

1 **Assessing recreational fisheries in an emerging economy: knowledge, perceptions**  
2 **and attitudes of catch-and-release anglers in India**

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32 **ABSTRACT**

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34 Across the globe, catch-and-release (C&R) angling represents a leisure activity indulged by  
35 millions. The practice of C&R is commonly advocated by conservation managers because of  
36 its potential to protect local fish populations from a range of anthropogenic threats, including  
37 over-fishing. In India, C&R angling in freshwaters has a history dating back to colonial  
38 times. Despite this, little is known about the current state of the sector. To address this, an  
39 online web-based survey was conducted to target C&R anglers who fish in Indian rivers to  
40 assess their knowledge, attitudes and perceptions relating to the national status of India's  
41 freshwater C&R fisheries. From a total of 148 responses, factors such as angling quality  
42 (score of 4.6/5.0); aesthetics of surroundings (4.6/5.0), presence of other wildlife (4.4/5.0),  
43 fishery management practices (4.6/5.0) and socioeconomic benefits (4.4/5.0) were evaluated.  
44 Over 65% (n=148) of the anglers reported an observed decrease in the quality of fishing (e.g.  
45 a reduction in the size and/or numbers of fish available for capture). Respondents also  
46 considered deforestation (score of 4.2/5.0), water abstraction (4.4/5.0), pollution (4.4/5.0),  
47 hydropower projects (4.2/5.0) and destructive fishing techniques (4.7/5.0) as factors which  
48 threaten both the habitat and species they target. C&R practitioners were largely united  
49 regarding the benefits and willingness to contribute both their time and financial input to  
50 support conservation initiatives (score of 4.7/5.0). The current study provides the first  
51 overview of the status of C&R angling in India and explores challenges, opportunities, and  
52 priorities for future resource management.

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54 **Keywords:** mahseer, conservation, Asia, developing country, freshwater, sport fishing

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## 57 **1. Introduction**

58 Apart from being an important protein source and facilitating vital ecosystem functions  
59 (Dugan et al., 2006; Welcomme et al., 2010; Brummet et al., 2013), freshwater fish also  
60 provide recreational benefits (Pinder and Raghavan, 2013). Recreational (catch-and-release  
61 (henceforth C&R)) fishing, defined as “a non-commercial activity that captures fishes for  
62 purposes other than nutritional needs” (Granek et al., 2008; Cowx et al., 2010) is a highly  
63 indulged pastime, both in developed and developing countries. C&R has a very high  
64 participation rate (Cooke and Cowx, 2004; Granek et al., 2008; Cowx et al., 2010) and its  
65 popularity is expected to grow in developing countries and emerging economies owing to  
66 increased wealth of their societies (FAO, 2012). For example, despite the popularity of  
67 recreational angling in India during colonial times, it is only in the past two decades that  
68 C&R angling has gained national popularity, and now represents a fast expanding market (see  
69 Everard and Kataria, 2011). Indeed, an increasing number of tour operators are offering  
70 angling as part of their wildlife and tourism packages to two of the nation’s biodiversity  
71 hotspots, the Himalayas and the Western Ghats (Everard and Kataria, 2011). Of particular  
72 attraction to international anglers are the mahseers (*Tor* spp.); often considered to be the  
73 world’s hardest fighting fish (TWFT, 1984), both foreign and domestic anglers frequent the  
74 upper Ganges catchment (in the Himalayas) and the Cauvery (in the Western Ghats) in  
75 pursuit of these fish.

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77 Despite contributing a multitude of key ecological functions and societal benefits (WWF,  
78 2006; Collen et al., 2014), freshwater ecosystems, especially rivers, comprise one of the most  
79 endangered and poorly protected ecosystems on earth (Dudgeon, 2011; Cooke et al., 2012).  
80 Multiple interacting threats including habitat alteration/loss, alien species, overexploitation,  
81 pollution and climate change (Xenopoulos et al., 2005; Dudgeon et al., 2006; Strayer and

82 Dudgeon, 2010; Vörösmarty et al., 2010; McDonald et al., 2011) are widely cited as  
83 contributing to the precarious state of global freshwater biodiversity. Since freshwater fishes  
84 are integral to ecosystem function and are also a source of food and livelihood to millions  
85 (Dugan et al., 2006; Welcomme et al., 2010; Brummet et al., 2013; Reid et al., 2013), they  
86 are considered a critical component of freshwater biodiversity. Freshwater fishes are  
87 nevertheless one of the most threatened vertebrate taxa on earth (Reid et al., 2013), with more  
88 than 36% (of the 5785 species assessed by the IUCN) at the risk of extinction and over 60  
89 species having already gone extinct since 1500 (Carrizo et al., 2013).

