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THE ANNUAL NUMBERS OF LEOPARD SEALS (*HYDRURGA LEPTONYX*) SIGHTED AT MACQUARIE ISLAND (OVER 56 YEARS) ARE CORRELATED SIGNIFICANTLY WITH THE PERIODIC FLUX OF SEA-ICE CONCENTRATION SOUTH-EAST OF THE ISLAND.

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This paper provides the first evidence to relate Leopard Seal numbers with sea-ice concentrations in a region of the Eastern Antarctic pack ice and to propose a biological mechanism (krill availability) to link the two.

Leopard seals have been periodic, and sometimes numerous, visitors to Macquarie Island; but they do not breed there. Their average period of stay has been only ~three days. Their sightings constitute a 56 year data-set span (three years with missing data) which is a considerable and unusual record of marine mammal behaviour from antarctic and subantarctic waters. The two sexes haul-out in near equal numbers (952 seals with sex determined); and they first appear in July with the last sightings in November. They are late winter arrivals.

In each of the three years prior to a year with very considerably increased numbers (an irruption) of seals, there are oceanic areas, south-east of the island, with sea-ice concentrations which have significant positive correlations with seal numbers. However, in the years of leopard seal irruptions at Macquarie Island, the correlations 'change sign'. This is to say that sea-ice concentrations have reduced and the increased numbers of seals then observed at M.I. are correlated with these reductions. Also, there is a negative correlation between the seal numbers and the northernmost extent of the pack-ice in the same region as inferred by a surrogate measure: MSA (Methane Sulfonic Acid) concentrations from a near coastal ice core from the same region of Antarctica. The irruptions have occurred at ~ four year intervals. The periodic fluxes in sea-ice concentration are associated with concurrent and related fluxes in sea-surface temperature and sea-level air pressure. Irruption years are characterised by a very large cell of high air-pressure that lies north of the Ross Sea. It is proposed that the three consecutive years of above-average sea-ice concentration foster the development and survival of krill; but then the abrupt reduction of sea-ice in the fourth year leads to the dispersion of the krill and then, consequently, the dispersal of the seals which had been foraging on them and other species of the krill-based ecosystem.