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Making and using predictions of species distributions to improve survey design

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Ecosystem monitoring programmes and environmental niche modelling (ENM, also known as species distribution models) have traditionally had an asymmetrical relationship: data generated by surveys is used to parameterise such models and forms the basis for high-impact publications, but there is rarely feedback in the other direction. However, the knowledge of the factors driving the distribution of a species that ENMs encompass can potentially be of great value to improve the design of surveys. When combined with modern advances in oceanographic observations and modelling, and especially the emerging predictability of some marine systems, the potential exists for great advances. Here I describe the development of a distribution forecast system for Mackerel (*Scomber scombrus*) in the North-east Atlantic. The system has significant forecast and hindcast skill of the spatial distribution of this species, and can therefore be used in real-time (nowcasts) to adapt the design of a survey dynamically. The model also allows prediction of the onset of spawning, thereby allowing the start of the survey to be set to ensure full temporal coverage. Furthermore, the model also shows appreciable forecast skill when coupled to oceanographic forecast models. The application of this approach to the design and execution of the upcoming 2016 Mackerel Egg Survey (MEGS) will be discussed.

Keywords: Environmental niche modelling; Species distribution modelling; Mackerel; predictions; MEGS

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