AMERICAN BEETLES

Polyphaga:
Scarabaeoidea through Curculionoidea

Ross H. Arnett, Jr. • Michael C. Thomas
Paul E. Skelley • J. Howard Frank
VOLUME 2

AMERICAN BEETLES

Polyphaga:
Scarabaeoidea through Curculionoidea
AMERICAN BEETLES

Polyphaga:
Scarabaeoidea through Curculionoidea

Edited by
the late Ross H. Arnett, Jr., Ph.D.
Michael C. Thomas, Ph.D.
Paul E. Skelley, Ph.D.
and
J. Howard Frank, D. Phil.
COVER FIGURES: Center - Coccinellidae, Harmonia axyridis (Palles) [Photo by Fred J. Santana]. Outer rim, clockwise from top: Ripiphoridae, Macrosiagon erasatum (Germar) [by Fred J. Santana]; Meloidae, Lytta magister Horn [by Charles L. Bellamy]; Carabidae, Rhadine exilis (Barr and Lawrence) [by James C. Cokendolpher]; Melyridae, Malachius mirandus (LeConte) [by Max E. Badgley]; Lampyridae, Microphotus angustus LeConte [by Arthur V. Evans].
To Ross H. Arnett, Jr.
1919-1999

and

Mary Arnett
1919-2002
Preface

It has been nearly 40 years since Ross H. Arnett, Jr. published the first fascicle of The Beetles of the United States: A Manual for Identification. It quickly became an indispensable tool for professional and amateur coleopterists, general entomologists, and naturalists. Although there were four additional printings it has long been out of print and difficult to obtain. It was prepared to replace Bradley’s A Manual of the Genera of Beetles of America, North of Mexico, which itself was some 30 years out of date in 1960. American Beetles is, in turn, designed to replace The Beetles of the United States. It is hoped that it will prove to be as useful as its predecessor.

Ironically, much of the preface to the original edition applies today as well as it did 40 years ago:

Many genera have since been described and reported within the area concerned, and many families have been revised. Extensive changes have been made in the family classification of the beetles of the United States during this period.

The aim of this series of fascicles is to provide a tool for the identification of adult beetles of the United States to family and genus with the aid of illustrations, keys, descriptions, and references to sources for keys and descriptions of the species of this area. All of the genera known to inhabit this area are included in the keys and lists of genera which follow.

The design and format of this work follow closely that of the original edition, but the way it was put together was quite different. Its predecessor was very much the work of one man, Ross H. Arnett, Jr. With a few exceptions (George Ball wrote the carabid treatment for both the 1960 edition and for this one), Dr. Arnett wrote the family treatments of The Beetles of the United States. Many specialists reviewed those chapters, but they were almost entirely Dr. Arnett’s work.

When Dr. Arnett announced plans to prepare a work to replace The Beetles of the United States, coleopterists literally lined up to volunteer their time and expertise in preparing the family treatments. Ultimately, more than 60 coleopterists participated in the preparation of American Beetles. This has truly been a community project.

Due to the size of the ensuing work, American Beetles is being printed in two volumes. Volume 1 includes the introductory material, and family treatments for the Archostemata, Myxophaga, Adephaga, and Polyphaga: Staphyliniformia. The remainder of the Polyphaga and the keys to families appear here in Volume 2.

Sadly, although Dr. Arnett initiated this project and was instrumental in its planning, he did not live to see its fruition. He became seriously ill in late 1998 and died on July 16, 1999 at the age of 80. We hope he would be pleased with the outcome.

Michael C. Thomas, Ph.D.
Gainesville, Florida
April 3, 2002
Acknowledgments for Volume II

Originally, Ross Arnett was to have authored many of the family treatments, especially for those families with no specialists available. His death in 1999 left many families without an author. Several volunteers stepped forward, but Dan Young of the University of Wisconsin took responsibility for more than his fair share and got several of his enthusiastic graduate students involved in the project also. The members of the Editorial Board, listed in the Introduction, provided guidance, advice, and constructive criticism, but J. Howard Frank of the University of Florida has been outstanding in his unwavering demands for scholarship and proper English, and joined Paul E. Skelley and Michael C. Thomas, both of the Florida Department of Agriculture and Consumer Services, as an editor of Volume II. John Sulzycki of CRC Press has been more than helpful throughout some trying times.

Many of the excellent habitus drawings beginning the family treatments were done by Eileen R. Van Tassell of the University of Michigan for *The Beetles of the United States*, and for Volume 2 of *American Beetles* she produced excellent new ones for families 100, 108, and 119.

Authors of the family treatments often have acknowledgments in their respective chapters throughout the body of the text.

Ross Arnett's widow, Mary, was always his support staff throughout his long and productive career. After Ross' death, she helped by providing free and gracious access to Ross' files, and by her steady encouragement and quiet conviction that we would indeed be able to finish this, Ross Arnett's last big project. Unfortunately, Mary Arnett did not live to see Volume II published. She became ill in the fall of 2001 and died on January 3, 2002.

And I would like to again acknowledge my wife, Sheila, for her patience and forbearance during the long and sometimes difficult path that led to this volume.

Michael C. Thomas, Ph.D.
Gainesville, Florida
April 3, 2002
Contributors to Volume 2 of American Beetles

Authors

Rolf L. Aalbu, Ph.D.
Department of Entomology
California Academy of Sciences
Golden Gate Park
San Francisco, CA 94118-4599
106. Tenebrionidae.

Robert S. Anderson, Ph.D.
Canadian Museum of Nature/Entomology
P.O. Box 3443, Station D
Ottawa, ON K1P 6P4 CANADA

Fred G. Andrews, Ph.D.
California Department of Food and Agriculture
Plant Pest Diagnostics Laboratory
3294 Meadowview Rd.
Sacramento, CA 95832-1448
95. Latridiidae.

Ross H. Arnett, Jr., Ph.D.
Senior Editor

C. L. Bellamy, D.Sc.
Entomology
Natural History Museum
900 Exposition Blvd
Los Angeles CA 90007, U.S.A.
40. Schizopodidae; 41. Buprestidae.

Marco A. Bologna, Ph.D.
Dipartimento di Biologia
Università degli studi “ROMA TRE”
Viale G. Marconi, 446
I-00146 ROMA
111. Meliidae.

Yves Bousquet, Ph.D.
Eastern Cereal and Oilseed Research Centre
Agriculture and Agri-Food Canada
Ottawa, ON K1A 0C6, CANADA
79. Monotomidae.

Stanley Bowestead, Ph.D.
Department of Entomology
The Manchester Museum, The University
Manchester M12 9PL England
94. Coryphidae.

Kirby W. Brown, Ph.D.
P.O. Box 1838
Paradise, CA 95967
106. Tenebrionidae.

J. Milton Campbell, Ph.D.
420 Everetts Lane
Hopkinsville, KY 42240
106. Tenebrionidae.

David C. Carlson, Ph.D.
4828 Dauntless Way
Fair Oaks, CA 95628

Donald S. Chandler, Ph.D.
Department of Zoology
University of New Hampshire
Durham, NH 03824
117. Anthicidae; 118. Aderidae.

Shawn M. Clark, Ph.D.
Monte L. Bean Museum
Brigham Young University
Provo, UT 84602
122. Megalopodidae; 123. Orsodacnidae; 124. Chrysomelidae.

Arthur V. Evans, Ph.D.
Department of Entomology
National Museum of Natural History
Smithsonian Institution
c/o 1600 Nottoway Ave.
Richmond, VA 23227
34. Scarabaeidae: Scarabaeinae.

Zachary H. Falin
Division of Entomology
Natural History Museum and Biodiversity Research Center
Snow Hall, 1460 Jayhawk Blvd.
Lawrence, KS 66045
102. Rhipiphoridae

R. Wills Flowers, Ph.D.
Center for Biological Control
Florida A & M University
Tallahassee, FL 32307
124. Chrysomelidae.

J. Joseph Giersch
Department of Entomology
Montana State University
Bozeman, MT 59717
65. Jacobsoniidae

Arthur J. Gilbert
California Department of Food and Agriculture
2889 N. Larkin St., Suite 106
Fresno, CA 93727
124. Chrysomelidae.

Bruce D. Gill, Ph.D.
4032 Stoneridge Road
Woodlawn, ON K0A 3M0, CANADA
34. Scarabaeidae: Scarabinae.

Michael A. Goodrich, Ph.D.
Department of Biological Sciences
Eastern Illinois University
Charleston, IL 61920
88. Byturidae; 89. Biphyllidae

Robert D. Gordon, Ph.D.
Northern Plains Entomology
P.O.Box 65
Willow City, ND 58384
128. Attelabidae.

Dale H. Habeck, Ph.D.
Entomology and Nematology Department
University of Florida
Gainesville, FL 32611
76. Bruchypterae; 77. Nitidulidae.

Robert W. Hamilton, Ph.D.
Department of Biology
Loyola University Chicago
6525 North Sheridan Road
Chicago, IL 60626
128. Attelabidae.

Henry A. Hespenheide, Ph.D.
Department of Organismic Biology
University of California
Los Angeles, CA 90095-1606
131. Curculionidae: Conoderinae.

Frank T. Hovore, Ph.D.
14734 Sundance Place
Santa Clarita, CA 91387-1542
28. Pleocomidae.

Anne T. Howden, M.Sc.
Canadian Museum of Nature
P.O. Box 3443, Station D
Ottawa, ON K1P 6P4 Canada
131. Curculionidae: Entiminae.
Michael A. Ivie, Ph.D.
Department of Entomology
Montana State University
Bozeman, MT 59717


John A. Jackman, Ph.D.
Department of Entomology
412 Heep Center
Texas A & M University
College Station, TX 77843

101. Mordellidae.

Mary L. Jameson, Ph.D.
W436 Nebraska Hall
Systematics Research Collections
University of Nebraska State Museum
Lincoln, NE 68588-0514

Paul J. Johnson, Ph.D.
Insect Research Collection, Box 2207-A
South Dakota State University
Brookings, SD 57007
42. Byrrhidae; 58. Elateridae; 55. Cerophytidae; 57. Throscidae.

