

NEARCTIC *ENOCHRUS*: BIOLOGY, KEYS, DESCRIPTIONS AND
DISTRIBUTION (COLEOPTERA: HYDROPHILIDAE)

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ABSTRACT

This article presents adult keys, descriptions, and distributions as well as biological data for the 24 species and 7 subspecies of the genus *Enochrus* in the Nearctic Region.

ACKNOWLEDGEMENTS

This revision of the *Enochrus* was started as a doctoral thesis at the University of Minnesota under Dr. Edwin Cook, Department of Entomology; Fisheries and Wildlife. Thanks to Dr. Cook's long enduring encouragement this study has reached completion. I am indebted to St. Cloud State University and the Department of Biological Sciences for providing student help and space. Material for this revision was borrowed from some 40 institutions in the United States and Canada, but special thanks must go to Hugh Leech, California Academy of Sciences; Paul Spangler, US National Museum; Margaret Thayer, Harvard; and David Miller, New City College for their comments and loans of large numbers of specimens. Numerous student assistants should also be acknowledged for their many hours of work in mapping, tallying, labeling, assembling plates, and innumerable other things over the years.

INTRODUCTION

The genus *Enochrus* is represented by 24 species and 7 subspecies in the Nearctic Region. The genus is separated from other genera of hydrophilids by moderate body size, 2.25-8.2 mm.; elytral striae, except for sutural, represented by rows of fine punctures; long slender maxillary palpi with the last segment directed outward rather than inward; and a thin, sharp-edged, longitudinal, mesosternal lamella (mesosternal crest) (figs. 1-3).

The last complete study of this genus for the Nearctic was by Winters (1927). Since then several new species have been described and several regional studies including species of *Enochrus* have been published: California (Leech & Chandler, in Usinger 1956); Florida (Young 1954); Michigan (Wilson 1967); North Dakota (Gordon 1965); Pacific Northwest (Miller 1964; in Hatch 1965). Besides the need for an updated key, a thorough revision was called for. In the genus *Enochrus* many anatomical characteristics are variable, some species differences are small,

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and many species distinctions are still based mainly on color and color patterns. A combination of anatomical characteristics, color, distribution, and male genitalia (useful in about one-third of the species) clarifies species line satisfactorily. Unfortunately, in some species color is still the most convenient or distinctive characteristic.

BIONOMICS

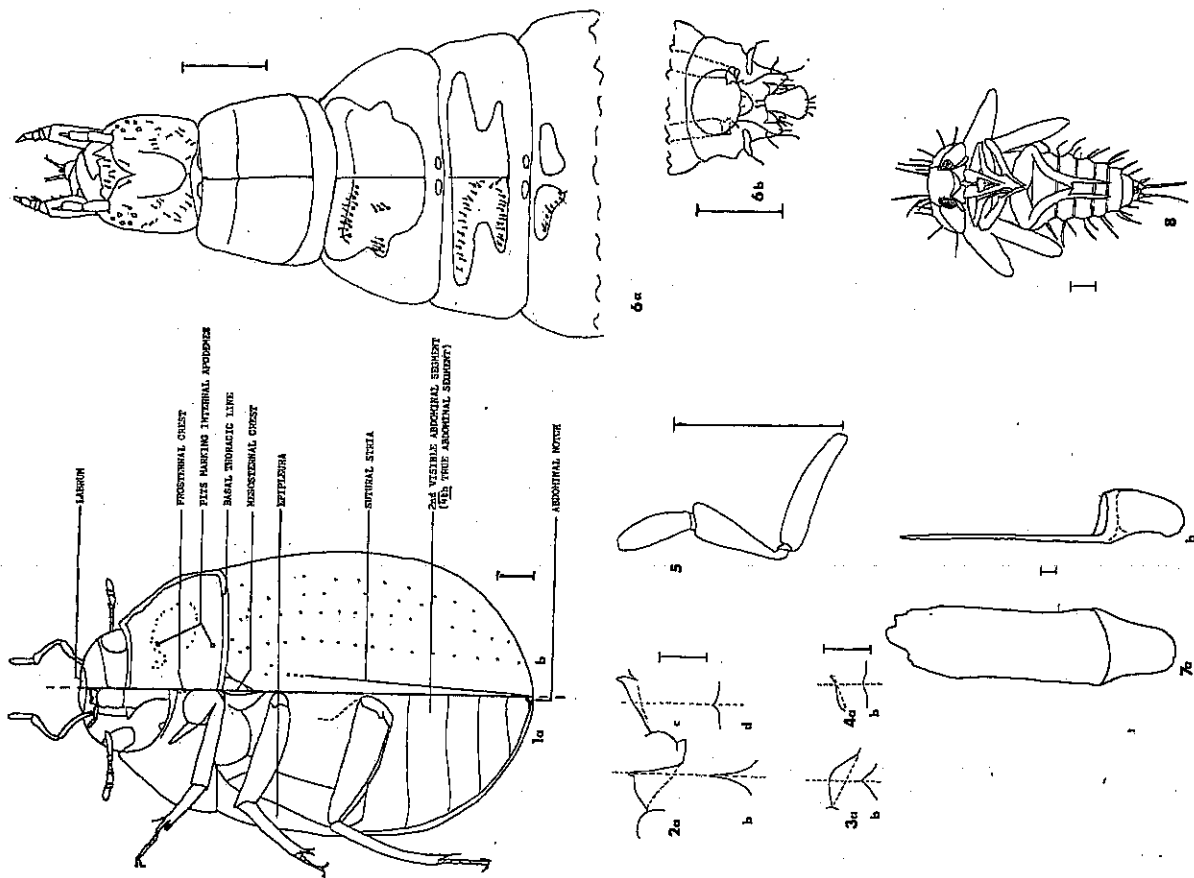
The typical habitat of the genus is shallow water clogged with debris, plants, or algae. The adults feed on algae or dead vegetation while the larvae (fig. 6) are predaceous, feeding on large protozoans, and very small crustaceans, insects and other invertebrates. Neither the larvae nor the adults are swimmers. This restricts them to the above mentioned habitats where wave action is minimal and they can easily crawl to the surface to replenish their oxygen supplies.

LIFE HISTORY

The life history of this genus is quite typical. In northern areas adults overwinter above water-line in debris. They become active in the spring when the water temperatures reach about 10°C and soon breed, laying their eggs in silken cocoons (fig. 7) attached to plants or debris at water surface. The eggs hatch in 2-4 days, but the larvae may stay in the cocoon for a day or so. Upon leaving the cocoon the larvae crawl to the surface, often on the ribbon-like top of the cocoon and fill the gut with air for buoyancy. The 3 larval instars last a total of 10-25 days. The pupal stage (fig. 8) of 2-6 days is spent in a cell of sand or debris above water level. The pupa is, therefore, highly susceptible to flooding during heavy rains. Adults spend 1-2 days in the pupal chamber while the cuticle completes hardening. In culture, adults have produced eggs about 2 weeks after emergence. Using the above timing and the fact that larvae can be found throughout the warm months there should be multiple generations per year with the major egg-laying in the spring.

SYSTEMATICS

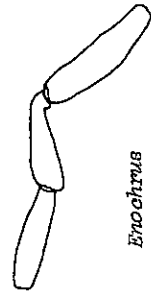
The following is a key to the species of the genus *Enochrus* from Canada, the United States, and Central Mexico. Distributions when known are given for the West Indies and Central America. Following the key are descriptions, including major synonymies, illustrations, and distribution maps for all Nearctic species. Special emphasis is given to the more recently described and more controversial species and subspecies. For complete synonymies of species of the subgenera *Enochrus* and *Methydrus* see Gundersen (1967: 68-198). Distribution lists for specimens examined upto 1967 are included in the above thesis pp. 211-253. Distribution lists are too lengthy to include here but are represented in the distribution maps (figs. 161-188).



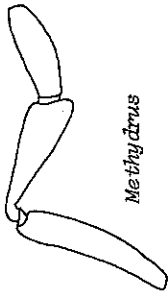
Figs. 1-8. Anatomy and developmental stages of *Enochrus*: 1, *E. cinctus* (a-ventral, b-dorsal); 2, *E. carinatus* (mesosternal crest: a-lateral, b-cross section; prosternal crest: c-lateral, d-cross section); 3-4, *E. ochraceus* (3, mesosternal crest: a-lateral, b-cross section); 4, prosternal crest: a-lateral, b-cross section); 5, *E. carinatus*, maxillary palpus; 6, *E. hamuliformis* larva (a-head and thorax, dorsal; b-tip of abdomen with respiratory plates, dorsal); 7, *E. ochraceus*, egg cocoon (a-frontal, b-lateral with compartment outlined); 8, *E. zygmaeus nebulosus*, pupa (from Wilson 1923-24:317, fig. 126); (scale line represents 0.5 mm).

Key to the Nearctic Species of the Genus *Eriochirus*

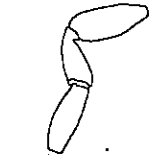
1. Last segment of maxillary palpi equal to or longer than penultimate; Western States and Mexico. (subgenus *Eriochirus*)... 3
 1'. Last segment of maxillary palpi distinctly shorter than penultimate; distribution various..... 2



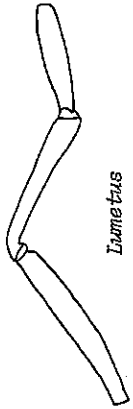
Eriochirus



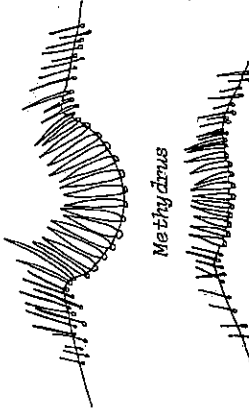
Methychirus



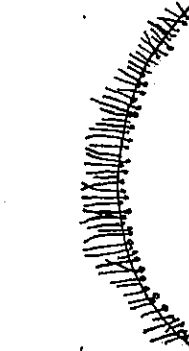
Isometus



- 2(1). Last abdominal sternite emarginate with a fringe of stiff golden bristles in the emargination (figs. 134-142, 148-160) or at least the fringe present; 2.25-8.2 mm. (subgenus *Methychirus*)..... 8
 2'. Neither a stiff golden fringe nor an emargination present, only a fringe of fine dark hairs; 3.0-6.6 mm. (subgenus *Isometus*)..... 26

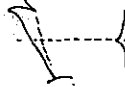


Methychirus

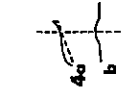


Isometus

- 3(1). Prosternum not carinate; corners of head broadly bright yellow; 3.4-4.0 mm; California..... *cuspidatus*
 3'. Prosternum carinate, a sharp ridge running down center ending in a sharp anterior point; corners of head variously colored; over 4.2 mm..... 4



carinate



non-carinate

- 4(3). Center of thorax black..... 5
 4'. Center of thorax yellow or brown. (*carinatus*)..... 7

- 5(4). Edges of elytra and thorax plus corners of clypeus broadly yellow; last maxillary segment completely yellow; inner protarsal claws of male broadly toothed; clypeal emargination straight centrally; weakly convex in cross section; 4.8-6.0 mm; central Mexico and New Mexico..... *mexicanus*
 5'. Edges of elytra and thorax brown to black; corners of clypeus narrowly pale; tip of last maxillary segment black; inner protarsal claws of male only slightly enlarged basally; clypeal emargination smoothly rounded; strongly convex in cross section; 4.0-6.0 mm; California to Ne Mexico. (*piceus*)..... 6



E. piceus

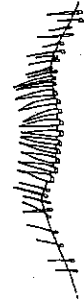


E. mexicanus



- 6(5). Few to several setae on the posterior edge of the mesosternal crest; punctation coarse; 4.3-6.0 mm; California to British Columbia and Wyoming..... *piceus piceus*
 6'. No setae on posterior edge of mesosternal crest; punctation fine; 5.0-5.7 mm; Arizona to western Texas..... *piceus glabrus*
 7(4). Few to several setae on the posterior edge of the mesosternal crest; 4.2-5.2 mm; California..... *carinatus carinatus*
 7'. No setae on posterior edge of mesosternal crest; 4.3-5.5 mm; Arizona to western Texas and central Mexico..... *carinatus fuscatus*

- 8(2). Black or very dark, only sides of thorax and corners of clypeus possibly paler; over 4.8 mm; (except *E. perplexus*, 4.2-6.0 mm, which has a very shallow wide abdominal notch); Eastern States and Mexico..... 9
 8'. Yellow to brown; (if very dark or black, less than 4.4 mm and with deep abdominal notch); center of thorax may be dark; less than 6.0 mm; distribution various..... 13



E. perplexus

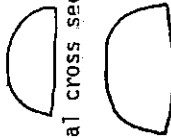


E. blatchleyi

- 9(8). Weakly convex; 4.2-6.0 mm; last abdominal sternite with a poorly developed notch or just a fringe of stiff golden bristles (see figures below); median lobe of male genitalia 0.4 length of parameres (figs. 155, 160); mesosternal crest large, thin, few to no setae, posterior edge smooth to slightly roughened (figs. 43, 45); edges of thorax and corners of clypeus yellow to brown..... 10
- 9'. Highly convex; 6.0-8.2 mm (except *E. cinctus*) which has an undercut mesosternal crest (fig. 30 and below); 4.9-7.5 mm; last abdominal sternite with a well defined deep notch; median lobe of male genitalia less than 0.25 length of parameres (figs. 157-159); mesosternal crest medium size, thickened, having posterior margin at least slightly roughened (figs. 30-32), a few setae; clypeus and thorax variable..... 11



E. consors
(well developed)



Elytral cross sections



- 10(9). Corners of clypeus narrowly to broadly yellow to brown; abdominal notch distinct but shallow, W/D = 4.3; mesosternal crest without setae, posterior edge smooth; dorsal strut of male genitalia gradually widened to width of median lobe where strut runs below it is ventral view (fig. 155); dorsal strut apically expanded in lateral view. New Jersey and Florida to Louisiana..... *Interruptus*
- 10'. Corners of clypeus narrowly yellow to brown; abdominal notch wide and very shallow, W/D = 11+; mesosternal crest with few hairs and slightly roughened posteriorly; male dorsal strut narrow, parallel sided, widened abruptly just before median lobe (fig. 160); dorsal strut apically narrowed in lateral view, widely distributed east of the Rockies..... *perplexus*

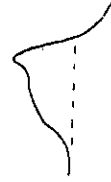


E. interruptus



E. perplexus

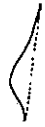
- 11(9). Mesosternal crest undercut at posterior end; inner protarsal claws of male not enlarged (fig. 33); edges of elytra and thorax and corners of clypeus yellow to brown; 4.9-7.5 mm..... *cinctus*
- 11'. Mesosternal crest not undercut; inner protarsal claws of male with large basal lobes (figs. 35-38); edges of elytra and thorax and corners of clypeus yellow to black; over 6.0 mm..... 12



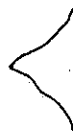
E. cinctus

E. consors

- 12(11). Edges of thorax and elytra brown to yellow; palpi yellow or brown; dorsal strut of male genitalia slender and parallel sided, not longitudinally impressed ventrally (fig. 160); clypeal emargination smoothly rounded; 6.0-7.6 mm..... *conscriptus*
- 12'. Edges of thorax and elytra black; palpi almost totally black to totally black; dorsal strut a narrow triangle, longitudinally concave ventrally (fig. 159); clypeal emargination straight centrally; 6.8-8.2 mm..... 13
- 13(7). Mesosternal crest small and rounded with no tooth or only a small posteriorly pointed one..... 14
- 13'. Mesosternal crest medium to large, triangular or rectangular with a sharp anterior angle..... 16



E. ochraceus





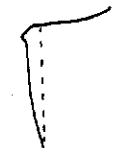



E. cristatus (triangular)



E. pseudochraceus

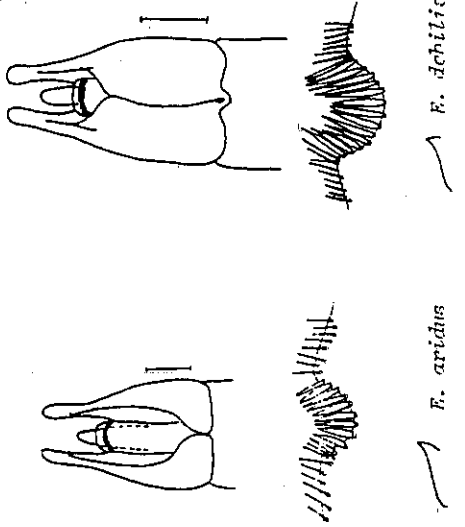
E. sharpi (rectangular)

- 14(13). Mesosternal crest with a posteriorly pointing tooth (see fig. above); parameres of male genitalia distinctly turned outward at tip; median lobe of genitalia 0.95 length of parameres (fig. 142); 2.7-3.7 mm; Mexico..... *pseudochraceus*
- 14'. Mesosternal crest without tooth (see fig. above); parameres straight; median lobe 0.6 length of straight tipped parameres (figs. 140-141); distribution various..... 15

- 15(14). Abdominal notch very small but deep (very hard to see); 2.25-2.7 mm; epipleura* normally pale; clypeus normally dark over central half; width of male genitalia 0.75 length of parameres (fig. 141); southern Atlantic Coastal States..... *sublongus*
- 15'. Abdominal notch medium size to large; 2.5-3.5 mm (seldom less than 2.9 mm); epipleura normally dark; clypeal center dark in northern and western specimens but light in southern specimens; width of male genitalia 0.6 length of parameres (fig. 140); United States and Mexico except dry Plains States..... *ochraceus*
-  *E. sublongus*
-  *E. ochraceus*
- 16(13). Prosternum not carinate; 3.0-5.9 mm..... 17
- 16'. Prosternum carinate (fig. 4); 4.8 mm or less (*pygmaeus* complex); (if only weakly carinate then mesosternal crest is rectangular or a elongate triangle (figs. 91 and 98 respectively and below), eastern or Mexican)..... 18
- 17(16). 3.0-4.4 mm; East Coast..... *blatchleyi*
- 17'. 4.8-5.9 mm; West Coast..... *californicus*
- 18(16). Body solid black; 3.4 mm; New Mexico..... *negrus*
- 18'. At least some areas of body yellow to brown..... 19
- 19(18). Mesosternal crest very large, rectangular, posterior edge horizontal, extending forward to between the front coxae; 3.2-4.2 mm; southern Mexico..... *sharpi*
- 19'. Mesosternal crest triangular, varying from very sharp to an elongate triangle with posterior edge broadly rounded, but never straight and horizontal; size and distribution various..... 20
-  *E. sharpi*
-  *E. p. nebulosus*
- 20(19). Epipleura pale except for medial edge and prosternum paler than metasternum; mesosternal crest an elongate triangle; inner protarsal claws of male not distinctly enlarged..... 21
- 20'. Epipleura and prosternum dark; mesosternal crest acutely triangular (except in *E. pygmaeus pygmaeus* with both the clypeus and prosternum completely light); inner protarsal claws of male distinctly enlarged..... 23
-  *E. aridus*
-  *E. cristatus*

* Under-turned edge of elytra (fig. 1).

