Preface

In this book, the authors present current research in the study of the phylogeny and evolutionary insights, conservation strategies and role in disease transmission in bats. Topics discussed in this compilation include the role of bats in lyssavirus epidemiology; implications for ecological cognitive psychology of human-bat-interactions; molecular phylogeography and conservation of Chinese Bats; and effects of climate change on the world's northernmost bat population.

Chapter I – Rabies is a disease maintained in nature by different reservior species, called reservoirs, also including bats of different eating habits, domestic and wild carnivores. Carini sopposed the possibility that bats play the role of rabies reservoir in herbivores in Santa Catarina State (Brazil) for the first time in the nineteenth century; however, international researchers did not readily accepted this hypothesis, which considered it a "tropical fantasy." Ten years later, a mysterious disease affected the cattle and humans on Trinidad Island in the Caribbean, was diagnosed as rabies. Afterwards, more than 30 occurrences of rabies transmitted by hematophagous bats were recorded in several countries of Latin America (Colombia, Bolivia, Mexico, Venezuela, Paraguay, Argentina, and Brazil). Moreover, at the same time there was the first description of rabies in non-vampire bats in Latin America. However, this finding was neglected. After the first description of a human incident associated with rabies in an insectivorous bat in the state of Florida (USA) in 1953, researchers considered the issue of rabies in non-vampire bats. Since then, public health authorities in the Americas (USA, Canada, Mexico, Guatemala, Panama, Honduras, Colombia, Venezuela and Brazil), Europe (Germany, Turkey and the former Yugoslavia), Asia (Thailand) and Africa (South Africa) became interested in knowing the extent of rabies in non-hematophagous bats, which was confirmed in different bat species of different dietary habits, including insectivores, frugivores, omnivores, pollinivores and piscivores. In recent years, reports of the isolation of rabies virus or viruses related to rabies from bats of different eating habits have become common worldwide, where many of these are called emerging lyssaviruses. The *Lyssavirus* genus is differentiated into 12 geneticlly divergent species: *Rabies virus*, *Lagos bat virus*, *Mokola virus*, *Duvenhage virus*, *European bat lyssavirus 1*, *European bat lyssavirus 2*, *Australian bat lyssavirus*, *Aravan virus*, *Irkut virus*, *Khujand virus*, *West Caucasian bat virus*, and *Shimoni bat virus*. With exception of *Mokola virus*, all other genotypes have been isolated from bats. Even in Japan, a country considered rabies-free, a virus was isolated from the bat *Rhinolophus cornutus*, which showed very similar characteristics to those of a lyssavirus. These emerging RNA viruses are not in a genetic stasis and, through mechanisms of transposition (spillover or species-jumping), mutation, immune evasion and adaptation of viruses to new hosts, new viruses may emerge in the future as pathogens affecting humans.

Chapter II – In Austin Texas, spring brings about not only spectacular shows from over a million Mexican free-tailed bats, but also increased interactions between humans and bats. Every year at the University of Texas alone there are several occasions in which a student will make direct physical contact with a bat, sometimes with potentially deadly consequences. In the present article, the authors evaluate psychological processes that people use to reason about bats. The authors approach the study of bat perception by testing theories of how people learn exceptions to a rule. Many lay people perceive bats as exceptions to the rule "If it has wings, it is a bird". Our research suggests that people rely on an error prone explicit memory system comprising the medial temporal lobes to learn about exceptions. In an experiment, the authors show that one consequence of bats' exception status is that people may be more likely to use knowledge about birds to reason about bats. When compared with non-exception mammals (dogs and hedgehogs), the authors found that people are more likely to assume facts about behavior and physiology in bats apply to birds and vice versa. These results have implications for ecological policy and zoonotic disease transmission in bats.

Chapter III – The climatic fluctuations of the Pleistocene are one of the main historical events that influenced the current distributions and the structure of chiropteran bats throughout China. Molecular findings suggest that climate change during the Pleistocene glacial periods influenced bat species range adjustments, population expansions/colonization, introgression or population divergences due to fragmentation in some refugia in China. These processes have been important in the origin and maintenance of bat biodiversity. The biogeography, taxonomy and conservation biology of Chinese bats is informed by phylogeographic research. In this paper, the authors will chart the main Pleistocene climatic events that determined the current distributions and structure of Chinese bats. The authors will also review the consequences of alternative bat phylogeographic models, and summarize the possible refugia, colonization and introgression patterns of bat populations based on some case studies on Chinese bat species. Finally, the authors will provide some bat conservation recommendations based on our molecular results of bat species in China.

Chapter IV - At the northern limit of the distribution of any bat in the world, the population of *Eptesicus nilssonii* may be particularly vulnerable to changes in environmental conditions. Surveys of nursery roosts in Troms, North Norway (69° 00' N, 19° 00' E) and counts of the numbers of individuals occupying the roosts started in 2000, giving 13 summers of data for the first and, originally, largest roost (termed "main roost"). A dramatic decline in the number of bats in this roost and 6 others was found. The main roost declined from a maximum of 135 bats in 2002 to only 6 bats in 2012. The overall reduction in the mainly adult female population size in 7 roosts from 2005 to 2012 was 70%. One roost increased in 2011 and another increased in both 2011 and 2012, confounding the conclusion of a strict downward trend in the overall population size and indicating some roost switching. For the main roost (with the longest time series), the decline was related to severe winter conditions; periods with little snow cover combined with low temperatures that most probably increased mortality during some hibernation seasons. Less snow and an insufficient snow cover to stabilize the temperature in the subnivean and underground environments have become more frequent over the last decade. If such conditions prevail, the population of *E. nilssonii* in Troms may soon face extinction.