Kerry Katovich
Department of Entomology
University of Wisconsin-Madison
Madison, WI 53706
39. Rhizoperidae; 47. Heteroveridae.

John M. Kingsolver, Ph.D.
Florida State Collection of Arthropods
P.O. Box 147100
Gainesville, FL 32614
68. Dermestidae; 121. Brechidae.

David G. Kissinger, Ph.D.
24414 University Avenue #40
Loma Linda, CA 92354

Boris A. Korotyaev, Ph.D.
Zoological Institute
Russian Academy of Sciences
Universitetskaya nab 1.
St. Petersburg, 199034, Russia
131. Carabionidae: Centorlynchinae.

Nadine L. Kriska
Department of Entomology
University of Wisconsin-Madison
Madison, WI 53706
109. Oedemeridae.

John F. Lawrence, Ph.D.
12 Hartwig Road
Mothar Mountain
Gympie, QLD 4570 Australia
98. Ciidae.

Richard A.B. Leschen, Ph.D.
New Zealand Arthropods Collection
Landcare Research, Private Bag 92170
120 Mt. Albert Road, Mt. Albert
Auckland, New Zealand

James E. Lloyd, Ph.D.
Entomology and Nematology Department
University of Florida
Gainesville, FL 32611
62. Lampyridae.

Wenhua Lu
Wes Watkins Agricultural Research and Extension Center
Oklahoma State University
P.O. Box 128
Lane, OK 74555
101. Mordellidae.

Adriene J. Mayor, Ph.D.
Department of Entomology and Plant Pathology
205 Ellington Plant Sciences Bldg.
University of Tennessee
Knoxville, TN 37901
74. Meliridae.

Joseph V. McHugh, Ph.D.
Department of Entomology
University of Georgia
Athens, GA 30602
75. Sphindidae; 87. Erotylidae.

Richard S. Miller, Ph.D.
Department of Entomology
Montana State University
Bozeman, MT 59717
59. Lycidae; 60. Telengusidae.

Jyrki Muona, Ph.D.
Division of Entomology
Finnish Museum of Natural History
P.O. Box 17, FIN-00014
University of Helsinki, Finland
56. Euconidae.

Gayle H. Nelson, Ph.D.
1308 N. W. Haw Creek
Blue Springs, MO 64015-1787
40. Schizopodidae; 41. Buprestidae.

Sean T. O’Keefe, Ph.D.
Department of Biological and Environmental Sciences
Morehead State University
Morehead, KY 40351
38. Dascillidae; 61. Phengodidae.

Weston Opitz, Ph.D.
Department of Biology
Kansas Wesleyan University
100 Claflin Avenue
Salina, KS 67401
73. Cleridae.

T. Keith Philips, Ph.D.
Department of Entomology
University of California
Riverside, California 92521
111. Meloidae.

Darren A. Pollock, Ph.D.
Department of Biology
Eastern New Mexico University
Portales, NM 88130

Michele B. Price
Department of Entomology
University of Wisconsin-Madison
Madison, WI 53706
78. Smicripidae.
Although officially called lady beetles, members of the family Coccinellidae are more commonly known as ladybugs (American) or ladybirds (Britain). The charismatic red and black dappled members of the tribe Coccinellini are easily recognized, even by young school children, but the family as a whole is somewhat difficult to characterize. Most species can be identified by the compact, rounded, body form with convex dorsum and flattened venter, clubbed antennae, and the presence of a postcoxal line on the first abdominal ventrite (lacking in *Paranaemia*, *Naemia*, and *Coleomegilla*). The tarsal formula of most species is 4-4-4 with the third tarsomere minute and tucked within the broad triangular second (cryptotetramerous or pseudotrimerous), only a few have the tarsomeres more equal (true tetramerous), some have tarsi reduced to 3-3-3 (true trimerous).

**Description:** Shape (Figs. 2-4) rounded, varying from circular to elongate oval, and superhemispherical to somewhat depressed; size 0.8 to 11 mm (some exotic species up to 18 mm). Many are aposematically colored, red, orange or yellow with contrasting markings in black and or white, some less conspicuously colored, black, brown, ivory or gray, a few metallic blue, green, or violet; body glabrous to finely pubescent.

Head deeply inserted into prothorax in most, but exposed, except basally, in more elongate species (*e.g.* *Coleomegilla* spp.) (Fig. 2); form subquadrate with epicranium, frons, genae and clypeus fused; surface punctate. Antennae (Figs. 20-28) moderately short, with eight to eleven antennomeres; terminating in a compact or loose club of one to six antennomeres and smooth to serrate lateral margins; antennae inserted (Figs. 7, 8, 9, 10, 20) at the inner front margin of the eyes, or below the eyes; antennal insertion exposed or covered dorsally by lateral extension of the fronto-clypeal region. Labrum short, transverse; mandibles (Figs. 36-39) moderately robust, strongly arcuate, the apices simple, bifid, or dentate, mola generally with two teeth (reduced or absent in some *Epilachninae* and *Sticholotidinae*), membranous prostheca present; maxillary palpus (Figs. 29-35) with four palpomeres, the apical palpomere typically large, securniform (hatchet-shaped), cup-shaped, or barrel-shaped, in some species elongate conical or oval (many *Sticholotidinae*); gula quadrate, the sutures generally distinct; mentum (Figs. 17, 18) trapezoidal or triangular; ligula prominent, rectangular or oval; labial palpus with three palpomeres (two in *Noviini*), the apical palpomere oval or conical, distally truncate. Eyes lateral, moderate, somewhat bulging, reniform (Fig. 9), entire (Fig. 5), or deeply divided by eye canthus (Figs. 10, 11), finely to coarsely faceted, glabrous or hirsute.

**Pronotum** (Figs. 8, 10, 11, 12) broader than the head; transversely oval to quadrate, weakly to strongly convex, with deep to shallow anterior emargination; lateral margins generally explanate, with fine raised border at sides and less commonly at base; surface punctate, pleural region broad; prosternum (Figs. 15, 16) long, generally T-shaped, elevated in many species; intercoxal process bicarinate, laterally margined, or unmodified; procoxal cavities generally closed behind, open in a few. Mesosternum short, trapezoidal to subquadrate, anteriorly emarginate or truncate; metasternum long and broad.

**Legs** (Figs. 40-44) short relative to body width (Figs. 3, 4) with most or all of femur hidden by elytra in dorsal view (except *Hippodamia*, *Coleomegilla*, and allies; Fig. 2); trochanters of the fore and middle legs exposed; procoxae transverse, separate; mesocoxae round, separate; metasternum transverse, widely separate; trochanters small, triangular; femora swollen; tibiae cylindrical (Fig. 40) or flattened, in some externally toothed and or grooved (Figs. 42-44), finely spinose, with or without single (Fig. 41) or paired (Fig. 40) minute apical spurs on middle and hind leg; tarsal formula generally 4-4-4 but apparently 3-3-3 (cryptotetramerous or pseudotrimerous) (Figs. 40, 43, 44) with the first and second tarsomeres apically dilated and spongy-pubescent beneath, the third minute, appearing as a basal annulation of the elongate fourth tarsomere; alternatively, formula 3-3-3 (true trimerous) through loss of or fusion of tarsomere three with four (some *Scymnini*, *Noviini*), exceptionally true tetramerous (4-4-4) with all tarsomeres more or less cylindrical and ventrally spinose.
Family 93. Coccinellidae

(Lithopilus and allies; soil-dwelling species not occurring in North America); claws (Figs. 45-48) simple, clavate, or with basal to median quadrate or triangular tooth. Scutellum small, triangular.

Elytra entire; surface shagreened to highly polished, finely to moderately punctate, non-striate, laterally explanate or steeply descending; epipleural fold entire (most species) to obsolete in apical third, with or without foveae to receive retracted tibiae and tarsi. Hindwing normally present and functional; wing venation apical third, with or without foveae to receive retracted tibiae and tarsi. Hysteronotum forming a V or inverted omega shape, lacking in some; epicranial stem obsolete except in Epilachninae. Antennae of one to three segments, not over three times as long as wide. Labrum distinct, mandibles moderate, stout, triangular, or sickle-shaped, apically acute, bidentate, or multidentate; mola generally present but reduced or absent in Epilachninae; maxillae with fused carino and stipes; maxillary palpi with two or three palpomeres; labium with fused submentum and ligula, labial palpi with one to two palpomeres. Three pair of stigmata generally present. Thorax with distinct armature and normally with tergal plates on each segment; legs elongate, each with four segments plus tarsus; apex of tibiae with elevate or flattened setae. Spiracles on the mesothorax and abdominal segments one to eight, annular. Abdomen ten-segmented; most abdominal segments with scattered setae or chalazae and transverse row of setae processes visible in a dorsal view; the tenth segment provided with an anal organ or sucking disk (pygopod); pores of repugnatorial glands may occur on each lateral margin of the tergum in the coria between segments. Urogomphi absent. Rees et al. (1994) provide a key to genera and selected species of North America; LeSage (1991) provides family and tribal level diagnoses and a key to North American tribes; Pope (1979) describes the phenomenon of wax production by larvae in diverse tribes. Descriptions and keys to selected North American genera and species include Gordon and Vandenberg (1993: genus Cyphonoe) and Gordon and Vandenberg (1995: genus Coccinella). Introduced species are described and illustrated in Gordon and Vandenberg (1991).

Pupa rounded or oval, attached to substrate at caudal end, exarate; generally preserved, but some enclosed within the last larval exuvium except for a narrow dorsolongitudinal strip (Chilocorini, Noviini, some Scymninae); most brightly colored or patterned. Phuoc and Stehr (1974) provide descriptions and a key to subfamilies and tribes of North America.

