

Movement and foraging behaviour of Cape fur seals in southern Africa in relation to fishing operations

Mette Mauritzen¹, Laurent Drapeau²,
Ndako Mukapali³ and Herman Oosthuizen⁴

¹Institute for Marine Research, Bergen, Norway

²IRD, France

³Marine Research Laboratory, Lüderitz, Namibia

⁴Marine and Coastal Management, Cape Town, South Africa

Project description

The main objectives of this project were to investigate movements of Cape fur seals *Arctocephalus pusillus pusillus*, factors affecting their foraging behaviour, and the potential for interactions between foraging seals and the commercial fisheries of the region. The latter is an important, high-profile issue because of possible competition between seals and fisheries for resources, the disruptive effect of seals on some fishing operations (e.g. purse seining), and the mortality inflicted upon seals by fishermen and fishing operations.

Movements were tracked through Argos satellite-linked tags fitted to seals at three breeding colonies in Namibia (Atlas Bay, Cape Cross and Cape Frio) and three in South Africa (Kleinsee, Geyser Rock and Seal Island, Mossel Bay), over a period of three years. In all, 54 animals were successfully tagged.

The data were analysed at four workshops, in Bergen, Swakopmund, Cape Town and Oslo, at which a strong emphasis was placed on training Namibian and South African scientists in the use of Geographical Information Systems (GIS) and the analysis and interpretation of tracking data.

