

Guest Editorial

Plastics in the Southern Ocean

Sometimes it takes a long time for a problem to catch political attention, but with the recent G7 meeting discussing ocean pollution by plastics, that time has finally arrived for all those who have been documenting this for many years. It has not gone unnoticed by the media, and the now infamous plastic gyres have been explained in the press and featured on the television. Indeed, it may be that the recent focus on plastics by Sir David Attenborough in the BBC's *Blue Planet II* was one of the key triggers for the sudden increase in political enthusiasm.

In the Southern Ocean, we have not been idle. With the CCAMLR beach survey documenting plastics litter now for many years, and published reports of ingestion of plastics by a range of birds from petrels to albatross and penguins, there has already been a major attempt to report on the problem. Entanglement of seals in plastic fishing debris has also been observed, whilst photographs of the stomach contents of dead albatross have clearly demonstrated the damage that floating plastic debris can do. Yet, despite this, the Southern Ocean seems to have been much less polluted than many of the other oceans, perhaps protected by the Polar Front and by the less industrialised nature of most Southern Hemisphere countries, potentially making it a useful baseline area for monitoring trends in plastic pollution.

More recently, there has been a global recognition that macroplastic debris is only one component of the total problem. Documentation of the breakdown of the macroplastics as well as observations of the apparent ubiquity of microplastics - fragments of 1–5 mm - has produced a sudden surge in political interest. The recent Greenpeace Antarctic cruise found microplastics in most of their limited number of water samples but the much more wide-ranging Antarctic Circumpolar Expedition of 2016–17 recorded microplastics in every surface sample taken all around the Antarctic, and even in remote locations like the Mertz Polynya. Indeed, microplastics concentrations have been recorded five orders of magnitude higher than predicted, so from where else is the plastic coming? Antarctica may not be as isolated as previously thought. We now know that rafting kelp can cross oceanic barriers to reach the continent, and plastic debris from more northerly latitudes may make this journey too. With recent research reporting on ingestion of microplastics and nanoplastics by fish and marine invertebrates there is clearly the likelihood that human food supplies have been contaminated for some time by microplastics. This could potentially include fish and krill from the Southern Ocean, but we do not yet understand the scale of the threat or the medical effects, if any, on humans. We also lack understanding of the impacts of ecologically meaningful concentrations of micro- and nanoplastics on keystone species such as krill, or whether biomagnification through food webs is occurring.

What can we do in Antarctica that would contribute usefully to understanding and managing this global problem? To co-ordinate the existing range of research and develop new ideas, SCAR have established a new Action Group on plastics in the Southern Ocean (PLASTICS-AG). The cross disciplinary group will assess the occurrence, distribution, source and fates of plastics in the Southern Ocean and the impacts on physical environments and biological communities, co-ordinating with other groups like CCAMLR, IAATO and SCOR. They will also develop and promote standardized methods, so that future sampling data are comparable. Without coordinated research, policy-makers within the Antarctic Treaty System will struggle to take informed decisions, and who knows what the consequence will be for the Southern Ocean and its vulnerable wild life.

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