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VIGILANCE IN GREY SEALS AS A FUNCTION OF TIME SINCE HAUL OUT

By

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ABSTRACT

Vigilance was investigated in hauled-out grey seals (*Halichoerus grypus*) on the island of Lundy. Vigilance, as measured by proportion of time the seals spent in visual scanning, decreased over time since haul out. A significant difference was observed between the declining trend for time spent scanning by newly hauled out seals, and the steady, low, rate of scanning shown by seals that had been hauled out for over 30 minutes. These results are consistent with data from common seals (*Phoca vitulina*). However, other observations made during data collection suggest that grey seals are much more sociable when hauled out than has been reported for common seals.

Keywords: *Grey seal, Halichoerus grypus, haul-out, vigilance, species differences*

INTRODUCTION

To the land-based observer, one of the most obvious behaviours of seals is their tendency to haul out onto rocks and beaches. Most research on haul-out has concentrated on estimating its frequency, as a function of age, sex, time of year and day, weather, and disturbance (e.g. Born, Riget, Dietz & Andriashek, 1999; Grellier, Thompson & Corpe, 1996; Härkönen, Hårding & Lunneryd, 1999; Sjöberg, McConnell & Fedak, 1999). However, it is also interesting to ask what seals are doing while hauled out. Although hauling out looks like a resting behaviour, hauled-out seals are by no means inactive, and this raises the question of what the function of the behaviours they show while hauled out might be. The first step in answering this question is of course to describe the behaviours. Da Silva and Terhune (1988) identified and studied four types of behaviour of harbour (common) seals, *Phoca vitulina,* on haul out sites: scanning, rest, movement and interaction. Scanning, defined as the lifting of head with the eyes open, and resting were found to be the most dominant behaviours during haul out, with a mere 0.4% of the time spent interacting and moving. The most likely function of scanning is anti-predator vigilance: seals can only move slowly and awkwardly on land, so despite its size a hauled-out seal is a relatively vulnerable animal.

One factor known to affect scanning behaviour is group size. Scanning occurs at lower frequencies in larger groups (e.g. Da Silva and Terhune, 1988, Krieber & Barrette, 1984; Terhune, 1985), as would be expected from theories of vigilance in social groups (e.g. Bertram, 1978). However, Da Silva and Terhune found that group size only accounts for a small proportion (15%) of the variation in scan time. In the search to find other vari-

ables affecting scanning in harbour seals, Terhune and Brillant (1996) observed seals when they had just hauled out and compared the amount of time spent scanning to those already hauled out for over 30 minutes, referred to as 'resident seals'. In addition, they investigated how scanning varied with time since haul out, by studying the target seal for repeated short periods over a 30-minute session. A resident seal was observed at the same time as each newcomer seal, so that similar conditions influenced scanning times in both seals. It was found that vigilance in the newcomer seal decreased over time, with the initial scan duration being significantly longer than their final scan duration. This difference was present despite group size not having changed significantly. The scan time for the resident seal was also found to be significantly less than that for the newly arrived seal.

The present study aimed to extend Terhune and Brillant's work by investigating the pattern of scanning behaviour in the grey seal, *Halichoerus grypus*. We focused on the effects of time since haul out rather than group size, since Terhune and his colleagues had found that recent arrival had a stronger effect on vigilance than group size.

The grey seal is found on the coasts of Canada and NW Europe, with three-quarters of the European seals being found on British coasts. Most British grey seals are found in Scottish waters, but there are small populations on the western coasts of England and Wales. The present study used the colony on the island of Lundy, in South West England. This marine nature reserve is home to 60-70 grey seals. Unlike the harbour seals studied by Terhune and Brillant (1996), the seals on Lundy have neither surface nor water predators. Furthermore, they are subject to little disturbance. Power-boats and low-flying aircraft can cause hauled-out seals to become vigilant and even to re-enter the water, even if they do not approach very close - within 250m for boats (Born et al, 1999) and 1.5km for helicopters (Suryan & Harvey, 1999). Such disturbances are rare on Lundy, especially at the north end of the island, where the seals typically haul out. We might therefore expect a lower level and perhaps a different pattern of vigilance in the Lundy seals, compared with the harbour seals studied by Terhune and Brillant.

METHOD

Grey seals were observed on Lundy, in the Bristol Channel, England, United Kingdom, in April 1997. Haul out sites and the tidal stages at which the seals used them were first identified by walking around the coasts of the island and noting those used by substantial numbers of seals. Data reported here come from sites at the north of the island, two near Gannet's Rock and two near Seal Rock. Observations were made using 8′ and 10′ binoculars from the cliff tops or slopes, ensuring that the seals were unable to see us in order to avoid any unnecessary disturbances. The study was carried out over four days during April 1997, between 10:00 and 17:00. Observations started approximately 3 hours before low tide and continued until the haul-out sites were submerged in water on the rising tide.

A scan was defined as any head movement that could increase the visual field of the seal, i.e. the raising and lowering of the head from a resting position. We excluded any head

movement that occurred whilst the seal was repositioning its whole body, scratching its nose or wiping its face.

