Why are Seal and Seabird Colonies where they are?

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BACKGROUND AND MOTIVATION

Ecologists are increasingly being asked to predict the short- and long-term responses of species distributions to rapid environmental change. Such predictions are particularly challenging for vertebrates (such as seals and seabirds) that form conspecific aggregations for all, or parts, of their lives. This is because, in addition to making day-to-day decisions on how to use their immediate environment, these animals must also make large-scale, sometimes life-long, choices concerning their central places (e.g. colonies or looser aggregations). There are three challenges in trying to disentangle these multi-scale effects: First, for each individual, decisions at different scales do not occur independently of each other. The choice of a central place determines the choice of foraging habitat within the animal's range. Conversely, animals are likely to evaluate the quality of foraging habitat before settling at a particular central place. Second, the choice of central place can rarely be made independently of the choices of conspecifics. Social animals may be attracted to central places already established by conspecifics (e.g. for protection or information gathering) but may also avoid dense aggregations due to resource competition or agonistic interactions. Third, the choice of central place may interact dynamically with the distribution of heterospecifics. For example, the distribution of prey is an essential characteristic of habitat quality but more subtle effects, such as predation and interspecific competition may also play a role. To date, there has been remarkably little progress in integrating data to understand how interactions between these different effects determine the locations and sizes of colonies of different species.

STUDY SPECIES

The PhD will consider five seabirds (northern gannets, European shags, common guillemots, razorbills, black-legged kittiwakes) and two pinnipeds (harbour seals, grey seals), chosen to represent a broad range of foraging habitats, ranges and prey capture techniques. This work will help to address the growing public and governmental concern about recent declines in the size of some seabird and seal colonies in the UK (harbor seals and kittiwakes), particularly in the light of considerable expansion in the number and size of the colonies of others (especially grey seals and gannets).

RESEARCH QUESTIONS

Remotely-sensed, high-resolution data on the movements of animals at sea and detailed coastal survey data will be combined with empirical and mechanistic modeling to address the following broad questions:

1. *What is the relationship between the marine environment and the position/size of colonies along the UK coast?*
2. *What is the influence of the terrestrial (coastal) environment on the position/size of colonies?*
3. *Are these interactions with the environment tempered by past and present conspecific density in the same or neighbouring colonies?*
4. *Does the past and present distribution of heterospecifics affect the current configuration of colonies?*

Training & Profile

The supervisors have extensive training experience and a track record of getting students published and into academia or the environmental sector. This exciting, concept-driven project comes at a pivotal time of data abundance, methodological maturity and conservation urgency. The student will be immersed in the activities of the group during this period of rapid developments and form a vital link in their interactions. This PhD would therefore be ideal for a candidate with academic aspirations, an affinity for conceptual thinking, a good understanding of ecological processes, curiosity about the natural world and a keen interest in acquiring quantitative skills.

Relevant References

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