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Impact of UK sport fishing on fish welfare and conservation

Commentary on **Key** on *Fish Pain*

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Abstract: Sport fishing or angling is the capture of fish for recreation or competition, i.e., for entertainment. Contrary to the claims of Key (2016), there is good evidence that fish feel pain and have the capacity for self-awareness (Sneddon et al., 2018; Woodruff, 2017). Wild fish experience a variety of adverse conditions in nature that can harm their welfare, but this does not justify humans intentionally inflicting such conditions on fish solely for our pleasure. This commentary summarises the many ways fish suffer harm to their welfare as a result of sport fishing. There are also discussions on associated activities that have negative effects on the welfare and conservation of other animals, as well as deleterious impacts on the environment. We should not allow scientific evidence-based conclusions to be discounted because of the large number of people that participate in the sport or the large sums generated for regional or national economies. The time has come for improvements in fish welfare to be incorporated in sport fishing, and a logical starting point would be the development of welfare guidelines for anglers.

Keywords: fish welfare, fishing, angling, UK, conservation

Tim Holmes is a conservation biologist with more than 30 years of experience in the management of threatened species, reintroduction of species, captive wildlife, wildlife research, wildlife kept as pets, trade in wildlife and wildlife causing grief to people. Much of his work has incorporated animal welfare issues. **Website**

Introduction. Sport fishing or angling is the capture of fish using a rod, reel, line and hook (with bait or lure) for recreational purposes — for the pleasure of catching them or for competition. The focus of this commentary is fishing as a sport in the UK: trying to catch fish for entertainment by competing against the fish or other anglers. It does not address fishing for consumption but the pain and suffering caused by fishing for sport and leisure. The commentary summarises the many ways fish suffer poor welfare as a result of sport fishing. It also discusses associated activities that have negative effects on the welfare and conservation of other animals, as well as deleterious impacts on the environment. There are three main types of sport fishing:

1. **Coarse fishing** is fishing for freshwater fish who are traditionally considered undesirable as a food and are returned to the water.
2. **Freshwater game fishing** usually involves the technique of fly-fishing, which uses a light-weight lure and is used to catch freshwater game fish (salmonids, which includes salmon, trout, and char).
3. **Sea fishing** includes boat fishing, shore fishing and big game fishing (targeting large pelagic fish such as tuna and shark).

Numerous fishing competitions are held throughout the UK and include both individual and team events. The events take place in both natural venues and commercial fisheries and cater to most types of fishing, including course, game, and sea fishing. The competitive categories include individual species, groups of species (e.g., silverfish), largest number of different species caught, caught from boat or land, weight of fish, and angler age categories (Angling Trust, 2020). Recreational fishing is usually selective with respect to fish species and size, age, sex or behavioural and physiological traits (Lewin, Arlinghaus, & Mehner, 2006). For some sport fishing communities, emphasis is placed on 'trophies', which are selectively targeted and are typically given for fish that are exceptionally large or have other characteristics that make them attractive to the angler (Arlinghaus & Cooke, 2009).

'Catch and release' fishing is becoming increasingly common. Sometimes this is done as a conservation tool to help manage fish populations, but it can also harm welfare, including causing death. Contrary to the thesis of Key's (2016) target article, there is good evidence that fish feel pain and have the capacity for self-awareness (Braithwaite, 2010; Branson, 2008; Sneddon, 2015; Sneddon et al., 2018; Woodruff, 2017). Wild fish naturally experience a variety of adverse conditions, including attacks by predators, fights with conspecifics, lack of food and exposure to poor environmental conditions. These natural conditions can harm welfare, but this does not justify humans intentionally inflicting more of them on fish (Huntingford et al., 2006). This is particularly true today with our current understanding of how fish feel pain. Knowing that a fish might suffer at our hands is pertinent to the moral and ethical judgments we make. We should become concerned for the animal. Often people are not concerned, either because they think they know that fish do not suffer pain or because they don't like to think about the consequences of concluding that they suffer (Benz-Schwarzburg, 2018).

Fishing continues to be a popular pastime. In England in 2015, freshwater sport fishing contributed £1.46 billion to the economy (expressed as gross value added) and supported 27,000 full-time equivalent jobs (Salado & Vencovska, 2018). Yet there is an overall decline in the sport. According to a report by the Environment Agency on freshwater fishing based on surveys undertaken in 2005 and 2015, the total number of freshwater fishing days spent in England in 2015 fell by 22% in that interval and fishing on all water types became less frequent. The greatest decline in fishing on rivers and canals was 43% and 39%, respectively (Salado & Vencovska, 2018). It is not fully understood why there has been a decline, but contributing factors might include the increased concern of the public for the well-being of individual wild animals or the increased awareness of welfare issues stemming from the growth in animal welfare science (Röcklinsberg, 2015; Blokhuis, 2018).

