

Dramatic increase in microplastics in seagrass soil since the 1970s

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High concentrations of microplastics have accumulated in the seagrass bed outside Spanish Almería on the Mediterranean, where the greenhouse plantations are called "the sea of plastic." The researchers have studied the sediment layers of seagrass beds to see the accumulation of microplastics over time. Credit: Miguel Ángel Mateo, Diego Moreno

Large-scale production of vegetables and fruit in Spain with intensive plastic consumption in its greenhouse industry is believed to have leaked microplastic contaminants since the 1970s into the surrounding Mediterranean seagrass beds. This is shown in a new study where researchers have succeeded in tracing plastic pollution since the 1930s and 1940s by analyzing seagrass sediments.

About half of Sweden's cucumbers and a fifth of the tomatoes in Sweden are currently imported from Spain according to the Swedish Board of Agriculture. A special area in Spain where large-scale vegetable cultivation takes place is Almería on the Mediterranean coast in southeastern Spain. A new study from the area of Almería, also known as "the sea of plastic," shows that the intensive use of plastics in the greenhouse industry seems to have led to ever-increasing emissions of microplastics since the development of intensive greenhouse farming in the 1970s.

"Almería is unique in Europe because it is one of the few human structures that can be seen from space because it is so large. The area accounts for about a quarter, or three million tons, of the total Spanish exports of vegetables and fruit," says Martin Dahl, researcher in marine ecology at the Department of Ecology, Environment and Plant Sciences, Stockholm University, who is the first author of the study in the scientific journal *Environmental Pollution*.

The study was conducted by researchers from Stockholm University in collaboration with the Center for Advanced Studies of Blanes, the Spanish High Council for Scientific Research (CEAB-CSIC), the Swedish Environmental Research Institute (IVL) and Södertörn University.

Sediment storage can be used as historical

environmental archives

Seagrass beds act as filters for coastal areas and can therefore capture particles, including microplastics, from land that get stuck on the leaves or end up in the sea bed. This makes [seagrass beds](#) interesting to study as they stabilize and build up thick sediment layers that can be used as historical environmental archives to, among other things, study the accumulation of microplastics over time.

The high concentrations of microplastics that have accumulated in the seagrass bed can potentially lead to the spread of microplastics to other environments or to animals:

"Seagrass beds could serve as a first step in the transfer of microplastics to animals, as many graze on seagrass or live in its sediment, and in this way could be exposed to plastic," says Martin Dahl.

Microplastics can also bind to heavy metals and other environmental toxins.

"We generally don't know enough about the effect of microplastics on the environment, but on the other hand we know that today plastic and microplastics occur almost everywhere in the oceans and therefore I think you should see it as a warning signal. Historically, there is usually a certain time lag from the introduction of environmental toxins until effects can be seen, such as with PCBs and DDT," says Martin Dahl.

The researchers found PVC and polystyrene

The high use of plastic in Almería is mainly due to the plastic films they use to cover the greenhouses. These wear out quickly and need to be replaced relatively often. Through usage and weathering of the plastic

film and other types of plastic used in the production of vegetables and fruits, they end up in the environment and are passed on to the sea through runoff.

The researchers were able to find PVC and polystyrene used in greenhouse cultivation in Almería. However, the analysis could not identify all specific plastic polymers and link them directly to the type of plastic that the greenhouses are covered with.

The researchers have chosen to investigate the area on the coast outside Almería due to the fact that it has previously been known that greenhouse cultivation has a high consumption of plastic and that this might influence microplastic contaminants in the surrounding seagrass beds, which are known to capture particles that are transported with the water.

According to Martin Dahl, there are several ongoing research projects on microplastics in Sweden, especially at Kristineberg's marine research station outside Fiskebäckskil in western Sweden, but they have mainly looked at plastics in other types of bottoms and in the open sea, not in seagrass sediments.

"Studying microplastics in seagrass beds is very new and this is the first study, as far as I know, where dated seagrass sediments have been used to analyze the accumulation of microplastics over time, which makes the study very exciting," says Martin Dahl.

"There are still many questions about the effect of microplastics on seagrass ecosystems, but I hope that this study can draw attention to the problems that obviously exist around [microplastic](#) pollutants, not only in Almería but in the ocean in general," says Martin Dahl.

More information: Martin Dahl et al. A temporal record of

microplastic pollution in Mediterranean seagrass soils, *Environmental Pollution* (2021). [DOI: 10.1016/j.envpol.2021.116451](https://doi.org/10.1016/j.envpol.2021.116451)

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