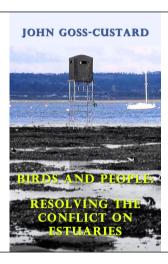Goss-Custard J. 2014. Birds and People: resolving the conflict on estuaries. Kindle Direct Publishing. E-book available from www.amazon.com. 505 pp.
ASIN B00JMCBBQO. US$ 5.86.

Shorebirds that depend on intertidal flats for feeding are vulnerable to changes and disturbances of their habitats. Human activities like shellfishing, infrastructure development and hunting lead to loss and deterioration of shorebird habitat and as a result, many shorebird populations are declining. 'Birds and people' is about the research and the modelling approach that Goss-Custard and his many colleagues have taken to investigate the effects of human activities on shorebird behaviour and populations. 'Birds and people' is available as an e-book; it can be read on a kindle device or on a computer with freely available software. The book chronologically describes about 40 years of ecological research on the Oystercatcher and other shorebird species. The book is suited and is interesting for a broad audience including students, scientists, policy makers, amateur ecologists, conservationists and environmental consultants concerned with the management and conservation of intertidal habitats and shorebird populations.

Clearly, human activities are affecting coastal areas all around the world in many different ways and there is tremendous concern about the negative impact of these activities on shorebird populations. It is usually impossible to quantify the impact of human activities on shorebird populations and it would be tremendously beneficial for conservation and ecosystem management if there were tools that could provide objective and

tractable foundations. This is the void that Goss-Custard and colleagues have been trying to fill by means of long-term ecological research on (mainly) the Oystercatcher and by the development of a quantitative Individual Based Model (IBM) for modelling shorebird populations. Because the natural histories of shorebirds are rich and complex, and because many processes are still undiscovered, developing a model through abstraction, simplification and implementation, is a challenging and lengthy enterprise. 'Birds and people' describes the scientific and social aspects of this enterprise thoroughly and vividly.

The first part of the book describes how the need for a shorebird model arose and it clarifies what ecological population models can be used for. It is noted – and this is an important point – that the type of modelling that Goss-Custard and colleagues had in mind was not meant to predict future population sizes, as this would be unrealistic due to the numerous stochastic factors that influence reproduction and survival. A successful model would, however, be able to assess the impact of a change in the environment (e.g. due to a disturbance or change in management) on a population, assuming that everything else remains the same. In other words, such a model could be used to predict population developments under different scenarios. Because there are important differences between individuals in foraging efficiency and interference sensitivity (i.e. the reduction in foraging speed caused by the presence of conspecifics) which affect spatial distributions and survival, the model had to be 'individual based' (i.e. the properties of individuals are tracked through time rather than averaged over the population). The Exe estuary in south Devon was selected as the study system on which the first version of the IBM was based. Some of the reasons to choose the Exe estuary were related to this estuary's relatively small size and geographical isolation (so that the population is not influenced by birds moving between estuaries). Furthermore, the population size and age-distribution were known and survival rates could be estimated on the basis of a population of colour-ringed individuals. However, before the first Oystercatcher model could be constructed, estimates of metabolism, intake rate, dominance, interference and properties of the prey distribution had to be obtained empirically. The amount of required empirical work was immense and the book gives an animated overview of the field research that was performed over many years and

illustrates the stamina of a group of ecologists dedicated to achieve this task.

When sufficient field information had been collected it was put together in the first version of the IBM, which was used to compute spatial distributions and density dependent mortality rates. The predictions were promising in that generic patterns of the spatial distributions of Oystercatchers across mussel beds were reasonably captured. Yet, there were also discrepancies between predicted and observed distributions, suggesting that the competitive processes between individuals were not adequately captured. In order to get predictions of shorebird mortality right, the spatial distributions, the condition of individual birds over time and food depletion also had to be predicted correctly. The reason is that in complex models one might get predictions right for the wrong reasons, which, of course, is undesirable. A large number of improvements and empirical tests followed, which resulted in an ever progressing matchup between observations and predictions.

The second part of the book describes how the Oystercatcher model is applied to explore the effects of Cockle and Mussel fisheries, human disturbance and infrastructure expansion in the Exe and other estuaries (e.g. Burry inlet, the Wash, Bangor, Cardiff bay, Baie de Somme in France). The management issues that the model is applied to are interesting. In each of the cases the book describes how the model was setup, how predictions were tested, and what the management recommendations were based on the model outputs. Then, a huge leap is made and the model is extended to other shorebird species. It is claimed that this extension is possible because 1) the asymptotes of species-specific functional responses can be calculated on the basis of the size of the predator species and the average biomass of consumed prey; 2) parameters of interference functions can be computed with behaviour-based models on the basis of the distance between foragers. Application of this generic model to the Seine estuary in France showed that the distributions and feeding activity of Curlew, Oystercatcher and Dunlin indeed matched the predictions reasonably well. Unfortunately, empirical mortality rates were not available so this important aspect could not tested. As if the extension to other shorebird species was not enough of a leap, the model was also extended to (herbivorous!) Barnacle and Brent Geese to illustrate how the model could be changed to model the use of and movement between geographically distinct areas.

'Birds and people' gives a wealth of information about many important aspects of the natural histories of foraging shorebird populations and how the key processes were implemented in the IBM. The book blends explanations of scientific concepts and descriptions of natural history with interesting anecdotes about the practical side of fieldwork. The boxes with side notes are usually light but always informative and interesting. They contain amusing anecdotes about researchers, policy makers, conservationists, fieldwork on mudflats, but also serious information about shorebird ecology, methodology and every now and then a bit of useful advice. The clear explanations of concepts, including graphs and figures, provide confidence in the enterprise. Mathematics and implementation details are not included in the book but references to journal papers with technical details are provided at the end of each chapter. I generally admire the bravery and the thoroughness of the enterprise and I appreciate the fact that nearly every possible relevant model test is carried out. However, I also became puzzled about why the model seemed to predict distributions so well, while crucial components of the shorebirds' behaviour were not incorporated. For example, I cannot understand why the model accurately predicts foraging distributions of Dunlins, whose diets are very variable and for whom foraging distributions are strongly influenced by social attraction. I therefore hope that this useful model will continue to be improved, because models should be as simple as possible, but no simpler.

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