Ocean meadows scrub seawater of harmful bacteria

Seagrasses keep waterborne pathogens in check, potentially benefiting people and coral reefs.

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Seagrass meadows provide homes for animals and protect people and coral reefs from disease.

Seagrass meadows are the most widespread coastal ocean ecosystems in the world. Research now finds that these plants can reduce the load of disease-causing bacteria such as *Enterococcus* in the surrounding seawater by up to 50%. What's more, coral reefs also show a 50% reduction in disease when seagrasses live nearby.

The meadows act as nurseries that shelter young animals, and provide permanent homes for creatures including fish, crabs and shrimp. The plants are also superstars when it comes to carbon sequestration. Now findings published 16 February in *Science*¹ add a health-care component to the long list of ecosystem services that seagrasses provide.

"This study touches on something that is often ignored or forgotten," says Lina Mtwana Nordlund, a marine and environmental researcher at Stockholm University. That's the ability of seagrasses to ameliorate the effects of terrestrial pollution on the marine environment.

The study's authors didn't investigate how exactly seagrasses neutralize bacteria. But lead author Drew Harvell, a marine ecologist at Cornell University in Ithaca, New York, suggests several possible mechanisms: oxygen produced by the plants could kill certain bacteria; filter-feeding animals living in seagrass meadows might strain out pathogens; or microbes could end up physically stuck to seagrass blades.

"Since seagrasses remove sediment and particulates from the water, it is not a stretch to expect bacteria and surface-associated pathogens to also be removed from the overlying waters," says Frederick Short, director of SeagrassNet, a global monitoring and information network for seagrass meadows. "It's a major finding to have convincing data on yet another important function of seagrass habitat."

Seasickness

A mass illness affecting participants of a workshop in 2011 inspired Harvell to look into the effects that seagrass meadows could have on pathogens. During a programme on coral health in Indonesia, everyone who went into the water, including Harvell, came down with amoebic dysentery. One researcher caught typhoid fever.

This is because relatively small islands like those in the Spermonde Archipelago, where the dives took place, can have thin, poor soil that does not soak up wastewater. The island communities often lack basic sanitation systems, so human waste and the accompanying bacteria can end up in the waves.

Harvell's team returned in 2014 to take samples, and found that levels of *Enterococcus* — which can cause vomiting, diarrhea and nausea — in some areas were about ten times what the US Environmental Protection Agency considers safe. But contamination was lower in areas with seagrass meadows. The team also found drastic reductions in disease among corals near seagrasses.

"I think this research is a huge contribution to helping us understand the demise of coral reefs occurring in many locations," says Esther Peters, a marine biologist who studies coral disease at George Mason University in Fairfax, Virginia. "I did not have any idea that seagrasses could be so important to corals by reducing potential bacterial pathogens."

In decline

Although the findings are promising, Nordlund would like to see the research expanded to a larger scale, with a broader range of seagrass species and densities.

Species come in a range of sizes: from hovering just a centimetre or two above the sea bed to towering several metres into the water column. And seagrass roots penetrate to different depths, depending on the species and the make-up of the sediment. This probably means that different species can scrub varying amounts of bacteria out of the water, Nordlund says.

Nevertheless, Short is pleased to see the results of the study, especially given that seagrass habitats are in decline around the world — mostly owing to the effects of human activity, including pollution, nutrient-rich run-off from farms and lawns and damage from boats. "It may help to convince people worldwide of the need to protect and restore seagrasses," he says.

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References

1. Lamb, J. et al. Science 355, 731-733 (2017).