1 **The role of social norms and informal sanctions in catch-and-release angling**

2 Running head: Norms and sanctions in catch-and-release angling

3 Stian Stensland [a]

4 Norwegian University of Life Sciences, Norway

5 Øystein Aas

6 Norwegian Institute for Nature Research &

7 Norwegian University of Life Sciences, Norway

8 [a]Correspondence information:

9 Norwegian University of Life Sciences

10 Department of Ecology and Natural Resource Management,

11 P.O. Box 5003, 1432 Ås, Norway.

12 Telephone: (+47) 6496 5715, E-mail: stian.stensland@nmbu.no

18

19

20

21

The role of social norms and informal sanctions in catch-and-release angling

Abstract

This study focuses on norms and informal sanctions of catch-and-release angling and their implications for fishery management. A web-based questionnaire of Atlantic salmon (*Salmo salar* L.) anglers in the Lakselva River, Norway yielded 656 answers (response rate 68 %). Anglers were segmented into four subgroups: Catch & release, Keeper, Something else, Trophy angler. In all groups, the reward (positive feeling) was high and punishment low for releasing a large salmon as expressed by the intensity of self-sanctions. All groups saw keeping a large salmon mostly as a rewarding experience, although the C&R and Trophy segments reported less rewards and more "punishment" for keeping. There is evidence for both a medium strength C&R norm and a weak keep norm in this fishery, receiving different ascriptions between angler groups. The results help understand angler group conflicts and explain how angling behaviour is formed, thereby helping management agencies achieving angler satisfaction.

Key Words: catch orientation, human dimensions, motivation, nature-based tourism, recreational fishing, sport fishing.

Introduction

Catch-and-release angling (C&R) is increasing all over the world (Arlinghaus *et al.* 2007). Historically, C&R has been more common in North America than in Europe where angling has been more of a means of catching food, and not fishing "just for fun" or "being cruel to fish" (Aas *et al.* 2002; Arlinghaus *et al.* 2007). There are also significant differences in the approach to, and dissemination of C&R between types of fisheries (Aas *et al.* 2002; Bartholomew &

2

45 Bonsach 2005; Arlinghaus *et al.* 2007). Catch-and-release angling for Atlantic salmon, *Salmo*

46 *salar* L., originated in the USA and Canada, and became part of formal regulations in the mid-

47 1980s. Since the mid-1990s, salmon angling in the United Kingdom have seen a significant

48 increase in C&R (Aas 2007). C&R is a tool that could help salmon recovery and at the same time

49 uphold significant social and economic values of the fishery (Thorstad *et al.* 2008). C&R has

50 recently increased in Norway. From 2009 to 2013 the number of released salmon in Norwegian

51 rivers grew from 7 % to 15 % of the total registered catch (Statistics Norway 2014), indicating a

52 growing and emerging norm for C&R. However, the registered C&R rate in Norwegian salmon

53 rivers varies from 0 % to more than 50 %.

54   It is generally agreed that C&R behaviour is a function of several factors, influenced by

55 personal as well as situational variables (Sutton & Ditton 2001; Sutton,2003; Arlinghaus et al.

56 2007). Commitment to angling and consumptive orientation have been put forward as two key

57 personal variables in explaining C&R behaviour, while a range of situational variables can

58 mediate the personal preferences, beliefs and attitudes the angler brings along to a given fishing

59 trip . An angler's consumptive orientation recognises that the importance of four catch-related

60 dimensions, namely a) importance of catching something, b) importance of keeping fish, c)

61 importance of catching trophy fish and d) importance placed on number of fish caught, can vary

62 among anglers (Sutton & Ditton 2001; Anderson *et al.* 2007). However, of these only the aspect

63 of keeping fish consistently affects C&R behaviour (Arlinghaus *et al.* 2007).

64   Arlinghaus *et al.* (2007) and Heberlein (2012) argue that the role of norms in

65 understanding C&R angling has been neglected, although norms are important both for fisheries

66 management as well as to understand general social processes in human-environment relations.

67 Unlike studies of concepts such as commitment to angling and consumptiveness, studies of

3

68   norms can shed light on how personal attitudes, beliefs and preferences change and are affected

69   socially, for instance by influence from other people, because norms are often said to describe

70   what a person "ought" or "should" do (Manfredo 2008).

71   A recent study by Stensland *et al.* (2013) showed that assumed environmental

72   consequences of C&R and social norms play a significant role in predicting anglers' intentions to

73   voluntary release fish. For norms to influence and change behaviour, there must be associated

74   sanctions – rewards or punishments - for conforming to or violating the norm (Heywood 2002,

75   2011). This paper looks specifically into the issues of informal sanctions, an aspect of C&R

76   behaviour that has not yet been subject to specific studies.

77

78   *Norms and sanctions*

79   Norms in recreation and natural resource management have been studied primarily within two

80   paradigms, norms as *structural standards* (The return potential model) and norms as *motivating*

81   *individual behaviour* (Manfredo 2008; Manning 2011). In this study we follow the latter

82   approach. A personal norm is the individual's own expectations of what to do in a given situation

83   (Schwartz 1977) and might differ from or be similar to the social norm. Social norms can be

84   defined as informal rules shared by groups that guide behaviour and have consequences that help

85   make the behaviour more or less self-correcting (Heywood 2011). Social norms are especially

86   strong in directing behaviour if they crystallize and have a necessary intensity. C*rystallization* is

87   the level of agreement or consensus about a norm (e.g. that all fish should be released), whereas

88   *intensity* is the relative strength or importance of a norm (e.g. the importance the angler ascribes

89   the norm of total C&R). The power of a norm to influence behaviour is a function of the

4

90 certainty of obligation (crystallization) and certainty of sanctions (intensity) implied when

91 conforming to or violating that norm (Heywood 2002).

92   A key element of social norms directing behaviour is that there are *sanctions* associated

93 with them that act as punishment for wrong behaviour and reward behaviour in accordance with

94 the norm (Grasmick et al. 1993; Heywood, 2002). "Sanctions are the independent power that

95 enhances the likelihood that obligations will be followed" (Heywood 2011, p. 443). There are

96 three types of informal sanctions[1] for a social norm (Heywood 2011): (i) *Informal sanctions*

97 imposed by others are what Durkheim (1893/1933:98, cited in Heywood (2011)) calls others'

98 "emotional reaction against the offender". They can be positive or negative feedbacks such as

99 facial expressions (smile, angry frown), body language (nod, head shaking) or verbal expressions

100 (praise, yelling) (Blake & Davis 1964). Such informal sanctions by others can result in an

101 internalization of sanctions by the angler (ii) (*informal internal sanctions*) where she or he would

102 feel admiration or embarrassment for conforming or not conforming to the C&R norm. Even in

103 situations where nobody is watching or knows about the outcome, the angler might experience

104 (iii) *internal sanctions* by feeling e.g. guilty or guiltless (Grasmick & Bursik 1990), shame or

105 pride (Heywood & Aas 1999), or uneasy or comfortable when violating or conforming to what is

106 seen as an obligation. Sanctions by others or self could lead to individual discomfort or comfort

107 and ultimately affect self-esteem and self-image, and thereby also shape C&R behaviour. The

108 two sanctions imposed by self – (ii) informal internal and (iii) internal – are subject for study in

109 this work.

---

[1] Another type of sanction is formal, external sanctions (e.g. ticketing, jail, etc.) associated with institutional norms. The latter defined by Heywood (2011, p. 446) as "Formal rules or standards that are formulated and implemented by administrative authorities and enforced by them through formal external sanctions".

