



Phylogenetics of Bees



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BOOK REVIEW

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In light of imminent and massive global economic development, climatic changes, biodiversity loss and their interconnected consequences, this book covers a topic pivotal to all these issues – the phylogenetics of bees and their ecology. Honey bees are one of the most studied insects in the world. At the same time, many important unanswered questions regarding their biology still remain – even the exact number of *Apis* spp. is unknown as it is noted in this book. Following some influential texts on the subject (RUTTER 2013, PLANT & PAULUS 2016), a concentrated review, which the current book represents, arrives just on time. Although the title of the book suggests a somewhat specific topic, the text covers a lot of additional problems such as evolution of the colony and the associated social behaviour in

the family Apidae and current status and drivers of bee biodiversity loss. It also practically delivers a primer on specific bee breeding techniques and beehive management enabling the taxonomic biodiversity loss prevention and conservation.

The text is accompanied by 12 colour plates and 55 black-and-white illustrations. These illustrations are generally well-selected and are a good summary to the written material in helping the reader assimilate it. However, some figures can be improved in quality (it can be assumed that this is due to a somewhat poor resolution of the original sources, rather than editors' or publishers' omission).

The editors were faced at the difficult task to properly structure and summarise the myriad of scientific facts, which, despite their quantity, have some non-insignificant temporal and spatial gaps to the present days. Their hesitation for the proper way to order the differently themed chapters is seen, e. g., by the fact that they have swapped the places of chapters 4 and 5 in the summarising conclusion of the book.

The first chapter follows the evolution of social behaviour in Apidae, following its development from solitary through eosociality and varying degrees of semi-sociality to eusociality, which is its most complex and advanced form. The evolution of the physical form of the nest (including its size, complexity and construction materials) is nicely presented and correlates with the changes in behaviour, both of individual bees and the maturation of the colony as a social evolutionary construct. This edition would only have benefited if even more space was allocated to the importance of bee behaviour, since it is one of the defining characteristics of the species and a Nobel prize was given for the discovery of the bee "dance" (VON FRISCH 1967).

The phylogenetics, diversity, current status and intra- and interspecies diversity of Eastern/Asian (*Apis cerana* – Chapter 2) and Western/European (*Apis mellifera* – Chapter 3) honey bees are presented, up-

dating on the current knowledge (ABROL 2013). The studies are based on molecular, morphometric and biogeographical data, with a separate Chapter 4 on the “classic” honey bee taxonomy and morphometry, at the same time providing the needed background and techniques for making such measurements. The original sources and scientific wisdom about honey bees and other *Apis* spp. spans practically centuries. Concentrated information is presented with emphasis on morphological, historical and biogeographical traits for each taxonomic group.

In Chapters 5, 9 and 10, bee biodiversity and its history in Siberia, South and North America are presented. Each geographical area represents a unique case. For example, the raised by humans honey bee species are native to the Palaearctic, Afrotropical and Indomalayan realms, while in the Nearctic and Neotropics, they were introduced by humans. Each case has its own intermingled and complex history and relationships between humans, domesticated and wild bee species, which representing nowadays a set of complicated challenges to economy and biodiversity. An interesting case is mentioned in the chapter regarding North America. It has been thought for long time that no *Apis* spp. were native before the arrival of modern man to the continent. It turns out that *Apis* spp. were actually present in North America during the Middle Miocene, in the face of the discovery of fossilised remains of a single female worker of *Apis nearctica*, a species which subsequently has gone extinct, probably about 7 million years ago.

An additional chapter is focused on bees in Africa, a subject covered by the classical book by HEPBURN & RADLOFF (1998) and the more recent book by SPIVAK et al. (2019). The latter would be an excellent addition to a future edition of the present book, completing the coverage of the world landmass where honey bees are present.

Chapters 6 and 7 are focused on the loss of biodiversity and its problems concerning the bees in general and particularly in Europe, Asia and Siberia. The main biological (with examples such as the bacteria *Melissococcus plutonius* – causative agent of European foulbrood disease, viruses – the Deformed Wing Virus, insects – *Aethina tumida* (small hive beetle) and arachnids – the notorious *Varroa* mite), chemical (Neonicotinoid and other pesticides) and more complex hazards (loss of habitats, loss of floral biodiversity, farmland mismanagement) to honey bee health are considered underlining their cumulative effects.

Chapter 8 provides baseline knowledge for breeding honey bees with focus on rearing resistant to pests swarms. Globalization brought invasive parasites and diseases to new localities and at the same time the breeding of new, more productive bee strains presents danger to traditional and resistant varieties and augments the problem. The possibilities, knowledge and official current programs and efforts for breeding bees resistant to pests (such as the *Varroa* mite or bacteria) are investigated.

The book successfully looks at the multifaceted problem of bee phylogenetics and biodiversity both from multiple dimensions and multiple levels, starting from specific details to walking the way up to more general principles. In conclusion, the present edition represents a very important summary and a contribution to the field of bee biology and phylogenetics and is recommended to everyone with professional interest in the subject.

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