

1  
Ag 84Ah  
copy 4

STA/STA

# A CATALOG OF THE COLEOPTERA OF AMERICA NORTH OF MEXICO

FAMILY: ELMIDAE

10 5 101  
BOSTON COLLEGE

NAL Digitizing Project



ah52950



UNITED STATES  
DEPARTMENT OF  
AGRICULTURE

AGRICULTURE  
HANDBOOK  
NUMBER 529-50

PREPARED BY  
AGRICULTURAL  
RESEARCH  
SERVICE

FAMILIES OF COLEOPTERA IN AMERICA NORTH OF MEXICO

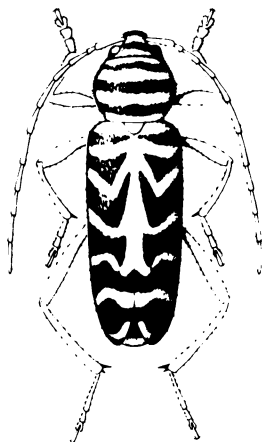
<i>Fascicle</i> <sup>1</sup>	<i>Family</i>	<i>Year issued</i>	<i>Fascicle</i> <sup>1</sup>	<i>Family</i>	<i>Year issued</i>	<i>Fascicle</i> <sup>1</sup>	<i>Family</i>	<i>Year issued</i>
1	Cupedidae	1979	45	Chelonariidae		98	Endomychidae	
2	Micromalthidae	1982	46	Callirhipidae		100	Lathridiidae	
3	Carabidae		47	Heteroceridae	1978	102	Biphyllidae	
4	Rhysodidae		48	Limnichidae		103	Byturidae	
5	Amphizoidae		49	Dryopidae	1983	104	Mycetophagidae	
6	Halplidae		50	Elmidae	1983	105	Ciidae	1982
8	Noteridae		51	Buprestidae		107	Prostomidae	
9	Dytiscidae		52	Cebrionidae		109	Colydiidae	
10	Gyrinidae		53	Elateridae		110	Monommatidae	
13	Sphaeriidae		54	Throscidae		111	Cephaloidae	
14	Hydroscaphidae		55	Cerophytidae		112	Zopheridae	
15	Hydraenidae		56	Perothopidae		115	Tenebrionidae	
16	Hydrophilidae		57	Eucnemidae		116	Alleculidae	
17	Georyssidae		58	Telegeusidae		117	Lagriidae	
18	Sphaeritidae		61	Phengodidae		118	Salpingidae	
20	Histeridae		62	Lampyridae		119	Mycteridae	
21	Ptiliidae		63	Cantharidae		120	Pyrochroidae	1983
22	Limulodidae		64	Lycidae		121	Othniidae	
23	Dasyceridae		65	Derodontidae		122	Inopeplidae	
24	Micropeplidae		66	Nosodendridae		123	Oedemeridae	
25	Leptinidae		67	Dermestidae		124	Melandryidae	
26	Leiodidae		69	Ptinidae		125	Mordellidae	
27	Scydmaenidae		70	Anobiidae	1982	126	Rhipiphoridae	
28	Silphidae		71	Bostrichidae		127	Meloidae	
29	Scaphidiidae		72	Lyctidae		128	Anthicidae	
30	Staphylinidae		74	Trogositidae		129	Pedilidae	
31	Pselaphidae		76	Cleridae		130	Euglenidae	
32	Lucanidae		78	Melyridae		131	Cerambycidae	
33	Passalidae		79	Lymexylidae		132	Bruchidae	
34	Scarabaeidae		81	Sphindidae		133	Chrysomelidae	
35	Eucinetidae		82	Nitidulidae		134	Nemonychidae	
36	Helodidae		83	Rhizophagidae		135	Anthribidae	
37	Clambidae		86	Cucujidae		138	Allocorynidae	
38	Dascillidae		90	Cryptophagidae		140	Brentidae	
39	Rhipiceridae		92	Languriidae	1983	141	Platypodidae	1979
40	Byrrhidae		93	Erotylidae		142	Scolytidae	
41	Psephenidae	1983	94	Phalacridae		143	Curculionidae	1983
42	Brachypsectridae		95	Cerylonidae	1982	144	Stylopidae	
43	Artematopidae		96	Corylophidae		145	Fossil Coleoptera	
44	Ptilodactylidae		97	Coccinellidae				

<sup>1</sup> Missing numbers are those assigned in the computer program to families not found in the United States and Canada.

# A CATALOG OF THE COLEOPTERA OF AMERICA NORTH OF MEXICO

FAMILY: ELMIDAE

BY  
HARLEY P. BROWN  
DEPARTMENT OF ZOOLOGY  
UNIVERSITY OF OKLAHOMA  
NORMAN, OK



UNITED STATES  
DEPARTMENT OF  
AGRICULTURE

AGRICULTURE  
HANDBOOK  
NUMBER 529-50

*PREPARED BY*  
AGRICULTURAL  
RESEARCH  
SERVICE

November 1983



## FOREWORD

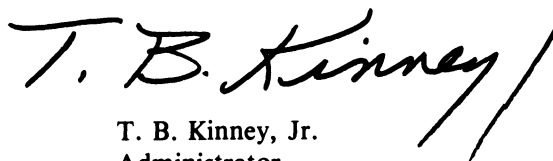
Many species of beetles are important pests of agricultural crops, stored food products, forests, wood products and structures, and fabrics. Many other species, in contrast, are beneficial in the biological suppression of pest arthropods and weeds, as well as in the decomposition of plant detritus, animal carcasses, and dung. Part of our national responsibility to American agriculture is to provide correct identification of species of American beetles so that appropriate controls can be applied.

Most information about animal species, whether agricultural, biological, or experimental, is filed under the species' scientific names. These names are therefore the keys to retrieval of such information. Because some species have been known by several names, a complete listing of these names for each species is necessary.

For the user of scientific names, an up-to-date taxonomic catalog providing currently accepted names and pertinent bibliographic and distributional data is an indispensable tool. Although taxonomic literature is constantly changing to reflect current work, the traditional published taxonomic catalog remains static with updating left to the individual user until it is revised. Production of catalogs in the past has been laborious with long printing delays resulting in data that are obsolete before being published. However, the computer now provides the capability of storing, updating, and retrieving taxonomic data; rapid publication through computer-driven typesetting machinery; and a greater degree of currentness and flexibility.

All 124 fascicles in this catalog of the beetles of America north of Mexico are produced by an original group of computer programs, designed and written during a pilot project by personnel of the Systematic Entomology Laboratory, Agricultural Research Service, and the Communications and Data Services Division, Science and Education Management Staff.

The published information is stored on computer tape, is updated periodically to reflect taxonomic progress in the family, and is available in a data base for computer searching.



T. B. Kinney, Jr.  
Administrator  
Agricultural Research Service



## PREFACE

The Coleoptera, or beetles, are represented in the world by about 220,000 described species, of which about 24,000 occur in the United States and Canada. A comprehensive taxonomic catalog of beetles for this area has not been available except the series of world-based "Coleopterorum Catalogus" volumes (1909–present, Junk, Berlin). The Leng "Catalogue of the Coleoptera of America North of Mexico" (J. D. Sherman, Jr., Mt. Vernon, NY), which was published in 1920 with supplements to the end of 1947, is a checklist. However, it has served professional and amateur alike for nearly 60 years as the principal source of scientific names of beetles. Since 1947, many new taxa have been described and many changes in status and nomenclature have appeared in numerous scattered publications, but little effort has been made to summarize these changes.

This catalog will supplant the Leng catalog and supply additional essential information. It is produced by an original suite of storage, retrieval, and printing programs written especially for automated taxonomic catalogs.

The catalog for each family is published as a separate fascicle with its introductory text, bibliography, and index. Each family is numbered as listed, but the order of issuance of fascicles is not necessarily in numerical sequence. The publishing of separate fascicles makes data available shortly after they are assembled. Computer tapes for each fascicle are maintained for updating and necessary reprinting.

The information on each family is the responsibility of the respective author or authors. The editors modify it only to correct obvious errors and to make it conform to the requirements of the computer programs.

No original proposal for a new name, taxon, status, or classification is given, such data having been previously published, but new host and distributional data are often listed. The rules of "The International Code of Zoological Nomenclature" are followed.

The geographic scope of this catalog includes the continental United States, Canada, Alaska, Greenland, and the associated continental islands. Names of taxa found only in other regions are excluded. If the range of a species extends outside these geographic limits, this fact is indicated. Inside the back cover is a map of the 12 faunal regions based on historical and faunal criteria to simplify distribution recordings. Two-letter Postal Service style abbreviations are used for States and Provinces, and faunal regions are indicated in each distribution record by a diagonal line between groups of abbreviations.

It is not the purpose of this catalog to present a complete scheme of higher classification within the order. The familial makeup is somewhat intermediate between that of R. H. Arnett in "The Beetles of the United States" (1960–62, Catholic University Press, Washington, DC) and that of R. A. Crowson in "The Natural Classification of the Families of Coleoptera" (1967, Biddles Ltd., Guildford, England). Modifications of these two systems are largely those advocated by J. F. Lawrence based in part on suggestions by taxonomic specialists for certain families.

Generic groups and higher categories within the family are arranged phylogenetically as indicated by the author of the particular fascicle, and species group names with their respective synonyms are arranged alphabetically.

Names referable to *incertae sedis* and *nomen dubium* are listed separately at the end of the nearest applicable taxon with notations as to their status.

Each available name is followed by its author, date proposed, and page number referring to the complete bibliographic citation containing the original description. Following each generic name are

the type-species and method of its designation, necessary explanatory notes, and pertinent references on immature stages, taxonomy, redescription, ecology, and keys. After the specific name entry are the original genus (if different from the present placement), type-locality, geographical distribution by State, Province, and broad extralimital units, explanatory notes, pertinent references to immature stages, taxonomy, redescription, and ecology, depository of type-specimen and its sex, and hosts.

In addition to the list under the map of faunal regions (inside back cover), the following abbreviations are used in this catalog:

#### ABBREVIATIONS, GENERAL

Amer. Bor.—America Borealis  
 Amer. Sept.—America Septentrionalis  
 Autom.—Automatic  
 C. Amer.—Central America  
 Co.—County  
 Cosmop.—Cosmopolitan  
 Design.—Designated  
 F.—Female  
 Holarc.—Holarctic  
 Isl.—Island  
 M.—Male  
 Mex.—Mexico  
 Monot.—Monotypy

Mus.—Museum  
 N. Amer.—North America  
 Orig. des.—Original designation  
 Preocc.—Preoccupied  
 S. Amer.—South America  
 Sp.—Species  
 Subseq. monot.—Subsequent monotypy  
 Subsp.—Subspecies  
 Taut.—Tautonymy  
 Univ.—University  
 USA—United States of America  
 Var.—Variety  
 W. Ind.—West Indies

#### MUSEUMS IN THE CONTINENTAL UNITED STATES AND CANADA <sup>1</sup>

AMNH—American Museum of Natural History, New York  
 ANSP—Academy of Natural Sciences, Philadelphia, PA  
 BYUC—Brigham Young University, Provo, UT  
 CASC—California Academy of Sciences, San Francisco  
 CISC—University of California, Berkeley  
 CNCI—Canadian National Collections, Ottawa  
 CUIC—Cornell University, Ithaca, NY  
 CWOB—C. W. O'Brien Collection, Tallahassee, FL  
 DHKC—D. H. Kistner Collection, Chico State College, CA  
 ELSC—E. L. Sleeper Collection, Long Beach, CA  
 FMNH—Field Museum of Natural History, Chicago, IL

FSCA—Florida State Collection, Gainesville  
 HAHC—H. & A. Howden Collection, Ottawa, Canada  
 ICCM—Carnegie Museum, Pittsburgh, PA  
 INHS—Illinois Natural History Survey, Urbana  
 JGEC—J. G. Edwards Collection, San Jose, CA  
 KMFC—K. M. Fender Collection, McMinnville, OR  
 KSUC—Kansas State University, Manhattan  
 LACM—Los Angeles County Museum, CA  
 LSUC—Louisiana State University, Baton Rouge  
 MCZC—Museum of Comparative Zoology, Harvard University, Cambridge, MA  
 MSUC—Michigan State University, East Lansing  
 NCSM—North Carolina State University, Raleigh  
 NYSM—New York State Museum, Albany  
 OSEC—Oklahoma State University, Stillwater  
 OSUC—Ohio State University, Columbus  
 OSUO—Oregon State University, Corvallis

<sup>1</sup> Abbreviations for U.S. and Canadian museums abridged from Arnett, R. H., Jr., and Samuelson, G. A., 1969, "Directory of Coleoptera Collections of North America (Canada Through Panama)," Cushing-Malloy, Ann Arbor, MI, 123 pp.