110   Earlier studies indicate an emerging C&R norm among salmonid anglers in Scandinavia

111   (Stensland *et al.* 2013) and that different angler groups might hold different norms for keeping as

112   well as for releasing salmon (Aas *et al.* 2002). Therefore this paper specifically studies social

113   norms for C&R and catch & keep angling for salmon, and angler segments' reported self-

114   sanctions for conforming to or violating the social norms, and how these self-sanctions impact

115   the intention to release salmon. Segmentation of respondents is based on measures of angler

116   catch orientation.

117

118   **Methods**

119   *Study site*

120   Lakselv River Owner Organization (ROO) manages and administrates most of the fishing on

121   behalf of the fishing right holders in the 45 km Lakselva River, Northern Norway.

122   For the period 2007-2013, annual rod catches varied from 1,100 to 1,900 salmon, averaging 5.4-

123   6.8 kg. The Lakselva River is known for its big salmon. The season normally runs June 1-

124   August 31.

125   Since 2008, Lakselv ROO has emphasized personal catch quotas and voluntarily release

126   of fish to meet escapement goals and secure future stocks. Catch-and-release angling has been

127   encouraged in information brochures, the website (www.lakselva.no) and a photo contest.

128   Current (2013) fishing regulations allow an angler to keep three salmon over 80 cm for the

129   season. For salmon under 80 cm, there is a daily bag limit of two fish, but no seasonal limit.

130   Lakselva River has among the highest release rates for salmon in Norway, increasing from 6% of

131   the numbers caught in 2007 to 35% in 2013.

132   *Data collection*

6

133   Anglers fishing on the five zones administered by Lakselv ROO are registered in an electronic

134   database. Over the period 2009-2011, there were 2,676 unique persons registered. Of these, the

135   1,010 who gave their e-mail address were sent a survey electronically with a language choice of

136   Norwegian, Finnish, English, or German. Three reminders were sent. To increase the response

137   rate anglers were informed that those who responded to the survey would be included in a raffle

138   for two seasonal permits to Lakselva River. The distribution of anglers from different countries

139   in the total population (2,676) and the e-mail sample (1,010) was similar. Data collection lasted

140   February - March 2012. The survey yielded 656 responses with no missing variables. Of the

141   initial 1,010 e-mails sent, 40 were returned undelivered, giving a valid sample of 970 and a

142   response rate of 68%. The distribution of anglers in the three groups Norwegians (39%), Finnish

143   (38%) or other foreign anglers (23%) were similar for total sample (2,676), sample used (1,010)

144   and responses (656). There was an under-representation of local anglers in the sample used.

145

146   *Angler Segmentation*

147   A principal component analysis reduced 12 variables from Anderson et al.'s (2007) catch

148   orientation scale into four components in accordance with previous studies, and addressed

149   anglers' catch orientation for salmon, sea-run brown trout *Salmo trutta* L., and sea-run Arctic

150   char *Salvelinus alpinus* L. The scree plot and Kaizer's criterion with eigenvalues greater than 1

151   were used to extract the number of components. An index value for each component and

152   respondent was calculated based on the average value of the three variables in each component.

153   Detailed report of the principal component analysis is given in Table 1.

154   The index value for the different catch orientation components was used in a cluster

155   analysis to segment anglers (Table 2). Advices from Hair *et al.* (1998, pp. 497-515) were

7

156 followed. First, a hierarchical cluster analysis (Ward's method) was applied to find the best

157 number of clusters and initial seed points (cluster centroids) for the clusters. Thereby the number

158 of clusters to be extracted was specified and cluster centroids from the hierarchical analysis were

159 used as seed points in a non-hierarchical K-means cluster analysis. Several cluster solutions were

160 tested. To check the robustness of the cluster solutions several types of cluster analyses were

161 conducted - (i) the combination of hierarchical and non-hierarchical analysis (as described), (ii)

162 hierarchical analysis, and (iii) non-hierarchical (K-means) analysis, and applied on a random half

163 split of the sample. A four group cluster solution showed similar results for all types of cluster

164 analyses (i-iii), and it was therefore deemed stable. This solution yielded distinct differences

165 between clusters, and theoretically it resembled some of the groups found in other angler studies

166 (Kyle *et al.*2007, Skullerud & Stensland 2013). Differences between cluster segments were

167 tested using one-way analysis of variance (ANOVA) and subsequent Tamhane's posthoc test.

168

169 *Variables*

170 All items were measured by answering statements on seven point semantic differential scales

171 with only endpoints given verbal labels. The following variables were used for the analyses:

172 Intention to release (a large salmon); measured by the question: " During your next season

173 fishing in the Lakselva River, how likely is it that you will be releasing one or more salmon over

174 80 cm which you may legally take?". Scale endpoints: 1=very unlikely and 7 =very likely.

175 Personal C&R norm; measured by the statement: "I should release all the fish I catch in the

176 Lakselva River" and personal KEEP norm; measured by the statement: "I should keep all the

177 legal fish I catch in the Lakselva River". Scale endpoints: 1 = strongly disagree and 7 = strongly

178 agree.

8

Social norm (obligation) for C&R and KEEP fish; measured by the two statements: "To what extent do you think that fishermen in the Lakselva River should (a) keep all the legal fish they catch; (b) release all the legal fish they catch. Scale endpoints: 1= should never and 7 = should always.

Self-sanctions for C&R and KEEP social norms: terms used for measuring sanctions for respectively releasing or keeping a big salmon were adapted from Heywood & Aas (1999), and Heywood (2002). Anglers were asked to respond to several statements: "If others saw you release [keep] a big salmon in the Lakselva River, would you feel (i) uneasy (1) or comfortable (7)?; (ii) ashamed (1) or proud (7); (iii) guilty (1) or guiltless (7)?; (iv) embarrassed (1) or admired (7)?; Internal sanctions were measured by (i-iii), and informal internal sanction measured by (iv).

The intensity of the KEEP and C&R norms was calculated as the average of the sum of: informal sanction plus the average of internal sanctions.

Social norm power for C&R and KEEP respectively: based on social norm (obligation) and intensity. Adapted from Heywood (2002), norm power was calculated by adding norm intensity (1-7) and social norm to keep or release fish (1-7).

Variables about beliefs and attitudes towards C&R were measured on scales with only endpoints 1 (strongly disagree) and 7 (strongly agree) given verbal labels, and elicited by presenting the following statements to the respondents:

Belief about C&R fish survival: "Most fish that are caught and released in Lakselva, would survive and spawn if handled correctly and hooked in the mouth".

Self-evaluation of C&R skills: "I know how to correctly handle and minimize damages to a fish that are going to be released".

9

202   Belief about C&R as part of conservation: "To release fish contributes to the conservation of

203   fish stocks in Lakselva River".

204   C&R as an act of wasting food: "Release of fish I could have kept is wasting food".

205   C&R as cruelty: "Release of fish is cruelty to animals".

206

207   *Data analyses*

208   Clusterwise comparisons were done using ANOVA and post hoc test. Frequencies for extreme

209   responses (1-2; 6-7) to the personal norm, social norm and self-sanction questions are given in

210   figures 1-3 as this was interpreted to better show crystallization (level of agreement) and

211   intensity between groups (cf. Heywood 2002). To test the power of C&R and KEEP social

212   norms variables respectively, a standard regression approach was run with behavioural intention

213   of releasing a large salmon as the dependent variable.

214

215   **Results**

216   *Angler segmentation*

217   The principal component analysis based on anglers catch orientation yielded four components:

218   keep fish, catch big fish, catch many fish, and catch any fish. The subsequent cluster analysis

219   based on the index value of the catch orientation components yielded a cluster solution with the

220   four angler groups : something else, catch & release (C&R), trophy angler, and keeper (Table 2).

