Foster tadpoles trigger parental instinct in poison frogs

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Poison frogs, especially male poison frogs, are very caring parents. After the tadpoles hatch, the males piggyback their offspring to distant pools spread around the rainforest where they can feed and develop. In a recent study, a team of researchers from Vetmeduni Vienna, the University of Vienna and Harvard University show that this parental behaviour can be triggered experimentally. When unrelated tadpoles are placed on the backs of adult frogs, male – and even female – "foster parents" make their way to pools in the forest in the same way as if they had picked up the tadpoles themselves. The experiment showed for the first time that an external stimulus can trigger complex behaviours such as parental care in amphibians. The study was published in the *Journal of Experimental Biology*.

Parental care is widespread in the animal kingdom. Poison frogs are also known to be dedicated parents. They pick up their tadpoles after they hatch and piggyback them to distant pools spread around the forest. Until now, the processes that trigger parental care have been mostly studied in birds and mammals. But the exact stimulus that triggers frogs to carry their offspring to the pools remains unstudied.

Researchers from Vetmeduni Vienna, the University of Vienna and Harvard University have now investigated whether adult frogs will only transport tadpoles if they pick up a clutch themselves or if this behaviour could be triggered experimentally. The team of researchers placed unrelated tadpoles on the backs of different frogs. The study showed that the amphibians are exemplary foster parents and that even females,

which under natural conditions only rarely perform the role of "transporter", assumed their parental duties just like males when tadpoles were placed on their backs.

Piggyback for all, no matter if the "children" were natural or adopted

After the foster tadpoles were placed on the backs of male and female frogs, the adults were fitted with miniature transponders for tracking. "We wanted to know if foster tadpoles were also transported to the pools. The results show that the tadpoles do not have to be picked up, but that contact with the backs of the adult frogs was enough to trigger the transport," explains Andrius Pašukonis of the University of Vienna, who led the study together with Kristina Beck and Eva Ringler.

"We observed that all tested frogs, both males and females, transported the experimentally placed tadpoles to pools," says Eva Ringler of the Vetmeduni Vienna's Messerli Research Institute. Their behaviour was the same as if they had decided to pick up and transport the tadpoles themselves. This shows that the parental care instinct in these frogs can be triggered by placing tadpoles on the backs of the adult animals whether they are related or not. However, the experiment could not yet clearly identify the mechanism that triggers this instinctive behaviour.

Tactile stimuli from the tadpoles could play a predominant role even among frog mothers

"We suspect that tactile stimuli, certain touching or movement patterns by the tadpoles, play a role. These findings are interesting, as they show how one stimulus can trigger such complex behaviour. The adult poison frogs don't just march off; the touching also stimulates memories of distant pool locations in the forest," says Pašukonis.

Also interesting was that the female frogs voluntarily carried the foster tadpoles to the pools. "In this species, females naturally transport tadpoles only in rare cases," explains Ringler. The instinctively triggered behaviour therefore does not appear to be sex-specific. Among both males and females, the physical presence to the tadpoles placed on their backs was sufficient to make the frogs transport the tadpoles to the pools and so to ensure the survival of unrelated young. The study was the first to show in the wild and among amphibians that such complex behaviour can be triggered by one external stimulus.

More information: Andrius Pašukonis et al. Induced parental care in a poison frog: a tadpole cross-fostering experiment, *The Journal of Experimental Biology* (2017). DOI: 10.1242/jeb.165126

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