PMNH—Peabody Museum, Yale University, New Haven, CT  
PSUC—Pennsylvania State Museum, University Park  
PURC—Purdue University, West Lafayette, IN  
RUIC—Rutgers University, New Brunswick, NJ  
SEMC—Snow Museum, University of Kansas, Lawrence  
SJSC—San Jose State College, CA  
SLWC—S. L. Wood Collection, Provo, UT

SMSH—Stovall Collection, University of Oklahoma, Norman  
TAMU—Texas A. & M. University, College Station  
UCDC—University of California, Davis  
UMMZ—University of Michigan, Ann Arbor  
UMRM—University of Missouri, Columbia  
USNM—U.S. National Museum of Natural History, Washington, DC  
WSUC—Washington State University, Pullman

#### MUSEUMS IN FOREIGN COUNTRIES

BMNH—British Museum (Natural History), London  
BPBM—Bernice P. Bishop Museum, Honolulu  
GUHC—Glasgow University, Hunterian College, Scotland  
HMOX—Hope Museum, Oxford, England  
HNHM—Hungarian Natural History Museum, Budapest  
IPZE—Institut Pflanzenschutzforschung Zweigstelle, Eberswalde, East Germany  
IRSB—Institut Royal Sciences Belgique, Brussels  
MFNB—Museum für Naturkunde (Humboldt), Berlin  
MGFT—Museum G. Frey, Tutzing, Munich, West Germany  
MHNL—Museum d'Histoire Naturelle, Lyon, France  
MNHP—Museum National d'Histoire Naturelle, Paris  
MNSL—Museum of Natural Sciences, Leipzig, East Germany  
MZBS—Museum Zoologia, Barcelona, Spain

NHRS—Naturhistoriske Riksmuseet, Stockholm  
NMPC—Narodni Museum, Prague, Czechoslovakia  
SCUT—Spinola College, University of Turin, Italy  
SMTD—Staatliches Museum für Tierkunde, Dresden, East Germany  
UNAM—Universidad Nacional Autonoma, Mexico City  
UZMC—University Zoological Museum, Copenhagen, Denmark  
UZMH—University Zoological Museum, Helsinki, Finland  
ZMAS—Zoological Museum, Academy of Sciences, Leningrad  
ZMPA—Zoological Museum, Polish Academy of Sciences, Warsaw  
ZMUL—Zoological Museum, University of Lund, Sweden  
ZMUM—Zoological Museum, University of Moscow  
ZSBS—Zoologische Sammlung Bayerischen Staates, Munich, West Germany

## ACKNOWLEDGMENTS

We are indebted to many individuals who contributed to the planning and development of this catalog. We are especially grateful to the following specialists who helped to make it as complete and accurate as possible: Richard H. Foote, Systematic Entomology Laboratory (SEL), Agricultural Research Service (ARS), for his suggestions, guidance, and encouragement; C. W. Sabrosky, SEL, for valuable counsel on nomenclatural problems; J. F. Lawrence, Division of Entomology, Commonwealth Scientific and Industrial Research Organization, Canberra, Australia, for his recommendations on higher categories; and more than 50 coleopterists in Canada, the United States, and Mexico for voluntarily contributing information about their specialty groups.

We thank the following members of the Communications and Data Services Division, ARS: Sandra Strauss and Marianne Kingston for designing and writing the computer programs, and Margaret Seldin for developing the editing system.

J. M. Kingsolver, editor in chief  
Systematic Entomology Laboratory, Agricultural Research Service  
Washington, D.C.

### Editorial Board

- J. M. Campbell, Biosystematics Research Institute, Agriculture Canada, Ottawa, ON  
T. L. Erwin, Department of Entomology, Smithsonian Institution, Washington, DC  
H. F. Howden, Department of Biology, Carleton University, Ottawa, ON  
P. J. Spangler, Department of Entomology, Smithsonian Institution, Washington, DC  
T. J. Spilman, Systematic Entomology Laboratory, ARS, Washington, DC  
R. E. White, Systematic Entomology Laboratory, ARS, Washington, DC

## CONTENTS

Family Elmidae .....	1
Subfamily Larinae .....	2
Tribe Larini .....	2
Subfamily Elminae .....	3
Tribe Ancyronychini .....	3
Tribe Elmini .....	3
Tribe Macronychini .....	12
Bibliography .....	14
Index .....	22

## Family ELMIDAE Shuckard, 1839

By Harley P. Brown

Limniidae Stephens, 1828: 104; Elmini Erichson, 1847: 520; Elmissiens Mulsant and Rey, 1872; Elminae LeConte and Horn, 1883: 165; Helmidés Grouvelle, 1896: 75; Helmidæ Grouvelle, 1900: 268; Helminthinae Ganglbauer, 1904: 108; Helminthidae Grouvelle, 1906: 145.

The elmids, commonly called riffle beetles, constitute the largest family of dryopoid beetles. Of the 110 genera described to date, 25 are represented in North America, but only 85 of the approximately 1,100 known species occur on this continent north of Mexico. Except for the Antarctic and Boreal Regions and islands remote from major land masses, all areas of the world exhibit a significant elm mid fauna.

Since elmids are both small and inconspicuous, it is hardly surprising that Linnaeus was apparently unaware of them. In fact, it was not until 1793 that an elm mid was first mentioned in scientific literature when Panzer described *Dytiscus volckmari*. Illiger (1802: 297) transferred this beetle to a new genus, *Limnius*, but failed to characterize or describe the genus. This oversight was not remedied until 1806 when Mueller provided a description. Meanwhile, in 1802 Latreille erected the genus *Elmis* for his new species, *E. maugetii*. Several authors have indicated that the first usage of *Elmis* Latreille, the type-genus of Elmidae, was 1798, but a thorough search of the indicated literature has proven this to be erroneous. Elmids were first placed in a family of their own by Stephens in 1828 and 1829 under the name Limniidae. Unfortunately, however, since he did not derive the name properly from that of a type-genus, it is invalid. His family comprised only two genera: *Georyssus*, now placed in another superfamily, and *Elmis*, in which he lumped all the British Elminae. The presently accepted name Elmidae was first used by Shuckard in 1839, but it has not been used continuously during the intervening years. At about the same time, Westwood (1839) designated the Elmidés as a subfamily of MacLeay's Parnidae. This usage prevailed during the following century, though with variations in terminology (Elminae of LeConte and Horn in 1883, Helminthinae of Ganglbauer in 1904, Helminae of Zaitzev in 1910) and under the family name Dryopidae after this was pointed out as the proper name by Grouvelle in 1900. Some workers (e. g., Bertrand 1972) prefer this scheme even now. This discussion applies primarily to the insects now placed in the subfamily Elminae.

The Larinae (LeConte 1861) were long considered closer to the present Dryopidae than to the Elminae. In much of the European literature and in Leng's catalog (1920), they were treated as a tribe (Potamophilini of Ganglbauer 1904) in the subfamily Dryopinae of the family Dryopidae. Hinton (1935, 1939) presented convincing arguments not only that they belonged in the family Elmidae but that they merited no more than tribal separation from other elmids. Revival of such names as Elminthidae or Helminthidae was effectively suppressed by Steyskal (1975).

Major early workers with European elmids included Philip Mueller, Erichson, Mulsant and Rey, Kuwert, and Ganglbauer; with tropical species, Sharp, Champion, Waterhouse, Grouvelle, and Pic; with Australian forms, Broun, King, Carter, and Zeck. Current European authorities include Berthelemy, Olmi, and Steffan. Masataka Sato replaced Nomura in Japan. Hinton and Deleve contributed enormously to our knowledge of the world elm mid fauna; Hinton dealt chiefly with neotropical and Deleve with Ethiopian and oriental groups. Bertrand is the world authority on larvae and pupae. In North America, notable workers since Say have been LeConte, Horn, Casey, Schaeffer, Fall, West, Musgrave, Chandler, and W. J. Brown. Sanderson laid the foundation for our present understanding of North American elmids. H. P. Brown, Finni, Hilsenhoff, LeSage and Harper, Nelson, and D. S. White are working on nearctic elmids.

As suggested by their taxonomic history, elmids are most closely related to dryopids, but they are not far removed from *Lutrochus* (recently considered a limnichid) or the eubriine psephenids. The georyssids, with which they were long associated, are now thought to be closer to hydrophilids, though they superficially resemble elmids.

Elm mid larvae are completely aquatic and are equipped with retractile cloacal tracheal gills. They range from vermiform to onisciform, are slow and sedentary, and feed on such plant matter as waterlogged wood, encrusting algae, and detritus. Their typical habitat is the substrate of shallow flowing streams. Adults of the subfamily Elminae share the food and habitat of their larvae. Pupation occurs in small cells in moist sand, beneath rocks, under loose bark,

or in other protected sites near the water. Adults commonly fly and may be taken at lights shortly after emergence. Once submerged, they may never return to the surface because their plastron respiration is adequate in well-aerated water. Many live more than a year, becoming heavily encrusted with mineral deposits or shaggy with peritrich ciliates. All are small, most being less than 3 mm long. Adults of the subfamily Larinae are usually larger, some giant exotics attaining a length of 11 mm; they are vastly different from Elminae in behavior and habitat. Most are found clinging to objects not far above the roiling water of cataracts or rapids, from which they fly readily and well. Some are submerged in shallow rapids.

Elmids are gaining increasing recognition as indicators of water quality in streams (Sinclair 1964, Hilsenhoff 1977).

This manuscript was received May 1976.

Boeving and Craighead, 1931; Sanderson, 1938a: 635; Hinton, 1939: 133; Sanderson, 1953b: 148 and 1954: 1; Leech and Chandler, 1956; Leech and Sanderson, 1959; Steffan, 1961: 255; Brown, 1972b.

### Subfamily LARINAE LeConte, 1861

Larini LeConte, 1861: 116; Potamophilaires Mulsant and Rey, 1872; Potamophilini Ganglbauer, 1940: 100; Laridae Boeving, 1929; Larinae, Boeving and Craighead, 1931.

Boeving and Craighead, 1931; Hinton, 1939: 133; Steffan, 1961: 255.

### Tribe LARINI

#### Genus LARA LeConte

**Lara** LeConte, 1852: 42. Type-species: *Lara avara* LeConte (monot.).

IMMATURE STAGES: Brown, 1972b: figs. 139-140 (larva); West, 1929b (larval type 3).

TAXONOMY: Darlington, 1929.

ECOLOGY: Brown, 1972b.

KEYS: Brown, 1972b: 26; Sanderson, 1953b.

**avara amplipennis** Darlington, 1929: 330, fig. 1c. WA: North Bend; BC WA.

TYPE DEPOSITORY: MCZC.

SEX OF TYPE: M.

TAXONOMY: Brown, 1972b: 26.

ECOLOGY: Brown, 1972b: 13.

HOST: Larva on submerged wood and debris.

**avara avara** LeConte, 1852: 42. CA; BC WA OR ID/ MT/ CA/ WY UT CO.

TYPE DEPOSITORY: MCZC.

IMMATURE STAGES: Brown, 1972b: figs. 139-140 (larva); West, 1929b (larval type 3).

TAXONOMY: Brown, 1972b.

ECOLOGY: Brown, 1972b: 13.

HOST: Larva on submerged wood and debris.

**gehringi** Darlington, 1929: 329, fig. 1a. WA: North Bend; WA OR/ CA.

TYPE DEPOSITORY: MCZC.

SEX OF TYPE: M.

TAXONOMY: Brown, 1972b.

ECOLOGY: Brown, 1972b: 13.

HOST: Larva on submerged wood and debris.

#### Genus PHANOCERUS Sharp

**Phanocerus** Sharp, 1882: 128, pl. 4, fig. 8. Type-species: *Phanocerus clavicornis* Sharp (monot.).

IMMATURE STAGES: Brown, 1972b: figs. 141-142 (larva); Hinton, 1940b: figs. 62-83 (larva).

TAXONOMY: Brown, 1972b: 26.

REDESCRIPTION: Hinton, 1940b: 245.

ECOLOGY: Brown, 1972b: 13.

KEYS: Brown, 1972b.

**clavicornis** Sharp, 1882: 129, pl. 4, fig. 8. Guatemala: Coban; TX/ Mex., C. Amer.

TYPE DEPOSITORY: BMNH.

IMMATURE STAGES: Hinton, 1940b: figs. 62-83 (larva); Brown, 1972b: figs. 141-142 (larva).

TAXONOMY: Brown, 1972b: 26.

REDESCRIPTION: Hinton, 1940b: 246.

