

# For freshwaters, these pets are high-risk invasive species

November 8 2023, by Nadja Neumann

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Pond slider terrapins have already established non-native populations worldwide. It is banned from trade in Germany. Other freshwater pets are also high-risk invasive species. Credit: James W. E. Dickey

Unwanted pets are often released as soon as they become a nuisance. Not just dogs and cats, but also exotic freshwater species. This contributes significantly to the spread of invasive species. Well known examples include the goldfish and pond slider terrapins, which have established

non-native populations globally.

Researchers led by IGB have identified the most important risk species among aquatic pets for Germany and developed a three-step risk assessment method that can serve as a screening tool and as a basis for legislation to restrict future releases of unwanted animals. This is essential, as [the study](#), published in *People and Nature*, also shows that 97% of the freshwater species sold in Germany are not native.

The spread of non-native species—animals, plants and other organisms introduced outside their native range—is one of the major drivers of biodiversity loss. Many of these species originate from the [pet trade](#). According to previous studies, this applies to around a third of all invasive [freshwater species](#).

Trade in some species has therefore already been banned or severely restricted in order to prevent further spread. For example, pond sliders (*Trachemys scripta*), which were previously widely traded in the Europe, are now banned from sale in the EU. The species has become established on every continent except Antarctica as a result of releases by pet owners worldwide.

"An increasingly globalized world has facilitated the movement of non-native species via the poorly regulated international pet trade. Prevention is particularly important to minimize the threat from [invasive species](#). This requires understanding the sources of risk and identifying the species that are most likely to be introduced and to establish in new habitats," explained IGB researcher James W. E. Dickey, lead author of the study.

The researchers performed an in-depth analysis of the freshwater pet trade in Germany compiling its species inventory. They surveyed pet stores, websites and the country's largest online classified portal, eBay

Kleinanzeigen (now: kleinanzeigen), recording the taxa encountered. For each species, they determined the likelihood of release based on availability and price under the assumption that more readily available, cheaper species have greater risk of getting into the wrong hands and being released.

Next, they determined which species have the greatest likelihoods of surviving and establishing non-native populations, based on their ecological niche breadths and niche overlaps with the environmental conditions in Germany.

The survey revealed 669 species, of which 651 were non-native to Germany. Fish were the most common taxonomic group with 89.5% of all species, followed by mollusks with 4.3%, crustaceans with 3.9% (shrimps: 2.1%; river and freshwater crayfish: 1.8%), amphibians with 1.2% and reptiles with 1.0%. Twenty-two of the species have already been found in the wild in Germany. Some of the species, such as the walking catfish (*Clarias batrachus*), are on the list of "100 of the world's worst invasive alien species." Others, such as the African clawed frog (*Xenopus laevis*), are on the EU list of "Union Concern."

## **Informal online marketplace**

Despite the high number of listings, the fewest taxa could be identified on eBay Kleinanzeigen. "What is worrying is the frequency with which rough generic names are used in the advertisements instead of precise species names—sometimes as vague as 'animals.' This also highlights the difficulties in regulating informal online marketplaces," said Professor Jonathan Jeschke, scientist at IGB and senior author of the study.

The reasons for disposal outlined on the studied eBay Kleinanzeigen listings were varied and partly related to the well-being of the animals: a high reproduction rate (most common), the size of the animal in relation

to the tank (third most common) and aggression towards other animals (fifth most common) were important reasons for giving them away. However, the second most common reason suggests that aesthetics may also take precedence over affection for the animals, with owners wanting to remodel their aquariums or replace the animal population stocks.

## **Among the high-risk species for Germany are the goldfish, the guppy and the red-rimmed melania snail**

The team developed a three-stage risk assessment method based on the data collected, the risk of release and the probability of survival in the new habitat. "We propose this method for the screening of commercial species. This could potentially curb the spread of particularly high-risk species, for example through special husbandry requirements or price," said James Dickey.

Among the high-risk species for Germany are the goldfish (*Carassius auratus*), the guppy (*Poecilia reticulata*) and the red-rimmed melania snail (*Melanoides tuberculata*). All three of these species have extensive invasion histories, and have already been found in the wild in Germany. Goldfish impacts stem from their high feeding rates, broad omnivorous diets and foraging behavior, which can lead to drastic changes to the waterbodies in which they establish.

As well as being popular pets, guppies have been used around the world for mosquito control and can also lead to declines of other invertebrates when introduced to new habitats. The red-rimmed melania, meanwhile, is capable of asexual reproduction and can reach huge densities in non-native habitats. As a result, they have outcompeted native freshwater snail species and can act as intermediate hosts for trematode parasites that pose a human-health threat.

The authors also argue that special attention should be paid to species without a history of invasion in Germany, such as the serpae tetra (*Hyphessobrycon eques*), and the variable platyfish (*Xiphophorus variatus*).

"The pet trade is incredibly dynamic, and new species are being added all the time. The prices and availabilities of species can also change depending on supply and demand. As a result, the risks of each species will fluctuate, meaning there is a need for focused, long-term monitoring of the industry," outlined Dickey.

"Hopefully, risk assessment methods like ours and increased public awareness can help prevent risky, potentially impactful [species](#) being released into German waterbodies."

**More information:** James W. E. Dickey et al, Identifying potential emerging invasive non-native species from the freshwater pet trade, *People and Nature* (2023). [DOI: 10.1002/pan3.10535](https://doi.org/10.1002/pan3.10535)

Provided by Forschungsverbund Berlin e.V. (FVB)

Citation: For freshwaters, these pets are high-risk invasive species (2023, November 8) retrieved 29 April 2024 from <https://phys.org/news/2023-11-freshwaters-pets-high-risk-invasive-species.html>

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