

THE ELATERIDAE OF WISCONSIN¹

I. A LIST OF THE SPECIES FOUND IN WISCONSIN AND KEYS TO THE IDENTIFICATION OF GENERA OF ADULTS AND LARVAE

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The click beetles and wireworms which make up the family Elateridae are familiar insects to a large part of the rural population of Wisconsin. In most cases the adult and larvae are not recognized as different stages of the same insect, but each claims attention in its own way. The adults are known for their ability, when placed on their backs, to spring into the air with an audible click which has earned them their common name. On the other hand, the larvae are best known as destroyers of newly planted corn and potatoes and are the cause of replanting or abandonment of certain fields.

Previous published work on the Elateridae in Wisconsin is scanty and consists mainly of short notes in Extension publications or in the Annual Reports of the Wisconsin Agricultural Experiment Station.

Similar work on the Elateridae of other states has been done in Indiana by Blatchley (1910), in Maine by Hawkins (1936), in Pennsylvania by Thomas (1941), in New York by Dietrich (1945), in South Dakota by Severin (1949) and in Georgia by Fattig (1951).

The purpose in making the present study was twofold. The first objective was to provide a means of recognizing adult and larval Elaterids occurring in Wisconsin. This includes (1) keys constructed for the identification of genera and species by means of both adult and larval characteristics and (2) descriptions of the adults and larvae of each species. An attempt has been made to present this information in a form that will be equally acceptable to taxonomist, student, and fieldman. The second aim was to provide information about the biology of the individual species since such knowledge is fundamental to the development of suitable con-

¹Contributions from the Department of Entomology, Wisconsin Agricultural Experiment Station, Madison, Wisconsin, and the Entomology Faculty, Division of Biological Sciences, North Carolina State College, Raleigh, N. C. Published with the approval of the Director of Research, North Carolina Agricultural Experiment Station as Paper No. 901 of the Journal Series.

²The author wishes to acknowledge the assistance of Judith B. Bain and Joyce A. Hunt in preparing the drawings and of Merton C. Lane who reviewed the manuscript.

trol procedures and to a clear understanding of the true relationships of the accepted taxonomic groups. Information on the biology of these insects has been obtained through observations in the field, by rearing of the immature forms and from published reports of other workers.

The first section of this report deals mainly with recognition of the genera. Discussion of specific characteristics and biology is to be taken up in subsequent sections.

CHARACTERISTICS OF THE ELATERIDAE

The adult click beetles vary greatly in size but are quite constant in general shape, their elongate form and the often prolonged hind angles of the pronotum making them easily recognizable. The elytra are rigidly constructed, narrowing gradually posteriorly, and the hind wings are well developed. The tarsi and abdomen are five segmented and there is always present a prosternal prolongation or process which fits into a cavity in the mesosternum. Adult members of this family differ from those of other closely related families which also possess a prosternal prolongation and mesosternal groove in that the Elaterids have the prothorax loosely joined to the mesothorax. This permits the movement necessary for making the snapping leap into the air when the beetles are placed on their backs.

The antennae are more or less serrate and are generally 11-segmented; in a few genera a 12th segment may be present. The mouthparts are adapted for chewing, with the mandibles quite small and retracted.

The legs are slender; the fore coxae are spherical with the cavity open behind, while the hind coxae are transverse and contiguous.

Wireworms also vary considerably in size but most species are readily recognized by their hard, shining bodies varying in color from pale yellow to dark red-brown and bearing only three pairs of five-segmented thoracic legs. The labrum is fused to the clypeus and forms a toothlike projection or projections known as the nasale. The clypeus is not distinctly delimited posteriorly and the frontoclypeal area is usually lyre-shaped and quite characteristic of the family.

The abdomen is apparently nine- but actually ten-segmented, the tenth segment appearing as a projection from the ventral surface of the ninth and bearing the anus. The ninth segment is extremely variable in shape; sometimes with horn-like terminal processes known as urogomphi surrounding a caudal notch.

Elaterid eggs are small, generally less than 0.5 mm. in diameter, and almost spherical. They are usually white, sometimes with a bluish or yellow tinge.

The pupae are dull yellow to white and have conspicuous spine-like processes at the anterior angles of the prothorax.