221   <TABLE 1 AND TABLE 2 AROUND HERE>

222

223   *Angler groups*

10

224   Groups were compared by running ANOVA and post hoc tests on salmon angling experience

225   and socio-demographic variables (Table 3).

226   *Group 1 Something else.* These anglers scored all four catch orientations medium or low, with

227   catch big fish and keep fish as the most important[2]. Nationality ratios did not differ from other

228   groups, but *Something else* has more regional anglers (from the Northern Norway region) (27%)

229   than *Trophy angler* and *C&R angler* groups. Average numbers of salmon fishing years (17) and

230   years fished Lakselva River (5) did not differ from other groups. Similar to other groups most

231   anglers were male (96%), and preferred fly-fishing (90%), but the ratio of anglers catching fish

232   (45%) was lower than for *C&R* anglers (67%). Average catch was 2.2 (SD 5.0) fish, of which 0.8

233   (2.0) was released. Release was lower than for the *C&R* group.

234

235   *Group 2 Trophy angler.* Catch big fish was scored high and other components low. Compared to

236   *Keepers*, *trophy anglers* and *C&R anglers* had a lower ratio of Norwegian and regional anglers,

237   and more Finnish anglers. *Trophy anglers* were on average younger (43 years) than *something*

238   *else* (47) and *keeper* (49), and had less fishing experience than *keepers* but generally fished more

239   frequent. More *trophy anglers* (97%) than *keepers* (88%) preferred fly-fishing. *Group 3 Catch-*

240   *and-release anglers (C&R).* Catching big fish was most important to this group, but catching any

241   or many was of high importance too. Keeping fish was not important. The *C&R* group had fewer

242   years (4) of fishing Lakselva River than *keeper*s (6), but a higher proportion of anglers in this

243   group (67%) caught more fish and released more fish than both *something else* and *keepers*.

---

[2] The low score on catch orientation indicates that these anglers might have other non-catch

oriented motivations as their primary drivers for participating in salmon angling.

11

244   *Group 4 Keeper.* For this group catching and keeping fish were scored high. Age and proportion

245   of Norwegian (52%) and regional anglers (26%) were high.

246

247   *Norms and sanctions*

248   The personal norm to release all fish caught was held by only 19% of anglers and expectedly

249   most appeared in the *C&R* (33%) and *trophy* (28%) groups (Figure 1). Almost 50 percent of the

250   anglers were in opposition to releasing all fish. However, a personal norm to keep all legal fish

251   was held by only 9% of the anglers, and the highest number by *keepers* (20%). Two thirds of all

252   anglers were opposed to keeping all fish. The social norm for Lakselva River anglers to release

253   or keep all fish caught showed similar trends with about equal proportions in each angler group

254   holding that social norm. There were although fewer anglers reporting opposition to the social

255   norms than to the personal norms.

256   Figures 2 and 3 show how the segments responded to the items intended to measure self-

257   sanctions for keeping or releasing a large salmon. The "keeper" and "C&R" groups were the two

258   groups most likely to report the strongest sanctions regarding keeping and releasing salmon. As

259   expected, we see that "keepers" express the highest frequency of positive responses to keeping

260   salmon, while the "C&R" segment report the highest frequency of positive responses when

261   releasing salmon. Generally, the two groups are similar in that they report strong positive

262   emotions regarding their preferred behaviour, but to a much more limited degree report negative

263   emotions if they conduct the opposite behaviour. In line with this, many of the C&R anglers also

264   report positive emotions if they keep a salmon. Even if fewer of the C&R anglers report that they

265   are proud if they keep a salmon compared to the Keeper-segment, more C&R anglers report that

266 they are proud than those C&R anglers who report they feel ashamed if they kill and keep a

267 salmon.

268

269 <FIGURES 1 – 3 AROUND HERE>

270 *Beliefs, attitudes and norm power*

271 The groups varied significantly on many of the variables related to C&R in Lakselva River

272 (Table 4). In general, all angler groups believed that a properly handled and released fish would

273 survive to spawning, and that releasing salmon contributed to protecting the fish stocks. *Keepers*

274 however agreed lesser to these two issues. Most anglers were of the opinion that they had the

275 skills to correctly handle fish to be released. *Trophy* and *C&R* anglers were however more

276 certain on this than *keepers*. On average, all angler groups disagreed on C&R being cruelty to the

277 fish or wasting food, however *keepers* disagreed less than the other groups.

278 *Trophy* and *C&R* anglers were highly likely to release a large salmon they were allowed

279 to take next year they fished the Lakselva River, and more so than *something else* (likely) and

280 *keepers* (unlikely) (Table 5). The power of the social C&R norm among groups was above the

281 neutral value of 8 indicating a somewhat agreement/compliance with the norm, except for

282 *keepers* where norm power was neutral. Norm power was highest among *trophy* and *C&R*

283 *anglers*. The KEEP norm power was above neutral only in the *keeper* group, with below neutral

284 scores for the other groups indicating a weak opposition to the norm.

285 <TABLE 4 AND 5 AROUND HERE>

286 The two independent variables *Social Norm power C&R* and *Social Norm power KEEP*

287 explained 28% of the variation in angler intention to release a large salmon, legal to keep in the

288 Lakselva River (Table 5). While norm power C&R had a positive influence, norm power Keep

13

289 exerted a negative influence on the intention to release. C&R norm power contributed slightly

290 more to the model as indicated by the larger absolute size of standardized regression coefficients.

291 <TABLE 6 AROUND HERE>

292

293 **Discussion**

294 This study documented that C&R attitudes, beliefs, personal norms, social norms, intensity of

295 self-sanctions, and norm power to do C&R or keep fish differed among angler groups. Further, it

296 adds understanding to the growth in C&R angling by showing that norm power (self-sanctions

297 and social norms) influences the intention to release fish. The results support evidence for the

298 existence of social norms for both keeping and releasing salmon in this fishery, and these norms

299 receive different ascriptions in different angler segments. The power of the C&R norm is more

300 pronounced than the keep norm. Arlinghaus *et al.'s* (2007) conceptual model of voluntary C&R

301 pointed to personal and situational factors as the two main factors influencing behaviour. The

302 study adds understanding to this model, and the work on C&R social norms by Stensland *et al.*

303 (2013), since we investigate how self-sanctions help guide behaviour. Social norms are important

304 since they influence personal as well as situational factors. It is obvious that social norms are

305 situational since the anglers you meet on a given trip have expectations about your behaviour,

306 thereby influencing informal sanctioning and ultimately C&R and keep behaviour.

