Briefing on Fish Sentience

Authors: Thomas Billington & Jennifer-Justine Kirsch – Fish Welfare Initiative

Conservative Animal Welfare Foundation

Summary

The UK farms an estimated 28 to 77 million[1] fish[2] and catches a further 1.5 to 2.7 billion per year.[3] Considering these vast numbers, the question of whether fish are sentient is vitally important. Welfare researcher Donald Broom defined five attributes indicating animal sentience that are widely acknowledged among the scientific community.[4] Fish fulfill each of these attributes:

- **Experience feelings (e.g. pain):** Fish have pain receptors, and their activation has been shown to alter behavior. Fish make trade-offs between pain and benefits.
- **Evaluate the actions of others in relation to itself and third parties:** Fish have complex social lives, including hierarchies, collaboration, and personal bonds.
- **Remember and learn from their actions:** Fish remember and learn from stressful experiences, such as being caught and having to find a way to escape.
- **Assess risks and benefits:** Fish make trade-offs between benefits (e.g., pain relief or a preferred environment).
- **Have some degree of awareness:** Fishes' ability to learn and make conscious choices reflects awareness.

---

[1] Fiscount. (2018). Estimated numbers of individuals in aquaculture production (FAO) of fish species (2017).

[2] Defined as finish. For crustacean sentience, see Crustacean Compassion (n.d.). Briefing on Crustacean Sentience and Welfare. For cephalopod sentience, see Sneddon, L. U., et al. (2014). Defining and assessing animal pain.

[3] Fishcount. (2017). Estimated numbers of individuals in average annual fish capture (FAO) by country fishing fleets (2007 - 2016).

[4] Broom, D. M. (2019). Sentience.

Common arguments against fish sentience focus on differences between fish and human anatomy (such as fish lacking a neocortex). However, this view is too anthropocentric. What matters is that fish experience pain and pleasure in their own right, which has been solidly proven to be the case.

"There is as much evidence that fish feel pain and suffer as there is for birds and mammals"

- Victoria Braithwaite, Author of "Do Fish Feel Pain?"

Sentience and Why it Matters

Sentience is the capacity to be aware of feelings and sensations.[5] Donald Broom, emeritus professor of animal welfare at Cambridge University, defines a sentient being as one that has some ability to:[6]

- Experience feelings (e.g. pain)
- Evaluate the actions of others in relation to itself and third parties
- Remember and learn from their actions
- Assess risks and benefits
- Have some degree of awareness

---

[5] For example, see Broom, D. M. (2019). Sentience.; Proctor, H. (2012). Animal Sentience: Where are We and Where are We Heading?
[6] Broom, D. M. (2019). Sentience.

As such, sentience drives the distinction between reacting to stimuli automatically and *feeling* stimuli. A sentient animal will suffer under conditions that inflict pain upon it.

In the UK, sentience is the foundation for much of the progressive welfare legislation that protects terrestrial animals.[7] For aquatic animals such as fish, however, this same progress has not been made. Despite the fact that the larger scientific community recognizes fish sentience,[8] legal industry practices still inflict unnecessary pain and suffering upon fish (e.g., slaughter without prior stunning).

In the UK, salmon farming makes up roughly 92% of farmed fish production.[9]

The UK farms an estimated 28 to 77 million[10] [11]and catches a further 1.5 to 2.7 billion[12] fish every year (excluding catches from recreational fishermen). A further 9 million fish are kept as pets.[13] Considering these vast numbers, it is essential to raise the question of fishes' sentience.

---

[7] Gov.uk. (2021). Animal welfare. Last opened: May 10, 2021.

[8] For example, see Brown, C. (2015). Fish Intelligence, Sentience, and Ethics., Sneddon, L. U. (2015). Pain in aquatic animals., Kristiansen, T. S. et al. (2020). The Welfare of Fish.

[9] FAO. (2020). FishstatJ.

[10] Fiscount. (2018). Estimated numbers of individuals in aquaculture production (FAO) of fish species (2017).

[11] Defined as finish. For crustacean sentience, see Crustacean Compassion (n.d.). Briefing on Crustacean Sentience and Welfare.

[12] Fishcount. (2017). Estimated numbers of individuals in average annual fish capture (FAO) by country fishing fleets (2007 - 2016).

[13] PFMA. (2021). Pet Population Data.

