HALIPLIDAE OF MINNESOTA

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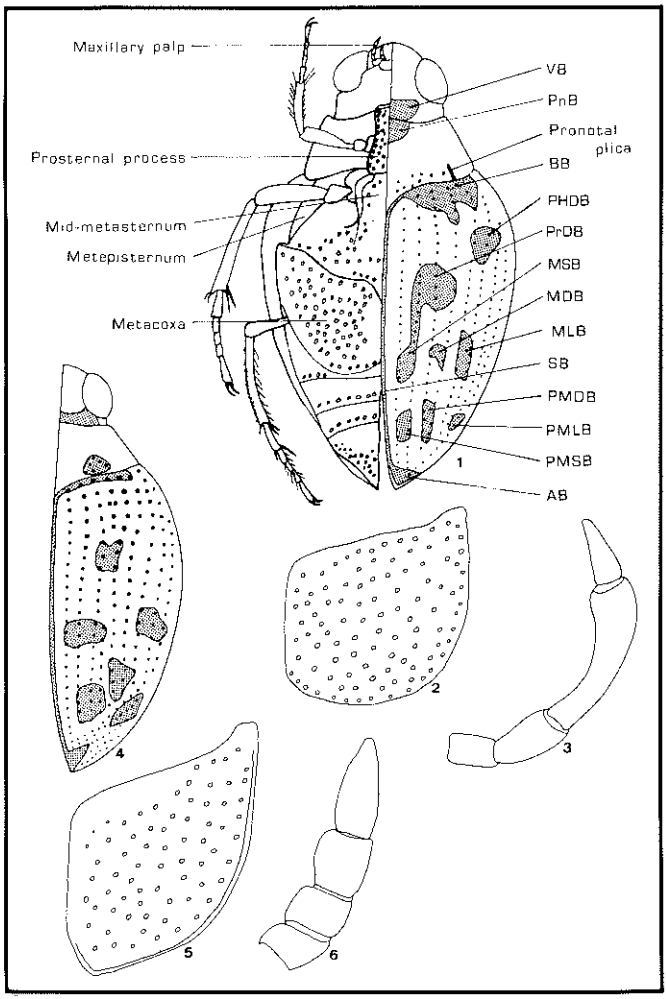
ABSTRACT — Haliplids occur in all types of shallow littoral habitats. The adults and larvae are mainly herbivores, feeding particularly on filamentous algae but occasionally on small invertebrates. Of the approximately 65 species found in America north of Mexico, 17 have been recorded from Minnesota and three others have distributions coming close enough to Minnesota for them to enter the state occasionally or be native to, but very rare in Minnesota. Four species are recorded from Minnesota for the first time: *Haliplus salinarus, H. strigatus, Peltodytes callosus* and *P. sexmaculatus*. Since very little serious collecting of Haliplids had been done in Minnesota prior to this study, it is difficult to fully assess the past abundance and distribution of Haliplids in the state. However, the continued presence of three rare species has been verified: *Haliplus apostolicus, H. pantherinus,* and *H. subguttatus*. Based on the discussion of *H. canadensis* and *H. nitens* in Brigham (1983), and examination of Minnesota specimens of *H. canadensis,* we believe that only *H. canadensis* occurs in Minnesota.

INTRODUCTION

Haliplidae, commonly known as crawling water beetles, range in length from 2.5 to 4.9 mm. The adult beetles are oval and strongly convex with the elytra broadest at the base and tapering smoothly posteriorly (Fig. 1). The most distinctive characteristic of this family is the greatly expanded hind coxae. The hind coxae overlap the first few abdominal segments and most of the length of the metafemur. Their color varies

from a pale-yellow to reddish-brown. The elytra are normally boldly spotted and have 10 rows of small to large punctures (Fig. 1). The elytral maculation ranges from small discrete spots confined between two striae, to large spots covering more than three striae which may coalesce with adjacent spots. Only one species in Minnesota, *Haliplus strigatus*, lacks maculation. The strial punctures of this species are dark and closely spaced, giving a striped appearance (Fig. 46).

Two genera and 17 species of Haliplidae are recorded from Minnesota. The genus *Peltodytes* can be distinguished from *Haliplus* by a pair of black basal depressions on the pronotum (Figs. 1, 4). These black depressions, which mark internal supporting plates, are present on all *Peltodytes;* however, the dark spots may appear to be present on *Haliplus* when in alcohol. The dark spots disappear in *Haliplus* when the specimen is dried. Also useful in distinguishing *Haliplus* from *Peltodytes* are the shape and length of the last segment of the maxillary palps which is equal to the penultimate in *Peltodytes* and much shorter in *Haliplus* (Figs. 3, 6). The edge of the metacoxa is margined in *Peltodytes* but not in *Haliplus* (Figs. 2, 5).



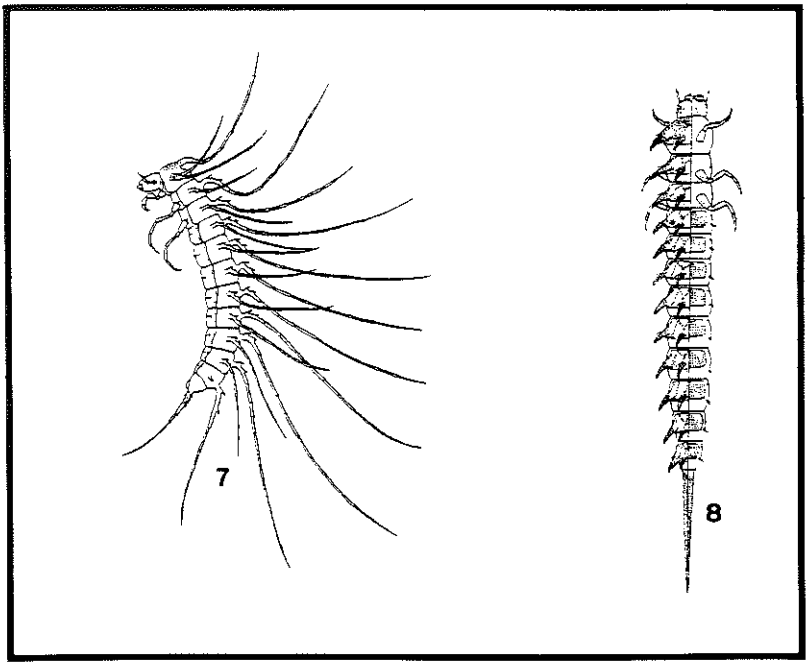
Figures 1-6. 1. Dorsal/Ventral view of *Haliplus*. 2. *Haliplus* metacoxa. 3. *Haliplus* maxillary palp. 4. Dorsal view of *Peltodytes*. 5. *Peltodytes* metacoxa. 6. *Peltodytes* maxillary palp; AB – anal blotch, BB – basal blotch, MDB – medial discal blotch, MLB – medial lateral blotch, MSB – medial sutural blotch, PHDB – posthumeral discal blotch, PNB – pronotal blotch, PMDB – postmedial discal blotch, PMLB – postmedial lateral blotch, PMSB – postmedial sutural blotch, PrDB – premedial discal blotch, SB – sutural band, VB – vertex blotch (labeling of spots modified from Brigham and Sanderson, 1972).

The species of Haliplidae can be separated using the following characteristics: 1) presence or absence of a darkened vertex, 2) a dark medial spot on the anterior margin of the pronotum, 3) a pair of basal plicae on the pronotum, 4) a contrasting subapical band on the metafemur, and 5) the shapes of the apical margins of the elytra and certain ventral sclerites. The male genitalia are distinctive in most species.

LIFE HISTORY

Adult haliplids are herbivores, eating mainly algae but also some plant material and a few soft-bodied invertebrates. They are found in ponds and the shallow vegetated edges of lakes and slow-moving streams and rivers. Long hairs fringe the legs enabling them to swim at a medium speed, but with a flailing movement. Adult haliplids are air breathing, coming to the surface occasionally to replenish the bubble of air carried under their elytra. Adults are active all year, often seen swimming around under the ice.

The larvae of the haliplids are slender and hard bodied, with dorsal spines (Figs. 7, 8). The larvae of *Peltodytes* have long dorsal spines, easily separating them from *Haliplus* larvae, which have short, often stubby, spines. Descriptions of the larvae of several species can be found in Hickman, 1930; Merrit and Cummins, 1984; and Leech and Chandler, 1956. The larve feed mainly on algae and plant material. Respiration is through the body surface, although second instar and older larvae have functional spiracles. Pupation takes place above water in cells in damp soil often under stones or debris (Leech and Chandler, 1956).