307   The social norms to do C&R only or to Keep all legal fish were however not highly

308 crystallized in the sample (Heywood 2002), with the C&R norm being of medium strength and

309 the Keep norm of weak strength. There is a shared opposition by large parts of the sample

310 towards "extreme" norms of either releasing or keeping all fish. This might be an important

311 explanation why positive sanctions are reported more often that negative sanctioning both among

14

312 those who are most release prone and those who are most keep oriented. Unlike other behaviours

313 such as littering, irresponsible, illegal or dangerous behaviour, where strong negative self-

314 sanctioning has been documented in surveys (Heywood 2002) the respondents had a more

315 nuanced view on releasing as well as on harvesting salmon. When assessing these findings, it is

316 important to bear in mind that it was legal to harvest some salmon, while at the same time

317 voluntary C&R was encouraged by the local river management body. The results indicate the

318 existence of agreement for a social norm of releasing some fish and keeping others, and a

319 continuum of accepted C&R levels from 0 to 100% varying between anglers. Aas *et al.* (2002)

320 suggest that there are two main dichotomous positions, where C&R is either (i) an unethical and

321 reprehensible practice or (ii) an ethical conservational approach to resource use. Our findings

322 question this hypothesis since few respondents take such positions. This is further supported by

323 how the sample as a whole including the "C&R" and "keep" segments for a large part seem to

324 agree that C&R is neither a waste of food, nor is it cruelty to animals, and that C&R also

325 generally is believed to help conserve the salmon stock in the study river. The arguments related

326 to subsistence (waste of food) and to animal welfare has been key issues in the European

327 discourse about the appropriateness of C&R (Aas *et al*. 2002, Arlinghaus *et al.* 2007, Policansky,

328 2008). This might be caused by an emerging C&R norm in our study area , cf. the increase in

329 C&R rates from near zero about 10 years ago to 35 % currently.

330 Understanding social norms for releasing and/or harvesting fish is important to fishery

331 management, because norms add to the typical human dimension investigations of individual

332 factors aiming at explaining behaviour, such as values, attitudes and preferences. Studies of

333 norms help explain how social processes play a role in forming angling behaviour, sometimes

334 independently of the resource and conservation status of the fishery as Policansky (2007) points

15

335   out. Norms are especially useful in understanding conflicts between groups of recreational

336   fishers (Manfredo 2008). Studying norms also adds to the understanding of how managers,

337   scientists and angling role-models unconsciously or deliberately play parts in such processes. In

338   line with Heberlein (1974, 2012, pp. 4-9) we suggest that encouragement of voluntary C&R is

339   most effective when it combine cognitive (e.g. normative information) and structural/institutional

340   (e.g. bag limits, awards for releasing fish) "fixes" or management actions.

341   The nature of social norms and associated sanctions might sometimes actually be a

342   barrier for providing a spectrum of angling opportunities. Fishery managers should be aware of

343   the strong behaviour-correcting potential of social norms. In situations where some angler groups

344   adopt and eventually elaborate a message about promoting voluntary C&R, a strong social C&R

345   norm might be institutionalised and become a formal C&R regulation. Policansky (2007) refers

346   to "the truly ugly of C&R" if regulations preclude harvest in situations where the resource can

347   sustain harvest and some anglers want to harvest. Again, studies of norms add to our

348   understanding of angler behaviour and angler diversity and provide arguments why spatial

349   zoning is such a useful tool for achieving satisfaction among different angler groups (Manning

350   2011).

351   Future studies conducted in the same area should look into if and how norm emergence

352   might also lead to more crystallized norms and reporting of more negative sanctions especially

353   for keeping salmon. Qualitative approaches including analyses of traditional media as well as

354   modern social media discourses could add insights about sanctions in angling and thereby

355   supplement traditional survey research (Policansky 2008). Our study addressed the Lakselva

356   River fishery, a river encouraging C&R and "Fish of a lifetime" (big salmon) as a brand. Due to

357   an underrepresentation of local anglers in our sample we believe the actual population of anglers

16

358   in the study river to be somewhat less positive towards C&R than what is presented here. Studies

359   addressing rivers with less C&R and especially targeting local anglers should be conducted..

360   Sanctions are influenced by the social surrounds, including who you are with and who watches

361   you. Stensland *et al.* (2013) showed different expectations of C&R by different groups of

362   significant others. Our segmentation of anglers is based on general (not Lakselva River specific)

363   catch orientation regarding salmon fishing. Stensland *et al.* (2013) found assumed consequences

364   for the fishery to be important for C&R behaviour. Many anglers fish more than one river;

365   investigating the situational context (e.g. being local vs. visitor, fishing regulations, stock status,

366   accepted practice) and how it influences C&R and Keep norms and C&R behaviour is crucial to

367   explain angler behaviour.

368   To what extent is C&R norm emergence and growth in the study area caused by changing

369   norms in the angler population or by replacing keep oriented anglers? The data suggest that both

370   processes take place. Keepers were older, consisting of a relatively large proportion regional

371   anglers, being least skilled and positive to C&R. Yet, many of those with a strong C&R norm –

372   being trophy anglers and C&R - had also been fishing salmon for many years, including the

373   study site indicating that they obviously must have changed their behaviour. Nordic recreational

374   fisheries have been perceived to be quite harvest oriented (Aas *et al.* 2002). The results from

375   Lakselva River show the opposite and most likely is a sign of a changing attitudes, norms and

376   practices about C&R over the recent years, a process we believe will continue.

377

378

379

380

    17

381 **References**

382 Aas, Ø. (2007) The role of catch and release in wild Atlantic salmon conservation in Europe -

383   possibilities and pitfalls. In: R.F. Carline & C. LoSapio (eds) *Wild Trout IX: Sustaining*

384   *wild trout in a changing world.* Bozeman, MT: Wild Trout Symposium. Available at

385   www.wildtroutsymposium.com

386 Aas, Ø., Thailing, C.E. & Ditton, R.B. (2002) Controversy over catch-and-relase recreational

387   fishing in Europe. In: T.J. Pitcher & C.E. Hollingworth (eds) *Recreational Fisheries:*

388   *Ecological, Economic and Social Evaluation.* Oxford: Blackwell Science, pp. 96-106.

389 Anderson, D.K., Ditton, R.B. & Hunt, K.M. (2007) Measuring angler attitudes toward catch-

390   related aspects of fishing. *Human Dimensions of Wildlife,* **12,** 181-191. doi:

391   10.1080/10871200701323066

392 Arlinghaus, R., Cooke, S.J., Lyman, J., Policansky, D., Schwab, A., Suski, C., Sutton, S.G. &

393   Thorstad, E.B. (2007) Understanding the complexity of catch-and-release in recreational

394   fishing: An integrative synthesis of global knowledge from historical, ethical, social, and

395   biological perspectives. *Reviews in Fisheries Science,* **15,** 75-167. doi:

396   10.1080/10641260601149432

397 Bartholomew, A. & Bohnsack, J. (2005) A review of catch-and-release angling mortality with

398   implications for no-take reserves. *Reviews in Fish Biology and Fisheries,* **15,** 129-154.

399   doi: 10.1007/s11160-005-2175-1

400 Blake, J. & Davis, K. (1964) Norms, values, and sanctions. In: R. Faris (ed.) *Handbook of*

401   *Modern Sociology.* Chicago, IL: Rand-McNally, pp. 456-484

402 Grasmick, H.G. & Bursik, R.J.J. (1990) Conscience, Significant Others, and Rational Choice:

403   Extending the Deterrence Model. *Law & Society Review,* **24,** 837-861.

18

404　Grasmick, H.G., Bursik, R.J.J. & Kinsey, K.A. (1993) Changes in Perceived Threats of Shame,

405　　　Embarrassment, and Legal Sanctions for Interpersonal Violence, 1982-1992. *Violence*

406　　　*and Victims,* **8,** 313-325.

407　Heberlein, T.A. (1974) The three fixes: Technological, cognitive and structural. In: D. Field, J.C.

408　　　Barren & B.F. Long (eds) *Water and Community Development: Social and Economic*

409　　　*Perspectives.* Ann Arbor, MI: Science Publishers, Inc., pp 279-296.

410　Heberlein, T.A. (2012) *Navigating environmental attitudes,* New York: Oxford University Press,

411　　　228 pp.

