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## **Sentience as part of emotional lives**

Commentary on [Crump et al.](#) on *Decapod Sentience*

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**Abstract:** It is high time to explore the sentience of invertebrate animals, but this topic cannot be discussed without also exploring their emotional lives, including positive emotions. Sentience probably evolved to allow the regulation of emotions by endowing them with associated feelings.

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The debate about animal sentience has been greatly advanced by the well-thought-out criteria laid out by Crump et al. (2022) in a much-needed update to Smith and Boyd (1991). Until relatively recently, the animal sentience debate often revolved around whether fish feel pain (e.g. Braithwaite & Huntingford, 2004; Key 2016) -- it is high time that we expand this debate to include the invertebrates (de Waal & Andrews, 2022).

The focus in Crump et al. (2022) is, however, entirely on the possibility of negatively valenced experiences. This is an important topic with potentially far-reaching ethical implications for how we, humans, ought to treat other species. I would argue, though, that sentience should be considered in a much wider context. The term “emotion” is barely mentioned in the target article, nor does it occur in most commentaries received thus far. Sentience is almost treated as a stand-alone capacity, which of course it isn’t. I’d urge any discussion to be closely tied to the growing research on animal emotions, the impact and reach of which can be expected to soon match the cognitive revolution reshaping the study of animal behavior (de Waal, 2019). Conversely, students of animal emotions would do well to pay attention to the sentience debate and take its ethical implications into account, instead of acting as if these implications were of little concern (Webb et al., 2020).

The science of affect often proposes a distinction between feelings and emotions. Feelings are private states that are not publicly observable, hence inaccessible to science, whereas the emotions are measurable physiological/neural states. Damasio (2004, pp. 50, 52), for example, stresses how emotions are “bioregulatory reactions” that prepare the organism for adaptive behavior, whereas feelings are the mental representations of the physiological changes that occur during an emotion. Whether or not emotions occur without feelings is a point of debate, but from an empirical perspective it remains true that the former are much easier to demonstrate than the latter. Consequently, affective science concentrates on the emotions of animals while generally staying neutral on associated feelings, but without

denying their possible existence (de Waal, 2011; Anderson & Adolphs, 2014). Debate on this distinction came to a head when Joseph LeDoux, after a long career of studying the neuroscience of fear in rats, proposed that the term “fear” is actually to be avoided in relation to nonhuman animals. For him, the amygdala detects threats and controls responses that help keep the organism safe, but is not a “fear circuit,” because we can’t know what the organism feels. Unless proven otherwise, self-defensive and escape behavior should be assumed to be unconsciously controlled and emotion-free, which in LeDoux’s (2019) terminology means that such behavior is possible without any inner experiences. Needless to say, many scientists disagree with this Cartesian view (e.g. Kret et al., 2022).

The distinction between emotions and feelings is less relevant in our own species since humans communicate feelings by means of language. We accept verbal statements about internal states as evidence of those states, and conversely sometimes equate the absence of language with the absence of those states. Until well into the 1980s, this argument was even extended to members of our own species. Skeptical that preverbal human babies felt anything, the medical profession freely subjected them to surgery without anesthesia (Rodkey & Riddell, 2013). Verbal reports of private states are not the same as the states themselves, however, but rather a source of evidence. In relation to human babies, the linguistic focus has since been abandoned and their pain is taken into account. We have argued that the same step should be taken in relation to nonhuman animals since, in light of evolution, it seems unreasonable to assume that dramatically similar emotional reactions occur in the absence of similar inner experiences (Kret et al., 2022).

I realize that this debate about emotions vs. feelings is a far cry from the current exercise to determine whether some or all invertebrates are sentient beings, but I also feel that the question of sentience cannot be separated from the study of animal emotions as reflected in the work of Panksepp (1998), Bekoff (2007), and others (myself; de Waal, 2011, 2019). Admittedly, this work rarely mentions invertebrates, but this situation is changing. The role for glucocorticoids (stress) and an oxytocin-/vasopressin-type peptide system (reproduction, bonding) can be demonstrated across a wide range of animals, including invertebrates (Ando et al., 2021). A study of honeybees has shown stress-related changes in levels of hemolymph dopamine, octopamine, and serotonin consistent with anxiety or depression in humans (Bateson et al., 2011; Chittka, 2022). We will no doubt see more research on invertebrate emotions in the future, which will tie in with the current reflections on sentience in these underestimated taxa.

If we consider why sentience might have evolved, there are only two reasons I can think of. One is that sentience assists learning and memory by attaching experiences to events, thus making them salient. The other is that sentience may serve the regulation of emotions, which are ancient neural and physiological programs that prepare the body for action. The capacity to *feel* emotions opens them up for conscious regulation. Animals need to regulate their emotions by selecting which ones to follow in case multiple emotions arise together or in case a given emotion is likely to lead to maladaptive action. The great advantage of emotions over so-called “instincts” is that they set the organism up for a certain course of action without dictating a specific behavioral outcome. Emotions are not blindly followed: there is room for appraisal and learning to affect the behavioral response. This is where sentience may play a crucial role by making the organism aware of its emotions and permitting their regulation. Crump et al.’s target article alludes to this advantage when one of the eight sentience criteria (#5, “Motivational trade-offs”) includes flexible decision-making as indicated by “centralized, integrative processing of information involving a common measure of value.” This is indeed an advantage of being sentient.

Placing sentience into this wider context of animal emotions will move us beyond questions of how to empirically establish feeling of pain, however important this is as a goal. It asks us to determine the entirety of felt experiences and inner processes and how awareness of these helps the organism negotiate the relation with its environment. Here, pain is not the sole focus, and equal attention is to be paid to positive and negative felt experiences.

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