

## **Principles and Procedures for Rearing High Quality Insects**

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Source: Florida Entomologist, 93(2) : 329

Published By: Florida Entomological Society

URL: <https://doi.org/10.1653/024.093.0234>

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SCHNEIDER, J. C. (ED.) 2009. Principles and Procedures for Rearing High Quality Insects. Department of Entomology and Plant Pathology, Mississippi State Univ. xi + 352 pp. ISBN 978-0-615-311906, hardback, \$69.95 (to US addresses +\$5.05 for shipping by US mail and handling), order at <https://www.irc.entomology.msstate.edu>

The last book to cover this subject area thoroughly was Singh & Moore (Eds.) 1985, Handbook of insect rearing. Now out of print, that book had been the standard for a quarter century. This new book, in large format ( $8.5 \times 11$ ), is carefully integrated to cover all aspects of rearing, and is a worthy successor. Not only that, but it provides excellent value, with printing costs subsidized by a contribution from BASF Corporation.

The concentration of this book is on medium-scale rearing using artificial diets, but it is relevant also to industrial-scale rearing and even to trouble-shooting in small-scale (tabletop) rearing. It has 11 chapters followed by an 18-page index, and it has nine contributors, 10 of them based in the USA, one a USDA employee based in Panama. Chapter 1 is a short Introduction explaining the diverse needs for reared insects, and the taxonomic diversity of reared insects (a 1987 publication claimed 676 species reared in more than 1500 cultures worldwide).

Chapter 2 is about insectary design and construction and, like so many other chapters, is essential reading. Among its many examples is that of the large-scale facility constructed near Tuxtla Gutierrez, Chiapas, Mexico, in the 1970s to rear billions of screwworm flies. Chapter 3 concerns management of an insectary, the need for planning and organization, and personnel management. Chapter 4 covers issues of the health and safety of workers in an insectary, with all the hazards that occur in other factories, but also with consideration of hazards special to insectaries: allergens and pathogens.

Of course, insects reared under artificial conditions will be placed under selection pressure to adapt, and this is a concern. Chapter 5 considers the genetics of reared insects and how the genetic quality of reared populations may be managed. Chapter 6 is titled 'Environmental biology of insect rearing' and deals with aspects of the environment (light, temperature, and humidity) within the insectary and how these must be regulated for the well-being of the insect occupants. It is peppered with 23 text boxes, each containing a helpful tip from the experience of the author. This chapter and its tips are helpful even to very small-scale rearing efforts outside rooms that might formally be designated insectaries.

Chapter 7 on insect nutrition, feeding, and diets, is arguably the very core of the book. Perhaps a whole book could be written on this topic alone (menus for reared insects), but this chapter does not have the space to deal with more than gener-

alities. Although the chapter leads toward the use of artificial diets for their economy in large-scale rearing, it must be noted that artificial diets for several insects are now available commercially for purchase. Also, for those persons wishing to develop a new artificial diet, some of the basic ingredients can be purchased ready prepared, such as Wesson salt mixture, and Vanderzant vitamin mixture.

Chapters 8 and 9 together occupy 140 pages, almost 40% of the book. They are on microbial contamination and insect rearing, and entomopathogens and insect rearing. As anyone who has tried to rear insects knows, pathogens can have a disastrous effect on an insect culture. What are these pathogens? How does contamination occur and how can it be minimized? How do diets get contaminated and how can this be minimized? What is the interplay between the human employees, the insect diets, and the insect cultures in fostering contamination, and which pathogens are dangerous to humans?

Although Chapter 3 already dealt with management of insectaries, Chapter 10 takes a hard look at quality control of their product. The insects produced obviously must be healthy and fit for their stated purpose. They must also be produced on time and in the planned quantity. Monitoring and testing obviously are required as in other industrial processes. Optimization is the key word. The chapter again mentions the screwworm rearing facility at Tuxtla Gutierrez, but also one for production of Mediterranean fruit fly, *Ceratitis capitata* (Wiedemann) (Diptera: Tephritidae) at Metapa de Dominguez, Chiapas, Mexico, which was constructed in 1979 and likewise has produced billions of flies.

The final chapter (11) takes a detailed look at a rearing production system for the southwestern corn borer, *Diatraea grandiosella* Dyar (Lepidoptera: Crambidae) at Mississippi State Univ. and touches on all the subjects (relevant to it) that appeared in the preceding chapters (relevant to insect rearing in general). This book is not something that any entomologist might pick up and skim just for pleasure, but it is something that any entomologist who gets serious about rearing insects should own and become familiar with.

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