Experience feelings (e.g. pain)

From an anatomical perspective, fish have receptors to detect painful stimuli, systems to propagate these stimuli, and a central processing structure (i.e., a brain) to process them.[14] As such, there is no question as to whether fish can detect pain.

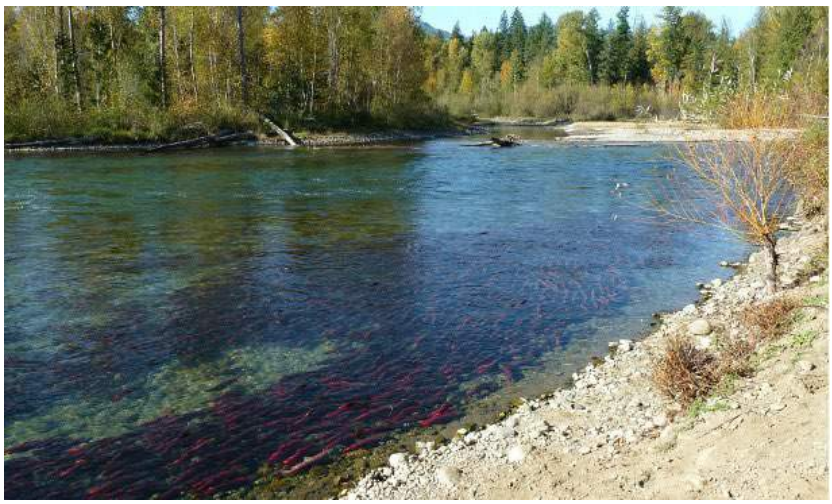
However, being able to *detect* pain is not equivalent to *feeling* pain. For this, fish would need to show a higher-level reaction to pain, affecting their behaviour in a way unlike any other stimuli. This, too, has been clearly demonstrated. For example, salmon feed less and are more lethargic after painful events.[15] Salmon will also trade off pain for other benefits, such as social dominance.[16] This shows that salmon are affected by pain and can make decisions either because of or despite it.

Apart from pain, fish have also been shown to exhibit mental states corresponding to anxiety, fear, depression, excitement, happiness, and calm/relaxation, similar to other vertebrates.[17]

[14] Sneddon, L. U. (2003). The evidence for pain in fish: the use of morphine as an analgesic.
[15] Bjørge, M. H. et al. (2011). Behavioural changes following intraperitoneal vaccination in Atlantic salmon *(Salmo salar)*.
[16] Ashley, P. J. et al. (2009). Effect of noxious stimulation upon antipredator responses and dominance status in rainbow trout.
[17] Cerqueira , M., et al. (2017). Cognitive appraisal of environmental stimuli induces emotion-like states in fish.

Evaluate the actions of others in relation to itself and third parties

Fish have highly complex social relationships. It is common for fish to have social hierarchies.[18] Fish also collaborate and work within groups. For example, sockeye salmon plan their migration according to social interactions and cues from other salmon.[19] Both collaboration and hierarchies require fish to evaluate and interpret each other's actions.



Sockeye salmon on their migration in the Adams River in British Columbia, Canada.

Fish also form personal social bonds. For example, female convict cichlids, a monogamous fish species, become more 'pessimistic' (less willing to look for food) when paired with a non-preferred male as compared to a female paired with her preferred-male.[20] In this way, emotions were shown to guide the female's choices and dictate her actions.

---

[18] Cloutier, J. et al. (2016). Chapter 9 - Neuroimaging Investigations of Social Status and Social Hierarchies.
[19] Berdahl, A. et al. (2017). Social interactions shape the timing of spawning migrations in an anadromous fish.
[20] Laubu, C., et al. (2019). Pair-bonding influences affective state in a monogamous fish species.

Remember and learn from their actions

Countering the myth that fish have three-second memories, many species are adept at memorizing their environment,[21] individual fish,[22] and even people.[23] For example, rainbow trout can learn to escape a new trawl apparatus within five exposures. Even 11 months after last seeing the apparatus, the trout still remembered how to escape.[24]

Gobies, a group of small, ray-finned fish, create visual maps of tide pools with astonishing accuracy. They can return to their home pool after being displaced over 30m,[25] and are still able to do so after 40 days of being removed from their home range.

