

RECENT PUBLICATIONS

BOOKS

Nonhuman Primate Welfare: from History, Science and Ethics to Practice, edited by Robinson LM. Springer 260pp. ISBN: 9783030827076. This book reviews the broad topic of welfare in nonhuman primates under human care. Chapters detail ethical and legal issues surrounding the use of nonhuman primates as entertainment or in research, the different approaches to measuring welfare, and how housing, enrichment, and other conditions can foster or degrade welfare. Readers from animal welfare science, primatology, animal testing, veterinary medicine, conservation to ethics and legislation will find this an important account. *Contents:* 1) The history of primates at Zoos – Hosey; 2) The history of chimpanzees in biomedical research – Turner; 3) Using primates in captivity: research, conservation and education – Prescott; 4) The welfare of primates in Zoo – Baker & Farmer; 5) Welfare of primates in laboratories: opportunities of improvement – Buchanan et al; 6) The welfare of primates kept as pets and entertainers – Hevesi; 7) Primates under human care in developing countries: examples from Latin America – Ferreira et al; 8) Using behavior to assess primate welfare – Lutz & Baker; 9) Cognitive bias tasks: a new set of approaches to assess welfare in nonhuman primates – Bethell & Pfefferle; 10) Physiological measures of welfare – Capitanio et al; 11) Questionnaires and their use in primate welfare – Gartner; 12) Meeting cognitive, behavioral, and social needs of primates in captivity – Talbot et al; 13) Primate breeding colonies: colony management and welfare – Ha & Sussman; 14) Common husbandry, housing, and animal care practices – Coleman et al; 15) Housing and husbandry for primates in zoos – Farmer et al; 16) Humane end points and end of life in primates used in laboratories – Wolfensohn; 17) Primate personality and welfare – Robinson & Weiss; 18) Sociality, health, and welfare in nonhuman primates – Beisner et al; 19) Benefits of improving welfare in captive primates – Schapiro & Hau; 20) Enrichment – Kemp; 21) Challenging cognitive enrichment: examples from caring for the chimpanzees in the Kumamoto Sanctuary, Japan and Bossou, Guinea – Morimura et al; 22) Training research primates – Bloomsmith; 23) Arguments against using nonhuman primates in research – Bailey; 24) The indispensable contribution of nonhuman primates to biomedical research – Treue & Lemon; 25) An unexpected symbiosis of animal welfare and clinical relevance in a refined nonhuman primate model of human autoimmune disease – t'Hart et al; 26) Animal welfare, animal rights, and a sanctuary ethos – Greun & Fleury; 27) The welfare impact of regulations, policies, guidelines and directives and nonhuman primate welfare – Bayne et al.

Conservation Technology, edited by Wich SA & Piel A, Oxford University Press. 3620pp. ISBN: 978-0198850250. This is the first comprehensive text to describe the breadth of available technology for conservation and to evaluate its varied applications, bringing together a team of international experts using a diverse range of approaches. Innovative solutions have been driven by dramatic advances in the conservation-technology interface. The use of camera traps, acoustic sensors, satellite data, drones, and computer algorithms to analyze the large datasets collected are all becoming increasingly widespread. *Contents:* 1) Conservation and technology: and introduction; 2) From the cloud to the ground: converting satellite data into conservation decisions; 3) Drones for conservation; 4) Acoustic sensors; 5) Camera trapping for conservation; 6) Animal-borne technologies in wildlife research and conservation; 7) Field and laboratory analysis for non-invasive wildlife and habitat health assessment and conservation; 8) Environmental DNA for conservation; 9) Mobile data collection apps; 10) Application of SMART software for conservation area management; 11) Challenges for the computer vision community; 12) Digital surveillance technologies in conservation and their social implications; 13) The future of technology in conservation.

WHY NEOTROPICAL PRIMATOLOGISTS SHOULD READ *OPOSSUMS*

Book Review of: Robert S. Voss and Sharon A. Jansa (2021) *Opossums: An Adaptive Radiation of New World Marsupials*. Johns Hopkins University Press, Baltimore. 313 pp. ISBN: 9781421439785 (hardcover), 9781421439792 (ebook). <<https://jhupbooks.press.jhu.edu/title/opossums>>

Jessica W. Lynch

Did you know that the opossum *Caluromys* is an agile climber with a primate-like gait and a primate-like diet of fruits, arthropods, small vertebrates and nectar, found throughout Neotropical rainforests? Or that the Neotropics are also home to the world's only semi-aquatic marsupial, the water opossum *Chironectes*, sporting webbed feet and water-resistant fur? That quick and predatory weasel-like opossums, *Lutreolina*, hunt in the Llanos, Cerrado and Pantanal? Or that *Lutreolina* opossums, along with *Didelphis* and *Philander*, are equipped with snake-venom resistance, allowing them to eat coral snakes and pit vipers?

In their new book *Opossums*, Rob Voss and Sharon Jansa bring together these and many other fascinating facts about the understudied taxonomic group, the Neotropical opossums. Voss is a curator in the Department of Mammalogy at the American Museum of Natural History and has worked for decades in the Neotropics on opossums

(and other mammalian taxa, including primates), identifying new species, resolving phylogenetic relationships, and studying species ecology, as well as advancing the study of Amazonian ethnobiology. Jansa, a professor of ecology, evolution and behavior at the University of Minnesota, specializes on phylogenetics and early diversification of marsupials, as well as the biology of venom resistance in snake-eating mammals. In *Opossums* they synthesize for the first time historical and current knowledge about extensive opossum biodiversity in the Neotropics, including opossum phenotypes (morphology, physiology and behavior) as well as opossum natural history (habitats, diets, parasites, predators, competitors and mutualists, and population biology). Beautiful photos and illustrations throughout the book allow readers to learn about and distinguish among the diverse taxa. Voss and Jansa assert that the Neotropical opossums (Didelphimorphia) have been neglected consistently by scientific publishers; this book is a *tour de force* to rectify this situation. It compiles and evaluates previous research findings in a central location with accessible language and clear referencing, and it also points to the diverse gaps in knowledge and needs for further research.