Habits and habitats. Adults and larvae of most species are predacious on aphids, psyllids, mealybugs, scales, or other small soft-bodied insects and mites. The larger, aposematically colored lady beetles can usually be found feeding amongst colonies of their prey or basking openly on vegetation. Coccinella species, which prefer a more humid microclimate, are frequently associated with aquatic vegetation, such as water lettuce. In agricultural plantings these beetles are often abundant inside the tightly whorled leaves of corn plants, feeding on wind blown pollen, aphids, mites, and the eggs or larvae of beetles and moths. Although most predacious lady beetles will consume pollen in the absence of prey, Coccinella is one of the few genera able to complete development on pollen alone. In North America, members of the subfamily Coccinellinae are typically aphidophagous.
In the United States, Neoharmonia species were assumed to be normal aphidophages until they were found feeding on the eggs and larvae of an exotic leaf beetle (Whitehead and Duffield 1982). In Central and South America the same and related species feed on native leaf beetles, suggesting that this is the more normal food preference for the genus. Many predacious coccinellids will feed occasionally on spider mites. The minute Steathus species have specialized in this particular prey group. Many of the smaller predacious lady beetles are adept at squeezing into the tiny nooks and crannies provided by plant architecture, or crawling inside the folds of distorted leaves damaged by sucking insects and mites; they can even find their way inside of hollow thorns or insect galls if furnished with a tiny opening, often provided by an ant. Ants are inimical to most lady beetles, but some lady beetle taxa are either tolerated or ignored. The larvae of Brachiacantha species have been reported feeding on Homoptera housed within ant colonies, and the Australian Symnades bellica Blackburn has been recorded preying on the ants themselves under eucalyptus bark (Pope and Lawrence 1990). The blind larvae of Oritistes are termiotrophes and live in Central America. Although the entomophagous members of the lady beetle family can all be categorized as predators, the larvae of some minute scale feeding Hyperaspis species will complete their development by burrowing into the large egg sac attached to a single female scale and thus approach a parasitic mode of existence.

Lady beetles in the subfamily Epilachninae are exceptional in following a completely phytophagous diet, feeding primarily on the leaf parenchyma, particularly of plants in the families Solanaceae, Curcurbitaceae and Leguminosae. This lady beetle subfamily is distributed worldwide, but is most diverse in the “Neotropics.” In Central and South America the same and related species feed on the larvae of the Halyziini (= Psylloborini) of the subfamily Coccinellinae (Fabricius), damages squash and related crop plants. The Halyziini (= Pyllloborini) of the subfamily Coccinellinae feed on powdery mildews (Ascomycetes: Erysiphales). Their greatest diversity is also in the tropics. Systematists argue whether this group of mycetophagous Coccinellinae represents a single or multiple phyletic lines. As with pollinivory, consumption of mold spores occurs among the entomophagous lady beetle taxa as well. Neocalvia, a genus of Coccinellinae restricted to the Neotropics, feeds on the larvae of the Halyziini.

Lady beetles have their share of natural enemies, but they are well protected against most birds, mammals, ants, and other generalist predators. Adult lady beetles are capable of releasing a bitter fluid from specialized glands at the tibia-femoral articulations which serve as a repellent. This renders most species palatable, and some are even highly toxic if ingested. Larvae are similarly protected by repugnatorial glands on the abdomen.

In North America many lady beetle species become dormant during the hot dry summer or the cold winter when prey are scarce. Some species migrate to the mountains and form large aggregations, while others remain in situ or fly only a short distance to form smaller clusters at the bases of prominent objects such as fence posts or rocky outcrops. The introduced multicolored Asian lady beetle, Harmonia axyridis (Pallas), annoys many home owners by moving indoors in large numbers toward the end of fall and remaining until spring.

Several predacious lady beetles have been used with great success as agents of biological control, particularly against scale insects (Drea and Gordon 1990). The vedalia beetle, Rodolia cardinalis (Mulsant) was successfully introduced from Australia into many parts of the world for control of a notorious citrus pest, the cottony cushion scale, Icerya purchasi Maskell. Cryptognatha nodiceps Marshall and Rhizophus pulchelius Montrouzier were successfully employed against coconut scale in Fiji and New Hebrides respectively, and Rhizophus lophanthae Blaisdell has proven to be an asset in controlling several scale pests in tropical areas of the world. The attempt to release generalist aphidophagous predators for biological control of introduced aphids has been less effective and sometimes produced undesirable side effects such as the displacement of native lady beetle species, predation on non-target species, or, in the case of the multicolored Asian lady beetle, H. axyridis, the creation of a new public nuisance. Further valuable readings on the habits and habitats of the Coccinellidae include Hodek and Honek (1996), Majerus (1994), Kuznetsov (1997), and Klausnitzer and Klausnitzer (1997).

**Status of the classification.** The family Coccinellidae belongs to the cerylionid series (8 families, 38 subfamilies), section Clavicornia, of superfamily Cucujoidea. Its closest affinities are believed to be with Corylophidae and Endomychidae (Crowson 1955, Sasaji 1971a) or with Axelides (= Sphaeromatidae) and Endomychidae (Slipinski and Pakaluk 1991). Various viewpoints on the systematic position of the Coccinellidae are summarized by Sasaji (1971a), Slipinski and Pakaluk (1991), Pakaluk et al. (1994, and Kovär (1996b)). Many contemporary works recognize six subfamilies of Coccinellidae (Sticholotitinae (= Sticholotinae), Scymninae, Coccidulinae, Chilocorinae, Coccinellinae, and Epilachninae) (Booth et al. 1990, Pakaluk et al. 1994, Lawrence and Newton 1995, Kuznetsov 1997), a system first proposed by Sasaji (1968), and based on a detailed morphological study of adult and larval characteristics. Other authors have built upon this classification through the addition of one or more subfamilies. There is no current consensus for the higher classification of the Coccinellidae, despite an attempt by Chazeau et al. (1989) and Fürsch (1996) to develop one, soliciting the input of the greater community of coccinellid specialists. The tribal level classification in the system developed by Sasaji (1968) has proven to be even less stable. Although coccinellid subfamilies are more or less worldwide in distribution, many proposed tribes are restricted to particular biogeographic regions where they fall outside the consideration of regional revisionists. This has resulted in a proliferation of alternative classifications which can not be easily reconciled.

Even a cursory review of the New World Coccinellidae suggests that generic and higher level taxa have not been rigorously defined, nor do they maintain a consistent hierarchical value throughout the family. Often the more derived members of a taxon have been stripped away and isolated under a separate name, leaving the parent group with a para- or polyphyletic as-
Family 93. Coccinellidae

semblage of residual taxa. Thus, some broadly defined genera with many species and species groups exist alongside other narrowly defined genera with one or only a few species (e.g., Hyperaspidius vs. Hyperaspidini, Hippodamia vs. Ceratomegilla, Coleomegilla vs. Paracolome megal or Naemia). To achieve a balanced classification, either these generic sets should be reunited, or the larger paraphyletic genera should be split into multiple genera.

The Halyziini (= Psyllloborini, see Pakaluk et al. 1994) of North America are a small and easily recognized group consisting of the single genus Psylllobora, but the world fauna is much more diverse. Various authors have classified these mycophagous coccinelines in multiple tribes (Fürsch 1996, Kovár 1996b), or combined some or all of them with their predacious relatives in the tribe Coccinellini (Kuznetsov 1997, Iablokoff-Khnzorian 1982). The single tribe classification (Sasaji 1968) is followed here as a matter of convenience and without an independent attempt at evaluating alternatives.

Pope (1988) revised the Australian coccinellid fauna and identified the classification of subfamilies Coccidulinae and Scymninae (sensu Sasaji 1968) as one problem area in the higher classification of the family. He suggested that a single subfamily with 5 tribes would more accurately portray the phylogeny of the cocciduline-scymnine lineage, but unfortunately he did not employ or elaborate upon this suggestion. Other authors sought to solve the same problem through diverse methods involving either (1) re-shuffling of scymnide and cocciduline tribes within the two existing subfamilies, (2) segregating specialized members of this lineage in additional subfamilies (3) elevating existing tribes to the subfamily level, and thus effectively sidestepping the issue of their relationship to one another, or a combination of the above (for further discussion, see Kovár 1996b, Gordon 1994a). None of these methods has proven entirely satisfactory, but the effect on the classification of the North American fauna has been minimized due to the fact that many of the problematic taxa do not occur in this region, or occur only as isolated introductions of exotic species.

The tribe Azyini Mulsant was resurrected by Gordon (1980) for two closely related genera (Azya Mulsant and Pseudazya Gordon) which were deemed sufficiently distinct from the rest of the neotropical fauna to justify their separation from Coccidulinae. Had exemplars from the Australian region been included in this study, it would have become evident that problematic taxa exist, in particular the probable sister genus Bucolus Mulsant (variably classified in Coccidulinae and Scymninae). The tribe Azyini is used here provisionally, but its subsequent elevation to subfamily status (Gordon 1994a), is not implemented as it does nothing to resolve existing problems. The classification of Scymninae and Coccidulinae is in need of serious study on a worldwide basis.

The classification presented here recognizes the split of Hyperaspidini (sensu lato) into Hyperaspidini and Brachiacanthini (Duverger 1989, as Hyperaspin and Brachiacanthadini), but does not employ Hyperaspidinae (= Hyperaspinaceae) as a subfamily level taxon (Duverger 1989). Although the separation of Hyperaspidinae from Scymninae has considerable merit, to achieve a holophyletic classification, the Hyperaspidinae would need to include other taxa remaining in Scymninae, such as Selvadini and Diomini (in part). The Selvadini share important derived antennal characters with Hyperaspsi, and neotropical members of Diomini appear to be polyphyletic with respect to Selvadini.

The tribe Scymnillini (Scymninae) shares many characteristics with members of Sticholotidini (Sticholotidinae), not only in external morphology (Sasaji 1971b), but in the genitalia of both sexes. Its placement is problematic. Kovár (1996b) identifies two major series within the Sticholotidini, and it may be that this latter subfamily is polyphyletic. Gordon (1994b) uses the scymnilline genus Zitus Mulsant as an outgroup for his cladistic analysis of the West Indian Sticholotidini, remarking that they have many similarities. The correspondence between both internal and external character states of Scymnillini and Sticholotidini suggests that the similarities are not due merely to convergence.

An additional problem area is with the generic level classification of the subfamily Chilocorinae. Kovár (1995) briefly reviewed the New World classification in a work primarily focusing on palaearctic members of the chilocorine genera Brunnus Mulsant, Esochomus Redtenbacher, and Brunnoides Chapin. He restricted use of these names to the Old World species, but provided no alternative placement for New World members.