SPECIES OF ELATERIDAE FOUND IN WISCONSIN

The specimens studied include representatives in the collection of The United States National Museum, the Milwaukee Public Museum, the William S. Marshall collection and the collection of the Department of Entomology at the University of Wisconsin, those in the author's collection, and larval specimens belonging to Dr. H. H. Jewett. In addition, a large number of specimens collected by Dr. R. D. Shenefelt and associates, was available for study. The literature was reviewed for references to the occurrence or possible occurrence of various species in Wisconsin or neighboring states.

Studies of Elaterid larvae by Hyslop (1917), Glen *et al* (1943), Van Emden (1945), Jewett (1946) and Glen (1950) provided information essential to an understanding of the characteristics of the genera occurring in Wisconsin.

Following is a list of the species occurring or probably occurring in Wisconsin, the letter "P" after a name indicating probable, though unreported occurrence:

LACON Castelnau

- L. auroratus* (Say)
- L. avitus* (Say)
- L. brevicornis* (Lec.)
- L. discoideus* (Web.)
- L. marmoratus* (Fab.)
- L. obtectus* (Say)

COLAULON Arnett

- C. rectangularis* (Say)

AL AUS Eschscholtz

- A. myops* (Fab.)
- A. oculatus* (L.)

CONODERUS Eschscholtz

- C. auritus* (Hbst.)
- C. vespertinus* (Fab.)

DRASTERIUS Eschscholtz

- D. dorsalis* (Say)

PITYOBIUS Leconte

- P. anguinus* (Lec.)

LIMONIUS Eschscholtz

- L. aeger* Lec.
- L. anceps* Lec.
- L. aurifer* Lec.
- L. auripilis* (Say)
- L. basilaris* (Say)
- L. confusus* Lec. P
- L. ectypus* (Say)
- L. griseus* (Beauv.)
- L. plebejus* (Say)
- L. quercinus* (Say)
- L. rudis* Brown

ATHOUS Eschscholtz

- A. acanthus* (Say)
- A. brightwelli* (Kby.)
- A. cucullatus* (Say)
- A. rufifrons* (Rand.)
- A. scapularis* (Say)

DENTICOLLIS Piller & Mitter-
packer

- D. denticornis* (Kby.)
D. productus (Rand.)

CTENICERA Latreille

- C. aethiops* (Hbst.)
C. appressa (Rand.)
C. appropinquans (Rand.)
C. arata (Lec.) P
C. cylindriciformis (Hbst.)
C. darlingtoni (Brown)
C. fallax (Say) P
C. falsifica (Lec.)
C. fulvipes (Bland)
C. hamata (Say)
C. hieroglyphica (Say)
C. inflata (Say)
C. insidiosa (Lec.) P
C. kendalli (Kby.)
C. lobata tarsalis (Melsh.)
C. mediana (Germ.)
C. mendax (Lec.)
C. nitidula (Lec.)
C. propola (Lec.)
C. pyrrhos (Hbst.)
C. resplendens (Esch.)
C. sjaelandica (Mueller)
C. spinosa (Lec.)
C. splendens (Zeig.)
C. sulcicollis (Say)
C. triundulata (Rand.)
C. vernalis (Hentz)

HEMICREPIDIUS Germar

- H. bilobatus* (Say)
H. decoloratus (Say)
H. memnonius (Hbst.)

HYPOLITHUS Eschscholtz

- H. abbreviatus* (Say)

NEGASTRIUS Thomson

- N. choris* (Say)
N. exiguus (Rand.)
N. obliquatus (Melsh.)
N. tumescens (Lec.)

PARALLELOSTETHUS
Schwarz

- P. attenuatus* (Say)

ELATER Linnaeus

- E. abruptus* Say

OXYGONUS Leconte

- O. obesus* (Say)

SERICUS Eschscholtz

- S. honestus* (Rand.)
S. incongruus (Lec.)
S. silaceus (Say)
S. viridanus (Say)

DALOPIUS Eschscholtz

- D. cognatus* Brown
D. pallidus Brown
D. vagus Brown

AGRIOTES Eschscholtz

- A. arcanus* Brown
A. avulsus (Lec.)
A. fucosus (Lec.)
A. insanus Cand.
A. isabellinus (Melsh.)
A. limosus (Lec.)
A. mancus (Say)
A. oblongicollis (Melsh.)
A. pubescens (Melsh.)
A. quebecensis Brown
A. stabilis (Lec.)

AGRIOTELLA Brown

- A. bigeminata* (Rand.)

GLYPHONYX Candezze

- G. recticollis* (Say) ?