ECOLOGY: Brown, 1972b: 13.

HOST: Larva on submerged plant material.

### Subfamily ELMINAE

Limniidae Stephens, 1828: 104; Elmidae Shuckard, 1839: 151; Elmini Erichson, 1847: 520; Elmissiens Mulsant and Rey, 1872; Helminae Zaitzev, 1910: 20; Helmidae Leng, 1920: 186; Elminae Hinton, 1935.

Hinton, 1939: 133 and 1940: 217; Sanderson, 1953: 148 and 1954: 1; Steffan, 1961: 255.

### Tribe ANCYRONYCHINI Ganglbauer, 1904

Steffan, 1961: 348.

#### Genus ANCYRONYX Erichson

**Ancyronyx** Erichson, 1847: 522. Type-species: *Macronychus variegatus* Germar (monot.).

IMMATURE STAGES: Brown, 1972b: 60, figs. 151-152 (larva); Sanderson, 1953b: 160, figs. 43-46 (larva).

TAXONOMY: Brown, 1972b; Sanderson, 1953b (revision).

REDESCRIPTION: Bertrand and Steffan, 1963.

KEYS: Sanderson, 1953b; Brown, 1972b.

**variegata** (Germar), 1824: 89 (*Macronychus*). 'Boreal America'; WI MI ON PQ/ KS MO IL IN OH KY/ NY PA NJ DE MD DC WV VA/ ME VT RI CT/ TX OK/ AR LA MS AL TN GA SC NC FL.

**cincta** Say, 1825: 186 (*Elmis*). PA.

**parumoculatus** Hardy, 1852: 270 (*Hydrochus*). England: near Newcastle. Sanderson (1953) questions whether the specimen described by Hardy was even an elmid; it was certainly not *Ancyronyx*. The synonymy is derived from Leng (1920).

IMMATURE STAGES: Brown, 1972b: 60, figs. 151-152 (larva); Sanderson, 1953b: 160, figs. 43-46 (larva).

TAXONOMY: Brown, 1972b.

ECOLOGY: Brown, 1972b: 14.

HOST: Larva on submerged wood or trash.

### Tribe Elmini Steffan, 1961

Elmisaires Mulsant and Rey, 1872; Elmini Steffan, 1961.

#### Genus AMPUMIXIS Sanderson

**Ampumixis** Sanderson, 1954: 3, figs. 22, 23. Type-species: *Helmis dispar* Fall (orig. des.).

IMMATURE STAGES: Sanderson, 1954: 3, figs. 69, 71; Brown, 1972b: figs. 169-171 (larva).

**dispar** (Fall), 1925: 180 (*Helmis*). CA: Siskiyou Co., Shasta Retreat; WA OR/ CA.

TYPE DEPOSITORY: MCZC.

SEX OF TYPE: M.

IMMATURE STAGES: Sanderson, 1954: 3 (larva); Brown, 1972b: figs. 169-171 (larva).

#### Genus ATRACTELMIS Chandler

**Atractelmis** Chandler, 1954: 125, figs. 1-3. Type-species: *Atractelmis wawona* Chandler (orig. des.).

**wawona** Chandler, 1954: 125, figs. 1-3. CA: Yosemite N. P.; OR/ CA. The entire adult was illustrated by Brown, 1972b: figs. 58-59.

TYPE DEPOSITORY: CASC.

SEX OF TYPE: M.

TAXONOMY: Brown and White, 1978.

## Genus CLEPTELMIS Sanderson

**Cleptelmis** Sanderson, 1954: 4, fig. 25. Type-species: *Elmis ornata* Schaeffer (orig. des.).

IMMATURE STAGES: Sanderson, 1954: 4 (larva); Brown, 1972b: figs. 171-172 (larva).

KEYS: Brown, 1972b: 35.

**addenda** (Fall), 1907: 226 (*Elmis*). NM: Pecos; OR ID/ SD/ CA NV WY UT CO/ NM.

TYPE DEPOSITORY: possibly MCZC.

**ornata** (Schaeffer), 1911: 120 (*Helmis*). MT; BC WA OR ID/ MT SD/ CA NV WY UT CO/ AZ NM.

TYPE DEPOSITORY: USNM.

## Genus CYLLOEPUS Erichson

**Cylloepus** Erichson, 1847: 521. Type-species: *Limnius araneolus* Mueller (monot.).

IMMATURE STAGES: Hinton, 1940b: 365, figs. 319-329 (larva); Brown, 1977: 167, fig. 1, (larva).

TAXONOMY: Hinton, 1940b.

REDESCRIPTION: Hinton, 1940b: 342.

KEYS: Hinton, 1940b: 346; Brown, 1972b: 40.

**abnormis** (Horn), 1870: 38 (*Elmis*). AZ: San Pedro River; AZ/ Mex.

TYPE DEPOSITORY: possibly MCZC.

REDESCRIPTION: Sanderson, 1953a: 37 (female paratype).

**parkeri** Sanderson, 1953a: 38, fig. 1. AZ: Yavapai Co., Bloody Basin; AZ.

TYPE DEPOSITORY: INHS.

SEX OF TYPE: M.

IMMATURE STAGES: Brown, 1977: 167, fig. 1 (larva).

## Genus DUBIRAPHIA Sanderson

**Dubiraphia** Sanderson, 1954: 4, figs. 26, 29. Type-species: *Elmis quadrinotata* Say (orig. des.).

IMMATURE STAGES: Brown, 1972b: figs. 143-144 (larva); Sanderson, 1954: figs. 53-55 (larva).

TAXONOMY: Hilsenhoff, 1973.

ECOLOGY: Brown, 1972b.

KEYS: Hilsenhoff, 1973.

**bivittata** (LeConte), 1852: 44 (*Elmis*). 'Upper Mississippi River'; AB/ WI ON/ IL IN.

TYPE DEPOSITORY: MCZC.

SEX OF TYPE: F.

REDESCRIPTION: Hilsenhoff, 1973: 59, fig. 1d.

**brevipennis** Hilsenhoff, 1973: 60, fig. 1I. LA: Hammond; LA.

TYPE DEPOSITORY: SSMH.

SEX OF TYPE: M.

**browni** Hilsenhoff, 1973: 60, fig. 1H. OK: Leflore Co., Kiamichi River; OK.

TYPE DEPOSITORY: SSMH.

SEX OF TYPE: M.

**brunnescens** (Fall), 1925: 177 (*Helmis*). CA: Lake Co., Clear Lake; CA.

TYPE DEPOSITORY: MCZC.

**giulianii** (Van Dyke), 1949: 54 (*Simsonia*). CA: Russian River; CA.

TYPE DEPOSITORY: CASC.

**minima** Hilsenhoff, 1973: 59, figs. 1F, G. WI: Taylor Co., Silver Creek; WI/ MO IN OH/ MD/ OK.

TYPE DEPOSITORY: Univ. WI, Madison.

SEX OF TYPE: M.

**parva** Hilsenhoff, 1973: 61, fig. 1J. OK: Pontotoc Co., Buck Creek; OK.

TYPE DEPOSITORY: SSMH.

SEX OF TYPE: M.

**quadrinotata** (Say), 1825: 187 (*Elmis*). 'United States'; WI/ IL IN OH/ PA.

TYPE DEPOSITORY: (Lost).

REDESCRIPTION: Hilsenhoff, 1973: 58.

**robusta** Hilsenhoff, 1973: 59, fig. 1E. WI: Burnett Co., Mudhen Lake; WI.

TYPE DEPOSITORY: Univ. WI, Madison.

SEX OF TYPE: M.

**vittata** (Melsheimer), 1844: 99 (*Elmis*). PA; MB/ WI MI ON PQ/ NE KS IA MO IL IN OH KY/  
NY PA NJ DE MD DC WV VA/ TX OK/ AR LA MS AL TN GA SC NC FL.

TYPE DEPOSITORY: MCZC.

SEX OF TYPE: M.

REDESCRIPTION: Hilsenhoff, 1973: 58.

### Genus ELSIANUS Sharp

**Elsianus** Sharp, 1882: 131, tab. 4, fig. 11. Type-species: *Elsianus robustus* Sharp (monot.).

IMMATURE STAGES: Hinton, 1940b: 276, figs. 131-163 (larvae and pupa); Brown, 1972b: figs. 165-166.

REDESCRIPTION: Hinton, 1940b: 261.

KEYS: Brown, 1972b.

**moestus** (Horn), 1870: 37 (*Elmis*). AZ: San Pedro River; AZ.

TYPE DEPOSITORY: MCZC?.

**shoemakei** Brown, 1971: 56, figs. 1-3. TX: Val Verde Co., Del Rio, San Felipe Creek; TX/ Mex.

TYPE DEPOSITORY: SSMH.

SEX OF TYPE: M.

**texanus** Schaeffer, 1911: 119. TX: Val Verde Co., Devil's River; NM TX/ Mex.

TYPE DEPOSITORY: USNM.

IMMATURE STAGES: Brown, 1972b: figs. 165-166 (larva).

### Genus GONIELMIS Sanderson

**Gonielmis** Sanderson, 1954: 5, figs. 28, 32. Type-species: *Helmis dietrichi* Musgrave (orig. des.).

IMMATURE STAGES: Sanderson, 1954: 7 (larva); Brown, 1972b: 64, figs. 182-184 (larva).

**dietrichi** (Musgrave), 1933: 54, fig. 2A (*Helmis*). MS: Dog River near Lucedale; MS AL TN GA  
FL SC.

TYPE DEPOSITORY: USNM.

SEX OF TYPE: M.

IMMATURE STAGES: Sanderson, 1954: 7 (larva); Brown, 1972b: 64, figs. 182-184 (larva).

### Genus HETERELMIS Sharp

**Heterelmis** Sharp, 1882: 130, tab. 4, fig. 10. Type-species: *Heterelmis obscurus* Sharp (design. by  
Hinton, 1940: 371).

IMMATURE STAGES: Brown, 1972b: 60, figs. 153-155 (larva); Hinton, 1940b: 390, figs. 382-401 (larva);  
Sanderson, 1953b: 162 (larva).

TAXONOMY: Hinton, 1940b: 368; Brown, 1972a: 229.

REDESCRIPTION: Hinton, 1940b: 369.

ECOLOGY: Brown, 1972b: 15.

KEYS: Brown, 1972a: 237 and 1972b: 39.

**glabra** (Horn), 1870: 37 (*Elmis*). AZ: San Pedro River; AZ TX/ Mex.

TYPE DEPOSITORY: MCZC?.

**acicula** Hinton, 1940b: 389, figs. 377-381 (synonymized by Brown, 1972a: 234). Mex.: Dist.  
Temascaltepec, Tejupilco.

TYPE DEPOSITORY: BMNH.

SEX OF TYPE: M.

**obesa** Sharp, 1882: 131, tab. 4, fig. 10. Guatemala: Vera Paz, San Joaquin; AZ NM TX/ Mex., C.  
Amer.

TYPE DEPOSITORY: BMNH.

REDESCRIPTION: Hinton, 1940b: 382, figs. 357-365.

**stephani** Brown, 1972a: 230, figs. 1-10. AZ: Pima Co., Santa Rita Mts., Madera Canyon; AZ.

TYPE DEPOSITORY: CNCI.

SEX OF TYPE: M.

**vulnerata** (LeConte), 1874: 53 (*Elmis*). TX; KS/ TX OK/ Mex.

TYPE DEPOSITORY: MCZC.

TAXONOMY: Brown, 1972a: fig. 15.

Genus **HETERLIMNIUS** Hinton

**Heterlimnius** Hinton, 1935: 178, figs. 4-5. Type-species: *Helmis koebelei* Martin (orig. des.).

IMMATURE STAGES: Brown, 1972b: figs. 185-186 (larva); Sanderson, 1954: 2, fig. 65 (larva).

REDESCRIPTION: Sanderson, 1954: 2 (restricts, redefines genus).

ECOLOGY: Brown and White, 1978: 6.

KEYS: Brown, 1972b: 43.

**corpulentus** (LeConte), 1874: 52 (*Elmis*). BC; BC WA OR ID/ AB MT SD/ CA NV/ WY UT CO/ AZ NM.

TYPE DEPOSITORY: MCZC.

**antennatus** Fall, 1907: 227 (*Elmis*) (synonymized by Fall, 1925: 181). NM: Beulah.

TYPE DEPOSITORY: MCZC.

**koebelei** (Martin), 1927: 68 (*Helmis*). WA: Easton; BC WA OR/ CA.

TYPE DEPOSITORY: CASC.

