Walker's Carnivores of the World. Ronald. M. Nowak. The Johns Hopkins University Press, 2715 North Charles Street, Baltimore, Maryland 21218-4363, USA. 2005. 313 pp. Price: £ 30.00.

Among all the mammalian orders, Carnivora has perhaps been the most sought after in all respects, be it for research or entertainment. Fortunately, trophy hunting for the most part has been abandoned globally, though illegal trade in body parts continues unabated. Although more than 250 species of carnivores (both terrestrial and aquatic) currently exist globally, research has tipped largely in favour of the more 'charismatic' large carnivores such as the large cats, wolves and bears, possibly due to the awe they inspire in us. A large percentage of the members of this order remain practically unknown. Given this scenario, a book encompassing all the families of this order, with descriptions of their natural history and the threats they face is more than welcome.

The book begins with an introduction to carnivores and then discusses each of the eight terrestrial families, with a brief overview followed by details of morphology, distribution, habits and habitats for each species. At the end, it provides a world distribution of genera from order Carnivora. The introductory chapter is lucid and detailed, with a captivating flow. For instance, the authors have described some species as 'surgical killers' due to the precision with which their canines fit the cervical vertebrae of their prey in order to dislocate it and complete the process of killing. It covers all aspects of carnivory such as morphology, variation, diet, reproduction, reasons for group-living versus solitary-living and conservation issues, with extensive referencing including the latest work done in the field.

The major drawbacks are the lack of distribution maps, unappealing black and white pictures, most of them commonly reproduced in other books, and the very small font size. Apart from this, the taxonomy followed, especially in the case of family Felidae, is somewhat confusing. Only four genera have been listed with 38 species. Although felid taxonomy is controversial, the Felid Taxonomic Advisory Group (TAG) revised it in 1996, which was followed by Nowell and Jackson[1]. The problem with giving just four genera, as done in this book, is that it completely misses out certain issues such as evolutionary history, karyotype and morphological variation. For example, the new world felids have 17 pairs of chromosomes, while the old world felids have 19 pairs[2]. The felid TAG recognizes 18 genera and 36 species, the house cat is considered to be a sub-species of the wild cat (*silvestris* group) and the Iriomote cat that of the leopard cat, which has been discussed in the book to some extent. The reason given here for lumping genera was that several species of cats have interbred (though artificially, in captivity) and produced viable offspring. However, in the description of the domestic cat, no mention is made of the several breeds that are currently popular and are in fact hybrids between domestic cats and leopard cats (Bengals), jungle cats (chausies), Geoffroy's cat (safari cats), among others. This could have been mentioned here, since few reports discuss it and it could have ethical/conservation implications.

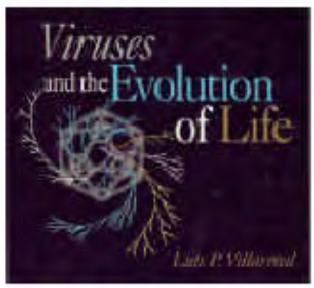
The section on wolves has practically no mention of the Indian population or of the work done in India on wolves, though several publications are available[3–8]. This is despite stating (rather fleetingly) that there are only 500–800 individuals left in India (p. 104) and that the populations from India, Pakistan, Nepal and Bhutan are listed in Cites Appendix I (p. 105).

Overall, despite the drawbacks, this is an important reference book for carnivore ecologists and enthusiasts, since it is one among the very few recent publications that discusses all the terrestrial carnivores under one cover. Little is known about many members of this order and the first paragraph (p. 34), sums up conservation concerns for several species that are largely overlooked due to their relative commonness and small size. It cautions against ignoring such species that despite being classified as 'of least concern', could actually be prone to extinction given their distributions, life history characteristics and behavioural traits.

1. Nowell, K. and Jackson, P. (eds), *Wild Cats: Status Survey and Conservation Action Plan*, IUCN (World Conservation Union), Gland, Switzerland, 1996.
2. Gittleman, J. L., (ed.), *Carnivore Behavior, Ecology, and Evolution*, Cornell University Press, New York, 1989.
3. Jhala, Y. V., Ph D dissertation, Virginia Polytechnic Institute and State University, 1991.
4. Jhala, Y. V., *Conserv. Biol.*, 1993, **7/4**, 874–881.
5. Jhala, Y. V. and Giles Jr., R. H., *Conserv. Biol.*, 1991, **5/4**, 476–483.
6. Jhala, Y. V. and Sharma, D. K., *J. Wildl. Res.*, 1997, **2**, 94–101.
7. Jethva, B. D. and Jhala, Y. V., *Biol. Conserv.*, 2004, **116**, 351–357.
8. Sharma, D. K., Maldonado, J. E., Jhala, Y. V. and Fleischer, R. C., *Proc. R. Soc. London*, 2004, **271**, S1–S4.

