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Are octopuses sentient beings?

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Abstract

Octopuses possess intelligence and sentience, contingent upon the definitions of these terms. If sentience is defined more strictly to encompass self-awareness, abstract language and memory, octopuses exhibit traits that may preclude them from being considered sentient, including: (1) cannibalistic tendencies and a lack of social bonds, (2) absence of parental care, (3) relatively short lifespan, and (4) a central nervous system similar to their counterparts. Similarly, if intelligence is defined as the capacity for prediction, octopuses may also fall short. Nevertheless, octopuses demonstrate a high level of intelligence and sentience, warranting consideration beyond mere sustenance.

Keywords: animal intelligence, behavior, Cephalopoda, Octopoda, anatomy.

Introduction

It is widely acknowledged that octopuses, despite their alien appearance (Figs. 1, 2, 3), are fascinating creatures. They have been the focus of scientific studies, featured in movies, and even the subject of an Oscar-winning documentary. As a result, they have gradually captivated the public imagination, transitioning from being merely considered gourmet food to being recognized as intelligent animals, replete with surprising reactions and behaviors.

Indeed, every diver, especially those who do not hunt, has had wonderful experiences upon encountering an octopus. I, myself, have had several amazing encounters, but those stories will be saved for another occasion. What truly matters is the astounding intelligence of octopuses, a phenomenon made even more impressive by the fact that they typically live for only about two years!

Given this scenario, the question becomes inevitable: Are octopuses sentient beings?

To be very direct, and based on the argumentation below, the answer should be simple: 'No.'"

However, a more sincere answer would be, "It depends on your concept of 'sentience.'" The broader the definition of sentience, the broader the range of beings included within it. Drawing from various scientific and fictional sources, a sentient being is commonly understood as an entity that experiences subjective sensations and consciousness. These beings are capable of feeling pleasure, pain, emotions, and various states of awareness. They possess the capacity to perceive and meaningfully respond to their environment.

Broadly speaking, most mammals and birds align with this definition and can be considered sentient beings. Additionally, other animals that exhibit emotions, learning abilities, and problem-solving skills, such as octopuses, fall within this category. However, the pivotal term to consider is "consciousness."

1: An *Octopus* checking what is happening (photo by Marinana Côrtes diving, taken in Florianópolis, Santa Catarina, Brazil).

Consciousness appears to be the primary point of contention. What constitutes consciousness in an animal, and how can it be detected? It may be perceived as a sense of individualism, wherein the individual recognizes itself, such as in the mirror test. The animal understands that the reflection is its own, distinct from another individual mimicking every movement. Dogs, for instance, do not typically display self-recognition when facing a mirror, whereas apes do. Surprisingly, octopuses have demonstrated the capacity for self-recognition in mirror experiments (e.g., Amodio & Fiorito, 2022).

However, the concept of consciousness can extend further to include self-awareness and the capacity for abstract language and memory. Under this more stringent definition, only human beings can unequivocally be classified as sentient. Therefore, this paper adopts a definition of consciousness that requires beings to possess self-awareness and the ability to engage in abstract language and memory. This definition of sentience presents a challenge, as there is only one known existing example for comparison – human beings.

2: An *Octopus americanus* swimming (photo by Áthila Bertoncini diving, taken in Rio de Janeiro, Brazil).

On the other hand, such questions are often explored in science fiction, particularly in discussions regarding the classification of species on other planets. If a species attains a certain level of sentience, the planet it inhabits is typically deemed off-limits for exploitation, and the species itself must be respected and left undisturbed to evolve independently. While this scenario is theoretical and fictional, it holds significant ethical implications, especially if species like octopuses were to be declared sentient beings.

Thousands of octopuses are killed and consumed each year by humans. Undoubtedly, there exists a significant ethical dilemma regarding the slaughter of sentient beings. If it is proven that octopuses possess sentience at the level previously mentioned, this genocide must be re-evaluated.

However, before those who enjoy eating octopus become alarmed, as mentioned earlier, octopuses do not exhibit characteristics that firmly classify them as sentient beings at that strict level. This will be further explained below.

Evidence against octopuses being classified as sentient beings in the strict sense:

Octopuses encompass more than 300 species, each with varying levels of intelligence and other neurological and behavioral parameters. Species like *Graneledone*, found in the depths of the sea, exhibit lethargic tendencies and may not possess the highest cognitive capabilities. Conversely, species such as the mimic octopus (*Thaumoctopus mimicus*) showcase remarkable intelligence, capable of outsmarting predators by mimicking other creatures like flounder fish, sea lilies, and even poisonous sea snakes. The intricacies of the neuronal mechanisms involved in such learning processes are staggering and may not be entirely encoded in their DNA.

Despite these remarkable attributes, octopuses possess 4 characteristics that diverge from those typically associated with strict sentient beings. These characteristics include:

1. Cannibalism

Cannibalism is a well-known behavior among octopuses. When two octopuses encounter each other outside of reproductive periods, the smaller one often becomes prey for the larger. In sentient beings, cannibalism is not typically expected, as self-awareness generally fosters empathy, and empathetic beings do not consume their peers.

