

Poisonous amphibian defenses are linked to higher extinction risk

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Research published by a Swansea University scientist has found amphibians which have a toxic defence against predators—such as the iconic poison dart frogs—have a much higher risk of extinction than species which use other types of defence mechanisms.

The key finding of Dr Kevin Arbuckle's latest study, published today in the journal *Royal Society Open Science*, is that poisonous [species](#) are 60% more likely to be threatened than species without chemical defences.

Amphibians are usually considered the most threatened group of vertebrate animals and are experiencing population declines globally, raising conservation challenges.

The threats to [amphibian](#) biodiversity are numerous and include rapid habitat destruction, exploitation, and pollutants entering the environment.

Many characteristics of animals may be linked to contemporary extinction risk. For instance, certain traits are either known or suspected to influence factors such as mortality rates or the ability of populations to recover after declines, and are therefore potential predictors of extinction risk.

The work by Dr Arbuckle, Lecturer in Biosciences (Evolutionary Biology) in the University's College of Science, used amphibians as a model system and tested whether chemical antipredator defence is

associated with contemporary extinction rates. This is possible by using conservation status (e.g. 'endangered', 'vulnerable') as a measure of extinction risk in species alive today.

Dr Arbuckle said: "The results of this new study suggest that while toxic defence can be great for avoiding predators, it might be bad news in the long-term for a species. It's another example of how evolution doesn't act 'for the good of the species', but instead for the good of the individual.

"The results also suggest that how a species defends itself might be part of the puzzle of working out which species are in need of conservation efforts.

"The study builds on my previous work, which found that toxic amphibians were also more likely to become extinct over their evolutionary history, and the next step is to figure out what mechanism is behind the link between defence and extinction.

Dr Arbuckle's paper, "Chemical antipredator defence is linked to higher extinction risk", is published in the journal *Royal Society Open Science* today.

Dr Arbuckle previously suggested three main possibilities to explain higher extinction rates in toxic amphibians, and figuring out which of these have been important are the focus of another study.

The different ideas are:

- Costly chemical hypothesis: Chemical defence is energetically costly;
- Marginal habitats hypothesis: Chemical defence allows shifts to 'marginal' (low carrying capacity) habitats, which are intrinsically

more vulnerable, and;

- Slow life-history hypothesis: Chemical defence is associated with slow life-histories, which damages the recovery of populations after declines.

More information: *Royal Society Open Science*,
[dx.doi.org/10.1098/rsos.160681](https://doi.org/10.1098/rsos.160681)

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