Assess risks and benefits

There are many examples of fish being able to make trade-offs based on the risks and benefits of situations presented to them. For example, zebrafish will typically show preference for an enriched tank (a tank with vegetation and objects to explore) over a barren tank. However, zebrafish who have undergone a painful experience will choose to be in a tank with painkillers dissolved in the water, even if that means being in a barren tank rather than an enriched one.[26] This clearly showcases fishes' ability to weigh costs and rewards to make a conscious decision.

---

[21] Brown, C. (2001). Familiarity with the test environment improves escape responses in the crimson spotted rainbowfish, *Melanotaenia duboulayi*.

[22] Bhat, A. & Magurran, A. E. (2006). Benefits of familiarity persist after prolonged isolation in guppies.

[23] Newport, C. (2016). Discrimination of human faces by archerfish (Toxotes chatareus).

[24] Brown, C. (2001). Familiarity with the test environment improves escape responses in the crimson spotted rainbowfish, *Melanotaenia duboulayi*.

[25] White, G, Brown, C. (2013). Site fidelity and homing behaviour in intertidal fishes.

[26] Sneddon, L. U., et al. (2014). Defining and assessing animal pain.

Have some degree of awareness

For many of the case studies about fish already discussed, conscious awareness is a prerequisite. For example, being able to make trade-offs between pain and social dominance, or showing preference between two male fish, requires that the fish making those decisions are aware of their choices and can weigh costs and benefits.

Considering Cephalopods and Crustaceans

The common argument against recognising cephalopods (octopus, squid, cuttlefish, etc.) and crustaceans (crabs, lobsters, crayfish, shrimps, and prawns) as sentient is their difference from vertebrate animals, whose centralized information processing occurs in the brain. However, having different neurological architecture to humans is not evidence of the absence of sentience. The important question is whether these animals are aware of feelings and sensations, and so this is what we shall consider.

We have some strong evidence that cephalopods and crustaceans do experience pain. Cephalopods have been shown to alter their behaviour after a painful experience. Octopi avoid attacking prey (hermit crabs) if they have stinging sea anemones attached to their shells.[27] Additionally, predator avoidance behaviour in hermit crabs appears to be more than just purely reflexive. In a laboratory setting, crabs who receive a shock typically move into new shells.[28] However, crabs remain in their shocked shells when the odor of a predator is present.[29] One explanation is that the crabs weigh the pain of the shock against the fear of a predator.

---

[27] Ross, D. M. (1971). Protection of Hermit Crabs (*Dardanus* spp.) from Octopus by Commensal Sea Anemones (*Calliactis* spp.).
[28] Appel, M. & Elwood, R. W. (2009). Motivational trade-offs and potential pain experience in hermit crabs.
[29] Magee, B. & Elwood, R. W. (2016). Trade-offs between predator avoidance and electric shock avoidance in hermit crabs demonstrate a non-reflexive response to noxious stimuli consistent with prediction of pain.

Though we have less evidence that cephalopods and crustaceans are sentient than we do for fish, the absence of evidence is not equivalent to an absence of sentience. Even if we were not certain that these animals were sentient, it would likely be advisable to follow the precautionary principle.[30] The stakes are high, with more than 420 million cephalopods and crustaceans landed by the UK fishing fleet each year.[31]

For more information on crustacean sentience, see Crustacean Compassion's Briefing on Crustacean Sentience and Welfare.[32] For more information on cephalopod sentience, see Sneddon et al,. (2014).[33]

