

Guest editorial

The numbers game

Many of the problems we have in Antarctic ecology come down to being unable to count animals accurately or precisely - be they whales, seals, birds, krill or fish. In this we are not alone as ecologists worldwide struggle to improve the quality of their data. In many cases the technology already exists but ecologists seem rather shy about asking for big ticket items such as satellites. Physical scientists seem to be able to get new satellites in orbit so that they can either examine rather esoteric phenomena, or so that they can improve the already high degree of accuracy with which they can estimate the dimensions of physical features. Why then are ecologists content to accept that we are unable to accurately assess the abundance of some of the key elements in the Southern Ocean ecosystem? For example, there are several orders of magnitude between estimates of krill abundance, no accepted Antarctic-wide abundance estimates for land-based vertebrates and highly contentious abundance estimates for whales. This problem, however, is not unique to the Antarctic. All the physiological measurements and ecological models in the world are devalued if we cannot precisely estimate animal abundance. If we are serious about detecting change - whether climate induced or as a result of fishing - then we have to have far better abundance estimates of animals and much of the technology to achieve this may already exist. Why are we not fighting for better access to this technology and more focussed development funding?

There is often a perception that counting animals is a trivial issue and not really a worthy activity for proper scientists. Much science is, however, about enumerating things whether they be elements, molecules or physical properties. When counting animals biologists face all the problems that physical scientists have when trying to count things together with the problems of unpredictable behaviour. For many species the most common behaviour is evasion - they actively seek to avoid detection and hence resist attempts to count them. When was the last time you encountered an elusive salinity or an evasive icefront? It is possible to start out treating animals as particles for the purposes of counting them but fairly soon the complexity starts to emerge and considerable statistical power has to be brought to bear to cope with the inadequacies of our methods of sampling. A further problem is that very often there are only one or two estimation techniques so ground truthing becomes problematic. For example, the abundance of krill is currently estimated through surveys using either scientific nets or hydroacoustics - and the results of the two methodologies rarely agree - but which do you believe? Both techniques have their proponents and detractors but the lack of agreement should be a matter for concern and active research, whereas it appears to be accepted as a rather unfortunate fact of life.

Physical scientists have been highly successful at selling their problems as being of sufficient importance that they can gain access to very expensive high technology. In addition they have found ways of reaching compromise agreements so that the whole community can back a particular bid. Ecological problems are of equally high importance and we should be active in seeking technical solutions and demanding development and investment to provide the required numbers. This would be so much simpler to do and more effective if ecologists as a community could agree on the fundamental problems that need to be solved before we can make substantial progress in Antarctic ecology rather than continuing to fight over the diminishing slices of the pie.

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