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91 Despite varying levels of threat as a result of escalating anthropogenic pressures (Vishwanath  
92 et al. 2010; Dahanukar et al., 2011), India supports notably high levels of freshwater fish  
93 diversity and endemism. National fishery focused conservation and management policies  
94 have often suffered from setbacks due to jurisdictional issues, oversights, and implementation  
95 of top-down approaches (Raghavan et al., 2011); poor enforcement of existing laws  
96 (Raghavan et al., 2013) and community-based conservation initiatives often failing to protect  
97 river stretches outside their own jurisdiction (Gupta, 2013). Furthermore, the Indian Wildlife  
98 (Protection) Act, 1972, the highest legal instrument for wildlife conservation in the country  
99 (Dahanukar et al., 2011; Raghavan et al., 2013), affords no mention of freshwater fish.  
100 Additionally, very few studies on C&R angling and its potential benefits are available from  
101 India (Everard and Kataria, 2011; Pinder and Raghavan, 2013). This paper seeks to enhance  
102 current understanding of the status of recreational angling by assessing the knowledge,  
103 attitudes and perceptions of both international and domestic anglers practicing C&R angling  
104 in India.

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## 106 **2. Methods**

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Prior to any data collection a pilot survey was carried out. The questions formulated were based on the concerns and opinions of C&R anglers fishing in India (N. Gupta, pers. comm. with C&R anglers). Randomly selected international and domestic respondents (n=25) from India-specific angling forums were requested to complete the survey and pinpoint any problems with its content (Andrews et al., 2003). A web-based survey was used (running for six months from November 2013 to April 2014) to facilitate quicker response times, increased response rates, and reduced costs (Oppermann, 1995; Lazar and Preece, 1999; Andrews et al., 2003). The survey design was based on a series of 23 questions (see supplementary material). Information on the fishing locations and target fish species of interest to anglers was first determined. Further, (a) preferred fishing techniques; (b) factors influencing the angling experience; (c) changes in quality of the angling experience over the course of angling at a particular location; (d) threats to target species and fishing locations; (e) awareness of the anglers on the conservation status (International Union for Conservation of Nature/IUCN Red List of Threatened Species) of target species; (f) various conservation strategies which the C&R anglers felt was needed for the protection of target species; (g) economics of C&R angling through the amount of money spent (in US\$) annually by the anglers on angling and related activities; (h) perception on the benefit of C&R angling as a conservation strategy; (i) willingness to pay for, and get involved in a conservation initiative; and (j) anglers willingness to contribute time and money towards such initiatives was also ascertained. An option for additional comments was also provided at the end of the survey to obtain views and opinions of anglers fishing in Indian waters. The respondents scored each criterion on a scale of 1-5, in ascending order of preference, and the mean score calculated and represented in a tabular form.

132 To assess international participation, the survey was advertised globally to target anglers  
133 spanning different method disciplines. The notification of the survey was posted on  
134 global/domestic conservation and angling websites and forums, published in  
135 international/national fishing and angling magazines/newsletters, and posted on social media  
136 (Facebook, Twitter) sites. All known India-specific angling forums were also targeted. The  
137 survey was advertised every fortnight to maintain interest. No changes were made to the  
138 survey questions during the course of data collection (Zhang, 2000) and care was taken to  
139 allow only one response per individual angler to avoid dual submission (Hasler et al., 2011)  
140 by thoroughly reviewing the responses to spot any duplicate submissions.

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142 Angling quality/experience was defined as the availability of fish (numbers/size) available for  
143 capture. The aesthetics of surroundings denoted the environment of the angling location. The  
144 presence of other wildlife refers to the visual presence of flora and fauna during angling  
145 activities. Fishery management practice considers effort applied by local fisheries/forest  
146 department towards the protection and conservation of fish communities. Local stakeholders'  
147 involvement and transparent sharing of C&R angling revenue dealt with the engagement of  
148 and financial benefits to local communities. Camp infrastructure considers the  
149 accommodation available to C&R anglers.

