‘Toadness’ a Key Feature for Global Spread of These Amphibians

It takes a special kind of toad to hop around the world, colonizing continent after continent. And Ines Van Bocxlaer knows the secret to that success. Through an extensive analysis of 228 toad species, the graduate student at the Free University of Brussels (VUB) has come up with a list of traits that made such a worldwide spread possible. On page 679, she and her colleagues reveal what enabled some toads to leave South America, where the first toads originated, for places far afield. “This study elegantly analyzes specific morphological traits and correlates them with successful range expansion,” says Jennifer Pramuk, a herpetologist at the Bronx Zoo in New York City.

That global spread may have accelerated speciation of this group of toads, says Franky Bossuyt, Van Bocxlaer’s adviser. The team’s work also suggests one way to evaluate if toads newly introduced to a location will become pests. “It’s a really good start to thinking about what kinds of attributes make for an invasive,” says Darrel Frost, a systematist at the American Museum of Natural History in New York City.

In 2009, using a combination of nuclear and mitochondrial DNA, Van Bocxlaer and her colleagues built a family tree that encompassed 86 toad species. Until that time, most systematists assumed that the Bufo genus of so-called true toads, which includes the cane toad, common toad, western toad, and others so-called true toads, which includes the cane toad, common toad, western toad, and others

Other traits that favored spreading included the possession of poison glands, to deter predators, and internal fat-storage bodies, for energy reserves. Large size likely helped as well, the researchers concluded. Toads that were flexible in where they laid eggs and could make use of temporary wet spots had an edge, too. Large clutch sizes, consisting of thousands of eggs, would also be beneficial, as would larvae that could feed off the environment rather than have to rely on energy stores provided by the mother.

To see whether toads that dispersed had all these traits, Bossuyt’s team added another 142 species to the toad family tree, so that it comprised 43% of all known toad species. At the same time, they compiled the ranges of each species from published records. The results are convincing, says Pramuk: “Genera of toads with the typical ‘toad’ morphology were ideally adapted for surviving and, apparently, colonizing the globe.”

Knowing what kind of toads spread in the past should help us understand which ones will survive if accidentally transported into a new environment, adds Ben Phillips, an evolutionary biologist at the University of Sydney in Australia. This work, he says, “may have far-reaching consequences for … how we might predict which taxa are likely to become invasive.”

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Cross-continental hopper. The common Indian toad has features that enabled it to become widespread.