AMPEDUS Dejean

- A. aereolatus* (Say)
A. apicatus (Say)
A. impolitus (Melsh.)
A. linteus (Say)
A. luctuosus (Lec.)
A. manipularis (Cand.)
A. melanotoides Brown

<i>A. militaris</i> (Harris)	<i>M. communis</i> (Gyll.)
<i>A. mixtus</i> (Hbst.)	<i>M. cribulosus</i> (Lec.)
<i>A. nigricans</i> Germ.	<i>M. depressus</i> (Melsh.)
<i>A. nigricollis</i> (Hbst.)	<i>M. divarcarinus</i> Blatch.
<i>A. nigrinus</i> (Hbst.)	<i>M. fissilis</i> (Say)
<i>A. pedalis</i> Germ.	<i>M. ignobilis</i> (Melsh.)
<i>A. rubricus</i> (Say)	<i>M. morosus</i> Cand.
<i>A. sanguinipennis</i> (Say)	<i>M. pertinax</i> (Say)
<i>A. semicinctus</i> (Rand.)	<i>M. tenax</i> (Say)
<i>A. socer</i> (Lec.)	<i>M. trapezoideus</i> (Lec.)
<i>A. verticinus</i> (Beauv.)	
<i>A. vitiosus</i> (Lec.)	

CARDIOPHORUS Eschscholtz

<i>C. convexulus</i> (Say)
<i>C. convexus</i> (Say)
<i>C. gagates</i> Er.

MEGAPENTHES Kiesenwetter

<i>M. stigmatosus</i> (Lec.)

MELANOTUS Eschscholtz

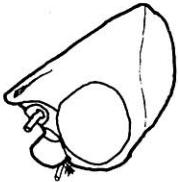
<i>M. americanus</i> (Hbst.)
<i>M. castanipes</i> (Payk.)

HORISTONOTUS Candeze

<i>H. curiatus</i> (Say)

KEY TO THE WISCONSIN GENERA OF ADULT ELATERIDAE

- Front flattened or concave, facing obliquely dorsally with anterior margin not extending downward below the level of the eyes and without oblique clypeal carinae beneath; mouthparts directed and usually projecting anteriorly (Fig. 1) (Pyrophorinae) ----- 3
 Front convex, facing anteriorly usually with anterior margin extending downward below the level of the eyes or carinate and supported beneath by converging oblique carinae (Fig. 2); mouthparts not projecting anteriorly (Fig. 3) ---- 2
- Scutellum, or posterior portion thereof, heartshaped (Fig. 8) (Cardiophorinae) ----- 25
 Scutellum variable in shape, not heartshaped (Fig. 5) (Elaterinae) ----- 16
- Hind coxae with ventral plates broad at inner third; broader in dilated portion than hind femora (Figs. 10, 12) ----- 4
 Hind coxae with ventral plates relatively narrow at inner third; as narrow or narrower in dilated portion than hind femora (Fig. 11) ----- 9
- Hind coxae truncate at outer ends (Fig. 10) prosternal sutures straight or concave, diverging near coxae (Figs. 13, 15) (Pyrophorini) ----- 5
 Hind coxae pointed at outer ends (Fig. 12) prosternal sutures convex, converging toward coxae (Figs. 16, 18) (Negastriini = Hypnoidini) ----- 15



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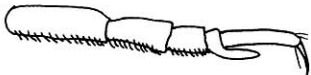
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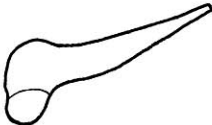
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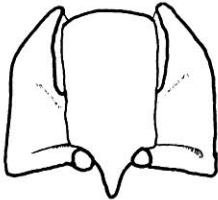
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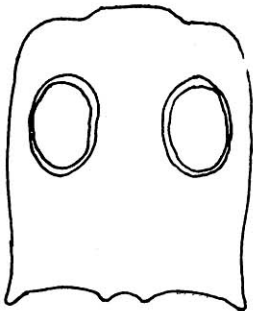
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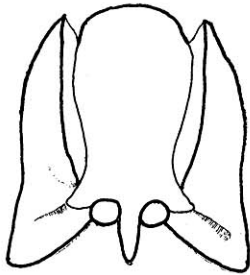
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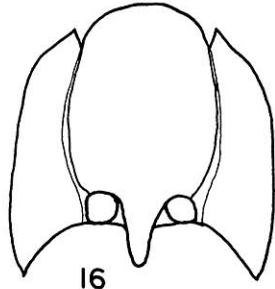