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### 151 **3. Results and discussion**

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153 A total of 148 responses were obtained and analysed from anglers specifically targeting  
154 fishing locations in India, (i.e., United Kingdom/UK + India) (see Figure 1). In comparison to  
155 anglers from the UK, Indian/domestic anglers chose highly diverse and multiple fishing sites  
156 distributed across the country (see Table 1).

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158 Many species targeted by C&R anglers in India have shown a declining trend of population  
159 and are listed as threatened in the IUCN Red List, (e.g. *Tor khudree*, *T. malabaricus* and *T.*  
160 *putitora*, all assessed as ‘Endangered’; the goonch catfish, *Bagarius bagarius* assessed as  
161 ‘Near Threatened’; and *Schizothorax richardsonii* assessed as ‘Vulnerable’), for none of  
162 these species has recreational C&R angling so far been mentioned as a threat (see species  
163 specific accounts in the IUCN Red List of Threatened Species). This has also been the case  
164 with most threatened fish species targeted by recreational anglers around the world (see  
165 Cooke et al., in press).

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167 Apart from angling quality, aesthetics of surroundings and camp infrastructure (all directly  
168 related to C&R angling experience), ecological factors such as presence of other wildlife,  
169 fishery management practices, and the inclusion of, and financial benefits to local  
170 communities were valued by C&R anglers (see Table 1). This not only highlights the  
171 ecological and social awareness among C&R anglers, but demonstrates alignment with the  
172 current objectives of river and fish conservation policies in the region. Such awareness has  
173 the potential to assist in the co-engagement of key stakeholders (Everard and Kataria, 2011)  
174 and bridge the gap between social, economic and biological dimensions of river ecosystem  
175 conservation (Cowx and Portocarrero-Aya, 2011). Indeed, an opportunity could exist where  
176 C&R anglers could become involved in future conservation programmes, and possibly assist  
177 in monitoring, data collection, enforcement and lobbying at local levels (Granek et al., 2008;  
178 Cowx et al., 2010).

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180 ‘Angling quality and experience’ is a key driving force for any C&R angler (Arlinghaus,  
181 2006; Granek et al., 2008). The responses obtained regarding decrease in this experience and

182 quality is a cause of concern not only for ecology and conservation, but also for the human  
183 dimensions of the fishery (Hunt et al., 2013). It has been suggested that any conservation  
184 assistance from anglers could rely heavily on the satisfactory fulfilment of an angler's leisure  
185 experience (Granek et al., 2008), and that a C&R angler's 'angling experience' depends on  
186 the well-being of the fishes they primarily target (Arlinghaus, 2006; Granek et al., 2008).  
187 Therefore, a decline in stocks is likely to have a profound effect on the quality of this  
188 personal experience, and subsequently impact the overall socioeconomic viability of the  
189 fishery (Danylchuk and Cooke, 2011).

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191 The perceptions of UK anglers on the major anthropogenic threats to angling quality (see  
192 Table 1) were consistent with those recorded in the scientific literature (Vishwanath et al.,  
193 2010; Dahanukar et al., 2011). However, 7% of domestic anglers disagreed with some of the  
194 identified threats. There could be many possible reasons for this (see Arlinghaus et al., 2007;  
195 Hunt et al., 2013) including a) international anglers being more environmentally conscious  
196 than domestic anglers, or b) domestic anglers being conditioned to accepting such threats as  
197 normal and therefore do not classify them to be such major issues.

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199 A substantial proportion (26%) of anglers from both groups (n=148) were unaware of the  
200 conservation status (IUCN Red List) of target fish species. Strict environmental guidelines  
201 for C&R angling, including those that deal with threatened species (see Cooke et al., in press)  
202 need to be enforced by the Department of Fisheries and/or the Department of Forest and  
203 Wildlife, and also by the angling associations who can influence the behaviour of their  
204 members and guests. In addition, voluntary regulations and informal institutions could also  
205 play a pivotal role in enforcing guidelines (Cooke et al., 2013).