Figures 7-8. 7. *Peltodytes* larva. 8. *Haliplus* larvae. (7 from Peterson, 1951; 8 from Hickman, 1930.)

In Minnesota the typical life cycle consists of one generation per year but a partial second generation may overwinter as larvae (Hickman, 1931). The adults are active all year, spending the winter under the ice in vegetation. *H. immaculicollis* and *H. strigatus* have been found buried about an inch into the bottom of dried up ponds during droughts (Wallis, 1933). The eggs are laid in the spring and early summer in notches cut into aquatic plants *(Haliplus),* on the surface of aquatic plants, or in leaf axles *(Peltodytes).* The adults of most species of haliplids in Minnesota are first seen in April soon after the ice goes out. They are most abundant in May and June, and again in September and October when the new adults emerge.

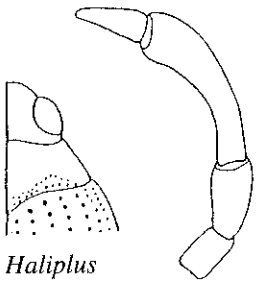
TAXONOMY

The material used in this study came predominantly from the St. Cloud State University collection. Habitat preference data was based on 6600 specimens collected from 330 Minnesota sites over the last 17 years. Additional material was borrowed from Dr. William Hilsenhoff, University of Wisconsin, Madison; University of Minnesota, St. Paul and Morris; Gustavus Adolphus College, St. Peter, Minnesota; University of Iowa, Ames; and University of North Dakota, Fargo.

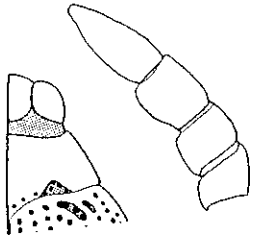
KEY TO THE HALIPLIDAE OF MINNESOTA

1. Pronotum with a pair of black basal impressions (*Haliplus* specimens in alcohol may falsely show black spots); last segment of maxillary palps as long or longer than penultimate. .....*Peltodytes* **2 (p. 30)**

1′. Pronotum without a pair of black basal impressions in dried specimens, last segment of maxillary palps much shorter than penultimate. ..... *Haliplus* **6 (p. 16)**



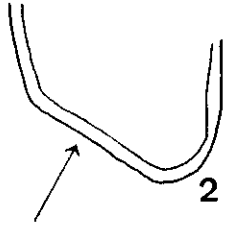
Haliplus

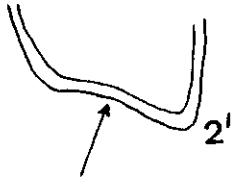


Peltodytes

2(1). Apex of metafemur uniformly tan; apical margin of elytra not concave. **3**

2′. Apex of metafemur black or black with a pale subapical band; apical margin of elytra concave. **4**





3(2). Vertex of head darkened; basal portion of elytral disc flattened with a bump or callus near center of each elytron; four dark spots on each elytron; length 3.5-3.9 mm. .....*P. callosus* **(p. 31)**

3′. Vertex of head uniformly tan; elytra convex or flattened but without callus; six or more spots on each elytron; length 4.0-4.4 mm..... *P. tortulosus* **(p. 34)**

4(2′). Metafemur entirely black; vertex of head uniformly tan; length 3.7-3.9 mm. ... *P. sexmaculatus* **(p. 32)**

4′. Metafemur black with distinct subapical pale band; vertex of head variable; length 3.5-4.1 mm. **5**

5(4). Vertex dark, apex of metacoxal plate bluntly angulate, no dark line at base of tenth stria; length 3.5-4.1 mm. ..... *P. edentulus* **(p. 32)**

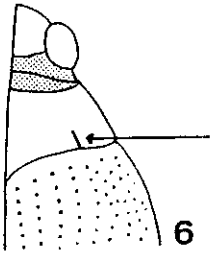
5′. Vertex light, apex of metacoxal plate distinctly angulate, dark line at base of tenth stria: length 3.5-3.9 mm. .....*P. duodecimpunctatus* **(p. 31)**

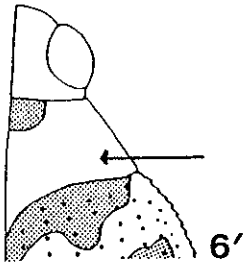
P. edentulus

P. duodecimpunctatus

6(1′). Basal pronotal plica present on each side. **7**

6′. Basal pronotal plicae absent. **10**





7(6) Elytral maculations absent or reduced to one large, ill-defined, central darkened spot. **8**

7′. Elytral maculation present and composed of several spots. **9**

8(7). Elytral maculation absent, elytral darkening limited to lines of sutural punctures; sutural band extends length of elytra; anterior pronotal blotch absent; length 3.1-3.6 mm. ..... *H. strigatus* **(p. 27)**

8′. Elytral maculation limited to central spot, some obscure posterior spots may be present; sutural band extends from middle of elytra to the tip; anterior pronotal blotch present; length 3.0-3.4 mm. ..... *H. longulus* **(p. 24)**

9(7′). Apical margin of elytra rounded or slightly sinuate; pronotal plicae 1/5 length of pronotum; anterior portion of prosternum not sulcate or concave; length 2.5-3.0 mm. ..... *H. immaculicollis* **(p. 22)**

9′. Apical margin of elytra strongly sinuate; pronotal plicae 1/4 length of pronotum; anterior portion of prosternum strongly sulcate or concave; length 2.7-3.1 mm. ..... *H. blanchardi* **(p. 17)**

H. immaculicolis *H. blanchardi*

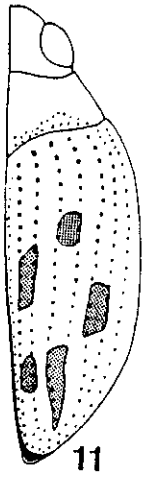
left elytron

10(6′). Pronotum without anterior black blotch. **11**

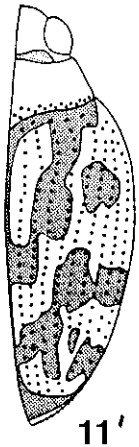
10′. Pronotum with anterior black blotch. **15**

11(10). Elytral spots confined between two striae, no joining of spots; vertex not darkened. **12**

11′. Elytral spots mostly extending over more than two striae, spots usually joined at least near suture; if spots smaller, then vertex darkened. **13**



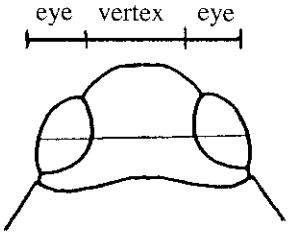
11



11′

12(11). Color reddish-brown to brown; vertex less than 1.9 (usually less than 1.6) times width of eye; darkened anterior pronotal punctures may be faintly present; sutural band extending the full length of the elytra; elytral punctures large and black often touching in rows anteriorly; length 3.7-4.1 mm. ..... *H. salinarus* **(p. 26)**

12′. Color tan to yellow; vertex 1.9 times width of eye; black anterior pronotal punctures absent; sutural band usually present only in apical 3/4 of elytra; elytral punctures medium, seldom touching in rows; length 3.9-4.2 mm. ..... *H. subguttatus* **(p. 28)**

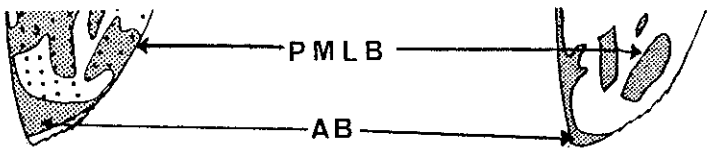


13(11′). Elytra with row of small teeth along apical margin; reddish-tan to yellowish-tan; elytral spots narrowly to broadly coalesced and joined to sutural band; length 3.8-4.5 mm. **14**

13′. Elytra without row of teeth along apical margin; yellowish to light tan; elytral spots not coalesced; length 2.8-3.1 mm. ..... *H. borealis* **(p. 18)**

14(13). Teeth along apical margin of elytra fine to missing near suture; spot PMLB (fig. 1) separated from apical spot (AB) by less than width of PMLB; length 3.8-4.3 mm. ..... *H. connexus* **(p. 20)**