- 21(20). Found in the United States east of a line from western Texas to Minnesota; pronotum completely pale; posterior edge of mesosternal crest broadly rounded, almost horizontal near tip; abdominal notch medium width but shallow (fig. 150); 3.7-4.2 mm..... *aridus*
- 21'. Found in Arizona, New Mexico and West Indies; center of pronotum distinctly darker; posterior edge of mesosternal crest more straight and not horizontal in any part; abdominal notch various; 2.8-4.3 mm; (if fitting the above anatomical characteristics but with the pronotum completely pale see *E. pygmaeus pygmaeus*, couplet 25)..... 22
- 22(21). Abdominal notch very small; prosternal crest medium to low; parameres of male touching only at base in ventral view (fig. 153); 3.4-4.3; Arizona and New Mexico..... *aridus*
- 22'. Abdominal notch wide and deep; prosternal crest very low, sharp only anteriorly; parameres meeting 0.4 up; from the West Indies..... *dehiscens*



- 23(20). Center of pronotum pale to slightly darkened; 2.7-4.8 mm; United States and Mexico. (*E. pygmaeus*)..... 24
- 23'. Center of thorax quite dark; 3.1-4.2 mm; Western States and Mexico; (if fitting the above but with mesosternal crest an elongate triangle and prosternal crest low and light colored (see figs. above), check couplet 22)..... *aristatus*
- 24(23). 2.7-3.6 mm; mesosternal crest sharp, normally acute; prosternal crest high and thin anteriorly (fig. 108); center of clypeus yellow to 0.5 darkened; punctuation of elytra very light to not evident at 30X; western Texas to southern California and into Mexico..... *pygmaeus pectoralis*
- 24'. 3.6-4.8 mm; mesosternal crest forming a right or obtuse angle; prosternal crest, clypeus and punctuation variable..... 25

Genus *Enochrus* Thomson 1859

Philhydrus Solier 1834:315 (*partim*) (*nee* Duftschmidt 1805 = *Elmis*, Elmidae); Thomson 1860:94.
Philhydrus Brulle 1835:276 (*partim*) (*nee* Brookes 1828:16 = a reptile).
Enochrus Thomson 1859:18; 1860:93; Zaitzev 1908:383; d'Orchymont 1913:6; 1919:154; 1936:11; Balfour-Browne 1941:264-266; 1958:21; Leech 1948:445-450; Gundersen 1967:52-54.

CATALOGS: Zaitzev 1908:382-390; Leng 1920:84; Knisch 1924a:200-219; Leng and Mutschler 1927:19; 1933a:16; 1933b:81; Blackwelder 1939:18; 1944:172-173.

BIOLOGY - Nearctic: Richmond 1920:65-71, Pl. 1, 14; Wilson 1923-24:316-321, figs. 112-127. Foreign: Knisch 1924a:201; Balfour-Browne 1958:21-34.

TYPE SPECIES: *Hydrophilus melanocephalus* Olivier 1792:127, species 12. Synonymies and Discussion: Zaitzev 1908:383-384; Knisch 1924a:201-203; d'Orchymont 1919:148; 1936:11-12; Balfour-Browne 1941:264-265; 1958:21-22, 27; Gundersen 1967:53-54.

Subgenus *Enochrus* Thomson 1859
Enochrus (*s. str.*) Thomson 1859:18; 1860:93; d'Orchymont 1919:155.

TYPE SPECIES: See above under genus.

This subgenus is characterized by having the last segment of the maxillary palpi longer than the penultimate and by the presence of an emargination in the last abdominal sternite. The 5 nearctic species occur in the western and southwestern states and extends through Mexico and Central and South America.

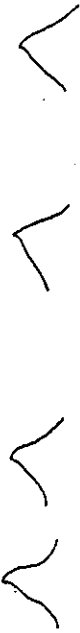
Enochrus (*Enochrus*) *carinatus* carinatus (LeConte) Figs. 13, 14, 135, 162, 189
Philhydrus (*Philhydrus*) *carinatus* Le Conte 1855:370; (*nee*. Horn 1873:126-127; *fide* Miller 1964:69-70).

Enochrus (*Enochrus*) *carinatus* (LeConte); Miller 1964:69-70 (*partim*).
E. (E.) carinatus carinatus (LeConte); Gundersen 1977:252, Figs. 1-3, 60, 76 (Description, Lectotype Designation).

LECTOTYPE: female, gold dot and San Francisco, (San Francisco and San Jose Description), Type No. 3085, LeConte Collection, MCZ.
 PARALECTOTYPE: female, same data (missing head and prothorax); Type No. 3085-2, LeConte Collection, MCZ.

LENGTH: 4.2-5.2 mm. WIDTH: 2.5-3.0 mm. COLOR: Dorsally yellow to yellowish-brown; head solid black (corners of head may appear lighter because of thinness); epipleura distinctly pale.
 ANATOMY: Last segment of maxillary palpi equal to or longer than penultimate; prosternal crest low but distinct; raised sharply anteriorly (Fig. 13); mesosternal crest large, triangular, distinct tooth at tip, series of long setae at posterior edge (Fig. 14); clypeal emargination fairly shallow, smoothly rounded; abdominal notch medium width and depth, W/D = 3.4 (Fig. 135); male protarsal claws basally enlarged, sharply bent; male genitalia typical, medium lobe 0.7, dorsal strut 0.85 length of slender-tipped parameres (Fig. 135).

25(24). Angle of mesosternal crest near 90°; clypeal center narrowly to broadly darkened; 3.7-4.8 mm; Eastern States.
 25'. Mesosternal crest an elongate triangle; clypeal center yellow; 3.6-4.8 mm; coast of Gulf States, West Indies, Mexico and Lower California..... *pygmaeus pygmaeus*



E. p. pectoralis *E. p. nebulosus* *E. p. pygmaeus*
 26(2). Predominantly yellow to light brown, at most thoracic center dark..... 27

26'. Predominantly black to dark brown, at most edges of elytra and thorax lighter..... *hamiltoni* (dark and *collinus* forms)

27(26). Posterior edges of elytra reflexed and expanded; totally yellow; 3.0-4.0 mm; East Coast..... *reflexipennis*
 27'. Posterior edges of elytra not reflexed; center of head and thorax often darkened; over 4.0 mm..... 28

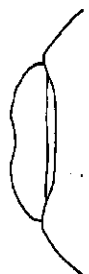


E. reflexipennis



E. hamiltoni

28(27). Center of clypeal emargination straight; body totally light; median lobe of male genitalia 0.57 length of parameres; 5.5-6.6..... *diffusus*
 28'. Center of clypeal emargination rounded; center of head and thorax often darkened; median lobe of male genitalia 0.70-0.74 length of parameres; 4.0-6.5 mm..... *hamiltoni* (light and typical forms)



E. hamiltoni



E. diffusus

DISCUSSION: The color pattern and proportions of the maxillary palpi separate this beetle from all other *Enochrus*. The original confusion was evidently due to a mistranslation by Horn of the original Latin description. He put the older name, "*carinatus*", on what was the new black species (*E. piceus*), and the new name, "*fucatus*", on the true yellow *E. carinatus*. Winters (1927) and others followed Horn's work without checking the types. Miller (1964) corrected the mistake.

DISTRIBUTION: Throughout California (fig. 162).
SPECIMENS EXAMINED: 330.

An interesting parallel variation occurs in *E. carinatus* and *E. piceus*. In the southern part of their ranges (Arizona, New Mexico, Texas and Mexico) several long hairs typically present on the mesosternal crest are lacking. The southern forms also vary slightly in other anatomical features and color. To acknowledge this variation, I am separating these populations as subspecies of their respective species.

Enochrus (Enochrus) carinatus fucatus (Horn)

Figs. 9, 12, 15-17, 162

Philhydrus (Philhydrus) fucatus Horn 1873:127.

Philhydrus (Enochrus) fucatus Horn 1890:244, Pl. 3, fig. 10.

P. discoidens Sharp 1882:67 (otype examined).

Enochrus (Enochrus) carinatus fucatus (Horn); Gundersen 1977:252, Figs. 4-5, 76 (Description, Lectotype Designation).

LECTOTYPE: male, Utah, Type No. 2975, Horn Collection, MCZ (formerly ANSP). **PARALECTOTYPES:** 1, sex unknown, Utah, Type No. 3096, LeConte Collection; 1, female, Arizona, Type No. 2975-2, Horn Collection, H-1625, MCZ.

LENGTH: 4.3-5.5 mm. **WIDTH:** 2.5-3.2 mm. The description of the typical *E. carinatus* fits *E. carinatus fucatus* with the following exceptions: very few to no setae on the mesosternal crest; both prosternal and mesosternal crests are higher (fig. 15-16); color somewhat paler; and size averaging slightly larger.

DISTRIBUTION: Arizona, New Mexico, western Texas and Central Mexico (fig. 162).

SPECIMENS EXAMINED: 65.

Enochrus (Enochrus) piceus, piceus Miller

Figs. 10-11, 134, 161, 190

Philhydrus (Philhydrus) carinatus Horn 1873:126-127 (*partim*); (*rec.* LeConte 1855:370; *vide* Miller 1964:70).

Philhydrus (Enochrus) carinatus Horn 1890:243-244, Pl. 3, Fig. 7 (*partim*); (not spelled *Philhydrus* as in Miller 1964:70).

Enochrus (Enochrus) piceus Miller 1964:70-71 (*partim*).

E. (E.) piceus piceus Miller: Gundersen 1977:254, Figs. 6-8, 59, 77.

HOLOTYPE: male; Wilbur, Wash., VIII-24-1932; UM (not examined). **ALLOTYPE:** female; same data as holotype, UM (not examined).

PARATYPES: 100; Washington, Idaho, Oregon, California (see Miller, 1964 for exact list and deposition). (20 paratypes examined, 6 retained; 2, Wilbur, Washington (U.W.); 2, Pistol River, Oregon (1 UM, 1 CMNH); 1, Lake Lowell, Washington (UM); 1, Roseburg, Oregon (UM)).

LENGTH: 4.3-6.0 mm. **WIDTH:** 2.2-2.8 mm. **COLOR:** Dorsally

black, corners of elytra slightly lighter (fig. 10). **ANATOMY:** Punctuation of elytra coarser than that of pronotum and head; prosternal crest low, raised only anteriorly; mesosternal crest a broad triangle, possible tooth at tip, series of long hairs on posterior margin; clypeal emargination smoothly rounded (fig. 11); abdominal notch medium depth and width, W/D=2.7 (fig. 134); male protarsal claws with small pointed basal lobe, moderately curved; male genitalia typical (fig. 134), median lobe 0.75, dorsal strut 0.82 length of parameres; genitalia slightly longer and thinner than those of *E. carinatus*.

DISCUSSION: Within its range *E. piceus* resembles *E. mexicanus* and the dark phase of *E. hamiltoni*. Presence of an abdominal notch and prosternal crest separate it from *E. hamiltoni*. Its greater convexity (fig. 17, 24), and almost complete lack of yellow markings separate it from *E. mexicanus*. It bears a resemblance to the *E. cinctus-perplexus* group also, but these species are eastern, (*E. perplexus* extends into western Mexico), have no prosternal crest, and have the last maxillary palp segment shorter than the penultimate.

E. carinatus and *E. piceus* are anatomically very close, being distinguished almost exclusively on the basis of color pattern. Miller (1964) mentioned having difficulty distinguishing between some *E. piceus* and *E. carinatus* in Oregon, and indicated a suspicion that they might be color forms of a single species. Perkins (1972) studying larvae of Hydrophilidae in Los Angeles County, California, found no dependable differences in the imatures. The parallel subspecies and widely overlapping distributions also lead to suspicion that they are merely color variations. I have, however, found virtually no color intermediates. *E. piceus* is always dark over the whole upper surface except for the corners of the clypeus. If the elytra are brown, then the head is also. *E. carinatus*, on the other hand, always has the head solid black, and even in light (general) specimens the head is much darker than the elytra. This does not preclude the possibility of synonymy. The final decision will have to be based on rearing and observation in the field.

This species has been recorded in two very interesting and contrasting habitats: hot springs at pH 8.3-9.3, salinity 1.0025-1.0074, and temperature 29-27.60°C (Brues, 1932 (*E. piceus piceus*)). and under rocks in a stream which was partially covered with ice (La Rivers, 1954 (*E. piceus glabrus*)).

DISTRIBUTION: Pacific Northwest from California to southern British Columbia west to Utah and Wyoming (fig. 161).

SPECIMENS EXAMINED: 1120.

Enochrus (Enochrus) piceus glabrus Gundersen

Fig. 161

Philhydrus (Philhydrus) carinatus Horn 1873:126-127 (*partim*); (*rec.* LeConte 1855:370; *vide* Miller 1964:70).

Philhydrus (Enochrus) carinatus Horn 1890:243-244, Pl. 3, Fig. 7 (*partim*).

Enochrus (Enochrus) piceus Miller 1964:70-71 (*partim*).

E. (E.) piceus glabrus Gundersen 1977:254-255, Fig. 77.

HOLOTYPE: male, Sunnyside Cr. W. side Huachuca Mts., 6,000 ft., Cochise Co., Arizona VIII-4-1952, H.B. Leech collector; Type No. 9376, C.A.S. **ALLOTYPE:** female; same data as holotype, C.A.S. **PARATYPES:** 1, same data as holotype; 1, Miller, Cr., Huachuca Mts.,

VII-23-1955, F.X. Williams; C.A.S.; 1, Chiricahua Mts., 5,000 ft., 3.5 mi. SW Portal, Arizona, Cochise Co., VIII-13-1952, H.B. Leech collector; SCSU.

LENGTH: 5.0-5.7 mm. WIDTH: 2.7-3.0 mm. The description of the typical *E. piceus* fits *E. p. glabrus* with the following exceptions: dorsal surface and legs slightly darker, corners of pronotum somewhat paler; mesosternal crest a little sharper with few to no long setae on posterior edge; punctation fine over whole dorsal surface

DISCUSSION: See discussion under *E. carinatus carinatus* and *E. piceus piceus*.

DISTRIBUTION: Arizona to extreme western Texas (fig. 161).

SPECIMENS EXAMINED: 32.

Enochrus (Enochrus) cuspidatus (LeConte)

Figs. 18-23, 137, 164, 191
Hydrobius cuspidatus LeConte 1878:597-598; Gundersen 1977:270 (Lectotype Designation).

Philydrus (Enochrus) cuspidatus (LeConte); Horn 1890:244-245.

Philydrus cuspidatus (LeConte); Fall 1901:57.

Enochrus (Enochrus) cuspidatus (LeConte); Zaitzev 1908:383.

LECTOTYPE: male, California (Lake Tahoe, California, Crotch collector, description), Type No. 3112-1, LeConte Collection, MCZ.
PARALECTOTYPE: 1, same data as lectotype, Type No. 3112-2; MCZ.

LENGTH: 3.4-4.0 mm. (1 specimen 4.5 mm.); WIDTH: 2.2-2.5 mm.
COLOR: Dorsally black to dark brown; clypeal corners, lateral edges of pronotum, and sides of elytra bright yellow to yellowish brown (fig. 18, 191); epipleura light. ANATOMY: Prosternal crest absent; mesosternal crest a large elongate triangle (fig. 21); clypeal emargination smoothly rounded; abdominal notch medium width but deep, W/D = 3.1 mm. (fig. 137); maxillary palpi short and very stout (fig. 23); male protarsal claws with small basal lobe (fig. 19-20); male genitalia short and stout (fig. 137), median lobe 0.7, dorsal strut 0.8 length of parameres.

DISCUSSION: This species looks somewhat like *E. piceus* and *E. mexicanus* both of which, however, are larger and have a carinate prosternum. *E. piceus* in addition has narrower light margins.

DISTRIBUTION: California and southern Oregon (fig. 164).

SPECIMENS EXAMINED: 95.

Enochrus (Enochrus) mexicanus (Sharp)

Figs. 24-28, 136, 163, 192

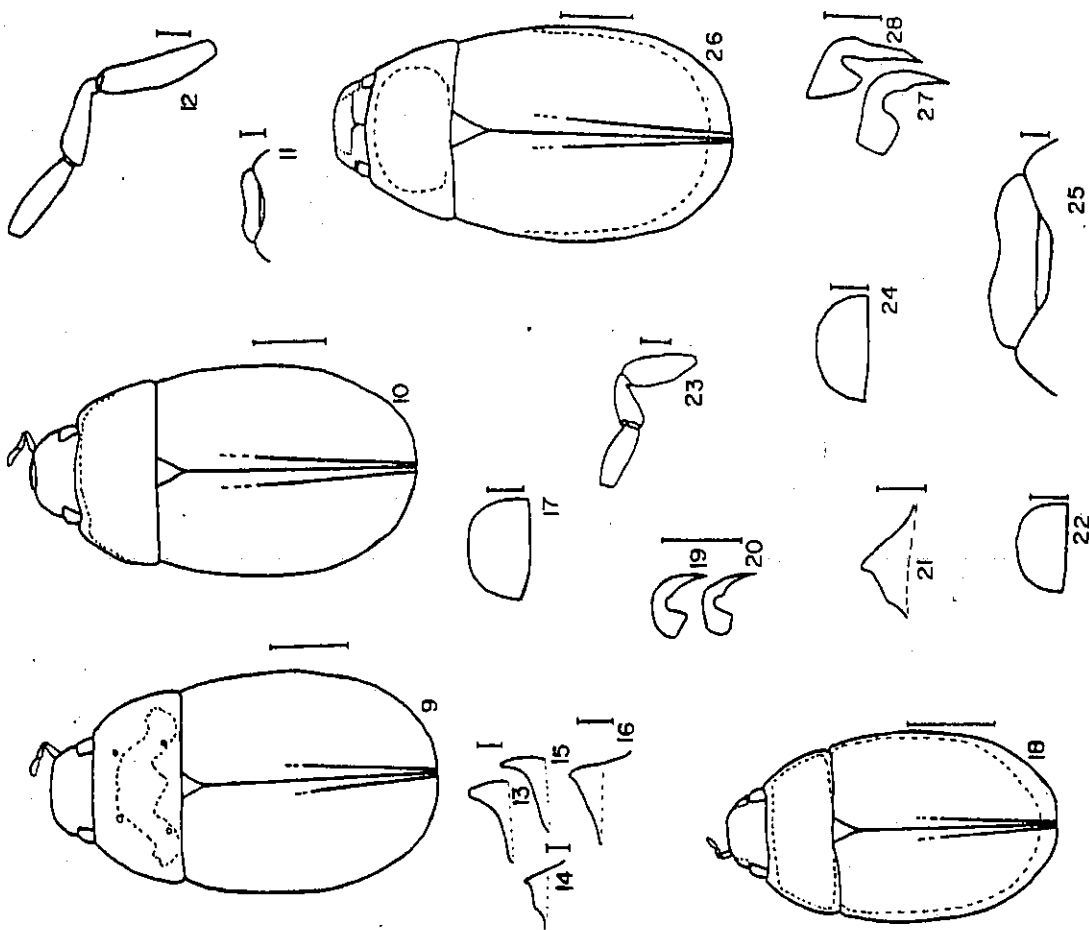
Philydrus mexicanus Sharp 1882:67-68, Tab. 2, Fig. 11.

Enochrus (Enochrus) mexicanus (Sharp); Zaitzev 1908:384.

COTYPES: Mexico: Oaxaca, Jalapa (Hoque), Puebla (Salle); BMNH (not examined by author).