412　Heywood, J.L. (2002) The cognitive and emotional components of behavior norms in outdoor

413　　　recreation. *Leisure Sciences,* **24,** 271-281. doi: 10.1080/0149040029005072 7

414　Heywood, J.L. (2011) Institutional norms and evaluative standards for parks and recreation

415　　　resources research, planning, and management. *Leisure Sciences,* **33,** 441-449. doi:

416　　　10.1080/01490400.2011.606781

417　Heywood, J.L. & Aas, Ø. (1999) Social norms and encounter preferences for cross country

418　　　skiing with dogs in Norway. *Leisure Sciences,* **21,** 133-144. doi:

419　　　10.1080/014904099273192

420　Kyle, G., Norman, W., Jodice, L., Graefe, A. & Marsinko, A. (2007) Segmenting Anglers Using

421　　　Their Consumptive Orientation Profiles. *Human Dimensions of Wildlife*, 115-132. doi:

422　　　10.1080/10871200701196066

423　Manfredo, M. (2008) *Who cares about wildlife? ,* New York, NY: Springer, 228 pp.

424　Manning, R.E. (2011) *Studies in Outdoor Recreation. Search and Research for Satisfaction*

425　　　*(Third edition),* Corvallis, OR: Oregon State University Press, 468 pp.

426 Policansky, D. (2007) The good, bad, and truly ugly of catch and release: What have we learned?

427   In: R.F. Carline & C. LoSapio (eds) *Wild Trout IX: Sustaining wild trout in a changing*

428   *world.* Bozeman, Montana: Wild Trout Symposium. Available at

429   www.wildtroutsymposium.com

430 Policansky, D. (2008) Trends and development in catch and release. Overview. In: Ø. Aas (ed)

431   *Global Challenges in Recreational Fisheries.* Oxford Blackwell Publishing, pp- 202-208.

432 Schwartz, S.H. (1977) Normative influences on altruism. In: L. Berkowitz (ed) *Advances in*

433   *experimental social psychology.* San Diego, CA: Academic Press, pp. 221-279.

434 Skullerud, E. & Stensland, S. (2013) Laksefiskere og motivasjon for å fiske i Lakselva,

435   Finnmark [Salmon anglers and motivation for salmon fishing in the Lakselva river,

436   Northern Norway. Abstract in English. *Tidsskriftet utmark*. Availlable at

437   http://www.utmark.org/utgivelser/pub/2013-

438   1/Skullerud_Stensland_Utmark_1_2013.html#

439 Statistics Norway (2014) Elvefiske etter laks, sjøaure og sjørøye, 2013 [River fishing for salmon,

440   sea-run trout and sea run char, 2013] Norway: Statistics Norway. Available at

441   https://www.ssb.no/jord-skog-jakt-og-fiskeri/statistikker/elvefiske/aar (Downloaded Feb

442   26 2014).

443 Stensland, S., Aas, Ø. & Mehmetoglu, M. (2013) The influence of norms and consequences on

444   voluntary catch & release angling behavior. *Human Dimensions of Wildlife,* **18,** 1-13. doi:

445   10.1080/10871209.2013.811617

446 Sutton, S.G. (2003) Personal and Situational Determinants of Catch-and-Release Choice of

447   Freshwater Anglers. *Human Dimensions of Wildlife,* **8,** 109-126. doi:

448   10.1080/10871200304300

20

449   Sutton, S.G. & Ditton, R.B. (2001) Understanding Catch-and-Release Behavior Among U.S.

450   Atlantic Bluefin Tuna Anglers. *Human Dimensions of Wildlife,* **6,** 49-66. doi:

451   10.1080/10871200152668698

452   Thorstad, E.B., Næsje, T.F., Mawle, G.W. & Policansky, D. (2008) The Atlantic salmon C&R

453   story. In: Ø. Aas (ed) *Global challenges in recreational fisheries* Oxford: Blackwell

454   Publishing, pp 219-222.

455

456

457

458

459

460

461

462

463

464

465

466

21

467 Table 1. Results of the principal component analysis (varimax rotation) based on 12 statements about anglers' catch

468 orientation (Anderson *et al.* 2007). Four distinct components were found: Keep fish, big fish, many fish and catch

469 any fish. Factor loadings above 0.4 showed in the table.

	Components			
	Keep fish	Big fish	Many fish	Catch any fish
Statements	Factor loadings			
I would rather catch 1 or 2 big fish than 10 smaller fish		0.85		
I'm happiest with the fishing trip if I catch a challenging fish		0.74		
I like to fish where I know I have a chance to catch a "trophy" fish		0.79		
A fishing trip can be successful even if no fish are caught[r]				0.83
If I thought I wouldn't catch any fish, I wouldn't go fishing				0.55
When I go fishing, I'm not satisfied unless I catch at least something				0.77
The more fish I catch, the happier I am			0.84	
A successful fishing trip is one in which many fish are caught			0.69	
I'm happiest with a fishing trip if I catch at least the limit			0.79	
I usually eat the fish I catch	0.71			
I'm just as happy if I don't keep the fish I catch[r]	0.84			
I'm just as happy if I release the fish I catch[r]	0.85			
% of variance explained (64.58)	16.91	16.20	15.97	15.50

| | Cronbach's alpha | | | 0.73 | 0.72 | 0.73 | 0.60 |

470

472

473

474

475

476

477

478

479

480

481

482

483

484

485

486

487

488   Table 2. The results of a cluster analysis based on the catch orientation components in table 1 yielded these four angler groups. Angler groups' mean response

489   (standard deviation) to catch orientation statements and components (in bold) are shown. Significant differences between groups indicated in the right column.

	Angler groups					
Statement[a]	1 Something else	2 Trophy	3 Catch & Release	4 Keeper	Total	Tamhane posthoc[b]
Catch big fish	**3.50 (0.92)**	**5.92 (0.78)**	**5.36 (1.02)**	**5.10 (1.04)**	**4.98 (1.30)**	**2>3,4>1**
I would rather catch 1 or 2 big fish than 10 smaller fish	3.27 (1.30)	5.88 (1.25)	5.13 (1.42)	4.81 (1.47)	4.78 (1.65)	2>3,4>1
I'm happiest with the fishing trip if I catch a challenging fish	3.52 (1.48)	5.98 (1.18)	5.29 (1.34)	5.06 (1.50)	4.97 (1.64)	2>3,4>1
I like to fish where I know I have a chance to catch a "trophy" fish	3.71 (1.54)	5.91 (1.15)	5.64 (1.26)	5.43 (1.30)	5.19 (1.57)	2>4>1; 3>1
Catch any fish	**2.15 (0.95)**	**1.84 (0.78)**	**3.99 (1.05)**	**3.34 (1.21)**	**2.86 (1.33)**	**3>4>1>2**
A fishing trip can be successful even if no fish are caught[r]	1.72 (1.04)	1.62 (0.92)	3.30 (1.65)	2.63 (1.42)	2.34 (1.47)	3>4>1,2
If I thought I wouldn't catch any fish, I wouldn't go fishing	2.46 (1.83)	1.99 (1.49)	4.29 (1.93)	3.89 (2.10)	3.20 (2.09)	3,4>1,2
When I go fishing, I'm not satisfied unless I catch at least something	2.25 (1.44)	1.90 (1.13)	4.39 (1.52)	3.49 (1.73)	3.04 (1.78)	3>4>2,1