14′. Apical elytral teeth distinct all the way to suture; spot PMLB separated from the apical spot by at least the width of PMLB; length 4.2-4.5 mm; (not recorded from Minnesota). ..... *H. tortilipenis* **(p. 28)**



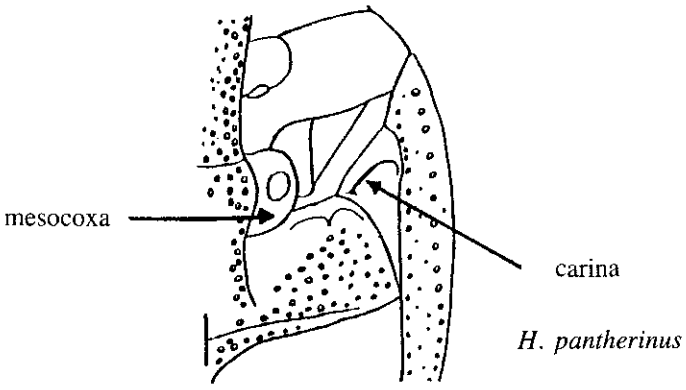
H. connexus *H. tortilipenis*

15(10′). No dark posterior pronotal punctures; vertex light. **16**

15′. Dark posterior pronotal punctures; vertex darkened. **18**

16(15). Metepisternal carina not or only slightly darkened; dorsal color variable; length 3.7-4.6 mm. **17**

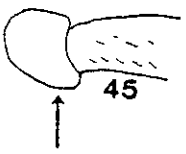
16′. Carina on anterior edge of metepisternum distinctly darkened; dorsally yellow to light tan; length 3.8-4.3 mm. ..... *H. pantherinus* **(p. 24)**



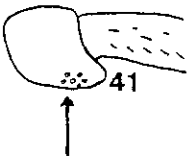
H. pantherinus

17(16). Elytra reddish-brown to yellow; elytral edge with fine apical and humeral teeth; mesotrochanter rounded with no or very small punctures; length 3.7-4.1 mm. ..... *H. triopsis* **(p. 29)**

17′. Elytra reddish-brown; elytral edge with only apical teeth; mesotrochanter elongate, extending beyond junction with femur, and with coarse punctures ventrally; length 4.1-4.6 mm; (not recorded from Minnesota). ..... *H. leopardus* **(p. 23)**



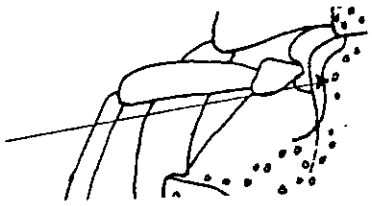
H. triopsis



H. leopardus

18(15′). Mid-metasternal plate margined; anterior maculation extends over three striae; length 4.1-4.5 mm. ..... *H. apostolicus* **(p. 16)**

18′. Mid-metasternal plate not margined; anterior maculation confined between two striae; length variable. **19**



H. apostolicus

19(18′). Subapical dark band on metafemur; length 3.8-4.3 mm. ..... *H. canadensis* **(p. 19)**

19′. No subapical dark band on metafemur; length 4.4-4.9 mm. ..... *H. cribrarius* **(p. 22)**

Genus *Haliplus* Latreille, 1802

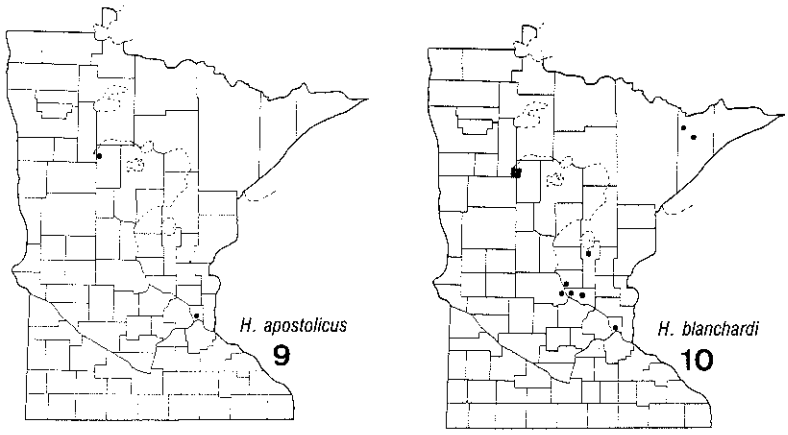
The genus is represented by 46 species in North America, north of Mexico. Of these, 13 have been collected from Minnesota and two others *(Haliplus leopardus* and *H. tortilipenis)* may very rarely occur in Minnesota. The genus is characterized by not having black depressions near the posterio-lateral corners of the pronotum; the last segment of the maxillary palps shorter and thinner than the penultimate segment; and a non-marginal edge on the metacoxae. The body is moderately convex pointed posteriorly, and the strial punctures of the elytra are small to medium-sized and evenly darkened and arranged over the whole elytral surface. In Minnesota their size ranges from 2.5-4.9 mm. Further descriptions and keys to species of the Minnesota area can be found in Gordon and Post, 1965; Hilsenhoff and Brigham, 1978; and Wallis, 1933.

Haliplus apostolicus Wallis, 1933 Figures 9, 25, 26, 59.

LENGTH: 4.1-4.5 mm. COLOR: Reddish-brown to brown; vertex distinctly darkened; pronotum with large anterior black blotch which is only slightly wider than long; posterior pronotal pits black but not pronounced; elytral maculations large, dark and sharply defined, anterior spots extend over 3 or more striae; sutural band runs full length of the elytra; strial punctures medium sized, sharp and black; ventral color totally light yellowish-brown, including metafemur. ANATOMY: No pronotal plicae; humeral and apical edges of elytra not toothed; edges of mid-metasternal plate distinctly raised or margined (Fig. 26). MALE GENITALIA: Figure 59.

COMPARISONS: Most easily confused with *Haliplus canadensis*, but *H. apostolicus* is distinctly larger and the mid-metasternal plate is margined. The similar but larger *H. cribrarius* has smaller elytral maculation and also lacks the mid-metasternal margining.

DISTRIBUTION: The only previous Minnesota records were from Bussey's Pond, University of Minnesota, St. Paul, VI-29-1921 and Green Lake, Itasca State Park, VIII-21-1922 (Wallis, 1933). It has been subsequently collected from a large permanent pond in Itasca Park VI-22,1968 (Fig. 9). Interestingly this was a night collection. The species may be nocturnal explaining its rarity in collections. It has been collected only from lake shores and permanent ponds and only from Minnesota and Wisconsin (Hilsenhoff and Brigham, 1978). Specimens examined: 5.



Figures 9-10. Minnesota distribution of *Haliplus apostolicus* and *H. blanchardi*.

Haliplus blanchardi Roberts, 1913 Figs. 10, 29, 30, 60.

LENGTH: 2.7-3.1 mm. COLOR: Yellowish-brown to reddish-brown; vertex not or only slightly darkened; pronotum unicolorous, and posterior punctures not darkened; elytral maculations large and distinct, several spots coalesced giving normally seven spots on each elytron, MDB, MSB, and sutural band appearing to form a transverse bar; PMSB and PMDB joined; major spots cover three or more striae; sutural band narrow but extending the full length of the elytra; strial punctures medium sized, distinct; ventral color totally yellowish-brown, including metafemur. ANATOMY: Pronotal plicae 1/4 length of pronotum; apical and humeral edges of elytra not toothed, apical edge is strongly expanded and sinuate (Fig. 30); prosternal plate distinctly concave anteriorly. MALE GENITALIA: Figure 60.

COMPARISONS: *Haliplus blanchardi* can only be confused with *H. immaculicollis* to which it is very similar (Figs. 29, 34, 36). If both species are present in a collection, they can be separated by comparing the sinuation of the apical edge of the elytra which is much less pronounced in *H. immaculicollis* (Figs. 30, 35). However, if only one of the species is available for comparison, then other anatomical features must be checked: the length of the pronotal plica, size of basal spot, BB (normally absent in *H. immaculicollis* but distinct in *H. blanchardi,* (Figs. 29, 34, 36), and the deeper concavity of the anterior edge of the prosternal plate of *H. blanchardi.* The surest method of separation on questionable specimens is the male genitalia (Figs. 60, 62).

