
On the path to extinction: climatic and anthropogenic drivers, buffering capacity and viability of a grey-headed albatross population.

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Abstract

The grey-headed albatross population at South Georgia constitutes 50% of global numbers but has declined by 60% in the last 30 years. We studied the causes and consequences of this decline using state-of-the-art demographic and population dynamics models incorporating 40 years monitoring of more than 8000 individuals.

First, annual effort in multiple fisheries, and oceanographic parameters were compiled from foraging areas during breeding and non-breeding, and their influence on temporal variation in juvenile and adult survival, return, breeding and success probabilities tested using AN-ODEV. This showed that low and extremely variable demographic rates drive the population decline, accentuated by a drop in adult survival in 2000 due to a lethal combination of fisheries bycatch and low food availability following El Niño.

Second, multi-event models were used to investigate this population's buffering capacity. Life-history theory predicts that in long-lived species, individuals reduce current reproduction to ensure future survival and reproduction if environmental conditions degrade, but other buffering mechanisms may operate in declining populations. A significant cohort effect was detected on recruitment rate; birds recruited earlier and at a higher rate explained by decreased population size. We identified a strategy adopted by deferring breeders which led to higher survival and breeding success, better resilience against years of poor environmental conditions and different senescence trajectories.

Matrix models were used to investigate the ecological and evolutionary mechanisms that might lead to population recovery. The study system offered an excellent framework providing key insights into demographic processes in this highly threatened and emblematic species.

Keywords: demography, seabird, fisheries, climate, survival, reproduction, endangered, population

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