Genus **HEXACYLLOEPUS** Hinton

**Hexacylloepus** Hinton, 1940b: 331, figs. 249-250, 252, 254. Type-species: *Elmis smithi* Grouvelle (orig. des.).

IMMATURE STAGES: Brown, 1973: 143, figs. 1-11 (larva).

ECOLOGY: Brown, 1973: 147.

**ferrugineus** (Horn), 1870: 39 (*Elmis*). TX; NM TX OK/ Mex.

IMMATURE STAGES: Brown 1973: 146, figs. 1-11 (larva).

ECOLOGY: Brown, 1973: 147.

TYPE DEPOSITORY: MCZC.

Genus **MICROCYLLOEPUS** Hinton

**Microcyllloepus** Hinton, 1935: 178, figs. 6, 7. Type-species: *Elmis pusillus* LeConte (orig. des.).

IMMATURE STAGES: Hinton, 1940b: 316, figs. 221-231 (larva); Brown, 1972b: figs. 156-158 (larva).

TAXONOMY: Hinton, 1940b.

REDESCRIPTION: Hinton, 1940b: 300.

KEYS: Brown, 1972b; Hinton, 1940b: 304.

**browni** (Hatch), 1938: 16, fig. 1 (*Heterelmis*). MT: Gallatin Co., Bridger Canyon near Bozeman; MT.

TYPE DEPOSITORY: USNM.

**moapus fraxinus** La Rivers, 1949a: 209. NV: Lincoln Co., Ash Springs, Pahrnagat Valley; NV.

TYPE DEPOSITORY: Univ. NV, Reno.

**moapus moapus** La Rivers, 1949a: 205, fig. 1. NV: Clark Co., Warm Springs (Big Pool, 1,700 ft.); NV.

TYPE DEPOSITORY: Univ. NV, Reno.

**pusillus aptus** (Musgrave), 1933: 56, fig. 2C (*Helmis*). VA: Dunlap Creek W. of Clifton Forge; VA/ FL.

TYPE DEPOSITORY: USNM.

SEX OF TYPE: F.

**pusillus foveatus** (LeConte), 1874: 53 (*Elmis*) (designated subspecies by Leech and Chandler, 1956: 362). Unknown, probably CA; OR ID/ CA NV.

TYPE DEPOSITORY: MCZC.

**pusillus loedingi** (Musgrave), 1933: 56 (*Helmis*). MS: Monger Creek near Lucedale; MS AL.

TYPE DEPOSITORY: USNM.

**pusillus perditus** (Musgrave), 1933: 56, fig. 2D (*Helmis*). FL: Leesburg; FL.

TYPE DEPOSITORY: USNM.

SEX OF TYPE: F.

**pusillus pusillus** (LeConte), 1852: 44 (*Stenelmis*). NY: Rapids of Niagara; MT SD/ WI ON/ CA NV/ WY UT/ NE KS IN/ NY PA MD DC WV VA/ ME CT/ AZ NM TX OK/ AR LA MS AL TN GA FL.

TYPE DEPOSITORY: MCZC?.

IMMATURE STAGES: Brown, 1972b: figs. 156-158 (larva).



**pusillus similis** (Horn), 1870: 38 (*Elmis*) (designated subspecies by Leech and Chandler, 1956: 362). AZ: San Pedro River; AZ.

TYPE DEPOSITORY: MCZC?.

**thermarum** (Darlington), 1928: 5 (*Helmis*). NV: Humboldt Co., Hot Spring no. 15, Opal Mine; NV.

TYPE DEPOSITORY: MCZC.

### Genus NARPUS Casey

**Narpus** Casey, 1893: 582. Type-species: *Narpus angustus* Casey (orig. des.).

IMMATURE STAGES: West, 1929b (larval type 7); Brown, 1972b: figs. 145-146 (larva).

KEYS: Brown, 1972b.

**angustus** Casey, 1893: 583. CA: Mendocino Co.; CA.

TYPE DEPOSITORY: USNM.

**arizonicus** (Brown), 1930a: 90 (*Helmis*). AZ: Apache Co., White Mts., Diamond Creek; AZ.

TYPE DEPOSITORY: CNCI.

**concolor** (LeConte), 1881: 75 (*Elmis*). NM: Santa Fe Canyon; BC WA OR/ AB/ CA NV/ WY UT CO/ AZ NM.

TYPE DEPOSITORY: MCZC?.

**solutus** Brown, 1933: 46 (*Helmis*). BC. Fall (1934) stated that *N. solutus* is the maculate form of *N. concolor*.

TYPE DEPOSITORY: CNCI.

SEX OF TYPE: M.

### Genus NEOCYLLOEPUS Brown

**Neocyloepus** Brown, 1970: 2, figs. 1-21. Type-species: *Elmis sculptipennis* Sharp (orig. des.).

IMMATURE STAGES: Brown, 1970: 21, figs. 35-52 (larva).

TAXONOMY: Brown, 1970: 1.

ECOLOGY: Brown, 1970.

KEYS: Brown, 1970: 10.

**boeseli** Brown, 1970: 15, figs. 2-3, 5-7, 9-10, 13. TX: Val Verde Co., Devil's River, 20 mi S. Juno; AZ TX/ Mex.

TYPE DEPOSITORY: USNM.

SEX OF TYPE: M.

IMMATURE STAGES: Brown, 1970: 25, figs. 37-66 (larva).

### Genus NEOELMIS Musgrave

**Neoelmis** Musgrave, 1935: 34. Type-species: *Neoelmis gracilis* Musgrave (orig. des.).

IMMATURE STAGES: Hinton, 1940b: 330 (larva); Brown, 1972b: figs. 159-160 (larva).

TAXONOMY: Hinton, 1940b.

REDESCRIPTION: Hinton, 1940b: 319.

KEYS: Hinton, 1940b: 323.

**caesa** (LeConte), 1874: 53 (*Elmis*). TX; TX OK.

TYPE DEPOSITORY: MCZC?.

### Genus OPTIOSERVUS Sanderson

**Optioservus** Sanderson, 1954: 8, figs. 30, 33. Type-species: *Limnius trivittatus* Brown (orig. des.).

IMMATURE STAGES: Sanderson, 1954 (larva); Brown, 1972b: figs. 176-177 (larva); West, 1929b (larval type 9).

TAXONOMY: White, 1978b.

REDESCRIPTION: White, 1978b.

KEYS: White, 1978b.

**browni** White, 1978b: 64, figs. 12, 27, 32. AR: Montgomery Co., above Albert Pike Campground; AR.

TYPE DEPOSITORY: USNM.

SEX OF TYPE: M.

**canus** Chandler, 1954: 130. CA: San Benito Co., Chalone Creek, Pinnacles N. M.; CA.

TYPE DEPOSITORY: CASC.

SEX OF TYPE: M.

REDESCRIPTION: White, 1978b: 65, figs. 11, 25.

**castanipennis** (Fall), 1925: 177 (*Helmis*). WY; WY UT CO/ NM. There are also dubious records from AZ, BC, and MT.

TYPE DEPOSITORY: MCZC.

SEX OF TYPE: M.

REDESCRIPTION: White, 1978b: 66, figs. 1, 4, 5, 19.

**divergens** (LeConte), 1874: 52 (*Elmis*). CA; BC/ AB SK SD/ CA NV/ WY UT CO/ AZ NM.

TYPE DEPOSITORY: MCZC.

SEX OF TYPE: M.

**pecosensis** Fall, 1907: 226 (*Elmis*) (synonymized by White, 1978b: 66). NM: Pecos.

TYPE DEPOSITORY: MCZC.

SEX OF TYPE: F.

REDESCRIPTION: White, 1978b: 66, figs. 6, 20.

**fastiditus** (LeConte), 1850: 217 (*Limnius*). Lake Superior: Maple Isl.; AB MB ND/ MN WI MI ON PQ/ IA IL IN/ NY.

TYPE DEPOSITORY: MCZC.

SEX OF TYPE: M.

REDESCRIPTION: White, 1978b: 67, figs. 17, 18, 31.

**heteroclitus** White, 1978b: 68, figs. 8, 22. CA: Yosemite N. P., Mosquito Creek N. Wawona; CA.

TYPE DEPOSITORY: USNM.

SEX OF TYPE: M.

**immunis** (Fall), 1925: 178 (*Helmis*). CT: Stratford; PA NJ/ CT/ TN GA SC NC.

TYPE DEPOSITORY: MCZC.

SEX OF TYPE: M.

**cryophilus** Musgrave, 1932: 79, pl. 9 (*Limnius*) (synonymized by White, 1978b: 69). TN: Greenbrier, Great Smoky Mts.

TYPE DEPOSITORY: USNM.

SEX OF TYPE: F.

REDESCRIPTION: White, 1978b: 69, figs. 16, 30.

**ovalis** (LeConte), 1863: 74 (*Limnius*). PA; PQ/ OH/ NY PA MD WV VA/ VT MA CT/ MS AL TN NC.

TYPE DEPOSITORY: MCZC.

SEX OF TYPE: M.

**ampliatus** Fall, 1925: 179 (*Helmis*) (synonymized by White, 1978b: 69). MA: Lowell.

TYPE DEPOSITORY: MCZC.

SEX OF TYPE: F.

IMMATURE STAGES: LeSage and Harper, 1976a, 1976b and 1977 (life history).

REDESCRIPTION: White, 1978b: 69, figs. 12-13, 28.

**phaeus** White, 1978b: 70, figs. 7, 21. KS: Scott Co. State Park; KS.

TYPE DEPOSITORY: USNM.

SEX OF TYPE: M.

**quadrinaculatus** (Horn), 1870: 37 (*Elmis*). CA: Fort Crook; BC WA OR ID/ AB MT/ CA NV/ WY UT CO.

TYPE DEPOSITORY: ANSP.

SEX OF TYPE: F.

REDESCRIPTION: White, 1978b: 70, figs. 10, 24.

**sandersoni** Collier, 1972: 18. AR: Washington Co.; KS MO/ OK/ AR.

TYPE DEPOSITORY: Univ. MN, St. Paul.

SEX OF TYPE: M.

**ozarkensis** Collier, 1972: 17 (synonymized by White, 1978b: 71). MO: Roaring River State Park, Cassville.

TYPE DEPOSITORY: Univ. MN, St. Paul.

SEX OF TYPE: M.

REDESCRIPTION: White, 1978b: 71, figs. 2, 26.

**seriatus** (LeConte), 1874: 52 (*Elmis*). CA; BC OR ID/ AB/ CA/ WY UT CO.

TYPE DEPOSITORY: MCZC.

SEX OF TYPE: F.

REDESCRIPTION: White, 1978b: 72, figs. 9, 23.

**trivittatus** (Brown), 1930a: 91 (*Limnius*). PQ: Knowlton; WI MI ON PQ/ MO IN OH KY/ NY PA NJ MD WV VA/ VT/ MS TN SC.

TYPE DEPOSITORY: CNCI.

SEX OF TYPE: M.

REDESCRIPTION: White, 1978b: 72, figs. 15, 29.

### Genus ORDOBREVIA Sanderson

**Ordobrevia** Sanderson, 1953b: 159. Type-species: *Stenelmis nubifer* Fall (orig. des.).

IMMATURE STAGES: Sanderson, 1953b: 160, figs. 41-42 (larva); Brown, 1972b: figs. 163-164 (larva).

**nubifera** (Fall), 1901: 238 (*Stenelmis*). CA: near Pasadena; WA OR/ CA.

TYPE DEPOSITORY: CASC?

IMMATURE STAGES: Brown, 1972b: figs. 163-164 (larva).

### Genus OULIMNIUS des Gozis

**Oulimnius** des Gozis, 1886: 9. Type-species: *Limnius tuberculatus* Mueller (monot.).

IMMATURE STAGES: LeSage and Harper, 1976a (life history), 1976b (pupa) and 1977 (larva).

TAXONOMY: Steffan, 1958: 147.

**latiusculus** (LeConte), 1866: 380 (*Elmis*). PA: mountains; PQ/ IN KY/ NY PA NJ DE MD WV VA/ NH VT MA RI CT/ MS AL TN GA SC NC.

TYPE DEPOSITORY: MCZC.

IMMATURE STAGES: Brown, 1972b: figs. 187-188 (larva); LeSage and Harper, 1976a (life history), 1976b (pupa) and 1977.

**nitidulus** (LeConte), 1866: 380 (*Elmis*). NY; NY NJ DE MD WV VA/ CT/ MS AL TN GA SC NC.

TYPE DEPOSITORY: MCZC.

### Genus PROMORESIA Sanderson

**Promoresia** Sanderson, 1954: 9, fig. 27. Type-species: *Helmis tardellus* Fall (orig. des.).

IMMATURE STAGES: West, 1929b (larval type 8); Brown, 1972b: figs. 173-175 (larva); LeSage and Harper, 1976b (pupa).

