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#### BOOK REVIEW

### Naked Mole-rats: A success story of sociobiology

The biology of the naked mole-rats. Eds. P. W. Sherman, J. U. M. Jarvis and R. D. Alexander. *Monographs in Behavior and Ecology*. Princeton University Press, Princeton, 1991; XVI+518 pp.; index ISBN 0-691-02498-0.

A central topic of this remarkable book is the evolution of eusociality as shown by a unique mammal species, the naked mole-rat (*Heterocephalus glaber*). Eusociality has a much narrower meaning than sociality in general and concerns multigenerational colonial species in which there exists a division of labour with a few, sometimes one, individuals capable of reproducing and many other sexually inactive ones doing all work necessary to maintain the colony. It had long been thought that only two orders of insects, *Hymenoptera* and *Isoptera*, fit to this definition until all attributes of eusociality were discovered in some aphids (*Homoptera*) and naked mole-rats, in the mid-1970s and in the early 1980s, respectively.

Charles Darwin was convinced that the phenomena of sterility and self-sacrifice as seen in extreme form in social insects were of critical importance to his theory of natural selection and were potentially able to falsify it if not reasonably explained. He initiated the approach which yielded the theory of kin selection put forward by W. D. Hamilton in the 1960s and the development of sociobiology or behavioural ecology in the 1980s. The prevailing view is now that it is a haplo-diploid genetic system of Hymenopterans that is conducive to the evolution of eusociality and in fact this happened several times independently in these insects. However, haplo-diploidy is not a necessary condition for eusociality to evolve and some other factors causing an increase in mean relatedness between individuals in a population may act in favour of a similar result.



This book is in my opinion one of the most impressive examples of the predictive power of the neodarwinian thinking on animal behaviour. Deduction from sociobiological theory led R. D. Alexander to a picture of a model eusocial mammal in the mid-1970s. He suggested that such a mammal should be a subterranean colonial rodent living in safe expansible burrows in soil rich with food e.g. large tubers, all of which turned out later on to be a good description of *Heterocephalus glaber*. Various conditions favourable to the evolution of eusocial behaviour, including a special role of subsociality, are critically reviewed in Chapter 1 (R. D. Alexander, K. M. Noonan and B. J. Crespi).

The next two chapters (2 – R. L. Honeycutt, N. W. Allard, S. V. Edwards and D. Schlitter and 3 – J. U. M. Jarvis and N. C. Bennett) concern the systematics and evolution of *Bathyergidae* and the ecology and behaviour of different species belonging to this family. The family *Bathyergidae* consist of 5 genera and 12 species of African subterranean rodents characterised by a spectrum of forms of sociality from a solitary life-style to eusociality (a single species, *Heterocephalus glaber*).

Eleven following chapters of this multiauthor book explore a variety of aspects of the naked mole-rat biology. Let us present the most basic findings.

Free-living colonies are variable in size, which is to some extent positively related to their age. Numbers of individuals composing colonies range from 25 to 295. New litters of about 10 young are produced every 70-90 days, irrespective of season. Colonies occupy burrow systems of variable size and complexity. The area of one of mapped systems covered as much as 105000 m<sup>2</sup>.

Establishing new colonies by small number of founders causes relatively high degree of intercolonial genetic differentiation, as contrasted with low within-colony variation. This is true of both nuclear and mitochondrial genomes.

Although descriptive aspects of ethology may be very interesting, one of the most exciting features of the naked mole-rat is the division of colony members into castes which differ in size, but the differences are not discrete. Three working groups are composed of both females and males. Every young individual, when it is three months old, joins the most hardworking cast of diggers and cleaners. The more senior group of little bigger individuals also do maintenance work but less intensively. A third group of still bigger mole-rats protect the colony acting as soldiers and volcanoers. Protecting colony and volcanoing (producing molehills) are certainly risky behaviours because of exposition to predators.

The only sexually active female is the queen and there are up to three breeding males per colony. Other colony members are kept sexually inactive by hormonal inhibitors excreted by the queen with her urine. Thus the authors use both proximate (physiological) and ultimate (natural selection) explanations in their interpretations of the naked mole-rat biology.

In Chapter 15 R. D. Alexander asks several unanswered questions about the biology and evolution of naked mole-rats. They will probably generate new programmes of investigations of this grotesque animal. It is certainly reasonable to recommend this book to all biologists interested in evolutionary biology of sociality.

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