

The second survey of Antarctic fur seals *Arctocephalus gazella* on the Courbet Peninsula, Iles Kerguelen

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The nonbreeding population of Antarctic fur seals Arctocephalus gazella at the Courbet Peninsula, Iles Kerguelen totalled 1 332 individuals, which were concentrated on the leeward northeast and southeast coasts. These comprised 98,6 per cent (n = 1 312) immatures of both sexes, and 1,2 per cent (n = 16) adult males. Few adult females were recorded, and two pups were born. The approximately 2,3 fold increase in total numbers since 1980 is at least in part a seasonal phenomenon as censuses were not directly comparable, but probably reflects the increase in A. gazella numbers which are manifested throughout their breeding range. The smaller size of yearlings on the Courbet Peninsula compared to their South Georgia counterparts suggests stunted growth as a result of low food availability during the post-weaning period. Low food availability could explain the slow development of breeding populations within the Kerguelen Province as a whole as it represents a suboptimal habitat away from large concentrations of krill Euphausia superba, their principal food resource elsewhere.

Die nie-telende bevolking van Antarktiese pelsrobbe Arctocephalus gazella op die Courbet-skiereiland, Iles Kerguelen, het uit altesaam 1 332 diere bestaan wat op die lywaartse noord-oostelike en suid-oostelike kuste gekonsentreer is. Hulle het uit 98,6 persent (n = 1 312) onvolgroeides van albei geslagte en 1,2 persent (n = 16) volgroeide mannetjies bestaan. Enkele volwasse wyfies is opgemerk en twee welpies is gebore. Die beraamde 2,3-voudige toename in die totaal sedert 1980 is ten minste gedeeltelik 'n seisoenverskynsel omdat die tellings nie direk vergelykbaar was nie, maar weerspieël waarskynlik die toename in A. gazella se getalle wat regdeur hul teelgebied waarneembaar is. Die voorkoms van kleiner jaarlinge op die Courbet-skiereiland teenoor dié op South Georgia word toegeskryf aan verpotte groei as gevolg van die beperkte beskikbaarheid van voedsel in die naspeentydperk. Die beperkte beskikbaarheid van voedsel kan die stadige ontwikkeling van teelbevolkings in die Kerguelen-gebied as 'n geheel verklaar, want dit is 'n suboptimale habitat weg van groot konsentrasies kril Euphausia superba wat elders die robbe se vernaamste voedselbron verteenwoordig.

Introduction

Exploited to the verge of extinction in the last century, the subsequent recovery of Antarctic fur seals which is centred on South Georgia has been well documented (Bonner 1968, Payne 1977, Bester 1984). Essentially a species inhabiting the sub-Antarctic, *Arctocephalus gazella* also breeds north of the Polar Front at the cold temperate Prince Edward Islands

(Condy 1978, Kerley 1983a) and Iles Crozet (Jouventin *et al.* 1982) where they co-exist with the more numerous sub-Antarctic fur seals *A. tropicalis*. Only recently did Jouventin *et al.* (1982) establish that *A. gazella* now breeds at Iles Kerguelen which lie on the Polar Front.

The Courbet Peninsula of the Kerguelen archipelago is a well defined and accessible area and a nonbreeding population of 589 Antarctic fur seals was present during January 1980 (Bester 1981). As the population data for this area probably also reflect the population trend for the whole archipelago, the present survey up-dates the population figure for *A. gazella* on the Courbet Peninsula for comparison with the earlier census. In addition, the assumed small size of one-year olds (yearlings) which were estimated by Bester (1981) to be below and at the low end of normal body size and weight variation for this age group at South Georgia (Payne 1979) was investigated.

Study Area

The Kerguelen archipelago (49°15'S, 69°30'E) lies on the Polar Front in the South Indian Ocean, the main island and associated islets having a combined area of 7 215 km² with a coastline of 3 000 km. Mean annual air temperature is 4,4 °C, westerly winds predominate and rainfall is evenly distributed over 250 to 300 days of the year. A description of the main study area – the Courbet Peninsula – which has a 267 km coastline, appears in Angot (1954).