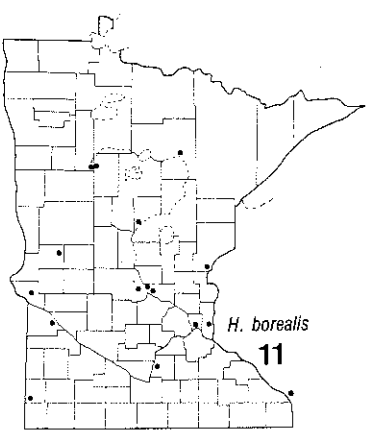
DISTRIBUTION: *Haliplus blanchardi* has been recorded from a wide range of habitats from the Mississippi River east and north in Minnesota (Fig. 10). It has been collected westward into Canada, eastward to New England and south to Missouri (Wallis, 1933). Seasonal cycle typical with peak adult collections in June. Specimens examined: 244.

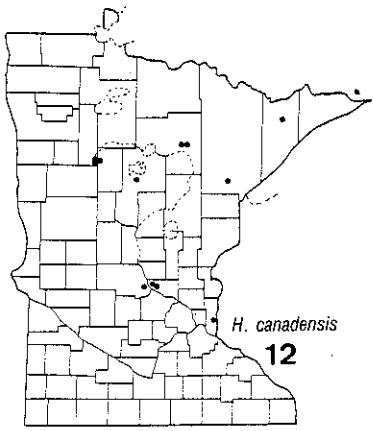
Haliplus borealis LeConte, 1850 Figs. 11, 31, 32, 61.

LENGTH: 2.5-3.1 mm (none less than 2.8 mm have been collected in Minnesota). COLOR: Yellow to light tan; vertex distinctly darkened; pronotum unicolorous with anterior and posterior punctures at most slightly darkened; elytral maculations large, dark and sharply defined, extending over at least 2 striae; PHDB distinctly larger than average, MDB, MSB, and sutural band occasionally joined forming a transverse band; sutural band extending full length of elytra; strial punctures medium sized, dark and distinct; ventral color uniformly brown, including metafemur. ANATOMY: Pronotal plicae lacking; humeral edge of elytra finely but distinctly toothed for approximately 1/3 elytral length, apical edge not toothed but distinctly sinuate (Fig. 32). MALE GENITALIA: Figure 61.

COMPARISONS: *Haliplus borealis* is most similar to the *H. blanchardi-immaculicollis* group but can be distinguished by its having a distinctly darkened vertex and no pronotal plicae. The edge of the elytra is intermediate between *H. blanchardi* and *H. immaculicollis* in sinuation (Figs. 30, 32, 35).

DISTRIBUTION: *Haliplus borealis* has been collected from most parts of Minnesota (Fig. 11). It has been collected from a wide range of weedy, standing-water habitats, but it has not been collected from bogs or edges of flowing water. It is distributed over the Great Lakes Region, extending south to Indiana, west through North Dakota to Montana and north into Central Canada (Gordon and Post, 1965; Blatchley, 1910). Seasonal cycle typical, with no adults collected in July or August. Specimens examined: 72.





Figures 11-12. Minnesota distribution of *Haliplus borealis* and *H. canadensis*.

Haliplus canadensis Wallis, 1933 Figs. 12, 27, 28, 63

LENGTH: 3.5-4.3 mm (none less than 3.8 mm collected from Minnesota). COLOR: Light brown to reddish-brown; vertex slightly to distinctly and broadly black; pronotum with broad anterior black area; posterior pronotal punctures numerous and darkened, anterior darkened pronotal pits present; elytral maculation small to medium sized (Figs. 27, 28), often somewhat coalesced along strial lines, seldom extending over more than two striae; sutural band fairly wide and extending full length of elytra; strial punctures large, black and very distinct; ventral color totally brown; metafemur usually has a darkened to black subapical band. ANATOMY: Pronotal plicae absent; humeral and apical edges of elytra smooth, no indication of teeth, apical edge only slightly sinuate. MALE GENITALIA: Figure 63.

COMPARISONS: *Haliplus canadensis* could be confused with *H. nitens*, *H. cribrarius*, or *H. apostolicus*. *H. apostolicus* has a margined mid-metasternum, and *H. cribrarius* is much larger, 4.4-4.9 mm. *H. canadensis* is closest to *H. nitens*. Brigham (1983) discusses the characteristics, questionable distribution, and status of *H. nitens*. It is recorded from the north shore of Lake Superior and possibly from Texas. Brigham has not been able to find any valid unquestionable records of *H. nitens* besides the type collection by LeConte in 1848 and therefore suggests that it might be extinct. I believe any recent distribution records listed as *H. nitens* in the Upper Midwest refer to *H. canadensis*. Examination of our

material, including genitalia, indicates that we have only *H. canadensis*. There is wide variation in the size of elytral maculation in *H. canadensis,* but all other characteristics are consistent within narrow limits.

For detailed information and description of *H. nitens* see Brigham (1983). To avoid possible misidentification of *H. canadensis* as *H. nitens* we have left *H. nitens* out of our key. Since *H. nitens* may yet be collected again, if you have a specimen with very fine elytral maculations that does not quite match *H. canadensis,* the following couplet from Brigham (1983) separates *H. canadensis* and *H. nitens*.

> Medial triangular projection at base of pronotum near elytral suture infuscate; metafemur bicolored, yellow, with a dark (often black) band around middle; base or pronotum usually with less than 50 infuscate punctures; color reddish yellow; elytral maculations large and distinct; northern U. S. and Canada.
>
> *Haliplus canadensis* Wallis 1933
>
> Medial triangular projection at base of pronotum near elytral suture not infuscate; metafemur uniformly pale yellow; base of pronotum with about 60 infuscate punctures; color pale yellow, almost straw color; elytral maculations small, but distinct; known only from type locality, Isle St. Ignace, Ontario (on north shore of Lake Superior) and Shovel Mt., Texas (validity suspect).
>
> *Haliplus nitens* LeConte 1850

DISTRIBUTION: *Haliplus canadensis* is found east and north of the Mississippi River in Minnesota (Fig. 12). Its distribution extends across the northern tier of states and into Canada, coast to coast (Brigham, 1983; Gordon and Post, 1965). *H. canadensis* is found in permanent ponds and shallow weedy lake shores. Seasonal cycle typical, with no adults collected in July or August. Specimens examined: 107.

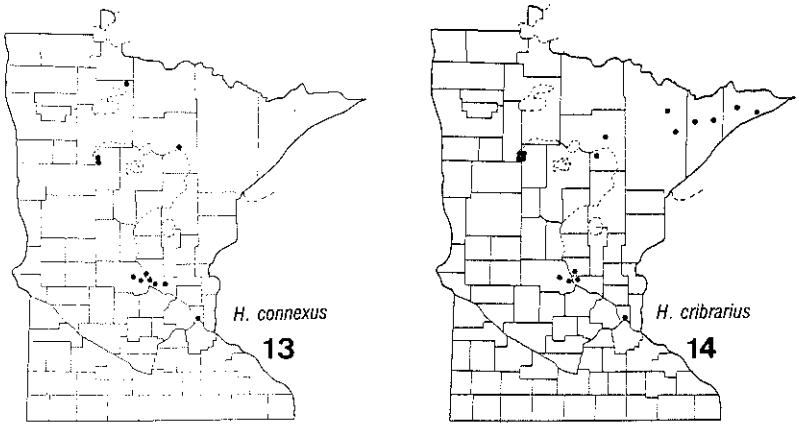
Haliplus connexus Matheson, 1912 Figs. 13, 33, 64.

LENGTH: 3.5-4.2 mm (none less than 3.8 mm collected from Minnesota). COLOR: Yellowish-tan to reddish tan; vertex with a distinct but not black basal band; no anterior pronotal blotch; posterior pronotal pits may be slightly darkened; elytral maculations bold, sharp and highly coalesced, covering three or more striae; sutural band narrow but running the full length of the elytra; strial punctures medium to small but

only slightly darkened; ventral surface totally brown, including metafemur. ANATOMY: Pronotal plicae absent; humeral edge of elytra without distinct teeth, apical edge with distinct teeth along clear area adjacent to apical blotch, apical edge only slightly sinuate. MALE GENITALIA: Figure 64.

