

# ANIMAL SENTIENCE

AN INTERDISCIPLINARY JOURNAL ON ANIMAL FEELING

Mather, Jennifer (2017) [Support for the precautionary principle](#). *Animal Sentience* 16(10)

DOI: 10.51291/2377-7478.1234

Date of submission: 2017-10-27

Date of acceptance: 2017-11-01



---

This article has appeared in the journal *Animal Sentience*, a peer-reviewed journal on animal cognition and feeling. It has been made open access, free for all, by WellBeing International and deposited in the WBI Studies Repository. For more information, please contact [wbisr-info@wellbeingintl.org](mailto:wbisr-info@wellbeingintl.org).



## Support for the precautionary principle

Commentary on [Birch](#) on *Precautionary Principle*

**Jennifer Mather**

Department of Psychology  
University of Lethbridge

**Abstract:** The precautionary principle gives the animal the benefit of the doubt when its sentient status is not known. This is necessary for advanced invertebrates such as cephalopods because research and evidence concerning the criteria for sentience are scattered and often insufficient to give us the background for the decision.

[Jennifer Mather](#), Professor of Psychology at the University of Lethbridge, does research on cephalopod behavior, particularly that of octopuses. She is co-editor of the upcoming book "Invertebrate Welfare" in the Springer series on animal welfare. [directory.uleth.ca/users/mather](http://directory.uleth.ca/users/mather)



Using a Precautionary Principle to judge animal sentience for welfare, Birch (2017) argues that we should 'set the bar low' and not wait for evidence for every less-studied species related in an Order. For the cephalopod molluscs, for whom there is evidence of sentience (Mather, 2008), the lack of information about their physiology and behavior means that we should indeed set the bar low, but for the whole group. As Birch and others have pointed out, we can never know for sure whether a species or an individual feels pain, or feels at all, because these are private experiences. Moreover, cephalopods and vertebrates are not similar anatomically, physiologically or behaviorally. Even though they have as many neurons as most small mammals and birds, cephalopods have 3/5 of these neurons in the eight arms, not in the central brain. Arm actions seem to be poorly represented in the brain, and Grasso (2014) suggests that the arm system may collectively make up a 'second brain.' Where would sentience reside, then? The cephalopods have a three-part behavioral system, composed of brain processing, the chromatophore-based skin display system, and the arms using localized feedback and integration (see Mather & Dickel, 2017, for an attempt to diagram this circuitry). While we have come far from Wells's (1978) allegation that the brain doesn't monitor the arm system, our evidence as to how these systems interact and are monitored is still fragmentary (Mather & Dickel, 2017).

Given our lack of knowledge of cephalopods, we should be careful to include or exclude these animals from ethical consideration based on the results of the few situations tested on one or two species so far. Birch suggests self-delivery of anesthetics, motivational tradeoffs, and conditioned place avoidance. A better set of criteria might be the more extensive one suggested by Smith et al. (2013) and evaluated for cephalopods by Andrews et al. (2013). These include presence of nociceptive receptors, possession of 'higher' integrative brain centers, connection of the nociceptive pathways to these centers, opioid receptors in the central nervous system, analgesics that modify responses to stimuli that would be painful to humans, learned association

of presumably painful events to non-painful ones, and (most importantly) behavior indicating central actions based on the peripheral input. One might evaluate a particular animal based on the cumulative evidence from these many anatomical, physiological and behavioral variables, but no cephalopod has yet been tested for more than a few of them.

Adamo (2017) points out that clumping all animals of the same family together for the evaluation of sentience might be problematic. She gives the example of the active *Octopus vulgaris* and the far less reactive deep-sea *Bathypolypus arcticus*. Yet we must also be careful not to mistake different behavioral responses to similar stimuli for possession of different physiological capacities. There are only two well-controlled studies of responses to arm removal in the cephalopods: those of Crook, Lewis, Hanlon, and Walters (2011) on *Loligo* squid and of Alupay, Hadjisolomou, and Crook (2014) on *Abdopus* octopuses. Both studies found strong behavioral responses: short- and long-term local responses and general avoidance responses. The squid, however, did not show the wound-tending behavior that suggests central monitoring of the peripheral stimuli (criterion 6 of Smith, 2013) whereas the octopuses did. Given the anatomical and behavioral similarities between the octopuses and the squid, it would be difficult to conclude that one animal group 'passed' a test for sentience and the other 'failed' on the basis of two studies. Until we have much more evidence of control and monitoring of the cephalopod nervous system and behavior, the adoption of Birch's Precautionary Principle for the treatment of these animals would be wise indeed.