TAXONOMY: Brown and White, 1978: 2.

ECOLOGY: LeSage and Harper, 1976a (life cycle).

KEYS: Brown, 1972b.

**elegans** (LeConte), 1852: 43 (*Limnius*). MA; KY/ NY PA NJ MD WV VA/ MA CT/ AL TN NC.

TYPE DEPOSITORY: MCZC.

IMMATURE STAGES: Brown and White, 1978: 5.

**tardella** (Fall), 1925: 179 (*Helmis*). MA: Tyngsboro; PQ/ NY PA NJ MD WV VA/ ME NH MA CT/ AL TN GA SC NC.

TYPE DEPOSITORY: MCZC.

**subarctica** Brown, 1930b: 241 (*Limnius*) (synonymized by Brown and White, 1978: 4). PQ: Bradore Bay.

TYPE DEPOSITORY: CNCI.

SEX OF TYPE: M.

IMMATURE STAGES: Brown, 1972b: figs. 173-175 (larva); Brown and White, 1978: 5; LeSage and Harper, 1977 (larva).

ECOLOGY: LeSage and Harper, 1976a (life history).

### Genus RHIZELMIS Chandler

**Rhizelmis** Chandler, 1954: 126. Type-species: *Rhizelmis nigra* Chandler (orig. des.).

IMMATURE STAGES: Brown, 1972b: figs. 149-150 (larva).

TAXONOMY: Brown and White, 1978: 10.

**nigra** Chandler, 1954: 128. CA: Colusa Co., Paradise Creek; CA. The entire adult was illustrated by Brown, 1972b: figs. 55-56.

TYPE DEPOSITORY: CASC.

SEX OF TYPE: M.

IMMATURE STAGES: Brown, 1972b: figs. 149-150 (larva).

### Genus STENELMIS Dufour

**Stenelmis** Dufour, 1835: 158. Type-species: *Elmis canaliculata* Gyllenhal (design. by Sanderson, 1938a: 654).

IMMATURE STAGES: Matheson, 1914; Bertrand, 1972 (pupa); Brown, 1972b: figs. 167-168; West, 1929b (larva).

TAXONOMY: Sanderson, 1938a.

REDESCRIPTION: Sanderson, 1938a.

KEYS: Brown, 1972b; Sanderson, 1938a.

**antennalis** Sanderson, 1938a: 695, pl. 80, fig. 19. MS: Lucedale; MS AL GA SC FL.

TYPE DEPOSITORY: INHS (Musgrave Coll.).

SEX OF TYPE: M.

**beameri** Sanderson, 1938a: 671, pl. 80, fig. 5. AR: Berryville; MO/ TX OK/ AR.

TYPE DEPOSITORY: SEMC.

SEX OF TYPE: M.

**bicarinata** LeConte, 1852: 44. OH; KS OH/ NY PA NJ/ NM TX OK/ Mex.

TYPE DEPOSITORY: MCZC.

REDESCRIPTION: Sanderson, 1938a: 679.

**calida calida** Chandler, 1949: 133, fig. 1. NV: Nye Co., Devil's Hole, elev. 2,500 ft.; NV. The type-locality is a thermal pool.

TYPE DEPOSITORY: CASC.

SEX OF TYPE: M.

IMMATURE STAGES: Chandler, 1949 (larva).

**calida moapa** La Rivers, 1949b: 218, fig. 1. NV: Clark Co., Warm Springs (Big Pool); NV.

TYPE DEPOSITORY: Univ. NV, Reno.

ECOLOGY: La Rivers, 1949b: 222.

**concinna** Sanderson, 1938a: 674, pl. 80, fig. 7. NY: North River (collected in the Hudson River); PQ/ NY WV/ MA/ NC.

TYPE DEPOSITORY: SEMC.

SEX OF TYPE: M.

**convexula** Sanderson, 1938a: 704, pl. 81, fig. 8. FL: De Funiak Springs; FL.

TYPE DEPOSITORY: INHS

SEX OF TYPE: M.

**crenata** (Say), 1824: 181 (*Elmis*). PA; WI MI ON PQ/ NF/ KS IL IN/ NY PA MD DC VA/ ME MA CT/ TX OK/ MS TN. The Say type-specimen was lost and a neotype from Guthrie, TN was designated.

TYPE DEPOSITORY: SEMC (neoholotype).

SEX OF TYPE: M.

**sordida** Motschulsky, 1859: 51 (synonymized by Sanderson, 1938a: 668). PA.

TYPE DEPOSITORY: ZMUM.

SEX OF TYPE: F.

IMMATURE STAGES: LeSage and Harper, 1976a (life cycle), 1976b (pupa) and 1977 (larva).

TAXONOMY: Sanderson, 1938a: 665.

REDESCRIPTION: Sanderson, 1938a: 666.

**decorata** Sanderson, 1938a: 701, pl. 81, fig. 4. KS: Lawrence; KS IL IN/ PA DC.

TYPE DEPOSITORY: SEMC.

SEX OF TYPE: M.

**douglasensis** Sanderson, 1938a: 685, pl. 80, fig. 12. MI: Cheboygan Co., Douglas Lake; MI.

TYPE DEPOSITORY: SEMC.

SEX OF TYPE: M.

HOST: On submerged wood.

**exigua** Sanderson, 1938a: 669, pl. 80, fig. 4. AR: Polk; MO KY/ OK/ AR.

TYPE DEPOSITORY: SEMC.

SEX OF TYPE: M.

**exilis** Sanderson, 1938a: 680. AR: Berryville; OK/ AR.

TYPE DEPOSITORY: SEMC.

SEX OF TYPE: F.

**fuscata** Blatchley, 1925: 164. FL: Royal Palm Park; AL FL.

TYPE DEPOSITORY: PURC.

REDESCRIPTION: Sanderson, 1938a: 689.

**gammoni** White and Brown, 1976: 189, figs. 1, 2. NC: Ashe Co., S. fork New R., 3.7 km SE Jefferson; NC.

TYPE DEPOSITORY: USNM.

SEX OF TYPE: M.

**grossa** Sanderson, 1938a: 686, pl. 80, fig. 13. MS: Ireland; TX OK/ AR LA MS.

TYPE DEPOSITORY: SEMC.

SEX OF TYPE: M.

**humerosa** Motschulsky, 1859: 50. TN; MD DC/ MA/ AL TN SC.

TYPE DEPOSITORY: ZMUM.

SEX OF TYPE: F.

*linearis* Zimmermann, 1869: 259. SC.

TYPE DEPOSITORY: MCZC (LeConte Coll.).

SEX OF TYPE: M.

REDESCRIPTION: Sanderson, 1938a: 692.

**hungerfordi** Sanderson, 1938a: 690, pl. 80, fig. 16. FL: Lacoche; GA FL.

TYPE DEPOSITORY: SEMC.

SEX OF TYPE: M.

**knobeli** Sanderson, 1938a: 677, pl. 80, fig. 9. AR: Hope; AR.

TYPE DEPOSITORY: INHS (Musgrave Coll.).

SEX OF TYPE: M.

**lateralis** Sanderson, 1938a: 672, pl. 80, fig. 6, pl. 81. AR: Berryville; MO/ PA VA/ AR MS TN.

TYPE DEPOSITORY: SEMC.

SEX OF TYPE: M.

**maerkelii** Motschulsky, 1854: 12. TN; WI/ MO IN/ NY PA/ MA/ AR TN.

TYPE DEPOSITORY: ZMUM.

SEX OF TYPE: M.

*maerkeli* Motschulsky, 1854: 12 (unjustified emendation). TN.

REDESCRIPTION: Sanderson, 1938a: 705.

**mera** Sanderson, 1938a: 682, pl. 80, fig. 11, pl. 81. TN: Guthrie; PQ/ NY PA WV VA/ MA/ AR TN NC.

TYPE DEPOSITORY: SEMC.

SEX OF TYPE: M.

**mirabilis** Sanderson, 1938a: 693, pl. 80, fig. 18. CT: Cos. Cob.; CT/ GA SC NC.

TYPE DEPOSITORY: SEMC.

SEX OF TYPE: M.

**musgravei** Sanderson, 1938a: 698, pl. 81, fig. 3. VA: Winchester; MO IN/ NY PA WV VA.

TYPE DEPOSITORY: SEMC.

SEX OF TYPE: M.

**parva** Sanderson, 1938a: 688, pl. 80, fig. 14. OK: Latimer Co.; TX OK.

TYPE DEPOSITORY: INHS (Musgrave Coll.).

SEX OF TYPE: M.

HOST: Waterlogged wood.

**quadrimaculata** Horn, 1870: 40. VT: Bennington Co.; MI PQ/ IN/ NY DC/ VT/ TN.

TYPE DEPOSITORY: MCZC.

*sulcata* Blatchley, 1910: 681 (preoccupied Grouvelle, 1892). IN: Marshall Co.

TYPE DEPOSITORY: PURC.

*blatchleyi* Musgrave, 1933: 57 (replacement name for *Stenelmis sulcata* Blatchley). IN: Marshall Co.

TYPE DEPOSITORY: PURC.

TAXONOMY: Sanderson, 1938a: 696.

REDESCRIPTION: Sanderson, 1938a: 696.

**sandersoni** Musgrave, 1940: 48 (replacement name for *Stenelmis tarsalis* Sanderson). VA: Winchester; ON/ IN/ WV VA/ OK/ AR TN.

TYPE DEPOSITORY: SEMC.

SEX OF TYPE: M.

**tarsalis** Sanderson, 1938a: 675, pl. 80, fig. 8, pl. 81 (preoccupied *S. tarsalis* Deleve, 1937). VA: Winchester.

TYPE DEPOSITORY: SEMC.

SEX OF TYPE: M.

**sexlineata** Sanderson, 1938a: 663, pl. 80, fig. 2, pl. 81. KS: Lawrence; KS IN OH KY/ TX OK/ TN.

TYPE DEPOSITORY: SEMC.

SEX OF TYPE: M.

ECOLOGY: White, 1978a (life cycle).

**sinuata** LeConte, 1852: 44. GA: Tallulah; LA MS AL GA SC FL.

TYPE DEPOSITORY: MCZC.

SEX OF TYPE: F.

REDESCRIPTION: Sanderson, 1938a: 699.

**vittipennis** Zimmermann, 1869: 259. SC; ND/ MN WI PQ/ KS IL IN/ NJ WV/ TX OK/ SC.

TYPE DEPOSITORY: MCZC.

REDESCRIPTION: Sanderson, 1938a: 702.

### Tribe MACRONYCHINI Steffan, 1961

Macronychiares Mulsant and Rey, 1872

#### Genus MACRONYCHUS Mueller

**Macronychus** Mueller, 1806: 207. Type-species: *Macronychus quadrituberculatus* Mueller (monot.).

IMMATURE STAGES: Perez, 1863: 621 (larva, pupa and hymenopteran parasite); Brown, 1972b: figs. 178-179; West, 1929b.

TAXONOMY: Hinton, 1940a: 113.

REDESCRIPTION: Hinton, 1940a: 113.

ECOLOGY: Perez, 1863: 621; Mueller, 1806: 207.

KEYS: Hinton, 1940a: 116; Brown, 1972b.

**glabratus** Say, 1825: 187. 'United States'; ND/ WI MI ON PQ/ KS IA MO IL IN OH KY/ NY PA NJ DE MD DC WV VA/ ME RI CT/ TX OK/ AR LA MS AL TN GA SC NC FL.

**lateralis** Melsheimer, 1844: 99 (synonymized by LeConte, 1854: 217). PA.

TYPE DEPOSITORY: MCZC?.

IMMATURE STAGES: LeSage and Harper, 1976a (life cycle), 1976b (pupa) and 1977 (larva).

ECOLOGY: Davis and Finni, 1974; West, 1929a.

HOST: Submerged wood or trash.

#### Genus ZAITZEVIA Champion

**Zaitzevia** Champion, 1923: 170. Type-species: *Zaitzevia solidicornis* Champion (orig. des.).

IMMATURE STAGES: Brown, 1972b; Sanderson, 1954; Leech and Chandler, 1956; Leech and Sanderson, 1959; West, 1929a.

**parvula** (Horn), 1870: 41 (*Macronychus*). CA: Fort Tejon; BC WA OR ID/ AB MT SD/ CA NV/ WY UT CO/ AZ NM.

TYPE DEPOSITORY: MCZC?.

**columbiensis** Angell, 1892: 84 (*Elmis*) (synonymized by Sanderson, 1938b: 146). BC: Fraser River Valley. No type-specimen was designated but topotypes identified by Angell are in the ICCM.