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PLATE I

ADULT STRUCTURES

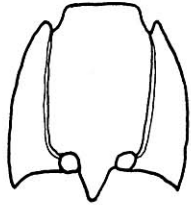
- FIGURE 1. *Pityobius anguinus* head, lateral.
2. *Glyphonyx* sp. head, frontal.
3. *Agriotes stabilis* head, lateral.
4. *Limonius basilaris* hind tarsus, lateral.
5. *Elater abruptus* scutellum.
6. *Conoderus auritus* hind tarsus, lateral.
7. *Hemicrepidius memmonius* hind tarsus, lateral.
8. *Cardiophorus gagates* scutellum.
9. *Drasterius dorsalis* hind tarsus, lateral.
10. *Drasterius dorsalis* ventral plate of hind coxa.
11. *Denticollis denticornis* ventral plate of hind coxa.
12. *Hypolithus abbreviatus* ventral plate of hind coxa.
13. *Colaulon rectangularis* prothorax, ventral.
14. *Alaus oculatus* pronotum.
15. *Lacon discoideus* prothorax, ventral.



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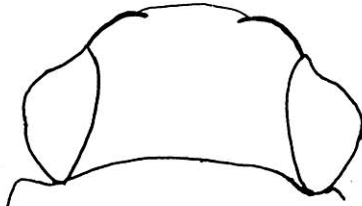
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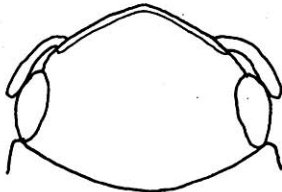
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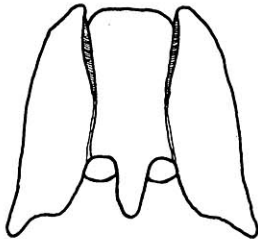
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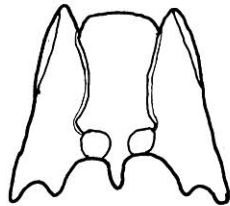
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PLATE II

ADULT STRUCTURES

- FIGURE 16. *Hypolithus abbreviatus* prothorax, ventral.
17. *Athous cucullatus* head, dorsal.
18. *Negastrius choris* prothorax, ventral.
19. *Oxygonus obesus* tarsal claw.
20. *Ctenicera pyrrhos* head, dorsal.
21. *Melanotus fissilis* ventral plate of hind coxa.
22. *Dalopius pallidus* ventral plate of hind coxa.
23. *Melanotus fissilis* tarsal claw.
24. *Megapenthes limbalis* head, dorsal.
25. *Elater abruptus* ventral plate of hind coxa.
26. *Ampedus linteus* prothorax, ventral.
27. *Parallelostethus attenuatus* mesosternal cavity, ventral.
28. *Megapenthes limbalis* prothorax, ventral.

