed and developing countries have the modern tools and techniques for catching the fish. In the developing country like in India, there is a huge gap on information, scientific knowledge about sport fish as because the sport fishing activities is region and species specific. Though few states in India follow the Government rules and regulation but there is a lack of awareness about sport fishing activities to conserve the threatened and going to endanger fish species. Also the activity will help to mitigate unemployment problem through income generation; simultaneously catering ecotourism avenues. Moreover Government interference is also necessary for sustainable development and management of sport fisheries activity in India.

Key words: Conservation, Employment opportunity, Rules and Regulation, Sport fishing, Sustainable development

Recreational fishing, also called sport fishing, is fishing for pleasure or competition. It can be contrasted with commercial fishing, which is fishing for profit, or subsistence fishing, which is fishing for survival. Recreational fishing can be defined as fishing of aquatic animals (mainly fish) that do not constitute the individual's primary resource to meet basic nutritional needs and are not generally sold or otherwise traded on export, domestic or

black markets (FAO, 2012). The most common form of recreational fishing is done with a rod, reel, line, hooks and any one of a wide range of baits. Other devices commonly referred to as terminal tackle are also used to affect or complement the presentation of the bait to the targeted fish. Some examples of terminal tackle include weights, floats and swivels. Lures are frequently used in place of bait. Some hobbyists make handmade tackle

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themselves, including plastic lures and artificial flies. The practice of catching or attempting to catch fish with a hook is known as angling. Big-game fishing is conducted from boats to catch large open-water species such as tuna, shark and marlin. Noodling, an art of capturing mainly large bodied catfish with bare hand and trout tickling are also recreational activities.

Sehgal (1987) defined sport or game fish as the fish caught or angled on rod and line putting up some fight and not thrown back in disgust by the angler or sportsman. In sport fishing, both the choices of gear and the target species for their fighting qualities contribute to the sport of the activity, as the fish is played by the angler until landed or lost (IGFA, 2016). A classification divides sport fishes into small and big ones depending upon the weight of the catch; 50kg being the dividing point in between. As a result, mahseers, trouts and snow-trouts belong to the former category whereas, large mahseers, goonch catfish (*Bagarius* sp.) etc. comes under the next. Depending upon the methods used, there are again a number of nomenclature viz. fly-fishing, still-fishing, plug-casting, surf-casting, trolling, launch fishing, shore fishing spinning etc.

The vast fishery resources of India in the Himalayan and peninsular region in which indigenous mahseer, snow trout, exotic trout and common carp are commercially important (Singh *et al.*, 2014) and also wide climatic diversity of the cold water sector

harbour plentiful gene pool are conducive to conservation and growing interest of people in fish farming, ornamental fish keeping and eco-tourism including angling (Singh, 2015).

Rules and Regulations of game fishing

Fishing in general and sport fishing in particular is not a new venture especially in India as it is referred in the Ramayana and Mahabharata periods. Regulatory measures primarily intended towards conservation of fishes dates back to 300 B.C. during the Maurya Dynasty when there was prohibition on fishing including angling extended from full moon day of Ashar month (mid June) to full moon day of Paush month (mid December) to ensure breeding and protecting the juveniles. Further back, during the reign of King Asoka (269–232 BC), fishing was prevented during July and November because fish breeding occurred during these months.

In sport fishing, both the choices of gear and the target species for their fighting qualities contribute to the sport of the activity, as the fish is played by the angler until landed or lost (IGFA, 2016). Sport fishing generally adheres to a particular set of rules and regulations set by governing bodies such as the International Game Fish Association (IGFA) (Whitelaw, 2013). Given the IGFA's recent inclusion of lagoon, estuarine and freshwater species as game fish (IGFA, 2016); this definition is extended beyond the blue water species usually referred to as game fish in the

Pacific (IGFA, 2016; Whitelaw, 2003). The most relevant points of the regulation include (i) fishing methods must minimize fish stress and (ii) catch mortality by applying catch-and-release. Also, the tourism venture must contribute to biodiversity conservation and poverty alleviation through the provision of alternative livelihoods and increased income. Therefore, the enhancement of the value of living fish and their supporting habitat to local communities is protected (Holland *et al.*, 2009; Everard and Kataria, 2011).

