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TITLE: Incursion and excursion of Antarctic biota: past, present and future

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ABSTRACT:

ABSTRACT Aim To investigate the major paradigms of intense isolation and little anthropogenic influence around Antarctica and to examine the timings and scales of the modification of the southern polar biota. Location Antarctica and surrounding regions. Methods First, mechanisms of and evidence for long?term isolation are reviewed. These include continental drift, the development of a surrounding deep?water channel and the Antarctic Circumpolar Current (ACC). They also include levels of endemism, richness and distinctiveness of assemblages. Secondly, evidence for past and modern opportunities for species transport are investigated. Comparative levels of alien establishments are also examined around the Southern Ocean. Discussion On a Cenozoic time?scale, it is clear that Gondwana's fragmentation led to increasing geographical isolation of Antarctica and the initiation of the ACC, which restricted biota exchange to low levels while still permitting some movement of biota. On a shorter Quaternary time?scale, the continental ice?sheet, influenced by solar (Milankovitch) cycles, has expanded and contracted periodically, covering and exposing terrestrial and continental shelf habitats. There were probably refugia for organisms during each glacial maxima. It is also likely that new taxa were introduced into Antarctica during cycles of ice sheet and oceanic front movement. The current situation (a glacial minimum) is not ?normal?; full interglacials represent only 10% of the last 430 ka. On short (ecological) time?scales, many natural dispersal processes (airborne, oceanic eddy, rafting and hitch?hiking on migrants) enable the passage of biota to and from Antarctica. In recent years, humans have become influential both directly by transporting organisms and indirectly by increasing survival and establishment prospects via climate change. Main conclusions Patterns of endemism and alien establishment are very different across taxa, land and sea, and north vs. south of the Polar Frontal Zone. Establishment conditions, as much as transport, are important in limiting alien establishment. Three time?scales emerge as important in the modification of Antarctica's biota. The natural ?interglacial? process of reinvasion of Antarctica is being influenced strongly by humans.

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