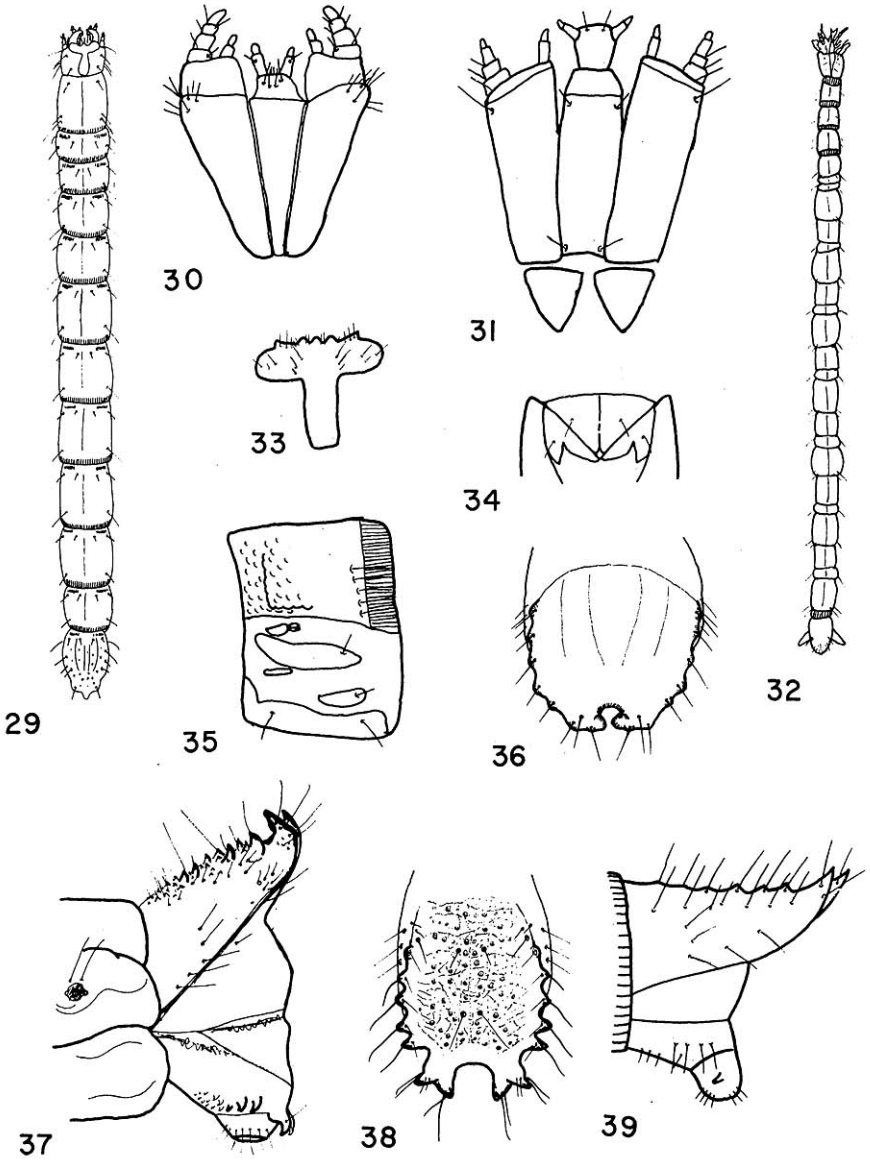
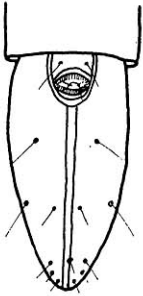


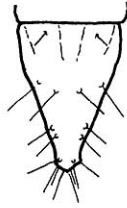
PLATE III

LARVAE

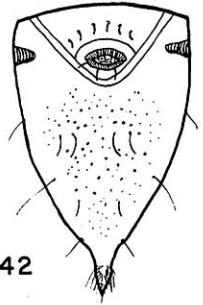
- FIGURE 29. *Melanotus communis* larva, dorsal.
30. *Drasterius dorsalis* ventral mouthparts.
31. *Ctenicera kendalli* ventral mouthparts.
32. *Cardiophorus* sp. larva, dorsal.
33. *Conoderus auritus* fronto-clypeal sclerite.
34. *Ctenicera kendalli* presternal area.
35. *Hemicrepidius bilobatus* sixth abdominal segment, lateral.
36. *Limonius* sp. ninth abdominal segment, dorsal.
37. *Alaus myops* ninth and tenth abdominal segments, lateral.
38. *Lacon marmoratus* ninth abdominal segment, dorsal.
39. *Conoderus auritus* ninth and tenth abdominal segments, lateral.



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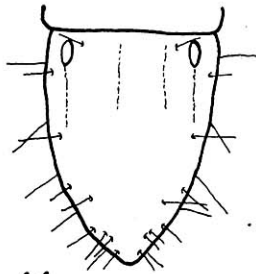
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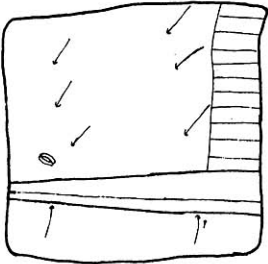
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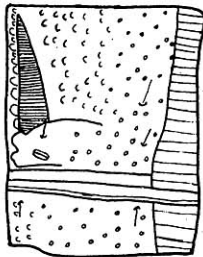
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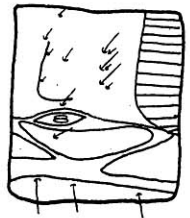
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PLATE IV

LARVAE

- FIGURE 40. *Elater abruptus* ninth and tenth abdominal segments, ventral.
41. *Dalopius pallidus* ninth abdominal segment, dorsal.
42. *Megapenthes limbalis* ninth and tenth abdominal segments, ventral.
43. *Elater abruptus* antenna.
44. *Agriotes mancus* ninth abdominal segment, dorsal.
45. *Parallelostethus attenuatus* antenna.
46. *Agriotes mancus* sixth abdominal segment, lateral.
47. *Ampedus nigricollis* sixth abdominal segment, lateral.
48. *Hypolithus abbreviatus* sixth abdominal segment, lateral.