IMMATURE STAGES: Brown, 1972b; Sanderson, 1954; Leech and Chandler, 1956; Leech and Sanderson, 1959; West, 1929a.

TAXONOMY: Sanderson, 1938b.

**thermae** (Hatch), 1938: 18, fig. 2 (*Macronychus*). MT: Gallatin Co., Bridger Canyon near Bozeman; MT. The habitat for *Z. thermae* is thermal springs.

TYPE DEPOSITORY: USNM.

## BIBLIOGRAPHY

- Angell, G. W. J.**  
1892 Two new species of Coleoptera. *Entomological News*, vol. 3, no. 1, p. 84.
- Bertrand, H. P. I.**  
1972 Larves et nymphes des coleopteres aquatiques du globe, avec tableaux de determination des genres et 561 figures. F. Paillart, Abbeville, France, 804 pp., illus.
- Bertrand, H. P. I. and A. W. Steffan**  
1963 Elminthidarum genus novum e regione aethiopica: *Pseudancyronyx* (Coleoptera: Dryopoidea). *Bulletin de l'Institut Francais d'Afrique Noire* 25, ser. A, no. 3, pp. 827-837, illus.
- Blatchley, W. S.**  
1910 An illustrated descriptive catalogue of the Coleoptera or beetles (exclusive of the Rhynchophora) known to occur in Indiana with bibliography and descriptions of new species. Bulletin no. 1 Indiana Department of Geology and Natural Resources. Indianapolis, Indiana, 1386 pp., illus.  
Reprinted by Nature Publishing Co. in 1910.
- Blatchley, W. S.**  
1925 Notes on the distribution and habits of some Florida Coleoptera with descriptions of new species. *The Canadian Entomologist*, vol. 57, pp. 160-168.
- Boeving, A. G.**  
1929 On the classification of beetles according to larval characters. *Bulletin of the Brooklyn Entomological Society*, vol. 24, no. 2, pp. 55-97, illus.
- Boeving, A. G. and F. C. Craighead**  
1931 An illustrated synopsis of the principal larval forms of the order Coleoptera. *Entomologica Americana*, n. ser., vol. 11, pp. 1-351, illus.
- Brown, H. P.**  
1970 *Neocyloepus*, a new genus from Texas and Central America (Coleoptera: Dryopoidea: Elmidae). *The Coleopterists' Bulletin*, vol. 24, no. 1, pp. 1-28, illus.
- Brown, H. P.**  
1971 A new species of *Elsianus* from Texas and Mexico, with records of other species in the United States (Coleoptera: Dryopoidea: Elmidae). *The Coleopterists Bulletin*, vol. 25, no. 2, pp. 55-58, illus.
- Brown, H. P.**  
1972a Synopsis of the genus *Heterelmis* Sharp in the United States, with description of a new species from Arizona (Coleoptera, Dryopoidea, Elmidae). *Entomological News*, vol. 83, no. 9, pp. 229-238, illus.
- Brown, H. P.**  
1972b Biota of freshwater ecosystems identification manual no. 6. Aquatic dryopoid beetles (Coleoptera) of the United States. Water Pollution Control Research Series, U. S. Environmental Protection Agency, Washington, D. C., ix and 82 pp., illus.
- Brown, H. P.**  
1973 The true larva of *Hexacyloepus*, with a description of the larva of *H. ferrugineus* and a summary of records for the genus. *The Coleopterists Bulletin*, vol. 27, no. 3, pp. 143-150, illus.
- Brown, H. P.**  
1977 Tell-tale larvae. *Transactions of the American Microscopical Society*, vol. 96, no. 2, pp. 165-170, illus.
- Brown, H. P. and D. S. White**  
1978 Notes on separation and identification of North American riffle beetles (Coleoptera: Dryopoidea: Elmidae). *Entomological News*, vol. 89, nos. 1 and 2, pp. 1-13, illus.



- Brown, W. J.**  
1930a New species of Coleoptera I. The Canadian Entomologist, vol. 62, pp. 87-92.
- Brown, W. J.**  
1930b Coleoptera of the north shore of the gulf of the St. Lawrence. The Canadian Entomologist, vol. 62, pp. 239-246.
- Brown, W. J.**  
1933 New species of Coleoptera IV. The Canadian Entomologist, vol. 65, pp. 43-47.
- Casey, T. L.**  
1893 Coleopterological notices. V. Annals of the New York Academy of Sciences, vol. 7, pp. 281-606.
- Champion, G. C.**  
1923 Some Indian Coleoptera (11). The Entomologist's Monthly Magazine, vol. 59, pp. 165-179, illus.
- Chandler, H. P.**  
1949 A new species of *Stenelmis* from Nevada. The Pan-Pacific Entomologist, vol. 25, no. 3, pp. 133-136, illus.
- Chandler, H. P.**  
1954 New genera and species of Elmidae (Coleoptera) from California. The Pan-Pacific Entomologist, vol. 30, no. 2, pp. 125-131, illus.
- Collier, J. E.**  
1972 (Descriptions of *Optioservus ozarkensis* and *Optioservus sandersoni*). In Brown, H. P., Aquatic dryopoid beetles (Coleoptera) of the United States. Biota of freshwater ecosystems identification manual no. 6. Water Pollution Control Research Series, United States Environmental Protection Agency, Washington, D. C., ix and 82 pp., illus.
- Darlington, P. J., Jr.**  
1928 New Coleoptera from western hot springs. Psyche, vol. 35, no. 1, pp. 1-6.
- Darlington, P. J., Jr.**  
1929 On the dryopid beetle genus *Lara*. Psyche, vol. 36, no. 4, pp. 328-331, illus.
- Davis, M. M. and G. R. Finni**  
1974 Habitat preference of *Macronychus glabratus* Say (Coleoptera: Elmidae). Proceedings of the Pennsylvania Academy of Science, vol. 48, pp. 95-97, illus.
- Deleve, J.**  
1937 Dryopidae du Congo belge. Bulletin et Annales de la Societe Entomologique de Belgique, vol. 77, pp. 149-164, illus.
- Dufour, L.**  
1835 Recherches anatomiques et considerations entomologiques sur les insectes coleopteres des genres *Macronique* et *Elmis*. Annales des Sciences Naturelles, Series Zoologie, vol. 2, no. 3, pp. 151-174, illus.
- Erichson, W. F.**  
1847 Naturgeschichte der Insecten Deutschlands. Abteilung 1, Coleoptera., vol. 3, pt. 4, pp. 481-640.
- Fall, H. C.**  
1901 List of the Coleoptera of southern California, with notes on habits and distribution and descriptions of new species. Occasional Papers of the California Academy of Science, vol. 8, pp. 1-282.
- Fall, H. C.**  
1907 Descriptions of new species. Pp. 218-272. In Fall, H. C. and T. D. A. Cockerell. The Coleoptera of New Mexico. Transactions of the American Entomological Society, vol. 33, pp. 145-272.

- Fall, H. C.**  
1925 New species of *Helmis* (Coleoptera). Journal of the New York Entomological Society, vol. 33, pp. 177-181.
- Fall, H. C.**  
1934 A new name and other miscellaneous notes (Coleoptera). The Pan-Pacific Entomologist, vol. 10, no. 4, pp. 171-174.
- Ganglbauer, L.**  
1904 Die Kaefer von Mitteleuropa. Die Kaefer der oesterreichisch-ungarischen Monarchie, Deutschlands, der Schweiz, Sowie der franzoesischen und italienischn Alpegebietes. Karl Gerolds Sohn, Wien, vol. 4, 1st half, 286 pp.
- Germar, E. F.**  
1824 Insectorum species novae aut minus cognitae, descriptionibus illustratae. I. Halae, Hendel, xxiv and 624 pp., illus.
- des Gozis, M. P.**  
1886 Recherche de l'espece typique de quelques anciens genres. Rectification synonymiques et notes diverses. Montlucon, Herbin, 36 pp.
- Grouvelle, A. H.**  
1892 Trois especes nouvelles d'Helmides des iles de la Sonde. Notes from the Leyden Museum, vol. 14, pp. 187-190.
- Grouvelle, A. H.**  
1896 Remarques synonymiques sur les dryopides, helmides, heterocerides et specialement sur les types de la collection Kuwert (Col.). Bulletin de la Societe Entomologique de France, pp. 75-77.
- Grouvelle, A. H.**  
1900 Nitidulides, colydiides, rhysoyides, cucujides, monotomides, cryptophagides, tritomides, dryopides. In Grouvelle and Leveille, Contribution a l'etude de la faune entomologique de Sumatra (Cote ouest: Indrapoera-vice-residence Painau) (Voyage de M. J.-L. Weyers). Annales de la Societe Entomologique de Belgique, vol. 44, pp. 262-268.
- Grouvelle, A. H.**  
1906 Voyage de M. Ch. Alluaud dans l'Afrique Orientale. Juin 1903 a mai 1904. Dryopidae, Helminthidae, Heteroceridae (Coleopteres). Annales de la Societe Entomologique de France, vol. 75, pp. 315-332.
- Hardy, J.**  
1852 In Hardy, T. and T. J. Bold, A catalogue of the insects of Northumberland and Durham. (Part iii). Transactions of the Tyneside Naturalist's Field Club, pp. 164-287.
- Hatch, M. H.**  
1938 Two new species of Helmididae from a warm spring in Montana. (Coleoptera). Entomological News, vol. 49, pp. 16-19, illus.
- Hatch, M. H.**  
1965 The beetles of the Pacific Northwest. University of Washington Publications in Biology, Volume 16, pt. 4, 268 pp., illus.
- Hilsenhoff, W. L.**  
1973 Notes on *Dubiraphia* (Coleoptera: Elmidae) with descriptions of five new species. Annals of the Entomological Society of America, vol. 66, no. 1, pp. 55-61, illus.
- Hilsenhoff, W. L.**  
1977 Use of arthropods to evaluate water quality of streams. Technical Bulletin No. 100, Department of Natural Resources, Madison, Wisconsin, 15 pp.
- Hinton, H. E.**  
1935 Notes on the Dryopoidea (Col.). Stylops, vol. 4, pt. 8, pp. 169-179, illus.

- Hinton, H. E.**  
1939 An inquiry into the natural classification of the Dryopoidea, based partly on a study of their internal anatomy (Col.). The Transactions of the Royal Entomological Society of London, vol. 89, pt. 7, pp. 133-184, illus
- Hinton, H. E.**  
1940a A synopsis of the genus *Macronychus* Mueller (Coleoptera, Elmidae). The Proceedings of the Royal Entomological Society of London, Series B. Taxonomy, vol. 9, pt. 7, pp. 113-119, illus.
- Hinton, H. E.**  
1940b A monographic revision of the Mexican water beetles of the family Elmidae. Novitates Zoologicae, vol. 42, no. 2, pp. 217-396, illus.
- Horn, G. H.**  
1870 Synopsis of the Parnidae of the United States. Transactions of the American Entomological Society, vol. 3, pp. 29-42.
- Illiger, J. C. W.**  
1802 Fuszgliederzahl der Kaefergattungen. Magazin fuer Insektenkunde, vol. 1, p. 297.
- La Rivers, I.**  
1949a A new species of *Microcylloepus* from Nevada (Coleoptera: Dryopidae). Entomological News, vol. 60, no. 8, pp. 205-209, illus.
- La Rivers, I.**  
1949b A new subspecies of *Stenelmis* from Nevada (Coleoptera, Dryopidae). Proceedings of the Entomological Society of Washington, vol. 51, no. 5, pp. 218-224, illus.
- Latreille, P. A.**  
1802 Histoire naturelle des fourmis, et recueil de memoires et d'observations sur les abeilles, les araignees, les faucheurs, et autres insects. Crapelet, Paris, 445 pp., illus.  
1798 is sometimes cited as the date when Latreille described *Elmis* ; however, a search of the literature failed to locate such a reference.
- LeConte, J. L.**  
1850 General remarks upon the Coleoptera of Lake Superior. Pp. 201-242. In Agassiz, L., Lake Superior: Its physical character, vegetation, and animals, compared with those of other and similar regions. Gould, Kendall and Lincoln, Boston, 428 pp., illus.
- LeConte, J. L.**  
1852 Synopsis of the Parnidae of the United States. Proceedings of the Academy of Natural Sciences of Philadelphia, vol. 6, pp. 41-45.
- LeConte, J. L.**  
1854 Some corrections in the nomenclature of Coleoptera found in the United States. Proceedings of the Academy of Natural Sciences of Philadelphia, vol. 7, pp. 216-220.
- LeConte, J. L.**  
1861 Classification of the Coleoptera of North America. Part I. Smithsonian Miscellaneous Collections, no. 136, (vol. 3), pp. 1-208.
- LeConte, J. L.**  
1863 New species of North American Coleoptera. Prepared for the Smithsonian Institution. Part 1. Smithsonian Miscellaneous Collections, no. 167, pp. 1-86.
- LeConte, J. L.**  
1866 Additions to the coleopterous fauna of the United States. No. 1. Proceedings of the Academy of Natural Sciences of Philadelphia, pp. 361-394.
- LeConte, J. L.**  
1874 Descriptions of new Coleoptera chiefly from the Pacific slope of North America. Transactions of the American Entomological Society, vol. 5, pp. 43-72.

