# Do macroalgae habitats help sustain fish populations in the Mediterranean?

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Whilst the importance of phytoplankton (microalgae) as a primary producer for coastal ecosystems and thus fish production is well documented, the importance of macroalgae and seaweed in the preservation of fish stocks remains obscure. Thanks to the LINKFISH project, scientists now better understand how specific characteristics of macroalgae habitats can help populations of juvenile fish to thrive.

According to Dr Hilmar Hinz, Marie-Curie Fellow at the Spanish Institute of Oceanography, whose research is supported under the EU-funded LINKFISH (Investigating the link between sub-littoral algae habitats and fish communities in the Mediterranean Sea) project, the lack of scientific understanding of macroalgae ecosystems is the consequence of limited scientific attention. Most research efforts in the Mediterranean so far have concentrated on sea grasses or deeper demersal systems, while algae habitats have been less well studied despite being equally widespread.

To fill this knowledge gap and feed into the ecosystem approach to fisheries management—which aims to identify, conserve and restore habitats critical to fish in order to regenerate and sustain their populations—Dr Hinz has conducted in-lab research and Mediterranean scuba-diving to analyse these habitats, their productivity and the biodiversity of associated benthic fauna and to determine how energy is transferred from algae to juvenile fish.

Completed in May, the project focused on ashallow water system

habitats (Cystoseira) for its experimental work, due to its traceability, but also investigated two deep water systems (Osmundaria—Phyllophora and Peyssonnalia) that occur widely in the Mediterranean. In this interview with the research*eu results magazine, Dr Hinz elaborates on the importance of his research and how it increases our understanding of the ecology of macroalgae habitats.

## What are the main objectives of the project?

The main goal of the project is to understand the importance of macroalgae as an essential habitat for juvenile fish in coastal systems of the Mediterranean.

We know that most coastal ecosystems in the Mediterranean are oligotrophic, meaning that there are very few nutrients in the water and therefore the production of plankton (microalgae) is relatively low when compared to other areas such as Northern European Seas. Macroalgae and sea grasses represent the primary producers of organic matter and therefore the main source of biological production sustaining coastal food chains. They are home to a diverse micro-fauna mainly consisting of tiny crustaceans which are a primary food source for juvenile and small fish, and they also provide structural shelter from larger predators.

Our research is trying to assess which algae species and which type of associated fauna may be particularly important for the transfer of energy to juvenile and small fish. Coastal algae habitats are currently under increasing pressure, and detailed understanding of their functional importance is thus far only sketchy. We hope that our project will be able to add some important details that may be useful in the future for the assessment of habitat quality in Mediterranean Europe's waters.

## How do you explain the current lack of research

## dedicated to macroalgae habitats?

In the Mediterranean, research on coastal systems has mainly been focused on seagrass beds, deeper demersal systems and Marine Protected Areas. Rocky reef habitats where algae dominate, despite their proximity to the shore and intensive human usage, have not been as intensively studied in particular with regards to their importance for fish. This is because studying juvenile fish in rocky shores poses considerable logistical challenges: juvenile fish of 2-6 cm in size are not easily caught and traditional fishing methods with trawls or gillnets cannot be used.

## What was your methodology for this research?

The project had various components. We have tried to combine observational studies in the field with laboratory experiments. The observational part of the study has been completed, while the experimental part is still ongoing and will be continued by the host institution after the end of my Marie Curie Fellowship funding.

Conducting the observational studies required several intensive field surveys with the collection of algae and fish samples by means of scuba-diving. In situ observations of fish and algae were made along dive transects to identify the various algae habitats prone to the presence of juvenile fish, and the diet, condition and isotopic signature of different size classes of juvenile fish were determined for areas with distinct algae coverage.

In the laboratory experiments, we are now trying to test the patterns we observed on site in a more controlled manner; in order to get a better understanding of the mechanistic link between algae, their associated fauna and fish.

## What have you discovered with regards to juvenile fish dependency on macroalgae?

The results are still very preliminary and we are still at the stage of analysis, but it appears that some algae types—especially algae that are long-lived and structurally complex such as Cystoseira —contain a higher density of prey compared to less structured algae morphotypes. This means that the feeding potential and thus habitat quality for juvenile fish is related to algae composition. So far, our observations seem to suggest that the richer and more complex an algae community, the higher the density of prey and juvenile fish. We still need to identify the mechanisms behind this fact, as algae may also serve as shelter for fish, and observed higher densities in these more complex habitats could also be associated with reduced predation. Hopefully the results of our ongoing laboratory experiments will shed some light on this.

## What about potential threats to these macroalgae?

Macroalgae are predominantly found in the coastal rocky shore. Due to their proximity to human activities, they are under increased anthropogenic pressure and thus more likely to be affected by environmental changes. Some algae such as the above-mentioned genus Cystoseira are in decline and have disappeared from many coasts of the Mediterranean because of reduced water quality which is itself caused by an increased urbanisation of coastal areas.

Furthermore, algae communities are under pressure from the introduction of alien species in the Mediterranean. For example the rabbit fish, a herbivore fish with a huge appetite for algae, is able to transform areas of previously healthy algae cover into barren rock with only a thin layer of turf, with obvious consequences for other fish. The introduction of alien algae species also has consequences for the overall

native composition of algae communities, with as yet unknown consequences for other ecosystem components.

## The project will be ending in May. How do you expect its results to impact the ecosystem approach to fisheries management?

Hopefully we will be able to highlight the importance of certain algae habitats for juvenile fish. On the basis of this work, we might be able to classify coastal habitat quality for juvenile fish on a larger scale and incorporate this into spatial management plans. Through the promotion of this knowledge, we hope to be able to sensitise marine stakeholders and the general public to the value of these habitats and hopefully initiate conservation efforts that would help preserve these ecosystems and secure future fish production.

## What are your plans for future research, if any?

I will remain in Spain to continue my research, as I successfully applied for a National fellowship funding scheme Ramón y Cajal. I am planning to pursue this new line of investigation which has opened up for me as a result of the Marie Curie Fellowship funding. Additionally I am planning to continue my involvement in fisheries-related EU projects and to pursue my research into the effects of fishing on benthic ecosystems.

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