

Biologists record increasing amounts of plastic litter in the Arctic deep sea

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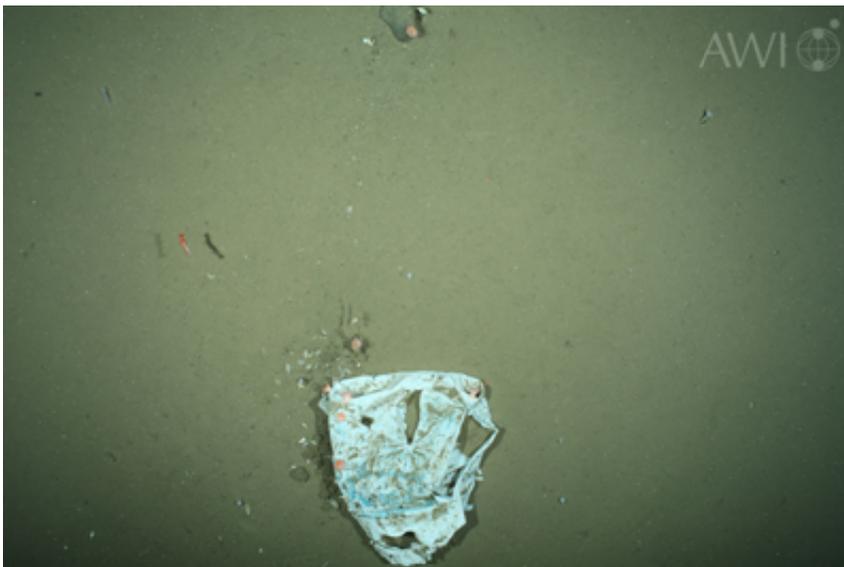


Photo of plastic waste, taken by the OFOS system in the HAUSGARTEN area in July 2012, Credit: Alfred Wegener Institute

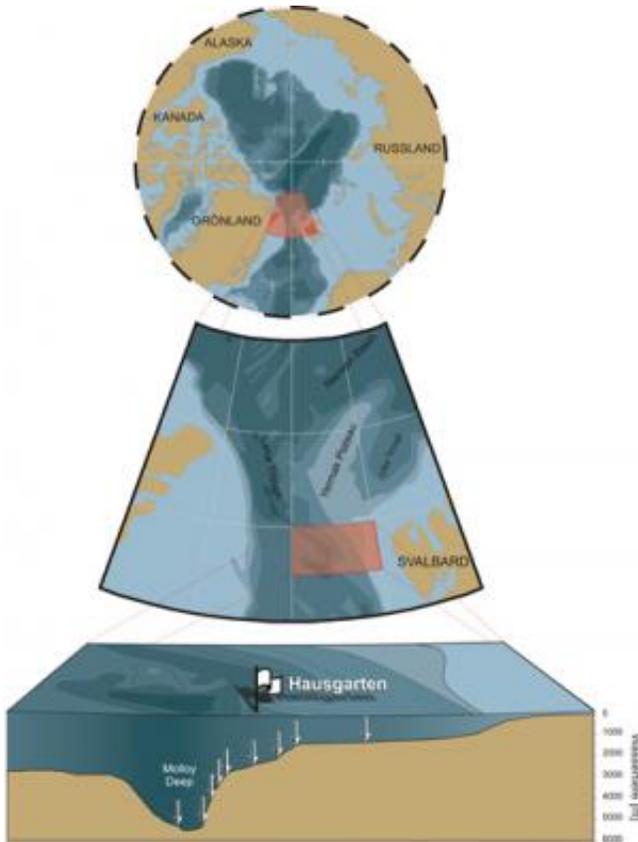
(Phys.org)—Biologists record increasing amounts of plastic litter in the Arctic deep sea: studies confirm that twice as much marine debris is lying on the seabed today compared to ten years ago

Bremerhaven, 22nd October 2012. The seabed in the Arctic [deep sea](#) is increasingly strewn with litter and plastic waste. As reported in the advance online publication of the scientific journal *Marine Pollution Bulletin* by Dr. Melanie Bergmann, biologist and deep-sea expert at the

Alfred Wegener Institute for Polar and Marine Research in the Helmholtz Association. The quantities of waste observed at the AWI deep-sea observatory HAUSGARTEN are even higher than those found in a deep-sea canyon near the Portuguese capital Lisbon.

For this study Dr. Melanie Bergmann examined some 2100 seafloor photographs taken near HAUSGARTEN, the deep-sea observatory of the Alfred Wegener Institute in the eastern Fram Strait. This is the sea route between Greenland and the Norwegian island Spitsbergen. "The study was prompted by a [gut feeling](#). When looking through our images I got the impression that plastic bags and other litter on the seafloor were seen more frequently in photos from 2011 than in those dating back to earlier years. For this reason I decided to go systematically through all photos from 2002, 2004, 2007, 2008 and 2011," Melanie Bergmann explains.

