

Kelp forests function differently in warming ocean

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Kelp forests in the UK and the wider North-East Atlantic will experience a marked change in ecosystem functioning in response to continued ocean warming and the increase of warm-water kelp species, according to a new study led by a team from the Marine Biological Association and the University of Plymouth.

Lead author Albert Pessarrodona, now with the University of Western Australia, said the team studied the ecosystem consequences of an expanding warm-water [kelp](#) species, *Laminaria ochroleuca*, which is proliferating under climate change. The findings are published today in the *Journal of Ecology*.

"As the ocean warms, species are moving up slopes and towards the poles in order to remain within their preferred environmental conditions. Species with warm affinities are migrating to many habitats previously dominated by cold-water ones, transforming ecosystems as we know them. These so-called novel ecosystems feature a mix of warm- and cold-affinity species, but we don't know whether they can retain desirable ecological processes and functions which human wellbeing relies on", Pessarrodona said.

The scientists studied kelp forests in the southwest of the UK, where the warm water kelp species has increased in abundance in recent years—probably at the expense of a cold-water species, which is less tolerant to warming seas.

"The warm-water kelp *Laminaria ochroleuca* was actually first detected in the UK in the late 1940s, but is now a common sight along the southwest coast and is predicted to continue expanding northwards in response to climate change, occupying most of the UK and large sections of the wider North-East Atlantic coastline by the end of the century", co-author of the study Dr. Dan Smale, from the Marine Biological Association, said.

Most studies so far have looked at how non-native invasive species introduced by humans alter [ecosystems](#). Far less attention has been paid to the impacts on ecosystem functioning of species expanding into new habitats as a result of [climate change](#).

Pessarrodona added: "We found that the warm-water kelps essentially acted as a conveyor belt of food production, growing and shedding its leaf-like lamina throughout the year and providing a continuous supply of food. In contrast, the cold-water species only grew during short, discrete periods of the year".

Overall, the warm water species was functionally "faster", with its organic material being rapidly processed by herbivores such as sea snails and limpets and with faster rates of decomposition.

"Our findings suggest that the proliferation of the warm-water kelp will alter the dynamics of North-East Atlantic marine forests by modifying the quantity, quality and availability of food. In other research we have also seen that the warm-water kelp harbors less biodiversity than the cold species. Such changes in the provision of habitat and food could eventually affect commercially important [species](#) such as crabs, lobsters and coastal fish", Smale said.

However, it is not all bad news. Some of the functions the study examined, such as carbon absorption or food provisioning, were

maintained or even enhanced. Moreover, the replacement of cold-water kelps by warm-water ones in the North-East Atlantic means this important habitat will likely survive in the future, in contrast to several other areas of the world, including Japan, Canada and Australia, where kelp forests are disappearing completely.

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