**LeConte, J. L. and G. H. Horn**

- 1881 Descriptions of new species of North American Coleoptera. Transactions of the Kansas Academy of Science, vol. 7, pp. 74-77.

**LeConte, J. L. and G. H. Horn**

- 1883 Classification of the Coleoptera of North America. Prepared for the Smithsonian Institution. Smithsonian Miscellaneous Collections, no. 507, vol. 26, no. 4, xxxvii and 567 pp.

**Leech, H. B. and H. P. Chandler**

- 1956 Aquatic Coleoptera, pp. 293-371. In Usinger, R. L. (ed.), Aquatic insects of California with keys to North American genera and California species. University of California Press, Berkeley and Los Angeles, ix and 508 pp., illus.

**Leech, H. B. and M. W. Sanderson**

- 1959 Coleoptera, pp. 981-1023. In Edmondson, W. T. (ed.), Fresh-water biology. Ed. 2. John Wiley and Sons, Inc., New York, xx and 1248 pp., illus.

**Leng, C. W.**

- 1920 Catalogue of the Coleoptera of America, north of Mexico. John D. Sherman, Jr., Mt. Vernon, New York, 470 pp.

**LeSage, L. and P. P. Harper**

- 1976a Cycles biologiques d'Elmidae (Coleopteres) du ruisseaux des Laurentides, Quebec. Annales de Limnologie, vol. 12, no. 2, pp. 139-174, illus.

**LeSage, L. and P. P. Harper**

- 1976b Description de nymphes d'Elmidae nearctiques (Coleopteres). Canadian Journal of Zoology, vol. 54, no. 1, pp. 65-73, illus.

**LeSage, L. and P. P. Harper**

- 1977 Description de cinq especes de larves d'Elmidae nearctiques (Coleopteres). Annales de la Societe Entomologique du Quebec, vol. 22, no. 1, pp. 18-32, illus.

**Martin, J. O.**

- 1927 A new *Helmis* (Coleoptera-Helmidae) from the northwest. The Pan-Pacific Entomologist, vol. 4, no. 2, p. 68.

**Matheson, R.**

- 1914 Life-history notes on two Coleoptera (Parnidae). The Canadian Entomologist, vol. 46, no. 6, pp. 185-189, illus.

**Melsheimer, F. E.**

- 1844 Descriptions of new species of Coleoptera of the United States. Proceedings of the Academy of Natural Sciences of Philadelphia, vol. 2, pp. 98-118.

**Motschulsky, T. V. von**

- 1854 Voyages. Lettre de M. de Motschulsky a M. Menetries. Etudes Entomologiques, pt. 3, pp. 1-15.

**Motschulsky, T. V. von**

- 1859 II. Entomologie speciale. Insectes des Indes orientales, et de contrees analogues. Etudes Entomologique, pt. 8, pp. 25-118.

**Mueller, P. W. J.**

- 1806a *Macronychus*, Krallenkaefer. Eine neue Kaefergattung. Magazin fuer Insektenkunde (1805), vol. 5, pp. 207-220.

**Mueller, P. W. J.**

- 1806b Beschreibung der um Odenback im Departement von Donnersberg beobachteten Schlammkaefer, *Limnius* Illig. Magazin fuer Insektenkunde, vol. 5, pp. 184-206.

**Mulsant, E. and C. Rey**

- 1872 Histoire naturelle des coleopteres de France. Tribu des Spinipedes. Paris, vol. 28, 58 pp., illus.

- Musgrave, P. N.**  
 1932 Notes on Helmidiae (Coleoptera) taken in the Tennessee Great Smoky Mountains, with description of a new species. *Proceedings of the Entomological Society of Washington*, vol. 34, no. 5, pp. 78-81, illus.
- Musgrave, P. N.**  
 1933 New species of Helmidiae (Coleoptera). *Proceedings of the Entomological Society of Washington*, vol. 35, no. 4, pp. 54-57, illus.
- Musgrave, P. N.**  
 1935 Two new Elmidae from Puerto Rico with description of new genus (Coleoptera). *Proceedings of the Entomological Society of Washington*, vol. 37, no. 2, pp. 32-35, illus.
- Musgrave, P. N.**  
 1940 A new name: Elmidae (Coleoptera). *Proceedings of the Entomological Society of Washington*, vol. 42, no. 2, p. 48.
- Panzer, G. W. F.**  
 1793 *Faunae insectorum germanicae initia oder Deutschlands Insecten.*, Heft 7, 24 pp.
- Perez, A.**  
 1863 *Histoire des metamorphoses du Macronychus quadrituberculatus et de son parasite.* *Annales de la Societe Entomologique de France*, ser. 4, vol. 3, pp. 621-636, illus.
- Sanderson, M. W.**  
 1938a A monographic revision of the North American species of *Stenelmis* (Dryopidae: Coleoptera). *The University of Kansas Science Bulletin*, vol. 25, no. 22, pp. 635-717, illus.
- Sanderson, M. W.**  
 1938b *Elmis columbiensis* Angell a synonym of *Zaitzevia parvulus* (Horn). *Journal of the Kansas Entomological Society*, vol. 11, no. 4, p. 146.
- Sanderson, M. W.**  
 1953a New species and a new genus of new world Elmidae with supplemental keys. *The Coleopterists' Bulletin*, vol. 7, no. 5, pp. 33-40, illus.
- Sanderson, M. W.**  
 1953b A revision of the Nearctic genera of Elmidae (Coleoptera). *Journal of the Kansas Entomological Society*, vol. 26, no. 4, pp. 148-163, illus.
- Sanderson, M. W.**  
 1954 A revision of the Nearctic genera of Elmidae (Coleoptera). *Journal of the Kansas Entomological Society*, vol. 27, no. 1, pp. 1-13, illus.
- Say, T.**  
 1824 Coleoptera. In *Narrative of an expedition to the source of St. Peter's River, etc., under the command of Stephen H. Long, Major U. S. T. E.* Philadelphia, vol. 2, pp. 268-378.
- Say, T.**  
 1825 Descriptions of new species of coleopterous insects inhabiting the United States. *Journal of the Academy of Natural Sciences of Philadelphia*, vol. 5, pt. 1, pp. 160-240.
- Schaeffer, C. F. A.**  
 1911 New Coleoptera and miscellaneous notes. *Journal of the New York Entomological Society*, vol. 19, pp. 113-126.
- Sharp, D.**  
 1882 Haliplidae, Dytiscidae, Gyrinidae, Hydrophilidae, Heteroceridae, Parnidae, Georisidae, Cyathoceridae. In *Biologia Centrali-Americana, Insecta. Coleoptera.* F. Godman and O. Salvin, eds. R. H. Porter, London, vol. 1, pt. 2, pp. 1-144.

**Shuckard, W. E.**

1839 The elements of British entomology. London, 240 pp., illus.

**Sinclair, R. M.**

1964 Water quality requirements for elmid beetles with larval and adult keys to the eastern genera. Tennessee Stream Pollution Control Board, Tennessee Department of Public Health, Nashville, 14 pp., illus.

**Steffan, A. W.**

1958 Die deutschen Arten der Gattungen *Elmis*, *Esolus*, *Oulimnius*, *Riolus*, *Aptykto-phallus* (Coleoptera: Dryopoidea). Genitalmorphologisch-taxonomische Studie an Dryopoidea I. Beitrage zur Entomologie, vol. 8, pp. 122-178, illus.

**Steffan, A. W.**

1961 Vergleichend-mikromorphologische Genitaluntersuchungen zur Klaerung der phylogenetischen Verwandtschafts-verhaeltnisse der mitteleuropaeischen Dryopidea (Coleoptera). Zoologische Jahrbuecher, Abteilung fuer Systematik, Oekologie und Geographie der Tiere, vol. 88, no. 3, pp. 255-354, illus.

**Stephens, J. F.**

1828 Illustrations of British entomology; or, a synopsis of indigenous insects containing their generic and specific distinctions; with an account of their metamorphoses, times of appearance, localities, food, and economy as far as practicable. Baldwin and Cradock, London, vol. 2, 112 pp., illus.

**Stephens, J. F.**

1829 A systematic catalogue of British insects: being an attempt to arrange all the hitherto discovered indigenous insects in accordance with their natural affinities. Containing also the references to every English writer on entomology, and to the principal foreign authors. With all the published British genera to the present time. Baldwin and Cradock, London, xxxiv and 388 pp.

**Steyskal, G. C.**

1975 The family-group names based on the name of the genus *Elmis* Latreille (Coleoptera). Proceedings of the Entomological Society of Washington, vol. 77, no. 1, pp. 59-60.

**Van Dyke, E. C.**

1949 New species of North American Coleoptera. The Pan-Pacific Entomologist, vol. 25, no. 2, pp. 49-56.

**West, L. S.**

1929a The behavior of *Macronychus glabratus* Say (Coleo.: Helmididae). Entomological News, vol. 40, no. 6, pp. 171-173.

**West, L. S.**

1929b A preliminary study of larval structure in the Dryopidae. Annals of the Entomological Society of America, vol. 22, no. 4, pp. 691-727, illus.

**Westwood, J. O.**

1839 An introduction to the modern classification of insects; founded on the natural habits and corresponding organisation of the different families. Longman, Orme, Brown, Green, and Longmans, London, vol. 1, 462 pp., illus.

**White, D. S.**

1978a Life cycle of the riffle beetle, *Stenelmis sexlineata* (Elmididae). Annals of the Entomological Society of America, vol. 71, no. 1, pp. 121-125.

**White, D. S.**

1978b A revision of the nearctic *Optioservus* (Coleoptera: Elmidae), with descriptions of new species. Systematic Entomology, vol. 3, pp. 59-74, illus.

**White, D. S. and H. P. Brown**

1976 A new species of *Stenelmis* from North Carolina (Coleoptera: Elmidae). The Coleopterists Bulletin, vol. 30, no. 2, pp. 189-191, illus.

**Young, F. N.**

- 1954 The water beetles of Florida. Biological Science Series, University of Florida Press, Gainesville, vol. V, no. 1, 238 pp., illus.

**Zaitzev, P. A.**

- 1910 Dryopidae, Cyathoceridae, Georyssidae, Heteroceridae. In *Coleopterorum catalogus auspiciis et auxilio W. Junk editus a S. Schenkling*. Junk, Berlin, pt. 17, (vol. 14), pp. 1-68.

**Zimmermann, C. C. A.**

- 1869 Synonymical notes on Coleoptera of the United States, with descriptions of new species, from the MSS of the late Dr. C. Zimmermann. Edited by John L. LeConte, M.D. *Transactions of the American Entomological Society*, vol. 2, pp. 243-259.

# INDEX

Names are indexed as follows:

**CAPITALS:** All names for taxa above the generic level;

**Boldface:** Valid generic and subgeneric names;

**Roman:** Valid specific and subspecific names;

*Italic:* All invalid names such as synonyms, nomina nuda, and extra-limital taxa even though valid.

Parentheses around an author's name indicate that the specific name has been transferred from its original genus. The generic name following the author's name indicates the present placement of the species. Synonyms of species-group names are listed with the original spelling.