LENGTH: 4.8-6.0 mm. WIDTH: 2.5-3.1 mm. COLOR: Dorsally dark brown to black except yellowish margins on elytra and thorax, anterior and posterior margins of thorax narrowly yellow (fig. 26, 192).

ANATOMY: Prosternal crest low, sharp, and raised anteriorly; mesosternal crest broadly triangular; clypeal emargination centrally straight (fig. 25), abdominal notch medium depth but wide, W/D = 2.6, (fig. 136), male protarsal claws with large basal lobe forming a narrow groove with free portion (fig. 27, 28); male genitalia typical (fig.



Figs. 9-28: 9, *Enochrus carinatus*, habitus; 10-11, *E. piceus* (10, habitus; 11, clypeal emargination); 12, *E. c. fuscatus*, maxillary palpus; 13-14, *r. c. carinatus* (13, prosternal crest; 14, mesosternal crest); 15-17, *r. c. fuscatus* (15, prosternal crest; 16, mesosternal crest; 17, cross section through abdomen); 18-23, *E. cuspidatus* (18, habitus; 19, outer male protarsal claw; 20, inner male protarsal claw; 21, mesosternal crest; 22, cross section through abdomen; 23, maxillary palpus); 24-28, *E. mexicanus* (24, cross section through abdomen; 25, clypeal emargination; 26, habitus; 27, outer male protarsal claw; 28, inner male protarsal claw; (scale line represents 1mm, figs. 9, 10, 17-18, 22, 24, 26; 0.25 mm, figs. 11, 14, 16, 21; 0.1 mm, 12, 13, 15, 19-20, 23, 25, 27-28)).

136), median lobe 0.75, dorsal strut 0.8 length of parameres, parameres with short thick tips.

DISCUSSION: Although I have not seen the cotypes Dr. Paul Spangler has compared specimens with them which satisfies me that this is the true *E. mesoleucus*. This species bears a resemblance to *E. piceus* and *E. perpleucus*. However, the wide yellow margins and presence of a large basal lobe on the protarsal claws of the male separate it from both species. *E. perpleucus* is further distinguished by its very shallow abdominal notch and shorter last segment of maxillary palpi.

DISTRIBUTION: Southern Mexico and populations in New Mexico (Fig. 162).

SPECIMENS EXAMINED: 44.

Subgenus *Methydrus* Rey

Methydrus Rev 1884:253, Sept.:45; Zaitzev 1908:384; d'Orchymont 1914:357-358; 1939:373-376; Knisch 1924a:217; Leech 1948:450; Gundersen 1967:55-56.

Agrophilydrus Kowert 1888:280; *fidæ* Knisch 1924a:217.
Agrophilydrus Everts 1898:644; *fidæ* Knisch 1924a:217.

TYPE SPECIES: *Hydrophilius affinis* Thunberg 1794:87. For type species discussion see Balfour-Browne 1958:32-33; Gundersen 1967:55.

This subgenus is now characterized by the last segment of the maxillary palpi being shorter than the penultimate (fig. 39) and the presence of an emargination in the last abdominal sternite (fig. 1). This subgenus was originally quite small, being distinguished by the last maxillary palp segment shorter than the penultimate and the absence of both a double series of punctures on the pronotum and a row of heavy punctures before each eye. Because of the difficulty in applying these characters, in separating *Methydrus* from *Lumetus*, d'Orchymont (1939:373-376) chose a new, more objective, character, the presence of a circular emargination in the last abdominal sternite (absent in *Lumetus*). The use of this new character shifted many species from *Lumetus* to *Methydrus*.

Eighteen species of this subgenus are distributed throughout the nearctic region, except for far northern Canada, and on into the neotropical area.

Enochrus (*Methydrus*) *blatchleyi* (Fall)

Figs. 51, 138, 166, 193

Philhydrus blatchleyi Fall 1924:85; Gundersen 1977:269 (Holotype designation).

Enochrus (*Lumetus*) *blatchleyi* (Fall); Winters 1927:20,22.

E. (Methydrus) blatchleyi (Fall); Young 1954:179, Figs. E, H.

HOLOTYPE: male, Dunedin, Florida; IV-3-1923; Fall Collection; Type No. 24005, MCZ. PARATYPES: 1 female; Dunedin, Florida, IV-6-1922; 2 same, IV-2-1923; 1 Tarpon Springs, Florida, III-31-1922; 1 St. Petersburg, Florida, IV-4-1922; 5 (2 male, 2 female, 1 ?) same, IV-6-1923; 1 same, III-26-1923; MCZ. These 11 specimens although not listed as paratypes by Fall appear to have been before him at the time of description.

LENGTH: 3.0-4.4 mm. WIDTH: 1.6-2.6 mm. COLOR: Dorsally yellow to dark brown, edges lighter (fig. 193). ANATOMY: Prosternum not carinate; mesosternal crest a sharply pointed broad triangle

(fig. 51); clypeal emargination smoothly rounded; abdominal notch medium width but very deep, W/D = 1.3 (fig. 138); male protarsal claws with large square basal tooth; male genitalia (fig. 138) with slender, short median lobe 0.65, dorsal strut 0.9 length of parameres.

DISCUSSION: *E. blatchleyi* is close to *E. ochraceus* and *E. fugamens nebulosus* in color and size but its very sharp mesosternal crest and very deep abdominal notch separate it from them. According to Young (1954) many *E. perpleucus* of Blatchley (1919) and Schwarz (1878) are *E. blatchleyi*. However, *E. perpleucus* is an almost solid black species with a very shallow abdominal notch. Young (1954) lists *E. blatchleyi* as found in detritus ponds.

DISTRIBUTION: Coastal from New England down along the Gulf Coast and then up through the Mississippi drainage to Illinois (fig. 166).

SPECIMENS EXAMINED: 480.

Enochrus (*Methydrus*) *californicus* (Horn)

Figs. 58-60, 139, 167, 194

Philhydrus (*Philhydrus*) *californicus* Horn 1890:248, Pl. 3, Fig. 8; Gundersen 1977:269 (Lectotype Designation).

Philhydrus (*Philhydrus*) *latiusculus* Horn 1873:130, MCZ; *nee.* Motschulsky 1853:11 *fidæ* Horn 1890:248).

Enochrus (*Lumetus*) *californicus* (Horn); Zaitzev 1908:386.

E. (Methydrus) californicus (Horn); Leech 1948:451.

LECTOTYPE: male; "California (probably northern)", Horn Collection, H-9314, Type No. 2974, MCZ (formerly ANSP). PARALECTOTYPE: sex unknown; same data; Horn Collection, MCZ.

LENGTH: 4.8-5.9 mm. WIDTH: 2.8-3.2 mm. COLOR: Dorsally brown to yellowish brown, center of pronotum slightly to distinctly darkened. ANATOMY: Prosternum not carinate; mesosternal crest a low triangle, a distinct tooth at tip (fig. 58); clypeal emargination flattened to smoothly rounded (fig. 59); abdominal notch medium depth but wide, W/D = 3.1 (fig. 139); male protarsal claws basally enlarged but not toothed; male genitalia with thin slightly inturned tips (fig. 139), inner edges of parameres ventrally overlapping to form a groove holding the median lobe and dorsal strut; median lobe about 0.5, dorsal strut 0.85 length of parameres.

DISCUSSION: This broad, large, western species is quite distinctive with its large abdominal notch and lack of prosternal crest. *E. hamiltoni* (light form) and *E. diffusus* are superficially similar, but both lack an abdominal notch.

DISTRIBUTION: West Coast from Baja to British Columbia and also Great Salt Lake area of Utah (fig. 167).

SPECIMENS EXAMINED: 735.

Enochrus (*Methydrus*) *trinctus* (Say)

Figs. 29-30, 33-34, 158, 173, 201

Hydrophilius trinctus Knoch, No. 1047 (*nomen nudum*); Melsheimer 1806:47. *H. trinctus* Say 1824:276.

Philhydrus trinctus Harold 1877:343; *fidæ* Knisch 1924a: 207.

Philhydrus limbatus Melsheimer 1844:101, MCZ, Type No. 32359 *fidæ* LeConte 1855:371 (quoting Melsheimer).

Enochrus (Lumetus) cinctus (Say); Zaitzev 1908:386.
Enochrus (Methydrus) cinctus (Say); Gundersen 1977:255 (Neotype Designation).

COTYPES: "Red River of Lake Winnepeek" (Red River leading to Lake Winnipeg, Ontario, or Minnesota-North Dakota Border) Lost.
NEOTYPE: male, Ringwood, Ithaca, New York, VII-14-1917, Dietrich collector (*E. cinctus*, det. Dietrich), Type No. 4422, Cornell.

LENGTH: 4.9-7.5 mm. WIDTH: 3.3-4.5 mm. COLOR: Dorsally solid black except for the edges and wide clypeal corners (figs. 29, 201). ANATOMY: Highly convex, prosternum not carinate; mesosternal crest a high triangle undercut as base posteriorly (fig. 30); clypeal emargination smoothly rounded (fig. 34); abdominal notch wide and very shallow, W/D = 5.5, (fig. 158); male protarsal claws simple (fig. 33); male genitalia stout (fig. 158); tips thick and sharply outturned, median lobe 0.2, dorsal strut 0.9 length of parameres.

DISCUSSION: *E. cinctus* is very similar to *E. consors* and *E. consorsus* but is distinguished by possessing the undercut mesosternal crest, wide yellow margins, particularly on the clypeus, and non-toothed male protarsal claws. It is also similar to *E. perplexus* and *E. interruptus* which are less convex, have a longer median lobe, and have at most only a narrow light margin. The cotypes of this species were lost probably before reaching a museum, but the description was clear and reference was made to its presence in Pennsylvania. Say (1924) listed the type locality as "Red River of Lake Winnepeek" (Red River leading to Lake Winnipeg in Ontario near the Minnesota-North Dakota Border). The map in Barber (1928) and the description of the route in Say's letter to J. Meisheimer in 1823 (Fox, 1902), both indicate the expedition passed this spot.

LeConte in a note in his reprinting of the "Complete Works of Thomas Say (1859), stated that this was a "*Philhydus*." LeConte (1855) and everyone since then has used this name unhesitatingly to refer to what is now known as *E. cinctus*. Therefore, I see no reason not to designate a neotype from material bearing that name. Because the original locality is on the fringe of the species range and no specimens were available from the type locality, a specimen from near the center of the range has been selected.

DISTRIBUTION: Eastern and Central States: Texas to Southern Manitoba to New Brunswick to Florida; most abundant north of the Missouri and Ohio Rivers (fig. 173).

SPECIMENS EXAMINED: 1400.

Enochrus (Methydrus) consors (LeConte)

Figs. 31, 35-36, 39, 159, 171, 202

Philhydus consors LeConte 1863a:24, No. 78; Gundersen 1977:269 (Lectotype Designation).

Philhydus (Philhydus) consors LeConte: Horn 1873:129.

Enochrus (Lumetus) consors (LeConte); Zaitzev 1908:386.

E. (Methydrus) consors (LeConte); Young 1954:179, Fig. 26 A, K ("Inland records probably apply in part to *consorsus*").

LECTOTYPE: female; Louisiana; Type No. 3103, *E. consors* Lec., LeConte Collection, MCZ (see Gundersen 1977:269).

LENGTH: 6.8-8.2 mm. WIDTH: 4.2-4.6 mm. COLOR: Dorsally solid black, only the slightest lightening along the edges (fig. 202), maxillary palpi black to predominantly dark. ANATOMY: Highly convex, pro-

sternum not carinate; mesosternal crest a high wide triangle, a fairly distinct tooth at tip (fig. 31); clypeal emargination flattened centrally; abdominal notch wide and deep, W/D = 3.1, (fig. 159); male protarsal claws with a large sharp basal tooth (fig. 35-36); male genitalia very stout (fig. 159), tips sharply turned outward, median lobe 0.2 and dorsal strut 0.9 length of parameres, dorsal strut narrow, parallel sided until near base, a groove along ventral side.

DISCUSSION: This species differs from the closest species, *E. consorsus*, by its almost totally black body and maxillary palpi, flattened clypeal emargination, and wider grooved dorsal strut.

DISTRIBUTION: Coastal from Louisiana to Massachusetts then across the Great Lakes Region (Fig. 171).

SPECIMENS EXAMINED: 510.

Enochrus (Methydrus) consorsus Green

Figs. 32, 37-38, 40, 150, 170, 203

Enochrus consorsus Green 1946:61-62, Figs. 2, 4.

HOLOTYPE: male; Atsion, N. J., VI-11-1945, J. Green collector, Green's Collection. ALLOTYPE: female; same data as holotype.

PARATYPES: 14 males, 13 females; Mass., N. Y., N. J., Ill., Mich., Wis., and Minn. (18 CAS, 2 SCUS).

LENGTH: 6.0-7.6 mm. WIDTH: 4.2-4.5 mm. COLOR: Dorsally black except for narrow edges of pronotum and corners of clypeus (Fig. 203), maxillary palpi almost completely light. ANATOMY: Strongly convex; prosternum not carinate; mesosternal crest a high broad triangle, a distinct tooth at tip (Fig. 32); clypeal emargination smoothly rounded; abdominal notch medium width and depth, W/D = 2.8 (Fig. 160); male protarsal claws with a large sharp basal tooth (Fig. 37-8); male genitalia stout (Fig. 160), tips bluntly turned outward, dorsal strut very narrow all the way to median lobe, dorsal strut 0.85 and median lobe 0.25 length of parameres, tip of dorsal strut turned upward.

DISCUSSION: This species as mentioned before has lighter edges and maxillary palpi than *E. consors* but narrower light areas than *E. cinctus*. It has a rounded clypeal emargination unlike *E. consors* and lacks the undercut mesosternal crest of *E. cinctus*. The genitalia and convexity separate it from *E. perplexus* and *E. interruptus*.

DISTRIBUTION: Florida, North Carolina to Maine, throughout the Great Lakes Region, and down the Mississippi River to Louisiana (Fig. 170).

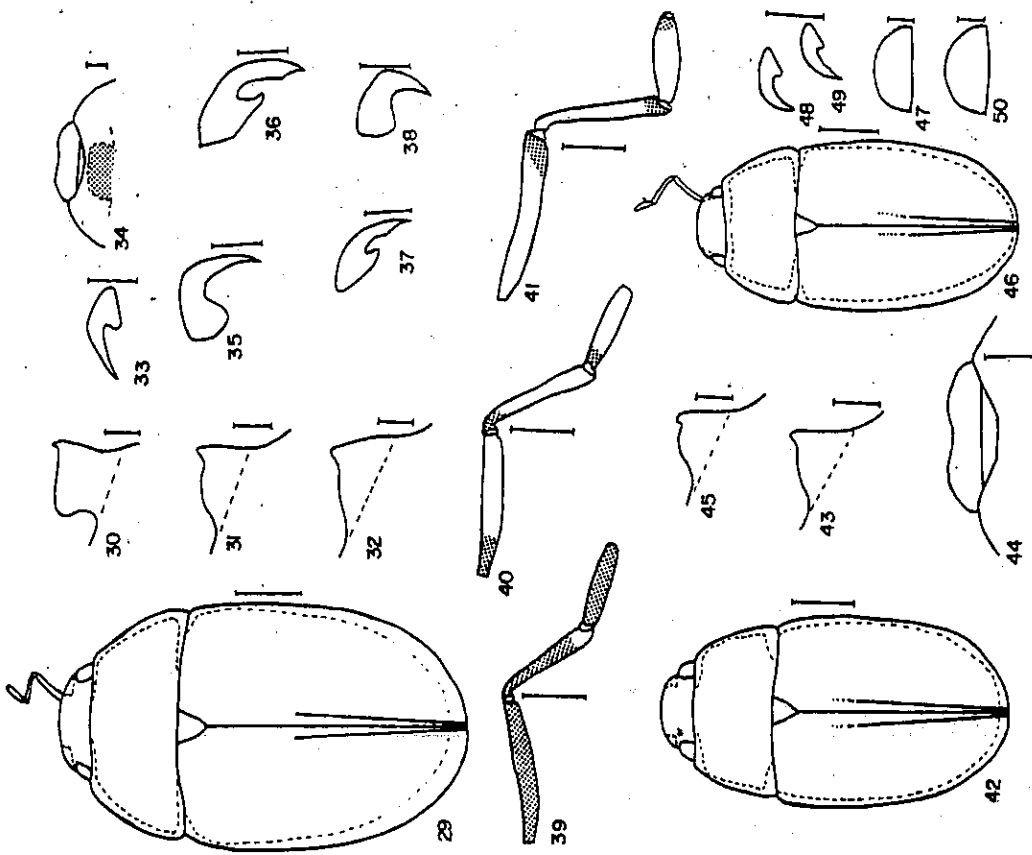
SPECIMENS EXAMINED: 410.

Enochrus (Methydrus) interruptus Gundersen

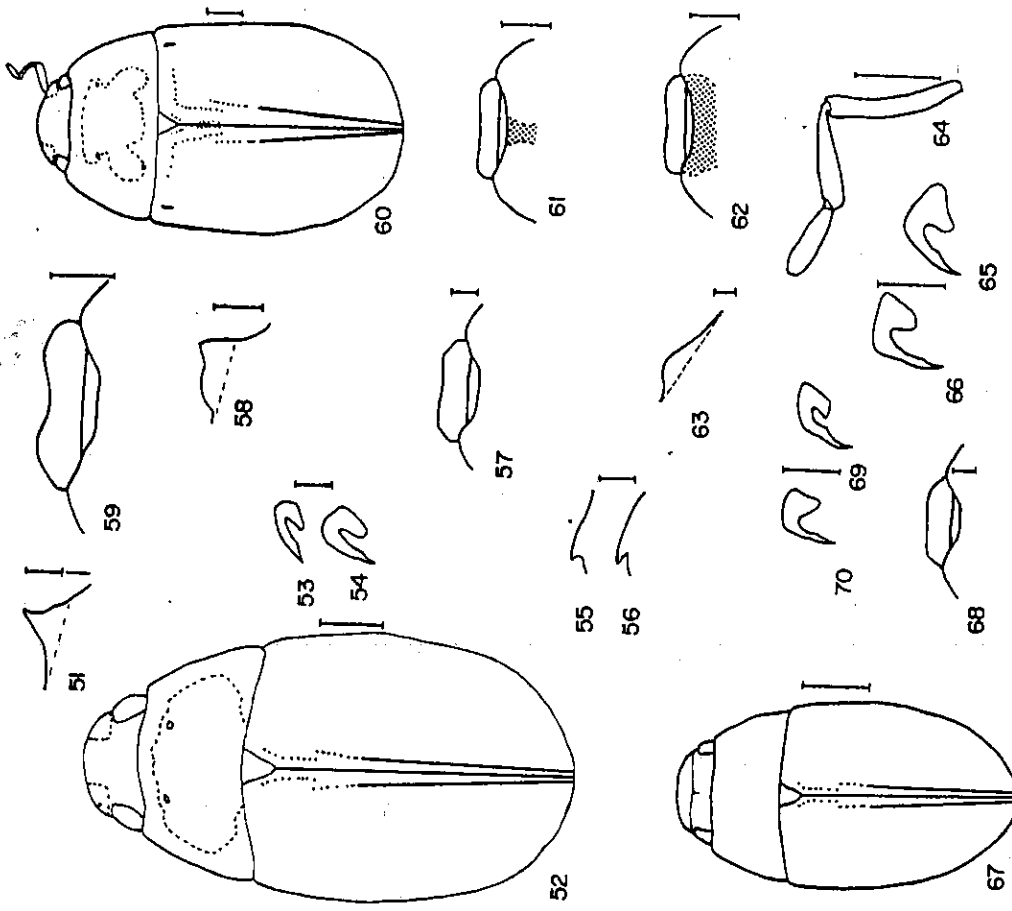
Figs. 42-44, 48-50, 156, 172, 198

Enochrus (Methydrus) interruptus Gundersen 1977:255-256, Figs. 52-57, 69, 79.

