of the hard evidence that they do not actually sleep is lacking. If sleep is indeed an inherent property of neuronal groups, as Krueger postulates, it will take more than observational studies to demonstrate that certain species do not sleep. The universal need for sleep is an important hypothesis for the field to pursue, because the existence of a species that can survive and even flourish without sleep could cast doubt on sleep as a crucial behavior. Rial et al. argue that the default attitude towards sleep should be a lack of function. The use of genetic models such as the mouse, zebrafish, and fruit fly offer the promise of testing Rial’s hypothesis by examining sleep functional genes for signatures of selection.

References

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Birds have been moved by humans from one portion of the world to another, intentionally and non-intentionally. These now-exotic organisms have the potential to contribute greatly to major problems in ecology and evolutionary biology. This is because they currently exist in a different environment than the one in which they evolved, and are forced to deal with different potential predators, competitors, parasites, and types of food, as well as with different climatic conditions. Their founding populations were even smaller than population sizes of endangered birds for which there is great conservation concern. There are diverse issues in population biology and community ecology that these introduced birds can be used to address.

This book on avian invasions by Tim Blackburn, Julie Lockwood, and Phillip Cassey addresses these issues in splendid fashion. It lives up to its subtitle in dealing with the ecology and evolution of exotic birds. This book defines the future of invasion biology by using a set of organisms for which the invasion pathway can be used rather than just an invasion event. The invasion pathway is the series of steps by which a native species becomes transported to invasive. At each stage, there is only a subset of species that proceeds to the next. Thus, there are a series of nested comparisons, with ever diminishing sample sizes. There are transported and nontransported species, from which there are released and nonreleased species, from which there are successful and unsuccessful introduced species, from which there are invasive and noninvasive species. Avian exotics are a combination of favored by hunters, delicious, beautiful, lucky and quite adaptable. It is useful to focus on avian exotics because the record-keeping and intentional human actions enable attention to be focused on the early stages of the invasion process. This is not the case for other types of organisms. As such, this book helps to define the field of invasion biology.

The book is organized along the invasion pathway. After an introductory chapter, there are chapters on transport, introduction, and on the success of establishment. For the latter, there are separate chapters on the role of contingency, species’ traits, and locations. Then there are chapters on geographic range expansion of exotic birds, ecology of the birds in novel locations, and genetics and evolution of exotic birds. The book ends with a chapter on lessons learned from exotic birds.

The strategy of the book is to emphasize the simplest explanations and build complexity from these. The simplest factor that determines successful introduction is propagule pressure, the product of the number of attempts at introduction times the number of individuals per attempt.

Consider how relevant propagule pressure is. Everyone knows that islands have more exotic birds than do mainland areas. Much attention has been devoted to understanding how susceptible islands are to invasion. This book does much to redirect attention away from what can now be identified as nonissues. Islands have more species of exotic birds because of propagule pressure. There have simply been more attempts and better attempts at introducing birds to islands. A lot of invasion biology of birds simply does not require ecological explanation. However, while
propagule pressure explains much variance in the success of introductions, there are residuals that comprise unexplained variation. These residuals become the data for determining if ecologically interesting characters are also involved. There are, such as size, reproductive rate, and mating system, but only after propagule pressure is considered first. Otherwise, these other characters are confounded with propagule pressure. This is why exotic birds are so important in dealing with issues in ecology. There are better records of attempts at introductions of birds, so propagule pressure is more readily calculated for birds than for other organisms.

There is a related issue, the concept of propagule bias that the authors adhere to throughout the book, but formally cover in the last chapter. Propagule bias reflects that species that emerge from the transport stage of invasion are far removed from a random set of all species in terms of their traits. It seems natural that to identify traits associated with success one would compare species that establish with the set that was transported, but this would lead to a bias. That comparison would be useful to answer some questions about changes along the way in the invasion process. However, to understand traits that might confer success, the appropriate comparison would be between the species that established and the invaders that failed.

It is worth elaborating on this. Referring to a study of introductions of parrots, a number of characters are important in comparing species that establish with the set that was transported. However, when comparing established parrot species with those that failed to establish, none of the characters in the former analysis were involved, whereas two characters that were not in the former analysis were identified as relevant. These were breadth of diet breadth and migratory tendency, with clear ecological interpretation. Propagule bias will become increasingly important in the field of invasion biology. This book has great value in emphasizing that.

The authors also addressed what they considered to be false dichotomies. One such dichotomy is whether species or location effects are more important for successful establishment. Another is whether deterministic or stochastic effects are more important. The first dichotomy is illustrated by niche breadth of a bird and climatic match between the native range and the location into which it is introduced. Species and location effects are covered in different chapters, but the authors consider both in relation to propagule pressure, and identify both species effects and location effects. It is not whether one is more important than the other. It is when either or both are relevant after propagule pressure is considered. For the second dichotomy, deterministic or stochastic, what could be more stochastic than propagule pressure? Certainly, demographic stochasticity associated with small population size is a direct function of propagule pressure.

There are a few minor quibbles with the book. The authors ignored the survey of the birds of Hawaiian forests (Scott et al. 1986), which showed that several birds introduced into Hawaii have colonized native forests. They also should have mentioned diffuse competition (MacArthur 1972), because this type of competition, in which each native species competes a little with a potential invader, is assumed to prevent a species from invading a community. The authors no doubt realize this, but it would be useful to formally incorporate this theory and data into the book.

In summary, this is an extraordinary book on ecology and evolutionary biology of a special set of birds. Any biologist whose research deals even remotely with introduced species will find much of value. The coverage of life history, range expansion, and changes in niche will appeal to ecologists. The genetics and evolution of introduced birds will be of interest to evolutionary biologists. Without question, this book should be read by all invasion biologists and ornithologists. It would be extremely useful for a graduate seminar.

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