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Temperate and tropical snails share an appetite for native and non-native temperate aquatic plants

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The plants and animals found in our ecosystems are rapidly changing because of a warming planet and the global transport of people and goods. As a consequence, Himalayan balsam colours our river banks pink, Japanese knotweed is the bane of house owners and floating pennywort transforms waterways into buoyant lawns. Ultimately, the success of such non-native plants depends strongly on whether native herbivores feed on them. Native herbivores and non-native plants are evolutionarily novel to each other (i.e. they have not evolved adaptations to one another), which can benefit either plant or herbivore. If herbivores are maladapted to consume exotic plants, the non-native plants will grow vigorously. Alternatively, if novel plants are maladapted to native herbivores, there will be strong biotic resistance against plant invaders because herbivores will prefer them to natives. Because novelty can work both ways, it does not consistently predict the palatability of plant invaders.

We tested whether plant palatability traits (plant traits that were expected to be indicative of their palatability to snails) and the latitudinal origin of plant species would help explain the palatability of non-native plants. We fed twenty native and twenty non-native aquatic plants (some of temperate origin, others of tropical origin) to two freshwater snails, one from Eurasia, the other from South America.

Snail eating freshwater plants. Photos provided by authors..

Our results show that both the temperate and tropical snail herbivores preferred to eat plants with a high ratio of specific plant traits, namely the ratio of a feeding stimulant (nitrogen content, often related to protein) to a feeding deterrent (total phenolics content; phenols are defense compounds that contribute to the bitter or astringent flavor of tea). The preference of snails for novel or non-novel plants was inconsistent as both preferred temperate plant species, i.e. the tropical snail preferred novel plants and the temperate snail preferred non-novel plants. The difference in consumption rates of temperate and tropical plants was reflected in the nitrogen-to-phenolics content, which was higher in temperate than tropical plant species. These findings indicate that herbivore preference for plants depends on plant traits and the latitudinal origin of plants, not simply on the novelty of plants to herbivores. Overall, exotic plants from the tropics are less edible to temperate and tropical animals than plant invaders from temperate regions.