As in the study of Terhune & Brillant (1996), a single observation period was 3 minutes long, followed by a 3-minute interval during which we recorded group size, group position and number of gulls within a 4m radius (2 body lengths) of the seal. The duration of each individual scan was recorded and total scan duration and frequency of scan for one observation period were derived from these data. A total of 5 consecutive observations were made of a single seal over 30 minutes.

Observations for the newly hauled out seals ('newcomer' seals) began as soon as the whole body was out of the water. Observations were discontinued if the seal returned to the water during the observation time. Resident seals were randomly chosen from any rock within observable distance. A dry coat was used as an indication that the seal had been out of the water for at least 20 minutes (Terhune & Brillant, 1996). So far as possible resident seals were observed at the same time as newcomers, but it was not possible to make an exact matching as Terhune and Brillant did, because of the smaller numbers of seals.

The hypotheses tested were:

(i) that newcomer seals would scan for longer, and with higher frequency, than residents;

(ii) that newcomer seals would show a decline in scan duration and frequency across the half-hour observation session;

(iii) that the rate of decline in scan duration and frequency would be greater for newcomer seals than for residents.

Results were tested using analysis of variance, supplemented by non-parametric tests of correlation.

RESULTS

Complete sets of observations were obtained from a total of 12 newcomer seals and 10 resident seals. Because of time constraints, governed by the tides, it was only possible to observe approximately 5 seals in the course of one day and generally two different haul out sites were used each day. Care was taken not to observe the same seal twice in the same day and the chance of this occurring was minimal due to the small number of observations made each day.

General observations of the seals in water showed that some seals hesitated to haul out despite the availability of space on the haul out site. This was particularly true of male seals. Five males were sighted 'bottling' (floating in a characteristic vertical posture with their noses out of the water) on different days, but only one male hauled out throughout

the time of the study. Whilst some seals did not haul out throughout the course of the day, others were attempting to haul out on a rising tide although they were washed off soon afterwards.

The resident seals were seen to be more active when observed on a rising tide, looking particularly in the direction of the incoming tide as opposed to inland. Gulls (*Larus spp.*) also seemed to elicit activity from the seals, regardless of the level of noise the gulls were making.

Group size was not observed to be greater than eight at any time in the study. It decreased rapidly during the course of observations on a rising tide, with the opposite effect being present on a falling tide. The seals lay quite close together on the haul-out site, sometimes making physical contact. Individual seals were also observed bottling around haul-out sites where a large group of seals were hauled out. Although the resident seals were observed to be resting with their eyes closed more than the newcomer seals, both groups were still moving, scanning, and interacting and sometimes calling throughout the 30-minute period. At no observation period was vigilant behaviour observed to be absent in any of the seals.

All the seals in both groups were females with the exception of one male in the newcomer group. Juveniles were not observed hauled out, and were only seen to be bottling near haul out sites throughout the course of the study.

Figure 1 shows the mean total scan duration of each group for the five observation periods within a 30-minute session, and indicates a reduction in scanning as time since haul out increases. The resident group scanned for less time than the newcomer group and it was only in the last two observations that the two groups show similar scan duration. The difference in scan duration between the newcomer seals and the resident seals was found to fall short of significance ($F_{1,18}=2.63$, $p=0.12$), but the planned comparison between the linear trends of scan duration on observation period was significant ($F_{1,72}=4.42$, $p<0.05$). The trends in percentage time spent vigilance across observation periods within each group were assessed using the nonparametric test described by Jonckheere (1954). For the newcomer, the statistic tau took the value -0.42 ($z = 3.25$, $p<$ 0.01 2 tailed). For the resident group, tau was near zero and non-significant (tau = -0.02, $z = 0.16$).

The total scan frequency for each observation session were submitted to similar analyses. For this measure, the main effect between groups was significant ($F_{1,18}=18.67$, $p<0.0005$). Scan rate declined more rapidly across the observation periods for the newcomer than for the resident group, but the planned comparison of trends showed that the difference was not significant ($F_{1,72}=0.12$, $p=0.73$). Thus the newcomer seals scan more frequently than residents, and continue to do so for at least half an hour after hauling out. The decline in scan rate across the observation period was not significant for either the newcomer or the resident group. The fact that the resident-newcomer difference was significant shows that the scan rate of newcomers must decline at some stage, but longer

observation periods would be required to say when that would be.

DISCUSSION

Mean scan times were lower than those observed by Terhune and Brillant (1996). Across the entire observation period, newcomer seals scanned for 65 seconds per 3-minute observation period; for the group sizes we observe, Terhune and Brillant report mean scan times of over 80 seconds. On the other hand, the pattern of the results was consistent with that observed by Terhune and Brillant, in that there were clear differences in scanning behaviour between resident and newcomer seals, and these differences declined with the time the newcomers had spent hauled out. It appeared that as a seal settles on a haul-out site, it first scanned for less time, and then later came to scan less often. The difference between the rates of decline of scan duration in newcomer seals and resident seals was significant, even though newcomers and residents could not be matched when the data were collected, as they were in Terhune and Brillant's study.

