

Bumblebees: Behaviour, Ecology, and Conservation

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Source: Florida Entomologist, 93(3) : 477

Published By: Florida Entomological Society

URL: <https://doi.org/10.1653/024.093.0332>

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GOULSON, DAVE. 2010. *Bumblebees: Behaviour, Ecology, and Conservation*. Second Edition, Oxford University Press, New York, Hardback, 317pp. ISBN 978-0-19-955306-8 (Hbk.), \$120, ISBN 978-0-19-955307-5 (pbk.), \$55.

This second edition extends and updates the first edition of the book that was published in 2002. Since the first edition, the author notes, there have been over 700 scientific publications on bumblebees, indicating the richness of the scientific field and workers interested in bumblebees. The recent, as well as earlier literature, is scattered in many scientific journals, and this edition brings a wealth of data together in one source. There are many illustrations (50 according to the publisher) and an 8-page section of color plates with 16 illustrations. Plate 16 illustrates the color pattern on the dorsal surface of male and female species of bumblebees in the United Kingdom. There are 70 pages of complete references, an invaluable resource for researchers as well as providing younger workers an entry into the literature. There is a thorough index of topics, including specific pages on which particular bumblebees (listed by scientific name) are discussed.

Chapter 1 presents the evolution, phylogeny and life cycle of bumblebees. Subgeneric relationships are illustrated in a Figure. I found the short Chapter 2: Thermoregulation, particularly interesting. Chapter 3: Social Organization and Conflict, a longer chapter, deals with caste determination, division of activities, gender determination, and sex ratios. Chapter 4: Finding a Mate, also a short chapter, has recent data on scent marking and pheromones that will be of particular interest to chemical ecologists. Chapter 5: Natural Enemies, an extensive chapter, describes work on parasitoids, viruses, bacteria, fungi, Protozoa,

nematodes, and other commensals including cuckoo bees in relationship to bumblebees. Chapters 6, 7, 8, 9, and 10 deal with foraging, forage searching patterns, choice of flower species, and scent marking. Chapter 11: Competition and Niche Differentiation in Bumblebee Communities and Chapter 12: Bumblebees as Pollinators lead into Chapter 13 on the importance of bumblebee conservation. In the final Chapter 14, the author describes both positive and negative effects of introducing bumblebees and honeybees into regions where they are not native. One might think that exotic bumblebees and honeybees would have little or no negative effects on an ecosystem, but the author lists, and then discusses, areas of concern, including competition with native insects for floral resources and nest sites, introgression with native species, transmission of parasites and pathogens to native species, changes in seed set with introduced species, and pollination of exotic weeds.

In addition to being a valuable scientific resource, the hardback copy has a colorful cover with a bumblebee foraging on a clover blossom and is an attractive addition to anyone's library. The paperback version is especially attractively priced, and I recommend both to scientists, naturalists, and libraries.

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