

The Bee Situation

Africanized Honey Bees and Bee Mites.

GLEN R. NEEDHAM, ROBERT E. PAGE, JR., MERCEDES DELFINADO-BAKER, and CLIVE E. BOWMAN, Eds. Horwood, Chichester, U.K., and Wiley, New York, 1988. xviii, 572 pp., illus. \$94.95. Ellis Horwood Series in Entomology and Acarology. From a conference, Columbus, OH, March–April 1987.

The last three decades have brought unanticipated problems of tremendous concern for world beekeeping, particularly where colonies of the European honey bee, *Apis mellifera*, are managed. A few swarms of an aggressive tropical African race of this species, *A. mellifera scutellata*, were accidentally liberated in Brazil in the mid-1950s, resulting in "Africanization" of millions of colonies of bees through most of South America and northward toward Mexico. The honey bee tracheal mite, *Acarapis woodi*, was introduced from Europe into South America and central Asia in the 1950s and has spread recently throughout most of Mexico and the United States. The varroa mite, *Varroa jacobsoni*, which occurred originally on the Asian honey bee, *Apis cerana*, readily transferred to colonies of the European honey bee brought into eastern Asia in the 1950s and then was introduced with shipments of these bees into Europe and South America in the 1970s, spreading to southern Mexico by 1986. These problems have also brought beekeeping into an unfavorable light through exaggerated media reports on "killer bees." An international conference was convened at Ohio State University to assess the problems, and this book, presenting 75 papers by 121 contributors representing 20 countries, constitutes the published proceedings of the conference.

There is stimulating reading here for anyone interested in bees or beekeeping, though some papers may be too technical or theoretical for general audiences. Not surprisingly, the papers on Africanized bees reveal how much more advanced is our knowledge of the honey bee than of its parasitic mites. Various authors emphasize the need to distinguish African races of *Apis mellifera*, of which there are about 10, from the Africanized honey bees that have arisen from the escape of *A. mellifera scutellata*. Although the Africanization of some 2 million colonies of bees of mixed European races through South and Central America would have been expected to diminish the undesirable characteristics of the original African genome, various authors note how Africanized bees remain mostly "African" in behavior and morphology, discussing mechanisms that may thwart hybridization effects and European characteristics. Papers on bee

thermoregulation provide data showing that African(ized) bees may be capable of inhabiting regions with extended cold climatic conditions. Some papers may surprise readers in discussing the breadth of bees' learning ability and in pointing out that some of the African races of bees, whose behavior is inadequately known, may actually have some traits useful for bee management. For useful as well as accurate identification of bee races, two papers recommend the use of combined types of data, including behavioral, morphometric, and biochemical analyses and brood cell size. Above all, from a management perspective, breeding for the most manageable and productive bees is put forward as the primary goal, including the search for and control of beneficial attributes among colonies showing intermediate levels of Africanization.

Among the papers on bee mites that offer new observations or thoughts for further research are those dealing with factors enhancing resistance to mites. A discussion of factors affecting the severity of infestation by varroa mites in European and in Africanized bees points to the need for experimental data on varroa population growth in native African races. Behavioral mechanisms by which varroa's natural host, *A. cerana*, resists infestation indicate factors that may be bred for in *A. mellifera*. One paper documents that the impact of varroa on bee mortality is increased by the presence of acute paralysis virus, which the mite transmits and enhances in virulence. The reported development of an artificial diet and rearing technique for varroa is a major advance for facilitating observation of this mite's behavior. In a paper that contrasts the mouthpart morphology of *Varroa* and *Tropilaelaps* mites, the latter is viewed as a predator that is not necessarily restricted to bees and perhaps can overwinter on alternative hosts in areas where bees become broodless during winter. This calls in question recent predictions that *Tropilaelaps* would not pose a dangerous threat to apiculture if introduced into colder regions.

Only nine papers, with relatively few new observations, are devoted to the tracheal mite, *Acarapis woodi*. Whereas the first of the papers is inaccurate in stating that the nymphal stage has been eliminated in the life cycle of this mite, the second correctly gives observational data on the inert pharate nymphal stage, separate from the larval and adult stages, and also notes behavioral differences between *Acarapis dorsalis* and *A. woodi* that would be interesting to pursue with *A. externus*, the species of external mite morphologically closest to *A. woodi*. A paper on ELISA detection of *A. woodi* within intact bees represents an exciting advance,

though the capability of the technique to distinguish *A. woodi* from *A. dorsalis* or *A. externus* is not convincing as yet.

This book as a whole provides a good current review of its subject and is attractively produced and well organized. Six months after the Columbus meeting was held, infestations of varroa mite were fourfold spread in the United States and Africanized bees had crossed the Isthmus of Tehuantepec in Mexico; the number of species of honey bees of the genus *Apis*, accepted as four or five in the present book, has now gone into flux with the discrimination of several more species; and during 1988 three new books—one each in English, German, and Russian—were published on the varroa mite, providing new compilations of knowledge of its anatomy, biology, detection, and control. As a result of these changes and advances in our knowledge this book will become dated in part. However, it will remain useful in focusing on questions that need to be resolved.

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Water-Formed Structures

Geomorphology and Hydrology of Karst Terrains. WILLIAM B. WHITE. Oxford University Press, New York, 1988. xiv, 464 pp., illus. \$45.

The title of this book accurately represents its content: the concepts and theories of two scientific disciplines applied to a special geologic setting. The literature of karst has traditionally been spread through a wide range of journals covering specialized aspects of geomorphology, geochemistry, geohydrology, sedimentology, and petrology and also collected in newsletters and bulletins of cave exploration clubs and societies. The author has been a major contributor to this diverse literature, and in this book he provides a useful and comprehensive review of the topic.

Although limestone caves are an obvious component of karst terrains, this is not a speleology book. It takes a broader view and synthesizes the parts of geochemistry that relate to dissolution and precipitation of limestone; the parts of fluvial geomorphology that relate to stream flow over and within soluble rocks; the parts of geomorphology that consider karst landscapes; the parts of geohydrology that concern fluid flow over and through solution conduits; and the parts of environmental geology that consider the hazards of ground subsidence and collapse. That some of the conduits are large