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207 Both UK and domestic anglers highlighted the top three strategies required for conserving the  
208 target species as education; effective anti-poaching patrol and improved legislation (see Table  
209 1). Despite only 16% of anglers highlighting education as important, the ‘spirit of the river’  
210 initiative developed to educate anglers in Mongolia about best-practice catch-and-release  
211 techniques for the Taimen (*Hucho taimen*) is an example of how education can also support  
212 conservation of threatened species targeted in recreational fisheries (Bailey, 2012). Although  
213 there is some legislation (Indian Fisheries Act and various State inland fisheries acts) to  
214 protect freshwater fishes in India, effective enforcement is considered to be limited (see  
215 Raghavan et al., 2011). The interest of anglers in conserving their target habitats and fish  
216 species opens up opportunities for developing participatory enforcement mechanisms based  
217 on existing legislations (see Pinder & Raghavan, 2013).

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219 In considering the value of ‘stocking’ as a potential conservation tool, domestic anglers  
220 scored this more highly (4.2/5.0) than UK anglers (3.5/5.0). The comments associated with  
221 this question were of particular interest as UK anglers expressed awareness of the potential  
222 for genetic pollution and the need for decisions on stocking policy to be informed by the  
223 historical and current population status of a species within catchments (Hickley and Chare,  
224 2004; Everard and Kataria, 2011; Pinder and Raghavan, 2013). Stocking for angling species  
225 has been carried out in major river systems of India (Pinder and Raghavan, 2013), and this  
226 could have influenced the responses of domestic anglers. However, comparatively higher  
227 awareness among UK anglers could be another reason, as the spread of knowledge regarding  
228 the associated issues with stocking of fish species is still in its infancy in India. Indeed, the  
229 IUCN Guidelines for Reintroductions and other Conservation Translocations explicitly  
230 suggests that reintroduction should be beneficial to the species in question and the ecosystem  
231 it occupies, and should only be carried out after focused scientific research (IUCN/SSC,

232 2013). Hence, stock augmentation for the sole purpose of increasing angler catches (numbers  
233 and/or size of fish) should be avoided. This is particularly true of the mahseers for which  
234 satisfactory knowledge pertaining to population genetics across India (and beyond) is still  
235 lacking (Pinder and Raghavan, 2013).

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237 Along with socio-economic benefits, the efficacy of C&R fishery management in conserving  
238 fish populations has been demonstrated in many regions of the world (Arlinghaus, 2006;  
239 Granek et al., 2008). Therefore, the high agreement rate (99%; n=148) of anglers that C&R  
240 fisheries have the potential to form effective conservation measures was not surprising (see  
241 Table 2). Hence, both groups (UK and domestic) expressed personal willingness to contribute  
242 their own time and money to support conservation initiatives within the rivers they fish.  
243 Willingness to pay (WTP) represents a successful model of protecting fish populations  
244 (Gozlan et al., 2013; Rogers, 2013) and enhance recreational fishery performance (Kenter et  
245 al., 2013). Added protection of river reaches can also enhance biodiversity and associated  
246 ecosystem services (Kenter et al., 2013). There is also potential for the revenue generated  
247 through C&R angling initiatives to feedback to local communities, and further strengthen  
248 societal support for future river and fish conservation strategies (Everard and Kataria, 2011).

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#### 250 **4. Conclusions**

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252 Both UK and domestic anglers fishing in India have demonstrated conservation awareness  
253 and a willingness to support local conservation initiatives. This is important as the industry is  
254 in an expansion phase in the country, and such collaborative opportunities could assist  
255 ongoing and future river and fish conservation strategies. However, there are concerns among  
256 C&R anglers that biodiversity managers and policy makers would initiate strict management

257 of C&R angling activities in Indian rivers. This is because there are serious concerns that  
258 some C&R anglers cause more risk than benefits to the fish species they target, especially  
259 threatened species (Gupta et al., in press). Further, domestic anglers were comparatively  
260 unaware of the genetic risks of stocking (see Table 1). This highlights the importance of  
261 spreading awareness through education. This can be facilitated by the existing angling  
262 organizations among its members through angling workshops and literature. Additionally,  
263 Indian anglers are interested in a much greater diversity of rivers and fish species (see Table  
264 1). This is a positive sign from a national perspective and demonstrates that C&R benefits  
265 beyond mahseer, the Cauvery and Ganges.