5. Prosternal sutures forming antennal grooves (Figs. 13, 15) (<i>Agrypnina</i>) -----	6
Prosternal sutures normal, no antennal grooves -----	7
6. Pronotum with deep linear impressions; antennal groove occupying entire prosternal suture (Fig. 15) -----	<i>Lacon</i>
Pronotum without deep impressions; antennal groove abbrevi- ated (Fig. 13) -----	<i>Colaulon</i>
7. Pronotum with eyelike spots (Fig. 14); tarsal claws with a long pencil of bristles at base of each -----	<i>Alaus</i>
Pronotum without eyelike spots; tarsal claws without a pencil of bristles (<i>Conoderina</i>) -----	8
8. Lobe on fourth tarsal segment prominent, projecting beneath fifth for at least one-fourth the length of the fifth segment (Fig. 6) -----	<i>Conoderus</i>
Lobed process on fourth tarsal segment short and broad, pro- jecting only slightly beneath the fifth (Fig. 9) ----	<i>Drasterius</i>
9. Antennae 12-segmented (<i>Pityobini</i>) -----	<i>Pityobius</i>
Antenna 11-segmented (<i>Denticollini</i> = <i>Lepturoidini</i>) ----	10
10. Tarsal claws simple (Fig. 4) -----	11
Tarsal claws with a stout tooth at base (Fig. 19) --	<i>Oxygonus</i>
11. Prosternal lobe extending forward well beyond hind margins of eyes; with appearance of typical Elaterid -----	12
Prosternal lobe short, not extending forward beyond hind margins of eyes; resembling a <i>Cantharid</i> -----	<i>Denticollis</i>
12. Margin of front straight, uniformly elevated (Fig. 17) ----	13
Margin of front curved, usually depressed in middle (Fig. 20) -----	14
13. First two tarsal segments subequal in length (Fig. 4) <i>Limoniis</i>	
First tarsal segment distinctly longer than second ----	<i>Athous</i>
14. Second and third tarsal segments lobed (Fig. 7)	
-----	<i>Hemicrepidius</i>
Tarsal segments without lobes -----	<i>Ctenicera</i>
15. Prosternal sutures subarcuate, converging gradually toward anterior lobe and coxal cavities (Fig. 16) -----	<i>Hypolithus</i>
Prosternal sutures converging suddenly at base of anterior lobe and at coxal cavities (Fig. 18) -----	<i>Negastrius</i>
16. Hind coxal plates with posterior margins sinuate (Fig. 22); propleural margins concave or excavated along prosternal sutures, at least anteriorly (<i>Agriotini</i>) -----	21
Hind coxal plates with posterior margins angulate (Figs. 21, 25); propleural margins variable along prosternal sutures -----	17
17. Propleural margins depressed or excavated along prosternal sutures, at least anteriorly (Fig. 26) -----	24
Propleural margins not depressed or excavated along pro- sternal sutures (Fig. 28) -----	18

18. Margin of front elevated above the clypeus (Fig. 24) ----- *Megapenthes*
 Margin of front not elevated in middle above clypeus (*Ela-*
terini) ----- 19
19. Hind coxal plates with a distinct angle or tooth at widest
 point (Fig. 25); length 15 mm. or more ----- 20
 Hind coxal plates with a blunt or indistinct angle at widest
 point; length, less than 15 mm. ----- *Sericus*
20. Sides of mesosternal cavity parallel (Fig. 27); pronotum
 piceous ----- *Parallelostethus*
 Sides of mesosternal cavity convergent posteriorly; pro-
 notum black ----- *Elater*
21. Tarsal claws pectinate ----- *Glyphonyx*
 Tarsal claws simple ----- 22
22. Lateral margins of prothorax inferior anteriorly ----- 23
 Lateral margins straight, not inferior anteriorly --- *Dalopius*
23. Margin of front elevated; prosternal lobe extending beyond
 anterior ends of propleura ----- *Agriotella*
 Margin of front not elevated (Fig. 3); prosternal lobe not
 extending beyond anterior ends of propleura ----- *Agriotes*
24. Tarsal claws pectinate (Fig. 23) (*Melanotini*) ---- *Melanotus*
 Tarsal claws simple (*Ampedini*) ----- *Ampedus*
25. Pronotum without a distinct lateral margin, apparent lateral
 margin visible posteriorly from ventral side ---- *Cardiophorus*
 Pronotum with lateral margin distinct posteriorly and visible
 dorsally ----- *Horistonotus*

