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Attendance behaviour of Antarctic and subantarctic fur seal females at Marion Island

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Abstract: The female attendance behaviour of Antarctic fur seals (*Arctocephalus gazella*) and subantarctic fur seals (*A.tropicalis*), which breed sympatrically on subantarctic Marion Island, was investigated. Over the same period after the breeding season, the mean duration of feeding trips to sea, and percentage of time spent at sea, did not differ significantly between lactating females of the two species. The difference in mean duration of shore visits was significant and the longer onshore attendance of *A. tropicalis* probably related to the lower demand by their pups which grow at a slower rate. The subpolar maternal adaptations of *A. gazella* were unchanged under the more temperate environment at Marion Island, and it remains to be established unequivocally whether conditions there are limiting to the species.

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Introduction

In otariids, maternal care typically consists of a relatively short perinatal period ashore with the single pup, followed by a long period of alternating onshore activity (predominantly suckling) and foraging at sea. Of the two species of fur seals which breed at Marion Island (46° 54'S, 37° 45'E), the Antarctic fur seal (*Arctocephalus gazella*) occurs characteristically on islands south of the Antarctic Polar Front (APF) and is a specialist feeder on krill (*Euphausia superba*) in high latitudes where it suckles its young for four months only (Gentry & Kooyman 1986, Doidge & Croxall 1985). The subantarctic fur seal (*A. tropicalis*) on the other hand, is abundant on islands to the north of the APF (Bester 1984) where it is a generalist feeder in mid-latitudes (Condy 1981, Bester & Laycock 1985) and suckles its young for 10–11 months (Bester 1981, Kerley 1983). The sympatric breeding of the two species just to the north of the APF at Marion Island provided the opportunity to quantify aspects of maternal effort in fur seals with different reproductive adaptations operating under the same environmental conditions.

Attendance behaviour, i.e. the pattern in which fur seal females deliver nourishment to their growing young, is divisible into quantitative measures such as the number and duration of visits to shore from birth to weaning, the number and duration of trips to sea, changes in trip duration as a function of the pup's age, and suckling frequency while ashore (Gentry & Kooyman 1986).

Attendance behaviour may be used as an indicator of food availability and environmental change, and to compare the situation at different breeding locations (McCann 1987). To this end, the present study compares the duration of trips to sea and visits to shore of both species at the same locality over a period of two months after the end of the breeding (pupping and mating) season.

Materials and methods

Mother-pup pairs (n = 33) of both species were individually marked with paint and monel metal tags (pups only) (Condy & Bester 1975) at the Rook's Bay breeding colony on the south west coast of Marion Island during the second week in January 1987. *A. gazella* frequented the open vegetated area behind the landing beach, while *A. tropicalis* also used a gully of jumbled rocks on the western boundary. The entire area was searched daily for marked pups and their mothers over about three hours around noon. Females that were located were noted as spending the entire day ashore, and those that were not sighted were noted as spending a day at sea. Daily searches continued until early March 1987 and terminated well before the onset of weaning in the Antarctic fur seal pups at the end of March (Kerley 1983). Data from suckling females who were absent from shore for more than 14 consecutive days (one in *A.tropicalis* and two in *A.gazella*) were deleted from the data base and treated as a failure of the observers to locate a female during one visit (Gentry & Holt 1986). All females in this study were assumed to be pregnant (phase of delayed implantation) and either suckling (pup alive) or non-suckling (lost their pups during the study).

An attendance cycle comprised a feeding trip and the subsequent shore period. The percentage time spent at sea for each female was calculated as the proportion of the feeding plus attendance time for each cycle (Doidge *et al.* 1986). Comparison of seasonal change in trip length was based upon time elapsed since the median birthdates (as suggested by McCann 1987). These were calculated as

6 December and 17 December for *A. gazella* and *A. tropicalis* respectively using a simplified probit analysis on census data (Kerley 1983). All calculated means are followed by one standard deviation of the mean.

Results

Antarctic fur seal females (n = 12) spent 74.5% (± 6.3%) of their attendance cycles (n = 78) at sea, while subantarctic fur seal females (n = 11) spent 66.2% (±9.4%) of their attendance cycles (n = 54) away on trips. This difference was not significant. The frequency distribution of the durations of onshore visits and offshore trips are shown in Fig. 1. Mean trip duration of *A. gazella* ($\bar{x}$ = 5.22 ± 2.42 days, n = 86 trips) did not differ significantly from that of *A. tropicalis* ($\bar{x}$ = 4.9 ±2.8, n = 62). On the other hand, the mean duration of *A. gazella* visits ashore ($\bar{x}$ = 1.7 ± 0.7, n = 83) was significantly shorter (Mann Whitney Test, z = -3.79, p < 0.001) than those of *A.tropicalis* ($\bar{x}$ = 2.5 ± 1.3, n = 55).