COMPARISONS: *Haliplus connexus* with its heavy maculation, lack of dark pronotal punctures and toothed apical margin of elytra can be confused with no other species collected in Minnesota. If specimen is over 4.2 mm and PMLB is distant from AB you may have *H. tortilipenis*, which has been recorded once from southeastern Wisconsin (Hilsenhoff and Brigham, 1978).

DISTRIBUTION: *Haliplus connexus* is found in all types of weedy habitats, including edges of flowing water. It has been collected from Red Lake down the Mississippi River to St. Paul (Fig. 13). Its range extends from northwestern North Dakota east to New England, south to Illinois and north into Canada (Brigham and Sanderson, 1972; Gordon and Post, 1965; Wallis, 1933). Seasonal cycle typical, with no adults collected in June, July, or August. Specimens examined: 104.



Figures 13-14. Minnesota distribution of *Haliplus connexus* and *H. cribrarius*.

Haliplus cribrarius LeConte, 1850 Figs. 14, 37, 65.

LENGTH: 4.4-4.9 mm. COLOR: Reddish-brown to light brown; vertex broadly black; anterior pronotal blotch large; anterior pronotal punctures small and black; posterior pronotal punctures very large and black, extending along whole posterior margin; elytral maculations small, heavier anteriorly, sharp, seldom extending over more than two striae, the only coalescence being a possible fine line between MSB and PrDB; sutural band thin but extending the full length of the elytra; sutural punctures large and black; ventral surface totally brown, including metafemur. ANATOMY: Pronotal plicae absent; humeral and apical margins of elytra smooth, no indication of teeth, and slightly sinuate at apex. MALE GENITALIA: Figure 65.

COMPARISONS: *Haliplus cribrarius* because of its large size and finer elytral maculation should be confused with no other Minnesota species. Separation from *H. apostolicus* and *H. canadensis* are discussed under those species. See also discussion by Wallis, 1933.

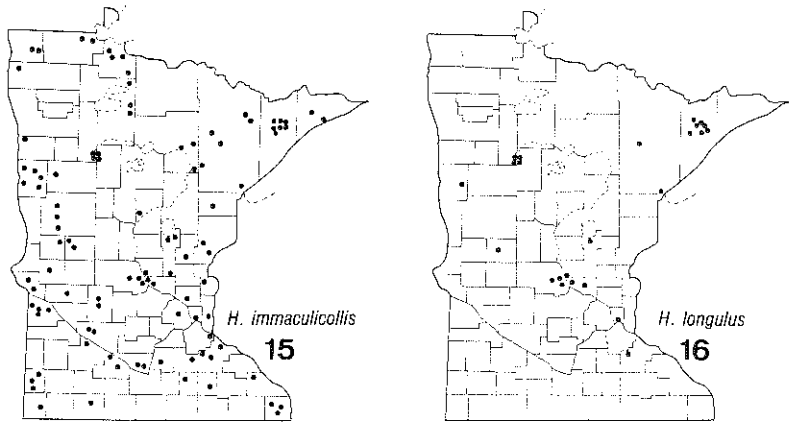
DISTRIBUTION: *Haliplus cribrarius* is found in all types of shallow weedy aquatic habitats, including edges of slow rivers. It is found north and east of the Mississippi River in Minnesota (Fig 14). Its distribution extends north into Canada, south to Indiana, and east to New England (Gordon and Post, 1965; Wallis, 1933; Blatchley, 1910). Seasonal cycle typical, with the peak in June and July. Specimens examined: 168.

Haliplus immaculicollis Harris, 1828 Figs. 15, 34, 35, 36, 62.

LENGTH: 2.5-3.1 mm. COLOR: Yellowish-brown; vertex usually not darkened, but in many specimens there is some indistinct darkening; pronotum unicolorous with no darkened punctures; elytral maculations large and distinct, BB usually weak or missing, central spots often coalesced into a partial transverse band, central spots extending over 2 and often 3 striae; sutural band narrow but extendng full length of elytra; strial punctures medium sized, distinct; ventral surface uniformly yellowish-brown, including metafemur. ANATOMY: Pronotal plicae 1/5 length of pronotum; humeral and apical edges of elytra with no indication of teeth, the apical edge weakly sinuate (Fig. 35); prosternal plate weakly concave anteriorly. MALE GENITALIA: Figure 62.

COMPARISONS: *Haliplus immaculicollis* can only be confused with *H. blanchardi* and possibly *H. borealis*. *H. borealis* has a distinctly darkened vertex and no pronotal plicae. The distinctions between *H. blanchardi* and *H. immaculicollis* are discussed under *H. blanchardi*.

DISTRIBUTION: *Haliplus immaculicollis* is our most abundant and ecologically diverse species. It has been collected from all types of aquatic habitats throughout Minnesota except for rapidly flowing water (Fig. 15). It has been collected from most states, coast to coast, and from Texas, north into Canada (Gordon and Post, 1965; Wallis, 1933). Adults are found from spring through fall, with the peak collections in May and June. Specimens examined: 3900.



Figures 15-16. Minnesota distribution of *Haliplus immaculicollis* and *H. longulus*.

Haliplus leopardus Roberts, 1913 Figs. 40, 41, 71.

LENGTH: 4.1-4.6 mm. COLOR: Light reddish-brown; vertex slightly darkened; anterior pronotal blotch present; neither anterior nor posterior pronotal punctures darkened; elytral maculation heavy and coalesced into a broad interconnecting pattern, spots extending over 3 or more striae; sutural band broad and running full length of elytra; strial punctures light and not very distinct; ventral surface brown, including metafemur. ANATOMY: Pronotal plicae absent; apical margin of elytra distinctly toothed but humeral margin smooth; apical margin not sinuate; mesotrochanter with very coarse punctures (Fig. 41). MALE GENITALIA: Figure 71.

COMPARISONS: *Haliplus leopardus* could be confused with *H. pantherinus* or *H. triopsis*. The coarsely punctured mesotrochanter of *H. leopardus* separates it from both species (Figs. 41, 45). *H. pantherinus* has the raised edge of the metepisternum darkened and only humeral

edge of elytra toothed (Figs. 38, 39). *H. triopsis* has both humeral and apical edges of elytra toothed (Fig. 44).

DISTRIBUTION: *Haliplus leopardus* prefers marshes and ponds. It has not been collected from Minnesota but has been collected from central and northern Wisconsin. Its known range, besides Wisconsin, extends from Pennsylvania to Massachusetts, down the East Coast to Georgia and also is recorded from Louisiana, but not Florida (Hilsenhoff and Brigham, 1978; Young, 1954). Specimens examined: 2.

Haliplus longulus LeConte, 1850 Figs. 16, 42, 66.

LENGTH: 2.7-3.4 mm. COLOR: Reddish-brown to light brown; vertex darkened but not black; anterior pronotal blotch thin but extending nearly the full width of the pronotum; no darkened pronotal punctures; elytral maculations lacking except for an ill-defined darkened area just posterior of the center of the elytra, and possibly a PMLB spot; sutural band extending from area of spot to tip of elytra; strial punctures medium sized and black; ventral surface uniformly brownish-yellow, including metafemur. ANATOMY: Pronotal plicae 1/3 length of pronotum; no indication of teeth along humeral or apical edges of elytra, apical edge rounded; body more slender than other species. MALE GENITALIA: Figure 66.

COMPARISONS: *Haliplus longulus,* having only a central darkened area on the elytra, could be confused only with *H. strigatus* which has no darkened area on elytra, vertex, or pronotum, but has the strial punctures coalesced into narrow strial lines which are not evident in *H. longulus* (Fig. 46).

DISTRIBUTION: *Haliplus longulus* is found in all types of shallow littoral areas, but most commonly in ponds and marshes. It has been collected in all parts of Minnesota except the southwest (Fig. 16). Its distribution extends from coast to coast across the northern states south to Indiana and north into southern Canada (Gordon and Post, 1965; Wallis, 1933; Blatchley, 1910). Seasonal cycle typical, with the peak in June and July. Specimens examined: 478.

