

Food Webs of Insects and Their Kin

A Computer Database

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MENUS/INDEXES

- Insects and their kin
 - Insects and their kin by ID Numbers
[precursors to hyperlinks]
 - Taxonomic Index
 - Alphabetical Index to Scientific Names
 - Alphabetical Index to Common Names
 - Environmental Impact (qualitative) (*with Insects etc. listed appropriately*)
 - Environmental Impact on Materials
 - Improving the Soil / Recycling Wastes
 - Damaging Structures
 - Infesting/Consuming Household Goods
 - Infesting/Consuming Foodstuffs
 - Producing Valuable Products (or simply inspiring beautiful designs)
 - Environmental Impact on Plants Feeding on Roots (or other underground parts of plants)
 - Chewing on the Shoots of Plants
 - Sucking Sap from the Shoots of Plants
 - Tunneling within Pithy Stems (including Tubers) or Roots
 - Boring within Woody Roots, Trunks, Branches, or Twigs
 - Mining within Leaves
 - Burrowing within Fruit and/or Seeds
 - Making Galls in Plants
 - Infecting Plants with Disease (specified)
 - Laying Eggs in and, thus, Injuring Twigs
 - Controlling Weeds
 - Pollinating Plants
 - Environmental Impact on Animals (including *Homo sapiens*)
 - Posing a Medical/Veterinary Threat (specified)
 - Serving in Medical/Scientific Research
 - Serving as Food for Wildlife / Human Beings
 - Controlling Other Invertebrates (See Biological Controls)
- Plants as Foods/Hosts (*with Insects etc. listed as feeders*)
 - Alphabetical Index
 - Botanical Groups
 - Agricultural Groups (plants in general)
 - Agronomic Crops (in general)
 - Lawns/Turf (in general—see also Grass and Legume families)
 - Vegetable Crops (in general)
 - Flower/Foliage Plants (in general)
 - Shrubs/Trees (in general)
 - Fruit Crops (in general)
 - Nut Crops (in general)

- Nurserystock (in general)
- Seedlings (in general)
- Weeds (in general)
- Animals (other than insects and their kin) as Prey/Hosts (*with Insects etc. listed as predators/parasites*)
 - Miscellaneous Invertebrates
 - Vertebrates, in general [Subphylum Vertebrata, of Phylum Chordata]
 - Bony Fishes [Class Osteichthyes]
 - Amphibians [Class Amphibia]
 - Reptiles [Class Reptilia]
 - Birds [Class Aves] (specified)
 - Mammals [Class Mammalia] (specified)
- Biological Controls (*with Insects etc. listed as prey/hosts*)
 - Pathogens/Commensals & Parasitic Worms (specified)
 - Insects and their kin as Parasites/Predators
 - Vertebrates as Predators (specified)
 - Commercially Available Organisms & their North American Suppliers
- Notes
 - Disclaimer
 - Introduction (*below*)
 - Conventions
 - Expanding Food Webs of Insects and their Kin
 - Major References (*below*)

— *Annual Review of Entomology*, 1984

Arguably, the four most complex subjects in the world are seismology, meteorology, psychology, and entomology: It is not surprising that computers should be extensively employed in each of these studies. This work attempts to shed some light on the myriad ecological interrelationships of some representative insects and other invertebrates commonly of concern to North American entomologists. Not only does this study stimulate basic scientific interest; but it also forms the basis for the biological control of agricultural, structural, and medical insect pests.

Dealing with the most diverse group of life on Earth, this database necessarily omits far more than it includes (including such data as acanthocephalans as parasitic worms/medical threats and insectivorous plants as "predators" of insects). In particular, the reader is encouraged to investigate such good works as those listed as my Major References, especially for more quantitative data and considered theory than exists in this "laundry list" database. In doing so, one will also note that at least some of the data is considered suspect (even if it is not marked with a "?" in this database): In addition to filling the gaps in the data, even existing data should be independently confirmed and re-confirmed before it is given the weight of scientific fact.

INTRODUCTION

"There can be no doubt ... that farm computerization will have as much impact as did farm mechanization decades ago."

As explained more fully in the database, no attempt has been made to provide comprehensive data for hyperparasites (and "hyperpredators" and "hyper-pathogens", if you

will, as well as hyper-hyperparasites, etc.): Once again, the reader is encouraged to investigate other references and conduct independent studies—under quarantined and otherwise strictly regulated conditions—to "expand the webs" and ascertain the complete impact on and by the environment for a given species in a given ecosystem.

See "Expanding *Food Webs of Insects and their Kin*" for adding your own data to this data base: These instructions are included not only as text on disk, accessible with this "webs" program, but also as hardcopy, for reference while modifying files on disk (Remember to make working copies of the disks first!). Incidentally, a hardcopy of any screenful of information can be generated with a standard printer by simply pressing SHIFT-PRTSC (typical for DOS software).