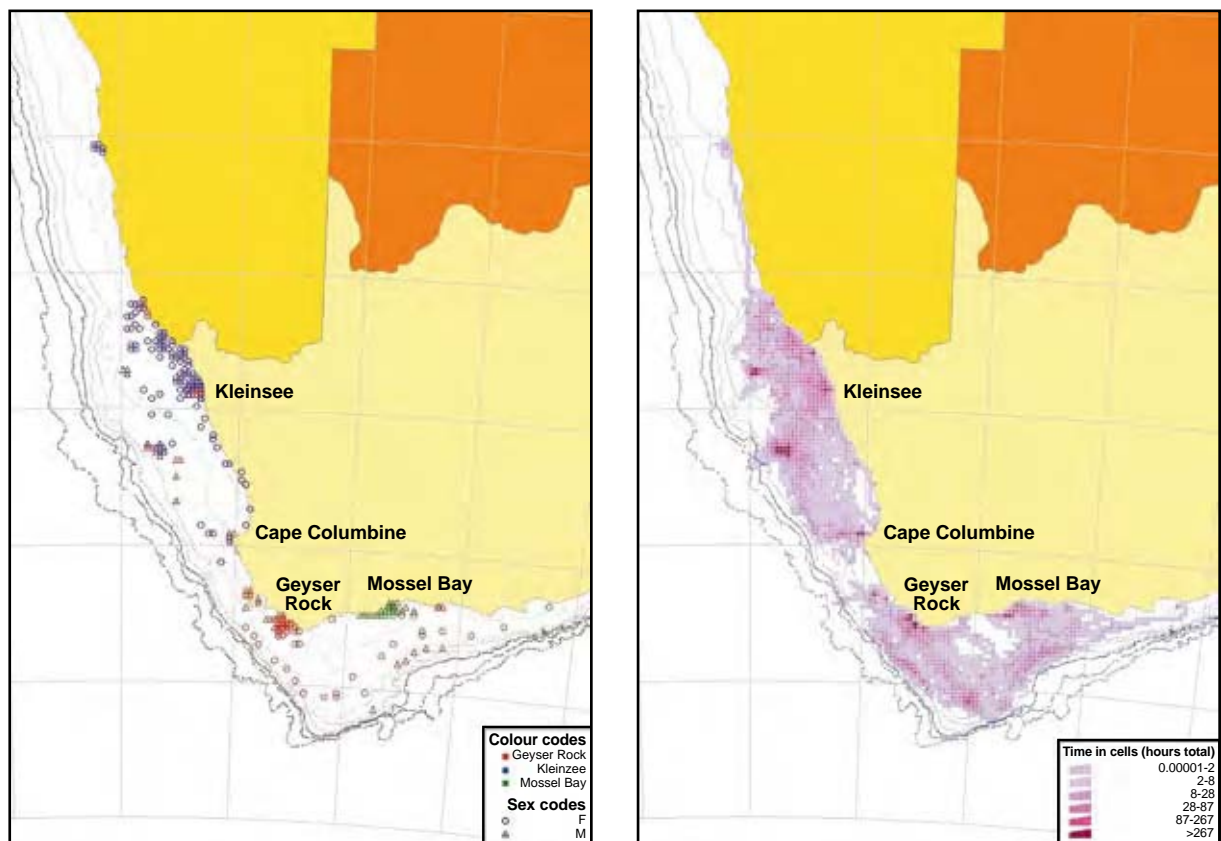


Figure 1. (Left) total time spent by Cape fur seals tagged in South Africa within 100 km² cells off the South African coast between 2003 and 2004, and (right) locations of most intensive foraging.

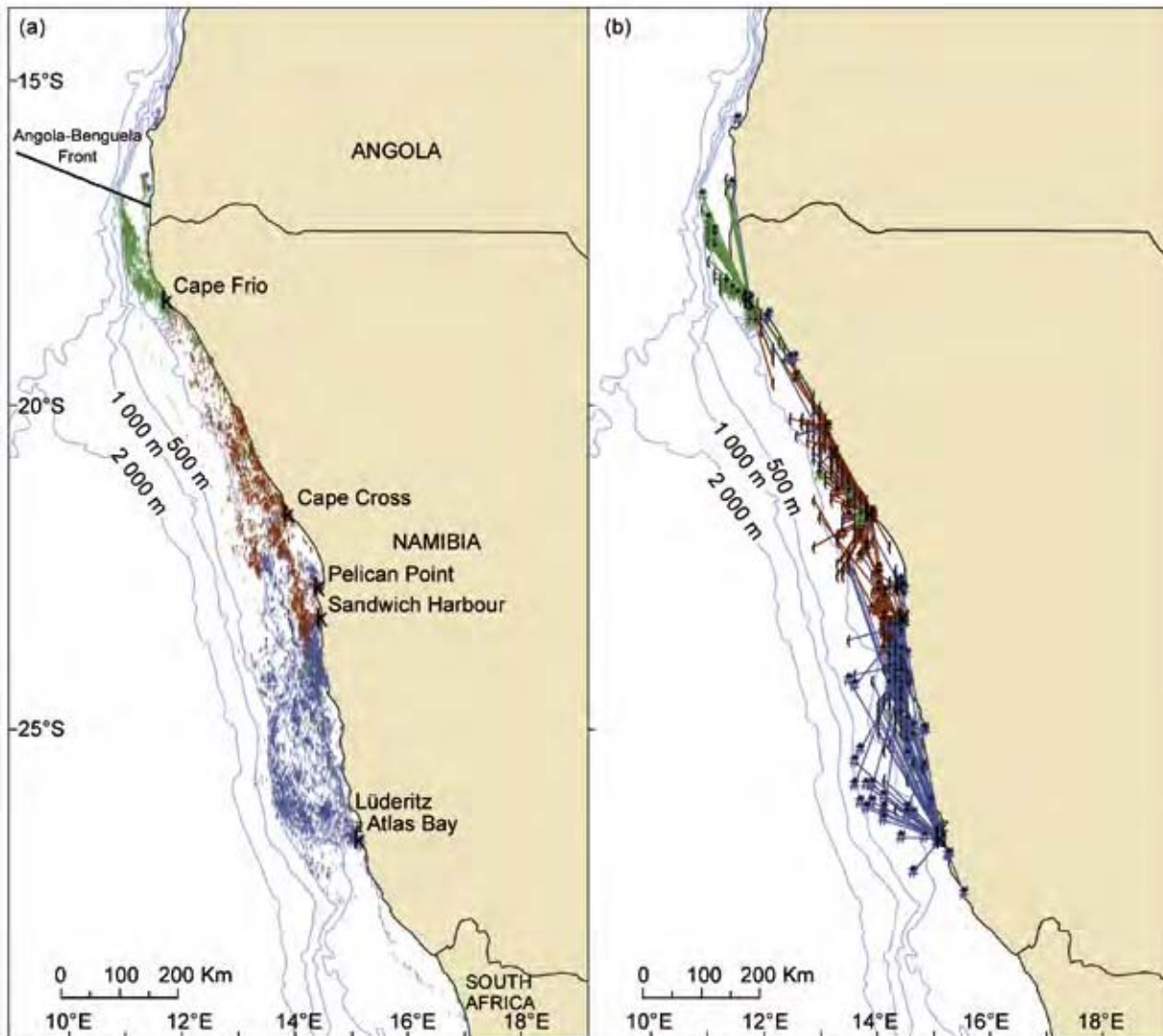


Figure 2. Positions (left) and foraging trips (right) of seals tagged at Atlas Bay (blue), Cape Cross (red) and Cape Frio (green) in 2003 and 2004.