SHOMITA MUKHERJEE

Centre for Wildlife Studies,
294, Surabhi,
5th Main, Canara Bank Layout,
Kodigehalli,
Bangalore 560 097, India
e-mail: shomitam@yahoo.com



Viruses and the Evolution of Life. Luis P. Villarreal. American Society for Microbiology, ASM Press, Washington DC. 2004. 395 pp. Price: US$ 120.

Traditionally, viruses have been associated with disease, distress and pestilence. Nevertheless, molecular biologists have known better aspects of this unique group of microorganisms. Viral studies have contributed tremendously to the scientific understanding of molecular mechanisms present in living organisms. The book under review, however, presents an entirely new facet of these interesting organisms – their role in the evolution of life.

Chapter 1 presents overall issues of virus and host evolution, such as lack of fossil records, habitats, population structures, persistent viruses, fitness landscape and tree of life. In closing this introductory chapter, the author contends that it is the viruses that can persist in their host cells that have left their indelible mark and assisted in the evolution of the cells of all life. Chapter 2 on insights from simulated evolution, is an attempt to understand some of the more theoretical aspects of early evolution. It also attempts to evaluate the relevance of these simulations to extant biological systems and processes that are amenable to experimentation. By definition, viruses as 'molecular genetic parasites' would be able to parasitize any genetic replicator, even the non-cellular prebiotic members of the 'RNA world'. Does that mean that viruses were the parasites of the prebiotic world? If so, these must have played a pivotal role in the evolution of replicator molecules. Computer-assisted modelling of replicator evolution also suggests the same.

Chapter 3 is a succinct account of interaction of persistent and lytic phages with bacterial hosts. There is a detailed account of the comparison of phages with plasmids, sex factors, transposable elements and pathogenicity islands (PAI). In recent years, comparative genomics approaches have indicated that ca. 20% of the genome of any bacterium is variable (dynamic) and the rest is stable. The author argues that this 20% of the 'dynamic genome' is contributed by the phages. In addition, there are evidences suggesting that substantial parts of the stable genome may also be contributed by phages, implying an important role of viruses in the evolution of prokaryotes. In the evolution of eukaryotic cells, a similar role could probably have been played by the retroviruses. There is overwhelming evidence that mitochondria and chloroplasts in the eukaryotic cells originated from prokaryotic endosymbionts. The author, however, suggests that the possibility of viral origin of these organelles should also be kept open.

An event that represents major discontinuity in the evolution of life is the origin of the nucleus. Chapter 4 examines in detail various possibilities and puts up a strong case for viral origin of the nucleus. Although it is difficult to correctly identify the virus that might have served as the protonuclear progenitor, several candidate viruses have been examined. These include vaccinia (poxviridae), phycodnaviruses (biocontrol agents of oceanic algal blooms) and pheoviruses (viruses of the filamentous brown algae). The author suggests that many of the eukaryotic cell paraphernalia such as nuclear pores, mitotic spindle and tubulin, introns and RNA modification systems have counterparts among viruses, but not in the prokaryotes. Overall, viruses appear to possess most characteristics that would be needed to span the prokaryotic and eukaryotic kingdoms.

The remaining four chapters (Chapters 5–8) are an extremely detailed account of the interaction of viruses with a variety of eukaryotic hosts, viz. diverse microscopic aquatic organisms (Chapter 5), early animals like worms to fish (Chapter 6), land plants and insects (Chapter 7) and terrestrial animals (Chapter 8). In these, the readers will find interesting references to viral origin of adaptive immunity, intricate relationship among plants, viruses and insects, baculoviruses as models for DNA virus evolution, insect-derived retrotransposons contributing to large-scale retrotransposon colonization of plant genomes leading to speciation, human cognition and endogenous retroviruses, complex behaviour (in human) and viruses, and many more. These constitute a fascinating account of parallelism of diversity and evolution in viruses, plants and animals. In this account, evolution for most part comes out as coevolution (a rather well accepted thesis of late), than viruses having affected evolution profoundly, as alluded to in the first few chapters of the book.

The book presents viruses in a different, albeit, entirely new perspective. It is strongly recommended to those having ardent interest in molecular virology and molecular underpinnings of the origin and evolution of life. In patches, the book would also be useful to those interested in host–pathogen interactions.

Although molecular virologists may find the book endearing for their own reasons that may not necessarily be related to their role in evolution, I am unable to gauge how the evolutionary biologists would react to the reasoning presented therein. The dictum of the author seems to be – 'since you were present there, you surely were involved'. It, however, elevates the whole issue of virus–host interactions and their role in evolution to the level of an intrigue. The author must be complimented for breaking new ice. A recent news published in *The Scientist* (24 May 2005) reported evolution to be the most important thing in science. This book proves it to be the most interesting too.

J. S. VIRDI

Microbial Pathogenicity Laboratory,
Department of Microbiology,
University of Delhi South Campus,
Benito Juarez Road,
New Delhi 110 021, India
e-mail: virdi_dusc@rediffmail.com