266

267 Apart from having a current global value in billions (in US\$) (FAO, 2012) C&R angling has  
268 also generated substantial income for national economies (Cooke and Suski, 2005; Cowx et  
269 al., 2010; Danylchuk and Cooke, 2011; Everard and Kataria, 2011). Economic benefits in the  
270 year 2005 alone were estimated at US\$2 billion in Canada, US\$800 million in New Zealand,  
271 US\$150 million in Argentina, and US\$10-15 million in Chile (Arismendi and Nahuelhual,  
272 2007). The amount of money spent by anglers fishing Indian rivers represents an emerging  
273 economy, and could play a decisive role for fish conservation by bringing both social and  
274 economic benefits for local communities and associated stakeholders. Everard and Kataria  
275 (2011) noted that a single 5-day angling tour for three anglers on the Ramganga River in  
276 2007 generated US\$ 1,220; and in 2010 (February-April), US\$ 7,800 was spent by anglers in  
277 this region on purchases and accommodation alone (Everard and Kataria, 2011). Such  
278 monetary incentives could motivate locals people to participate voluntarily in fish tourism,  
279 and assist in the protection of threatened species from illegal fishing techniques (Everard and  
280 Kataria 2011; Pinder and Raghavan, 2013).

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282 As the industry expands, there remains a need to maintain transparency during the profit  
283 sharing stages, and ensure the marginalization of any particular group of stakeholders is  
284 avoided. C&R anglers frequenting the Indian rivers have expressed concern over the  
285 acceptable distribution of angling derived revenue by some angling tourism operators (see  
286 Gupta at al. in review). One way to overcome this would be to set up community  
287 conservation units (CCUs) within local villages, the members of whom could interact with  
288 local angling associations and ensure that appropriate dividends reach their communities.  
289 With the current perilous state of Indian rivers and their associated biodiversity, there is an  
290 urgent need for alternate conservation strategies, and C&R anglers as a local stakeholder  
291 group could potentially provide such an opportunity.

292

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**Table 1:** Summary of responses obtained from recreational anglers fishing in the Indian rivers

Criteria	UK anglers (n= 40)	Domestic anglers (n=108)
<b>Preferred fishing locations (rivers)</b>	(a) Cauvery: 75% (b) Kali: 6% (c) Ramganga: 19%	Assi Ganga, Barak, Beas, Bhadra, Bhagirathi, Bhakra, Bhatsa, Bhavani, Bhilangana, Bhima, Cauvery, Damodar, Gambur, Ganga, Giri, Godavari, Indrayani, Jaldhaka, Jia Bharali, Kali, Kallada, Kamini, Kosi, Krishna, Manjira, Mula, Narmada, Nira, Pavana, Ramganga, Rangeet, Ravi, Saryu, Shimsha, Subansiri, Sutlej, Teesta, Tirthan, Tons, Tungabhadra, Ulhas, Wardha, Warna and Yamuna
<b>Preferred target fish species</b>	(a) <i>Tor</i> spp: 82% (b) <i>Bagarius bagarius</i> : 18%	(a) <i>Barbodes carnaticus</i> , <i>Ctenopharyngodon idella</i> , <i>Gibelion catla</i> , <i>Hypselobarbus</i> spp, <i>Oncorhynchus mykiss</i> , <i>Salmo trutta</i> , <i>Schizothorax richardsonii</i> , <i>Labeo calbasu</i> , <i>Labeo rohita</i> , <i>Channa marulius</i> , <i>C. striata</i> , <i>Etrophus suratensis</i> , <i>Oreochromis</i> spp, and <i>Wallago attu</i> : 61% (b) <i>Tor</i> spp: 26% (c) <i>Bagarius bagarius</i> : 13%
<b>Fishing techniques</b> (score from 1-5, where 5 = most preferred; mean score)	(a) Bait (live/dead): 3.6 (b) Lure/spinner: 3.6 (c) Fly fishing: 3.2	(a) Bait (live/dead): 3.6 (b) Lure/spinner: 4.1 (c) Fly fishing: 2.2
<b>Factors influencing angling experience</b> (score from 1-5, where 5 = strongly agree; mean score)	(a) Angling quality: 4.8 (b) Aesthetics of surroundings: 4.7 (c) Presence of other wildlife: 4.5 (d) Fishery management practices: 4.8 (e) Inclusion of, and financial benefit to local communities: 4.6 (f) Camp infrastructure: 3.6	(a) Angling quality: 4.4 (b) Aesthetics of surroundings: 4.4 (c) Presence of other wildlife: 4.2 (d) Fishery management practices: 4.4 (e) Inclusion of, and financial benefit to local communities: 4.1 (f) Camp infrastructure: 3.7