HOLOTYPE: male; Okeechobee, Florida III-18-1943, Wm. Procter collector; Chamberlain Collection; (bore labels "*E. cinctus* Say, det. Dietrich and *E. perplexus* Lec."); Type No. 4423, Cornell. ALLOTYPE: female; same data as holotype, Cornell. PARATYPES: Cornell 1, same data as holotype; 1, same data but III-19-1943; 3 Lake Placid, Florida, IV-2-1945, J. G. Needham (1 SCUS); 2 Lake Placid, III-IV-1945 (1 SCUS); 5, Lake Placid, IV-19-1950 CNM; 5, 3 mi. SW. Lake Marion, Florida, III-15-1956 (1 SCUS); 6, same data but III-14-1956, lights (1 SCUS).



Figs. 29-50, *Enochrus cinactus* (29, habitus; 30, mesosternal crest); 31, *E. consors*, mesosternal crest; 32, *E. consors*, mesosternal crest; 33-34, *E. cinactus* (33, male protarsal claw; 34, clypeal emargination); 35-36, *E. consors* (35, outer male protarsal claw; 36, inner male protarsal claw); 37-38, *E. consors* (37, inner male protarsal claw; 38, outer male protarsal claw); 39, *E. consors*, maxillary palpus; 40, *E. consors*, maxillary palpus; 41, *E. perplexus*, maxillary palpus; 42-44, *E. biterrapilus* (42, habitus; 43, mesosternal crest; 44, clypeal emargination); 45-47, *E. pomplexus* (45, mesosternal crest; 46, habitus; 47, cross section through abdomen); 48-50, *E. biterrapilus* (48, outer male protarsal claw; 49, inner male protarsal claw; 50, cross section through abdomen); (scale line represents 1 mm, figs. 29, 42, 46-47, 50; 0.25 mm, figs. 30-32, 34, 39-41, 43-45; 0.1 mm, figs. 33, 35-38, 48-49).



Figs. 51-70: 51, *Enochrus blatchleyi*, mesosternal crest; 52-57, *E. pseudochraceus* (52, habitus; 53, outer male protarsal claw; 54, inner male protarsal claw; 55-56, mesosternal crest; 57, clypeal emargination); 58-60, *E. californicus* (58, mesosternal crest; 59, clypeal emargination; 60, habitus); 61-66, *E. ochraceus* (61, light phase, clypeal emargination; 62, dark phase, clypeal emargination; 63, mesosternal crest; 64, maxillary palpus; 65, inner male protarsal claw; 66, outer male protarsal claw); 66-70, *E. sublongus* (67, habitus; 68, clypeal emargination; 69, inner male protarsal claw; 70, outer male protarsal claw); (scale line represents 0.5 mm, figs. 52, 60, 67; 0.25 mm, 51, 55-56, 58-59, 61-62, 64; 0.1 mm, 57, 63, 66; 0.05 mm, 53-54, 65-66, 69-70).

DISCUSSION: The presence of the distinct fringe of golden bristles if not a distinct notch marks it as a true member of the subgenus *Methydrus*. It appears to be allied to the *E. cinctus* group and very close to *E. interruptus*. It is less convex than *E. cinctus*, *E. consors*, or *E. consors* but only slightly less than *E. interruptus* (fig. 47, 50). The median length median lobe also separates it from all but *E. interruptus*. It can be distinguished from *E. interruptus* by its straight dorsal strut, non-notched medial edge of parameres, and very shallow abdominal notch.

E. perpallens can easily be confused with the dark phase of *E. hamiltoni* (*conjunctus-collinus* phase) of the west coast, Canada, and northeastern states. These completely lack the abdominal notch and golden bristles and have thin straight tips on the parameres.

DISTRIBUTION: Throughout the United States and northern Mexico, but most abundant along the Gulf of Mexico and north of a line from Kansas to Maryland (fig. 174).

SPECIMENS EXAMINED: 2380.

Enochrus (Methydrus) ochraceus (Melsheimer)
Figs. 61-66, 140, 165, 195-196

Philhydus ochraceus Melsheimer 1844:101; Gundersen 1977:270 (Lectotype Designation).

P. lacustris LeConte 1855:369-370 (Type No. 3088, MCZ) *vide* Fall 1924:87 (nec Horn 1873:131-132) *vide* Smetana 1974:73 (= *Cymbiodita minuta* Notman).

Philhydus simplex LeConte 1863a:24 (Type No. 3104, MCZ); *vide* Horn 1873:129.

Enochrus (Lumetus) ochraceus (Melsheimer); Zaitzev 1908:388.

E. (Methydrus) ochraceus (Melsheimer); Winters 1927:20.

LECTOTYPE: sex unknown; orange (brick red) dot, Southern States (Pennsylvania, description); Type No. 32360, LeConte Collection, MCZ.

LENGTH: 2.5-4.0 mm. **WIDTH:** 1.5-2.2 mm. **COLOR:** Dorsally yellow to dark brown, color homogeneous, slightly lighter laterally, head and center of clypeus in northern and western specimens black, clypeal center of southeastern specimens lighter (Figs. 61, 62, 195, 196); epipleura distinctly darker than elytra. **ANATOMY:** Prosternum not carinate; mesosternal crest very low (Fig. 63), small, and smoothly rounded with no indication of a point or tooth; clypeal emargination smoothly rounded (Fig. 61-62), abdominal notch medium size and depth, variable, normally W/D = 1.3, (Fig. 140); male protarsal claws with a very large, rounded basal lobe forming a narrow groove with free end of claw (Fig. 65-66), male genitalia typical (Fig. 140), median lobe 0.6, dorsal strut 0.8 length of parameres.

DISCUSSION: This widely distributed species would be confused only with *E. pygmaeus* or a large *E. sublongus*. *E. pygmaeus*, however, has a carinate prosternum, and *E. sublongus* is smaller and has a light epipleura and smaller abdominal notch (Fig. 140-1). The wide and discontinuous distribution of *E. ochraceus* might warrant naming of subspecies on the basis of the color of clypeus and very slight anatomical differences but preliminary work indicates that these differences may be environmental not genetic. Found abundantly in any weed or debris clogged shallow water.

23

LENGTH: 4.8-6.0 mm. **WIDTH:** 2.6-3.5 mm. **COLOR:** Dorsally black; corners of clypeus, edges of pronotum and elytra narrowly to broadly brown to yellow (Fig. 52); palpi completely yellow. **ANATOMY:** Prosternum not carinate; mesosternal crest a large, thin triangle (Fig. 54); clypeal emargination smoothly rounded (Fig. 53); abdominal notch wide but shallow, W/D = 4.3 (Fig. 156), male protarsal claws only slightly enlarged basally (Fig. 48-49); male genitalia with tips of parameres bent outward at tip (Fig. 156), a small notch 0.4 from base on inner edge; median lobe 0.4 and dorsal strut 0.85 length of parameres; dorsal strut in lateral view abruptly thickened and curved upward near tip.

DISCUSSION: Specimens of this species were formally placed under one of these names: *E. consors*, *E. consors*, *E. perpallens* or possibly *E. cinctus*. *E. interruptus* is most similar to a rather robust *E. perpallens*, being about intermediate between this species and *E. consors* and *E. consors*. *E. interruptus* is distinguished from *E. perpallens* by the deeper abdominal notch, more sharply bent dorsal strut, notched paramere, and more convex body (Fig. 47, 50).

DISTRIBUTION: Gulf Coast, Louisiana to Florida; New Jersey; and New Hampshire (Fig. 172).

SPECIMENS EXAMINED: 111.

Enochrus (Methydrus) perpallens (LeConte)
Figs. 45-47, 157, 174, 197

Philhydus (Philhydus) perpallens LeConte 1855:371; Gundersen 1977:270-271 (Lectotype Designation).

Enochrus (Methydrus) perpallens (LeConte); Leng & Davis 1924:19, No. 2836.

Hydrophilus fimbriatus Melsheimer 1806:47, No. 1055 (nomen nudum).

H. fimbriatus = *H. lateralis* Knoch (nomen nudum); Melsheimer 1806:47.

Philhydus fimbriatus Melsheimer 1844:101, MCZ, Type No. 32358 *vide* Gundersen 1977:270.

nec *P. fuscus* Motschulsky 1859:178 *vide* LeConte 1863b:19 (probably *E. hamiltoni* dark-form based on description).

LECTOTYPE: male, yellow dot, Central Valley or Western States (description: New York, Illinois, Lake Superior, Nebraska), Type No. 3090-3, LeConte Collection, MCZ. **PARALECTOTYPES:** 2 pink dot (Middle States: Md., Del., N.Y., N.J., Pa., Conn.?, R.I.?) 3090-1, 2; 1 green dot (Wb., Kans., N. Dak., S. Dak., Okla., Colo., Wyo., Mont.) 3090-5; LeConte Collection, MCZ. Types 3090-4 (Lake Superior), 3090-7 (New Jersey), 3090-10, 11 (California), and 3090-13, 14 (Cambridge) are *E. hamiltoni*. Types 3090-6 (New Jersey), 3090-8 (Florida), 3090-9 (red dot), and 3090-12 (gold dot) are *E. perpallens* but from localities not listed in description. Type 3090-15 (HBT) is *Cymbiodita* sp. All at MCZ.

LENGTH: 4.2-6.0 mm. **WIDTH:** 2.4-3.2 mm. **COLOR:** Dorsally black, edges usually narrowly pale (Fig. 46, 197). **ANATOMY:** Prosternum not carinate; mesosternal crest broadly but sharply triangular, a distinct tooth at tip (fig. 45); clypeal emargination smoothly rounded; abdominal notch very shallow to be represented only by the fringe of golden bristles, W/D = 11 or more (fig. 157); male protarsal claws simple; male genitalia with tips thin and sharply turned outward (fig. 157); median lobe about 0.4 length of parameres; dorsal strut very slender and straight in lateral view, 0.9 length of parameres.

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DISTRIBUTION: Eastern two-thirds of the United States, California, Washington, Mexico, and West Indies. (Fig. 165).
SPECIMENS EXAMINED: 6800.

Enochrus (Methydrus) sublongus (Fall)
Figs. 67-70, 141, 168, 199

Philhydrus elongatus Fall, 1924:85; (near Macleay, 1873:130).
P. sublongus Fall, 1926:125.

Enochrus (Methydrus) sublongus (Fall); Winters 1927:20.
(?) *E. (M.) curvatus* Knisch, 1924b:55 (based on description and distribution).

HOLOTYPE: female; Dunedin, Florida, IV-6-1922, Fall collector; Type No. 24007, Fall Collection, MCZ. **PARATYPES:** 1, Dunedin, Florida, IV-2-1923; 1, Tarpon Springs, III-31-1922; 2, St. Petersburg, IV-4-1922; Fall Collection, MCZ. These four specimens although not listed as paratypes appear to have been before Fall at the time of description.

LENGTH: 2.25-2.7 mm. **WIDTH:** 1.3-1.5 mm. **COLOR:** Dorsally yellow to tan except for black vertex and normally middle third of clypeus (Fig. 67, 199), epipleura same as elytra. **ANATOMY:** Prosternum not carinate, mesosternal crest very low, smoothly rounded; clypeal emargination slightly flattened centrally (Fig. 68); abdominal notch very small, but distinct, W/D = 1.65 (Fig. 141);

male protarsal claws with large nearly square lobe parallel to free portion of claw (Fig. 69-70); male genitalia typical but tips of parameres short (Fig. 144), median lobe 0.6, dorsal strut 0.85 length of parameres, exposed portion of strut narrowly triangular.

DISCUSSION: This species is similar only to a very small *E. ochraceus*. It can be distinguished from *E. ochraceus* by having a pale epipleura, very small abdominal notch, and its size. *E. sublongus* appears to be limited to coastal areas. It has been listed as being found in upland and flatwood streams and occasionally in tentic areas (Young, 1954) and sphagnum ponds and saline ponds (salinity 0.03 (label data)).

DISTRIBUTION: Coastal States, from Louisiana to Virginia (Fig. 168).

SPECIMENS EXAMINED: 400.

Enochrus (Methydrus) pseudoohraceus Gundersen

Figs. 52-7, 142, 169, 200

Philhydrus ochraceus Meisheimer; Sharp, 1882:70 (partim).

Enochrus (Methydrus) pseudoohraceus Gundersen 1977:256, Fig. 10-13, 62, 80

HOLOTYPE: male; 12 miles southwest of Liberia, Costa Rica, VII-13-1965, collected by P. J. Spangler, Type No. 69621, USNM. **ALLOTYPÉ:** female; same data as holotype. **PARATYPES:** 320 males and 255 females; same data as holotype; USNM and SCSU (5 males, 5 females).

LENGTH: 2.7-3.7 mm. **WIDTH:** 1.5-2.0 mm. **COLOR:** Dorsally yellowish-brown to brown; center of pronotum slightly to distinctly darker; vertex and central 0.6 of clypeus black (Figs. 52, 200). **ANATOMY:** Prosternum not carinate; mesosternal crest low and rounded (Figs. 55, 56), a distinct backward pointing tooth just

posterior of the middle; clypeal emargination slightly flattened centrally (Fig. 57); abdominal notch deep, W/D = 1.3, (Fig. 142); male protarsal claws with a large rounded basal lobe (Figs. 53, 54); male genitalia with tips flattened, out-turned (Fig. 142); median lobe very long, broad, pointed, 0.95 length of parameres; dorsal strut not visible ventrally, equal in length to median lobe.

DISCUSSION: This species is Neotropical but occurs along most of the southern border of the Nearctic. *E. pseudoohraceus* is very similar to *E. ochraceus* in general appearance and structure. However, the backward pointing tooth on the mesosternal crest of *E. pseudoohraceus* and the respective differences in genitalia distinguish them (Figs. 55, 56, 63). The lack of prosternal crest separates it from the very similar *E. pygmaeus* complex found in parts of the same area. The series labeled *Philhydrus ochraceus* by Sharp in 1882 contained both *E. ochraceus* and *E. pseudoohraceus*.

Balfour-Browne first recognized this species and in his collection, tentatively and gave it the name *E. d'orchymonti*. This name had been used by Mouchamps (1956). Dr. P. J. Spangler compared specimens of *E. pseudoohraceus* to the specimens in Balfour-Browne's collection in 1966 and found them to be conspecific.

DISTRIBUTION: Mexico, Central America, and the West Indies (probably extends into South America) (Fig. 169).

SPECIMENS EXAMINED: 2000.

Enochrus pygmaeus complex

This very abundant, widespread group consists of 7 species and 3 subspecies in the Nearctic. Of these, 5 species and 3 subspecies are found in the United States. They are medium to small, 2.7-4.8 mm.; and have both prosternal and mesosternal crests. Attempts to classify this group have produced serious taxonomic disagreements.

Some have combined while others have split the group into many species. Horn (1890) and Zaitzev (1908) have included the whole complex, except *E. cristatus*, under the name *E. nebulosus*, listing *E. pygmaeus* as a questionable species. Leech (1948) considered them as a complex and discussed the geographic forms and suggest synonymies. His breakdown of species and subspecies agrees quite closely with mine. For a more complete list of synonymies than included here see Gundersen (1967).

Enochrus (Methydrus) pygmaeus (Fabricius)

E. pygmaeus can be separated into 3 subspecies. Specimens from the centers of their respective ranges can easily be separated:

- 1) typical subspecies - Indies and Mexico-United States border,
- 2) subspecies *E. p. nebulosus* - east-central states, and 3) subspecies *E. p. pectoralis* - western states. However, where the 3 subspecies meet in southern Texas and Mexico they are virtually indistinguishable. To determine which subspecies is referred to in local keys and faunal lists, check the distribution maps (Figs. 175-177).

Enochrus (Methydrus) pygmaeus pygmaeus (Fabricius)
Figs. 100-105, 148, 175, 206

Hydrophilus pygmaeus Fabricius 1792:186, No. 23 (Americae meridionalis aquis); 1801:254, No. 28 (Americae meridionalis insulis).

Enochrus pygmaeus pygmaeus (Fabricius); Young 1953:14; Gundersen 1977: 257, Figs. 29-33, 63, 81.

E. (Methydrus) pygmaeus complex, No. 1 Leech 1948:452-453 (*partim*); CAS (Leech material examined)
E. (M.) rosei Leech 1948:451-452; CAS, Type No. 5467 (paratype examined)

HOLOTYPE: (only specimen in Fabricius collection) "Americae meridionalis Insulis, Dr. Pflug," (Antilles). Kiel Museum (on loan to Copenhagen Museum in 1966); (see d'Orchymont 1933:307, for type locality discussion.) (Specimens sent to Copenhagen Museum for comparison.)

LENGTH: 3.4-4.8 mm. **WIDTH:** 1.85-2.7 mm. **COLOR:** Dorsally yellowish brown to brown except head and center of clypeus (Fig. 100, 206); prosternum and mesosternal crest may be lighter. **ANATOMY:** Punctuation fine to medium over whole dorsal surface; prosternal crest high and sharp edged (Fig. 105); mesosternal crest large (Fig. 104), tip drawn out to a distinct tooth, posterior edge straight to convex, clypeal emargination smoothly rounded to slightly flattened; abdominal notch medium width, fairly deep, $W/D = 2.1$; (Fig. 148). Male protarsal claws slightly toothed but sharply bent (Fig. 102-3; male genitalia (Fig. 148) with median lobe 0.65, dorsal strut 0.8 length of slender-tipped parameres.

DISCUSSION: *Enochrus pygmaeus pygmaeus* is most similar to *E. sayi* and the other *E. pygmaeus* subspecies. It differs from *E. p. pectoralis* by having heavier punctuation, larger size, and longer mesosternal crest (Fig. 104, 106). Although similar in punctuation to *E. p. nebulosus*, *E. p. pygmaeus* is larger and has a larger mesosternal crest. *E. sayi* has the same basic color pattern, but the posterior margin of the mesosternal crest is broadly convex (Fig. 98) and the prosternal crest is low (Fig. 97).

DISTRIBUTION: Gulf Coast, across southern Texas to southern California, down through Mexico and the Bahama Islands (Fig. 175).

SPECIMENS EXAMINED: 320.