Although ecotourism emerged as a potential facet for added household income, complete dependence on this sector should be avoided because it is highly sensitive to global financial shocks (Bohensky *et al.*, 2011; Cinner and Orjan, 2010). Instead, to buffer against periods of adverse market conditions a diversity of household livelihood strategies should be encouraged to allow switching to activities unaffected by market shocks (Allison and Ellis, 2001; Pomeroy *et al.*, 2006). Sport fishing projects should encourage other livelihood strategies and options to minimize risk. The introduction of new fishing technologies and practices used for sport fishing could also be adopted by local fishers for other species, increasing fishing success and hence pressure on fish stocks.

Benefits of recreational fishing

Recreational fishing particularly angling has been recognized by so many medical authorities in the West as a healthy pursuit

for long. It has been emerged as a means of outdoor recreation and became popularized as go-fishing during vacations in the occident resulting in tourism ventures. Since trout and mahseer fishing satisfies diverse tastes and pursuits it has become a source of recreation of the tourists attracted to the hills of northern and southern uplands of India (Shegal, 1987). Both social and economic benefits associated with recreational angling worldwide have been recognized (Arlinghaus and Cooke, 2009), and these benefits may be substantial in developing countries (Pinder and Raghavan, 2013; Bower *et al.*, 2014). However, information regarding issues and opportunities for angler associations and participants are extremely meager as the focus of national survey is very poor for the anglers as well as the stakeholders. Recreational angling in India started in British Empire when worldwide anglers visited with their angling skills (Everard and Kataria, 2011).

Though recreational fishing has created income for regional and national economies (Everard and Kataria, 2011), its negative impact have been noticed on biodiversity and ecosystems (Lewin *et al.*, 2006) regarding issue like conservation of threatened and endangered species (Cowx *et al.*, 2010). Therefore, recreational fisheries should be conscious about species-specific and better management process (Gupta *et al.*, 2015b). Regrettably, due to poor policy regarding recreational fishing in India (Pinder and Raghavan, 2013) there

is enough scope for development of better management practices of this emerging sector of fishery activity (Gupta *et al.*, 2015a). Catch-and-release angling has the potential to provide socio-economic benefits to local stakeholders (Pereira *et al.*, 2008; Barnett *et al.*, 2015), generate income for national economies (Suski and Cooke, 2007; Cowx *et al.*, 2010; Danylchuk and Cooke, 2011; Everard and Kataria, 2011) and facilitate both species and ecosystem conservation (Arlinghaus, 2006; Granek *et al.*, 2008; Pinder and Raghavan, 2013).

Genesis of sport fisheries in India

The history of angling is as old as the world and the earliest known references of fishing dates back to the ancient world. Among the Greeks, great philosophers like Aristotle and Plato referred to the sport of angling, while historian Plutarch offered advice on fishing lines. From Greece and Rome to the ancient civilizations of India and Egypt, fishing played an important role and amalgamated with the creed and culture of the society. The early evolution of fishing as recreation is not lucid in the history of sport fisheries. It is possible that antecedents of recreational fly fishing arrived in England with the Norman conquest of 1066 (McCully, 2000). Although the point in history where fishing could first be said to be recreational is not clear, it became conspicuous with the publication of 'The Compleat Angler' by Izaak Walton in 1653. The book is one of the earliest works that describes fishing's value as a recreational pastime. It is

historically ambiguous when exactly recreational fishing began. Fishing purely for fun and releasing caught fish is a much more modern development. The evolution of sport fishing to big game fishing was made possible by the motorized boats. The invention of big game fishing is largely attributed to Dr. Charles Fredrick Holder, who in 1989 published several articles and books on the subject.