The majority (80%, n = 16) of females of both species for which > 4 consecutive trips were recorded (n = 20) showed no increase of trip duration over time (Spearman rank correlation coefficient r_s), while one *A. tropicalis* (r_s = 0.63, $p < 0.05$, n = 11 trips) and three *A. gazella* females (r_s = 0.72–0.85, $0.01 < p < 0.05$, n = 8–11 trips) showed a significant increase. One of two non-suckling *A.gazella* females which had lost their pups remained ashore for 17 consecutive days and did not return before the end of the study (22 days). The second female remained ashore for six days, was absent the following 20 days, and returned at the end of the study period.

Discussion

Lactating females of *A. gazella* and *A.tropicalis* spent a similar percentage of their attendance cycles at sea with similar mean durations of foraging trips. The 11-day disparity in the median birthdates of the two species, and therefore the possible increase in trip duration with time, is unlikely to influence this result as the progressive rate of duration amounts to only 1.2 days for every 30 days *postpartum* in the northern fur seal (*Callorhinus ursinus*). The similar results do not necessarily suggest that females of both species respond in the same way to the food availability around Marion Island since they may utilise different foraging adaptations (foraging in different areas, feeding at different depths, taking prey of different size or species, or diving more/less frequently), which need not influence the duration of trips to sea (Gentry & Holt 1986).

No comparable data on attendance behaviour have been published for *A. tropicalis*. In *A. gazella* both the mean trip duration (5.2 ± 2.4 days) and percentage time spent at sea (74.5%) found in this study fell within the range recorded for the *A. gazella* population at South Georgia (Doidge *et al.* 1986) where they feed largely on krill (Doidge & Croxall 1985), which is absent around Marion Island (Antezana 1985). From this recorded overlap in the length of feeding trips and the percentage of time spent at sea by *A. gazella* at the two localities, it does not follow that the species do equally well at Marion Island and South Georgia on an altered diet. Different foraging adaptations, which need not affect the duration of trips to sea (Gentry & Holt 1986) may be in operation, and while pup growth of *A. gazella* at Marion Island (Kerley 1985) was at least as fast as at South Georgia (Payne 1979), it may not reflect varying food resources within the foraging range of lactating females (Doidge *et al.* 1984). In addition, it is perhaps significant that the figures obtained for *A.gazella* (present study), here at the northern boundary of its global breeding distribution (Bester 1984), are virtually the same as those for Bird Island (South Georgia) seals in 1978 (5.2 ± 2.3 days and 76.9%) which was apparently a poor season (Doidge *et al.* 1986).

Although the duration of foraging trips did not consistently increase over time, this may be the result of small sample sizes (number of consecutive trips) for females of both species (present study). Only those females for which >7 consecutive trips were noted showed a significant positive relationship. Both *C. ursinus*, and *A. gazella* at Bird Island, showed such a relationship and it was concluded that the females were responding to the increased needs of their young over time (Gentry & Holt 1986, Doidge *et al.* 1986). In the present study, the increased needs of the young of *A. gazella* over that of *A. tropicalis* are manifested in the shorter mean onshore visits (1.7 ± 0.7 days) of *A.gazella* females compared to *A.tropicalis* (2.5 ± 1.3 days); *A. gazella* pups grow faster (89.0 g d^{-1} versus 71.5 g d^{-1}) and are weaned at an earlier age (112 days versus ± 300 days) (Kerley 1985). The increased needs of their young also suggest that the brief shore visits in *A.gazella* function solely to feed the pup and that the female returns to sea as soon as her milk is depleted. As the time spent nursing and the amount of energy transferred during a shore attendance period is more dependent on the pup's, rather than the mother's, nursing ability (Doidge 1987), the process of milk depletion conceivably takes longer in *A. tropicalis* females with their less demanding pups. Maternal status also seems to have an influence on attendance pattern with non-suckling females in this study making visits to shore in an unpredictable manner as in *C.ursinus* (Gentry & Holt 1986).