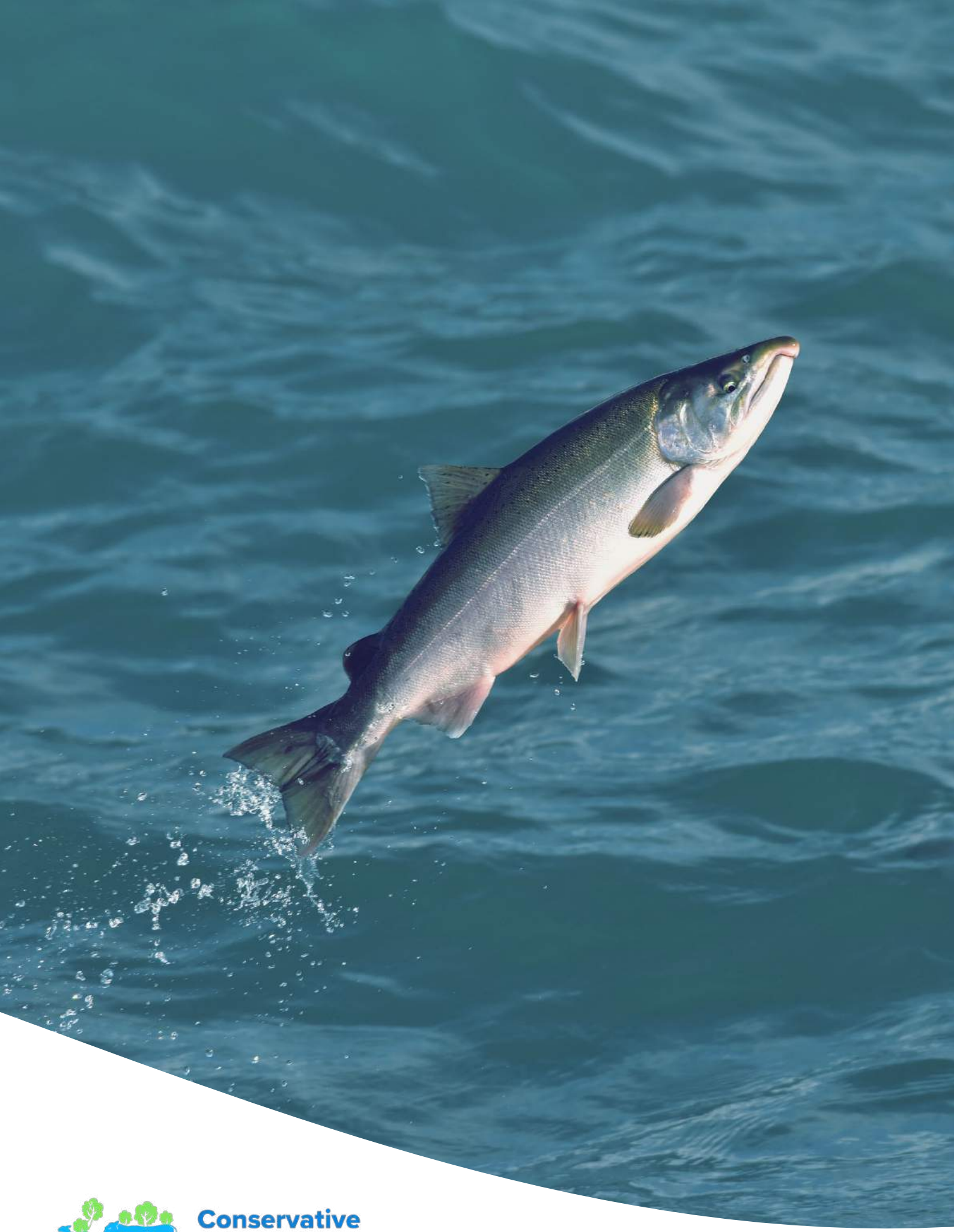
Conclusion

There is ample scientific evidence that fish are sentient beings fulfilling all requirements of the definition as suggested by Donald Broom. This report has highlighted evidence sufficient to prove this assertion, but there is much more available.[34]

Common arguments against fish, crustacean, and cephalopod sentience focus on distinctions between these animals' anatomies and human anatomy (such as fishes' lack of a neocortex). This anthropocentric view, however, fails to capture what it means for an animal to be sentient. Fish, crustaceans, and cephalopods undoubtedly experience the world differently from ourselves. What matters, though, is whether that experience entails conscious feelings of pleasure and pain. For fish, we believe this has been proven past a reasonable doubt. Now, the conversation must shift towards what is required in order to protect these sentient animals.

---

[30] A principle which states that we should "err on the side of caution" when formulating animal welfare practices and legislation.
[31] Dr. Maisie Tomlinson. (2021). Grasping the moment: recognising decapod crustacean sentience in 2021.
[32] Crustacean Compassion. (2021). Briefing on Crustacean Sentience and Welfare.
[33] Sneddon, L. U., et al. (2014). Defining and assessing animal pain.
[34] For more information, see Kristiansen, T.S., Fernö, A., Pavlidis, M.A. and Van de Vis, H. eds., 2020. The welfare of fish.



Conservative
Animal Welfare
Foundation