24

Catch many fish	**1.94 (0.80)**	**2.29 (0.96)**	**4.02 (1.09)**	**3.34 (1.18)**	**2.92 (1.31)**	**3>4>2>1**
The more fish I catch, the happier I am	2.31 (1.37)	2.85 (1.66)	4.37 (1.53)	3.73 (1.69)	3.34 (1.75)	4>3>2>1
A successful fishing trip is one in which many fish are caught	1.87 (0.96)	2.37 (1.37)	4.28 (1.45)	3.23 (1.47)	2.96 (1.61)	3>4>2>1
I'm happiest with a fishing trip if I catch at least the limit	1.65 (0.85)	1.64 (.97)	3.42 (1.65)	3.05 (1.45)	2.47 (1.51)	3,4>1,2
Keep fish	**3.58 (1.14)**	**2.51 (1.06)**	**2.45 (1.03)**	**5.26 (0.90)**	**3.44 (1.55)**	**4>1>2,3**
I usually eat the fish I catch	5.50 (1.76)	3.97 (2.15)	3.75 (2.02)	6.31 (0.97)	4.91 (2.07)	4>1>2,3
I'm just as happy if I don't keep the fish I catch[r]	2.85 (1.83)	1.94 (1.35)	1.91 (1.11)	4.85 (1.42)	2.93 (1.89)	4>1>2,3
I'm just as happy if I release the fish I catch[r]	2.38 (1.56)	1.62 (1.07)	1.70 (1.04)	4.63 (1.56)	2.63 (1.82)	4>1>3; 1>2
N	157	157	166	176	656	

Note. [a] Respondents were asked on a scale from 1 (strongly disagree) to 7 strongly agree) to what extent they agreed or disagreed on the above statements about their general fishing for Atlantic salmon, sea trout and sea-run Arctic char . [b] Cluster by cluster compared using Tamhane's posthoc multiple comparison method. The > symbol denotes significance between clusters at a 5% level. [r] Variable reversed coded for analysis purposes

25

497 Table 3. Mean values (standard deviation) for socio-demographics and experience use history of the four angler groups. Significant differences between groups

498 indicated in the right column.

	Angler groups						
Variable	1 Something else	2 Trophy	3 Catch & Release	4 Keeper	Total	F-value	Tamhane posthoc[c]
Ratio Norwegian anglers (=1)[a]	0.38 (0.49)	0.29 (0.46)	0.34 (0.47)	0.52 (0.50)	0.39 (0.49)	7.3***	4>2,3
Ratio Finnish anglers (=1)[a]	0.40 (0.49)	0.43 (0.49)	0.42 (0.50)	0.28 (0.45)	0.38 (0.49)	3.3*	2,3>4
Ratio other countries anglers (=1)[a]	0.22 (0.41)	0.28 (0.45)	0.24 (0.43)	0.19 (0.40)	0.23 (0.42)	1.3 ns	ns
Ratio Northern Norway anglers (=1)[a]	0.27 (0.45)	0.13 (0.34)	0.08 (0.28)	0.26 (0.43)	0.19 (0.39)	9.6***	1,4>2,3
Age in years	46.8 (11.7)	43.1 (11.9)	45.0 (12.2)	48.5 (11.6)	45.9 (12.0)	6.3***	4>2,3; 1>2
No. of years fishing for salmon	16.7 (12.7)	16.0 (10.9)	16.6 (11.6)	19.7 (12.5)	17.3 (12.0)	3.40*	4>2
No. of days fishing for salmon in 2011	19.3 (19.3)	22.3 (24.5)	20.0 (8.0)	16.5 (17.1)	19.5 (19.9)	2.41[(*)]	2>4) [(*)]
No. of years fishing the Lakselv river	4.87 (6.2)	4.08 (5.0)	3.74 (4.9)	5.7 (8.7)	4.6 (6.5)	3.03*	4>3 [(*)]

No. of days fished the Lakselv[b]	6.9 (7.3)	6.5 (6.1)	6.3 (5.5)	6.6 (6.7)	6.6 (6.4)	0.24 ns	
No. of hours per day fished the Lakselv[b]	8.7 (2.9)	9.9 (2.8)	10.1 (2.8)	9.3 (2.7)	9.5 (2.9)	6.97***	3,2>1
No. of fish caught[b]	2.2 (5.0)	2.0 (4.0)	2.8 (2.5)	1.9 (4.1)	2.2 (4.4)	1.50 ns	
No. of fish released[b]	0.8 (2.0)	1.2 (3.1)	1.8 (3.5)	0.6 (1.6)	1.1 (2.7)	6,71***	3>1,4
Caught fish in Lakselv river (=1)[ab]	0.45 (0.50)	0.54 (0.50)	0.67 (0.47)	0.45 (0.50)	0.53 (0.50)	7.30***	3>1, 4
Prefer fly fishing in Lakselva (=1)[a]	0.90 (0.30)	0.97 (0.18)	0.95 (0.22)	0.88 (0.32)	0.93 (0.26)	4.02**	2>4

499 Note: (*)<0.1, *<0.05, **<0.01, ***<0.001. [a] Measured as a dummy variable where 1 denotes fulfilling the requirements for the variable, 0 otherwise. [b]

500 Numbers given for the last year they fished Lakselv river. [c] Cluster by cluster compared using Tamhane's posthoc multiple comparison method. The > symbol

501 denotes significance between clusters at a 5% level ((*)=10% level).

27

502 Table 4. Mean values (standard deviation) for beliefs and attitudes about C&R among angler groups. Significant

503 differences between groups indicated in the right column.

	Angler groups						
Variables	1 Something else	2 Trophy	3 Catch & Release	4 Keeper	Total	F-value	Tamhane posthoc[a]
Belief about C&R survival[b]	5.73 (1.49)	6.29 (1.28)	6.25 (1.21)	5.26 (1.62)	5.87 (1.47)	20.2***	2,3>1>4
Self-evaluation C&R skills[b]	6.24 (1.21)	6.52 (1.13)	6.60 (.78)	5.97 (1.48)	6.32 (1.21)	10.0***	2,3>4; 3>1
Belief about C&R as conservation[b]	6.01 (1.54)	6.50 (1.20)	6.44 (1.27)	5.44 (1.57)	6.08 (1.46)	20.5***	2,3>1>4
C&R is wasting food[b]	1.61 (1.30)	1.39 (1.15)	1.58 (1.20)	2.95 (1.90)	1.91 (1.57)	43.5***	4>1,2,3
C&R is cruelty[b]	1.93 (1.48)	1.68 (1.35)	1.90 (1.45)	2.69 (1.73)	2.07 (1.56)	14.3***	4>1,2,3

504 Note: ***<0.001. [a] Cluster by cluster compared using Tamhane's posthoc multiple comparison method. The >

505 symbol denotes significance between clusters at a 5% level. [b] Responses ranged 1 (strongly disagree) to 7 (strongly

506 agree) given verbal labels.

507

508

509

510

28

511 Table 5. Mean values (standard deviation) and frequencies [in %] for intention to release, norms and sanctions

512 among angler groups. Significant differences between groups indicated in the right column.