Methods

The entire Courbet coastline, excluding small stretches in the south and northwest (Fig. 1) was searched by three observers on foot from 14 January to 19 February 1984. The areas of relatively large concentrations of fur seals in 1980, and bounded by Cap Cotter in the north and Pointe Suzanne in the south, were covered in a relatively short period from 24 January to 2 February 1984. Due to the relief ship's schedule, and the extended coastline, censuses could not be executed over the same period as previously (3 January – 13 January 1980), nor could censusing be carried out within a day or be repeated to provide confidence limits for the estimate. All fur seals counted were allocated to the following categories; adult males (AM), adult females (AF), immatures of both sexes (SAU) and black coated pups (P). A median birthdate of 6 December determined for *A. gazella* at Marion Island (Kerley 1983b) was assumed. Therefore yearlings included in the SAU class during early February were approximately 14 months old. Age and sex classification

were based on pelage colouration and size criteria following Bonner (1968) and Payne (1979).

From 19 February to 22 February 1984 yearling *A. gazella* ($n = 15$) were caught and restrained by scooping them individually into a net. They were then immobilised chemically through intramuscular administration of a combination of ketamine hydrochloride and xylazine hydrochloride (unpublished data). Total weight was determined using a 25 kg Salter spring balance, and standard length recorded using a 2 m flexible tape (American Society of Mammalogists 1967) but with the fur seals lying on their ventrum. Standard lengths (STDL) were only measured from yearlings that were completely immobilised and which could be fully stretched out ($n = 6$). When fur seals were found in groups, target yearlings were selected using their smaller size to exclude older SAU's. The similar size of the canine (c1) and accessory canine (i3) in yearlings was used as a final criterion to separate them from two-year-olds. The sex was determined, recorded and data analysed separately.

Results

During the January/February 1984 census 1 332 fur seals were counted on the Courbet Peninsula (Table 1). They were concentrated on the leeward northeast and southeast coasts and few were present on the northwestern, Morbihan Gulf and inner Norvégienne Bay coastlines (Fig. 1). The vegetated slopes and flat vegetated areas behind the rocky

or sandy beaches were favoured as the majority of fur seals were found here, but they avoided the flat exposed areas on top of the slopes.

The SAU class (including yearlings) predominated (98,6 %) and only a few (1,2 %) adult males were encountered. Two adult females without pups were seen north of Cabane l'Estacade and at Cap Digby on 18 January and 15 February respectively and one black coated pup within the fur seal concentrations at both Cap Noir and Cap Sandwich without their mothers in attendance (Table 1). The AM:SAU ratio of the earlier period (8-13 January) in 1980 (Bester 1981) was 138:427 compared to 8:1 312 in the latter period (29 January - 3 February) in 1984 for the area Baie Charrier to Pointe Charlotte (Table 1, present study), and this change was significant ($\chi^2_{(1)} = 290,5; p < 0,001$).

Yearling males were significantly longer ($t = 10,06; df = 4; p < 0,001$) and heavier ($t = 5,86; df = 13; p < 0,001$) than females at Iles Kerguelen at 14 months of age (Table 2). Furthermore, both yearling male and female *A. gazella* from Iles Kerguelen were significantly shorter ($t = 8,41; df = 10; p < 0,001$ and $t = 6,11; df = 5; p < 0,01$ respectively) and weighed less ($t = 2,42; df = 15; p < 0,05$ and $t = 4,47; df = 9; p < 0,01$ respectively) than their counterparts of comparable age at South Georgia (Table 2). Males and females were shorter on average by 13,1 cm and 16,6 cm respectively with no overlap in the ranges of STDL within sex groups, and they weighed less on average by 3,2 kg and 3,5 kg for males and females respectively.