<b>Criteria</b>	<b>UK anglers (n=40)</b>	<b>Domestic anglers (n=108)</b>
<b>Changes in quality of angling experience at the angling locations</b>	(a) Negative change: 75% (b) Positive change: 25%	(a) Negative change: 65% (b) Positive change: 35%
<b>Threats to target fish species and fishing locations</b> (score from 1-5, where 5 = strongly agree; mean score)	(a) Deforestation: 4.2 (b) Water abstraction: 4.6 (c) Hydropower projects: 4.3 (d) Water pollution: 4.3 (e) Destructive fishing techniques: 4.8	(a) Deforestation: 4.2 (b) Water abstraction: 4.2 (c) Hydropower projects: 4.1 (d) Water pollution: 4.5 (e) Destructive fishing techniques: 4.6
<b>Awareness regarding conservation status of target species</b> (score from 1-5, where 5 = strongly aware; mean score)	3.3	3.4
<b>Conservation strategies for target species</b> (score from 1-5, where 5 = strongly agree; mean score)	(a) Afforestation: 4.1 (b) Legislation: 4.7 (c) Scientific research: 4.0 (d) Anti-poaching patrol: 4.8 (e) Harsher fines: 4.5 (f) Education: 5.0 (g) Stocking: 3.5	(a) Afforestation: 4.0 (b) Legislation: 4.5 (c) Scientific research: 4.6 (d) Anti-poaching patrol: 4.8 (e) Harsher fines: 4.6 (f) Education: 4.8 (g) Stocking: 4.2
<b>Perceptions on angling as a conservation strategy</b>	(a) Yes: 100% (b) No: 0%	(a) Yes: 97% (b) No: 3%
<b>Willingness to pay for and support conservation action</b> (score from 1-5, where 5 = very interested; mean score)	4.5	4.8

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432 **Table 2:** Dominant responses obtained from C&R anglers (UK + Indian; n=148) regarding the benefits of angling as a tool for conservation of threatened fish species in India

<b>Activity during C&amp;R angling</b>	<b>Benefits to threatened fish species</b>	<b>Reasons</b>
<b>Monitoring</b>	(a) Protection against poachers	(a) Discourages poaching activities
	(b) Helps build recognition for the species	(b) Limits poaching
	(c) Helps raise conservation awareness among the wider C&R angling community	(c) Provides more eyes on the water
	(d) Keeps track of fish counts, species diversity and habitat status	
	(e) Helps assess the health and quality of the fishery, if applicable	
<b>Prolonged presence along rivers</b>	(a) Effective bankside protection	(a) Deterrent to poachers
	(b) A source of first-hand information on natural and anthropogenic factors affecting fish species	(b) More easily accessible information regarding fish species
<b>Revenue generation</b>	(a) Future conservation work	(a) Local availability of funds
	(b) Formation of local anti-poaching patrol parties	(b) Economic influence by financially supporting local communities
<b>Involvement of local stakeholders</b>	(a) Formation of local groups targeting the conservation of fish species	(b) Creation of local job opportunities and training
		(c) Local awareness and education
		(d) Spreading understanding of the high value of protecting fish species for sustainable recreational purposes
		(e) Resulting political influence

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**Table 3:** Angling locations in the three most important river systems targeted by survey respondents (see Fig 1)

<b>River</b>	<b>Location</b>	<b>Coordinates</b>
Cauvery	Bheemeshwari <sup>1</sup>	12.312N, 77.274E
Cauvery	Dodamakalli <sup>1</sup>	12.334N, 77.181E
Cauvery	Forbes Sagar/WASI Lakes	12.973N, 77.641E
Cauvery	Galibore <sup>1</sup>	12.282N, 77.374E
Cauvery	Krishna Raja Sagar (KRS) Dam	12.413N, 76.574E
Cauvery	Valnur (Kodagu)	12.354N, 75.873E
Jia Bharali	Tezpur	26.933N, 92.834E
Ramganga	Bikhyasen	29.695N, 79.260E
Ramganga	Ramnagar	29.605N, 79.092E