King Somesvara's (1127 AD) has mentioned about angling (Matsyavinoda) in his treatise "Manasollosa" in India about recreational fisheries (Hora, 1951). Mahseer (*Tor spp*) were first described in the Ganges in the early 19th century (Hamilton, 1822) and attained popularity as an angling species through the efforts of the Oriental Sporting Magazine (Nautiyal, 2014). H. S. Thomas has pointed out angling in 1873 (Tank Angling in India), and 1897 (The Rod in India). Edward James "Jim" Corbett (1875–1955) dealt with mahseer in many of his works besides dealing with tigers and leopards in India. The Angler in India on the Mighty Mahseer authored by Dhu (1923) and Circumventing the Mahseer and Other Sporting Fishes by A. St. J. Macdonald (1948) are worth mentioning in this regard (Sehgal, 1987). British anglers have introduced first time brown trout (1860s) and rainbow trout (1909) in streams and rivers of the Himalayas and Western Ghats (Sehgal, 1999a, b).

Although recreational angling struggled to maintain its popularity after India's

independence, interests of both foreign and Indian anglers began to focus on Indian freshwater systems and its fish species in the 1970s. Established and emerging angling organizations across the country invested both time and money to build on the earlier foundations of sport fishing (Gupta *et al.*, 2015a). The All India Game Fishing Association acting as a pivotal role in popularizing sport fishing in India with its state and regional representatives. It is a non-profit making, charitable organization with its regional affiliates like Mustad, Maharashtra State Angling Association (MSAA)-Powai (Maharashtra), SHIMANO, The Rogue Angler, Anglers Association (Futala Lake)-Nagpur (Maharashtra), Gypsy's Camp-Bhakhra (Himachal) and Dasvino Town & Country Club.

Sport fishing sites in India

The major sites of recreational fishing in India centered round the following places:

- Kashmir- with its network of rivers, streams and high altitude lakes, all abounding in trout, both brown and rainbow, has been rightly defined as an 'angler's paradise'. Major points of angling in the state are the Indus and Lidder rivers, their tributaries and a network of smaller rivers and streams. The best time for fishing here are early mornings and late evenings. There is an, 'ideal' fishing permit that allows you to fish exclusively, in a beat of 2 km.
- Himachal Pradesh - Streams feeding

the Beas River in the Kullu Manali region are well known for Brown Trout. The cold mountain streams are well suited for trout, and are home to some of the biggest varieties of Trout. The best beats are at Larji valley, situated on the confluence of the river Larji and Tirthan. Sainj, which is also a trout stream, flows on the other side.

- Uttar Pradesh - Dodital Lake nestled among the snow-clad peaks in the Uttarkashi Himalayas is a fresh water lake and a tempting trout pool, where you can get a good catch, during all seasons. The forest rest house at Dodital and Barkot are ideal for the night stay. Other options for fishing Mahseer in Uttar Pradesh are in the Ramganga and the Sharda rivers in the range of Jim Corbett National Park. You can also go to Rishikesh that offers good fishing sites.
- South India - The best season to go trout-fishing in the southern India is from April to September. Accommodation is available at the forests bungalows. One can even go camping, if the idea is to have some added adventure. Cauvery Fishing Lodge near Mysore is a great place to catch Mahseer. In Kerala streams around the hill stations of Munnar are ideal for sport fishing.

However, more specifically the major angling sites in India are presented in Table 1.

Table 1. Important angling sites in India

State	Location	Sport Fish
Uttarakhand	Ramganga River	Golden Mahseer, Goonch catfish
Himachal Pradesh	Sangla Valley	trout
Kashmir	Gulmarg	brown trout
Karnataka	Kaveri River	Mahseer
Andamans	-	Marine sport fish
Lakshadweep Islands		
Himachal Pradesh	Manali	trout, brown trout
Uttarakhand	Beas Gha	Golden Mahseer
	Pancheshwar Mahakali	
	Saryu rivers	
Uttarakhand	Dakpatthar	Red-finned and yellow-finned Mahseer
	River Yamuna	Indian trout
		Goonch catfish Mahseer
	Tributaries of the Yamuna	Brown trout, in upper reaches
	River Tons and Pabbar	
North Sikkim	Teesta	-
Meghalaya	Ranikhor	Golden Mahseer, Goonch catfish
Assam	Jia Bhoroli adjacent to Nameri National Park	Golden Mahseer, Goonch catfish, Indian trout
Arunachal Pradesh	Brahmaputra and its tributaries Tezu on the LohitTipi and Bhalukpong on the Bhoroli Pasighat, on the Siang	-