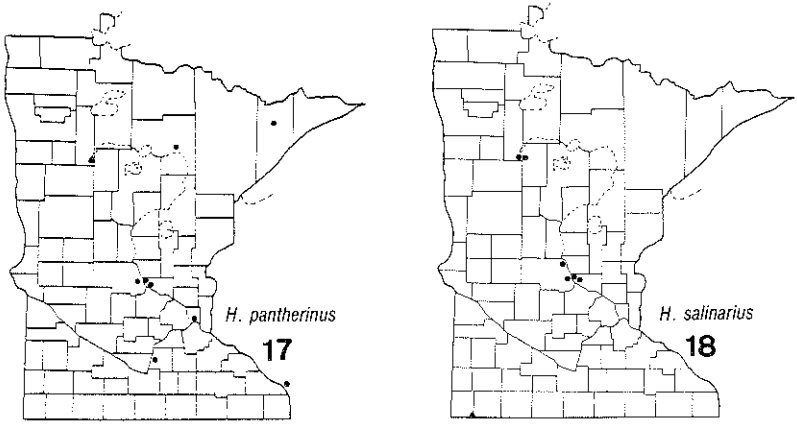
Haliplus pantherinus Aube, 1838 Figs. 17, 38, 39, 67.

LENGTH: 3.3-4.1 mm. COLOR: Yellow to light tan; vertex at most slightly darkened; anterior pronotal blotch large, twice as wide as long; anterior and posterior pronotal punctures present but not darkened;

elytral maculation strong and sharply defined, normally covering 3 striae; BB, MSB, PMSB and AB fused with the broad sutural band; strial punctures medium sized, not darkened; ventral surface uniformly brown, including metafemur; carina on metepisternum distinctly darkened (Fig. 39). ANATOMY: Pronotal plicae absent; humeral edge of elytra toothed; apical edge sinuate but not toothed; mesotrochanter with at most small punctures, similar to *H. triopsis* (Fig. 45). MALE GENITALIA: Figure 67.

COMPARISONS: *Haliplus pantherinus* is most similar to *H. leopardus* and *H. triopsis*. *H. leopardus* is somewhat larger, 4.1-4.6 mm, and has the mesotrochanter much more deeply pitted (Fig. 41). *Haliplus triopsis* has at most a slightly darkened metepisternum, and there are distinct teeth along both the apical and humeral margins of the elytra (Fig. 44).

DISTRIBUTION: *Haliplus pantherinus* was collected only from permanent ponds and along lake shores in the forested eastern half of Minnesota (Fig. 17). Its distribution extends east probably to New England and south to Louisiana (Wallis, 1933). Seasonal cycle fairly typical, but none have been collected in June and the peak populations are seen in May. Specimens examined: 48.



Figures 17-18. Minnesota distribution of *Haliplus pantherinus* and *H. salinarus*.

Haliplus salinarus Wallis, 1933 Figs. 18, 47, 72.

LENGTH: 3.7-4.1 mm. COLOR: Reddish-brown to brown; vertex usually slightly darkened; anterior pronotal blotch absent; posterior pronotal punctures black and large; anterior pronotal punctures large but only occasionally darkened; elytral maculation fine with edges blurred in most specimens, basal spot and PMLB spot absent and PHDB small giving the appearance of spots being absent anteriorly and laterally, spots confined between two striae; strial punctures large and often connected forming short series on humeral and discal portions of elytra; subsutural interstrial punctures regular and even basally but distinctly crowded and irregular apically, forming two lines; sutural band very narrow but extends full length of elytra; ventral color uniformly brown, including metafemur. ANATOMY: The distance between the eyes is less than 1.9 times the width of an eye (Gordon and Post, 1965 and Wallis, 1933 list the width as 1.6 times the width of the eye); basal width of pronotum almost twice the medial length, anterior pronotal corners very acute, and center of anterior edge of pronotum distinctly produced; pronotal plicae absent; pronotal punctures large with smooth areas scattered over disc; humeral and apical margins of elytra not toothed; apical margin smoothly rounded. MALE GENITALIA: Aedeagus nearly parallel-sided in apical half (Fig. 72).

COMPARISONS: *Haliplus salinarus* is very similar to *H. subguttatus*. The two species are often hard to distinguish. *H. salinarus* can best be distinguished by its genitalia. Having the distance between its eyes only 1.6 times the width of the eye may not always be valid. Also useful are the more sharply acute anterior corners of the pronotum, the more irregular sutural interstrial punctures, the much more conspicuous darkened pronotal and strial punctation, and the complete sutural band (Fig. 47). Further study over the full range of these two species is needed to clarify the differences between them.

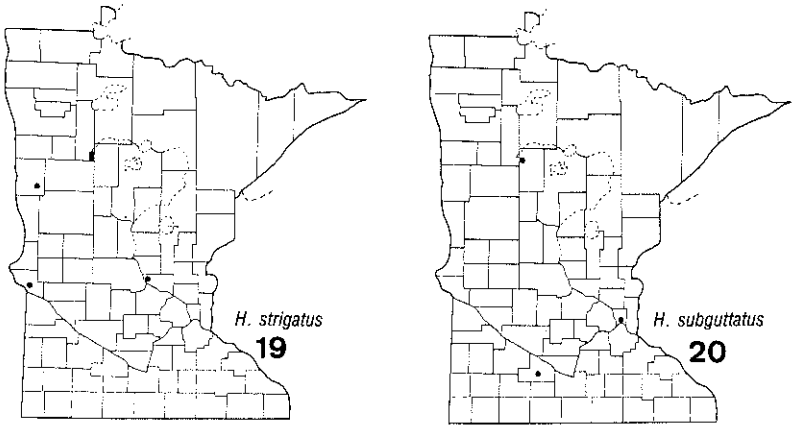
DISTRIBUTION: *Haliplus salinarus* was collected for the first time from Itasca State Park and the area around St. Cloud, although it should be found all the way to the western edge of Minnesota (Fig. 18). Its range extends westward to Washington and British Columbia (Gordon and Post, 1965). Not enough data is available to determine a seasonal cycle. Specimens examined: 12.

Haliplus strigatus Roberts, 1913 Figs. 19, 46, 68.

LENGTH: 3.1-3.8 mm. COLOR: Yellow to light brown; vertex slightly darkened; no anterior pronotal blotch; anterior pronotal punctures usually darkened, a few posterior pronotal punctures darkened; elytral maculation absent; strial punctures medium size and darkened forming narrow dark lines the length of the elytra; sutural band narrow but extending full length of elytra; ventral surface tan, including metafemur. ANATOMY: Pronotal plicae 1/5 length of pronotum; humeral and apical elytral margins not toothed. MALE GENITALIA: Figure 68.

COMPARISONS: *Haliplus strigatus* is similar in appearance only to a very light specimen of *H. longulus*, but the entire lack of elytral maculation and anterior pronotal blotch separates it from that species and all others.

DISTRIBUTION: This is the first record of this species in Minnesota. It has been found only in permanent ponds in the central and west-central portions of Minnesota (Fig. 19). It has been recorded from Minnesota, west to Washington and British Columbia and south to Wyoming (Gordon and Post, 1965). Not enough data available to establish a seasonal cycle. Specimens examined: 8.



Figures 19-20. Minnesota distribution of *Haliplus strigatus* and *H. subguttatus*.

Haliplus subguttatus Crotch, 1873 Figs. 20, 48, 73

LENGTH: 3.9-4.2 mm. COLOR: Tan to yellow; vertex slightly darkened; anterior pronotal blotch may be faintly present; no darkened anterior pronotal punctures; black posterior pronotal punctures medium to large but not as dense as in *H. salinarus;* elytral maculations sharp but small, confined between two striae, spots BB, PHDB and PMLB absent; sutural band incomplete, extending over basal three-quarters of elytra; strial punctures medium to large seldom touching except maybe in humeral area; subsutural interstrial punctures even and at most slightly irregular and crowded apically; ventral surface totally brown, including the metafemur. ANATOMY: Eyes almost twice as far apart as the width of the eye; pronotal base 1.7 times medial length, apical corners normally acute and anterior medial edge only weakly produced; pronotal puncture medium and except for a few central punctures leaving the disc smooth; pronotal plicae absent; humeral and apical margins of elytra smooth. MALE GENITALIA: Aedeagus distinctly narrower at tip than at mid-length (Fig. 73).

