

FUR SEALS IN THE FRONTAL ZONE: NOVEL ENVIRONMENTAL PERFORMANCE INDICATORS FROM MACQUARIE ISLAND

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The fur seal population at Macquarie Island represents one of the most isolated populations of Antarctic (*Arctocephalus gazella*), and subantarctic (*A. tropicalis*) fur seals, and the only population in the Polar Frontal Zone in the South Pacific Ocean. The original population was exterminated by sealers in the early 1800s, and the first breeding record since then was not recorded until 1955. Since recolonisation the population has been recovering slowly. Over the last 20 years, a research program has monitored annual pup production, and investigated species composition, extent of hybridisation, diet and distribution of foraging effort, maternal strategies, reproductive and survival rates and pup growth. Fur seals at the site forage in a relatively defined region just north of the islands associated with a trench in the Macquarie Ridge that receives the majority of flow in the Subantarctic Front. Here fur seals feed almost exclusively on myctophid fish, with *Electrona subaspera* typically accounting for more than 80% of the diet. Annual fecundity rates in the population are highly negatively correlated ($r^2=0.81$) with sea surface temperatures (SSTs) in the foraging grounds during the preceding autumn months, such that high fecundity follows cooler autumn SSTs. In addition, pup growth rates to 90 days of age, are highly negatively correlated ($r^2=0.80$) with foraging ground SSTs during summer months. During warm SST period, the predominance of *E. subaspera* in diet diminishes, suggesting that local prey availability is affected by regional changes in oceanographic conditions. Results suggest that variance in both the number and quality of offspring produced in each breeding season is highly sensitive to changes in local environmental conditions, especially warming SSTs. The results are significant in terms of their contribution to assessing how the reproductive performance of high trophic level predator populations such as fur seals, are affected by oceanographic at annual and lifetime scales. Maintenance of this program into the future could provide a critical environmental performance indicator for the region, especially if oceanic warming continues.