Enochrus (Methydrus) pygmaeus nebulosus (Say)
Figs. 110-111, 151, 178, 208

Hydrophilus labiatus Knoch: Melsheimer 1806:47, No. 1049 (*nomen nudum*) *vide* Say 1824:277

H. nebulosus Melsheimer 1806:47, No. 1049 (*nomen nudum*) *vide* Say 1824:277

H. nebulosus Say 1824:277

Enochrus (Lumetus) nebulosus (Say); Zaitzev 1908:387 (*partim*)

Enochrus pygmaeus complex, No. 1 Leech 1948:452 (*partim*); Leech material examined

E. (Methydrus) pygmaeus nebulosus (Say); Gundersen 1977:257-258, Figs. 38-39, 64, 84

HOLOTYPE: "Lake of the Woods" (Ontario-Manitoba-Minnesota border) September, 1823.LOST (Locality discussion - Fox, 1902:39; map, Barber 1928:16).

MEATYPE: male; Harrison Lake, Fulton Co., Ohio, IX-27-1952, I. Slesnick, P. J. Spangler Collection, 1962; Type No. 69623, USNM.

LENGTH: 3.4-4.2 mm. **WIDTH:** 1.6-2.3 mm. **COLOR:** Dorsally yellow, center of the pronotum may be somewhat darkened, head except corners of clypeus black. **ANATOMY:** Punctuation fine; prosternal crest low to medium height (Fig. 110); mesosternal crest medium (Fig. 111), posterior margin slightly convex, no distinct tooth at tip; clypeal emargination deep and wide, centrally flattened; ab-

dominal notch medium sized, $W/D = 2.2$, (Fig. 151); male prosternal claws with distinct basal tooth, sharply bent; male genitalia (Fig. 151) with median lobe 0.6, dorsal strut 0.75 length of parameres.

DISCUSSION: Since the original type of *E. p. nebulosus* cannot be located, I have designated a Neotype from the center of the distribution of the subspecies. Some of Say's types are in Leconte's Collection (MCZ) (Darlington, 1961) but none of his *E. nebulosus* are from the type locality, "Lake of the Woods," is a questionable locality for what has long been called "*nebulosus*" (Fig. 177). However, this name has been used to refer to this form for 150 years. Of 9 specimens labeled "*E. nebulosus*" in Leconte's Collection (1850's and 1860's) 7 are what I am calling *E. p. nebulosus* and 2 are *E. sayi*, a more southern species. Also, the one specimen labeled "*E. nebulosus*" in Winter's 1920's collection is *E. p. nebulosus*.

E. p. nebulosus is distinguished from the sympatric *E. sayi* by its smaller, more triangular mesosternal crest (Fig. 95, 111) and dark prosternum. Distinct punctuation separate it from the similar but smaller *E. p. pectoralis*. The medium size mesosternal crest best separates it from *E. p. pygmaeus*. It also bears a strong resemblance to *E. ochraceus* which, however, has no prosternal crest and only a small rounded mesosternal crest.

Wilson (1923-24) lists this species as feeding on algae but laying its eggs on broad-leaf water plants such as *Potamogeton*. This agrees with Young (1954) who lists it as not found in temporary situations.

DISTRIBUTION: New England States to Colorado and Wyoming down to Texas and back through the Gulf States excluding Florida and Georgia. It is most abundant east of the Mississippi and above the Ohio River (Fig. 178).

SPECIMENS EXAMINED: 1,826.

Enochrus (Methydrus) pygmaeus pectoralis (LeConte)

Figs. 106-109, 149, 176, 207

Philhydrus (Philhydrus) pectoralis LeConte 1855:370

Enochrus (Lumetus) nebulosus var. *pectoralis* (LeConte): Winters 1927:21.

E. (L.) nebulosus (Say); Zaitzev 1908:388 (*partim*).

E. (Methydrus) near *pectoralis* Leech 1948:453-454 (Leech material examined)

E. (M.) pectoralis (LeConte); Miller 1964:72

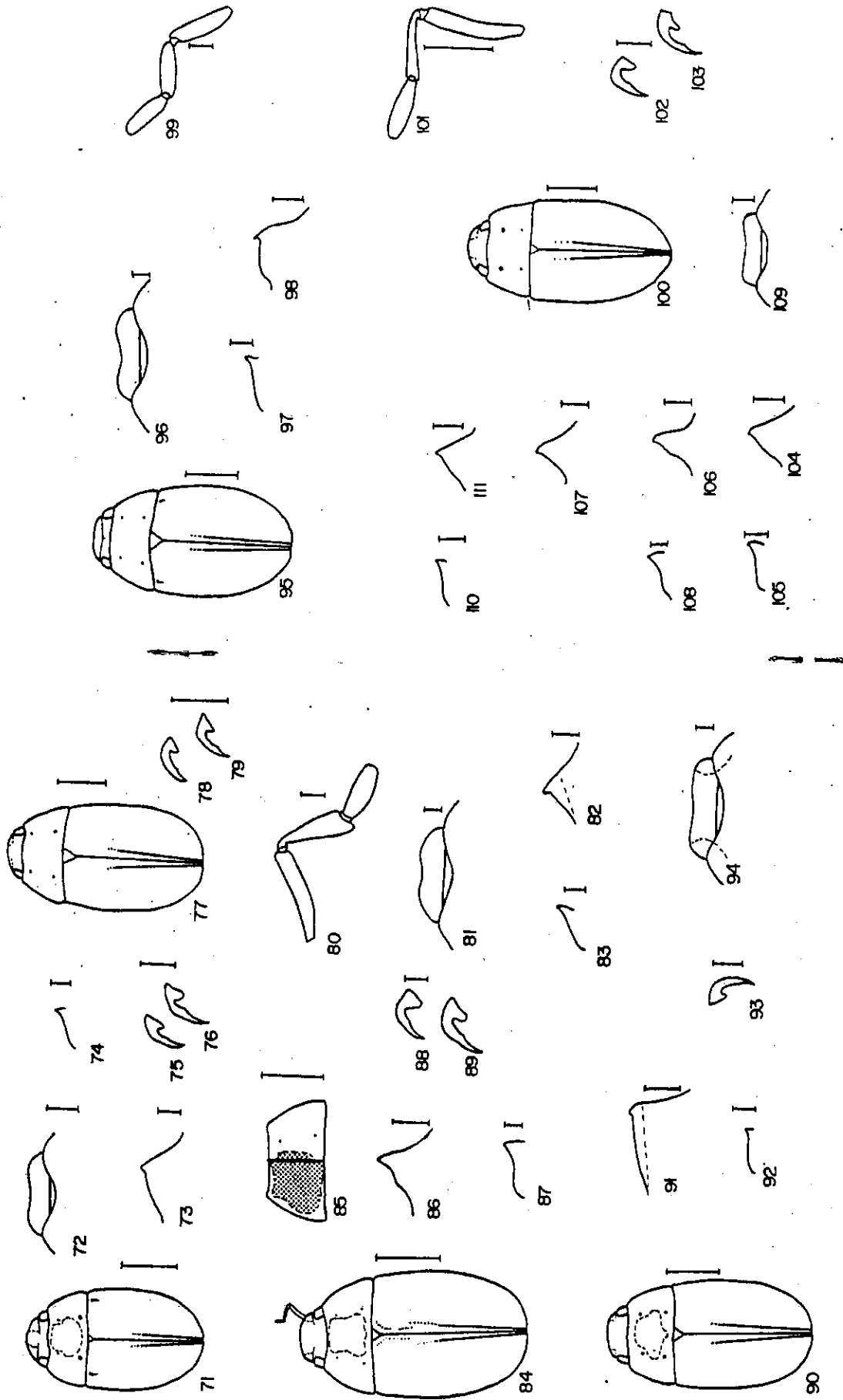
E. (M.) pygmaeus complex, No. 2: Leech 1948:452 (Leech material examined)

(non) *Philhydrus maculifrons* Motschulsky 1859:179; as listed by LeConte 1863b:19; Horn 1873:127; Leng 1920:84; *vide* Leech 1948:452 (= *E. (M.) cristatus* (LeConte) based on description)

E. (M.) pygmaeus pectoralis (LeConte); Gundersen 1977:258-259, Fig. 34-37, 65, 82

LECTOTYPE: male; gold dot (California), (Colorado River, California, description); Type No. 3089, *P. pectoralis*, Lec. Col., LeConte Collection, MCZ. **PARALECTOTYPE:** gold dot (California) (missing head and prothorax); LeConte Collection, MCZ.

LENGTH: 2.7-3.6 mm. **WIDTH:** 1.6-2.0 mm. **COLOR:** Dorsally yellow to yellowish brown except for head and center of clypeus (Fig. 207); sides of mesosternal crest, prosternum, and epipleura often paler. **ANATOMY:** Elytral punctuation not evident to very fine



Figs. 71-94: *Enochrus debilis* (71, habitus; 72, clypeal emargination; 73, mesosternal crest; 74, prosternal crest; 75, outer male protarsal claw; 76, inner male protarsal claw); 77-83, *E. arizidus* (77, habitus; 78, outer male protarsal claw; 79, inner male protarsal claw; 80, maxillary palpus; 81, clypeal emargination; 82, mesosternal crest; 83, prosternal crest); 84-89, *E. cricetatus* (84, habitus; 85, pronotum, dark and light extremes; 86, mesosternal crest; 87, prosternal crest; 88, outer male protarsal claw; 89, inner male protarsal claw); 90-94, *E. sharpi* (90, habitus; 91, mesosternal crest; 92, prosternal crest; 93, male protarsal claw; 94, clypeal emargination); (scale line represents 1 mm, figs. 71, 77, 84-85, 90; 0.25 mm, figs. 72-74, 82, 86, 91-92; 0.1 mm, figs. 80-81, 83, 87, 94; 0.05 mm, figs. 75-76, 78-79, 88-89, 93).

Figs. 95-111: *Enochrus sayi* (95, habitus; 96, clypeal emargination; 97, prosternal crest; 98, mesosternal crest; 99, maxillary palpus); 100-105, *E. pygmaeus pygmaeus* (100, habitus; 101, maxillary palpus; 102, outer male protarsal claw; 103, inner male protarsal claw; 104, mesosternal crest; 105, prosternal crest); 106-109, *E. pygmaeus pactoralis* (106-107, mesosternal crest; 108, prosternal crest; 109, clypeal emargination); 110-111, *E. p. nebulosus* (110, prosternal crest; 111, mesosternal crest); (scale line represents 1 mm, figs. 95, 100; 0.25 mm, figs. 98, 101, 104-107, 110-111; 0.1 mm, figs. 96-97, 99, 108-109; 0.05 mm, figs. 102-103).

at 30X, only the typical stria rows of punctures evident; prosternal crest high and sharp (Fig. 108); mesosternal crest medium but very acute (Fig. 106-7), anterior edge nearly vertical; clypeal emargination medium depth and smoothly rounded to flattened centrally (Fig. 109); abdominal notch wide and deep, W/D = 2.6 (Fig. 149); male protarsal claws with large bluntly pointed basal lobe which forms a narrow notch with free end of claw; male genitalia with median lobe gradually widened toward base (Fig. 159), 0.6 length of parameres and dorsal strut narrowly triangular, somewhat over 0.75 length of parameres, tips of parameres very slender and weakly divergent.

DISCUSSION: This member of the *E. pygmaeus* complex has been at various times treated as a subspecies, a synonym, and a good species. In the United States, it seems to be quite distinct. The lack of apparent elytral punctation, the very high prosternal crest, acute mesosternal crest, and the overall pale color separate it from all other members of the *pygmaeus* complex. The most similar forms, *E. P. nebulosus* and *E. P. pygmaeus*, are both more heavily punctate and on the average larger, being 3.3-4.2 mm. and 3.4-4.8 mm., respectively. In Mexico and southern Texas, however, *E. P. pectoralis* intergrades with the typical "*pygmaeus*" and what has until recently been called "*nebulosus*."

DISTRIBUTION: Southwestern States over to Texas and down through Mexico (Fig. 176).

SPECIMENS EXAMINED: 1700.

Enochrus (Methydrus) aridus, Gundersen
Figs. 77-83, 153, 179, 211

Enochrus (Methydrus) aridus Gundersen 1977:259, Figs. 19-23, 68, 85
HOLOTYPE: male; Bear Canyon, Huachuca Mts., Arizona, V-8-1953, A & H. Dietrich; Type No. 4424; Cornell. **ALLOTYPE:** female; Baboquivari Canyon, west side of Baboquivari Mts., Pima Co., Arizona VII-25-27-1952; Cornell. **PARATYPES:** 8, same data as holotype, Cornell and 1 in author's collection; 5, same data as allotype, CAS and 1 in author's collection; 1, Baboquivari Mts., Arizona, XI-1-1934, Bryant Lot 104; CAS.

LENGTH: 3.4-4.3 mm. **WIDTH:** 1.9-2.1 mm. **COLOR:** Dorsally yellow to brown, center of thorax somewhat, to much darker than wide anterior and lateral edges, center 1/2 to 1/3 of clypeus dark (Fig. 77, 211), mesosternal crest and prosternum distinctly pale, epipleura same color to slightly darker than elytra, never dark brown. **ANATOMY:** Prosternal crest medium height (Fig. 83); mesosternal crest a thin, medium to large triangle (Fig. 82), a distinct tooth at the tip, posterior edge nearly horizontal; clypeal emargination deep, smoothly rounded; abdominal notch small, W/D = 2.0 (Fig. 153); male protarsal claws untoothed (Fig. 78-79); male genitalia slightly stouter than those of closely related species (Fig. 153); median lobe wide, parallel-sided, 0.65, dorsal strut 0.75 length of paramere.

DISCUSSION: Most similar in size, color, and structure to *E. sayi* and *E. cristatus*. It has the prosternal and mesosternal crest similar to that of *E. sayi* but the dark pronotal center of *E. cristatus*. This combination of characteristics, along with a smaller abdominal notch, and stouter genitalia, mark this as a distinct species with a limited distribution.

DISTRIBUTION: Extreme southern portions of California and Arizona (Fig. 179).

SPECIMENS EXAMINED: 57.

Enochrus (Methydrus) cristatus (LeConte)
Figs. 84-9, 152, 183, 210

Philhydrus (Philhydrus) cristatus LeConte, 1855:370; Gundersen 1977:270 (holotype designation).

P. nebulosus var. *cristatus* LeConte: Horn, 1893-94:316.

P. obtusiusculus Motschulsky 1853:11 (*nomen nudum*); 1859:179, No. 67 (description); (based on description and comments by Leech 1948:452-3); "1" LeConte 1863b:19.

Philhydrus nigellus Sharp, 1882:68, BMNH.

Enochrus (Limetus) nigellus (Sharp): Winters, 1927:21.

(?) *Hydnobius melanocephalus* Kirby, 1837:120 (based on description).

(?) *Philhydrus maculifrons* Motschulsky, 1859:170 (based on description).
E. (Methydrus) near *cristatus* Leech 1948:453.

E. (M.) cristatus (LeConte); Miller 1964:73.

HOLOTYPE: female; gold dot (San Diego, description); Type No. 3086, LeConte Collection, MCZ.

LENGTH: 3.1-4.2 mm. **WIDTH:** 1.7-2.3 mm. **COLOR:** Dorsally yellowish brown to dark brown, usually pale brown, center of pronotum distinctly darker to black (Fig. 85), head and majority of clypeus black (Fig. 84, 210). **ANATOMY:** Prosternal crest medium height (Fig. 87), gradually to abruptly raised anteriorly; mesosternal crest medium size (Fig. 86), triangular, sharp tip but no distinct tooth; clypeal emargination medium to shallow, smoothly rounded; abdominal notch average, W/D = 2.2 (Fig. 152); male protarsal claws with very large basal lobes (Fig. 88-9), inner or anterior claw with largest lobe (Fig. 78-9); male genitalia typical (Fig. 152), median lobe 0.6, dorsal strut 0.85 length of slender-tipped parameres.

DISCUSSION: This species or complex of forms has been in question for many years and undoubtedly will continue to be. There are slight differences in color, punctation and shape of the crests but from the material I have examined I can see no trends in the characteristics that could justify recognition of separate taxa. I believe there are only environmental or minor genetic differences.

After examination of the type series of *E. cristatus*, a homotype of *P. nigellus*, and specimens from several old collections, where the names "*maculifrons*," "*melanocephalus* Kirby," and "*obtusiusculus*" were used, along with comparison of the descriptions of these, I believe these names were all applied to the same species. *E. cristatus* is most similar to *E. aridus* which, however, has stouter genitalia, smaller abdominal notch, and a light prosternum.

DISTRIBUTION: West of a line from Idaho to Texas and down through Mexico (Fig. 183).

SPECIMENS EXAMINED: 1640.

Enochrus (Methydrus) debilis (Sharp)
Figs. 71-76, 155, 185, 205

Philhydrus debilis Sharp, 1882:69.

TYPE: Guatemala, Paso Antonio, 400 ft. (Champain); BMNH.

LENGTH: 2.8-3.5 mm. WIDTH: 1.6-1.9 mm. COLOR: Dorsally yellow to brown except pronotal center which ranges from darkened to black, head and central 0.4 of clypeus black (Fig. 71, 205).
epipleura yellow to darkened on medial edge, prosternum light.
ANATOMY: Prosternal crest very low (Fig. 73), sharp only anteriorly; mesosternal crest medium size (Fig. 73), an elongate triangle, posterior edge straight but not horizontal; clypeal emargination medium depth and width (Fig. 72); abdominal notch medium width but deep, W/D = 1.8 (Fig. 155); male protarsal claws basally enlarged and sharply bent leaving a wide groove between lobe and free portion of claw (Fig. 75-6); male genitalia distinctive (Fig. 155); median lobe very wide, concealed except for tip by overlapping ventral edges of parameres, median lobe 0.7, dorsal strut 0.85 length of parameres.

DISCUSSION: In general appearance this species looks like other species with a dark pronotal center; *E. aridus*, *E. crinitatus*, *E. pseudochraceus*, *E. sharpi*, etc. However, it is a little broader and more brightly colored, but most distinctive are the overlapping parameres of the male genitalia (Fig. 156). The large triangular mesosternal crest and paler pronotum and epipleura separate it from all but *E. aridus* which is more northern.

DISTRIBUTION: Mexico and the West Indies (Fig. 185).

SPECIMENS EXAMINED: 295.

Enochrus (Methydrus) negrus Gundersen

Enochrus (Methydrus) negrus Gundersen 1977:262.

HOLOTYPE: male; Glen Ranch, Brewster Co., Alpine, Texas, 1926, O. C. Poling Collector; Type No. 9375, CAS.

LENGTH: 3.4 mm. WIDTH: 1.8 mm. COLOR: Totally black.
ANATOMY: Punctuation indistinct; prosternal crest high and sharp, distinctly raised anteriorly; mesosternal crest large, anterior edge slightly concave; last two segments of maxillary palpi almost equal; clypeal emargination medium depth, flattened centrally; abdominal notch medium depth, W/D = 1.2; male protarsal claws with a distinct basal enlargement, forming a sharp angle with the rest of the claw; male genitalia essentially identical to those of *E. pygmaeus pectoralis*; median lobe broad, widened toward base, 0.63, dorsal strut narrowly triangular, 0.8 length of parameres.

DISCUSSION: The combination of anatomy plus the solid black color separate this from all other species. It is however, very very close to *E. pectoralis* and may be just a melanistic specimen. The type is in poor condition. Pending more collection in southwestern Texas and Chihuahua and Coahuila, Mexico, I am placing it as the sole specimen of a new species.

DISTRIBUTION: Single specimen collected at Alpine, Texas.

