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<http://idw-online.de/de/news845852>Forschungsergebnisse, Wissenschaftliche Publikationen
Biologie, Umwelt / Ökologie
überregional**Should I stay or should I go: When do young fish leave their home?**

Shell-dwelling cichlids take intense care of their offspring, which they raise in abandoned snail shells. A team at the Max Planck Institute for Biological Intelligence used 3D-printed snail shells to find out what happens inside. The young and the mother each follow their own, but synchronized schedules: as soon as the larvae prefer light, they leave the shell on the ninth day after fertilization. The mother, in turn, follows a strict brood-care routine to prevent the young from emerging before this day. The study thus identifies important innate processes during the brood care of cichlids and highlights the complex interplay of different behaviors.

The ideal time to leave home should be carefully considered: if children move out too early, they may not be able to cope on their own. On the other hand, if they stay too long in Hotel Mom, the parents' resources will be overwhelmed. All over the animal kingdom, this balancing act can determine the fate of parents and offspring.

Brood care in abandoned snail shells

But who or what decides when it is time for the young to leave? A team in Herwig Baier's research department has studied this in cichlids. These fish are particularly interesting because, unlike many other fish species, they are very social and provide intensive brood care.

The fish species studied, *Lamprologus ocellatus*, belongs to the family of shell-dwelling cichlids and are naturally found in Lake Tanganyika in Africa. What makes them special is that they live in abandoned snail shells in which they raise their offspring. Although these cichlids are a popular aquarium fish, what goes on inside the shell has, until now, been hidden from the outside world.

Insights into the shell

With a clever idea, Ash Parker and her colleagues managed to gain insight into the so far hidden interior of the cichlid home: they printed snail shells with a 3D printer. With a sophisticated design, these shells provide an ideal home for the fish, but are open on one side. Placed against the aquarium glass, the researchers were able to document what was happening with videos and photos.

The AI-supported image analysis revealed exciting behaviors and a precise chronological sequence: The mother lays the eggs in the upper chamber of the snail shell. The father then fertilizes the eggs. After two to three days, the larvae hatch and the mother transports them with her mouth to the lowest chamber of the shell. After seven to eight days, the larvae feed independently and make their first attempts at swimming.

Throughout this time, the mother guards the shell and takes care of the young. She keeps putting the eggs and larvae into her mouth to clean them. She also rapidly moves her rear fins to ensure a constant exchange of water in the shell.

Leaving the house on the ninth day

While the larvae initially remain in the lower, dark chamber of the shell, by the ninth day after fertilization they increasingly swim to the upper chambers and even out of the shell. The researchers found that at this point, the larvae suddenly start to like brighter areas. Thus, the time of emergence appears to be controlled intrinsically by a change in light preference.

The larvae are only indirectly dependent on their mother to follow this schedule: when Ash Parker removed the mother, water quality probably decreased due to the absence of fin fanning and the larvae left the shell before the ninth day.

Two independent schedules for mother and larvae

The mother fish itself also has a precise idea of when it is time to let her offspring go: if her young were replaced with an older clutch, she would push the larvae that she thought swam out too early back into the shell – without considering their advanced developmental stage.

The observations show that mother and young follow independent, innate schedules. However, these are perfectly synchronized: the juveniles and the mother seem to agree that the offspring is ready to leave parental care for the first time on the ninth day. The study thus reveals important processes during brood care in cichlids and lays the foundation for studying the evolution and neural basis of this complex behavior.

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URL zur Pressemitteilung: <https://www.bi.mpg.de/baier> - Department website

URL zur Pressemitteilung: <https://www.bi.mpg.de/baier/cichlids> - More information on the research project



3D-printed shell halves allowed researchers to peek inside the cichlid's home and observe the behavior of the mother and her fry during brood care.

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