Achievements

The main achievement of the project has been the successful tracking of seal movements from all the colonies sampled, for periods of up to eight months. This has enabled at-sea movements of seals before, during and after the breeding season to be described in detail for the first time, and their feeding ranges during these different periods to be determined. In the case of Atlas Bay and Kleinsee, tagging in different years allowed some investigation into inter-annual differences in foraging behaviour.

South Africa

The tracks of 95 foraging trips by seals tagged in South Africa (cf. Fig. 1) were captured in a GIS, and related to satellite-derived SST and chlorophyll distributions and gradients, bathymetry and distance from colony through Generalised Linear and Additive models. It was found that coarse-scale oceanographic features had only a weak affect on seal foraging behaviour, but that foraging strategies were consistent with the expected distribution of their food on this scale. Between Kleinsee and Cape Columbine, seals foraged mainly in coastal areas and on two highly productive shallow banks close to the shelf break which are heavily fished by hake trawlers. Little activity was observed in the St Helena Bay region, except during the months when the abundance of pelagic fish recruits there is high. None of the animals tagged at Kleinsee traversed the area between Cape Columbine and Cape Town, suggesting that there may be little or no overlap between seals from

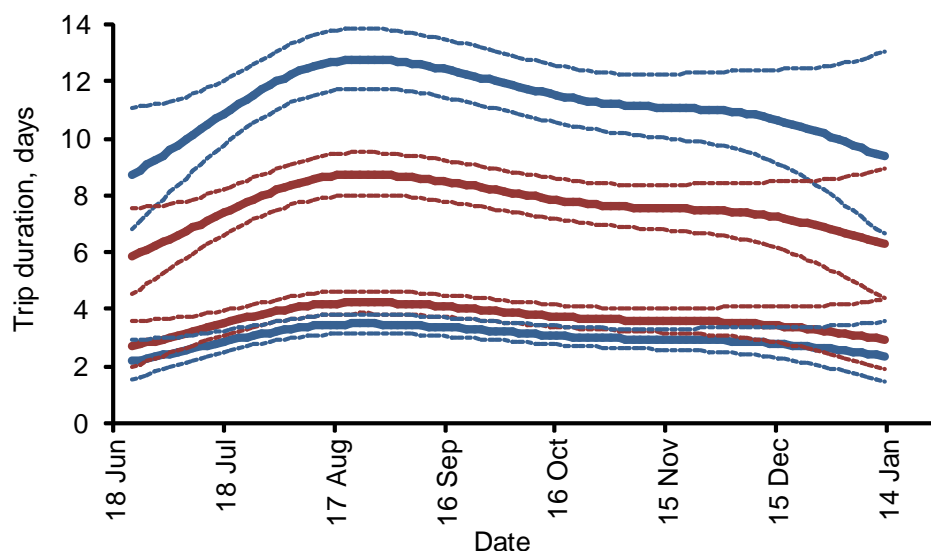


Figure 3. Predicted effects (from GAMM model) of season, sex and body size on duration of foraging trips (± 1 standard error) by Cape fur seals tagged in Namibia. Upper curves for largest adult male (blue) and female (red), and lower curves for smallest male and female.

Kleinsee and the two study colonies in the south. On the Agulhas Bank, seals from Geyser Rock and Mossel Bay foraged predominantly along the shelf break, where hake trawling activity is high, and in inshore regions to the west and east of the two colonies, respectively. The shelf break and midshelf region is also a spawning ground for pelagic fish, which comprise a large proportion of the diet of Cape fur seals. In all areas there were clear differences between the feeding strategies of males and females, most probably due to differences in foraging behaviour and/or diet preferences. The overall conclusions were that although Cape fur seals have the ability to access large areas, they do demonstrate strong preferences for certain areas where feeding conditions are good, and that in South African waters environmental conditions play only a minor role in their distribution.

