Page last updated at 09:57 GMT, Monday, 22 February 2010

Peru poison frog reveals secret of monogamy

By Matt Walker
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Evolved for each other (video taken from the BBC series: Life in Cold Blood)

The first monogamous amphibian has been discovered living in the rainforest of South America.

Genetic tests have revealed that male and females of one species of Peruvian poison frog remain utterly faithful.

More surprising is the discovery that just one thing - the size of the pools of water in which they lay their tadpoles - prevents the frogs straying.

That constitutes the best evidence yet documented that monogamy can have a single cause, say scientists.

Details of the frog's sex life is to be published in the journal The American Naturalist.

"This is the first discovery of a truly monogamous amphibian," says biologist Dr Jason Brown, then of East Carolina University in Greenville, North Carolina, who made the discovery with colleagues Dr Victor Morales and Professor Kyle Summers.

> **"These frogs are truly devoted to their offspring, and to each other"**
>
> Dr Jason Brown
> Duke University

The monogamous frog species *Ranitomeya imitator*, known as the mimic poison frog, is already known to science.

In recent years, Dr Brown and his colleagues have extensively studied many of its habits, which were filmed by the BBC natural history documentary series Life in Cold Blood.

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After mating, a female mimic poison frog lays her eggs on the surface of leaves.

The male frog then takes away the tadpoles that hatch, carrying them one by one on his back to pools of water which collect in bromeliad leaves high up in the branches of trees.

Each of half a dozen babies are put into their own tiny pool, which he then looks after.

When the tadpoles become hungry, the male calls to his female partner who arrives to lay a non-fertile egg in each pool, which the tadpole eats as food.

But while the male and female frogs appear to act in unison, new experiments have revealed the extent of their fidelity.

Many animals appear to be monogamous, with males and females forming pairs that can often last a lifetime.

But the recent explosion in genetic analyses has revealed many of these so-called monogamous relationships to be a sham.

While many animals might stay together and breed, they will often sneak off and cheat on their partners when they get a chance.

So Dr Brown and his colleagues decided to check out the mimic poison frog more closely.

They sampled the DNA of many pairs of adult frogs, and the subsequent generations of tadpoles they produced.

Of 12 frog families, 11 had males and females that remained continually faithful to one another, together producing all their offspring. In the twelfth family, a male frog mated with two females.

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"Others have found evidence of social monogamy in amphibians where parents remain paired, however they didn't look at the genetics of these couples and their offspring to confirm this," Dr Brown told the BBC.

"Or they have looked at the genetics and observed that they are actually promiscuous."

So that makes the mimic poison frog the first confirmed monogamous amphibian.

That contrasts with another closely related frog called the variable poison frog, which the mimic poison frog imitates, having a very similar colour pattern.

Genetic tests on the variable poison frog (*Ranitomeya variabilis)* by the researchers show it is promiscuous.

Further research by the team has also revealed why the two frogs, similar in so many ways, are sexually very different.

The variable poison frog lays its eggs in much bigger pools of water, five times as large on average than those used by the mimic poison frog.

Also, the female plays no part in their raising, leaving their care to the male frog only.

Keeping guard

When the researchers moved tadpoles from both species into different sized pools, they found that the tadpoles grew quickly in the larger pools, which contain more nutrients, but could not survive alone in smaller ones.

That strongly suggests that variable poison frogs don't need to stick together, as their tadpoles can survive in larger pools without feeding from their mothers.

Mimic poison frogs have been forced to take a different path, however.

Their tadpoles cannot survive without the care of both their father and mother, as there is too little natural food in their smaller pools.

So the adult frogs stick together.

Fatherly protection

Overall, the researchers believe they have found convincing evidence of an evolutionary chain of causation: changing the breeding pool size forced the mimic poison frog to change its system of parental care, with males and females working together. That then culminated in social and genetic monogamy.

If the pools were bigger, the frogs wouldn't have to remain faithful, as they wouldn't be tied by their need to work together to raise their brood.

"These frogs are truly devoted to their offspring, and to each other," says Dr Brown, who is now studying at Duke University in Durham, North Carolina, US.