COMPARISONS: *Haliplus subguttatus* is very similar to *H. salinarus* from which it can be hard to separate. See discussion under *H. salinarus.*

DISTRIBUTION: *Haliplus subguttatus* at this time is very rare in Minnesota, having been collected only once in the last 60 years, from a temporary pond in the southwestern portion of the state. About 75 specimens had been formerly collected from Itasca State Park and St. Paul (Fig. 20). Of the 5000 specimens of Haliplidae collected by Gordon from North Dakota only two were *H. subguttatus* (Gordon and Post, 1965). The species, however, is fairly common in the southeastern portion of Wisconsin (Hilsenhoff and Brigham, 1978). Its range extends along the United States-Canadian border from coast to coast, and south to northern California, Utah, and Illinois (Brigham and Sanderson, 1972; Leech, 1964; Wallis, 1933; Roberts, 1913). The seasonal cycle appears to be typical. Specimens examined: 75.

Haliplus tortilipenis Brigham and Sanderson, 1972 Figs. 43, 70.

LENGTH: 4.2-4.5 mm. COLOR: Yellow to reddish-tan; vertex not distinctly darkened; no anterior pronotal blotch; posterior pronotal punctures may be slightly darkened; elytral maculation bold, sharp and narrowly coalesced, covering 3 or more striae, PMLB farther from the apical blotch than the width of PMLB; sutural band narrow but running the full length of the elytra; strial punctures medium to small but only slightly darkened; ventral surface totally brown, including metafemur.

ANATOMY: Pronotal plicae absent; humeral edge of elytra without distinct teeth; apical edge with distinct teeth which fade out toward the sutural line; apical edge of elytra only slightly sinuate. MALE GENITALIA: Figure 70.

COMPARISONS: *Haliplus tortilipenis* is closest to *H. connexus* (Fig. 33), from which it can be separated by having the PMLB spot farther from the AB and the teeth missing from the sutural portion of the apex of the elytra. The discussion and diagrams are based on the species description by Brigham and Sanderson (1972) and the discussion in Hilsenhoff and Brigham (1978).

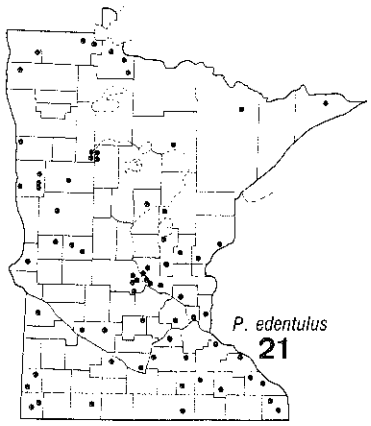
DISTRIBUTION: This species has been recorded from Illinois, South Dakota and Wisconsin, but as yet not from Minnesota (Brigham and Sanderson; 1972). No specimens have been examined.

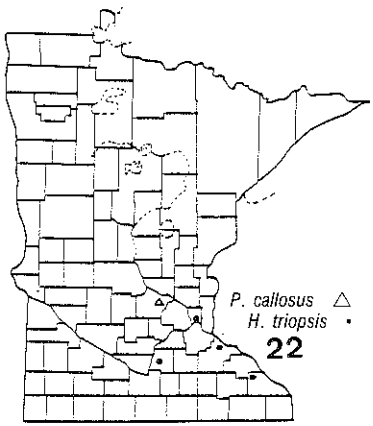
Haliplus triopsis Say, 1823 Figs. 22, 44, 45, 69.

LENGTH: 3.5-4.1 mm. COLOR: Yellow to reddish-yellow; vertex at most slightly darkened; anterior pronotal blotch present; anterior and posterior pronotal punctures not darkened; elytral maculations bold, sharp and coalesced, spots cover 3 or more striae; sutural band broad, extending full length of elytra; strial punctures medium sized and light; ventral surface uniformly tan, including the metafemur. ANATOMY: Pronotal plicae absent; distinct teeth on humeral and apical margins of elytra. MALE GENITALIA: Figure 69.

COMPARISONS: *Haliplus triopsis* is similar to *H. pantherinus* and *H. leopardus* (Figs. 38, 40). The distinctions are discussed under the respective species.

DISTRIBUTION: *Haliplus triopsis* is, and always has been, a very rare species in Minnesota, having been recently collected only once from a large permanent pond in Winona County, southeastern Minnesota (Fig. 22). All other Minnesota records are 60 years old but from the same general area. This is probably the extreme western extent of the northern portion of its range, as it is quite common in Wisconsin (Hilsenhoff and Brigham, 1978). Its range extends south to Illinois and Florida and east to New England, and is also recorded from Texas and New Mexico (Brigham and Sanderson, 1973; Wallis, 1933). Seasonal cycle appears to be typical. Specimens examined: 7.





Figures 21-22. Minnesota distribution of *Haliplus triopsis, Peltodytes callosus,* and *P. edentulus.*

Genus *Peltodytes* Regimbart, 1878

The genus is represented by 18 species in North America north of Mexico. Of these, four have been collected from Minnesota, and one has been collected from Wisconsin and should be found in southeastern Minnesota. This genus is characterized by having a black depression near each of the posterio-lateral corners of the pronotum (Fig. 4); the last segment of the maxillary palps as long as or longer than and as wide as the penultimate (Fig. 6); and a margined edge on the metacoxae (Fig. 5). The body is highly convex, pointed posteriorly, and the strial punctures of the elytra are large to very large and irregular in pattern on the posterior portion of the elytra. The beetles of this genus are more broad-shouldered than *Haliplus* and our species always lack the pronotal plicae and anterior pronotal blotch often seen in *Haliplus*. The size of Minnesota species ranges from 3.3-4.5 mm. Further descriptions and keys to species of the Minnesota area can be found in Gordon and Post, 1965 and Hilsenhoff and Brigham, 1978.

Peltodytes callosus (LeConte) 1852 Figs. 22, 49, 74.

LENGTH: 3.5-3.9 mm. COLOR: Yellowish-tan; vertex distinctly darkened; posterior pronotal punctures darkened; elytral maculation restricted to sutural portion of elytra (a large MSB fused to sutural band and a small PrDB), a small elongate spot (portion or BB) may be present in the humeral area; strial punctures dark, most distinct anteriorly; sutural band narrow, running full length of elytra; ventral color totally tan, including metafemur. ANATOMY: A distinct raised area just at spot MSB near the center of each elytron and basal-medial area of elytra flat and depressed; humeral and apical edges of elytra smooth, not toothed or distinctly sinuate. MALE GENITALIA: Figure 74.

COMPARISONS: Having the maculation restricted to the central and posterior portions of the elytra, the center of each elytron depressed and a raised humeral area, this robust species can be confused with no other in our area.

DISTRIBUTION: This is a western species. Its distribution is listed as extending from British Columbia, south to California and New Mexico and east through North Dakota (Gordon and Post, 1965; Roberts, 1913). It has been collected once in a river backwater in Central Minnesota (Fig. 22). Seasonal cycle not known. Specimens examined: 6.

Peltodytes duodecimpunctatus (Say) 1823 Figs. 54, 55, 77.

LENGTH: 3.5-3.9 mm. COLOR: Yellow to light brown; vertex not darkened; posterior punctures not darkened; elytral maculations bold and sharp, spots covering more than two stria, typical in pattern, with addition of narrow elongate spot at the base of tenth stria; strial punctures large and black; sutural band wide along the first half of elytra where it coalesces into the MSB/PrDB spot, apical half of band narrow, extending to tip of elytra; ventral color brown, metafemur black with yellow subapical band. ANATOMY: Apical edges of elytra slightly sinuate; apical and humeral edges of elytra not toothed; carina on anterior edges of metepisternum distinctly darkened; metacoxal plate apically angulate (Fig. 54). MALE GENITALIA: Figure 77.

COMPARISONS: Can be confused with *P. edentulus*. However, *P. duodecimpunctatus* lacks the darkened vertex characteristic of *P. edentulus*, has a darkened spot at base of tenth stria, and has a distinctly angulate apical margin on the metacoxa (Fig. 54).

DISTRIBUTION: Not recorded from Minnesota. Most likely to be found along the eastern, and especially the southeastern, edges of Minnesota. Hilsenhoff and Brigham (1978) state that all Wisconsin specimens were collected from the margins of streams. This species range extends over the northeastern United States and southern Canada from Wisconsin and Indiana eastward (Malcolm, 1971; Matheson, 1912; Blatchley, 1910). Specimens examined: 1.

Peltodytes edentulus (LeConte) 1863 Figs. 21, 50-53, 76.