Ways in which sport fishing results in poor welfare for fish. The evidence to support sentience and pain perception in fish is as good as anything we have for birds and mammals (Braithwaite, 2010). Fish can detect and respond to harmful stimuli and can learn to remember painful situations (Braithwaite, 2010; Huntingford et al., 2006; Sneddon, Braithwaite, & Gentle, 2003; Sneddon, 2015). They suffer poor welfare from the following.

Hooks inflict injury, hence, by definition, negatively influence fish welfare (Davie & Kopf, 2006). The size of the hook, shape, arrangement, and presence of barbs are major differences which influence the severity of the tissue trauma and the anatomical locus of impalement (Muoneke & Childress, 1994). Damage to the eyes and mouth structures may permanently influence the ability and competitiveness of released fish in feeding (Davie & Kopf, 2006). Hooking injury is considered the primary cause of sport fishing-related mortality (Cooke & Wilde, 2007).

The process of catching is a stressful experience for fish (Cooke, Bunt, Ostrand, Philipp, & Wahl, 2003; Gustaveson, Wydoski, & Wedemeyer, 1991; Meka & McCormick, 2005). The intensity and vigour of the fight put up by a fish as the animal attempts to escape may reflect the level of welfare compromise being experienced (Davie & Kopf, 2006), and growth rates are inversely related to the frequency of capture events (Diodati & Richards, 1996). Expansion of gas in the gas bladder (barotrauma) causes stress and death in harvested fish (Davie & Kopf, 2006). The level of expansion of the bladder and mortality rate of fish increases with increasing depth (Feathers & Knable, 1983). Estimates of catch-and-release mortality are around 28% (95% confidence interval 17–44%) (Millard et al., 2003) and most post-release mortalities are related to metabolic exhaustion or lethal injury (Raat, Klein Breteler, & Jansen, 1997).

Nets cause abrasions of fins, and may cause skin abrasions, which increase the risk of fungal and bacterial infections in released fish (Barthel, Cooke, Suski, & Philipp, 2003). Keep-nets and live-wells prolong the negative influences of catching fish by hook-and-line, in that capture is followed by confinement. Retention in nets also compromises long-term growth rates (Raat et al., 1997). Other retention devices, such as stringers and fish-baskets, can result in significant injury and can increase rates of post-release mortality (Cooke & Hogle, 2000).

Gaffs (poles with sharp hooks fixed at the end used to penetrate the flesh and bone of a fish) are often used to control large fish (>5 kg), who are ultimately killed. Gaffs cause injuries that often result in significant bleeding so that exsanguination (bleeding out) may precede stunning or death, which means significant pain from a much-delayed death (Davie & Kopf, 2006).

Handling fish causes them stress, especially from exposure to air during removal of the hook (Ferguson & Tufts, 1992). The number of handling events has cumulative effects on stress, and indicates that multiple catch-and-release events during a short period are increasingly detrimental (Barton, Schreck, & Sigismondi, 1986). Handling, exposure to air, and physical injury appear to be the most important factors suppressing the success of spawning and behaviour in captured and released fish (Makinen, Niemelia, Moen, & Lindstrom, 2000; Thorstad, Hay, Naesje, Chanda, & Økland, 2004).

The methods of killing, i.e., hypothermia (ice slurry), asphyxia (exposure to air at ambient temperatures), and exsanguination, result in variable and extended times to cause insensibility and death (Diggles, 2016; Poli, Parisi, Scappini, & Zampacavallo, 2005), which is unacceptable. The *American Veterinary Medical Association Guidelines for the Euthanasia of Animals* (AVMA, 2013) state that finfish (true fish as distinguished from, for example, shellfish, crayfish, or jellyfish) should be accorded the same considerations as terrestrial vertebrates with regard to relief from pain, and the aim of killing fish is to accomplish death rapidly with the minimum amount of pain and distress practicable.

Live bait, including fish, cephalopods, and crustaceans, can significantly compromise the welfare of these animals (Davie & Kopf, 2006). The evidence that cephalopods and crustaceans feel pain is as strong as it is for fish (Elwood, 2012; Ponte, Andrews, Galligioni, Pereira, & Fiorito, 2019). Poor welfare of live bait can occur from transporting animals, their holding conditions and hooking injuries.

Associated activities of sport fishing that have a negative effect. The associated activities of sports fishing can have a negative effect on the welfare and conservation of other animals as well as deleterious impacts on the environment.