The deep-sea scientists from the HGF-MPG Group for Deep-Sea Ecology and Technology of the Alfred Wegener Institute regularly deploy their towed camera system OFOS (Ocean Floor Observation System) during Polarstern expeditions to the HAUSGARTEN. At the central HAUSGARTEN station it is towed at a water depth of 2500 metres, 1.5 metres above the seabed, and takes a photograph every 30 seconds. Deep-sea biologists principally use these photographs to document changes in biodiversity with respect to larger inhabitants such as [sea cucumbers](#), sea lilies, sponges, fish and shrimps. However, for Melanie Bergmann they also provided evidence of increasing deep-sea pollution: "Waste can be seen in around one percent of the images from 2002, primarily plastic. In the images from 2011 we made the same discovery on around two percent of the footage. The quantity of waste on the seabed has therefore doubled", the scientist says. If we consider the time span between 2007 and 2011 the amount has even risen by an order of magnitude.



Map of the AWI deep sea long term observatory HAUSGARTEN. Credit: Alfred Wegener Institute

At first sight, the "two percent" result may not cause much concern. However a comparison demonstrates the true extent of the pollution in the Arctic deep sea: "The Arctic Ocean and especially its deep-sea areas have long been considered to be the most remote and secluded regions of our planet. Unfortunately, our results refute this notion at least for our observatory. The quantities observed were higher than those recorded from a deep-sea canyon not far from the industrialised Portuguese capital Lisbon," Melanie Bergmann explains. It is also important to bear in mind that, according to recent research, more plastic waste will accumulate in deep-sea canyons than in open slope environments such as

HAUSGARTEN.

Melanie Bergmann is unable to determine the origin of litter from photographs alone. However she suspects that the shrinking and thinning of the Arctic sea ice may play an important role. "The Arctic sea ice cover normally acts as a natural barrier, preventing wind blowing waste from land out onto the sea, and blocking the path of most ships. Ship traffic has increased enormously since the ice cover has been continuously shrinking and getting thinner. We are now seeing three times the number of private yachts and up to 36 times more fishing vessels in the waters surrounding Spitsbergen compared to pre-2007 times," Melanie Bergmann says. Furthermore, litter counts made during annual clean-ups of the beaches of Spitsbergen have shown that the litter washed up there originates primarily from fisheries.

The main victims of the increasing contamination of the seafloor are the deep-sea inhabitants. "Almost 70 percent of the plastic litter that we recorded had come into some kind of contact with deep-sea organisms. For example we found plastic bags entangled in sponges, sea anemones settling on pieces of plastic or rope, cardboard and a beer bottle colonised by [sea lilies](#)," Melanie Bergmann says.

When sponges or other suspension feeders come into contact with plastic, this may cause injuries to the surface of their body. The consequence: the inhabitants of the sea bed are able to absorb fewer food particles, grow more slowly as a result, and probably reproduce less often. Breathing could also be impaired. Furthermore, plastic always contains chemical additives, which have various toxic effects. "Other studies have also revealed that plastic bags that sink to the seafloor can alter the gas exchange processes in this area. The sediment below then becomes a low oxygen zone, in which only few organisms survive," Melanie Bergmann says. On the other hand, other animals use the waste as hard substratum to settle on. "This allows colonisation by species that

previously would have found hardly any suitable substratum. This means that the waste could change the deep-sea composition of species and therefore biodiversity in the long-term," the researcher adds.

In view of the far-reaching climate changes in the Arctic, Melanie Bergmann and colleagues want to expand their research projects on "litter in the sea": "Until now our results from the Fram Strait merely constitute a snapshot, reflecting the observations that we were able to make with the naked eye," the scientist explains. For example, the focus is currently moving to the question of deep-sea pollution resulting from so-called micro-plastic particles. "We took samples for the first time during the last expedition with our research ice breaker POLARSTERN to the HAUSGARTEN observatory. Our AWI colleagues from Helgoland will analyse them for micro-plastics," says Melanie Bergmann. Micro-plastics can be ingested by marine animals including commercially harvested prawns and fish and enter the human food chain.

During this expedition Belgian mammal and bird observers also counted 32 pieces of litter floating at the water surface. The probability of researchers finding more litter on the deep [ocean floor](#) is therefore great. Melanie Bergmann: "Pieces of plastic on the deep seafloor are unlikely to degrade into micro-plastics as quickly as is the case on the North Sea coast, for example. This is due to the lack both of sunlight at a depth below 200 metres and of strong water movement. Instead it is dark and cold there. Under these conditions [plastic](#) waste can probably persist for centuries."

More information: [doi: 10.1016/j.marpolbul.2012.09.018](https://doi.org/10.1016/j.marpolbul.2012.09.018)

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