Namibia

Figure 2 shows the distribution of the 29 seals tagged in Namibia and of their foraging trips. It was found that these seals generally remained within the northern Benguela system bordered by the Angolan front and the Lüderitz upwelling cell, although the tracks of two animals showed that these borders can be crossed. In the south the seals made long (5 to 7 days) trips to distant, dispersed and variable foraging areas at the shelf break. Foraging time was short compared to travel time, indicating poor feeding habitats. In the central region, shorter trips were made to dispersed foraging areas within the 200 m isobath, while in the north the trips were longer (6 to 8 days) to persistent aggregated foraging grounds at the shelf break or on the shelf. As in the south, trips were long and foraging times short compared to travel times, but fidelity to the foraging area suggests better feeding conditions than further south. Fidelity to colonies was also higher in the north compared to the southern and central regions. Foraging behaviour was found to differ between the sexes, as in the southern Benguela, and between size classes (e.g. Fig. 3). The overall picture to emerge is that within the northern Benguela, Cape fur seals move frequently between colonies and foraging areas, resulting in seal-prey interactions at regional, inter-colony scales rather than at local, intra-colony scales, particularly in the southern and central areas.

Outputs

Data

A database consisting of the seal tracks and data on anchovy, sardine, hake and horse mackerel catches in Namibia and South Africa has been compiled, through which the seals/fisheries data are available to all countries involved in the project.



BENEFIT

Benguela Environment Fisheries Interaction and Training Programme (BENEFIT) Research Projects



GLOBEC Report No.25



GLOBAL OCEAN ECOSYSTEM DYNAMICS

GLOBEC Report No. 25

Benguela Environment Fisheries Interaction and Training Programme (BENEFIT) Research Projects

I. Hampton, N. Sweijd and M. Barange (Eds.)

GLOBEC Special Contributions

- No. 1. Predicting and Monitoring of the Physical-Biological-Chemical Ocean. A.R. Robinson (Ed.).
- No. 2. An Advanced Modeling/Observation System (AMOS) For Physical-Biological-Chemical Ecosystem Research and Monitoring (Concepts and Methodology). GLOBEC International Working Groups on Numerical Modeling and Sampling Observational Systems.
- No. 3. GLOBEC Workshop on the Assimilation of Biological Data in Coupled Physical/ Ecosystems Models. A.R. Robinson and P.F.J. Lermusiaux (Eds.).
- No. 4. Report on the GLOBEC National, Multinational and Regional Programme Activities 2001. H. Willson (Ed.).
- No. 5. Report of the first meeting of the SPACC/IOC Study Group on 'Use of environmental indices in the management of pelagic fish populations', 3-5 September 2001, Cape Town, South Africa.
- No. 6. Report of the second meeting of the SPACC/IOC Study Group on 'Use of environmental indices in the management of pelagic fish populations', 9-11 November 2002, Paris, France.
- No. 7. Update of the GLOBEC National, Multinational and Regional Programme Activities, 2004. D.M. Ashby (Ed.).

Additional copies of these reports are available from:

GLOBEC International Project Office
Plymouth Marine Laboratory
Prospect Place
Plymouth PL1 3DH
United Kingdom

Tel: +44 (0)1752 633401
Fax: +44 (0)1752 633101
e-mail: GLOBEC@pml.ac.uk
Homepage: www.globec.org

The GLOBEC Report Series is partially supported by the US National Science Foundation under grant OCE-0608600. Any opinions, findings and conclusions or recommendations expressed in these reports are those of the authors and do not necessarily reflect the views of the US National Science Foundation.

GLOBEC is a Programme Element of the International Geosphere-Biosphere Programme (IGBP).
It is co-sponsored by the Scientific Committee on Oceanic Research (SCOR) and the
Intergovernmental Oceanographic Commission (IOC).

This report should be cited as:

Hampton, I., M. Barange and N. Sweijd (Eds.). 2009. Benguela Environment Fisheries Interaction and Training Programme (BENEFIT) Research Projects. GLOBEC Report 25: ii, 126pp.