Enochrus (Methydrus) sayi Gundersen

Enochrus (Methydrus) sayi Gundersen 1977:262, Figs. 24-28, 67, 83

HOLOTYPE: male; Okeechobee, Florida, III-12-1943, Wm. Procter, Chamberlain Collection (bears label *E. nebulosus*); Type No. 4425, Cornell. ALLOTYPE: female; same data as holotype; Cornell. PARATYPES: 39; same data as holotype; Cornell and author's collection (4)

LENGTH: 3.5-4.1 mm. WIDTH: 2.0-2.3 mm. COLOR: Dorsally yellow to pale brown except for vertex and central portion of clypeus (Fig. 95, 209), prosternum and mesosternal crest yellow to yellowish brown, epipleura same color as elytra. ANATOMY: Prosternal crest very low, sharp, raised only at anterior end (Fig. 97); mesosternal crest large, posterior edge smoothly rounded almost horizontal toward front, a blunt anterior tooth (Fig. 98); clypeal emargination smoothly rounded (Fig. 96); abdominal notch medium width, shallow, W/D = 2.0 (Fig. 150); maxillary palpi shorter and stouter than normal for group (Fig. 99); male protarsal claws slightly enlarged basally; male genitalia (Fig. 150) with median lobe wide, parallel-sided, 0.7, dorsal strut 0.75 length of parameres, ventrally visible portion of dorsal strut narrowly triangular.

DISCUSSION: *E. sayi* is distinguished from other United States members of this genus by the large posteriorly rounded mesosternal crest and very low prosternal crest (Fig. 97-8). The solid yellow dorsal color, and the pale epipleura, prosternum, and mesosternal crest separate it from the closest species, *E. pygmaeus pygmaeus*, and *E. P. nebulosus*. This widespread, abundant species probably will be found in many collections under *E. nebulosus* or *E. pygmaeus*.

DISTRIBUTION: Texas to Iowa, east to Massachusetts; also South Carolina and very abundant in Florida (Fig. 177).

SPECIMENS EXAMINED: 270.

Enochrus (Methydrus) sharpi Gundersen

Enochrus (Methydrus) sharpi Gundersen 1977:262-264, Fig. 14-18, 66, 78.

HOLOTYPE: male; Colliacan, Sinaloa, Mexico, VII-16-1963, P. J. Spangler collector; Type No. 69622, USNM. ALLOTYPE: female, same data as holotype, USNM. PARATYPES: 20, male, 12 female; same data as holotype, USNM and author's collection (3 males and 2 females).

LENGTH: 3.0-4.2 mm. WIDTH: 1.9-2.3 mm. COLOR: Dorsally yellowish brown to brown, center of pronotum normally light but occasionally distinctly darkened, clypeus broadly black (Fig. 90, 204), prosternum and mesosternal crest paler to yellowish brown, epipleura distinctly darker than elytra. ANATOMY: Punctuation fine over whole dorsal surface; prosternal crest very low, sharp, raised slightly anteriorly (Fig. 92); mesosternal crest extremely large, rectangular, thin, extending forward to between front coxae, posterior edge horizontal and straight (Fig. 91); clypeal emargination fairly deep, smoothly rounded (Fig. 94); abdominal notch narrow but deep, W/D = 1.7 (Fig. 154); male protarsal claws un-toothed (Fig. 93); male genitalia with median lobe short, narrow, parallel-sided, 0.5, dorsal strut narrowly triangular, 0.8 length of parameres (Fig. 154).

DISCUSSION: Very close to *E. aequalis* (Sharp); the mesosternal crest is long and the center of the clypeus darkened like *E. aequalis* but punctuation is a bit heavier, color slightly darker, and sutural stria not as distinct as described by Sharp (1882). Comparison of specimens of *E. sharpi* with the type of *E. aequalis* by P. J. Spangler and personal comparison with a homotype form the type series indicates that this is not *E. aequalis*. The

very large rectangular mesosternal crest separates this from all other *Enochrus* from North and Central America.

DISTRIBUTION: Western and Southern Mexico (Fig. 184).

SPECIMENS EXAMINED: 170.

Subgenus *Lumetus* Zaitzev

Philydrus Thomson 1859:18 *fide* d'Orchymont 1913:6; Thomson 1860:94.
Philydrus (s. str.) Kurent 1888:274; *fide* Knisch 1924a:204.
Philydrus (s. str.) Everts 1898:644; *fide* Knisch 1924a:204.
Lumetus Zaitzev 1908:385; n. n. for *Philydrus* Thomson; *fide* d'Orchymont 1913:6; 1919:155.

TYPE SPECIES: *Hydrophilus bicolor* Fabricius 1792; SYNONYMS: Zaitzev 1908:103; Knisch 1924a:205. DISCUSSION: d'Orchymont 1936:13-25; Leech 1948:450; Balfour-Browne 1958:24; Gundersen 1967:56-57.

Lumetus was never described by Zaitzev as a new subgenus except by inclusion of known species but its distinguishing characters evidently were understood by the workers of that period. d'Orchymont in 1919 (p. 155) finally defined the subgenus in print.

This subgenus is characterized by the absence of an emargination in the last abdominal sternite and by having the last segment of the maxillary palpi shorter than the penultimate (see discussion under subgenus *Methydrus*). The subgenus is represented throughout the Nearctic, except to northern Canada. There are 3 nearctic species in the subgenus.

Enochrus (*Lumetus*) *diffusus* (LeConte)

Figs. 130-133, 144, 180, 215

Philydrus (*Philydrus*) *diffusus* LeConte 1855:371; Gundersen 1977:270 (Lectotype Designation).

Philydrus (*Philydrus*) *diffusus* LeConte; Horn 1890:249-250, Pl. III, Fig. 11.

Enochrus (*Lumetus*) *diffusus* (LeConte); Zaitzev 1908:386.

LECTOTYPE: sex unknown; green dot (California and Nebraska, description), Type No. 3087-4, LeConte Collection, MCZ. (See Miller 1964:72 for discussion).

LENGTH: 5.1-6.1 mm. WIDTH: 2.8-3.5 mm. COLOR: Dorsally solid yellow to yellowish brown, center of pronotum may be slightly darkened, the 4 black dots are always very evident (Fig. 215), epipleura darker than elytra but distinctly lighter than venter. ANATOMY: Prosternum not carinate; mesosternal crest a broad but sharply pointed triangle; clypeal emargination medium depth, center broadly straight (Fig. 131); last abdominal segment not emarginate; protarsal claws with large lobes (Fig. 132-3), the lobe on the inner claw almost as long as the free portion of the claw and turned somewhat outward; male genitalia typical (Fig. 144), medium lobe 0.57, dorsal strut 0.84 length of parameres.

DISCUSSION: With the lack of the abdominal emargination and the large size *E. diffusus* could be confused only with light form of *E. hamiltoni*. The wide, straight center of the clypeal emargination; slightly longer dorsal strut; and larger lobes on the male protarsal claws separate it from this form of *E. hamiltoni*. The close similarity between these two species has undoubtedly led to many misidentifications in faunal lists.

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DISTRIBUTION: Southern California to Minnesota northwest to Great Slave Lake west to the Pacific Ocean; with isolated populations in Illinois and New York (Fig. 180).

SPECIMENS EXAMINED: 560.

Enochrus (*Lumetus*) *hamiltoni* (Horn)

Figs. 112-122, 126-129, 145-147, 182, 186-188, 206, 212-214

Philydrus (*Philydrus*) *hamiltoni* Horn 1890:249, Pl. III, Fig. 9
Philydrus (*Philydrus*) *hamiltoni* Horn; Leng & Beutenmuller 1893:194; Fall 1901:57.

Enochrus (*Lumetus*) *hamiltoni* (Horn); Zaitzev 1908:387; Gundersen 1977:264, 269, Figs. 40-49, 70-71, 73-75 (Discussion and Lectotype Designation).

Philydrus (*Lividus*) Walker 1866:319 (nec. Forster = *Helochares*) *fide* Miller 1964:71.

Philydrus (*Lumetus*) *conjunctus* Fall 1901:217-218, Type No. 24006, MCZ *fide* Gundersen 1977:264.

Enochrus (*Lumetus*) *collinus* Brown 1931:118, CNC *fide* Gundersen 1977:264.

E. horni Leech 1949:250-252, Fig. 8, CAS *fide* Gundersen 1977:264.

E. hamiltoni (*pacificus*) Leech 1949:253-255, CAS *fide* Gundersen 1977:264.

E. h. pyretus Leech 1949:255, CAS *fide* Gundersen 1977:264.

E. diffusus Winters 1927:23 (*partim*), *fide* Leech 1949:253.

LECTOTYPE: male, New Jersey ("coast," description), Horn Collection, H-9315; Type No. 2976-1, MCZ (formerly ANSP). PARALLECTOTYPES: 1 New Jersey, 2976-2; 1 Tyngs (Tyngsboro) Massachusetts, 2976-3; 4 Canada, 2976-4, 8, 9, 10; 1 California, 2976-5; 1 no data, 2976-6; 1 Oregon, 2976-7; MCZ. All of these paratypes have been accounted for by Margaret Thayer (MCZ) or myself, except 2976-6.

LENGTH: 4.3-6.1 mm. WIDTH: 2.3-3.1 mm. COLOR: Dorsal color highly variable, elytra yellow to black, pronotum totally light, centrally dark or almost totally black (Fig. 112-114, 126, 206, 212-214). ANATOMY: Prosternum not carinate; mesosternal crest a broad triangle, either smoothly pointed or a blunt tooth at tip; clypeal emargination medium depth to deep, smoothly rounded (when deep, then very center may be straight) (Fig. 119-121, 129); last abdominal segment not emarginate; male protarsal claws heavily and unequally lobed, the inner claw (Fig. 116-117, 126) with lobe pointed to rounded, 0.5-0.67 length of free portion of claw and a slight to sharp angle with the free portion, the larger the lobe the sharper the angle and narrower the slot between claw and lobe, lobe of the outer claw distinctly smaller (Fig. 115, 118, 127); mesotarsal claws equally lobed, lobe slightly smaller than that of the outer protarsal; metatarsal claws unlobed; male genitalia typical (Fig. 145-147), median lobe 0.70-0.74 and dorsal strut 0.80-0.82 length of slender-tipped parameres, dorsal strut slightly to distinctly exceeding median lobe.

DISCUSSION: After studying material from the total range of this species, I am recognizing 3 color forms: dark (*conjunctus* - form, almost totally black), light (*horni* - form, totally light), and typical (*hamiltoni* - form, only proximal center dark). The dark form is abundant along the West Coast with isolated populations along the Canadian-United States border (formerly referred to as *E. collinus*). The other two forms are common over most of the United States and southern Canada.

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I feel *E. hamiltoni* is a polymorphic species which at this time cannot be split into subspecies. Local populations of this species are often distinct in proportions of the claws, relative lengths of dorsal strut and median lobe of the male genitalia, and color pattern; but these differences vary independently making subspecies separation impossible. Miller (1964:71) commented on the similarities and intergradation of *E. horvati* and *E. conjunctus* in the Pacific Northwest. The 3 forms are most distinct in the northeastern states, from Minnesota east, and eastern Canada. Possibly glaciation in this area or some other phenomena separated populations long enough for some genetic isolation. I recommend distinguishing the forms when possible. Further study may discover characters, at least in the east, allowing subspecific separation.

The typical form is not likely to be confused with any other Nearctic species. The light form can be confused with *E. diffusus*, which has the central portion of the clypeal emargination broadly flattened (Fig. 131), a significantly longer dorsal strut (Fig. 144) and larger lobes on the male protarsal claws (Fig. 132-133). The dark form is superficially similar to other nearly to totally black species. *E. piceus* and the *E. cinctus* group are all much more highly convex. *E. perplexus* and *E. interruptus* differ in having at least a fringe of golden bristles at the center of the last abdominal sternite, which is lacking in all *Liometus*.

DISTRIBUTION: Throughout the United States and Canada, except inland southeastern states. The dark form is limited to the western states with scattered populations across Canada and from Minnesota to Vermont (Fig. 182, 186-188).

SPECIMENS EXAMINED: 7,400.

Enochrus (Liometus) reflexipennis (Zimmermann)

Figs. 123-125, 143, 181, 217

Philydrus reflexipennis Zimmermann 1869:250; Gundersen 1977:271 (Lectotype Designation).

P. angustatus Casey 1884:83-84, USNM (type examined).

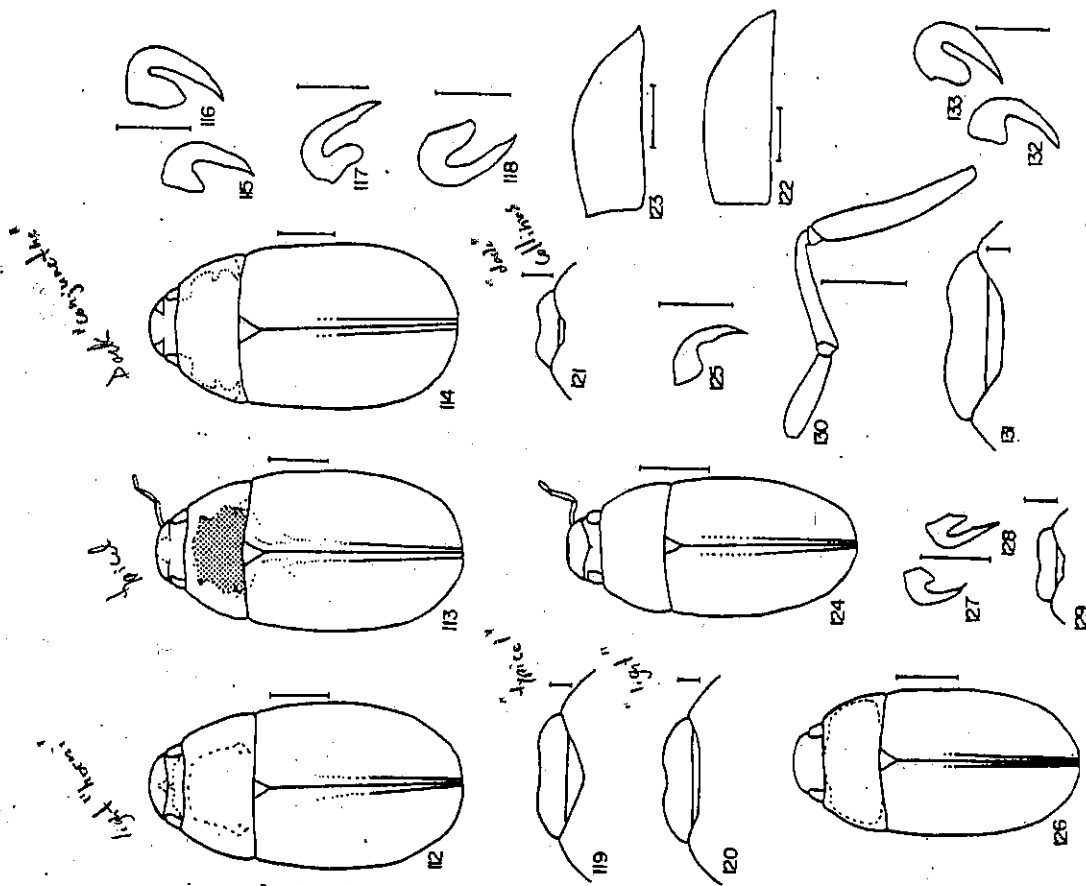
Philydrus reflexipennis Zimmermann; Horn 1890:250, Pl. III, Fig. 12.

Enochrus (Liometus) reflexipennis (Zimmermann); Zaitzev 1908:107.

LECTOTYPE: male; New Jersey (7422.2); Type No. 3140; LeConte Collection, MCZ. Since only New Jersey is listed in the description, the other specimens in the series cannot be considered paralectotypes.

LENGTH: 3.4-5.0 mm. **WIDTH:** 2.1-2.35 mm. **COLOR:** Dorsally yellow to light brown, no dark markings except the typical 4 black dots on prothorax (Figs. 124, 217), epipleura only slightly darker than elytra. **ANATOMY:** Prosternum not carinate; mesosternal crest a broad sharp triangle, blunt in some; clypeal emargination fairly deep and straight at center; last abdominal segment not emarginate; posterior edge of elytra reflexed (Fig. 123); male protarsal claws unlobed (Fig. 125); male genitalia typical (Fig. 143) but tips of parameres short, median lobe 0.83, dorsal strut 0.90 length of parameres.

DISCUSSION: *E. reflexipennis* is a very distinct species. The combination of solid light color, lack of an abdominal emargination and the reflexed edges of the elytra easily set



Figs. 112-133: 112-122, *Enochrus hamiltoni* (112-114, habitus: 112, typical, and dark forms respectively; 115-116, light form, outer and inner male protarsal claws respectively; 117, dark form, inner male protarsal claw; 118, typical form, inner male protarsal claw; 119-121, clypeal emargination: typical, light, and dark forms respectively; 122, lateral view of elytron; 123-125, *E. reflexipennis* (123, lateral view of elytron); 124, habitus; 125, protarsal claw; 126-129, *E. hamiltoni* dark (*collis*) form (126, habitus; 127, outer male protarsal claw; 128, inner male protarsal claw; 129, clypeal emargination); 130-133, *E. diffusus* (130, maxillary palpus; 131, clypeal emargination; 132, outer male protarsal claw; 133, inner male protarsal claw); (scale line represents 1 mm, figs. 112-114, 122-124, 126; 0.25 mm, figs. 121, 129-130; 0.1 mm, figs. 115-120, 125, 127-128, 131-133).

this species apart from all others in the Nearctic. It is our only small light colored member of the subgenus. The light form of *E. hamiltoni* is normal over 5 mm. The *E. pygmaeus* complex and *E. ochraceus* although similar seldom reach 4 mm., and both have a distinct abdominal emargination and normally some dark on the head.

DISTRIBUTION: Southeastern Canada down to West Virginia; also South Carolina, Florida and Louisiana (Fig. 181).

SPECIMENS EXAMINED: 270.