	Angler groups						
Variables	1 Something else	2 Trophy	3 Catch & Release	4 Keeper	Total	F-value	Tamhane posthoc[a]
Intention to release[b]	4.92 (2.17)	5.68 (1.91)	5.53 (1.87)	2.75 (1.99)	4.67 (2.32)	79.33***	2,3>1>4
Personal norm C&R[c]	3.01 (1.90)	4.11 (2.01)	4.14 (2.07)	1.93 (1.47)	3.27 (2.08)	53.8***	3,2>1>4
Personal norm KEEP[c]	2.27 (1.79)	1.77 (1.44)	1.78 (1.27)	3.48 (2.09)	2.35 (1.82)	39.2***	4>1>3,2
Social norm C&R[c]	3.53 (1.69)	4.41 (1.56)	4.46 (1.65)	2.92 (1.48)	3.81 (1.72)	36.5***	3,2>1>4
Social norm KEEP[c]	2.64 (1.43)	2.42 (1.38)	2.49 (1.40)	3.91(1.51)	2.89 (1.56)	41.3***	4>1,2,3
Intensity self-sanction C&R[d]	5.72 (1.05) [0.6; 72.0]	6.10 (0.97) [1.3; 84.7]	6.21 (0.91) [0.6; 85.5]	5.18 (1.19) [4.0; 54.0]	5.79 (1.11) [1.7; 63.6]	34.0***	1,2,3>4
Intensity self-sanction KEEP[d]	4.90 (1.37) [8.9; 42.7]	4.70 (1.81) [21.0;45.9]	4.43 (1.86) [25.3; 38.0]	5.30 (1.18) [4.5; 58.5]	4.84 (1.60) [14.8;46.5]	9.1***	4>1,2,3
Norm power C&R[e]	9.25 (2.11)	10.5 (2.04)	10.7 (1.97)	8.1 (2.06)	9.6 (2.30)	58.5***	2,3>1> 4
Norm power	7.54 (2.09)	7.12 (2.55)	6.92 (2.69)	9.21 (2.01)	7.73 (2.52)	33.6***	4>1,2,3

29

KEEP[e]

Note: ***<0.001. [a] Cluster by cluster compared using Tamhane's posthoc multiple comparison method. The >

514   symbol denotes significance between clusters at a 5% level. [b] Answers ranged 1= very unlikely to 7=very likely. [c]

515   Responses ranged 1 (strongly disagree) to 7 (strongly agree) given verbal labels. [d] Average value of four self-

516   sanction variables (see methods), range 1-.7, where low values mean the angler gets negative feelings/emotions by

517   doing the C&R or KEEP, around 4= neutral, and high values give the angler positive feelings/emotions. Frequencies

518   are reported for the toward the end of the scale values [$\sum$[1.00-3.00]; $\sum$<5.00, 7.00]] respectively and given in %

519   proportion for the angler group. [e] Norm power = intensity + obligation. Range 2-14. Low values mean opposition to

520   the norm, values around 8 neutral (4+4), and high values in favour of the norm.

521

522

523

524

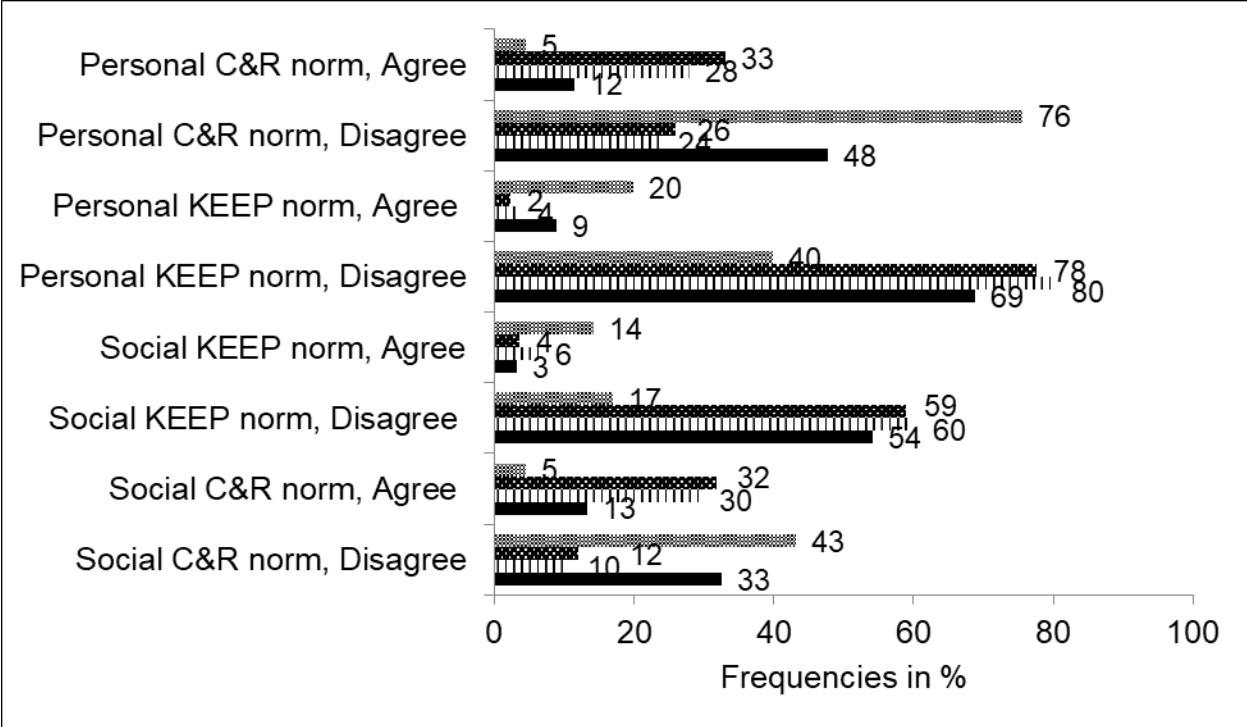525

526

527

528

529

530

531

532

533

534 Table 6.Estimation results for the standard multiple regression model of intention to release a large salmon in the

535 Lakselva River, as a function of the two variables Norm power C&R and Norm power KEEP.

Dependent variable: Release intention. R^2=0.28, $F_{2, 653}$= 129.4, p<0.001

Independent variables	Regr. coeff.[a]	Beta[b]	t[c]	Part[d]	sr^{2} [e]
Interceptor	3.43 (0.52)		6.65***		
Norm power C&R	0.34 (0.04)	0.34	9.38***	0.311	0.10
Norm power KEEP	-0.27 (0.03)	-0.29	-7.96***	-0.264	0.07
Unique variance ($\sum sr^2$)					0.17
Shared variance					0.11

536 [a] Regr.coeff.= unstandardized regression coefficients (standard error) , [b] Beta = standardized regression coefficient, [c]

537 t = t-value; [d] Part = semipartial correlation; [e] sr^2= squared semipartial correlation. ***p<0.001.

