

Sea turtle: Sentinels and victims of plastic pollution in the Adriatic Sea

February 25 2021



Researchers analysed the faecal samples of 45 turtles hospitalised at the Sea Turtles Rescue Center (CRTM) and found plastic debris in all 45 samples. Plastic debris in their intestines can dangerously alter their microbiota, eventually compromising their health. Credit: Carlo Marinacci

Sea turtles are witnesses and victims of the high level of plastic pollution

of the Adriatic Sea. A group of researchers at the University of Bologna analyzed 45 turtles hospitalized at Fondazione Cetacea in Riccione and found plastic debris in their feces. Besides confirming the role of turtles as ideal sentinels to monitor plastic pollution in the sea, the results of their analysis—published in the journal *Frontiers of Marine Medicine*—crucially show how the plastic debris in their intestines can dangerously alter their microbiota, eventually compromising their health.

"The results of this study prove the pervasiveness of plastic pollution in the ecosystem of the Adriatic Sea, a [marine environment](#) intensively exploited by the industry," explains Elena Biagi, the first author of the study who is also a researcher at the Department of Pharmacy and Biotechnology of the University of Bologna. "Plastic waste originates [debris](#) that enters the marine food webs and can be found in high concentrations across the food chain up to the top predators, such as marine turtles. This bears severe consequences on their health, some of which are also due to the variations caused in their gut microbiota."

Turtles as Sentinels

It has been estimated that more than 10 million tons of plastic enter the oceans every year, becoming responsible for more than 80% of marine litter. Between marine mammals, birds and sea turtles, around 260 species are threatened by plastic debris because of entanglement and/or ingestion. Moreover, in time, plastic breaks down into smaller fragments and filaments (microplastics) that fish and shellfish species may ingest, causing microplastics to progressively accumulate across the food chain up to the top predators, including humans.

In this context, sea turtles (*Caretta caretta*) represent a flagship species. Indeed, they allow monitoring the level of [plastic pollution](#) in the sea because their health strictly connects with that of the environment they live in. Plastic waste, in particular, is a dangerous threat for them: [sea](#)

[turtles](#) often mistake [plastic waste](#) for preys and eat or ingest them while moving around, or feed on small fish that previously ate plastics.

Researchers tried to study their environmental context as precisely as possible. They analyzed the fecal samples of 45 turtles hosted at the Sea Turtles Rescue Center (CRTM) of the "Fondazione Cetacea" in Riccione (Rimini, Italy). Pollution in the Adriatic Sea is mostly due to intensive fishing, fish farming and tourism and it is at a worryingly high level. This is indeed confirmed by the plastic debris contained in all 45 samples.

"Our results show that all 45 samples under study contained plastic waste no matter how long the turtles stayed at the rescue center," says Prof. Silvia Franzellitti who is one of the authors of the study and works at the Lab of Environmental and Animal Physiology of the University of Bologna. "A comparison of our dataset with the existing literature on the matter is difficult to carry out because previous studies considered data obtained from necroscopies on dead animals. Despite this, our research suggests that the level of plastic contamination in the feces of the observed turtles is very high both in terms of the number of animals that ingested plastic and of the concentration of plastic debris in their feces."

Plastics and Gut Microbiota

The data of this study tell us something about marine pollution and the turtles' health. Once ingested, plastic debris piles up in the last part of their intestinal tract, where it can stay for weeks before being expelled. Here plastic debris can cause epithelial damages as well as favor toxic chemicals to be absorbed. Finally, plastic debris can force changes in the gut microbiota, eventually altering its composition and functioning.

The microbiota plays a central role in all vertebrates: it helps digestion and the assimilation of nutrients, regulates metabolism, engages with the

immune system and helps prevent pathogenic colonization. This is why any change in the microbiota can have serious consequences on the health of the organism.

"Our analysis allowed us to link the presence of plastic debris to specific pathological alterations of the [gut microbiota](#) of the turtles and the consequent negative effects on their health," states Elena Biagi. "For instance, our results show that [plastic](#) debris can act as a carrier of some bacterial communities that evolved to thrive alongside toxic chemicals or of some pathogens that are usually found in marine environments. These bacteria and pathogens could then reach the [turtles'](#) intestinal ecosystem through [plastic debris](#)."

More information: Elena Biagi et al, Impact of Plastic Debris on the Gut Microbiota of *Caretta caretta* From Northwestern Adriatic Sea, *Frontiers in Marine Science* (2021). [DOI: 10.3389/fmars.2021.637030](https://doi.org/10.3389/fmars.2021.637030)

Provided by Università di Bologna

Citation: Sea turtle: Sentinels and victims of plastic pollution in the Adriatic Sea (2021, February 25) retrieved 4 July 2024 from <https://phys.org/news/2021-02-sea-turtle-sentinels-victims-plastic.html>

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