While it is acknowledged that there have been instances of cannibalism among humans or certain tribes, such behaviors are generally considered pathological and exceptional.

Linked to this feature, another expected characteristic of a sentient being is the formation of social bonds, which octopuses decidedly lack. They are primarily solitary creatures and do not establish enduring social connections, neither complex social structures.

2. Lack of parental care

Octopuses, while proficient egg caretakers, exhibit a lack of parental care beyond egg incubation. Once the eggs hatch, the offspring are left to fend for themselves. Most octopus species mate only once, perishing after the reproductive season. Consequently, their offspring receive no further assistance, leading to high mortality rates, with only a few individuals surviving to adulthood. Octopuses, like all cephalopods, follow an r-strategy, characterized by high reproductive rates, where survival to reproductive age relies on sheer numbers rather than parental investment.

Such behavior is not typically observed in sentient beings, as the inefficiency and loss of thousands of offspring do not align with sound reproductive strategies.

3. Short life

Many coleoid cephalopods have a short lifespan, typically around two years, living only until the culmination of a single reproductive season. During the mating phase, dissecting a

cephalopod reveals a significantly enlarged gonad that occupies the entire visceral space, leading to the occlusion of the stomach. Consequently, the animal is unable to feed, and after expending all its energy in mating efforts, it becomes too weak to sustain its routine and quickly perishes.

Sentient beings are generally expected to have longer lifespans, allowing for the application of acquired knowledge and the investment of intellectual attributes gained by the individual and society. Humans notably possess an extended lifespan compared to their phylogenetic counterparts.

4. Size and complexity of the central nervous system

Cephalopods, particularly octopuses, possess remarkably well-developed brains, even protected by a skull-like structure. However, the complexity and proportional size of the octopus' brain are not comparable to those of mammals. Excluding the skull and associated glands, the nervous tissue of cephalopods is not as proportionally developed as that of higher tetrapods like birds and mammals.

While size isn't the sole determinant of brain efficiency, it's worth noting that the cephalopod brain may exhibit total efficiency comparable to or even better than that of vertebrates. However, the distinctions observed in the brains of more developed mammals, which lack strict sentience, compared to humans, are not evident when comparing other cephalopods to octopuses.

The challenge of a scarcity of comparative bases arises again, as only humans are available for analysis. However, strict sentience appears to be correlated with additional brain development, which in humans is approximately three times more extensive than in phylogenetic relatives. Such differences are not observed in Octopoda.

Therefore, based on the reasons mentioned above, octopuses can be considered sentient in a broad sense, akin to higher vertebrates. However, they do not possess sentience in the strictest sense, such as humans, as they lack at least the four characteristics mentioned earlier, which appear to be significant markers of sentience.

Octopuses are indeed intelligent creatures. However, the assessment of their intelligence relies heavily on the definition used. Intelligence can be interpreted in multiple ways depending on the context, but generally, it pertains to the capacity to acquire and apply knowledge and skills effectively. This includes a diverse array of mental abilities such as reasoning, problem-solving, learning, understanding, perception, creativity, and adaptability to new situations. In essence, intelligence could be encapsulated as:

Intelligence – capacity of prediction

Prediction, in this context, doesn't entail any esoteric connotations of divination or mere guessing. Rather, it involves the capacity to foresee an event based on an individual's wisdom, accumulated knowledge, and ability to process the present context in order to anticipate future outcomes. This is why we often seek guidance from more experienced individuals when we are young or new to a particular endeavor.

This type of intelligence is predominantly characteristic of human beings. While there are some animal societies, such as those of elephants, where the oldest and wisest matriarch leads the

herd, this is incomparable to figures like Einstein or Gandalf. Nevertheless, in the case of octopuses, the subject of this essay, they have often been likened to having the intelligence of a domestic cat (e.g., Flory, 2007; Two Oceans Aquarium, 2024). However, cats do not possess the ability to open jar lids, manage eight arms simultaneously and independently, nor do they have the capacity to change their color and texture to blend into their surroundings. While octopuses may not reach the stature of Gandalf, they exhibit abilities far beyond those of our familiar fauna.

3: An *Octopus americanus* among sea urchins, the spines do not bother it (photo by Áthila Bertoncini diving, taken in Rio de Janeiro, Brazil).

While the current paper suggests that octopuses may not be sentient in the strictest sense nor exhibit intelligence at the predictive level, they appear to be creatures deserving consideration for their potential high level of sentience and intelligence. They may even surpass several animals that humans do not typically consume.

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References

Amodio, P & Fiorito G, 2022. A preliminary attempt to investigate mirror self-recognition in *Octopus vulgaris*. Frontiers in Physiology 13: 951808. doi: 10.3389/fphys.2022.951808.

Flory, E, 2007. Giant Pacific Octopus *Enteroctopus dofleini*. Website https://seagrant.oregonstate.edu/sites/seagrant.oregonstate.edu/files/sgpubs/onlinepubs/g07002.pdf (extracted in 28.ii.2024).

Two Oceans Aquarium, 2024. Website https://www.aquarium.co.za/animals/octopus (extracted in 28.ii.2024.

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