The impact of climatic variation on the opportunity for sexual selection

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Supplementary Online material.

BACKGROUND TO GREY SEAL BREEDING BEHAVIOUR:

Approximately 40% of the world's population of grey seals breed around the British Isles, typically at remote island sites such as North Rona, Scotland (59^{o} 06' N, 05^{o} 50' W), where adults aggregate to breed each autumn. At North Rona, individual females spend around 20 days ashore, during which time they each bear and suckle one pup. Females enter oestrus for approximately 1 day around day 16 of lactation. The breeding season lasts eight weeks, thus, there is a turnover of females during the season. Males do not defend resources or actively herd harems, but compete to maintain loose home ranges amongst the groups of females (Twiss *et al.* 2006).

Previous studies of grey seals breeding on North Rona have demonstrated the importance of fine scale spatial heterogeneity in breeding habitat quality in determining pupping site preferences of females and therefore seal dispersion patterns on the colony and longer term patterns of colonisation (Twiss *et al*. 2000, 2001, 2003, Pomeroy *et al*. 2001, Redman *et al*. 2001). Access to preferred pupping sites confers reproductive benefits in terms of greater maternal time investment in offspring (Twiss *et al*. 2000, 2001), increased pup growth rates (Pomeroy *et al*. 2001) and reduced pup mortality (Twiss *et al*. 2003). In particular, access to small pools of water (size range: 0.01-2.5m^2) is critical with females

travelling long distances to gain access to pools in dry periods (Redman *et al*. 2001), and is most likely associated with thermal stress and behavioural thermoregulation (Twiss *et al*. 2002). The number and abundance of pools of water increases through the breeding season as autumnal rainfall (and sea-spray) contributes to the increase in standing water on colony (measures of pool abundance and size (total area) for four dates spread through the 2002 breeding season correlate well with cumulative rainfall during the breeding season (abundance: $r = 0.995$, $p = 0.015$, area: $r = 0.997$, $p = 0.003$)).

RESULTS

Table 1: Summary data for sex ratios, male and female numbers and space use by year. R = Spearman's Rank correlations with rainfall, p = two-tailed significance, p(B) = two-tailed significance with Bonferroni correction for multiple tests.

Notes: All data are for the period between 1st and 25th October: (a) Total Rainfall during October in mm. (b) Number of individually identified males within the study area. (c) Total number of observed successful copulations. (d) Median duration of male stay ashore in days. (e) Median size of male home range in m^2. (f) Mean daily ratio of females per male. (g) 'Female-days' is the cumulative number of females mapped each day and provides an accurate index of female numbers. (h) Median female nearest neighbour distance in m which provides an index of female dispersion patterns. (i) Median of individual female median daily movements in m. We calculated median distance moved between successive days for each known female using their daily locations. Collating all known females for each year provided an overall median measure of daily female movements.

Table 1:

Year	Rain[a]	No. males [b]	Total copul-ations[c]	Male stay[d]	Male home range size[e]	Mean sex ratio[f]	No. female days[g]	Female nearest neighbour distance[h]	Female median daily movement[i]
1996	211.6	104	60	2.5	392.2	6.18	6843	4.13	.
1997	55.5	141	75	3.0	493.5	6.81	7486	4.08	10.13
1998	152.3	153	98	2.0	509.2	6.99	6759	3.88	8.46
1999	132.3	126	103	2.0	524.7	6.00	7041	3.66	7.27
2000	190.3	133	105	3.0	698.9	8.35	6046	3.81	5.38
2001	179.4	114	102	7.0	840.1	7.59	6522	3.52	6.37
2002	91.4	110	80	3.0	739.9	8.67	4990	3.96	7.53
2003	76.2	109	137	.	.	6.42	5906	3.96	.
2004	143.6	101	129	.	.	.	.	.	.
R		-0.12	-0.13	-0.02	-0.07	0.05	-0.02	-0.20	-0.83
p		0.71	0.74	0.97	0.88	0.91	0.96	0.63	0.042
p(B)		1.0	1.0	1.0	1.0	1.0	1.0	1.0	0.34

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