Developmental phages of sport fishing in India

Earlier development: Wildlife Association of South India (WASI) has taken a 22 km stretch of the Cauvery River in Karnataka through lease in 1976 to protect the mahseer from anthropogenic threats also, the

stocking of mahseer fingerlings, catch and release angling using rod and line was permitted for both domestic and international anglers (Gupta *et al.*, 2015a). Local fishing guidelines were generally followed by the anglers for sustainability. In 1978, a collaborative venture was taken

by the Indian Tourism Development Corporation (ITDC) with Air India and WASI by organizing an event with the Trans World Fishing Expedition (TWFE) and Boote Mission to get important information about mahseer (Sehgal, 1999b). After that, the National Commission on Agriculture recommended a comprehensive survey of mahseers in the Indian water bodies.

Coorg Wildlife Society (CWS) began protecting mahseer primarily on a 28 km stretch of the Cauvery River in 1993 (Sehgal, 1999b) which increased to 92 km in 2006 (Dinesh *et al.*, 2010). The Department of Fisheries, Karnataka, set up a mahseer hatchery during 1987 to produce fingerlings for ranching in rivers and reservoirs in the Western Ghats (Sehgal, 1999b). In 2004, a group of local stakeholders from the Mahseer Conservancy secured a lease from the Forest Department for a 24 km stretch of the Ramganga River encompassed within the boundaries of Corbett National Park in the State of Uttarakhand (Mahseer Conservancy, 2014). Jeremy Wade, a world renowned recreational angler, helped to promote the mahseer and the goonch catfish (*Bagarius bagarius*) in his television series “Jungle Hooks India” and “River Monsters” (Gupta *et al.*, 2015a). In northern India, special bylaws of the Indian Fisheries Act permitted capturing of brown and rainbow trout in the Himalayan region with rod and line using artificial and live baits within the regulated fishing season, bag limits, and prescribed baits.

Recent development: Through Indian Wildlife Protection Act (WPA), a legal notice was issued to Karnataka Forest Department for temporary construction of the privately owned Bush Betta fishing camp within the Cauvery Wildlife Sanctuary (Pinder and Raghavan, 2013) as it helped to draw the attention to the potential violation of the WPA by permitting angling within the boundaries of the Cauvery Wildlife Sanctuary. However in due course, the Union Ministry of Environment and Forest (MoEF) has stopped angling within the Cauvery Wildlife Sanctuary. In July 2012, recreational angling was prohibited in all protected areas (PAs) of the country as per the directives of the Apex Court of India. As of now, recreational angling is permitted only on river reaches outside PAs where recreational anglers can go for game fishing. Gupta *et al.* (2015a) documented a number of species which is usually targeted by the anglers in India which include *Tor* sp., *T. putitora*, *T. khudree*, *Neolissochilus hexagonolepis* and *Gibelion catla*. Occasionally caught other Indian native fish species include *Channa diplogramma*, *C. marulius*, *C. punctata*, *C. striata*, *Wallago attu*, *Hemibagrus maydelli*, *Bagarius bagarius*, *Labeo rohita*, *Cirrhinus cirrhosus*, *Hypophthalmichthys molitrix*, *Cyprinus carpio*, *Ctenopharyngodon idella* and *Aristichthys nobilis*.

In northern India, State fisheries departments continuously monitor recreational fishing by providing rod

licenses on a daily basis. Sport fishing in marine waters has also evolved as a popular recreational activity in the Indian Ocean, the Bay of Bengal and in the lagoons and seas around the Andaman Islands. In marine fishing, vessels have to obtain licenses from the respective State Fisheries Departments. On an average, more than 100 boats operate per month in the marine waters during the peak angling season extending from October to April. Likewise documentation of fresh water game fishes, Gupta *et al.* (2015a) documented important marine species for sporting and gaming as *Caranx ignobilis*, *Cynoglossus macrostomus*, *Gymnosarda unicolor*, *Lates calcarifer*, *Sphyræna* sp., *Rachycentron canadum* and *Thunnus obesus*.