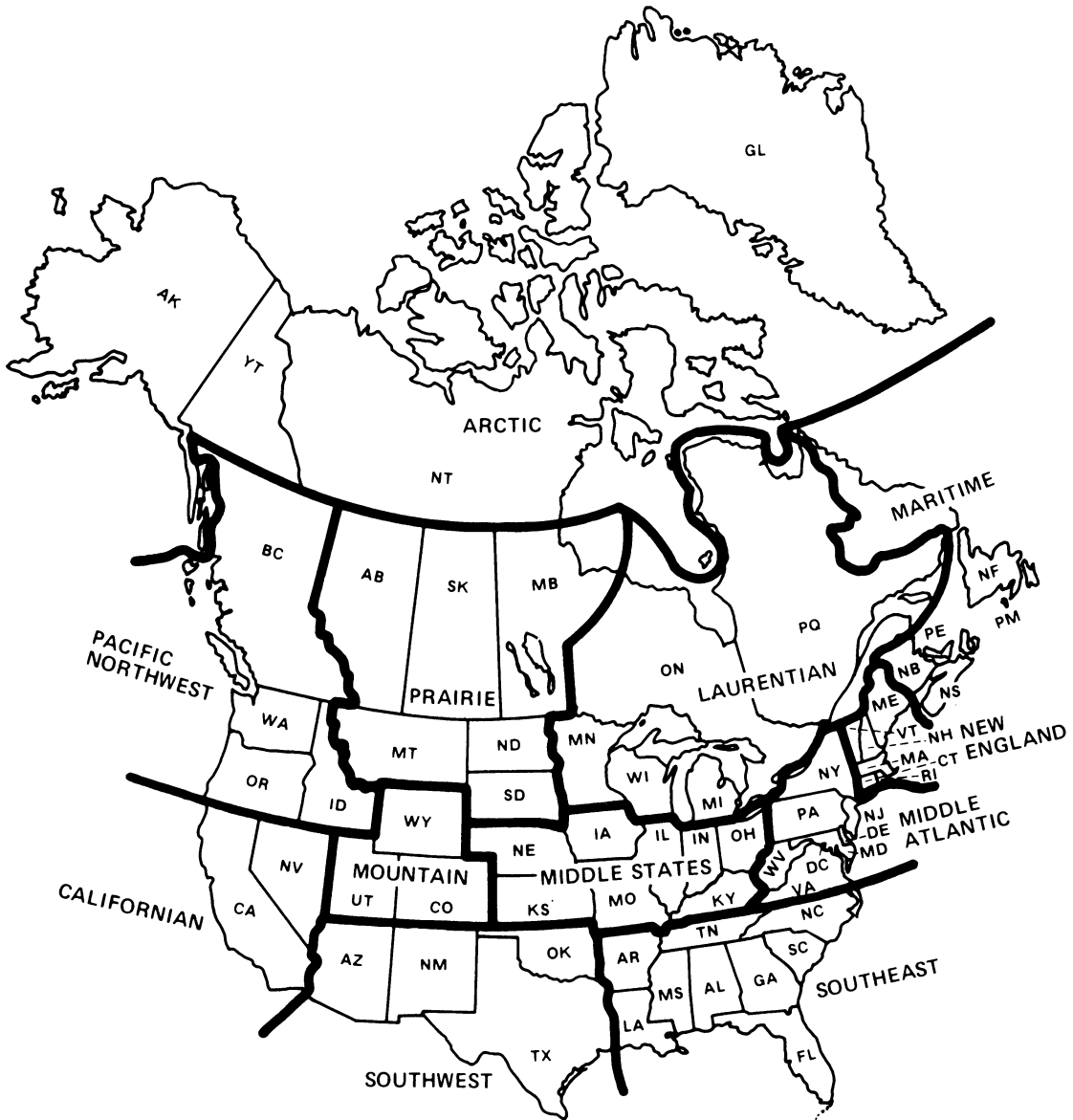
abnormis (Horn), Cylloepus.....	4
acicula Hinton, Heterelmis.....	5
addenda (Fall), Cleptelmis.....	4
ampliatus (Fall), Optioservus.....	8
amplipennis Darlington, Lara.....	2
Ampumixis Sanderson.....	3
ANCYRONYCHINI.....	3
Ancyronyx Erichson.....	3
angustus Casey, Narpus.....	7
antennalis Sanderson, Stenelmis.....	10
antennatus (Fall), Heterlimnius.....	6
aptus (Musgrave), Microcylloepus.....	6
arizonicus (Brown), Narpus.....	7
Atractelmis Chandler.....	3
avara LeConte, Lara.....	2
beameri Sanderson, Stenelmis.....	10
bicarinata LeConte, Stenelmis.....	10
bivittata (LeConte), Dubiraphia.....	4
blatchleyi Musgrave, Stenelmis.....	11
boeseli Brown, Neocylloepus.....	7
brevipennis Hilsenhoff, Dubiraphia.....	4
browni (Hatch), Microcylloepus.....	6
browni Hilsenhoff, Dubiraphia.....	4
browni White, Optioservus.....	7
brunnescens (Fall), Dubiraphia.....	4
caesa (LeConte), Neaelmis.....	7
calida Chandler, Stenelmis.....	10
canus Chandler, Optioservus.....	8
castanipennis (Fall), Optioservus.....	8
cincta (Say), Ancyronyx.....	3
clavicornis Sharp, Phanocerus.....	3
Cleptelmis Sanderson.....	4
columbiensis (Angell), Zaitzevia.....	12
concinna Sanderson, Stenelmis.....	10
concolor (LeConte), Narpus.....	7
convexula Sanderson, Stenelmis.....	10
corpulentus (LeConte), Heterlimnius.....	6
crenata (Say), Stenelmis.....	10
cryophilus (Musgrave), Optioservus.....	8
Cylloepus Erichson.....	4
decorata Sanderson, Stenelmis.....	10
dietrichi (Musgrave), Gonielmis.....	5
dispar (Fall), Ampumixis.....	3
divergens (LeConte), Optioservus.....	8
douglasensis Sanderson, Stenelmis.....	10
Dubiraphia Sanderson.....	4
elegans (LeConte), Promoresia.....	9
ELMINAE.....	3
ELMINI.....	3
Elsianus Sharp.....	5
exigua Sanderson, Stenelmis.....	10
exilis Sanderson, Stenelmis.....	11
fastiditus (LeConte), Optioservus.....	8
ferrugineus (Horn), Hexacylloepus.....	6
foveatus (LeConte), Microcylloepus.....	6
fraxinus La Rivers, Microcylloepus.....	6
fuscata Blatchley, Stenelmis.....	11
gammoni White and Brown, Stenelmis.....	11
gehringi Darlington, Lara.....	2
giulianii (Van Dyke), Dubiraphia.....	4
glabra (Horn), Heterelmis.....	5
glabratus Say, Macronychus.....	12
Gonielmis Sanderson.....	5

grossa Sanderson, Stenelmis.....	11
Heterelmis Sharp.....	5
Heterlimnius Hinton.....	6
heteroclitus White, Optioservus.....	8
Hexacylloepus Hinton.....	6
humerosa Motschulsky, Stenelmis.....	11
hungerfordi Sanderson, Stenelmis.....	11
immunis (Fall), Optioservus.....	8
knobeli Sanderson, Stenelmis.....	11
koebele (Martin), Heterlimnius.....	6
Lara LeConte.....	2
LARINAE.....	2
LARINI.....	2
lateralis Melsheimer, Macronychus.....	12
lateralis Sanderson, Stenelmis.....	11
latiusculus (LeConte), Oulimnius.....	9
linearis Zimmermann, Stenelmis.....	11
loedingi (Musgrave), Microcylloepus.....	6
MACRONYCHINI.....	12
Macronychus Mueller.....	12
maerkeli Motschulsky, Stenelmis.....	11
maerkelii Motschulsky, Stenelmis.....	11
mera Sanderson, Stenelmis.....	11
Microcylloepus Hinton.....	6
minima Hilsenhoff, Dubiraphia.....	4
mirabilis Sanderson, Stenelmis.....	11
moapa La Rivers, Stenelmis.....	10
moapus La Rivers, Microcylloepus.....	6
moestus (Horn), Elsianus.....	5
musgravei Sanderson, Stenelmis.....	11
Narpus Casey.....	7
Neocylloepus Brown.....	7
Neaelmis Musgrave.....	7
nigra Chandler, Rhizelmis.....	10
nitidulus (LeConte), Oulimnius.....	9
nubifera (Fall), Ordobrevia.....	9
obesa Sharp, Heterelmis.....	5
Optioservus Sanderson.....	7
Ordobrevia Sanderson.....	9
ornata (Schaeffer), Cleptelmis.....	4
Oulimnius des Gozis.....	9
ovalis (LeConte), Optioservus.....	8
ozarkensis Collier, Optioservus.....	8
parkeri Sanderson, Cylloepus.....	4
parumoculatus (Hardy), Ancyronyx.....	3
parva Hilsenhoff, Dubiraphia.....	4
parva Sanderson, Stenelmis.....	11
parvula (Horn), Zaitzevia.....	12
pecosensis (Fall), Optioservus.....	8
perditus (Musgrave), Microcylloepus.....	6
phaeus White, Optioservus.....	8
Phanocerus Sharp.....	2
Promoresia Sanderson.....	9
pusillus (LeConte), Microcylloepus.....	6
quadrinotata Horn, Stenelmis.....	11
quadrinotata (Horn), Optioservus.....	8
quadrinotata (Say), Dubiraphia.....	4
Rhizelmis Chandler.....	9
robusta Hilsenhoff, Dubiraphia.....	4
sandersoni Collier, Optioservus.....	8
sandersoni Musgrave, Stenelmis.....	12
seriatus (LeConte), Optioservus.....	9
sexlineata Sanderson, Stenelmis.....	12
shoemakei Brown, Elsianus.....	5
similis (Horn), Microcylloepus.....	7
sinuata LeConte, Stenelmis.....	12
solutus (Brown), Narpus.....	7
sordida Motschulsky, Stenelmis.....	10
Stenelmis Dufour.....	10
stephani Brown, Heterelmis.....	5
subarctica (Brown), Promoresia.....	9
sulcata Blatchley, Stenelmis.....	11
tardella (Fall), Promoresia.....	9
tarsalis Sanderson, Stenelmis.....	12
texanus Schaeffer, Elsianus.....	5
thermae (Hatch), Zaitzevia.....	13
thermarum (Darlington), Microcylloepus.....	7



trivittatus (Brown), Optioservus .....	9	vulnerata (LeConte), Heterelmis.....	5
variegata (Germar), Ancyronyx .....	3	wawona Chandler, Atractelmis.....	3
vittata (Melsheimer), Dubiraphia .....	5	Zaitzevia Champion .....	12
vittipennis Zimmermann, Stenelmis.....	12		





**AB** Alberta  
**AK** Alaska  
**AL** Alabama  
**AR** Arkansas  
**AZ** Arizona  
**BC** British Columbia  
**CA** California  
**CO** Colorado  
**CT** Connecticut  
**DC** District of Columbia  
**DE** Delaware  
**FL** Florida  
**GA** Georgia  
**GL** Greenland  
**IA** Iowa  
**ID** Idaho  
**IL** Illinois  
**IN** Indiana  
**KS** Kansas  
**KY** Kentucky  
**LA** Louisiana  
**MA** Massachusetts

**MB** Manitoba  
**MD** Maryland  
**ME** Maine  
**MI** Michigan  
**MN** Minnesota  
**MO** Missouri  
**MS** Mississippi  
**MT** Montana  
**NB** New Brunswick  
**NC** North Carolina  
**ND** North Dakota  
**NE** Nebraska  
**NF** Newfoundland  
**NH** New Hampshire  
**NJ** New Jersey  
**NM** New Mexico  
**NS** Nova Scotia  
**NT** Northwest Territories  
**NV** Nevada  
**NY** New York  
**OH** Ohio  
**OK** Oklahoma

**ON** Ontario  
**OR** Oregon  
**PA** Pennsylvania  
**PE** Prince Edward Island  
**PM** St. Pierre-Miquelon  
**PQ** Quebec  
**RI** Rhode Island  
**SC** South Carolina  
**SD** South Dakota  
**SK** Saskatchewan  
**TN** Tennessee  
**TX** Texas  
**UT** Utah  
**VA** Virginia  
**VT** Vermont  
**WA** Washington  
**WI** Wisconsin  
**WV** West Virginia  
**WY** Wyoming  
**YT** Yukon Territory

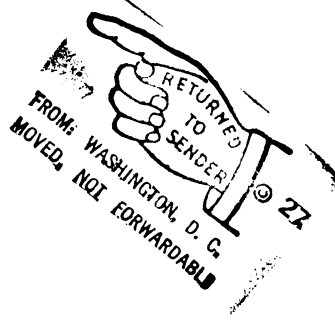
United States Department of Agriculture  
Agricultural Research Service  
Washington, D. C. 20250

OFFICIAL BUSINESS  
Penalty for Private Use, \$300



Postage and Fees Paid  
United States  
Department of Agriculture  
AGR-101

~~POST~~ B1st/v.



25879 12011/20045EFW 130001  
EDITOR FARM WOMAN

930 NATIONAL PRESS BLDG  
WASHINGTON DC 20045-

Microfiche or printed copies of this publication may be purchased from the National Technical Information Service, 5285 Port Royal Road, Springfield, Va. 22161. For additional information, contact NTIS at the address above or call NTIS order desk at (703) 487-4650.