Agreement on the Conservation of Albatrosses and Petrels

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Effects of climate change and fisheries bycatch on Shy Albatross (*Thalassarche cauta*) in southern Australia

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SUMMARY

The impacts of climate change on marine species are often compounded by other stressors that make direct attribution and prediction difficult. Shy albatrosses (*Thalassarche cauta*) breeding on Albatross Island, Tasmania, show an unusually restricted foraging range, allowing easier discrimination between the influence of non-climate stressors (fisheries bycatch) and environmental variation. Local environmental conditions (rainfall, air temperature, and sea-surface height, an indicator of upwelling) during the vulnerable chick-rearing stage, have been correlated with breeding success of shy albatrosses. We use an age-, stage- and sex-structured population model to explore potential relationships between local environmental factors and albatross breeding success while accounting for fisheries bycatch by trawl and longline fisheries. The model uses time-series of observed breeding population counts, breeding success, adult and juvenile survival rates and a bycatch mortality observation for trawl fishing to estimate fisheries catchability, environmental influence, natural mortality rate, density dependence, and productivity. Observed at-sea distributions for adult and juvenile birds were coupled with reported fishing effort to estimate vulnerability to incidental bycatch. The inclusion of rainfall, temperature and sea-surface height as explanatory variables for annual chick mortality rate was statistically significant. Global climate models predict little change in future local average rainfall, however, increases are forecast in both temperatures and upwelling, which are predicted to have detrimental and beneficial effects, respectively, on breeding success. The model shows that mitigation of at least 50% of present bycatch is required to offset losses due to future temperature changes, even if upwelling increases substantially. Our results highlight the benefits of using an integrated modelling approach, which uses available demographic as well as environmental data within a single estimation framework, to provide future predictions. Such predictions inform the development of management options in the face of climate change.

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