Based on the Marine Fisheries (Regulation and Management) Bill, 2012, guidelines and regulatory measures have been formulated by the Department of Fisheries, Govt. of Andaman and Nicobar Islands particularly focusing towards vessel fishing of marine sport fishes. A uniform regulation of 61 day monsoon fishing ban upto 31st July including sport fishing has been imposed during 2017-18 throughout the Western maritime states viz. Kerala, Karnataka, Goa, Maharashtra and Gujarat.

Major threats to sport fisheries and its management

For both freshwater and marine water sport fishes the rules and regulations of sport fishing are mainly based on Indian Fisheries Act, 1897. However, some rules and

regulations have also been formulated by local level anglers associations for safeguarding their interests and ecological concerns. Sehgal (1987) documented important issues as major constraints for management and conservation of sport fishes. These are poaching, unlawful fishing, competitions among sport fishers and local stakeholders, impact of river basin projects on fish habitat, flow of industrial, domestic and pesticide wastes. Domestic waste water discharge in Dal and Wular Lake in Kashmir, Naini Tal Lake in Kumanon are well known which has a direct bearing upon the native aquatic fauna including the sport fishes. Moreover, the Ganga river system including her tributaries and distributaries viz. the Yamuna, the Sone, the Gomoti are affected by industrial wastes and pollutants as heavy fish mortalities during 1980 near Allahabad was recorded (Sehgal, 1987). Run-off water mixed with pesticide viz. DDT, aldrin, BHC, malathion, parathion from livestock and agriculture field adversely affects the riverine fisheries in India. Such happenings are not uncommon in marine fisheries as in 2017; there was high fish mortality along the Mumbai coast of the Arabian Sea primarily because of oil spills.

Management measures in recreational fisheries are primarily focused on stock enhancement, increase in heterogeneity through species introductions, habitat improvements, elimination of pest species, control of piscivorous avian and fish predators. Fisheries regulations are

formulated and imposed primarily to regulate fishing effort particularly during closed seasons and closed areas; catch limits, gear restrictions and size restrictions on harvest. However, recreational fisheries are constrained by conflicts with commercial fisheries, other water-based recreational users, water resource development programmes, ecological alterations and water quality degradation. Cowx (2000) opined that if the status of recreational fisheries is to be sustained, more appropriate techniques are developed to provide sound economic valuation of the fisheries and an integrated approach to aquatic resource management is promoted.

Issues in recreational angling sector in India

Despite the potential benefits of recreational fisheries in India, there are various issues that need urgent attention as they could be constraining the sustainable development of this sector (Gupta *et al.*, 2015a). The fisheries managers and anglers have to be concerned about various issues towards conservation of endangered fish species and to maintain the natural biotic system for sustainable development. Though, several studies are available on the natural history of some mahseers (Nautiyal, 2014), the ambiguities contiguous species taxonomy and distribution make these of little value for practical conservation planning and action. The condition is related for the goonch, *Bagarius bagarius*, one of the largest freshwater catfish occurring in the Indian subcontinent.

Therefore, recreational fisheries could play a significant role in sustaining research on such freshwater species which are demonstrated through a recent study using angler catch data to generate biological information for conservation and management of mahseers in the Cauvery (Gupta *et al.*, 2015a). Lack of scientific knowledge and co-ordination among government and anglers association/ fishing communities are the major causes of the absence of a uniform strong regulatory measure for holistic management of sport and game fishing of the country.

