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Guest Editorial

Unpredictable change in Antarctic terrestrial systems: a consequence of science and policy priorities?

Last year was not an especially good one for climate envelope models. Using a novel, null model approach, Beale *et al.* (2008, *PNAS*, **105**, 14908) demonstrated that species-climate associations identified by these models were no better than chance for 68% of the European bird species they examined. They cautioned that change adaptation policies based on these models may require revision. This was not the first criticism of the climate envelope approach, with others emphasizing the confounding effects of complex species interactions. The obvious question is what has this to do with change in the terrestrial Antarctic?

Across the region (including the sub-Antarctic islands), predation and parasitism are relatively uncommon, and, where present, typically involve simple, 2-3 species interactions. Abiotic conditions of some form, usually water availability and temperature or some combination thereof, are thought to be most significant in determining the local abundance and distribution of many species. In consequence, a combination of climate envelope and niche-based models (see Kearney 2006, *Oikos*, **115**, 186) should be exceptionally useful for forecasting current distributions and their change in terrestrial Antarctic systems. They should also provide excellent predictive ability for the likely extent of biological invasions. Given the substantial concerns raised about the impacts of climate change and invasion in the region, one might have expected to see a plethora of such work. Curiously, it is conspicuous by its rarity.

Why might this be? Among the many possible reasons, three seem most plausible. First, the availability of environmental data. Although this may have been problematic in the past, the Antarctic environmental domains analysis published by Fraser Morgan and his colleagues from Manaaki Whenua Landcare Research, New Zealand in 2008 means that such data are available. Low cost instrumentation for collecting local scale data is also readily available. Therefore, the environmental data reason seems weak although the long-term deployment of microclimatic recording systems is still woefully inadequate.

Second, for climate envelope models, distribution data for the species concerned are required. Whilst a variety of local-scale studies are available, broader scale information is surprisingly sparse. Comprehensive, systematic catalogues of various groups are becoming available, but recent analyses have demonstrated that the spatial information concerning Antarctic species is patchy. Admittedly it's a large continent, with ice-free land making up very little of it, and widely scattered. However, comprehensive data do not exist even for comparatively well studied areas. Why should this be the case? Perhaps the most obvious reason is that the political will has simply not been there to extend to the terrestrial realm the kinds of resources deployed to explore deep time and the deep sea.

Third, despite a wealth of data available on the environmental physiology of Antarctic organisms, niche-based models have simply not been popular. For this, we have only our concerns with other questions to blame.

We now have new floras and increasingly complete checklists for other groups. That at least some Antarctic terrestrial ecosystems, especially those along the Peninsula, will change in the next several decades is indisputable. But how they will change seems quite unpredictable. This lack of predictability may have more to do with what we have elected to study and fund than with the complexities of prediction. A co-ordinated international response to changing priorities would improve our understanding and forecasting ability, so also informing policy responses to change. The Circum-Antarctic Census of Marine Life has shown what can be done – it is time the terrestrial environment enjoyed its own 'armada' for research.

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