Environmental pollution: Litter and discarded or lost recreational fishing gear (including lines, fishing tackle, nets, and traps) remain in the environment for years and can

lead to the entanglement of wildlife, causing significant injuries and death to animals (Lewin et al., 2019). Fishing hook and line injuries in wild animals are regularly encountered in the UK (Harvey, 2010; Mullineaux & Keeble, 2016). Wildlife can also die as a result of ingesting fishing line (Di Bello et al., 2013). Animals killed or affected by these types of injuries include bats, raptors, waterfowl, waders, gulls, seabirds, marine mammals, crustaceans, squid, and turtles (Di Bello et al., 2013; Jones, Weidig, Spetz, & Brennan, 2018; Parrish, 1991; Ryan, 2018; Sleeman, 2013; Unger et al., 2017). Litter and lost recreational fishing gear also result in habitat degradation and ecological damage (UNEP, 2009).

Lead poisoning and environmental contamination can lead to rapid, acute effects or chronic, long-term effects in people and other animals, including mammals, birds, reptiles, and fish (Franson & Pain, 2011; Pokras & Kneeland, 2009). Animals can absorb lead from ingested weights, which can cause substantial suffering and mortality (Pain, Cromie, & Green, 2015). Prior to 1987, lead was commonly used in recreational fishing in the UK and identified as a major source of mortality for the Mute Swan (NCC, 1985). Then in 1987, legislation in England and Wales banned the sale and use of lead fishing weights of a certain size resulting in a decrease in Mute Swan deaths from lead poisoning (Wood et al., 2019). However, lead weights can still be used if they are 0.06 grams or less or more than 28.35 grams (GOV.UK, n.d.). Recreational fishing continues to contribute lead to the water from lost or discarded tackle, and has been identified as a high-risk impact (Lewin et al., 2019).

Fish conservation: Overfishing from recreational fishing is a problem in the UK for some species that are also exploited commercially by increasing overall fish mortality (Winfield, 2016). Many recreational fisheries intentionally or accidentally target fish during the reproductive period (Arlinghaus & Cooke, 2009). This can have negative consequences for individual fitness, reproductive success, and recruitment (Cooke, Schreer, Dunmall, & Philipp, 2002; Lewin et al., 2019). In some cases, anglers are drawn to particular fish because they are rare, especially in trophy fishing where anglers target the largest individuals of a species (Huddart, 2019). Harvesting (or indirect mortality) has an impact on the conservation of species that have life-history characteristics such as late age at maturity and low fecundity, making them vulnerable to overfishing (Arlinghaus & Cooke, 2009). The three high-risk impacts of marine recreational fishing are:

> 1. **High and selective fishing mortality** can contribute directly or indirectly to the decline of fish stocks and undermine biodiversity and ecological resilience.
> 2. **Use of live bait originating from non-local water bodies** when released or lost can affect genetic, species, and ultimately ecosystem diversity.
> 3. **Loss of fishing tackle containing lead** can cause environmental contamination (Lewin et al., 2019).

Disturbance of habitat and wildlife: Recreational activities, including fishing, carried out on shores can cause stress and disturb the wintering, resting, feeding, and reproduction of resident and migratory birds closely associated with shoreline habitats (Lewin et al., 2019). Instream anglers wading in rivers cause a significant reduction in egg and larvae development; a single wading event on shallow, salmonid-spawning habitats during the period before hatching was found to have killed 43% of eggs and fry; a twice-daily wading killed up to 96% (Huddart, 2019). Intensive bait collection and particularly mechanical bait harvest can reduce the number and abundance of benthic faunal and floral organisms by direct (removal and damage) and indirect (habitat destruction) mechanisms (Lewin et al., 2019).

Conclusion. Most injuries to caught fish occur as a result of the equipment used by anglers, and most stress caused to fish arises from the practices of those catching fish. Both these contributing factors could be managed to improve the welfare outcomes for fish. Cooke and Sneddon (2015) provide a comprehensive list of measures to reduce disturbance, injury, and mortality including particularly the following six areas:

1. Minimise fishing duration
2. Minimise air exposure and improve handling
3. Select appropriate tackle (hooks, baits, lures, and flies)
4. Avoid angling in extreme environmental conditions or habitats
5. Avoid angling during the reproductive period
6. Use optimal slaughter method when killing is unavoidable.

The scientific consensus is that fish experience pain. We should not allow conclusions drawn from scientific evidence to be ignored and overridden by the large number of people who participate in the sport or the large sums generated for regional or national economies. The time has come for fish welfare to be incorporated in sport fishing. A key component of improving fish welfare is education; developing welfare guidelines for anglers is a logical start.

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