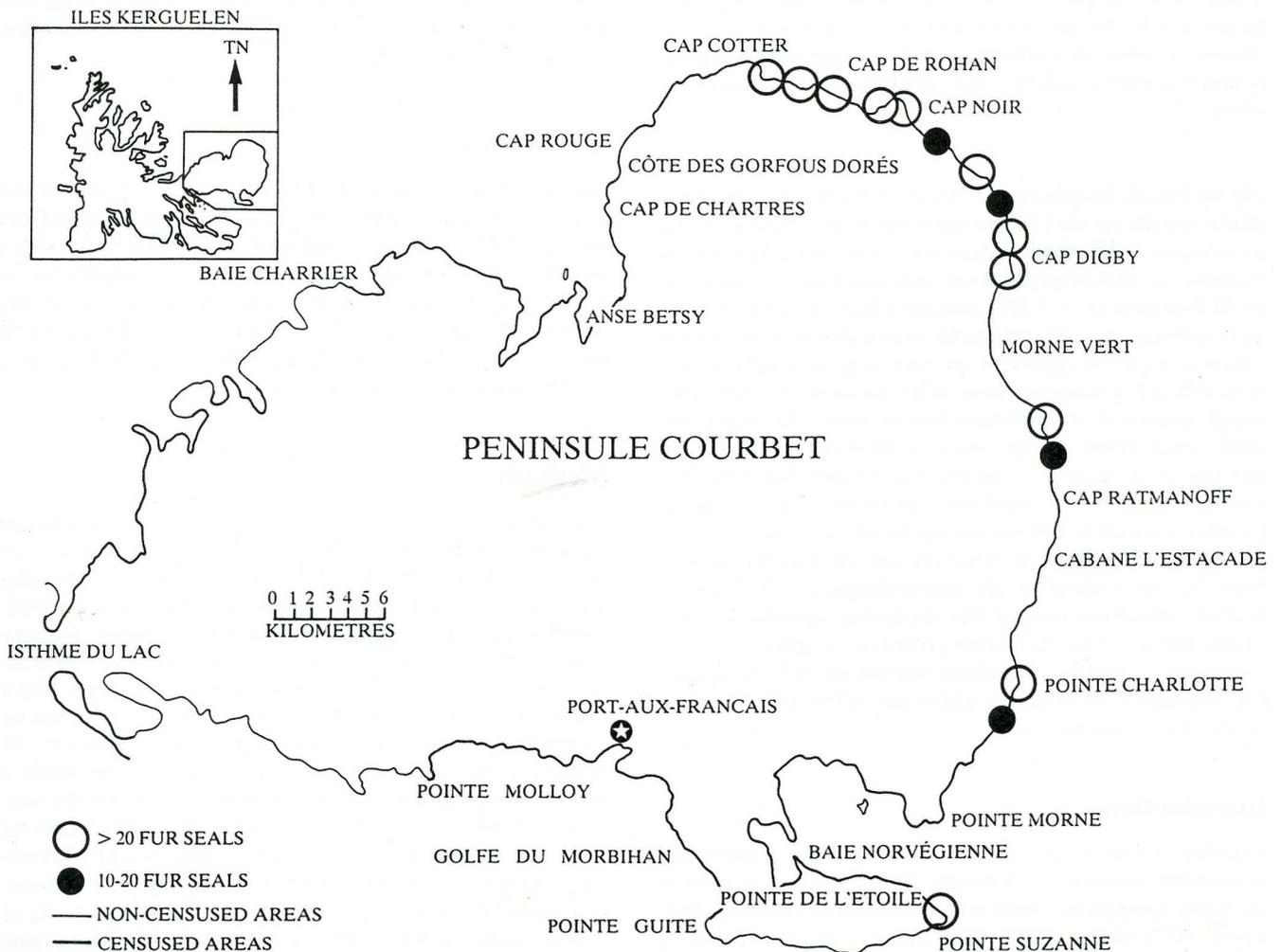


Fig. 1. The distribution of Antarctic fur seals on the Courbet Peninsula during January/February 1984.

Table 1
Results of a census of *A. gazella* during January/February 1984 at the Courbet Peninsula, Iles Kerguelen.

