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Movement Ecology of Neotropical Forest Mammals

Focus on Social Animals

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Chapter 1
Why Movement Ecology Matters

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The scientific discipline of "Movement Ecology" (Nathan et al. 2008) has played an important role in advancing our understanding of almost every ecological and evolutionary process, from nutrient cycling, to habitat selection, to population dynamics and community ecology. Interestingly, it has been almost a quarter of a century ago since Rodgers and Anson (1994) stated that GPS-based animal-location systems would become the standard for habitat selection studies. They were right! The data made available from GPS telemetry (i.e., sequence of GPS locations) quickly boosted the field of "Movement Ecology" (Nathan et al. 2008), and this field was also greatly advanced when the Max Planck Institute of Ornithology developed a free online database, Movebank (movebank.org), that allowed movement data from many, many species to be freely accessed and analysed (millions and millions of travel routes). Further advancements became possible with the development and use of new analytical tools to understand the rules used by the study animals to move (Ropert-Coudert and Wilson 2005; Sengupta et al. 2018).

In 2008 a Special Feature of the Proceedings of the National Academy of Science was published that was based on an international project held at the Institute for Advanced Studies in Israel. The Special Feature aimed to generate a conceptual

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framework of movement and of ways of generating and analysing movement paths (Nathan 2008; Nathan et al. 2008). In addition, the Special Feature illustrated the application of the framework to different types of questions and illustrated the scope of the Movement Ecology field, both from theoretical and taxonomic perspectives (Fryxell et al. 2008; Holyoak et al. 2008).

The study of animal movement progressively has become more important as the world has become more and more aware of how human actions were endangering natural systems. Today, the loss of tropical forest is causing the extinction and endangerment of many species (Estrada et al. 2017; Pimm et al. 2014). Globally, it is estimated that biodiversity is being lost at an accelerating rate, with current extinction rates approximately 1000 times higher than background rates (Pimm et al. 2014). Recent estimates suggest that 11,000–58,000 species are lost each year and that surviving vertebrate species have declined in abundance by 25% since 1970 (Dirzo et al. 2014). Humans are clearly responsible for this accelerating loss of biodiversity, particularly in the neotropics. Between 2000 and 2012, 2.3 million km^2 of forest was lost globally, and in the tropics forest, loss increased each year (Hansen et al. 2013). To put this in perspective, this area is approximately the size of Mexico. Global estimates of the extent of wildlife over-exploitation are very poor. However, Bennett et al. (2000) estimated that six million mammals were hunted annually in Malaysian Borneo. With respect to climate change, temperatures are predicted to increase by 1.5 °C by the end of the twenty-first century (IPCC 2014), and using moderate greenhouse gas emission estimates, it is projected that by 2100 75% of all tropical forests present in 2000 will experience temperatures that are higher than the temperatures presently supporting closed canopy forests (Peres et al. 2016; Wright et al. 2009).

This volume represents the culmination of a discussion that stated at our field site 4 years ago. We were both adamant that a greater understanding of animal movement would advance tropical conservation efforts, and we were determined to illustrate this. As a result, we gathered together an amazing group of scholars who worked on animal movement and had them contribute papers to this book. We sincerely hope that when readers finish examining the contributions we have gathered together, they will be convinced of the importance of "Movement Ecology" advancing a myriad of academic questions and addressing many of the most important conservation/management questions. Most importantly, we hope that the chapters in this volume inspire the next generation to devote the huge amounts of time to collect and analyse animal movement data to conserve the amazing mammals that we find in the neotropics.

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