The identification of Coccinellidae from America has been greatly facilitated by the publication of a comprehensive and well illustrated work (Gordon 1985) with keys and descriptions of 57 genera and 475 species. A few additional species have subsequently become established either by immigration or through biological control efforts, or represent earlier establishments which were overlooked until recent times (Vandenberg 1990, Gordon and Vandenberg 1991, Peck and Thomas 1998). Some native Coccinellini, once quite common, have become rare in the last decade, most likely due to competition with exotic species. Similarly, some species ranges reported here may no longer be accurate.

In the future, we can also expect changes in the number of recorded North American species due to a reassessment of the species versus subspecies or varietal status in some problematic groups, or the discovery of new species and species synonyms, particularly in the more minute, cryptically colored taxa. Changes in the higher classification of the Coccinellidae and a better understanding of their position within the group of related families can be anticipated, particularly as information is shared among specialists from around the world.


Key to Nearctic Genera

1. Eye deeply divided by transverse projection (canthus) from inner ventral margin (head positioned vertically); canthus broad, band-like, expanded to cover basal antennomeres from frontal view; clypeus not projecting, with semicircular emar-
Family 93. Coccinellidae · 375

2(1). Postcoxal line of first abdominal ventrite merging with posterior margin of ventrite (Fig. 49) .................. Chilocorus

— Postcoxal line of first abdominal ventrite not merging with posterior margin of ventrite (Figs. 50, 52, 53, 54) .............................................. 4

3(2). Postcoxal line of first abdominal ventrite parallel and close to posterior margin of first ventrite (Fig. 50); antenna composed of 7 antennomers .... Halmus

— Postcoxal line of first abdominal ventrite recurved apically, complete or not; antenna of 8-10 antennomers ........................................ 4

4(3). Postcoxal line of first abdominal ventrite complete (Figs. 53, 54) ......................................................... 5

— Postcoxal line of first abdominal ventrite incomplete (Fig. 52) ........................................................................... 8

5(4). Tarsal claw simple, without basal tooth (Fig. 45); anten- tenna composed of 8 antennomers ........................................ Brumoides (sensu lato)

— Tarsal claw with basal tooth (Fig. 47); antenna composed of 10 antennomers (exceptionally of 9 antennomers but these species not occurring in North America) ........................................ 6

6(5). Pronotum finely margined at base ............................... 7

— Pronotum not margined at base (North America na- tives) ................. Exochomus (sensu lato; in part)

7(6). Postcoxal line of first abdominal ventrite reaching or directed toward the inner end of lateral line (Fig. 54) .................. Brumus (sensu Kovár 1995)

— Postcoxal line of first abdominal ventrite reaching or directed toward midpoint of lateral line (Fig. 53) .... Exochomus (sensu stricto; Kovár 1995)

8(4). Elytron metallic blue without spots .......... Curinus

— Elytron blackish with one or more red to yellow spots ......................................................... 9

9(8). Elytral margin not reflexed, with marginal bead; length less than 3.6 mm ........................................ Arawana

— Elytral margin feebly reflexed, with or without margi- nal bead; length more than 5.0 mm ........ Axion

10(1). Mandible with apex multidenticate, bearing three or more large irregular teeth (Fig. 38); all tibiae with one or two apical spurrs present (Fig. 40, 41) (North American fauna); dorsal surfaces pu- bescent; antenna inserted dorsally between eyes and distant from inner ocular margin (Fig. 9), long, loosely articulated, with 11 antennomers and inner margin of club weakly serrated; eye bean- shaped without an abrupt notch or emargination (Fig. 9); length 3.5mm or greater (Epilachninae; Epilachnini) ........................................ 11

— Mandible with bifid or single apex (Figs. 36, 37), a few with very weak subapical tooth (some Sticholotidinae), but then body size minute, length less than 3.0 mm; if with additional well developed apical teeth (Halyziini (=Psylloborini)) then teeth regular, comb-like (Fig. 39), all tibiae lacking apical spurs and dorsal surfaces glabrous; other characters variable ...................... 12

11(10). Anterior tibia slender, not angulate at outer margin; anterior tibia with single spur at apex (as in Fig. 41); body length more than 6.0 mm .... Epilachna

— Anterior tibia relatively robust, with outer margin angulate at apical 1/4; anterior tibia with pair of spurs at apex (as in Fig. 40); body length less than 5.0 mm ......................................... Subcoccinella

12(10). Dorsal surfaces glabrous; distal maxillary palpomere broadly securiform (hatchet-shaped) with sides strongly divergent apically, base narrowly articu- lated with preceding palpomere (Fig. 29); antenna equal to 2/3 head width or longer (Fig. 20, right); femur not strongly flattened; tibia simple, with- out angulations (Fig. 40) (Coccinellinae) ................ 13

— Dorsal surfaces glabrous or pubescent; distal maxil- lary palpomere barrel-shaped, oblong, oval or conical (tapered toward apex) (Figs. 31-34); if securiform, then base rather broadly articulated with previous palpomere (Figs. 30, 35) and an- tenna less than 2/3 head width (Fig. 20, left); or dorsal surfaces pubescent; femur sometimes strongly flattened; tibia simple or modified (Fig. 42-44) ........................................ 14

13(12). Apex of mandible multidenticate with small comb- like denticles (Fig. 39); eye bean-shaped without an abrupt emargination (Fig. 8); eye facets coarse, bead-like; spurs lacking on all tibiae; elytral ground color yellow or white with brown speckles or blotches; mycetophagous on powdery mildews (Halyziini (=Psylloborini)) .............. Psyllobora

— Apex of mandible bifid (Fig. 36); eye circular or oval with an abrupt notch or digitiform emargination produced by eye canthus (Figs. 13, 14); eye fac- ets fine, somewhat flattened; one or pair of spurs usually present on apex of middle and hind tibia (Figs. 40, 41), rarely absent (Mulsantina, Neocharinaria, Harmonia, Aphidecta); elytral color pattern variable; predacious on insects and mites (Coccinellini) ........................................ 45

14(12). Distal maxillary palpomere elongate: conical, or par- allel-sided with an acute apex (Figs. 33, 32) (mouth- parts may be hidden from view, see couplet 15, below); mentum usually narrowly articulated with submentum (Fig. 17); length of body less than 3.0 mm (Sticholotidinae) ........................................ 15

— Distal maxillary palpomere short and/or broad (al- though somewhat elongate in Scymnillini, Fig. 31); barrel-shaped, securiform, or with apex weakly convergent (Figs. 30, 31, 34, 35); mentum rather broadly articulated with submentum (Fig. 18); length of body variable .................. 20
FIGURE 2.93-19.93. 2-4 silhouettes showing a range of coccinellid body types (arrow identifies apex of mesofemur); 5. *Nephaspis* sp., head, anterior part of thorax (ventral view of body); 6. *Delphaspis* sp., head, anterior part of thorax (ventral view of body); 7. *Gnathouveina* sp., head; 8. *Pyliobora* sp. (Halyziini), head, pronotum; 9. *Epilachna* sp. (Epilachnini), head, anterior edge of pronotum; 10. *Chilocorus* sp. (Chilocorini), head; 11. *Cryptognatha* sp. (Cryptognathini), head, pronotum; 12. *Azya* sp. (Azyini), head, pronotum, arrows indicate inner and outer edge of thickened anterolateral margin; 13. left compound eye with elongate eye canthus (*Seymmillini*) (diagrammatic); 14. left compound eye with brief notch-like eye canthus (diagrammatic); 15. *Seymmillini* sp., prosternum (ventral view, diagrammatic); 16. *Scymnus* sp., prosternum (ventral view, diagrammatic); 17. mentum (above) showing narrow articulation with submentum (typical of Sticholotidinae, diagrammatic); 18. mentum (above) showing broad articulation with submentum (typical of most Coccinellidae, diagrammatic); 19. *Nipus* sp. (dorsal view, appendages retracted). (Some figures modified from the works of Sasaji and Gordon)
Family 93. Coccinellidae · 377

15(14). Prosternum greatly expanded to conceal mouthparts (Fig. 6); antennal club composed of a single oblong or oblong-elliptical antennomere (Fig. 25); femur broad, flat, fitting into depressions on ventral surface (Serangiini) .................... Delphastus
— Prosternum not expanded or with small lobe-like expansion that does not conceal mouthparts; antennal club composed of more than one antennomere, terminal antennomere not oblong or oblong-elliptical; femur not broad or flat; ventral surface without depressions for femora ............ 16

16(15). Dorsal surface clothed in conspicuous long semirecumbent pubescence; head large, exposed, vertical; eye large, convex, elongate (Cephaloscymnini) .................. Cephaloscymnus
— Dorsal surface glabrous or with inconspicuous stubble-like pubescence; head small, concealed or exposed; eye small, round or oval (Microweiseini) .................................................. 17

17(16). Head entirely concealed beneath pronotum (Fig. 19) ............................................................. Nipus
— Head exposed or only partially concealed ...... 18

18(17). Head unusually long and narrow (Fig. 7) ..........
— Head more or less transverse .................. 19

19(18). Antenna composed of 10 antennomeres; length of antepenultimate antennomere subequal to penultimate antennomere .................. Microweisea
— Antenna composed of 9 antennomeres; antepenultimate antennomere much shorter than penultimate antennomere .................. Coccidiophilus

20(14). Procoxa broad, obscuring lateral arm of prosternum; antenna of 8 antennomeres with weakly formed, spine-shaped club (Fig. 26); eye densely pubescent; tarsi trimerous (Novini. The two genera occurring in North America are distinguished primarily by larval characteristics; species specific color patterns are used to separate the adults, below) .................................................. 21
— Procoxa normal, not obscuring lateral arm of prosternum; antenna of 9–11 antennomeres, club of various forms (Figs. 22–24, 27, 28); eye glabrous or with sparse to moderate pubescence laterally; tarsi trimerous or cryptotetramerous .......... 22

21(20). Elytron reddish with a complicated pattern of dark marks (Fig. 56); apical one-third with a reddish mark entirely or partially enclosed by a darker border (color pattern of single introduced species: Rodolia cardinalis (Mulsant)); pronotum with outline of basal half not completely arcuate; posterior angles apparent .................. Rodolia
— Elytron predominantly dark with a median red spot and reddish anterolateral border; these reddish areas sometimes confluent; apical one-third dark without additional marks (color pattern of single native species Anovia virginalis (Wickham)); pronotum with outline of basal half completely arcuate; posterior angles obsolete ........... Anovia

