

**LONG-TERM CHANGES IN THE POPULATION STATUS OF SOUTHERN ELEPHANT SEALS (*MIROUNGA LEONINA*) AT MACQUARIE ISLAND, 1952 – 2005**

J. van den Hoff, H. Burton, B. Raymond, M. Bester

<sup>1</sup>Australian Antarctic Division, Kingston, Tasmania, Australia, <sup>2</sup>University of Pretoria, Pretoria, South Africa

The southern elephant seal (*Mirounga leonina*) population at Macquarie Island represents about 10% of the world's population. The number of adult females breeding at the island has decreased substantially since the first whole island census was conducted in 1952. Whole island censuses have been undertaken annually since 1988 on or about the peak haulout date for females (15<sup>th</sup> Oct.). We made detailed and sequential observations of the female's haulout period and of pre-weaning mortality to correct our census figures for the maximum number of females on the island in a breeding season.

We took the natural log of our count data to remove heteroscedasity; and then fitted linear and nonlinear regression models to determine if the population of female elephant seals was continuing to decline or had stabilised. Both regression models fitted the data well (all  $R^2 > 0.62$ ) but the nonlinear model had a significantly ( $P < 0.05$ ) better fit than the linear model. We identified 1994 as the year when the intrinsic rate of population change ( $r$ ) began slowing and 1999 was the year when the trend reversed to become positive.

As part of the census methodology we sub-divided Macquarie Island into distinct census areas bounded by geographic features. An analysis of small scale changes in the distribution of the seals around Macquarie Island showed the numbers of females within some island sectors have decreased while others have remained stable or increased. The  $r$  values were most negative for the coast between Hurd Point and Green Gorge where large populations of King Penguins breed and positive for the east isthmus and west coast sections where suitable breeding habitat exists but is limited.

It is clear that the population reduction of ~ 50% between the 1950's and 1990's has ceased. We interpret this to mean that the quantity/quality of food accessed by the seals from the Indian and Southern Ocean marine ecosystem is now adequate to support this population level, and perhaps higher.