

Biodiversity in the Mediterranean is threatened by alien species

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Millions of tourists visit the Mediterranean each year, but its deep-blue waters host the largest invasion currently underway on Earth. Almost 1,000 alien species, including fish, crustaceans, and algae are now established from other seas through human activities. In the open-access journal *Frontiers in Marine Science*, a multinational team of researchers analyzed data from a new information system developed by the European Commission to show how the introduction of alien species has changed the native biodiversity within the Mediterranean.

A hotspot for [marine biodiversity](#), the Mediterranean includes 17,000 described species, of which around 20% occur nowhere else. But [invasive species](#) can disrupt this delicate balance. For example, *Siganus luridus* and *S. rivulatus* fish from the Indian Ocean have invaded the eastern Mediterranean, where they overgraze on forests of brown algae in the shallows, stripping them bare to the rocks, with devastating effects on the animal species within this ecosystem. Elsewhere, communities of native algae, corals, and invertebrates die because they are starved of oxygen, light, and food beneath the fast-growing invasive alga *Caulerpa cylindracea*, which forms mats of up to 15 cm thick.

Stelios Katsanevakis, a researcher at the European Commission's in-house science service, the Joint Research Centre (JRC), and colleagues looked at data on 986 [alien species](#) and tracked their spread. They used the new online platform, called the European Alien Species Information Network (EASIN). Developed by the JRC, EASIN allows for European-wide assessments of the pathways of introduction, the spread, and the

impacts of alien species. Analyzing this online resource, the researchers show severe consequences for food webs and ecosystem services as invasive species expand their range and native species are driven to local extinction.

"Using the information in EASIN, we could map in unprecedented detail how far each alien species has already spread. We found that the composition of marine communities, which in the past was shaped solely by climate, the environment, and oceanographic barriers, now greatly depends on the human activities. In many areas, shipping, aquaculture, and the opening of navigational canals are now becoming the main drivers of species distribution. Proper management of the pathways of introduction of alien species is urgently needed, such as the entry into force of the Ballast Water Management Convention, to prevent new introductions", says Dr Katsanevakis.

The researchers found that around 60 species, mainly algae, have been introduced accidentally through aquaculture, especially off the coast of Venice and southwestern France. More than 400 species of alien fish and invertebrates in the Mediterranean have come by way of the 145-year-old Suez Canal. The rate of their arrival is increasing: over 80% first arrived less than 50 years ago.

The researchers believe that "stowaway" species have profited from increasing shipping activities over this period, but the invasion has also been helped by global warming. Especially the waters between southern Turkey, Syria, Lebanon, Israel, Gaza, Cyprus, and Egypt have become markedly warmer over the past 20 years, well suited for species from the Red Sea, the Arabian Sea, and the Indian Ocean. In this region of the Mediterranean, conveniently located near the exit of the Suez Canal, up to 40% of the marine fauna is now of alien origin.

"These invasions will continue and will keep affecting biodiversity in the

Mediterranean. Its future ecosystems will likely be very different to what they are now," warns Dr Katsanevakis. "We need further research to better understand what effect these changes will have, including on the vital services that humans obtain from marine ecosystems, such as food provision, coastal protection, recreation and tourism."

More information: Invading the Mediterranean Sea: biodiversity patterns shaped by human activities , *Frontiers in Marine Science*, [DOI: 10.3389/fmars.2014.00032](https://doi.org/10.3389/fmars.2014.00032)

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