

Research reveals cuttlefish can form false memories, too

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Cuttlefish. Credit: Maxime Navon

During an event, details like what you saw, smelled, and felt aren't stored as a single memory. Rather, they are encoded and stored in your brain separately. To retrieve that memory, those pieces must get put back

together. When that doesn't happen in the right way or details are distorted, it can lead to the creation of false memories.

Now researchers reporting in the journal *iScience* on July 17 have evidence that the common cuttlefish may create [false memories](#), too.

"Forming false memories is different from making memory errors," said Christelle Jozet-Alves of the University of Caen in Normandy, France. The results suggest that cuttlefish do not encode events as filmstrips but rather mentally reconstruct the event by associating different features that were present during the original event, says Jozet-Alves.

Cuttlefish have been recognized as the only invertebrates possessing episodic-like memory. In other words, they can remember and recall what happened to them in the past. But the underlying mechanisms involved in their ability to recall previous events weren't known. Does a cuttlefish's memory for past events depend on a reconstruction process?

To find out, Jozet-Alves and colleagues decided to try and induce false memories in cuttlefish. If the animals rely on a reconstructive process for their episodic-like memories, they reasoned, then they should be susceptible to forming false memories.

To encourage false memories, the researchers exposed cuttlefish to successive events sharing many common features. They wanted to see if they could make cuttlefish remember seeing their favorite food—shrimp—in a particular tube even when they hadn't. First, they showed cuttlefish different tubes, one with shrimp, one with a less-preferred crab, and one empty. Each tube had a specific visual pattern.

Next, they showed two of the three tubes previously encountered: the shrimp tube and the empty tube, but this time the content of the tubes was not visible. They attempted to mislead the animals with the visual

patterns and odors, creating overlapping features. The question was whether the cuttlefish would falsely remember there being shrimp in a tube that was in fact empty because they saw this tube a second time in the presence of the shrimp tube.

To test it out, they let the cuttlefish choose between the empty tube and the crab tube with the contents not visible. And their choices suggested that the misleading information in those past events had altered their memories. Rather than choosing a tube containing their less preferred crab, the cuttlefish more often than otherwise expected sometimes chose an empty tube, suggesting they thought they remembered it contained [shrimp](#).

While more study is needed, the findings suggest that cuttlefish can form false memories for visual information but not for scents. The researchers suggest this memory strategy might reduce the cost of memory.

If [cuttlefish](#) can store smaller building blocks of memories and then reconstruct them, it might optimize memory while allowing them to imagine different combinations of features in the future, the researchers suggest. However, they also noted an unexpected amount of variation among individuals.

"What was surprising was that the susceptibility to form false memories seems different between individuals," Jozet-Alves said. "Some appeared unaffected when exposed to a misleading event while others did form false memories. This phenomenon is commonly found in our own species in which this susceptibility varies among individuals and within individuals."

In future studies, they say it will be important to "better understand why all individuals are not as sensitive to the formation of false memory and whether it could change within an individual depending on its age, its

level of attention to the task, or even its emotional state."

More information: False memories in cuttlefish, *iScience* (2024).
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