

SOUTHERN ELEPHANT SEALS AND CCAMLR

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Abstract

This paper describes research findings of primarily South African (including some French and Australian results) studies on the southern elephant seal (Mirounga leonina) in the Kerguelen Province of the Southern Ocean. Sub-populations of this species have declined at Kerguelen, Marion, Prince Edward and Heard Islands. Population studies during the animals' terrestrial phase have failed to explain this observed decline which has also been recently confirmed for the Macquarie Island stock. The availability of food, competition with rapidly growing fur seal populations and competition with fishing fleets have all been suggested as possible causes of the elephant seal's decline in the region. Such explanations assume that a communal feeding ground, not yet identified, exists and that this exerts some common influence on the species' population dynamics. As such, study of both the elephant seal's spatial and temporal distribution during its pelagic phase is extremely important. Recent South African research in this field has been initiated and it is hoped that this will help to elucidate the reasons for the observed decline of M. leonina in the southern Indian Ocean.

Résumé

Ce document décrit les conclusions de recherches entreprises essentiellement par l'Afrique du Sud (et incorporant des résultats obtenus par la France et l'Australie) sur l'éléphant de mer du Sud (Mirounga leonina) dans la province de Kerguelen (océan Austral). Les sous-populations de cette espèce ont diminué dans les îles Kerguelen, Marion, Prince Edouard et Heard. Des études démographiques menées au cours de la phase terrestre des animaux n'ont pu expliquer cette baisse qui a également touché le stock de l'île Macquarie comme il vient d'être confirmé. La disponibilité de nourriture, la concurrence avec les populations d'otaries en rapide croissance et la concurrence avec les flottes de pêche ont été suggérées comme causes possibles du déclin de l'éléphant de mer dans la région. De telles explications supposent l'existence d'un secteur d'alimentation commun (qui n'a pas encore été identifié) ayant la même influence sur la dynamique démographique de l'espèce. L'étude de la répartition spatiale et temporelle de l'éléphant de mer au cours de sa phase pélagique est donc extrêmement importante. De récentes recherches sud-africaines dans ce domaine ont

été engagées et il est permis d'espérer qu'elles aideront à expliquer les raisons de ce déclin de M. leonina dans l'océan Indien sud.

#### Resumen

Este documento describe los resultados de los estudios en su mayor parte sudafricanos (incluyendo algunos resultados franceses y australianos), sobre el elefante marino austral (Mirounga leonina) en la provincia de Kerguelén del Océano Austral. Las subpoblaciones de esta especie han declinado en las islas Kerguelén, Marion, Prince Edward y Heard. Los estudios de población durante la fase terrestre de los animales no han podido explicar esta declinación observada, la cual también ha sido confirmada recientemente para la reserva de la isla Macquarie. Tanto la disponibilidad de alimentos como la competencia con las rápidamente crecientes poblaciones de focas peleteras y la competencia con las flotas pesqueras, han sido sugeridas como causas posibles de la declinación del elefante marino en la región. Tales explicaciones suponen que existe un terreno de alimentación comunitario, aún no identificado, y que esto ejerce cierta influencia común sobre la dinámica de la población de las especies. Como tal, el estudio de las distribuciones tanto espacial como temporal del elefante marino durante su fase pelágica es extremadamente importante. Se ha iniciado recientemente una investigación sudafricana en este campo y se espera que esto ayudará a dilucidar las razones de la declinación observada de M. leonina en el Océano Índico austral.

#### Резюме

В этой работе описаны результаты исследований - в основном Южной Африки (включая некоторые результаты, полученные французскими и австралийскими учеными) - по южному морскому слону (Mirounga leonina) в области Кергелена, Южный океан. Подпопуляции этого вида сократились в районе островов Кергелен, Марион, Принц Эдуард и Хэрд. Исследования популяций во время наземной фазы жизни этих животных не смогли объяснить наблюдавшегося истощения запасов, подтвержденного недавно и для запаса острова Макуори. Доступность пищи, конкуренция с быстро растущими популяциями морских котиков и конкуренция с промысловыми флотилиями - все это было предложено в качестве возможных причин сокращения численности морских слонов в этом регионе. Такие объяснения подразумевают наличие общей пищевой базы (пока не обнаруженной), которая, в свою очередь, оказывает общее влияние на

динамику популяции этих видов. В таком случае чрезвычайно важными являются исследования пространственного и временного распространения морских слонов во время пелагической фазы их жизни. Недавно было начато проведение Южной Африкой исследований в этой области, и имеется надежда на то, что это поможет выявить причины наблюдавшегося сокращения численности M. leonina в южной части Индийского океана.

### SOUTHERN ELEPHANT SEALS AND CCAMLR

The southern elephant seal Mirounga leonina breeds on islands on both sides of the Antarctic Convergence and comprises three stocks - these being referred to as the South Georgia, Macquarie and Kerguelen stocks. The last includes not only elephant seals of the Kerguelen archipelago, but also those found at Heard, Marion and Prince Edward Islands, Iles Crozet and Amsterdam and St. Paul Islands.

Two pelagic (feeding) and two terrestrial (fasting) phases can be distinguished in the annual cycle of at least the adult breeding elephant seals.