Marsupials are an ancient and native mammalian radiation in South America; however, their fame has been eclipsed by Australian marsupials, and there is a folk-scientific belief that South American marsupials, outcompeted by eutherian mammals, are a relict and depauperate group. Voss and Jansa work hard in this volume to dispel this myth of marsupials as the “victims in a global struggle for dominance with placental mammals” (p. 3), showing instead that Neotropical opossums have persevered and diversified after the appearance of caviomorph rodents and primates, as well as after the more recent introduction of diverse sigmodontine rodents and other North American animal species into South America during the Great American Biotic Interchange. Voss and Jansa point to the diverse habitats occupied by living marsupials—they are found across all primate habitats in the Neotropics, with a primate-like preference for lowland rainforest, but marsupials also extend beyond primates’ modern range into the deserts of Atacama and Monte (*Thylamys*), and even into wet-temperate Patagonian forests (*Dromiciops* and 3 genera of paucituberculatans or shrew-opossums), as well as into tropical thorn scrub in northern Venezuela (*Marmosa xerophila*). The most famous but highly atypical Neotropical marsupial, *Didelphis virginiana*, has expanded its range as far north as Canada.

As described in *Opossums*, Neotropical opossums can have communities of up to 14 sympatric species (i.e. in Paracou, French Guiana), rivalling the most diverse primate communities in Amazonia. Different opossum species also preferentially occupy different microhabitats, from canopy and subcanopy to the understory and

the ground (and for *Chironectes*, streams). In fact, in the Neotropics, there are 116 known species of opossums (Didelphidae), as well as seven species of shrew-opossums (Caenolestidae), and a single species, monito del monte, in the Microbiotheriidae. Together marsupials make up the largest living non-volant Neotropical mammal radiation other than primates and rodents. While living South American opossums are all relatively small (adult weight ranging from 10 g to 3 kg), within ancient South American radiations some marsupial relatives were impressively large and carnivorous, including those similar (at least superficially) to dogs, bears, hyenas or saber-toothed cats. Voss and Jansa characterize both the past and present diversity of the opossum radiation in the book, with detailed taxonomic accounts of all the living genera, and they even provide a check-list for living opossum species.

Voss and Jansa also point to many ways we can think about morphological similarities between opossums and primates. *Caluromys* is reported to “closely resemble cheirogaleid lemurs” (p. 29) and these species can be considered “appropriate living models for testing adaptive hypotheses about early primate evolution” (p. 30). Desert-living *Lestodelphys* has a carrot-shaped tail that becomes seasonally swollen with fat, suggesting parallels to the fat-tailed dwarf lemur (*Cheirogaleus*) that also seasonally stores fat in its tail in harsh habitats in Madagascar (Fietz and Dausmann, 2007). Voss and Jansa also mention several opossum taxa (*Caluromys*, *Hyladelphys*, *Gracilinanus*, *Marmosa*, *Marmosops*, *Thylamys*) in which males may have blue scrotal skin, as seen otherwise uniquely in cercopithecoïd primates; the bright sexual skin coloration is thought to be for social signaling in primates, but its function in opossums is still unknown.

Primates and opossums enter into diverse ecological relationships with one another, and can provide similar or even complementary ecosystem services, for example as seed dispersers and pollinators, as described by Voss and Jansa. In fact, overall platyrrhines “trophically resemble opossums” with a diet of “ripe fruit pulp and insects” (p. 197). Many of the same fruits are consumed in the canopy and subcanopy by large primates and arboreal opossums; then the terrestrial opossums may also eat the remains from these same fruit species that fall to the forest floor. *Marmosa* opossums may compete with callitrichids across their range for insects and small fruits in the understory of primary forest habitats. Another opossum genus *Glironia*, distributed across lowland Amazonia, is thought to eat exudates, like marmosets and tamarins, but it is rare across its range and very poorly studied. As most opossums are nocturnal, it would be especially interesting to compare their ecology to widely sympatric owl monkeys, *Aotus*, the only nocturnal anthropoid. While some marsupials may act as primate competitors, other opossums can be occasional prey for primates such

as gracile capuchin monkeys in the Andes (Pederson et al., 2019), robust capuchin monkeys in the Atlantic Forest (*Sapajus*: Resende et al., 2003; Palmeira and Pianca, 2012) and marmosets in the dry Brazilian Cerrado (*Callithrix*: Camargo et al., 2017).

Opossums are an understudied radiation that evolved in sympatry with primates over millions of years. *Opossums'* last chapter focuses on adaptive radiation, and the molecular time-tree produced by Voss and Jansa (p. 231) reveals that modern South American marsupial diversification can be accommodated within the last 35 million years, beginning just at the arrival of the first platyrrhine ancestors in South America (Bond et al., 2015). This suggests that platyrrhine and opossum radiations are intimately linked across time and space, and comparative biogeography would be a fruitful area for further study. Opossums continue to live in sympatry with primates across the Neotropics today. As primatologists we could do more to advance knowledge about the diverse opossums at our field sites, and to understand the ecological synergies and similarities across opossums and primates. The new book *Opossums* by Voss and Jansa provides a wonderful guide to orient us and an impetus to explore this type of comparative research.

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