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SCIENCE DESK

## ESSAY; Fishing for Clarity in the Waters of Consciousness

By JAMES GORMAN (NYT) 1074 words

The study of consciousness has always fascinated me. I love all the impossible arguments about the self and the nature of experience. I also love fishing, but I never expected the two interests to coincide or, more precisely, collide.

I heard the crash when I read the word "nociception" in the current issue of that esteemed scientific journal *Field and Stream*, which I often read, but not usually for news of neurobiology.

The word was in a news item about the research of Dr. James D. Rose at the University of Wyoming. Dr. Rose published a paper last year in *The Review of Fisheries Science*. In it, he argued that fish do not have the brains to produce a level of consciousness capable of feeling pain.

What is occurring in fish, he said, is nociception, which, in fishing terms, is to get hooked but feel no pain. This is not at all the same as a fisherman who is "feeling no pain" and fails to notice he has hooked himself in the ear. Nociception is what most people imagine happens when a worm is put on a hook in order to catch a fish. The worm clearly reacts, but it is hard to imagine that it has a conscious mind that can register pain.

No sooner had I read this than a colleague called to my attention a study about to be published in one of the many proceedings of the British Royal Academy, proving that fish do feel pain.

None of this was good news. I like to think about consciousness, because I have it, although for the life of me I can't think why. Particularly when I am fishing, I prefer not to think about who I am. I consider fishing one of those pursuits in which you can lose yourself, along with a lot of expensive flies.

Resist as I might, once I learned about the papers, I was compelled to read them. I started with Dr. Rose, whose paper was thick with neuroscience and philosophy. He described the accepted division of consciousness into primary and higher. Higher consciousness is what I have, and which I assume, but cannot really prove, that you have. Chimpanzees may have it, too. But the consensus is that guinea pigs and frogs and men who wear golfing pants do not have it.

Primary consciousness, thought to be more widespread, consists of awareness but not awareness of self. An organism would experience sensations and feelings of who knows what sort. Pain would feel like pain; it just wouldn't be clear who was feeling it.

There is no real argument for fish having higher consciousness. What Dr. Rose argues in his paper is that they do not have the brain structure, like the neocortex, which has been shown to be active during conscious experience, and is thought to be necessary for it. Nor do fish have other structures complicated enough to support consciousness, at least in any way comparable to human beings.

I turned to the article to be published in The Proceedings of the Royal Society Series B in June, but posted ahead of time on the Web for subscribers. In the paper, Dr. Lynne U. Sneddon and Dr. Michael J. Gentle of the Roslin Institute in Midlothian, where the sheep Dolly was cloned, and Dr. Victoria A. Braithwaite of the University of Edinburgh reported first that they had demonstrated nociception in fish. No argument from Dr. Rose there.

They claimed further to have demonstrated that fish feel pain, by injecting them with bee venom and noting prolonged behavior like rubbing the spot of the injection as if it hurt.

Rather than simply quote dueling scientists, I settled on a referee. I called Dr. Piet Hut, an astrophysicist at the Institute for Advanced Study in Princeton, N.J., where Einstein worked. Dr. Hut is not just any old astrophysicist. He also has a profound interest in consciousness and philosophy, so he knows the turf. He is not an angler. Although he was once a vegetarian, he does now eat some fish but no meat.

Of Dr. Rose's work, Dr. Hut said: "I think it's a very interesting study. But we're still quite far away from solving the problem of consciousness of fish."

He said he thought that the paper made a convincing case that there was no evidence in fish brain structure to indicate consciousness that is comparable to human experience.

But, Dr. Hut said, there was really no way of telling whether fish might have some form of awareness unlike that of humans or mammals.

As to the other paper, Dr. Hut said, simply showing a reaction to negative stimuli was insufficient. No organism would survive if it did not move away from negative or damaging stimuli. Robots could be programmed to do the same without being conscious. But the behavior witnessed in response to bee venom injections, he said, head rubbing and movements that suggested persistent pain, "makes it a little bit more plausible that there could be something that we could call consciousness."

This was not proof, by any means, but he said that if he had to choose how to act "I would give them the benefit of the doubt." The fish, that is. He would not, however, assume that what fish feel can be understood in human terms.

There are big environmental issues at stake beyond the moral purity of the individual. On the one hand, if people stopped fishing or there were laws banning it (and people obeyed them), no fish would get hooks in their mouths. On the other hand, a huge political force for cleaning up rivers and lakes and ponds would be lost. And because fishermen, particularly catch-and-release fishermen, support the preservation of wild rivers, there would probably be fewer fish.

Dr. Hut had the most difficulty with the idea of catch-and-release fishing, in which the fish, if they suffer, suffer for the angler's pleasure. "If I were to fish," Dr. Hut said, "I think I would eat the fish rather than throwing it back."

Fish might prefer to be treated less ethically, getting hooked, caught and tossed back rather than eaten. But then, neither paper addressed the question of whether fish can do philosophy.

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