Date	Locality	AM	AF	SAU	P	Total
29.01.84	Baie Charrier – Pointe Scott	0	0	2	0	2
29.01.84	Pointe Scott – Rivière du Nord	0	0	2	0	2
29.01.84	Rivière du Nord – Anse Betsy	0	0	0	0	0
31.01.84	Anse Betsy – Cap de Chartres	0	0	5	0	5
31.01.84	Cap de Chartres – Cap Rouge	0	0	4	0	4
31.01.84	Cap Rouge – Cap Cotter	1	0	10	0	11
01.02.84	Cap Cotter – Cap de Rohan	5	0	170	0	175
01.02.84	Cap de Rohan – Cap Noir	2	0	324	1	327
01.02.84	Cap Noir – Cap Digby	0	0	130	0	130
02.02.84	Cap Digby – Cap Sandwich	0	1*	418	1	420
02.02.84	Cap Sandwich – Cap Ratmanoff	0	0	100	0	100
03.02.84	Cap Ratmanoff – Pointe Charlotte	0	1**	48	0	49
18.01.84 – 20.01.84	Pointe Charlotte – Pointe Morne	2	0	23	0	25
19.02.84	Pointe Morne – Pointe Matley	0	0	8	0	8
24.01.84	Pointe de l'Etoile – Pointe Suzanne	6	0	63	0	69
14.01.84 – 19.01.84	Pointe Guite – Pointe Molloy	0	0	5	0	5
TOTAL		16	2	1 312	2	1 332

* Sighted on 15.02.84

** Sighted on 18.01.84

Table 2
Comparison of weight (kg) and standard length (cm) of yearling *A. gazella* from Iles Kerguelen (19 – 22 Feb) and South Georgia (25 Jan – 6 Mar)

	Kerguelen			South Georgia*		
	$\bar{x} \pm S D$	Range	n	$\bar{x} \pm S D$	Range	n
STDL ♂♂	95,5 ± 1,73	94-98	4	108,6 ± 2,83	104-114	8
♀♀	79,5 ± 2,12	78-81	2	96,1 ± 3,47	91-100	5
Weight ♂♂	18,9 ± 2,37	16,5-22,4	9	22,1 ± 3,03	19,4-28,6	8
♀♀	12,5 ± 1,57	11,0-15,0	6	16,0 ± 0,91	14,8-16,9	5

* From T.S. McCann *in litt* (17/04/85)

Discussion

In both 1980 (Bester 1981) and 1984 (present study), the relatively large concentrations of *A. gazella* on the Courbet Peninsula occurred in the same localities on the leeward southeastern and southern coastline in sheltered areas and apparently these are favoured sites. This conforms to the hypothesis that *A. gazella* congregate on protected lee shores on high latitude islands south of the Polar Front before population pressure dictates the expansion of their local range (Bester 1982). Their particular habitat selection of open rocky or inland vegetated areas agrees well with the behaviour found on islands over their entire distributional range (Bonner 1968, Budd 1970, Bester 1982, Condy 1978, Jouventin *et al.* 1982).

The increase in numbers since 1979/80, which was centred on the Cap de Rohan to Cap Sandwich area culminated in the presence of the first pups. Both pups had been born in the immediate vicinity as they were found at the onset of pup moult in *A. gazella* (Payne 1979, Kerley 1983b), before recorded temporary movement to the sea (Kerley 1983b) and well before their weaning and departure in mid-April (Payne 1979, Kerley 1983b). Furthermore, the only other known breeding (pupping) locality is ± 130 km distant at Ile

de Croy (Iles Nuageuses) on the northwestern tip of the Kerguelen archipelago (Jouventin *et al.* 1982). The presence of the few pups during 1984 does not necessarily indicate the development of an indigenous breeding population on the Courbet Peninsula and the single females found during both 1980 and 1984 (Bester 1981, present study) may be the source of sporadic births.

The observed increase in population numbers since 1980 seems to be at least in part a seasonal phenomenon. The decrease in AM numbers, and concomitant increase in SAU numbers towards end January/onset of February as reflected in the change in the AM:SAU ratio accords well with the seasonal cycle of *A. gazella* at Marion Island (Kerley 1983b).