The lower scan times compared with Terhune and Brillant's results are what we would expect from the absence of predation or serious disturbance on Lundy. However, the pattern of the results is consistent with a continuing anti-predator function for scanning in hauled-out seals. The alternative explanation for scanning would be that the seals were scanning for mates (Renouf & Lawson, 1986), but this is ruled out as the study was conducted out of mating season.

Although there were many apparently suitable haul out sites on Lundy, it was found that the seals showed a preference to the North side of the island, specifically targeting four sites. This is similar to the findings of Da Silva and Terhune (1988), who observed that only 26% of the sites that appeared suitable were used by harbour seals.

Because only a few sites were used, there were usually quite a number of seals on each site. Clear examples of sociable behaviour were observed both in the water and on the rocks. One newcomer seal in particular spent the first 15 minutes moving up the rock until finally positioning itself at right angles (making physical contact) to a resident seal. These observations represent a difference from findings in some other species, such as harbour seals and leopard seals, where physical contact appears not to be tolerated (Sullivan, 1982; Rogers & Bryden, 1997).

Another difference from Terhune and Brillant's (1996) results was that some grey seals were observed to be quite high on the rock, up to 2 metres above water level, and made no attempt to get closer to the water. In contrast, Terhune and Brillant found that harbour seals preferred locations on the rock that allowed easy escape into the water. Although this may reflect a species difference, the surroundings in which the two species of seals were observed differed substantially and may have caused the difference in behaviour. In the Bay of Fundy, the harbour seals were in danger of being hunted, whilst there are no known predators of grey seals on Lundy. Hence it appears reasonable that the grey seals would not be as cautious as the harbour seals. In line with this is the finding that harbour seals in the Bay of Fundy are more vigilant than the legally protected

harbour seals in California (Terhune, 1985). A similar comparison can be made between the ringed seals (*Phoca hispida*) in the Arctic, which are preyed upon by polar bears (*Ursus maritimus*), and the Weddell seals (*Leptonychotes weddell*) in the Antarctic, which do not have any surface predators. The ringed seals cannot be approached easily, and have a higher level of vigilance than the Weddell seals (Stirling, 1977).

The impact of group size on the vigilance of grey seals could not be pursued in this study, because only small numbers of seals gathered at any one time on a haul out site; eight was the largest group seen. Although larger groups on a single site are sometimes seen on Lundy, a more practical option for investigating group size effects would be to target grey seals in Scotland, where larger populations can be found.

This study has demonstrated both differences and similarities between the grey seals on Lundy and the harbour seals that have been studied elsewhere. Some of these are no doubt species differences. In addition, though, it should be noted that the seals on Lundy are free from attack and almost any form of interference, whereas in the Bay of Fundy, for example, seals are not protected. It would be interesting to extend the present findings to other species of seals, in a range of environments.

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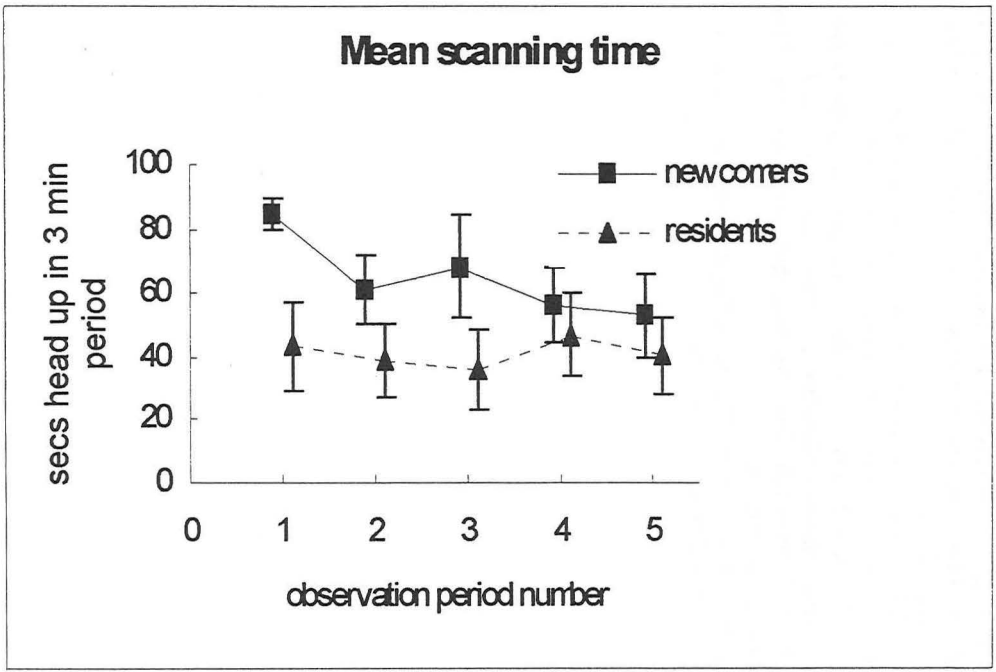

Figure 1: The level of vigilance, measured as percentage time spent with head up (scan duration) of 'newcomer' (recently hauled-out) seals as compared with 'residents' (seals hauled out for over 30 mins). Data were recorded in 5 3-min observation periods spread over 30 mins, and are plotted as means +/- standard errors.