KEY TO THE WISCONSIN GENERA OF LARVAL ELATERIDAE³

1. Ninth abdominal segment with a median caudal notch (Figs.
 36, 38) (*Pyrophorinae*) ----- 3
 Ninth abdominal segment without a median caudal notch
 (Figs. 29, 32, 40, 41, 42, 44) ----- 2
2. Abdomen entirely soft-skinned; abdominal segments sub-
 divided into 2 or 3 ringlike divisions (Fig. 32) (*Cardio-*
phorinae) ----- 26
 Abdomen partially or completely sclerotized; abdominal seg-
 ments not subdivided as above (Fig. 29) (*Elaterinae*) ---- 17
3. Submentum triangular; bases of stipes contiguous (Fig. 30) 4
 Submentum not triangular; bases of stipes well separated
 (Fig. 31) (*Denticollini* = *Lepturoidini*) ----- 9
4. Anal hooks present on tenth abdominal segment (Figs. 37,
 39) (*Pyrophorini*) ----- 5
 Anal hooks absent, armature consisting of a narrow ridged
 band on each side of tenth segment (*Pityobini*) ---- *Pityobius*

³ The larvae of *Oxygonus* are unknown.

- 5. Dorsum of head with a prominent longitudinal groove extending from near frontal suture to hind margin of head on either side; with short spines in addition to anal hooks on tenth abdominal segment (Fig. 37) (*Hemirhipina*) ----- *Alaus*
 Dorsum of head without extensive longitudinal grooves, sometimes with short grooves or rows of setae posteriorly; without short spines in addition to anal hooks on tenth segment ----- 6
- 6. Anal hooks long and prominent, extending to or beyond tip of tenth abdominal segment (*Agrypnina*) ----- 7
 Anal hooks short and inconspicuous, not extending to tip of tenth abdominal segment (Fig. 39) (*Conoderina*) ----- 8
- 7. Dorsum of ninth abdominal segment covered with small tubercles (Fig. 38) ----- *Lacon*
 Dorsum of ninth abdominal segment without tubercles ----- *Colaulon?*
- 8. Frons truncate at base (Fig. 33) ----- *Conoderus*
 Frons tapering to a blunt point at base ----- *Drasterius*
- 9. First 8 abdominal segments conspicuously sculptured or pitted (Fig. 35) ----- 14
 First 8 abdominal segments smooth; sparsely or finely punctured ----- 10
- 10. Nasale tridentate or if consisting of one triple-pointed tooth, with a dorsal seta on the head on each side of and adjacent to the posterior portion of the fronto-clypeal area ----- 15
 Nasale consisting of one single- or triple-pointed tooth; without dorsal setae adjacent to the posterior portion of the fronto-clypeal area ----- 11
- 11. Presternum of prothorax consisting of one large triangular sclerite ----- 12
 Presternum of prothorax divided into 2 or more sclerites (Fig. 34) ----- *Ctenicera*
- 12. Lateral margins of ninth abdominal segment with two or more prominent projections on each side; caudal notch variable ----- 13
 Lateral margins of ninth abdominal segment sinuate with not more than one prominent projection on each side (Fig. 36) caudal notch small ----- *Limonius*
- 13. Dorsum red-brown to black; urogomphi with outer prongs longer than inner ----- *Denticollis*
 Dorsum yellow-brown or amber; urogomphi variable *Ctenicera*
- 14. Eyes present; abdominal segments with conspicuous pits or crescent-shaped sculpturing ----- *Athous*
 Eyes absent; abdominal segments with crescent-shaped sculpturing (Fig. 35) ----- *Hemicrepidius*