## References

- Adamo, S. A. (2017). [The "Precautionary Principle" — A work in progress](#). *Animal Sentience*, 16(4).
- Alupay, J. S, Hadjisolomou, S. P. & Crook, R. J. (2014). Arm injury produces long-term behavioral and neural hypersensitivity in octopus. *Neuroscience Letters*, 558: 137-142.
- Andrews, P. L. R., Darmaillacq A.-S., Dennison N., Gleadall I. G., Hawkins P., Messenger J. B., Osorio D., Smith V. J., & Smith J. A. (2013). The identification and management of pain, suffering and distress in cephalopods, including anaesthesia, analgesia and humane killing. *Journal of Experimental Marine Biology and Ecology*, 447: 46-64.
- Birch, J. (2017). [Animal sentience and the precautionary principle](#). *Animal Sentience*, 16(1).
- Crook, R. J., Lewis, T., Hanlon, R. T. & Walters, E. T. (2011). Peripheral injury induces long-term sensitization of defensive responses to visual and tactile stimuli in the squid *Loligo pealeii*, Lesueur 1821. *Journal of Experimental Biology*, 214: 3173-3185.
- Grasso, F. (2014). The octopus with two brains: How are distributed and central representations integrated in the octopus central nervous system? In A.-S. Darmaillacq, L. Dickel & J. Mather (Eds.), *Cephalopod Cognition* (94-122). Cambridge, UK: Cambridge University Press.
- Mather, J. A. (2008). Cephalopod consciousness: Behavioral evidence. *Consciousness and Cognition*, 17(1): 37-48.
- Mather, J. A. & Dickel, L. (2017). Cephalopod complex cognition. *Current Opinion in Behavioural Sciences*, 16: 131-137.
- Smith, J. A., Andrews, P. L. R., Hawkins, P., Louhimies, S., Ponte, G. & Dickel, L. (2013). Cephalopod research and EU Directive 2010/63/EU: Requirements, impacts, and ethical review. *Journal of Experimental Marine Biology and Ecology*, 447: 31-45.
- Wells, M. J. (1978). *Octopus: Physiology and behaviour of an advanced invertebrate*. London: Chapman & Hall.

## ANIMAL CONSCIOUSNESS

On **November 17-18, 2017**, the NYU Center for Mind, Brain and Consciousness, the [NYU Center for Bioethics](#), and NYU Animal Studies will host a conference on [Animal Consciousness](#).

This conference will bring together philosophers and scientists to discuss questions such as: *Are invertebrates conscious? Do fish feel pain? Are non-human mammals self-conscious? How did consciousness evolve? How does research on animal consciousness affect the ethical treatment of animals? What is the impact of issues about animal consciousness on theories of consciousness and vice versa? What are the best methods for assessing consciousness in non-human animals?*

**Speakers and panelists** include:

[Colin Allen](#) (University of Pittsburgh, Department of History & Philosophy of Science), [Andrew Barron](#) (Macquarie, Cognitive Neuroethology), [Victoria Braithwaite](#) (Penn State, Biology), [Peter Carruthers](#) (Maryland, Philosophy), [Marian Dawkins](#) (Oxford, Zoology), [Dan Dennett](#) (Tufts, Philosophy), [David Edelman](#) (San Diego, Neuroscience), [Todd Feinberg](#) (Mt. Sinai, Neurology), [Peter Godfrey-Smith](#) (Sydney, Philosophy), [Lori Gruen](#) (Wesleyan, Philosophy), [Brian Hare](#) (Duke, Evolutionary Anthropology), [Stevan Harnad](#) (Montreal, Cognitive Science), [Eva Jablonka](#) (Tel Aviv, Cohn Institute), [Björn Merker](#) (Neuroscience), [Diana Reiss](#) (Hunter, Psychology), [Peter Singer](#) (Princeton, Philosophy), [Michael Tye](#) (Texas, Philosophy)



**Organizers:** Ned Block, David Chalmers, Dale Jamieson, S. Matthew Liao.

The conference will run from 9am on Friday November 17 to 6pm on Saturday November 18 at the NYU Cantor Film Center (36 E 8th St).

**Friday sessions** will include “Invertebrates and the evolution of consciousness”, “Do fish feel pain?”, and “Animal consciousness and ethics”.

**Saturday sessions** will include “Animal self-consciousness”, “Animal consciousness and theories of consciousness”, and a panel discussion.

A detailed schedule will be circulated closer to the conference date.

Registration is free but required.

Register [here](#).

See also [the conference website](#).