#### TERRESTRIAL PHASE

The number of breeding elephant seals has been declining at least since 1970 at the Prince Edward Islands (Marion Island), Heard Island, Iles Crozet (Ile de la Possession) and Iles Kerguelen (Peninsula Courbet). These decreases are all of the same order varying from 2.5% (Heard; 1949 - 1985) to 4.6% a<sup>-1</sup> (Marion; 1973 - 1986) for adult cows. The reason for this decline is obscure and it is possible that factors implicated in these trends may vary with subpopulations.

At Iles Kerguelen, on the other hand, the population decline since 1970 may be part of a long-term fluctuation in the breeding population size related to density as the degree of long-term fluctuation in cow numbers increased with density.

Based upon censuses of parts of the coastlines, both the Kerguelen and Marion elephant seal breeding populations have shown a change in the adult sex ratio in favour of cows, which suggests a selective removal of bulls during their pelagic phase. On the other hand, whole island censuses (Marion) suggested that both cows and bulls declined at the same rates.

Factors responsible have not been identified. Populations of subantarctic fur seals Arctocephalus tropicalis and/or Antarctic fur seals Arctocephalus gazella, sharing the island habitats with the elephant seals during the austral summer, do not compete with them on land as they are spatially and temporally separated during their breeding season.

#### PELAGIC PHASE

Killer whales Orcinus orca are abundant around Marion Island and Ile de la Possession and show a regular annual visitation cycle closely related to the seasonality in occurrence of elephant seals. They may have contributed to the decline of elephant seals. This appears not to be the case at Iles Kerguelen where killer whales were seldom seen and the magnitude of the decline of elephant seals suggests that other factors, for example the availability of food, are involved.

The diet and foraging behaviour of elephant seals, both geographically and with respect to the position in the water column, are poorly known. It has generally been accepted that elephant seals consume approximately 75% squid and 25% fish, feeding mainly on fish in inshore waters and on cephalopods elsewhere. The large, rapidly expanding A. tropicalis population at Marion Island which feeds on fish, cephalopods and euphausiids may be competing with the declining elephant seal population, especially with the newly independent underyearling elephant seals in the local oceanic zone. Underyearling elephant seals appear to spend most of their summer reasonably close to the island after attaining nutritional independence and are probably in competition with the fur seals, many of which make short feeding trips throughout the summer. At Iles Kerguelen and Heard Island, however, the fur seals A. gazella population is unlikely to compete; it is small and may well utilise a different food resource; for example at South Georgia it feeds largely on krill. On the other hand, whereas no commercial exploitation of fish takes place around the Prince Edward islands and Iles Crozet, commercial catches of fish on the Kerguelen shelf area may have contributed to the downward trend in elephant seal numbers since 1970 through a reduction in food availability.

The initial standing stock of fish for the Kerguelen Shelf area (50 000 km<sup>2</sup>) was estimated to be in excess of 230 000 t and with a maximum sustainable yield (MSY) of 80 000 t per annum compared with recently suggested standing stock of only 130 000 t and a MSY of about 20 000 t. Both estimates are far below the 394 000 t of fish the Kerguelen subpopulation of elephant seals would consume annually using a population estimate of 157 000 and published biomass and food consumption estimates of fish stocks need revision, and it seems premature to attribute the declines in elephant seal numbers at Iles Kerguelen to overfishing in the vicinity.

Although elephant seals move widely about the oceans, as evidenced by their visits to the continents abutting on the Southern Ocean, and penetrate both tropical and Antarctic waters, a tendency for small immatures of both sexes to disperse widely from their natal island(s) within the Kerguelen Province in the vicinity of the Antarctic Convergence seems to exist. Sub-adult and adult bulls of 5 a and older, and therefore at or after the growth spurt associated with puberty in the male show a southward displacement into colder water as demonstrated by their presence in the Vestfold Hills, 2 000 km distant from Iles Kerguelen which is the most northerly known source of southern elephant seals.

A non-directional dispersal of elephant seals throughout the circumpolar feeding zone during winter, and concentration on the breeding and moulting sites in summer were assumed in the past but the recorded annual return of some individuals to the Vestfold Hills and movement (an assumed return) of others from there to Iles Kerguelen however, suggest a two-way directional migration for at least part of the population.

In looking for some common factors responsible for the observed declines in the elephant seal subpopulations in the Kerguelen Province, we can suggest two possibilities: first, that the factor(s) responsible for the decline is acting simultaneously, and possibly independently, at or near each of the breeding islands when the subpopulations are gathered during spring and summer; and second, that the factor is operating at some other location, such as a common feeding ground, where the subpopulations may mingle in winter. Also, it can be hypothesized that large sized

elephant seals, i.e. older sub-adult and adult bulls, in this extremely sexually dimorphic species range over and feed in marine areas segregated from adult cows and younger (smaller) age classes of both sexes and may therefore be affected differently by environmental conditions. This postulate is important in view of the proposed selective removal of bulls during their aquatic phase, the overall decline in breeding population sizes and self-regulating population model advocating security of the fully adult population as being the key to persistence.

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