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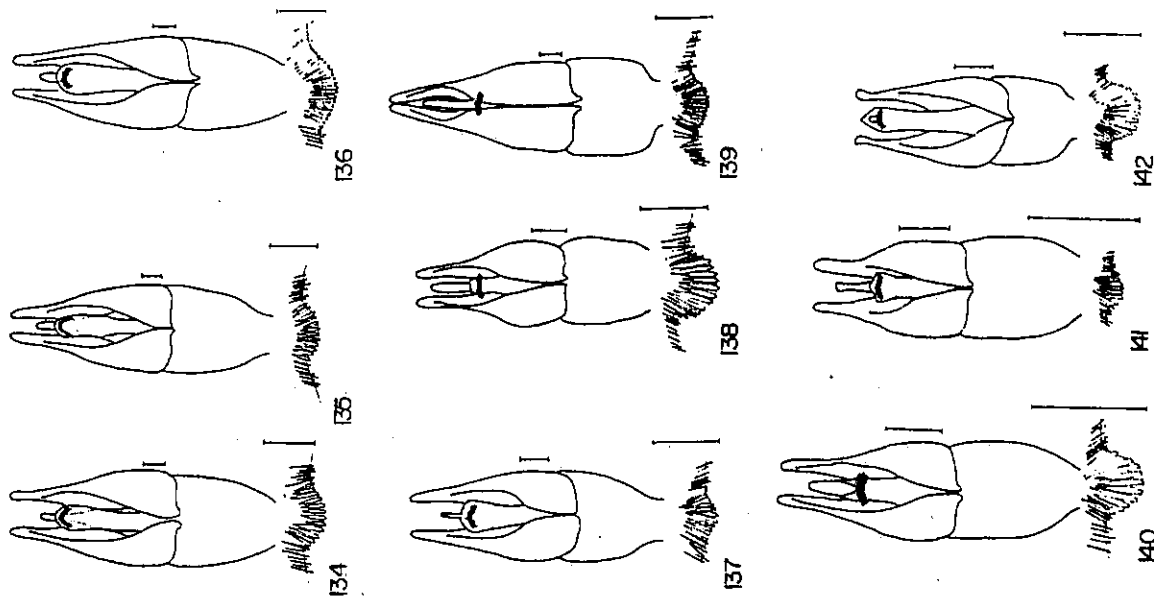
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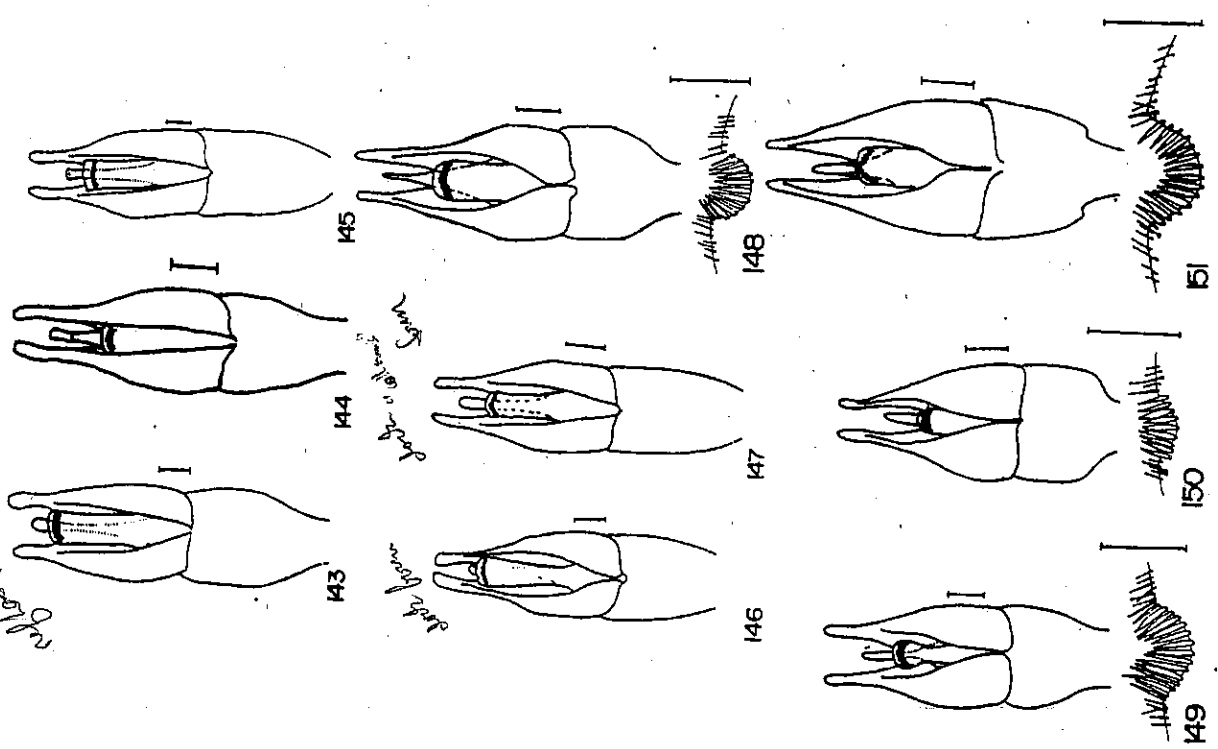
MUSEUM ABBREVIATIONS

- ANSP - Academy of Natural Sciences - Philadelphia
 BMNH - British Museum of Natural History
 CAS - California Academy of Sciences
 CMNH - Chicago Museum of Natural History
 CMC - Canadian National Collection - Ottawa
 MCZ - Museum of Comparative Zoology - Harvard
 SCSU - St. Cloud State University - St. Cloud, Minnesota (author's collection)
 USNM - United States National Museum
 UW - University of Washington

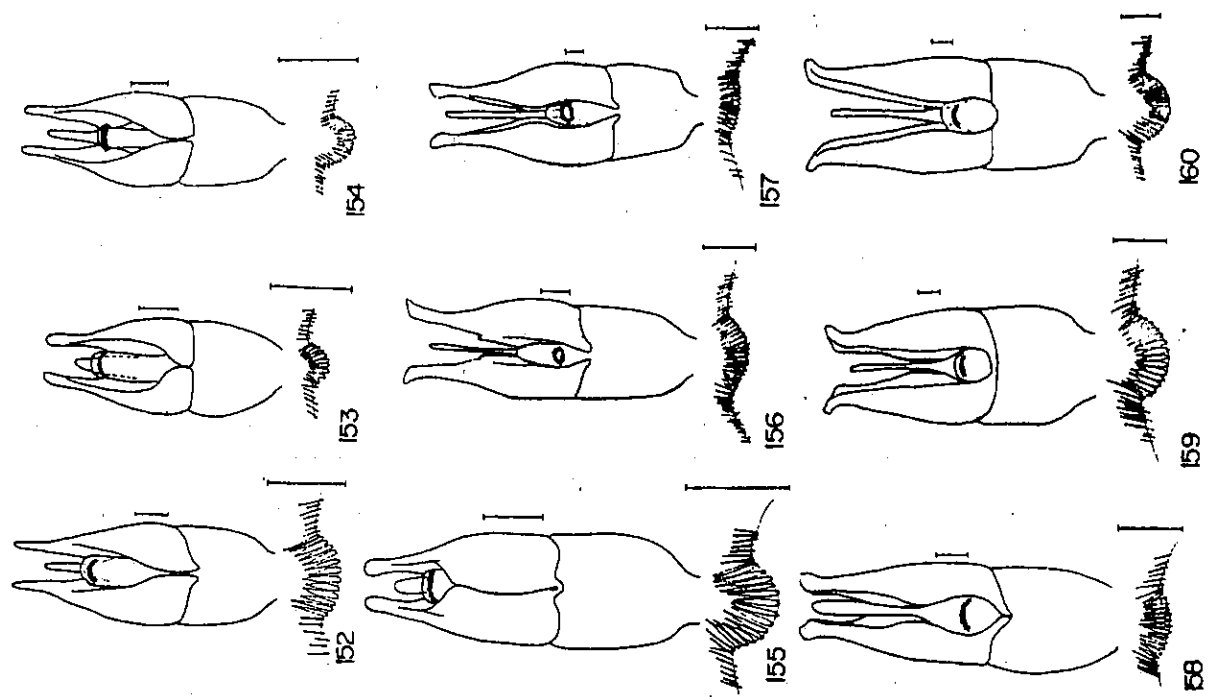


Figs. 134-142, *Enochrus*, male genitalia and emargination in last abdominal sternite (abdominal notch), ventral: 134, *E. piceus*; 135, *E. carinatus*; 136, *E. mexicanus*; 137, *E. cuspidatus*; 138, *E. blatchleyi*; 139, *E. californicus*; 140, *E. ochraceus*; 141, *E. sublongus*; 142, *E. pseudochraceus*; (scale line represents 0.2 mm).

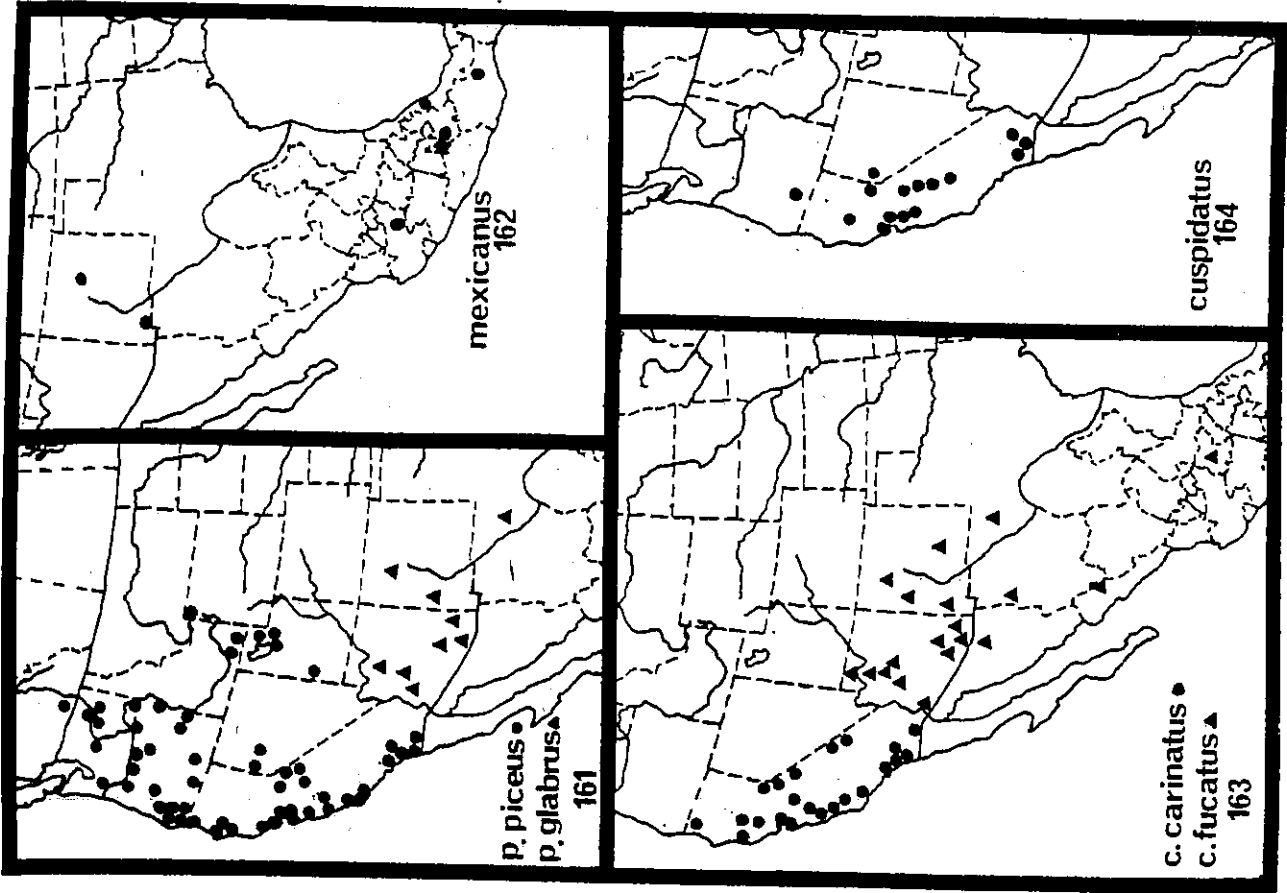
collar-like
 narrow
 very narrow



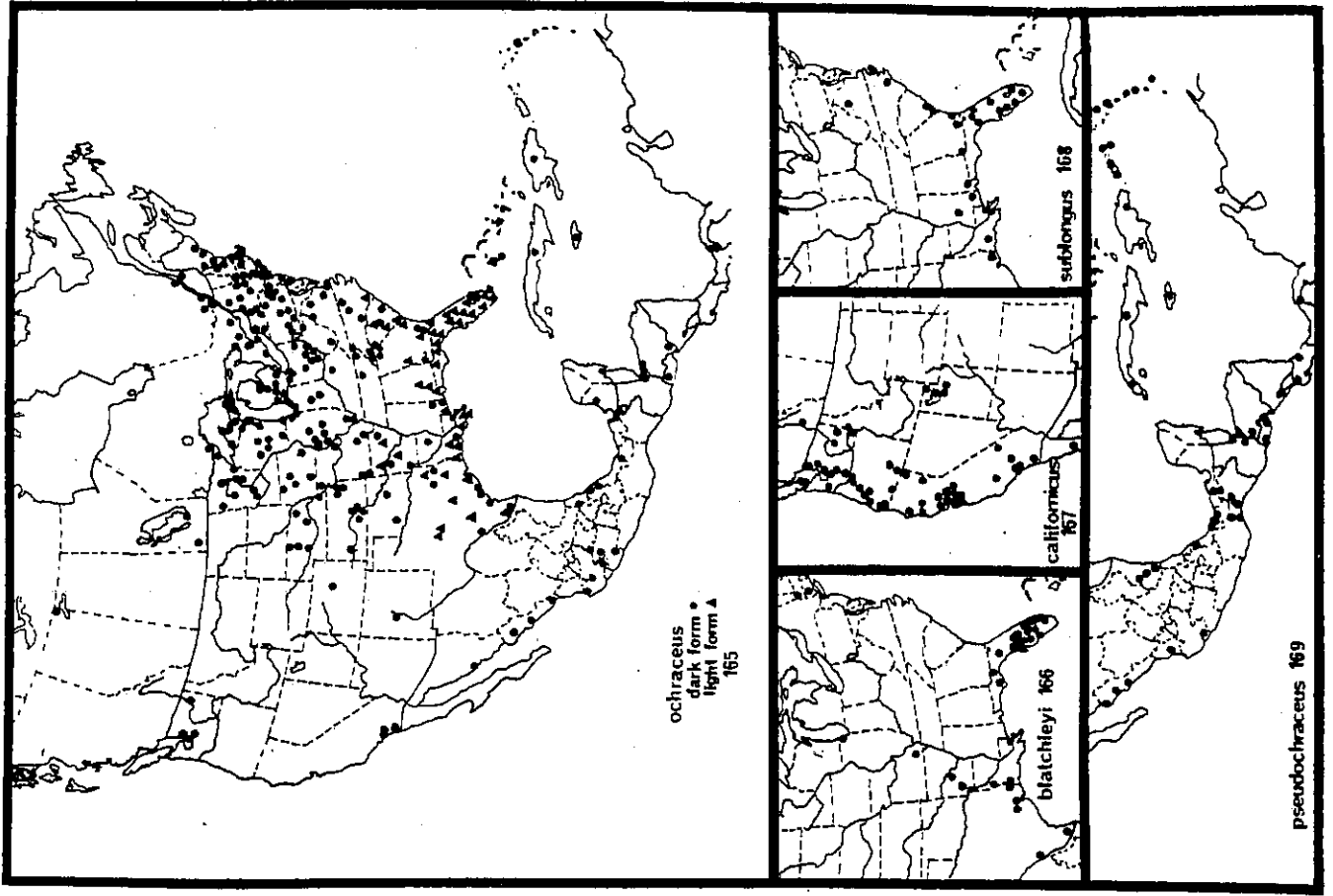
Figs. 143-151, *Enochrus*, male genitalia and emargination in last abdominal sternite (abdominal notch), ventral: 143, *E. reflexipennis*; 144, *E. diffusus*; 145, *E. hamiltoni*, typical form; 146, *E. hamiltoni*, dark form; 147, *E. hamiltoni*, dark (*collinus*) form; 148, *E. pygmaeus pygmaeus*; 149, *E. p. pectoralis*; 150, *E. sayi*; 151, *E. p. nebulosus*; (scale line represents 0.2 mm).



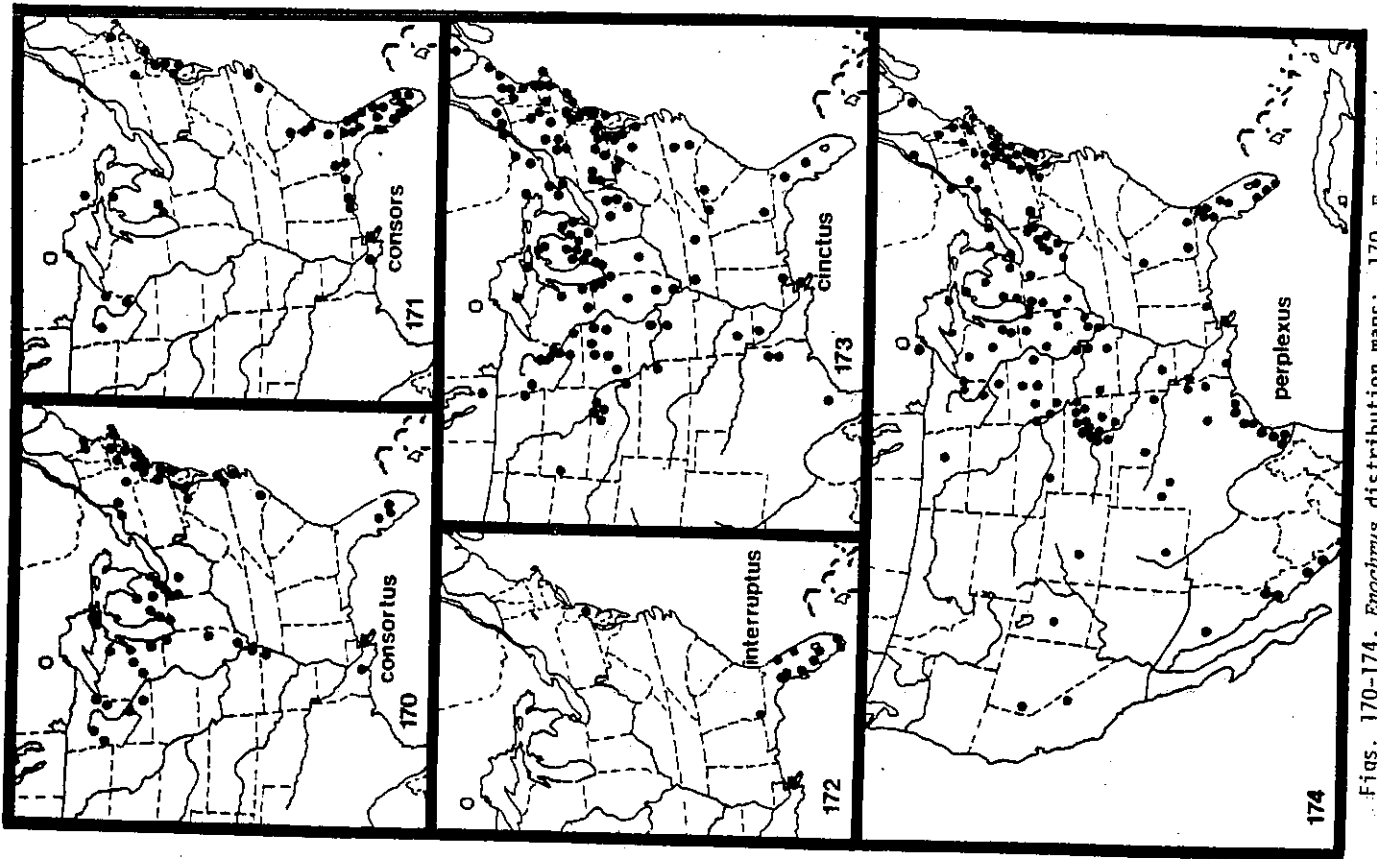
Figs. 152-160, *Enochrus*, male genitalia and emargination in last abdominal sternite (abdominal notch), ventral: 152, *E. cristatus*; 153, *E. arcticus*; 154, *E. sharpi*; 155, *E. debilis*; 156, *E. interruptus*; 157, *E. periparus*; 158, *E. cinctus*; 159, *E. conorvi*; 160, *E. conorvi*; (scale line represents 0.2 mm).