22(20). Pronotum with anterolateral margin thickened, with sharply defined inner and outer edge (Fig. 12); hypomeron with foveae to accommodate the antennal club and part of anterior leg (Azyini). . . 23
— Pronotum with anterolateral margin not thickened; hypomeron not as above .................... 24

23(22). Pronotum with intercoxal process elevated, narrow .................................................. Azya
— Pronotum with intercoxal process flat, not elevated ........................................ Pseudoaza

24(22). Pronotum broadly rounded anteriorly (similar to Fig. 6), at least partially concealing mouthparts and antennae .......................... 25
— Pronotum not as above .......................... 27

25(24). Clypeus with anterior margin upturned; eye canthus long and narrow, nearly dividing eye (Cryptognathini) (Fig. 11) ............ Cryptognatha
— Clypeus with anterior margin not upturned; eye canthus short to obsolete (Figs. 5, 13, 14) .... 26

26(25). Size 3.4 mm or greater; prosternal intercoxal process carinate; distal maxillary palpmere diverging toward apex (Fig. 25; Scaevoliinae in part) .................................................. Cryptolaemus
— Size less than 2.0 mm; distal maxillary palpmere weakly tapered toward apex (Fig. 24); prosternal intercoxal process not carinate (Stethorini) .... Stethorus

27(24). Eye canthus long and narrow, nearly dividing eye; basal antennomere greatly enlarged (Exoplectrini) .................................................. Exoplectra
— Eye canthus extending distinctly less than half across eye (Figs. 13, 14); basal antennomere variable .... 28

28(27). Antennae long, more than 2/3 head width, inserted laterally; flagellum and club well differentiated, terminal antennomere usually large and quadrate (Fig. 20, right) (Coccidulini) .................. 29
— Antenna short, 2/3 head width or less (Fig. 20, left), inserted laterally or ventrally; flagellum and club merging gradually, not well differentiated; terminal antennomere reduced, often tapered (Figs. 22, 23, 24, 27, 28) ............ 30

29(28). Dorsal pubescence uniform, decumbent ..........
— Dorsal pubescence of mostly decumbent hairs with some long, erect hairs scattered throughout .... Coccidula

30(28). Abdomen with 5 ventrites; prosternal intercoxal process very broad and flat, without carinae (Fig. 15); eye canthus extending about halfway across eye (Fig. 13) (Scaevoliinae) ............ 31
— Abdomen with 6 or 7 ventrites; prosternal intercoxal process normal, with (Fig. 16) or without carinae; eye canthus extending distinctly less than half-way across eye (Fig. 14) ............ 32

31(30). Elytron apparently glabrous or with only sparse hairs in evidence; often with metallic sheen ...... Zilus
— Elytron with dense, mostly erect pubescence; without metallic sheen .................. Zagloba

32(30). Dorsal surfaces glabrous .......................... 33
— Dorsal surfaces pubescent .......................... 37

33(32). Anterior tibia with external tooth or spine (Fig. 42); eye emarginate; male of many species with cusp

34(33). Dorsal surface clothed in long appressed pubescence; male without antennal club (Scymnini) .......... 35
— Dorsal surface glabrous or with inconspicuous stubble-like pubescence; male with antennal club (Scymnini) .......... 36

35(34). Clypeus with anterior margin not upturned; eye canthus short to obsolete (Figs. 5, 13, 14) .... 36
— Clypeus with anterior margin upturned; eye canthus long and narrow, nearly dividing eye (Cryptognathini) (Fig. 11) ............ Cryptognatha

36(35). Procoxa broad, obscuring lateral arm of prosternum; antenna of 8 antennomeres with weakly formed, spine-shaped club (Fig. 26); eye densely pubescent; tarsi trimerous (Novini. The two genera occurring in North America are distinguished primarily by larval characteristics; species specific color patterns are used to separate the adults, below) .................. 37
— Procoxa normal, not obscuring lateral arm of prosternum; antenna of 9–11 antennomeres, club of various forms (Figs. 22–24, 27, 28); eye glabrous or with sparse to moderate pubescence laterally; tarsi trimerous or cryptotetramerous .......... 38
Family 93. Coccinellidae
34(33). Epipleuron of elytron not excavated for reception of middle and hind femoral apices; tarsal claw simple (Fig. 45) .......................... Hyperaspidius
— Epipleuron of elytron excavated for reception of middle and hind femoral apices; tarsal claw toothed (Fig. 47) or simple (Fig. 45) .......... 35

35(34). Epipleuron of elytron strongly slanting down and away from body; anterior tibia wide, rounded externally in basal one-third, subangulate externally at apical one-fourth (Fig. 44); elytron greenish black with red spot behind middle .... Thalassina
— Epipleuron of elytron flat or only feebly inclined; anterior tibia slender throughout or with a lobe-like preapical expansion (Fig. 43); elytron not greenish black.............................. Hyperaspis

36(35). Femur short, stout; tibia with a lobe-like preapical expansion (Fig. 43); elytron reddish brown, without maculation .......................... Helesius
— Femur slender; tibia without a lobe, without a lobe-like preapical expansion; elytron usually black or brown with pale maculation, rarely immaculate . .......................... Hyperaspis

37(32). Head with mouthparts directed postero-ventrally in repose, concealing prosternum (Fig. 5); basal 2 antennomeres greatly enlarged relative to remaining antennomeres (Fig. 27) ............ Nymphaspis
— Head with mouthparts not directed postero-ventrally, not concealing prosternum; basal 2 antennomeres of normal size (Figs. 22, 23), or at least not greatly enlarged relative to club (Fig. 28) ................... 38

38(37). Antenna very short, of 9 antennomeres, with two or more terminal setae much longer than last 3 antennomeres combined (Fig. 28); eye large, elongate ........................................ Pseudoscymsnus
— Antenna longer, of 10-11 antennomeres; terminal setae never longer than last 3 antennomeres combined (Figs. 22-24); eye smaller, rounded ..... 39

39(38). Antennal club fusirom, symmetrical, with lower margin even; distal antennomere conical; last 2 antennomeres with concentration of shorter setae in membranous area on inner surface (Fig. 24); third antennomere subequal to remaining flagellomeres .......... 40
— Antennal club oval, asymmetrical, with lower margin somewhat uneven; distal antennomere quadrature or rounded with concentration of shorter setae on distal or oblique outer face; third antennomere often elongate relative to remaining flagellomeres (Figs. 22, 23) .................. 41

40(39). Head with clypeus more or less truncate in frontal view; postcoxal line of first abdominal ventrite not recurved at outer end (Fig. 50) (Selvadius) . .......................................................... Selvadius
— Head with clypeus strongly arcuately emarginate in frontal view; postcoxal line of first abdominal ventrite recurved at outer end (Fig. 52) (Hyperaspidius in part) ............... Blaisdelliana

41(39). Postcoxal line of abdomen reaching and joining posterior margin of ventrite; apex not recurved (Fig. 49); distal maxillary palpomere secundiform, strongly expanded distally (as in Fig. 30) (Diomini in part) ................................................................. 42
— Postcoxal line of abdomen not reaching posterior margin of ventrite; continuing parallel to margin (Fig. 50) or with apex recurved (Figs. 52, 54); distal maxillary palpomere roughly parallel-sided or parallel-shaped (as in Fig. 31), at most only weakly expanded distally (Scymnini in part) .......... 43

42(41). Antenna with 11 antennomeres .......... Diomus
— Antenna with 10 antennomeres (Fig. 23) ............... Decadiomus

43(41). Prosternum with distinct carinae on intercoxal process; carinae often reaching anterior margin of prosternum (Fig. 16) ......................... Scymnus
— Prosternum lacking distinct carinae, or with only abbreviated ridges near coxal cavities ...... 44

44(43). Postcoxal line complete, recurved to base of first abdominal ventrite (Fig. 54) .................. Didion
— Postcoxal line incomplete, not reaching base nor lateral margin of first abdominal ventrite; apex recurved (Fig. 52) or parallel to posterior margin (Fig. 50) ........................................ Nephus

45(13). Tarsal claws each with a small median triangular tooth (Fig. 46); postcoxal line of abdomen not recurved toward anterior margin of ventrite (Fig. 49); specimens 6.0 to 10.0 mm in length; elytron vittate, or solid brown to beige in color .... Myzia
— Tarsal claws variable; if small triangular tooth present, then position of tooth more apical (Fig. 48) and postcoxal line of abdomen absent (Fig. 49)