<sup>1</sup>recreational fisheries is now closed (see Pinder and Raghavan, 2013)

**Supplementary material:** catch-and-release angling survey questionnaire

This questionnaire aims to investigate the available positive support from the catch-and-release angling community for river and fish conservation on a global scale. The data gathered will be used for an article which will highlight a possible two-pronged approach where research scientists and catch-and-release anglers work together to bring about conservation benefits.

1) What is your age?

Under 18  
Between 18 - 24  
Between 25 - 34  
Between 35 - 44  
Between 45 - 54  
Between 55 - 64  
Over 65

2) Sex

Male  
Female

3) Nationality

4) Which of these international/national organizations do you have affiliation(s) with?

Wildlife Association of South India (WASI)  
Mahseer Trust  
The Himalayan Outback  
Coorg Wildlife Society (CWS)  
WWF  
Angling Trust  
AIGFA  
MSAA  
IGFA  
The Billfish Institute  
Other:

5) On average, how many angling excursions do you make per year in your own country?

None  
1 - 3  
4 - 6  
7 - 10  
11 - 20  
Over 20

6) On average, how many angling excursions do you make per year outside your own country?

None

1 - 3

4 - 6

7 - 10

11 - 20

Over 20

7) Which of these continents have you visited for recreational angling activities?

North America

South America

Australia

Asia

Africa

Europe

Antarctica

8) Which of these Asian countries have you visited for recreational angling activities?

India

Malaysia

Sri Lanka

Nepal

Indonesia

Other:

9) If in India, which of these rivers do you target?

Cauvery

Kali

Ramganga

Other:

10) In Asia, which of these are your main target fish species?

Mahseer

Cat fishes (Goonch)

Marine species

Other:

11) Which of these do you prefer as your angling method? (Please provide a score from 1 - 5, where 5 is the most favored)

1 2 3 4 5

Bait

Live/dead bait

Lure/spinner  
Fly

12) Regarding your angling experience, are the below-mentioned factors important to you?

Strongly disagree, Disagree, Neither agree nor disagree, Agree, Strongly agree

Angling quality  
Aesthetics of surroundings  
Other wildlife  
Catch and release (suitable fishery management practices)  
Camp infrastructure  
Inclusion of, and financial benefit to local communities

13) Have you observed a change in angling quality over the years?

Yes  
No

14) What are these changes?

Positive changes  
Negative changes  
No change

15) In your opinion, are the below-mentioned threats impacting your target fish species, and your leisure experience?

Strongly disagree, Disagree, Neither agree nor disagree, Agree, Strongly agree

Deforestation  
Water abstraction  
Hydro projects (flow regulation)  
Water pollution  
Destructive fishing techniques

16) Do you feel the below-mentioned conservation efforts need to be implemented to protect and conserve the fish biodiversity in the region?

Strongly disagree, Disagree, Neither agree nor disagree, Agree, Strongly agree

Afforestation  
Legislation protecting threatened species  
Scientific research (enhance understanding of population trends and key habitat requirements)  
Effective anti-poaching patrol  
Harsher fines for culprits  
Education  
Stocking

17) Have you witnessed destructive fishing techniques first hand?

Yes

No

18) How much money do you spend annually towards recreational angling activities (in £)?

0

1 - 3000

3001 - 6000

6001 - 9000

9001 - 12000

Above 12001

19) How aware are you of the conservation status (IUCN Red List) of the fish species you target?

Strongly unaware

Unaware

Neither aware nor unaware

Aware

Strongly aware

20) Do you think that recreational angling can benefit the conservation of threatened species?

Yes

No

Please explain your answer to the above.

21) How willing would you be to get involved in a conservation initiative in your angling region?

Very interested

May be

Not at all interested

22) Would you be willing to contribute your time and money for such an initiative?

Yes, time and money both

Yes, but only time

Yes, but only money

Neither time nor money

23) Any additional comments



Figure 1  
[Click here to download high resolution image](#)