Lack of perception about biotic responses: No studies have been conducted on post-capture mortalities in mahseer or other species targeted by anglers in India, but studies have implicated that high mortality will be due to exhaustion, injuries, and associated infections (Dinesh *et al.*, 2010) and also due to use of different types of fishing rods (Rocklin *et al.*, 2014). Natural, worm-baited and live baits have been shown to increase the higher mortality rates than use of artificial lures and flies among fish species due to deeper hooking (Wilde *et al.*, 2000). Also, use of circle hooks helps to decrease angling mortality among fish species in that they promote shallow hooking (Cooke and Suski, 2004). Barbless hooks tend to reduce the handling time required to remove the hook (Schaeffer, 2002) and lessen the tissue damage to fish species (Casselman, 2005).

Need for best management practice for sustainable angling promotion: Presently,

there are no official guidelines specifically focused towards recreational fisheries in India. In June 2014 an “All India Fresh Water Angling Competition” organized by AIGFA in partnership with Maharashtra State Angling Association and WASI in River Cauvery was organized where over 30 skilled recreational anglers participated. A set of nine recreational angling guidelines was provided to each of the anglers as a precondition to participate and stay in the competition. However, such practices are neither advocated nor used by many angling associations. Growing awareness through angler education and cheering fulfillment through enforcement by a legal entertaining angling body is extremely required (Gupta *et al.*, 2015a).

Gupta *et al.* (2016) envisaged that as the anglers targeting multiple fishing locations throughout India, there is a need for consistent governance structures and policy instruments to support the development of sustainable recreational fisheries while minimizing conflict with other stakeholder groups and also the impacts of catch and release (C&R) fisheries interactions on individuals and populations (especially for threatened species) need to be studied in the Indian context. Direct participation by recreational anglers in C&R research could strengthen broader conservation and management initiatives throughout the country by increasing stewardship (Gupta *et al.*, 2016).

Unregulated stocking and introductions

The development of recreational fisheries

in India has been guided by stocking and introduction of both exotic species and captive bred populations of native species. Many upland lakes and upper reaches of rivers were regularly stocked with exotic salmonids to develop recreational fishing opportunities during the British Raj (Sehgal, 1999a). Similar stocking programs have been carried out in the Nilgiri, Anamalai and Cardamom hills of the Western Ghats (Sehgal, 1999b), with trout hatcheries set up in Avalanche (Nilgiris) and Eravikulam-Rajamalai (Munnar, Kerala). Now a day, recreational trout fishing is commercially encouraged by the local angling associations for self-sustaining populations of the exotic species and their continuous stocking from the local hatcheries.

A specific need to assess in detail the preferences and awareness among C&R anglers regarding the targeting of native and non-native fishes, to understand the extent to which anglers target non-native fish species (Nguyen *et al.*, 2013), and to estimate support for stocking to enhance recreational fishing (Granek *et al.*, 2008). Large-scale stock replenishment of various “species” of mahseer has been carried out in the Western Ghats region, particularly in the Cauvery River (Ogale, 2002), which has resulted in the proliferation of hybrids and the suspected decline of native lineages (Pinder *et al.*, 2015).

Concern about biodiversity hotspots: The most popular fishing locations are mainly situated in the Himalayas and Western Ghats, two of the important biodiversity

hotspots which are also currently threatened by numerous anthropogenic pressures (Dahanukar *et al.*, 2011). Due to angling, some species have shown a dilapidated population trend and are listed as threatened in the IUCN Red List (e.g., *T. khudree* and *T. putitora* assessed as “Endangered”; the goonch catfish, *B. bagarius* assessed as “Near Threatened” and *Cirrhinus cirrhosus* assessed as “Vulnerable”), no one of these assessments list recreational angling as a threat to the species (Gupta *et al.*, 2015a).

Poor interference of governance authorities : Raghavan *et al.* (2012) opined that multi-jurisdictional nature of fisheries governance in India has slowed down the development of recreational fisheries sector. Majority of angling associations in India are registered and catalogue the practice of recreational angling through paid permits, however, a number of unlicensed angling associations continue to operate in major angling locations of India (Gupta *et al.*, 2015a). Communicational lapse among the sport fisheries management associations and government agencies is an additional impediment to the sustainable development of recreational fisheries sector in India. Even if recreational angling tourism provides social and economic benefits to some local communities (Pinder and Raghavan, 2013), there is prevailing low transparency during profit-sharing stages of local stakeholders in India. Moreover, preventing the artisanal fishers from capturing food fish from water bodies protected by angling associations resulted

in conflicts in recreation angling areas.