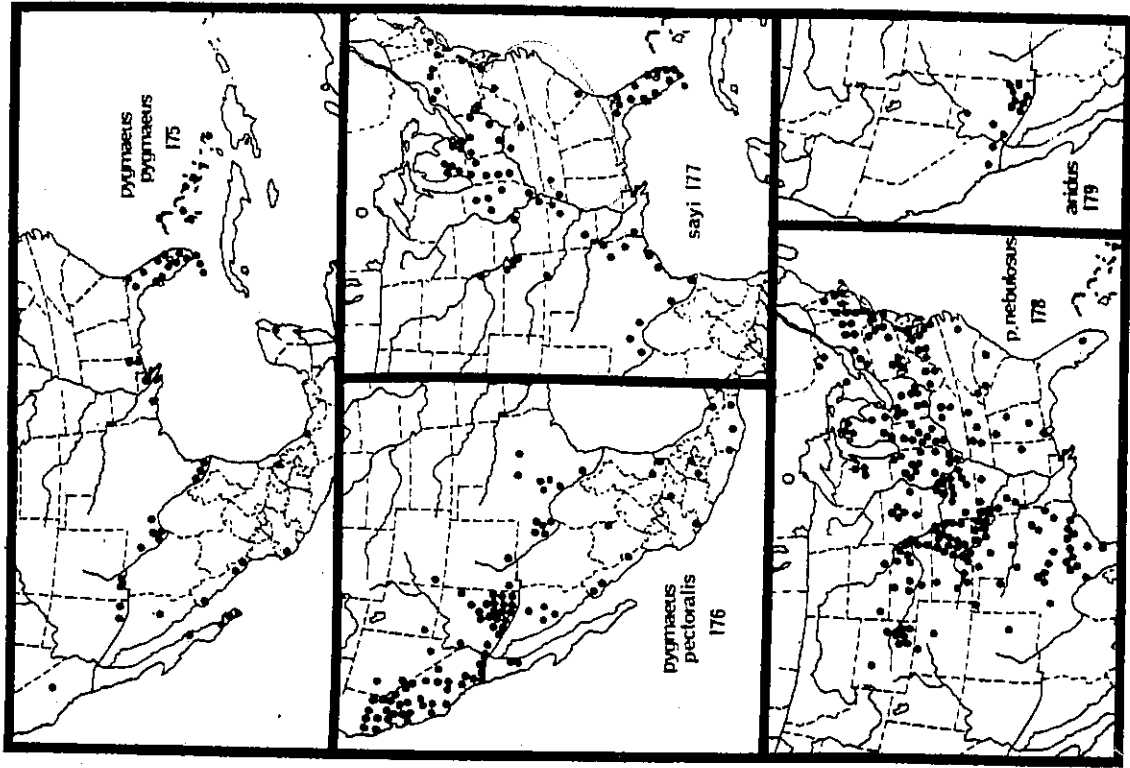
Figs. 161-164, *Enochrus* distribution maps: 161, *E. piceus piceus* and *E. p. glabrus*; 162, *E. mexicanus*; 163, *E. carinatus carinatus* and *E. c. fucatus*; 164, *E. cuspidatus*.



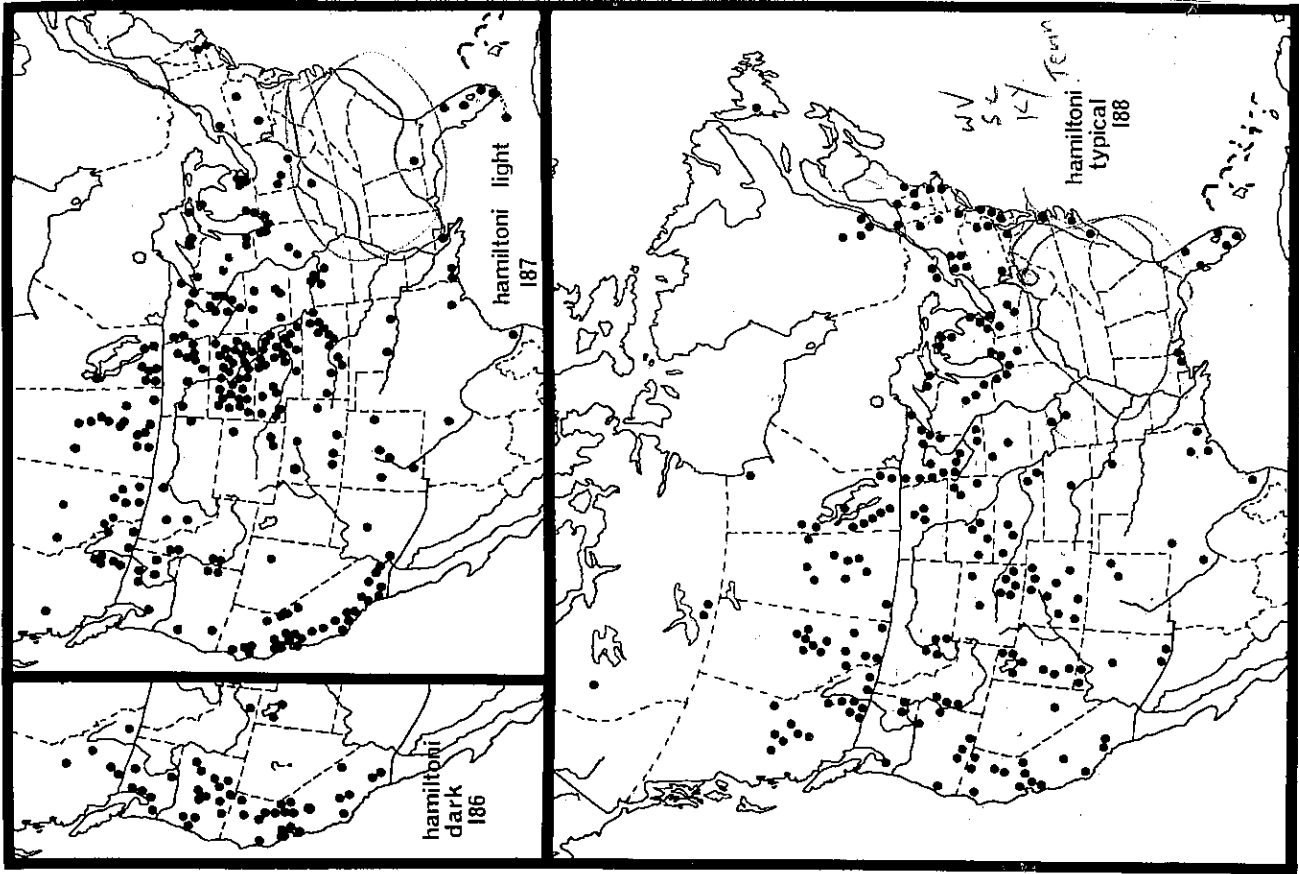
Figs. 165-169, *Enochrus* distribution maps: 165, *E. ochraceus*; 166, *E. blotchleyi*; 167, *E. californicus*; 168, *E. sublongus*; 169, *E. pseudochraceus*.



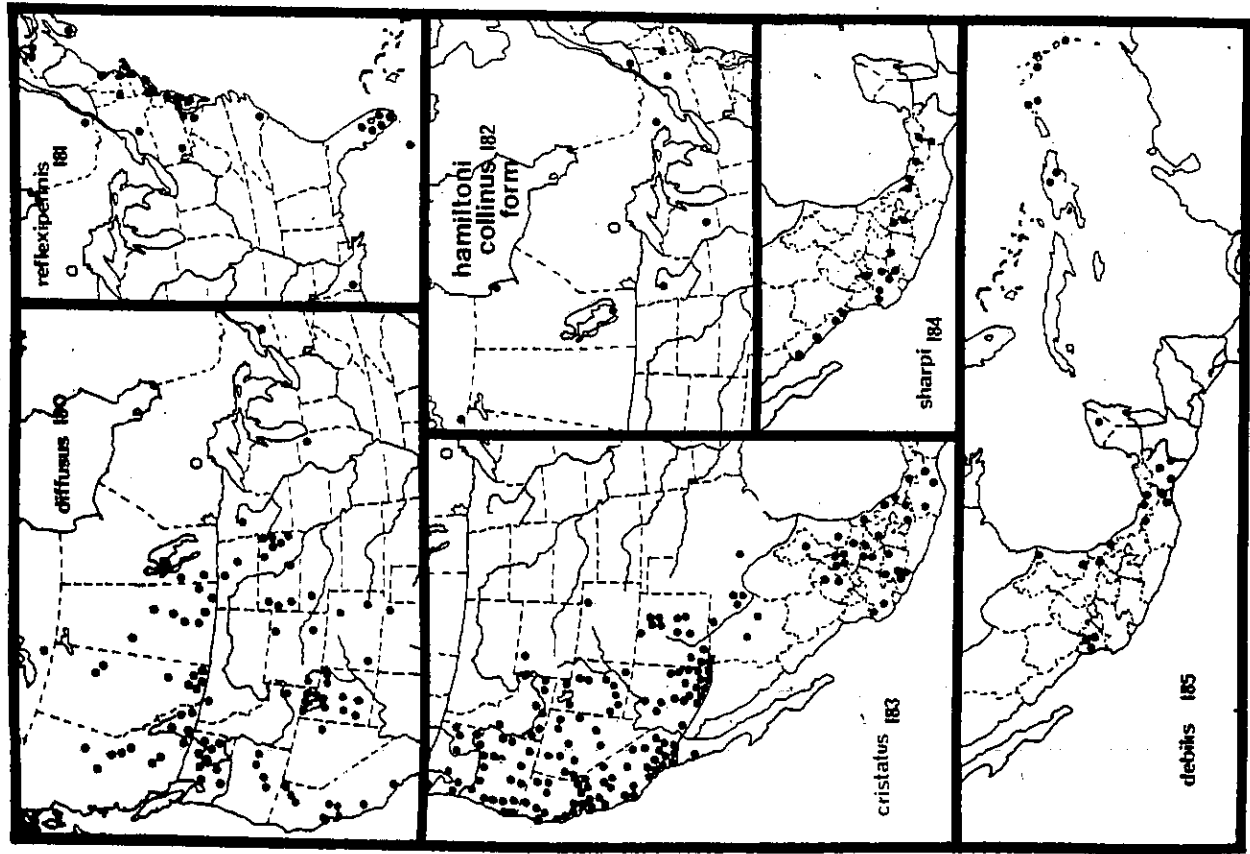
Figs. 170-174, *Enochrus* distribution maps: 170, *E. consortus*; 171, *E. consors*; 172, *E. interruptus*; 173, *E. cinctus*; 174, *E. perplexus*.



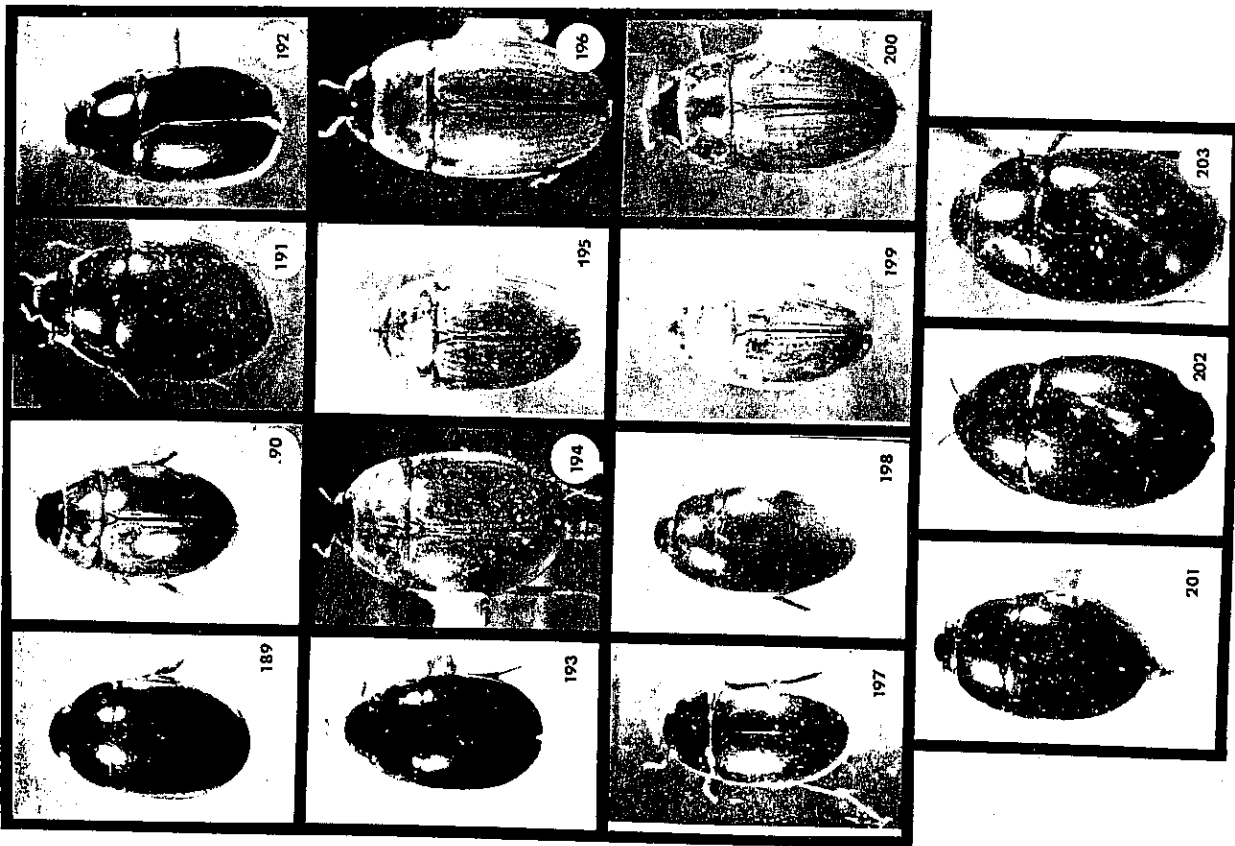
Figs. 175-179, *Enochrus* distribution maps: 175, *E. pygmaeus pygmaeus*; 176, *E. p. pectoralis*; 177, *E. sayi*; 178, *E. p. nebulosus*; 179, *E. aridus*.



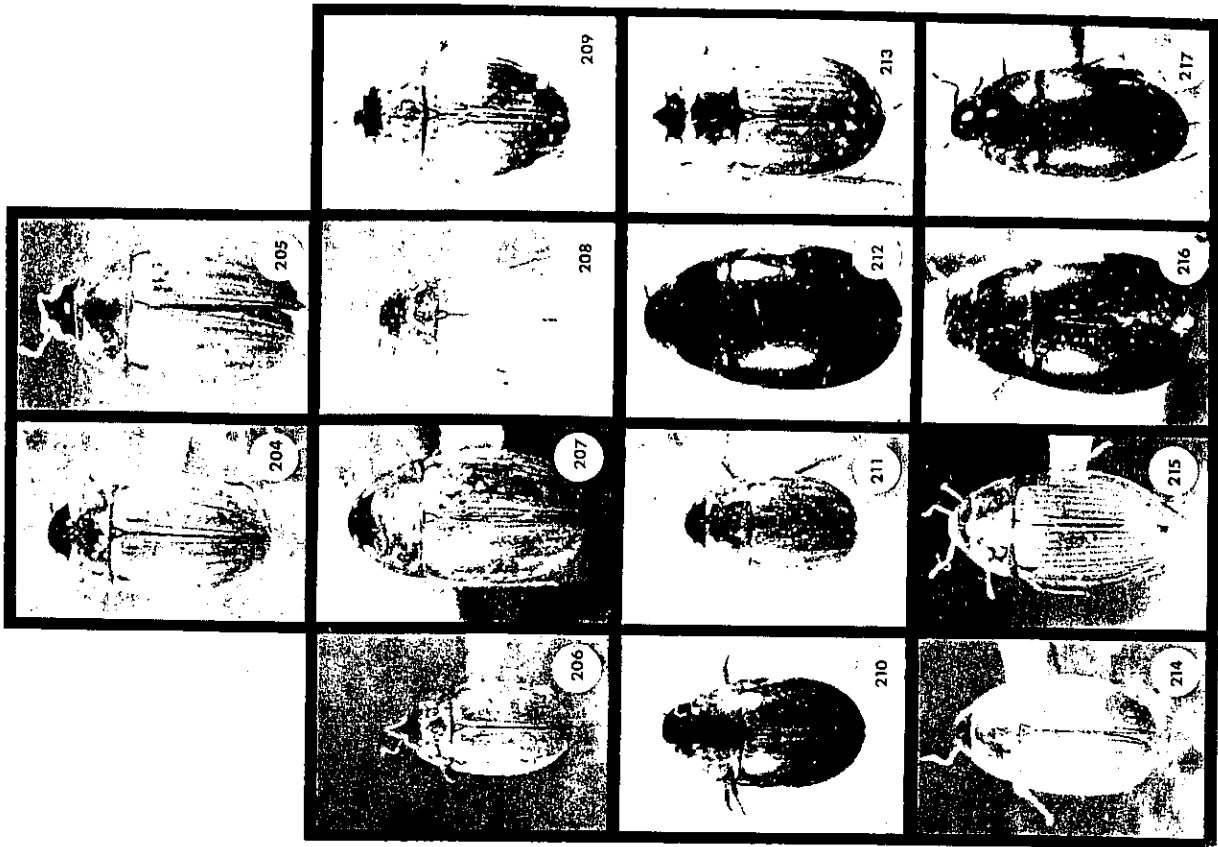
Figs. 186-188, *Enochrus hamiltoni* distribution maps: 186, dark form (see also fig. 182); 187, light form; 188, typical form.



Figs. 180-185, *Enochrus* distribution maps: 180, *E. diffusus*; 181, *E. reflexipennis*; 182, *E. hamiltoni* dark (*collinus*) form (see also fig. 186); 183, *E. cristatus*; 184, *E. sharpi*; 185, *E. debilis*.



Figs. 189-203, *Enochrus carinatus* conspurcatus; 190, *E. piceus* piceus; 191, *E. cuspidatus*; 192, *E. mexicanus*; 193, *E. hickshayi*; 194, *E. californicus*; 195, *E. ochraceus*, light form; 196, *E. ochraceus* dark form; 197, *E. purpuratus*; 198, *E. heteropictus*; 199, *E. sublongus*; 200, *E. pseudochiracatus*; 201, *E. cinctus*; 202, *E. consors*; 203, *E. consors*.



Figs. 204-217, 204, *Enochrus carinatus*; 205, *E. hickshayi*; 206, *E. mexicanus*; 207, *E. mexicanus* dark form; 208, *E. purpuratus*; 209, *E. consors*; 210, *E. consors*; 211, *E. consors*; 212, *E. consors*; 213, *E. hickshayi*, typical form; 214, *E. hickshayi*, light form; 205, *E. hickshayi*; 206, *E. hickshayi*, dark (collar) form; 207, *E. consors*.