It is reasonable to assume that at least some of the adults and immatures on the Courbet Peninsula are the progeny of the proximate breeding population on Ile de Croy and with wider searching further breeding colonies may still be located within the archipelago. *A. gazella* populations at Heard and McDonald islands may also contribute to the immature population (Bester 1981). In March 1980 the Heard Island population was estimated at 4 500 (Johnstone 1982) with 46 pups (G.W. Johnstone, 1985 *in litt.*) while on the eastern beaches of the McDonald Islands 200 adults and 100

pups were counted (Johnstone 1982). Neither Heard Island nor the McDonald Islands appear to have been important breeding stations prior to the advent of sealing (Bonner 1982).

The picture that emerges is one of slowly increasing *A. gazella* populations on the sub-Antarctic and cold temperate islands of the South Indian Ocean (Kerguelen Province) all of which are situated within approximately 300 km on either side of the Polar Front. Both Heard (Budd 1970) and Marion islands (Kerley 1983a) benefit from an influx of *A. gazella* from elsewhere, probably from within the Kerguelen Province (*vide* Budd & Downes 1969) and possibly South Georgia (Budd 1972, Laws 1973) where the fur seal population has been increasing at an annual rate of 16,8 per cent over the last 20 years with a doubling time of 4,5 years (Payne 1977). A possible explanation for the observed slow recovery is that the islands within the Kerguelen Province are remote from the nearest principal concentration of Antarctic krill *Euphausia superba* in the Kerguelen-Gaussberg Ridge area (Bester 1984). South Georgia by contrast lies within the area of the Weddell Stock of krill, the principal food of especially breeding female *A. gazella* during summer (Bonner 1968, Doidge & Croxall 1985). It also suggests that an alternative local food resource, i.e. squid and fish, that *A. gazella* feed on opportunistically at South Georgia (Doidge & Croxall 1985) was inadequate to hasten population growth in the Kerguelen Province past the slowly increasing establishment phase into the anticipated recolonisation phase of faster population growth (*vide* Roux in press).

Antarctic fur seal pups at both Bird Island, South Georgia (Payne 1979) and at Marion Island (Kerley 1985), have similar growth to weaning and weaning weights. This agrees with the finding that varying resources within the foraging range of breeding seals during summer may not have a significant effect on the growth rates and weaning weights of pups (Doidge *et al.* 1984b). The availability of food to the whole population in autumn and winter may on the other hand come to exert a significant effect, particularly on mortality rates of juveniles and possibly of breeding females (Doidge *et al.* 1984a). Since body size can be considered a measure of nutrient intake (Fitzhugh 1975), it is possible that the small yearlings in the present study at the Courbet Peninsula exhibit stunted growth. This could result from low prey abundance during their post-weaning period (>110 days) when the buffering effect of their (lactating) mothers has been removed, coupled with an assumed initial low feeding efficiency following a change in diet.

Despite the virtual lack of overlap between the two data sets, the difference between random sampling at South Georgia and selection for small size at Kerguelen could have introduced a bias given the small samples. It may also be compounded by the differences in timing, albeit small, of weighing in particular. However, given the large disparity in size between sexes (Table 2), the identification of yearlings using small size which was random for sex, would have allowed inclusion of larger females. Yet females showed the largest mean differences in both weight and STDL between the data sets. Although annual variations in growth rates and body sizes in response to local environmental conditions could conceivably have caused the observed results, such changes related to food availability have been described for other pinnipeds, for example the northern fur seal *Callorhinus ursinus* and harp seals *Phoca groenlandica* at different population densities (Scheffer 1955, Innes *et al.* 1981), as well as between two stocks of southern elephant seals *Mirounga leonina* (Bryden 1968, Laws 1984).

Clearly more information is needed from both Iles Kerguelen and South Georgia over consecutive seasons using large sample sizes to reach firm conclusions. The present study however, suggests that the apparently slow recovery and poor development of indigenous breeding populations of *A. gazella* in the Kerguelen Province are a consequence of low availability of food resources.

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