4. BIOGEOGRAPHY

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Introduction

The biogeography of Antarctica and its surrounding islands is both complex and contentious. Why this should be the case is readily apparent when considering the region and its biotas. The Antarctic continent alone has a surface area of c.45 million km^2, originated following accretion of several very different terrains, and now has less than 0.32% of this surface exposed above its extensive ice cover (British Antarctic Survey 2004, Peck et al. 2006). Its surrounding islands, which are distributed sparsely within the vast Southern Ocean between approximately 45° - 60°S, likewise have varied geological origins, ranging from Upper Jurassic/Lower Cretaceous continental crust in the case of South Georgia to recent (0.5 million years) basaltic volcanism in the case of the Prince Edward Islands (Le Masurier and Thompson 1990, Peck et al. 2006), and their glacial histories differ markedly from archipelago to archipelago, and even among islands within a group (Hall 2002). Making use of this geological chessboard are a group of pieces whose origins,

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identities, positions, moves and roles are often poorly understood. Many ice-free areas have yet to be systematically explored and investigations of several areas are surprisingly recent (Broady and Weinstein 1998, Convey et al. 2000a,b, Marshall and Chown 2002, Stevens and Hogg 2002, Bargagli et al. 2004, Convey and McInnes 2005, H.J. Peat et al. unpubl. data). Moreover, no comprehensive database of the distributions of Antarctic and subantarctic species yet exists (see Griffiths et al. 2003 for a marine example), although several non-digital compilations are now becoming available (eg Pugh 1993, Bednarek-Ochyra et al. 2000, Øvstedal and Lewis Smith 2001, Pugh et al. 2002, Pugh and Scott 2002, Ochyra et al. in press) and the RiSCC biodiversity database has accumulated 80 000 terrestrial and freshwater records. Systematic information is also absent for many taxa, the number of systematists working on the biota of the region is surprisingly low (ie a substantial taxonomic impediment exists, Samways 1994) and comprehensive phylogenies based on modern molecular methods are rare (for an exception see Allegrucci et al. 2006). In consequence, biogeographic assessments have to rely on incomplete data and methods that often make use of species as if they were wholly independent of each other and shared no phylogenetic history, when other, more powerful phylogeographic or similar approaches are available (van Veller and Brooks 2001). It is little wonder then that Antarctic biogeography remains pre-occupied with many of the same questions that puzzled the region's early biogeographers, although in some cases this pre-occupation is waning given recent solutions to these problems.

Perhaps best known among the questions facing Antarctic terrestrial biogeography are:

- The role that dispersal and vicariance have played in determining the current distribution of organisms across the region and the significance of the order of break-up of Gondwana for both these taxa and their relatives on the surrounding Southern Hemisphere continents (Brundin 1966, Darlington 1970, Craig 2003, Bergstrom et al. this volume, Gibson et al. this volume).
- The age of the Kerguelen Plateau and Iles Crozet, and the origin of the biotas both of these islands and others in this region, that is often known as the Kerguelen Biogeographic province or the South Indian Ocean Province (Udvardy 1987, Kuschel and Chown 1995, Craig et al. 2003).
- Whether most Antarctic organisms are recent, post-glacial colonists, or whether, at least in some taxa, palaeoendemism is the norm (Chown and Convey 2006).

In this chapter, we provide a review of the historical and ecological biogeography of terrestrial systems in the Antarctic, realizing that the distinction between the two approaches to biogeography is largely artificial. It represents little more than a convenient way to discuss the same patterns of biodiversity from the perspective of different scales (Ricklefs 2004). In doing so, we also recognize that both Antarctica and at least some of its surrounding islands have not always been occupied by their current biotas. The continent was once home to a diverse flora (eg Quilty 1990) and a fauna that included dinosaurs (Hammer and Hickerson 1994), the