

Guest editorial

Polar Ecotoxicology - a missing link

There is a pressing need for region-specific information on the response of polar species to contaminants. The Protocol on Environmental Protection to the Antarctic Treaty states "...regular and effective monitoring shall take place to allow assessment of the impacts of ongoing activities, including the verification of predicted impact...". Although the Treaty only applies to the Antarctic, similar requirements exist for the Arctic; thus, our comments below apply to both polar regions. Without ecotoxicological information all the effort that is directed towards contaminants monitoring is largely meaningless as it does not tell us whether the levels detected pose an environmental risk.

Effective monitoring of contaminants must include four components: concentrations of contaminants; the status of resident populations exposed to those contaminants; toxicity (acute and chronic) of those contaminants to resident individuals and populations; and, for those contaminants whose concentrations increase with ascending trophic levels, biomagnification (actual or potential). A small but growing body of information is now available for three of these four components. However, there is still a paucity of information on the toxicity of contaminants to exposed organisms in the polar regions. This omission is both surprising and worrisome.

To date, there have only been six studies assessing the toxicity of polar aquatic organisms to contaminants - for both Arctic and Antarctic regions. To put this in perspective, the USEPA Ecotox database includes over 220 000 records for aquatic species alone, including data from tests on more than 4000 species and in excess of 7000 chemicals. The few studies using polar organisms indicate differences in bioavailability to chemical contaminants compared to temperate organisms, resulting in longer response times. Furthermore, exposure pathways differ from temperate organisms. In particular epontic (under-ice) biota, which form a major basis for marine food chains, are exposed to contaminants in freshwater runoff from overlying ice as well as from other sources. Thus there is no reason for assuming that environmental information developed in and for temperate regions is appropriate for high latitude regions.

Fundamental, specific ecotoxicological information is necessary for understanding the implications of polar conditions on the effects of environmental contaminants. Considerable effort has been directed towards generating standardized techniques for environmental monitoring in the Antarctic (and Arctic), but the discussion on how to interpret the results has not yet begun. For instance, how much contamination is too much? Do we just accept levels and limits generated in other parts of the world or do the different conditions in polar regions warrant a different set of limits? Although it may be some way into the future, if high levels of contamination were considered to be damage under the environmental liability regime currently being developed under the Antarctic Treaty System, then it follows that specific trigger values and target levels for remediation may be needed. Without all the necessary monitoring information, including region-specific ecotoxicological data, these could only be guesses based on practices developed for very different conditions.

In writing this editorial we want to both encourage individual research projects that would contribute to this essential monitoring information but also to bring this issue to the attention of SCAR and the Committee on Environmental Protection, as well as to the Arctic Council and the Arctic Monitoring and Assessment Programme. Collaborative, multi-national research efforts are needed to generate an understanding of the ecological implications of contamination in polar regions. It is an activity that would benefit considerably from a coordinated collaboration among Arctic/Antarctic research groups. We strongly encourage both individual and collaborative efforts.

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