The maternal adaptations of both *A. gazella* and *A.tropicalis* at mid-latitude Marion Island (Kerley 1985) accord with those of their conspecifics at the major population centres in higher (South Georgia — 62° S) and lower (Gough Island — 40° S) latitudes (Bester 1981, Gentry & Kooyman 1986) respectively, and appear genetically fixed. The apparent inflexibility of the *A. gazella* maternal adaptation which resisted change when individuals made the transition from a subpolar to a temperate environment, contrasts with the situation in the low latitude Galapagos fur seal (*A. galapagoensis*) which can reduce weaning age (up to three

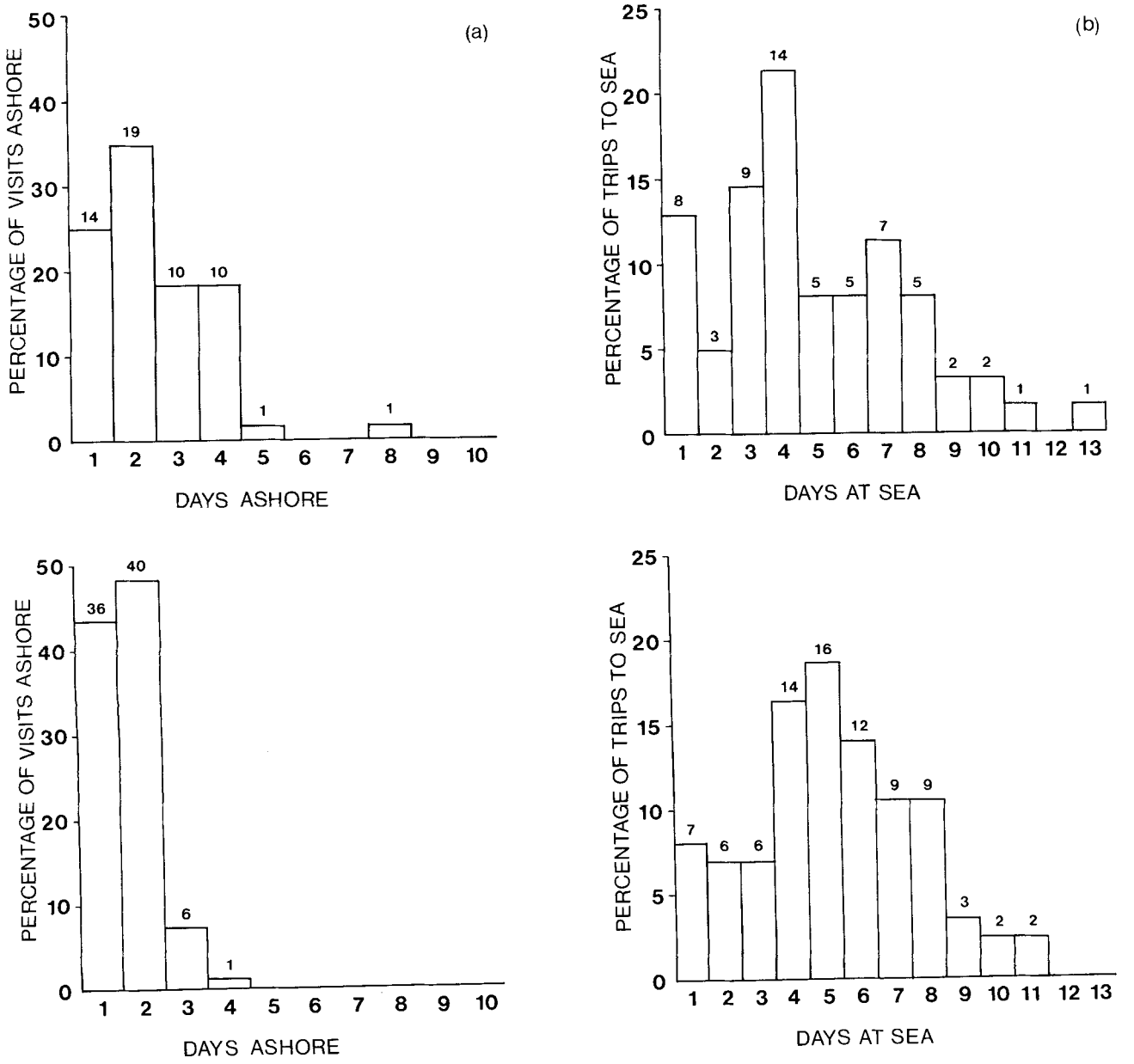

Fig. 1. Frequency distribution of the duration of (a) visits ashore and (b) trips to sea for *A.tropicalis* (top) and *A.gazella* (bottom) females at Marion Island.

years in the species) to one year (Trillmich 1986)in response to change in food supply. They can thus shift from the tropical to the temperate maternal strategy (Gentry *et al.* 1986).

The limited information on the attendance behaviour of fur seals in the present study precludes a decision on whether conditions at Marion Island are limiting for the small, increasing population of *A. gazella* at the northernmost extension of its breeding range, and in the face of the large, rapidly expanding population of *A.tropicalis*. A comprehensive study of attendance behaviour, at-sea-behaviour, milk composition, and the integrated result of these, the growth rate of pups (Gentry *et al.* 1986), will address this question following a current study of the diet of both species at Marion Island.

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