FIGURE 20.93-39.93. 20. diagram: variation in form/length of antenna: a shorter antenna with gradually formed club typical of scymnines (left), a longer antenna with more abruptly differentiated club typical of coccinellines and coccidulines (right); 21. Chilocorini, antenna; 22. Scymnus sp. (Scymnini), antenna; 23. Deadiomus sp. (Diomini) antenna; 24. Brachiacanthina sp. (Brachiacanthini), antenna, apical part (rotated to expose inner surface) note specialized membranous sensory area of last two antennomeres, typical of Brachiacanthini, Hyperaspidini, Selvadiniini (art: E. Roberts); 25. Delphastini sp., antenna; 26. Rodolia sp. (Novini), antenna; 27. Nephaspis sp., antenna; 28. Pseudoscymsnus sp., antenna; 29. Coccinellini (generalized), maxillary palpus; 30. Rodolia sp. (Coccidulinae; Novini), maxillary palpus; 31. Zagloba (Scymnulina), maxillary palpus; 32. Cephaloscymsnus (Sticholotidinae; Cephaloscymsnini), maxillary palpus, apical part; 33. Microweisea (Sticholotidinae; Microweiseini), maxillary palpus, apical part; 34. Stethonus sp., (Stethorini; Coccinellinae), maxillary palpus; 35. Hyperaspidis sp. (Hyperaspidini; Scymninae), maxillary palpus; 36. Coccinellini, mandible; 37. Chilocorini, mandible; 38. Epilachnini, mandible; 39. Halyziini, mandible. (Some figures modified from the works of Sasaji and Gordon; Figures 36-39 after Kovár 1996a).
FIGURE 40.93-62.93. 40. *Myzia* sp. (Coccinellinae; Coccinellini), hind leg, arrows indicate position of paired tibial spurs; 41. *Anisosticta* sp. (Coccinellinae; Coccinellini), apex of hind tibia, arrow indicates position of single tibial spur; 42. *Brachiacantha* sp. (Brachiacanthini), front tibia; 43. *Helesius* sp. (Hyperaspini), front leg, arrow shows position of preapical semi-circular expansion of tibia; 44. *Thalassa* sp. (Hyperaspini), front leg, arrows show positions of rounded basal expansion (above) and subangulate preapical expansion (below); 45-48. different configurations of the tarsal claw: 45. simple; 46. with triangular median tooth; 47. with subquadrate basal tooth; 48. with apical cleft; 49-55. Left side of first abdominal ventrite showing different forms of postcoxal line(s): 49. postcoxal line merges with posterior margin of ventrite, not recurved at apex; 50. postcoxal line runs parallel to posterior margin of ventrite; 51. postcoxal line as above, but with oblique line present; 52. postcoxal line recurves at apex, incomplete; 53. postcoxal line reaches midpoint of lateral line; 54. postcoxal line reaches inner margin of lateral line; 55. postcoxal line obsolete; 56-59. Dorsal color patterns: 56. *Rodolia cardinalis* (Mulsant); 57. *Olla v-nigrum* (Mulsant); 58. *Propylea quatuordecimpunctata* (L.), darker form; 59. as previous, lighter form; 60-62. pronotal color patterns: 60. *Cycloneda* sp.; 61. *Cycloneda* sp. 62. *Coccinella* sp. (Some figures modified from the works of Gordon)
47(46). Prosternum strongly convex and thickened along— Surface between pronotal punctures not shagreened; anterior margin of mesosternum truncate, with shallow emargination or with deep but narrow emargination ............................................. 47

46(45). Surface between pronotal punctures not shagreened; anterior margin of mesosternum with deep, broad, triangular emargination ....... Calvia

— Surface between pronotal punctures shagreened; anterior margin of mesosternum strongly convex and thickened along— Pronotal base without marginal bead; abdomen with

47(46). Prosternum and antenna not as above; body form

48(47). Postcoxal line of first abdominal ventrite always present, joining or running parallel to posterior margin of ventrite (Figs. 49, 50); oblique dividing line often present (Fig. 51). Body form compact subcircular to slightly elongate oval (Figs. 4, 3); tips of femora hidden by or just visible beyond lateral margins of elytra (Figs. 4, 3) .......... 57

— Postcoxal line of abdomen absent (Fig. 55) or recurved toward anterior margin of segment (Figs. 52-54); body form elongate oval to highly elongate oval or elliptical (Figs. 3, 2); tips of femora just visible to well extended beyond lateral margins of elytra (Figs. 3, 2) ....................... 49

49(48). Tarsal claw not toothed or cleft, simply widened basally (Fig. 45) ............................................. 50

— Tarsal claw toothed or cleft (Figs. 47, 48) ........... 53

50(49). Pronotal base with fine entire marginal bead; abdomen with postcoxal line obsolete (Fig. 55) ....... 51

— Pronotal base without marginal bead; abdomen with postcoxal line distinct (Fig. 52) ...................... 52

51(50). Elytron with large black spots; metasternum with postcoxal line........................................ Naemia

— Elytron vittate; metasternum without postcoxal line

52(50). Apex of middle and hind tibia each with 2 spurs (Fig. 40); elytron with straight, regular vittae; epipleuron declivitous, Macronaemia

— Apex of middle and hind tibia each with single spur (Fig. 41); elytron spotted, or with spots joined to form irregular and sinuous vittae; epipleuron horizontal .................. Anisosticta

53(49). Tarsal claw cleft near apical 1/3 (Fig. 48) ........

— Tarsal claw with subquadrate basal tooth (Fig. 47) ................................................................. 54

54(53). Metasternum and first abdominal ventrite with distinct postcoxal lines ................. 55

— Metasternum without postcoxal line; first abdominal ventrite without postcoxal lines (Fig. 55) or with a trace indication only .......... Coleomegilla

55(54). Apex of middle and hind tibia each with pair of spurs (Fig. 40) ............................................. 56

56(55). Pronotal base arcuate, without marginal bead; body form slightly elongate oval (Fig. 3) ........... Adalia

— Pronotal base sinuate, with marginal bead; body form highly elongate (Fig. 2) ....................... Ceratomegilla

57(48). Apex of middle and hind tibia without spurs ..... 58

— Apex of middle and hind tibia each with pair of spurs (Fig. 40) .................................................. 60

58(57). Postcoxal area of first abdominal ventrite without an oblique dividing line (Fig. 50) ....... Musantina

— Postcoxal area of first abdominal ventrite with an oblique dividing line (Fig. 51) ...................... 59

59(58). Scutellum with apical angle much more acute and attenuated than basal angles .......... Harmonia

— Scutellum with apical and basal angles similar ....... Neocharina

60(57). Hind margin of mesepimeron with median triangular projection; pronotal hypomeron with a well defined fovea to accommodate the antennal club ......................................................... Coelophora

— Hind margin of mesepimeron straight or curved, without projection; pronotal hypomeron without a well defined fovea ........................................ 61

61(60). Pronotum black with large, subtrapezoidal or triangular white spot on each anterolateral angle (Fig. 62); elytral ground color yellow to red with black bands or spots in many .................... Coccinella

— Pronotal and elytral color pattern not as above ....

62(61). Pronotum black with white lateral border and discal spot in each lateral third (Fig. 61); spot may be connected anteriorly and laterally to form a complete or broken ring-shaped mark (Fig. 60); elytra without black markings (Fig. 63) ............. Cycloneda

— Pronotum not as above; elytra with black markings

63(62). Distal antennomere elongate, oval; scutellum with base slightly longer than side; maculation on elytron typically forming a yellow and black “checkerboard” pattern (Figs. 58, 59) ... Propylea

— Distal antennomere short, robust, obtriangular; scutellum with side slightly longer than base, elytron black with red spot or pale, ashen with minute dark spots not forming a “checkerboard” pattern (Fig. 57) ................. Olla

CLASSIFICATION OF THE NEARCTIC GENERA

Coccinellidae Latreille 1807

For most of the genera listed below, keys to the North American species, morphological and habitus illustrations and other useful information can be found in Gordon (1985). This citation will not be repeated for each entry. More recent papers are referenced below along with older but more complete works when appropriate.
Sticholotidinae Weise 1901

Pharini Casey 1899 (unavailable, preoccupied type genus)
Pharini Ganglbauer 1899 (unavailable, preoccupied type genus)
Sticholotini Weise 1901
Clanini Weise 1901 (unavailable, preoccupied type genus)
Coelopterini Della Beffa 1912
Sticholotidinae Gordon 1977 (emendation)

**Diagnosis.** North American members of this subfamily can be easily distinguished by the shape of the terminal maxillary palpomere which is distinctly elongate (Fig. 32, 33): conical, oval, or parallel-sided with an oblique apex (taxa from other parts of the world may have this palpomere shortened or distally expanded). Additional diagnostic characteristics include: mentum generally narrowly articulated with submentum (Fig. 17); middle coxal cavities broadly separated; size less than 3.0 mm; dorsal surfaces glabrous or hirsute.

Gordon (1977) discusses the taxonomy, phylogeny and zoogeography of the New World members. Kovár (1996b) provides a revised phylogeny which recognizes two phyletic series, each with a distinct form to the metendosternite and genitalia of both sexes. Gordon (1994b) contributes additional West Indian genera to the tribe Sticholotidini. Predominantly scale predators, but Delphastus (Serangiini) are predacious on whiteflies.

Microweiseini Leng 1920

Pharini Casey 1899 (unavailable, preoccupied type genus)
Microweisina Gordon 1985 (incorrect subsequent spelling)

**Microweisea** Cockerell 1903 (new name for *Epismilia* Cockerell 1900).
New World, from southern Canada into South America; 5 species described from north of Mexico.

*Smilia* Weise 1891, not Germar 1833
*Epismilia* Cockerell 1900, not Fromental 1861 (new name for *Smilia* Weise)
*Pseudoweisea* Schwarz 1904 (name made available by accident)

**Cocciophilina** Brethes 1905. New World; 2 species described from north of Mexico; *C. atronitens* (Casey), California, Nevada, Arizona, Oregon, and Utah; *C. marginata* (LeConte), Maine, New York, Pennsylvania, New Jersey, and Michigan; 1 additional new species reported from Florida (Peck and Thomas 1998).

*Cryptoweisea* Gordon 1970

**Gnathoweisea** Gordon 1970. Known only from North America; 6 species, California, Nevada, Arizona, New Mexico, and Texas.

*Nipus* Casey 1899. Southwestern United States; 4 species, California, Utah, Wyoming, Arizona, and Colorado.

Serangini Blackweiler 1945 (unavailable name, published without description).

**Serangini** Pope 1962

*Delphastus* Casey 1899. New World; 3 species from north of Mexico: Rhode Island, Connecticut, New York, west to California, south to Texas and Florida. Gordon (1994c) revises, keys and illustrates members of the genus from the Western Hemisphere.

*Oeneis* LeConte 1852, not Mulsant 1850
*Cryptogantha* Crotch 1874 (in part), not Mulsant 1850
*Liocynus* Champion 1913

**Cephaloseymnini** Gordon 1985

*Cephaloscyumnus* Crotch 1873. New World, most diverse in the tropics; 3 species from north of Mexico with scattered distributional data: Illinois, New Jersey, Maryland, Virginia, West Virginia, District of Columbia, Indiana, Tennessee, South Carolina, Texas, New Mexico, Arizona, California.

**Scymninae** Mulsant 1846

Scyminiens Mulsant 1846
Scyminae Della Beffa 1912

**Scymnillini** Casey 1899

Zilini Gordon 1985 (unnecessary replacement name for Scymnillini)

Note: This tribe has many affinities with Sticholotidini (Sticholotidinae) and may be misclassified in Scymninae. The two included genera are predacious on whiteflies.

