

# ANIMAL SENTIENCE

AN INTERDISCIPLINARY JOURNAL ON ANIMAL FEELING

Franks, Becca; Sebo, Jeff; and Horowitz, Alexandra (2018) [Fish are smart and feel pain: What about joy?](#). *Animal Sentience* 21(16)

DOI: 10.51291/2377-7478.1368



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## **Fish are smart and feel pain: What about joy?**

Commentary on [Sneddon et al.](#) on *Sentience Denial*

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**Abstract:** Sneddon et al. rightly point out that the evidence of fish pain is now so strong and comprehensive that arguments against it have become increasingly difficult to defend in balanced academic discourse. But sentience involves more than just pain. Recent research indicates that fish have an impressive range of cognitive capacities, including the capacity for pleasure, in the form of play and other behaviors likely to involve positively valenced experience. Having made the case for pain, research can now focus on other aspects of fish sentience. Doing so will not only provide a more complete picture of the mental lives and abilities of fish, but it will also promote their welfare and protection.

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Sneddon et al. (2018) write that “more funding is needed in the area of fish welfare to provide robust empirical evidence we can use to inform the humane and ethical treatment of fish.” We ask: What sort of additional empirical evidence is required?

Thus far, the debate over fish sentience has focused almost entirely on whether fish can feel pain (e.g., Key, 2016). Pain is a complicated concept that cannot be proven or disproven in a species through a single, stand-alone experiment (Sneddon, Elwood, Adamo, & Leach, 2014). The body of evidence as a whole provides strong reason to accept that fish have experiences that we can plausibly describe as pain: Fish pay to avoid potentially painful stimuli, forfeit good outcomes for the sake of avoiding such stimuli, and seek out analgesics after potentially painful procedures (Sneddon, 2015). These behaviors require active decision making and are thus easier to explain by accepting that fish can experience pain rather than assuming that they cannot.

Pain, however, is not the sum-total of sentience. Sentience is a complicated concept, but most scholars agree that it involves the ability to experience pain *and pleasure* (Broom, 2016; Harnad, 2016). While scientific studies over the past several years have indicated that fish have the cognitive equipment necessary for rich mental lives (Brown, 2015), the scientific study of fish pleasure has been relatively neglected. Thus, focusing future research on fish pleasure is likely to generate a wealth of theoretically and practically useful information, including answers to questions about what kinds of positive experiences fish may have and under what circumstances they might have them.

Several decades ago, the positive psychology movement sought to correct a similar bias in the human literature, arguing that beyond being a luxury, positive psychology is at the very core of human experience (Seligman & Csikszentmihalyi, 2000). More recently, the field of animal welfare also began to consider ways to promote positive welfare beyond simply trying to alleviate poor welfare (Boissy et al., 2007; Mellor, 2014; Yeates & Main, 2008). Even though fish have yet to benefit directly from these correctives, both fields — positive psychology and animal welfare — contain insights about ways forward for research on fish pleasure.

In positive psychology, Fredrickson (2013) has identified ten core positive emotions: joy, gratitude, serenity, interest, hope, pride, amusement, inspiration, awe, and love. While these might seem like strange words to apply to a fish (at least from a behaviorist perspective), the field of animal welfare is beginning to develop methodologies for identifying similar experiences in nonhuman animals. For example, studies on cognitive biases in nonhuman animals suggest that animals with better welfare have more optimistic interpretations of ambiguous cues (Baciadonna & McElligott, 2015; Harding, Paul, & Mendl, 2004). In other words, they are hopeful. In addition, behavioral research with many species has provided evidence of curiosity (e.g., Berlyne, 1966; Glickman & Sroges, 1966; Hall, Melfi, Burns, McGill, & Doyle, 2018), which is defined as the motivation to gain information. In other words, they display interest.

The existing literature on fish pleasure is slim, but promising. Studies dating back to the early twentieth century have examined spontaneous leaping and somersaulting behavior in fish, as well as voluntary and nonfunctional object manipulation and social interaction that fulfill the criteria of play (Burghardt, 2005; Fagen, 2017). As a naturally occurring behavior, play may provide the best example of a behavior that is widely observed across the animal kingdom (Ahloy-Dallaire, Espinosa, & Mason, 2017). And, in humans at least, play is associated with intensely positive emotional experiences like joy and amusement. Studies of participation in play may be the most fruitful way to develop theoretical and empirical markers of positive emotional experiences in nonhuman animals, including fish.

Other promising lines of research include preferential attachment (aka friendships) in guppies (Heathcote, Darden, Franks, Ramnarine, & Croft, 2017), social motivation in cichlids (Galhardo, Almeida, & Oliveira, 2011), and free-choice exploration in zebrafish (Graham, von Keyserlingk, & Franks, 2018). Most recently, research with zebrafish suggests that when they are housed in naturalistic environments, they engage in heightened shoaling behavior — protracted bouts of tight group cohesion and increased behavioral synchrony — another behavior that may yield insights for future work on positive emotion in fish (Franks, Graham, & von Keyserlingk, 2018). Further developing operational definitions of positive emotions such as joy, gratitude, and serenity will allow us to test whether such terms should continue to be reserved to a single species (i.e., ourselves).

The human impact on fish is increasing at an alarming rate: Aquaculture and the use of fish in science is expanding rapidly, as are habitat degradation and threats to wild populations from overfishing. The pressures to understand fish sentience are more urgent than ever, yet both academics and the general public remain focused primarily on pain, where the evidence is already compelling. We need a more complete picture of fish sentience. To ground decision-making about humane and ethical treatment, the biggest need going forward is for research on positive emotional experience in fish, including joy.

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