

EMDEN, H. F. VAN, AND M. W. SERVICE. 1994. *Pest and Vector Control*. Cambridge Univ. Press, Cambridge, U.K. xii + 349 pp. ISBN 0-521-01083-7. Paperback. \$50.00. ISBN 0-521-81195. Hardback. \$120.00.

Both authors have previously written well-accepted books. HvE has published textbooks on agricultural pest control, of which this one is a descendant. MWS has published on medical entomology and mosquito ecology. Now, they have been persuaded by a publisher to co-author a book on all aspects of control of all pest arthropods. The integration is seamless. The pests in question include agricultural and horticultural pests, stored products pests, household pests, pests of veterinary importance, and pests of public health and medical importance. The authors do not specifically state the target audience, but I believe it would be useful as a textbook for undergraduate students. The book also is a good read for anyone who wants to know the basics.

The text is not loaded down with references to the sources of information. In fact, the end of the book has only three pages of References. This makes it an unsuitable reference book. The trade-off is that it is easy to read. There are 13 chapters. The first two (Man and insects; The causes of pest and vectored disease outbreaks) serve as a general background, including the ways in which human activities have caused problems with pest arthropods. The next three chapters (Insecticides and their formulation; Application of insecticides; Problems with insecticides) concern chemical pesticides. Then follow seven chapters about alternative control methods (Environmental/cultural control; Biological control; Insect pathogens; Genetic control; Pheromones; Plant and host resistance; Other control measures and related topics). Last follows a very thoughtful chapter (Pest and vector management) in which the authors assemble and discuss the concepts they presented in the previous chapters. There is an appendix listing chemical pesticides, pheromones and repellents, and a few microbial insecticides. My characterization of the last chapter in no way implies that the previous chapters were devoid of thoughtfulness and discussion.

The idea of juxtaposing in one book all types of arthropod targets of control has, I believe, led to many interesting contrasts. Those who have enjoyed reading the book as an introduction and want more depth will probably want to read more specialist texts, for example on toxicology, integrated pest management, and host plant resistance.

How many agriculturists realize, for example, that agricultural methods followed in wetland rice cultivation and pig-farming have led directly to vastly increased mosquito populations and disease transmission to humans and pigs? How many realize that many chemical pesticides (albeit with different trade names), also are used against mosquitoes, and that frequent use of such chemicals

against agricultural pests may help to develop resistance to those chemicals by mosquitoes (or vice versa)? How many public health agencies pay attention to the possibility that their use of chemicals against mosquitoes may kill honey bees, reduce pollination of crops, and lead to lower yields? How many agriculturists still do not realize that their use of chemical pesticides against pests may have devastating effects on insect natural enemies which, left alone, might be able to provide a high level of control of the pests in question? How many agriculturists using modern farming methods simply do not want to be bothered with the complexity of scouting for population levels of pests and natural enemies, and would rather apply a chemical pesticide on some schedule to "guarantee" (at least for the moment, and at unwarranted cost) that they will be free of a particular pest problem. From there, we get into pest dynamics, computers, and mathematical models.

Chapter 7, on biological control, in contrast to the other chapters, has several curious statements and errors. On page 154, a statement "The Tachinidae have been far less exploited for biological control; ectoparasitism is the norm" suggests that ectoparasitism is the norm in Tachinidae. I do not know of any ectoparasitoid tachinid. On p. 167, a fly imported into California from Australia as a parasitoid of *Icerya purchasi* Maskell (Margarodidae) is erroneously attributed to Tachinidae. In fact, this fly was *Cryptochetum iceryae* (Williston) (Cryptochetidae).

The topic of one of the discussions is the need by adult insect parasitoids for nectar. The authors write about "repeated failures" of a biological control program headed by George Wolcott in Puerto Rico due to the "absence of suitable flowers for the adult hunting wasp *Larra americana* that were being released to prey on mole crickets (a species of *Gryllotalpa*) in cereal fields." Errors are that the currently correct name of the wasp is *Larra bicolor* (F.), that it is a parasitoid rather than a predator, that its target was *Scapteriscus didactylus* (Latreille), not "a species of *Gryllotalpa*" (in another tribe or even subfamily of mole crickets), which damaged many crops (sugarcane, coffee, vegetable seedlings, pastures, and turf) (Frank & Parkman 1999). In fact, Wolcott's program was proclaimed a partial success by Cruz & Segarra (1992). The truth behind the story is that there exists in Puerto Rico a highly suitable nectar source for the wasp, a native rubiaceous plant called "botón blanco" (*Spermacoce verticillata* L.), but it was and is destroyed as a weed by farmers, grazed by cattle, and exists abundantly only in sandy uncultivated areas, so that its abundance is far from optimal to promote *L. bicolor* popula-

tions (Wolcott 1941). Management of populations of the plant could lead to enhanced populations of the wasp if agriculturists were to treat it as a beneficial wildflower instead of a weed.

The discussion about nectar sources goes on to state that George Wolcott introduced *Cordia* (species not specified) into Mauritius as a nectar source (for what, is not stated) and that this plant became a weed and then itself a target of a successful biological control program. In fact, *Cordia macrostachya* (Jacquin) Roemer and Schultes (Boraginaceae) arrived as a contaminant of sugarcane imported from Guyana about 1890, had become a localized weed in sugarcane fields by 1912, and was dispersed by birds (Goeden 1977). Later, it was for a while propagated as a nectar source for imported tiphiid and scoliid wasps that attacked larvae of a non-native scarab beetle pest of sugarcane (Goeden 1977). Later still, a successful biological control program was undertaken against *C. macrostachya* by importation of a chrymelid beetle and a eurytomid wasp (Wiehe 1960; Goeden 1977). George Wolcott was born in 1889 and did not introduce *C. macrostachya* into Mauritius.

The information on p. 156 about entomopathogenic nematodes is not quite right. The species there called *Neoalectana carpocapsae* has for over a decade been called *Steinernema carpocapsae*. The trade name Nemasys is claimed to apply to *Steinernema feltiae*, stated to be "particularly useful in controlling a number of soil pests (e.g., vine weevil, *Orthorhinus klugi*)." However, The trade name Nemasys is used, with qualifications, for two nematodes, *Steinernema feltiae* and *Heterorhabditis megidis*. In the U.K., 'Nemasys leather jacket killer' (for control of pest tipulid larvae) and in the U.S.A. Nemasys (for control of sciarid fungus gnats) are *S. feltiae*. In the U.K., 'Nemasys chafer grub killer' and 'Nemasys vine weevil killer' as well in the U.S.A. as 'Nemasys H' (for control of

black vine weevil, *Otiorynchus sulcatus*) are *H. megidis*. In the U.S.A. only is sold Nematoc S (*Steinernema scapterisci*, for control of *Scapteriscus* mole crickets), and in the U.K. only is sold Nemaslug (*Phasmarhabditis hermaphrodita*, for control of slugs). These are products of just one company, other species of beneficial nematodes being produced by other companies, so the products and uses are much broader than suggested.

Outside chapter 7, the erroneous use of the verb "to predate" as meaning to prey on, when its correct meaning is "to antedate" (p. 96 and p. 126) caught my attention. The few erroneous examples in this paragraph and the four above are trivial compared to the wealth of correct and appropriate examples interwoven in this most readable text. I would buy this book.

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