*Zilus* Mulsant 1850. Primarily neotropical with 4 species recorded from the United States; in the east, from Maryland to Florida and west to Wisconsin with disjunct localities in Louisiana; in the west from Idaho and Washington to California and Arizona.

**Scymnus** (Zilus) Mulsant 1850
**Scymnilus** Horn 1895
**Scymnillida** Sicard 1922
Zagloba Casey 1899. New World tropical and temperate; 4 species from north of Mexico: Oregon, California, Arizona, Texas, and Florida.

Stethorini Dobzhansky 1924


Scymnini Mulsant 1846

Nephasiares Mulsant 1846
Nephasia Costa 1849

Nephasia Casey 1899. 4 neotropical species, one of which, N. oculatus (Blatchley), established in scattered localities in the United States: Florida, Louisiana, Texas, Iowa, and Vermont.

Nephasia Korschensky 1931 (error)

Cryptolaemus Mulsant 1853. 1 species, C. montrouzieri Mulsant, introduced from Australia for biocontrol of Planococcus citri (Risso); established in Indiana, Missouri, Florida, and California.

Didion Casey 1899. Restricted to North America; 3 species, generally distributed.


subgenus Scymnus Kugelann 1794. 11 species, widely distributed north of Mexico.

subgenus Pullus Mulsant 1846. 82 species, widely distributed north of Mexico.

Pseudoscyumnus Chapin 1962 (replacement name needed; preoccupied by Pseudoscyumnus Herre 1935). Pseudoscyumnus tsgae McClure and Sasaji, imported from Japan to control woolly hemlock adelgid, Adelges tsuga Annand, has become established at release sites in Connecticut, Virginia, and New Jersey.

Clitostethus Kamiya 1961, not Clitostethus Weise 1885

Nephus Mulsant 1846. Worldwide (at least nominally); 5 subgenera are recognized in the New World fauna. Gordon (1976b, 1985) revised the genus from north of Mexico.

subgenus Nephus Mulsant 1846. 1 species, N. (N.) ornatus LeConte, with 2 subspecies, United States and Canada

subgenus Sidis Mulsant 1850 (as subgenus of Scymnus). 1 species, N. (Sidis) binaevatus (Mulsant), California.


subgenus Scymnobius Casey 1899. 9 species, widely distributed in the United States, extending into southern Canada.


Diomini Gordon 1999

Diomus Mulsant 1850. Worldwide; 18 species recorded from north of Mexico, generally distributed. The generic placement of some of these species may need to be reassessed. Primarily mealybug predators. Gordon (1999) revised the South American members of Diomus and related taxa.

Decadiomus Chapin 1933. Primarily Caribbean; 1 species, D. bahamica (Casey) reported in Florida (Peck and Thomas 1998).

Selvadiini Gordon 1985

Seladius Casey 1899. A New World genus; 4 species occur north of Mexico: Texas, Arizona, California, and Colorado. Prey unknown; possibly scale insects.

Hyperaspidini Mulsant 1846

Hyperaspieni Mulsant 1846
Hyperaspini Costa 1849 (= Hyperaspinii)
Hyperaspini Casey 1899
Hyperaspidae Crotch 1873
Hyperaspidae Berg 1874
Hyperasplets Chapuis 1876
Hyperaspidina Jacobson 1916
Hyperaspidina Wingo 1952 (emendation)

Blaisdelliana Gordon 1970. Monobasic genus; B. secus (Casey), California, Arkansas, and Utah.

Heleusia Casey 1899. Only 3 known species; 2 species in North America: Montana, Colorado, and Texas; 1 species, Colombia.

Thalassa Mulsant 1850. Neotropical with 6 described species, 1 species, T. montezumae Mulsant, penetrating north of Mexico: Arizona, Texas, and Louisiana.

Hyperaspidus Redtenbacher 1844. Worldwide; 94 species north of Mexico, generally distributed. Predators of various Homoptera.

Oxynthus LeConte 1850

Hyperaspidus Crotch 1873. New World; 26 species, generally distributed in the United States and southern California; undescribed species occur in Mexico and Central America. Predators of scale insects and mealybugs.

Brachiacanthini Mulsant 1850

Brachiacanthaires Mulsant 1850
Brachiacanthadini Duverger 1989:143
Brachiacanthadini Duverger 1989 (misspelling)
Brachiacanthini Pakaluk et al. 1994 (emendation)
**Brachiacantha** Dejean 1837. New World; 25 species north of Mexico, generally distributed. Predators of coccids in ant nests and possibly other Homoptera.

*Brachycantha* Chevrolat 1842 (unjustified emendation).

**Cryptognathini** Mulsant 1850

Cryptognathaires Mulsant 1850

Pentilaires Mulsant 1850

Oeneini Casey 1899 (genus preoccupied)

Cryptognathini Gordon 1971

Oeniini Gordon 1985 (error)

**Cryptognatha** Mulsant 1850. Neotropical; 1 species, *C. nodiceps* Marshall, introduced from Trinidad for biocontrol of *Aspidiotus destructor* Signoreet, established in Florida.

**Chilocorinae** Mulsant 1846

Chilocoriiens Mulsant 1846

Exochomaires Mulsant 1850

Chilocorinae Sasaji 1968

Clanini Pakaluk et al. 1994 (presumably based on *Clanis* Mulsant 1850, misspelling of *Cladis* Mulsant 1850; not Clanini Weise 1901, see entry under Sticholotidinae)

**Diagnosis.** North American members of this subfamily all belong to the tribe Chilocorini (tribes Telsimini, Platynaspini and Aspidimerini occur in the Eastern Hemisphere), and can be readily identified by the following combination of character states: eye canthus deeply dividing eye (Fig. 10), broad, hand-like, expanded to cover basal antennomeres from dorsal or frontal view; clypeus not projecting, with semicircular emargination medially; antenna (Fig. 21) of ten or fewer antennomeres, with spindle-shaped flagellum; mandible (Fig. 37) scythe-like with single apical tooth; tibia angulate externally in many species; dorsum apparently glabrous (North America natives), but may exhibit lateral pubescence at least on pronotum; only the introduced species *Exochomus metallicus* Korschefsky has the pronotum and elytron evenly covered with moderately long silky hair. Predominantly scale predators, but some species known to feed on mealybugs, aphids, adelgids and psyllids.

**Chilocorini** Mulsant 1846

Chilocoriiens Mulsant 1846

Exochomaires Mulsant 1850

Chilocorini Costa 1849

Clanini Pakaluk et al. 1994 (presumably based on *Clanis* Mulsant 1850, misspelling of *Cladis* Mulsant 1850; not Clanini Weise 1901, see entry under Sticholotidinae)


**Brunoides** Chapin 1965 (*sensu lato*, not *Brunoides* *sensu* Kovár 1995 who restricted use of this name to certain Old World species). 3 species, 1 with 3 subspecies, widely distributed in the United States but absent from the southeastern states, extending into Canada.

**Brunus** (of authors; not Mulsant 1850)


**Axion** Mulsant 1850. 2 species; *A. plagiatum* (Olivier), Pacific Coast and southwestern states from Oregon to Louisiana; *A. tripylastatum* (De Geer), Pennsylvania south to Florida, west to Colorado and Texas.

**Curinus** Mulsant 1850. Neotropical; 1 adventive species, *Curinus coeruleus* (Mulsant), reported in Florida (Peck and Thomas 1998).

**Arawana** Leng 1908. New World; 1 species in North America, *A. arizonicus* (Casey), Arizona.

**Exochomus** Redtenbacher 1843 (*sensu lato*). Worldwide; 9 species north of Mexico, generally distributed. The 7 native Nearctic species which have a non-bordered pronotal base are excluded from *Exochomus sensu Kovár* (1995), but as no alternative placement is provided, they remain in *Exochomus* for the time being. Only the two introduced species, *E. flavipes* and *E. metallicus* with bordered pronotal base belong to *Exochomus sensu Kovár* (1995) (see also *Brunus*).

**Halmus** Mulsant 1850. 1 species, *H. chalybeus* (Boisduval), introduced from Australia, established in California.

**Orcus** Mulsant 1850

**Chilocorus** Leach 1815, in Brewster. Worldwide; 8 species in North America, generally distributed.

**Coccidulinae** Mulsant 1846

**Cocciduliiens** Mulsant 1846

**Trichosomoides** Mulsant 1846 (unavailable name, not based on genus)

**Coccidulinae** Sasaji 1968

**Diagnosis.** Members of this subfamily are difficult to characterize, but can usually be recognized by the following combination of character states: Dorsal surfaces conspicuously pubescent; body length 2.0 to 7.5 mm; antenna usually long (more than two-thirds head width) (Fig. 20, right), loosely articulated, with irregularly shaped club (externally serrate or papillate), but shorter, more compact in *Noviini* (Fig. 26) and *Exoplectrini*; meso- and metasternum narrowly articulated; maxillary palpus secundiform (Fig. 30) to parallelsided; legs slender, simple, to flattened and highly modified. Predominantly scale predators.
Family 93. Coccinellidae

Coccidulini Mulsant 1846
Coccidulini Costa 1849
Rhizobiareas Mulsant 1846
Coccidulien Mulsant 1846
Coccidulides Crotch 1873
Rhizobiides Crotch 1874
Rhizobiini Weise 1885
Rhizobiinae Della Beffa 1912
Coccidulina Jacobson 1916

Gordon (1994a) revised the South American genera and species.

Coccidula Kugelann 1798. Europe and North America; 1 species, *C. kupid LeConte*, in northern United States and southern Canada.

*Stramylus* Panzer 1813
*Coccidula* Curtis 1827
*Coccidula* Stephens 1828

Rhizobiini Stephens 1829. 2 species, southern United States.

*Rhizobius* Stephens 1832 (error)
*Rhizobius* Agassiz 1846 (unjustified emendation)
*Lindorus* Casey 1899
*Rhizobiella* Oke 1951 (unnecessary replacement name)

Noviini Mulsant 1850
Noviaries Mulsant 1850
Rodololaires Mulsant 1850
Noviini Ganglbauer 1899

*Rodolia* Mulsant 1850. 1 species, *R. cardinalis* (Mulsant), South Carolina, Florida, Louisiana, Texas, New Mexico, Arizona, and California; introduced from Australia for biocontrol of *Icerya purchasi* Maskell.

