Marine Mammal Scientific Support Research Programme MMSS/001/11

MR 5.4 Report

Inter-haul-out transition rates

Executive summary

The aim of this study was to predict the changes in the number of seals hauled at the South-East Islay Skerries Special Area of Conservation (EIS SAC) in response to disturbance at other haul-out sites.

Telemetry data from 25 harbour seals (*Phoca vitulina*), tagged between 2011 and 2014 at capture sites close to the Sound of Islay, were used to populate a movement model based on individual haul-out transition matrices. This model generalised the matrices in order to represent population movements. Disturbance was modelled as the serial permanent closure of one of the 35 haul-out sites used by the tagged seals. The model excluded movement during the breeding season. The modelled response was the change in numbers hauled out at the Ardmore haul-out site within in the EIS SAC. The varying effect of disturbing different haul-out sites reflected the complexity of the haul-out network.

Most disturbances had a positive effect of the number of seals at Ardmore (range: -0.5% to +21%). Haul-out sites with the largest effects were within 50 km of Ardmore and there was little or no effect when the disturbed site was more than 150 km away, though the response was variable and within 50km distance did not predict which disturbed haul-outs affected Ardmore, as many sites within 50km had little or no effect. Thus the power to infer the effect of remote haulout disturbance by distance alone was limited, other than to say that the effect was greatest within 50 km of the haulout of interest.

However, within a range of 50km, the shortest network path between the disturbed haul-out site and Ardmore provided more information about which sites had an effect. Haul-out site networks adjacent to Ardmore (such as Machrihanish and Eilean nan Coinein) had a larger influence. There was no significant effect when a disturbed haul-out site was more than two transition jumps (connections) from Ardmore. Such network path information can be efficiently obtained in other areas with a simplified and cheaper telemetry system.

The effect of disturbance on the entire EIS SAC depended on the representativeness of the 25 tagged seals' usage within the EIS SAC. The distribution of haul-outs in the August moult survey differed from the haulout usage of the tagged seals in this study. However, this may be due in part to redistribution during the breeding season. If the tagged seals were representative, the proportional effect of a disturbance to the EIS SAC would be similar. If, however, seals that used other haul-out sites in the EIS SAC were part of a completely different network of haul-out sites then the effect reported here would be reduced.

Whilst useful in this study, the model that was developed was essentially mechanistic. The limitations of this approach are reviewed and recommendations about future work using Individual Based Models are made.