
Ecology of Pesticides. A. W. A. Brown. 1978. John Wiley and Sons, New York. 525 p. $25.00.

Dr. A. W. A. Brown is a noted authority on pesticide ecology and his book is the 1st rather complete survey of the literature on pesticide ecology. He covers insecticides, herbicides and fungicides with major emphasis in 3 areas: 1) The fate of the major pesticides in soil and water, 2) the side effects of insecticides on beneficials and non-target organisms and, 3) food chain magnification.

Much of the information in this textbook can be found in Watson and Brown's book, *Pesticide Management and Insecticide Resistance* (1977, Academic Press), Metcalf and Luckman's book, *Introduction to Insect Pest Management* (1977, John Wiley and Sons), as well as many other sources. However, Dr. Brown arranges all of these data in a natural order which students can follow in a general toxicology course. *Ecology of Pesticides* also makes a good reference book to look up LD_{50} effects on microflora and aquatic biota, etc. The Author Index is extensive, complete, and covers 32 pages.—R. L. LIPSEY, Dept. of Ent. and Nema., University of Florida, Gainesville, 32611.

Adaptation and Speciation in the Fall Webworm. T. Hidaka, ed. 1977. Kodansha, Tokyo. 179 p. 5000 yen. Joint or sole authors of individual chapters are T. Hidaka, Y. Hirai, Y. Itô, S. Masaki, and K. Umeya.

When the U.S. forces occupied Japan after WW II, they somehow brought with them *Hyphantria cunea,* the fall webworm. It soon became a serious defoliator of roadside and garden trees and a potential threat to Japan's deciduous forests. In 1966, Japanese scientists organized a Study Group on the Biology and Population Dynamics of *Hyphantria cunea* in Japan. This book summarizes what they have learned thus far.

What they have learned is impressive, and the 5 authors manage to present it in lucid English, effectively illustrating every major finding with pictures, graphs, or tables. The resulting book is more than a scientific natural history of an invading species; it is a model of effective research and skillful reporting.

The basic theme of adaptation and its underlying physiological mechanisms is subdivided into chapters on Larval Life, Life Cycle, Programming, The Biological Clock, Mating Behaviour, Birth and Death, and Past and Future. Topics discussed include nest-webs, silk trails, social behavior of larvae, photoperiodic and thermal control of diapause and development, adult and larval color variation, timing of adult eclosion, mating, life tables, and population dynamics.

In most instances the findings are of sufficient general interest to invite detailed review, but a few exemplars must suffice. The fall webworm is bivoltine in Japan. Adults from overwintered pupae eclose in May when nighttime temperatures are frequently too low for flight. The summer, non-diapause generation ecloses in late July and early August when nights are generally warm. Spring moths eclose mostly in the afternoon, whereas summer moths eclose mostly after dark. Mating, which occurs after the moths

have found host plants, begins in evening for spring adults and at dawn for summer adults. The timing of eclosion and mating depends on light-dark transitions, temperature declines, and their interactions.

Females that have found and settled on a food plant signal their readiness to mate by adopting a characteristic posture and releasing a pheromone which is not effective at long range. Males must fly within ca 3 m of the calling female before they detect her. The pheromone is also not effective at extreme short range! The final approach of the male to the female depends upon visual cues. Males generally did not land or contact a pheromone source they had detected unless a moth or a paper model of 1 was present. The occurrence in the male of larger eyes with more ommatidia than in the female was an initial clue to the importance of vision in sexual pair formation.

Under field conditions the highest mortality is in the final larval instars and is caused by birds and *Polistes* wasps. The importance of these mortality factors was confirmed by covering trees with coarse net (excluding birds but not *Polistes*) and fine net (excluding both). Over the range of webworm densities studied, both factors worked in an inversely density dependent manner making them destabilizing factors. What prevents the fall webworm population from going to extinction or to infinity is still unclear. At high densities the number of eggs laid per female dropped to half the value at low densities but the factor(s) responsible were not identified.

Only the final chapter deals with speciation, and it is concerned mostly with proving the existence of and describing 2 sibling species in North America rather than with how the 2 originated from 1 ancestral species.

The research summarized in this book is only the 1st phase of a plan to monitor the continuing adaptation of the fall webworm ("blackheaded" sibling species) as it spreads to its eventual limits in Japan. We can hopefully look forward to a sequel describing the changes in the fall webworm in Japan and its divergence from its North American relatives—perhaps even its speciation.

The present book will reward any reader interested in how insects have adapted to their environment and how one goes about learning the details. It should, in particular, be read by those dealing with other invading species. —THOMAS J. WALKER, Dept. of Ent. & Nema., University of Florida, Gainesville, 32611.

Fresh-Water Invertebrates of the United States, 2nd ed. Robert W. Pennak. 1978. John Wiley and Sons, Inc., New York. xv + 803 p., 548 figs. $27.50.

1978 was a banner year for North American aquatic biologists. First, Merritt and Cummins' *An Introduction to the Aquatic Insects of North America* appeared. This was followed by Dr. Pennak's book with its splendid coverage of fresh-water invertebrates, which complements the first even though it includes insects.

The 1st edition of "Fresh-Water Invertebrates" was virtually indispensible to my students in aquatic entomology. They found the keys most helpful in identifying their insects after which they then turned to works dealing with specific orders to confirm the name and to find descriptions and eco-