



ZOOLOGY

HANDBOOK OF THE MAMMALS OF THE WORLD. Volume 9: Bats.

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Bats need friends. Although only future research will settle the origin of SARS-CoV-2, the genome of the virus shows telltale signs of its history in wildlife (Y.-Z. Zhang and E. C. Holmes. 2020. *Cell* 181:223–227). A close evolutionary relationship between the human pathogen and a virus of unknown pathogenicity previously found in a *Rhinolophus affinis* bat was uncovered early on (P. Zhou et al. 2020. *Nature* 579:270–273). But subsequent analyses revealed that a key piece of the viral genome, the receptor-binding domain of the spike protein that enables entry into host cells, is more closely related to that of viruses found in pangolins (T. T.-Y. Lam et al. 2020. *Nature* 583:282–285; T. Zhang et al. 2020. *Current Biology* 30:1346–1351.E2). Since SARS-CoV-2 is not a direct recombinant of any of the wildlife viruses sampled to date and bat viruses diverged from the human pathogen some 40–70 years ago (M. F. Boni et al. 2020. *bioRxiv* 2020.03.30.015008), the precise identity of the wild reservoirs that resulted in the spillover to humans remains obscure.

Notwithstanding these specifics, reactions against bats have been swift, with attempts to evict hibernating bats from buildings and suggestions of mass slaughter (H. Zhao. 2020. *Science* 367:1436). Most people may not know it, but we too need bats, and not just because they are indispensable for forest regeneration, pollination of key commercial crops such as agave or durian, and keeping insect pest populations in check (S. J. Ghanem and C. C. Voigt. 2012. Increasing awareness of ecosystem services provided by bats. Pages 279–302 in *Advances in the Study of Behavior*, Volume 44, edited by H. J. Brockmann et al. Waltham (MA): Academic Press). We also need bats because insofar as bat immune systems have been studied, they reveal a series of molecular adaptations to viral infection that could well inform future human therapies and prevention strategies (A. Banerjee et al. 2020. *Frontiers in Immunology* 11:26). This is why education and public un-

derstanding of the natural history of bats—from their diversity, ecological roles to their conservation status and, yes, even the risks from viruses that circulate among bats in the wild—are more urgent now than ever before.

One could do no better than to start an education on bats with the present volume, the result of efforts by 52 contributors comprising a who's who of bat scientists around the world, from Swaziland and Australia to Brazil and Argentina, and from Thailand to Germany and Canada. Despite the Herculean task of comprehensively outlining the biology of more than 1400 species, this volume achieves exactly this with close to no mistakes. However, one noted error is the bat on page 470 is not *Monophyllus plethodon*, but *Phyllonycteris poeyi*. With plates depicting every single species known to date, an introduction that piques interest with its summaries for each family, and spectacular photographs of bats in their natural environment, this handbook combines the vicarious and anticipatory pleasures of leafing through a field guide, with the heft and beauty of an admittedly massive coffee-table book.

Although the field guide-like species accounts for every species have no precedent, the syntheses on individual bat families are the most rewarding to read. To condense thousands of pages of research into brief chapters reveals most of all how much more work is needed to understand the conservation status and human impacts on most bat species (W. F. Frick et al. 2019. *Annals of the New York Academy of Sciences* 1469:5–25). Such briefs naturally take up more space for the most species-rich families, such as Vespertilionidae (85 pages), Pteropodidae (45 pages), Phyllostomidae (43 pages), or Molossidae (21 pages), but most family accounts are considerably shorter reflecting less past research and sparking greater curiosity. What extreme genomic adaptations to life in their arid habitats have yet to emerge from studying the few species in the family Rhinopomatidae? Could *Craseonycteris*, the only extant member of its eponymous family, reveal the limits to body size across mammals? Even the longer accounts inspire. Which particular phyllostomid species inspired the intricate gold breastplates and ornaments of the Tayrona and Calima jewelers or the Mayan representations of the bat of death, Camazotz?

These strengths should give the handbook an audience beyond bat specialists. For biologists, the breadth and erudition of coverage from historical taxonomy to bat-human interactions will prove helpful guides to enduring questions in natural history. For budding naturalists, the accounts point to the literature and offer synthetic introductions to vast and growing fields of research. And for families at home hoping to encourage the next generation of