*Rodolia* (Macronovius) Weise 1885

*Anovia* Casey 1920. New World; 1 species, *A. virginalis* (Wickham), occurring north of Mexico: Texas, New Mexico, Arizona, and Utah.

Exoplectrini Crotch 1874

Chnoodiens Mulsant 1850
Chnoodiaires Mulsant 1850
Siolaires Mulsant 1850
Exoplectrae Crotch 1874
Exoplectrides Gorham 1895
Exoplectrinae Weise 1904
Exoplectrini Casey 1908


Azyini Mulsant 1850

Azyaires Mulsant 1850
Azyae Crotch 1874
Azyini Schilder and Schilder 1928
Azyinae Gordon 1994

Gordon (1980) revised the neotropical members of this tribe.


Coccinellinae Latreille 1807

Coccinellides Leach 1815, in Brewster
Aphidiphages LaPorte 1840
Gymnosomides Mulsant 1846
Coccinellites Costa 1849
Coccinellidae Crotch 1873
Coccinellides Aphidiphages Chapuis 1876
Coccinellidae Aphidiphages Weise 1885
Coccinellinae Ganglbauer 1899

Diagnosis. This subfamily contains some of the larger, more conspicuously colored members of the North American lady beetle fauna, and can be easily recognized by the following combination of character states: dorsal surfaces glabrous; body length 1.75 to 10.5 mm; terminal maxillary palpomere securiform (Fig. 29); antenna two-thirds head width or longer (Fig. 20, right), with 11 antennomeres (except in some neotropical species). Primarily predacious on aphids and other Homoptera, but occasionally specializing in other prey groups; all members of the Halyziini feed on powdery mildews.

Coccinellinae Latreille 1807

Coccinellinae Latreille 1807
Adoniates Mulsant 1846
Coccinellaires Mulsant 1846
Coccinellates Mulsant 1846
Coccinellens Mulsant 1846
Hippodamiaires Mulsant 1846
Micraspaires Mulsant 1846
Mysiates Mulsant 1846
Hippodamiini Costa 1849
Micraspidarii Costa 1849
Cariaires Mulsant 1850
Alesiaires Mulsant 1850
Family 93. Coccinellidae

Coelophoraires Mulsant 1850
Cydoniates Mulsant 1850
Coccinellina Thomson 1866
Coccinellides Thomson 1866
Coccinellidae Berg 1874
Hippodamidae Berg 1874
Tythaspides Crotch 1874
Caritites Chapuis 1876
Coccinellites Chapuis 1876
Hippodamites Chapuis 1876
Coccinellini Weise 1885
Synonychini Weise 1885
Halyziides Gorham 1892 (in part)
Synonychinae Della Befà 1912
Anisostictinii Jacobson 1916
Coccinellina Jacobson 1916
Synonychina Jacobson 1916
Hippodamiina Dobzhansky 1926

Paranaemia Casey 1899. Monobasic genus; 1 species, P. vittigera (Mannerheim), western United States, western Canada.

Naemia Mulsant 1850. North America through Central America and the Caribbean; currently treated as 1 species with 2 subspecies; in the United States N. s. seriata Melshheimer ranges from Rhode Island, south to Texas (coastal localities); N. s. litigiosa Mulsant is recorded from southern California and southern New Mexico. This genus is in need of revision.

Ceratomagilla Timberlake 1920. Restricted to the New World, most diverse in the tropics. Gordon (1985) followed Timberlake (1943) in recognizing 3 subspecies of C. maculata (DeGeer) from north of Mexico: C. m. longi, eastern United States; C. m. strenua, southwestern United States; and C. m. fusilabris (Mulsant), South Carolina to Florida and west to Louisiana (coastal localities). Problems with the current species level classification are discussed in Krafstur and Obyrcki (2000). This genus is in need of revision.

Megilla Mulsant 1850 (in part), not Fabricius 1805, not Erichson 1804

Ceratomagilla Crotch 1873. Monobasic; C. ulkei Crotch, Alaska, and arctic and subarctic Canada. Although separable from indigenous North American members of Hippodamia, Ceratomagilla is not so easily distinguished if the entire holarctic fauna is considered; generic limits in need of reassessment.

Ceratomagilla Malkin 1943 (in error)

Megilla Mulsant 1850 (in part), not Fabricius 1805, not Erichson 1804

Sipalidella Tian-Shanskij and Dobzhansky 1923

Hippodamia (Ceratomagilla) Iablokoff-Khnzorian 1982

Hippodamia Dejean 1837. Primarily holarctic; 18 species occur north of Mexico (1 recently introduced), generally distributed. Chapin (1946) illustrates some of the variability of color patterns within the New World species.

Hemisphaerica Hope 1840

Adonia Mulsant 1846

Anisosticta Dejean 1837. Holarctic; 2 species in North America: A. bitriangularis (Say), Labrador to New Jersey, west to Alaska, California, and British Columbia; A. borealis Timberlake, Manitoba to Alaska.

Anisostica Malkin 1943 (error)

Macronaemia Casey 1899. Oriental and Nearctic; 1 species, M. episcopalis (Kirby) in North America: Ontario to New York, west to Yukon Territory and northern California.

Micronaemia Weise 1905

Aphidecta Weise 1899 (emendation). A monotypic, palearctic genus; A. obliquata (Linnaeus) was released in the United States and Canada for biocontrol of Adelges piceae (Ratzeburg); established in North Carolina.

Aphidella Weise 1893 (error)

Adalia Mulsant 1846 (addenda). Worldwide; 1 holarctic species, A. bipunctata (L.), widely distributed in the United States and Canada, as well as temperate parts of South America (Argentina, Chile).

Idalia Mulsant 1846, not Hübner 1819

Arrivella Brethes 1925

Coccinella Linnaeus 1758. Primarily holarctic; 12 species occur in the United States, generally distributed. Brown (1962) and Brown (1967) provide keys, illustrations and additional discussion of this genus in the United States and Mexico respectively.

Spilota Billberg 1820

Neococcinella Savoyskaya 1969

Dobzhanskaia Iablokoff-Khnzorian 1970


Dandis Mulsant 1850 (not Erichson 1842)

Coccinellina Timberlake 1943

Harmonia Mulsant 1850. An exotic genus with 3 introduced species, now widely distributed in the United States. Gordon and Vandenberg (1991) provide a key and illustrations of the introduced species. (Volume 2, Color Figure 31)

Anatis Mulsant 1846. Holarctic and neotropical (species from the latter region previously placed in other genera); 4 species occur north of Mexico; most common in coniferous forests, woodland habitats, urban plantings of mature trees.

Myzia Le Conte 1852 (in part)

Pellia Mulsant 1850

Palla Mulsant 1850, not Hübner 1819, not Billberg 1820

Neopalla Chapin 1955 (new name for Pellia Mulsant and Palla Mulsant)
Family 93. Coccinellidae

*Myzia* Mulsant 1846. Holarctic and neotropical; 3 species north of Mexico, generally distributed; arboreal.

*Neomysia* Casey 1899

*Calvia* Mulsant 1850. Primarily Old World; 1 holarctic species, *C. quatuordecimguttata* (L.), with numerous color forms, northern United States and Canada.

*Anisocalvia* Crotch 1871

*Eocaria* Timberlake 1943

*Propylea* Mulsant 1846. Old World; 1 species, *P. quatuordecimpunctata* (L.), introduced from Puerto Rico; eastern United States and Hawaii.

*Olla* Casey 1899. New World with 4 described species; 1 species, *O. v-nigrum* (Mulsant), generally distributed in the United States, complete range from southern Canada as far South as Argentina. Vandenberg’s revision (1992) provides a key and illustrations of the known species.

*Propylea* Mulsant 1846 (error)

*Coelophora* Mulsant 1850. Primarily Old World tropics, including Africa, Asia and Australia; 1 species, *C. inaequalis* (Fabricius 1775), introduced into eastern Canada southward along the eastern United States from Maine into New York, New Jersey, and Pennsylvania. Vandenberg and Gordon (1991) review and illustrate the known species.

*Psyllobora* Dejean 1836. Worldwide, most diverse in the tropics; 6 species occur north of Mexico, generally distributed. Feed on powdery mildew.

*Psyllobora* (Psyllobora) Mulsant 1850

*Thea* Mulsant 1846

*Epilachninae* Ganglbauer 1899

*Epilachniens* Mulsant 1846

**Diagnosis.** North American members of this subfamily all belong to the tribe Epilachnini, and can be easily identified by the following combination of character states: Mandible (Fig. 38) with apex multidenticate, bearing three or more large irregular teeth; all tibiae with one or two apical spurs present (North American fauna); dorsal surfaces pubescent; antenna inserted dorsally between eyes and distant from inner ocular margin (Fig. 9), long, loosely articulated, with 11 antennomeres and inner margin of club weakly serrate; eye bean-shaped without an abrupt notch or emargination; length 3.5 mm or greater. Gordon (1976a) revised the species of the Western Hemisphere.

*Epilachnini* Costa 1849

*Epilachna* Dejean 1837. Primarily neotropical; 3 species occur in the United States, but absent from western and northern central states. Two plant families serve as hosts for the North American species. *Epilachna borealis* (F.) and *E. tricincta* (Latreille) feed on members of the Cucurbitaceae, *E. varivestis* Mulsant feeds on members of the Leguminosae.

*Solanophila* Weise 1898

*Afrina* Dieke 1947
Subcoccinella Huber 1842. Old World; 1 species, S. vigintiquatuor punctata (L.), accidentally introduced from Europe where it is a pest of alfalfa; established in Illinois, Maryland, New Jersey, New York, Ohio, Pennsylvania, and West Virginia. Fortunately the established biotype feeds primarily on bouncing bet (Saponaria officinalis L.).

BIBLIOGRAPHY


VANDENBERG, N. J. and R. D. GORDON. 1991. Farewell to Panis Mulsant (Coleoptera; Coccinellidae); a new synonym of Propylea Mulsant. Coccinella, 3: 30-35.
