

Global study shows exotic species are a complex threat

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In the coral reefs of the Caribbean, lionfish occur naturally, (left) but in seagrass areas, they are invasive species (right). Credit: 2019 Andrea Anton

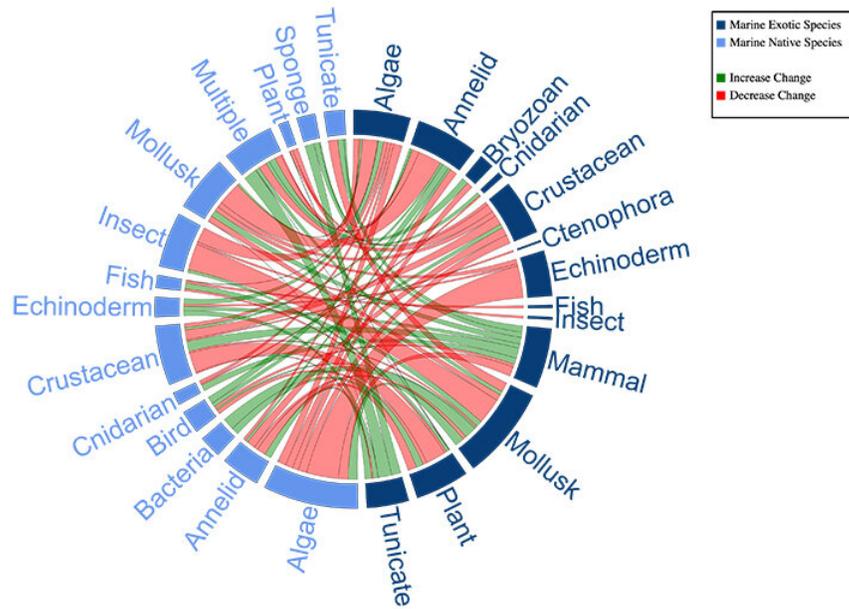
When species are introduced by humans into marine habitats, they can disrupt their new environment, according to a study at KAUST, which also identified key species for conservation efforts to focus on.

While the significant damage caused by some exotic species is beyond question, there is an ongoing debate among researchers about the overall impacts of exotic species, many of which may be innocuous. "This discussion is intensifying within the [scientific community](#)," says Andrea Anton, the study's lead author. To help resolve the debate, she and her

colleagues at the University's Red Sea Research Center and around the world undertook a meta-analysis of the ecological impact of exotic species in [marine environments](#).

They collected data from more than 150 studies covering 76 exotic species. By using a metric which measured the increase or decrease of different ecological variables, the team circumvented the need to categorize the changes as positive or negative, a source of potential bias when studying cascading effects in complex contexts, such as ecosystems.

Their analysis showed that exotic species do tend to disrupt marine ecosystems. The overall effect appears relatively modest compared with other anthropogenic factors, such as global warming or overfishing, perhaps because of differences between subgroups. For example, although primary producers were negatively affected by exotics, there was less impact on species at other trophic levels. Likewise, exotic predators and primary producers consistently had a substantial disruptive impact, while exotics from other trophic levels did not.



Taxonomic cord diagram showing the interactions (green: positive/increased; pink: negative/decreased) between exotic (dark blue) and native (light blue) species. Credit: © 2019 KAUST; kaust-vislab.github.io/Biological-Network/

The impact also differed based on the origin of the exotic species—[marine species](#) had an effect, while freshwater and terrestrial exotics did not—and the environment to which they were introduced, with habitats on continental margins seeing a significant impact, unlike those close to islands. Overall, exotic species reduced the abundance of native species but did not affect the diversity or survival of communities.

"Globally, exotic species are a threat: although we also found that only 10 percent of species introduced outside their natural area of distribution are actually destructive. However, 90 percent of them are not," says Anton. "So both sides of the debate are partially correct."

This divergence is echoed in the ranking of marine exotic species

created by the team to guide biodiversity conservation efforts. Of the 19 [species](#) that appeared in three or more studies, only two were consistently disruptive of ecosystems globally. However, given the extensive variability and context dependence of the impact of [exotic species](#), the researchers recommend that policy makers look at granular results rather than just the global picture.

The study is published in the *Nature Ecology and Evolution*.

More information: Global ecological impacts of marine exotic species, *Nature Ecology and Evolution*, [DOI: 10.1038/s41559-019-0851-0](#)

Provided by King Abdullah University of Science and Technology

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