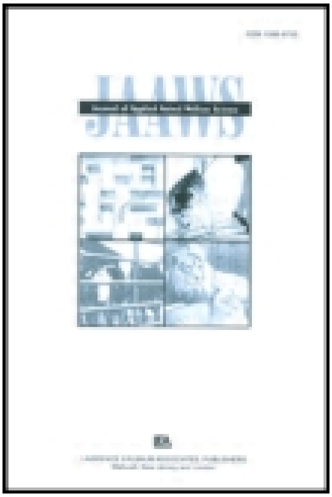

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REVIEW SECTION

Do Fish Feel Pain?

***Do Fish Feel Pain?* By Victoria Braithwaite. London, UK: Oxford University Press, 2010. 256 pp. ISBN 10-0199551200. Hardcover, $29.95.**

Every so often a book comes along that is simple, straightforward, easy to read, and important. Victoria Braithwaite's *Do Fish Feel Pain?* is one of those books. She discusses what pain is, how the sensory aspect of pain called nociception works, whether fish have brain areas associated with emotion and can make mental representations, and what her conclusions mean to our interactions with fish. This not only leads us to many questions about the nonhuman animals for whom we should have welfare concerns but also gives a clear blueprint for how to evaluate this.

Pain is hard to define because the sensory event, sometimes called nociception, is only the first step in pain perception. Evolutionarily, nociception and the avoidance of potential damage are very old; one good example is sea anemones, who have no brain but clearly show nociception. To move beyond the simple sensory experience, she suggests that we have to give freely moving animals choice situations and see how the nociceptive experience alters their voluntary choices so that it can be seen as pain.

To conclude that fish feel pain, it is first necessary to evaluate the receptor system and look for parallels with "higher" vertebrates. Luckily, anatomical studies show that fish have the same dual system of A-delta and C-fibers that mammals and birds do, though they have fewer C-fibers. Braithwaite's summary of her research studies show that two different stimuli, vinegar and bee venom, cause nociceptive reactions in these fibers. Treated fish have a systemic reaction, a higher gill-beat rate, far longer than the control fish who were simply handled. Morphine suppresses pain in a wide range of animals including snails, and it suppresses the gill-rate increase to these chemicals in the fish. Braithwaite was also interested in the effect of these chemicals on "higher order" voluntary behavior, giving awareness changes that might indicate pain. She found that fish given these injections were not as avoidant of a novel stimulus (a brightly colored LEGO brick tower) and thus their attention had been affected. This suggests that the fish have moved from simple nociception to pain.

The next chapter firms up her belief that fish have a simple form of consciousness, necessary to the assumption that they have pain and suffering. The debate as to whether simpler animals have consciousness is an ongoing one; however, animals have at least a simple form of it if they have mental representations. One example of this ability is spatial memory, found widely in mammals, birds, insects, and even octopuses. Aronson's early studies of gobiid fish showed that these intertidal animals memorize the location of tidal pool shelters when the tide is high. When the tide is out, they remember and jump from pool to pool to escape pursuit. Another ability that suggests mental representation is observational learning. Male cichlid fish, who fight to defend territories, watched as other males fought. When placed in the middle between two former fighters, they moved toward the presumably easier-to-defeat "losers," showing transitive inference and observational learning.

What of the necessary emotional responses programmed in the brain? For a long time, the lack of a visible neocortex in the fish brain suggested they do not have this center of higher order thinking. However, Braithwaite points out that the brain organization of fish is inside out compared with that of mammals, that an area parallel to the neocortex exists internally and can be traced developmentally. Areas in this location are parallel to the mammalian amygdala, which deals with emotional stimuli and would be necessary for this aspect of pain, and to the hippocampus, which processes and stores spatial information. Thus, the fish brain has the capacity to evaluate and store pain information.

Given this information about fish, the next chapter looks more widely and asks how many animals have similar processing and might be eligible for concerns about their welfare. Some mammals and birds have an understanding of the consequences of their own actions and may also be aware of the motivation or knowledge of conspecifics. Monkeys also seem to be aware of the reliability of their own memory. Is there a sufficient parallel between them and "lower" vertebrates and even invertebrates that we should extend our welfare considerations to them? Invertebrates may make similar evaluations and may be considered to have simple consciousness.

Cephalopods, because of their considerable cognitive and learning ability, are suggested for consciousness and protected by the Canadian Council of Animal Care. Elwood's research evaluated choices when hermit crabs were given small electric shocks from the base of their borrowed snail shells. The avoidance of this shock tapped into the complex calculations that hermit crabs make about shell entry, including consideration of the "quality" of the shell and potential rivals, suggesting that crustaceans have some cognitive ability. Thus, we open a Pandora's box by trying to evaluate by awareness which animals deserve our care and consideration.

Braithwaite asks why we are aware of this only now. One reason is that fish are really different from other vertebrates and were once considered to have minimal memory and little cognitive ability. Now we know differently.

Another possibility is that we really haven't wanted to know. A vibrant animal rights movement has made life better for the animals but difficult for scientists, animal keepers, and agriculture specialists. Mass production and housing of agricultural animals have often led to poor living conditions, and animal rights activists have rightfully protested this. Are fish the next target for this kind of concern?

Last is a practical issue—what we will do given that fish feel pain and have suffering? The simplest situation is aquaculture, as good rearing conditions are going to lead to healthy animals; thus, welfare and rearing success coincide. What, however, of conditions in aquariums, where fish are often crowded and sometimes at risk from other species? Will we have a fish equivalent of Free Willy? Deep sea fishery practices are often brutal to fish and need to be modified now that we know what suffering they cause.

What of that ubiquitous pastime, angling? Modifications such as barbless hooks cause fish to feel as little pain as possible when caught. Anglers, however, often practice catch and release, so the fish might be put through pain and suffering twice, a practice that is ethically shunned by researchers. Why don't fish learn not to approach the fly or hook? Given enough food, pike in captivity learn after one experience to avoid the line. Fish in the wild must be very hungry and thus are forced to endure the inhumane treatment of repeat captures. In all, the information in this book challenges practitioners of this ancient and ubiquitous pastime. Still, some of the information leads to "might" and "could be." We know far too little about the fish species we capture and keep, so we do not always know how they are reacting to our treatment. Braithwaite recommends more knowledge first, emphasizing we need to go from facts to ethical approaches to animals and only then to treatment guidelines. Still, this book challenges us to do so for fish and also other "lower" animals.

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