15. Lateral margins of ninth abdominal segment with prominent projections, anterolateral impressions on tergites of abdominal segments 2 through 8 reaching or approaching mid-dorsal line ----- *Ctenicera*
 Lateral margins of ninth abdominal segments smooth or hardly protuberant; anterolateral impressions absent or more abbreviated (Fig. 48) (Negastrini = Hypnoidini) ----- 16
16. Nasale consisting of one triple pointed tooth; urogomphi two pronged ----- *Hypolithus*
 Nasale tridentate; urogomphi simple, undivided --- *Negastrius*
17. Sternum of ninth abdominal segment narrower anteriorly than sternum of eighth posteriorly (Fig. 40); tip of ninth segment broadly rounded (Elaterini) ----- 18
 Sternum of ninth abdominal segment broader anteriorly than sternum of eighth posteriorly (Fig. 42); tip of ninth segment bluntly or sharply pointed or scalloped (Figs. 29, 41, 42, 44) ----- 20
18. Nasale consisting of one triple-pointed tooth; second antennal segment with 5 or more papillae (Figs. 43, 45) ----- 19
 Nasale consisting of one single-pointed tooth; second antennal segment with a single papilla ----- *Sericus*
19. Second antennal segment with 8 to 13 papillae (Fig. 45) ----- *Parallelostethus*
 Second antennal segment with 5 to 7 papillae (Fig. 43) *Elater*
20. Dorsum of ninth abdominal segment flattened and with margin scalloped (Fig. 29) (Melanotini) ----- *Melanotus*
 Dorsum of ninth abdominal segment neither flattened nor scalloped ----- 21
21. Nasale consisting of one triple-pointed tooth, abdominal tergites without striate impressions (Agriotini) ----- 22
 Nasale variable, if consisting of one triple-pointed tooth, the abdominal tergites with striate impressions (Fig. 47) (Ampedini) ----- 25
22. Ninth abdominal segment with a pair of central dorso-tergal setae (Fig. 41) ----- *Dalopius*
 Ninth abdominal segment without central dorso-tergal setae (Fig. 44) ----- 23
23. First 8 abdominal tergites with 3 or more prominent setae in a transverse line anteriorly (Fig. 46) (additional short setae may be present); eyes usually present ----- 24
 First 8 abdominal tergites with only 2 prominent setae in a transverse line anteriorly (additional short setae may be present); eyes lacking ----- *Agriotella?*

24. Submentum approximately 4 times as long as average width; most dorsal of the large anterior setae on the first 8 abdominal tergites with a small seta on either site transversely ----- *Glyphonyx*
 Submentum not more than 3 times as long as average width; most dorsal of the large anterior setae on abdominal tergites without small setae on either side transversely (Fig. 44) ----- *Agriotes*
25. Abdominal segments sparsely or finely punctured (Fig. 46) nasale tridentate ----- *Megapenthes*
 Abdominal segments conspicuously sculptured or with pits or coarse punctures (Fig. 47) nasale usually consisting of one single-pointed tooth ----- *Ampedus*
26. With an eye at base of each antenna (Fig. 32) -- *Cardiophorus*
 Without eyes ----- *Horistonotus*

LITERATURE CITED

- BLATCHLEY, W. S. 1910. Coleoptera of Indiana. *Nature Publ. Co.*, Indianapolis. pp. 699-773.
- DIETRICH, HENRY. 1945. The Elateridae of New York State. N. Y. (*Cornell Agr. Exp. Sta. Mem.* 269. 79 pp.
- FATTIG, P. W. 1951. The Elateridae of Georgia. *Emory Univ. Museum Bull.* 10. 25 pp.
- GLEN, ROBERT. 1950. Larvae of the Elaterid Beetles of the Tribe Lepturoidini. *Smiths Misc. Coll.* Vol. III, No. 11. 256 pp.
- GLEN, ROBERT, K. M. KING and A. P. ARNASON. 1943. The identification of wireworms of economic importance in Canada. *Can. Jour. Res.* 21:358-387.
- HAWKINS, J. H. 1936. The bionomics and control of wireworms in Maine. *Maine Agr. Exp. Sta. Bul.* 381. 146 pp.
- HYSLOP, J. A. 1917. The phylogeny of the Elateridae based on larval characters. *Ann. Ent. Soc. Am.* 10:241-263.
- JEWETT, H. H. 1946. Identification of some larval Elateridae found in Kentucky. *Ky. Agr. Exp. Sta. Bul.* 489. 40 pp.
- SEVERIN, H. C. 1949. The wireworms (Elateridae) of South Dakota. *S. Dak. Agr. Exp. Sta. Tech. Bul.* 8. 18 pp.
- THOMAS, C. A. 1941. The Elateridae of Pennsylvania. *Jour. N. Y. Ent. Soc.* 49:233-263.
- VAN EMDEN, F. I. 1945. Larvae of British Beetles. V. Elateridae. *Ent. Monthly Mag.* 81:13-37.