538

539

540

541

542

543

544

545

31

546

Figure 1. Responses to the KEEP and C&R personal norm and social norm by the four salmon angler groups *keeper* (top bar), *C&R* (2nd bar), *trophy angler* (3rd bar) and *something else* (bottom bar) in Lakselva River, Norway. Frequencies are given for extreme responses only (disagree =1-2, agree = 6-7 on a 1-7 scale).
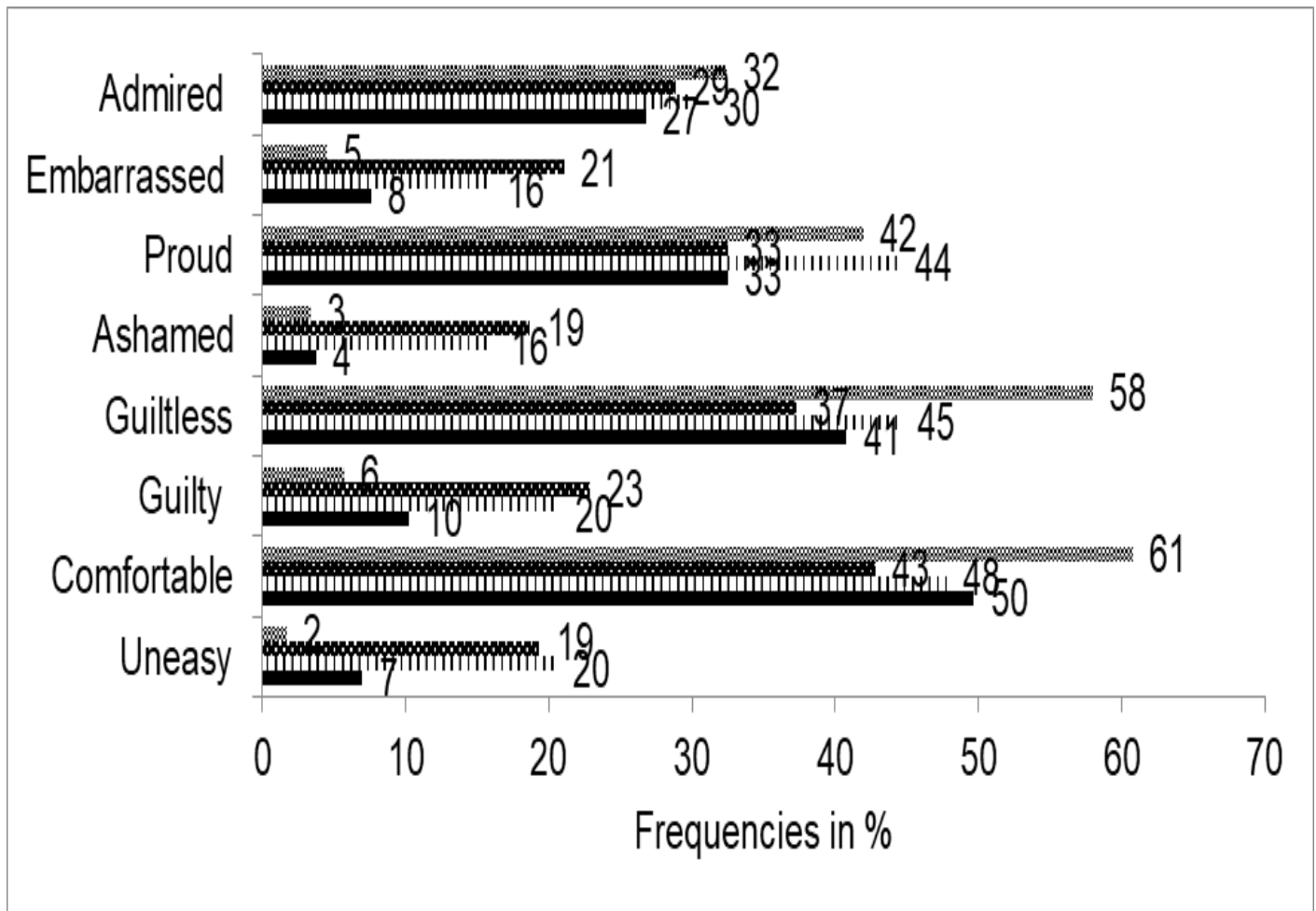
547
548
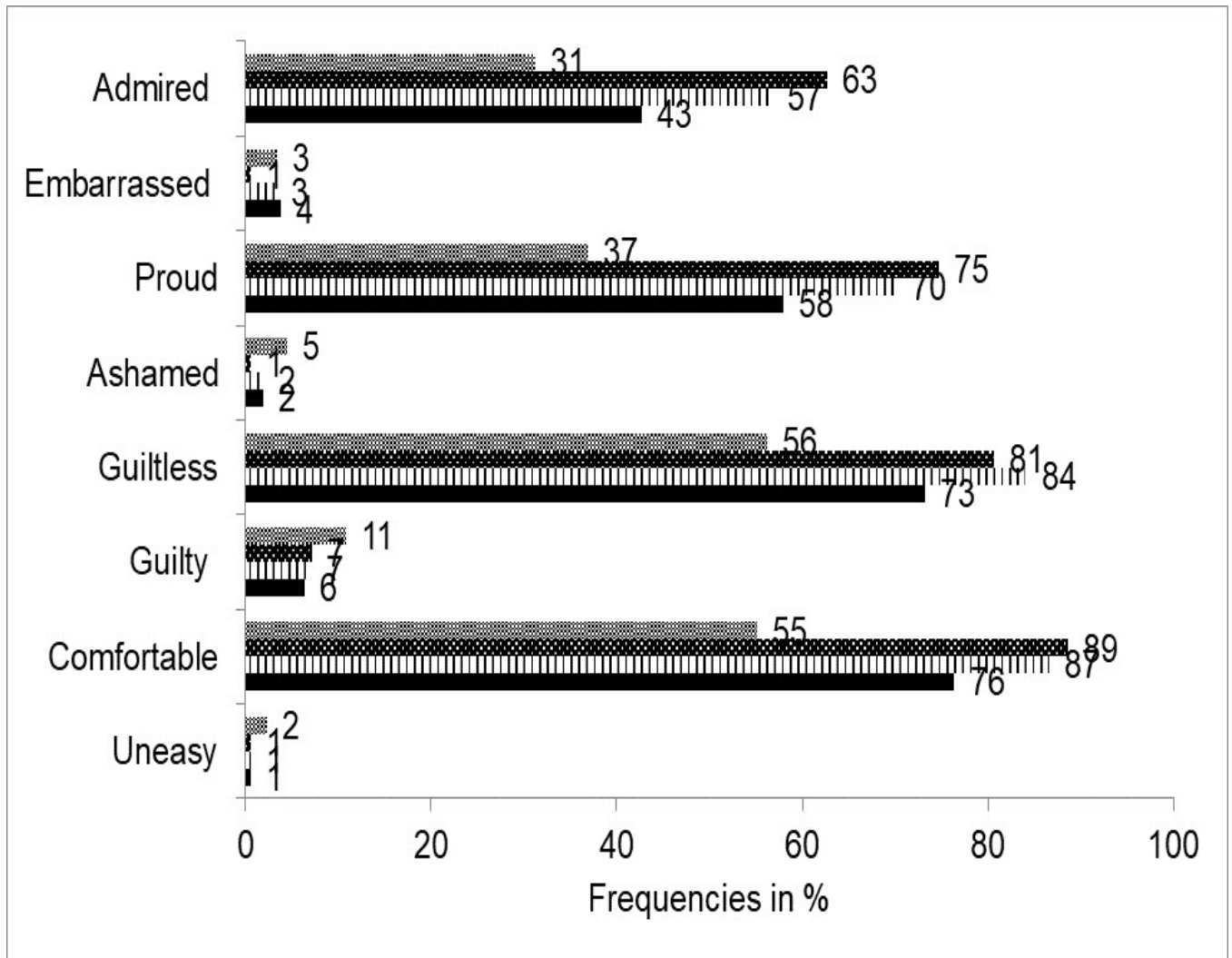549
550

551

552

553

554

555

556

557

558

559

560

561

32

Figure 2. Self-sanction response to keeping a large salmon, by the four salmon angler groups *keeper* (top bar), *C&R* (2nd bar), *trophy angler* (3rd bar) and *something else* (bottom bar) in Lakselva River, Norway. Frequencies are given for extreme responses (1,2 or 6,7 on 1-7 scales) for how they would feel if others saw them keep a big salmon in Lakselva River, where Embarrassed (1) – Admired (7) are informal sanctions. Internal sanctions are uneasy (1) - comfortable (7), ashamed (1) - proud (7), guilty (1) - guiltless (7).

33

576

577

Figure 3. Self-sanction response to releasing a large salmon, by the four salmon angler groups
keeper (top bar), *C&R* (2nd bar), *trophy angler* (3rd bar) and *something else* (bottom bar) in
Lakselva River, Norway. Frequencies are given for extreme responses (1,2 or 6,7 on 1-7 scales)
for how they would feel if others saw them release a big salmon in Lakselva River, where
Embarrassed (1) – Admired (7) are informal sanctions. Internal sanctions are uneasy (1) -
comfortable (7), ashamed (1) - proud (7), guilty (1) - guiltless (7).

584

585

586

587

588

589

590