Requirement of scientific adaptive measures: A general lack of evaluation is presently the major concern about the condition of recreational fisheries in India. Few registered angling associations have maintained a record of effort, catch, harvest, and release rates of fish species but they are not maintaining any record on fishing behaviors and information during angling seasons (Gupta *et al.*, 2015a). Additionally, no scientific studies have been conducted to understand the impacts of recreational fisheries on fish population structure or evaluate impacts of recreational fishing activity. An adaptive management approach is necessary from the experiences of the stakeholders so as to build on management successes (FAO, 2012). Setting up of freshwater fish safe zones on river reaches monitored by local communities could be an ideal solution (Gupta *et al.*, 2014a). The suggestion to Legislative support (central or state level) for recreational angling could provide an overall structure to this leisure activity and highlight its associated benefits (FAO, 2012).

Sport fishing should be promoted by male and female members of fishing community. The recreational fisheries sector in India is also dependent on the assistance and support from local communities living near the angling locations, thus recreational fisheries associations would do well to incorporate village communities in their planning for the long-term success of their organizations (Gupta *et al.*, 2014b). Also

Govt. should initiate the river ranching facilities for more diversification of fish species to maintain the genetic viability.

Eco-tourism and sport fishing

Eco-tourism contributes to environmental conservation by providing socio-economic benefits through the non-consumptive uses and indirect values of the natural biological resources. Fishery based eco-tourism is an emerging potential area for employment generation and recreational fishing. Among the Himalayan streams and river, Beas and its tributaries and the river Giri (Himalchal Pradesh), Yamuna between Tajwala (Haryana) to Dhak Pathar, Ganga between Rishikesh to Tehri, river Chenab and its tributaries and river Jia-bhorelu, Dibang, Subarnasiri and Manas (NEH region) are important fishing sites. Presently a few enthusiastic farmers in Kullu-Manali (HP) and in Sikkim have developed their trout farms near highways or tourist places as a sport fishery enterprises. In Pithoragarh district of Uttarakhand has also developed an excellent exotic carp based sport fishery enterprise with integration of boating and swimming facilities. There are also further scope to enhance the income through additional aqua sports and adventuring sports.

The biggest advantage in India is that all the major rivers are sited in easily reachable places and near major cities. Some major rivers and its tributaries where fishing can be enjoyed are Mahanadi, Yamuna, Kaveri, Ganga, Brahmaputra, Sutlej and Teesta. A wide variety of fishes like Golden Mahseer,

Silver Mahseer, Silver Gray Mahseer, Black Mahseer, Trout, Rohu, Katli, Brown Trout are found in these rivers. The coastal waters also have some amazing variety of fishes like Sea Bass, Mackerel, Marlin etc. Keeping in mind the potential of fishing in promoting tourism and adventure sports, the fishing departments of different states have started hatcheries and fish sanctuaries. Fishing license is a major issue for promoting angling tourism. Also most of the trout and mahseer farms are not well connected by roads. Therefore, institutional support and co-ordination is the utmost need to augment sport-tourism in India.

Conclusion

The sport fisheries in India are confined only to certain regions and the development pattern is not uniform. As sport fishing sector is still in its infancy in India with enough scope and possibilities, various issues comes in the way as attributes likely river ranching, genetic viability and stability, fish diversification, species conservation, awareness among the stakeholders etc. Also sport or recreational fishing has a great influence on the local fishing community as it helps to generate employment opportunity through eco-tourism business activities and creation of social capital. Besides, there is enough scope of documentation of indigenous traditional and technical knowledge particularly in designing gears, formulations of baits etc. as the country is extremely rich with such knowledge with diverse topology and habitats. However, the stakeholders must be

aware of the fall-outs of overall anthropogenic activities in the fishing ground to sustain the environment and biodiversity as a whole. Therefore, co-

operation and co-ordination among the stakeholders will be a best approach for development and promotion of sport fisheries in various states in India.

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