Please note that the numbering system employed (a 2-digit order number followed by a 2-digit family number and a 3-digit genus/species number, as indicated by "XX.XX.XXX" below) is much like your telephone number: Do not attach too much significance to it—the numbering system evolved as the project developed. Although the order numbers are in a rather generally accepted taxonomic order, the family numbers are rather randomly assigned within each order; and the genus/species numbers are very randomly assigned (as with numerous "gaps") within each family. Just use them as they come (Prompts will instruct you if you have entered an invalid number or if, as in the case of a family with species entries but no general entry, there is "no data").

In researching this database, remember to consult higher taxonomic groupings (ex. 57.00.000 and 57.32.000 for 57.32.003) for possible foods/predators/threats/etc. However, be aware that an order or family entry is often more of a "catchall" than a comprehensive summary.

Because of the sheer of volume of material (and my limited resources), the bulk of this database has been automatically compiled: The reader must assume some "editorial" responsibility, as by consulting taxonomic lists and alphabetical lists to account for the inevitable misspellings and redundancies (and please never hold any of my references responsible for my obvious to subtle errors!).

Finally, it is worth remembering that not all controls over insect populations consist of pathogen/parasite/predator "teams", attacking various life stages of their hosts/prey: Such natural factors as weather as well as such artificial factors as cultural and chemical controls and pollution are, of course, very significant. However, most pest outbreaks result from disruptions in the populations of such general predators as spiders, ground beetles, or birds: By protecting such species and by introducing into ecosystems carefully selected, typically highly selective pathogens and parasites—co-evolved and co-evolving with often chemically resistant pest populations—agriculture and the rest of our society can be not only safer but also more efficient in the long-run.

MAJOR REFERENCES

Borror, Donald J., Dwight M. DeLong, and Charles A. Triplehorn, *An Introduction to the Study of Insects*, Fourth and Fifth Editions, Saunders College Publishing, San Francisco, CA, 1976 and 1981.

Borror, Donald J., and Richard E. White, *A Field Guide to the Insects of America North of Mexico*, The Peterson Field Guide Series, Houghton Mifflin Company, Boston, MA, 1970.

Burges, H. D., Editor, *Microbial Control of Pests and Plant Diseases 1970–1980*, Academic Press, San Francisco, CA, 1981.

Burges, H. D., and N. W. Hussey, Editors, *Microbial Control of Insects and Mites*, Academic Press, New York, NY, 1971.

Cantwell, George E., Editor, *Insect Diseases*, Marcel Dekker, Inc., New York, NY, 1974.

Ignoffo, Carlo M., "Living Microbial Insecticides," in *Essays in Applied Microbiology*, J. R. Norris and M. H. Richmond, Editors, John Wiley and Sons, New York, NY, 1981.

Little, V. A., *General and Applied Entomology*, Third Edition, Harper and Row, Publishers, Inc., San Francisco, CA, 1972.

Lynch, J. M., and J. E. Hobbie, Editors, *Micro-Organisms in Action: Concepts and Applications in Microbial Ecology*, Blackwell Scientific Publications, Palo Alto, CA, 1988.

Maggenti, Armand R., *Introduction to*

Nematology (lecture notes), University of California, Davis, CA, 1977.

Poinar, George O., Jr., *Nematodes for Biological Control of Insects*, CRC Press, Inc., Boca Raton, FL, 1979.

Stefferd, Alfred, Editor, *Insects: The Yearbook of Agriculture 1952*, United States Department of Agriculture, Washington, DC, 1952.

Stoetzel, Manya B., Chairman, Committee on Common Names of Insects, *Common Names of Insects & Related Organisms 1989*, Entomological Society of America, Lanham, MD, 1989.

Swan, Lester A., *Beneficial Insects*, Harper and Row, Publishers, New York, NY, 1964.

Swan, Lester A., and Charles S. Papp, *The Common Insects of North America*, Harper and Row, Publishers, Inc., San Francisco, CA, 1972.

Thompson, W. R., and F. J. Simmonds, Directors of Preparation, *A Catalogue of the Parasites and Predators of Insect Pests*, Imperial [later Commonwealth] Agricultural Bureaux, Belleville, Ontario, Canada, 1943 – 1964. (The reader is encouraged to research supplementary volumes of this enormous reference published from 1971 as *A Catalogue of Parasites and Predators of Terrestrial Arthropods*, prepared by B. Herting, under the general direction of F. J. Simmonds.)

Yepsen, Roger B., Jr., Editor, *Organic Plant Protection*, Rodale Press, Inc., Emmaus, PA, 1976.