LENGTH: 3.5-4.1 mm. COLOR: Yellow to occasionally light brown; vertex distinctly darkened; posterior pronotal punctures usually not darkened; elytral maculation bold and sharp, typical in pattern, most spots confined between two striae, and some spots coalesced in some specimens; strial punctures large, black and distinct; sutural band conspicuous and running full length of elytra; ventral color totally brown, metafemur black with yellow subapical band (Fig. 52). ANATOMY: Apical edges of elytra slightly sinuate (Fig. 51); apical edge of metacoxa bluntly and slightly angulate (Fig. 53); apical and humeral edges of elytra not toothed. MALE GENITALIA: Figure 76.

COMPARISONS: Most easily confused with *P. sexmaculatus* (Fig. 56), which has the metafemur totally black. Can also be confused with *P. duodecimpunctatus* which, however, lacks the darkened vertex, has a distinctly angulate metacoxa, and has not been collected this far west (Hilsenhoff and Brigham, 1978).

DISTRIBUTION: This is our most common species of *Peltodytes,* being common throughout the state (fig. 21). Its distribution extends coast to coast along the United States-Canadian border and down to Kansas and Illinois (Brigham and Sanderson, 1973); Gordon and Post, 1965). It is common in all types of shallow littoral situations, including edges of slow rivers. It has been collected in Minnesota as early as March 27 and as late as November 22, but is most abundant in early summer and fall. Specimens examined: 1550.

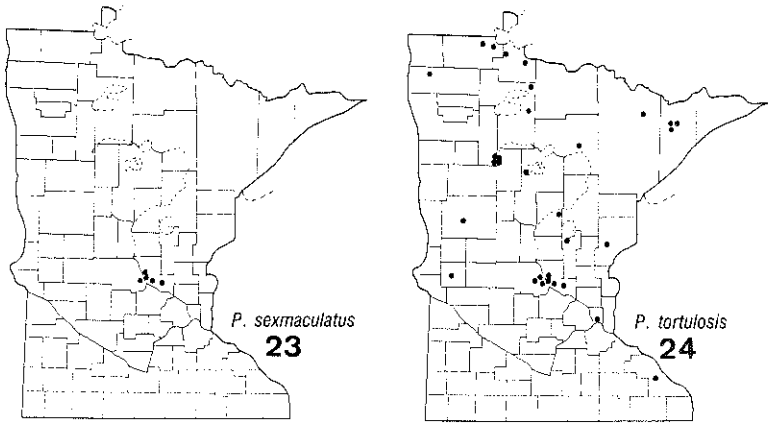
Peltodytes sexmaculatus Roberts, 1913 Figs. 23, 56, 75.

LENGTH: 3.7-3.9 mm. COLOR: Yellow to tan; vertex slightly to distinctly darkened; pronotum with no darkened punctures except the darkened depressions near posterio-lateral corners; elytral maculation bold and sharp, typical in pattern, spots covering more than two striae;

strial punctures large and black; sutural band wide, running full length of elytra; ventral color totally tan; metafemur totally black. ANATOMY: Apical edge of elytra slightly sinuate; apical and humeral edges of elytra smooth, no indication of teeth. MALE GENITALIA: Figure 75.

COMPARISONS: This species is similar in appearance to *P. edentulus* (Fig. 50), which has a yellow band on the metafemur. *P. sexmaculatus* is the only species we have with a totally black apical two/thirds of the metafemur.

DISTRIBUTION: The first record of *P. sexmaculatus* in Minnesota was in 1979, in the central portion of the state, near St. Cloud (Fig. 23). Its distribution extends east to Massachusetts and south to Kansas, Texas, Louisiana, and Florida (Young, 1954; Roberts, 1913). Our specimens were collected from ponds and a lake shore habitat. Hilsenhoff and Brigham (1978) listed the preferred habitat as "streams or river-bottom ponds." Seasonal cycle uncertain. Specimens examined: 7.



Figures 23-24. Minnesota distribution of *Peltodytes sexmaculatus* and *P. tortulosus*.

Peltodytes tortulosus Roberts, 1913 Figs. 24, 57, 58, 78.

LENGTH: 4.0-4.4 mm (Wallis, 1933 and Gordon and Post, 1965 list size as 4.5-5.0 mm). COLOR: Yellow to light brown; vertex at most slightly darkened; posterior pronotal punctures large and black; elytral maculation bold and sharply margined, usually confined between two striae and not coalesced, basal spot limited to one or two comma-shaped dark spots; strial punctures very large and black; sutural band very narrow but running full length of elytra; ventral color totally tan, including metafemur. ANATOMY: Apical edge of elytra not sinuate (Fig. 58); apical and humeral margins of elytra smoothly rounded and not toothed (Fig. 57). MALE GENITALIA: Figure 78.

COMPARISONS: This species although robust and slightly flattened dorsally does not have the raised humeral area of *P. callosus*, the only other *Peltodytes* in this area with a totally light metafemur. A complete set of elytral maculation also separates it from *P. callosus*.

DISTRIBUTION: This species is common to all types of shallow littoral habitats in all but the extreme southwestern portion of Minnesota (Fig. 24). It has been recorded from North Dakota, Manitoba, and Wisconsin (Hilsenhoff and Brigham, 1978; Gordon and Post, 1965). Seasonal cycle typical, but uncommon in August and after September. Specimens examined: 350.

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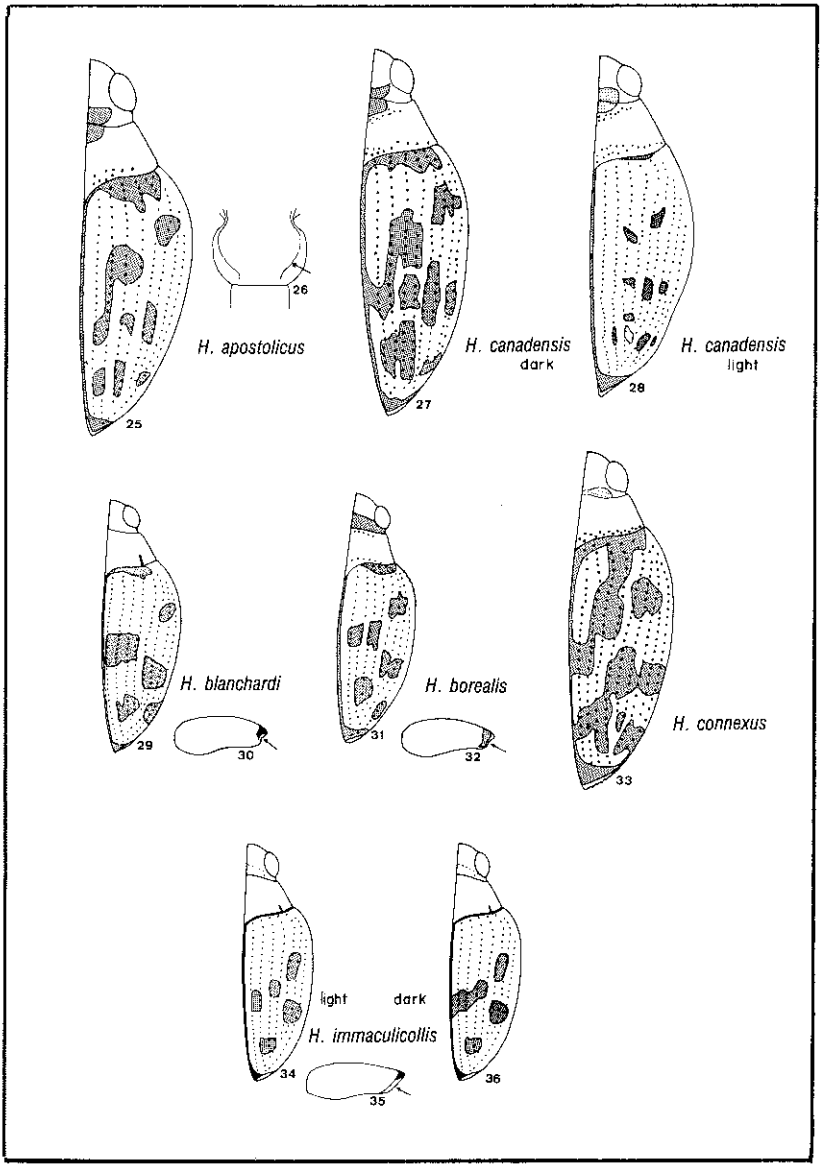
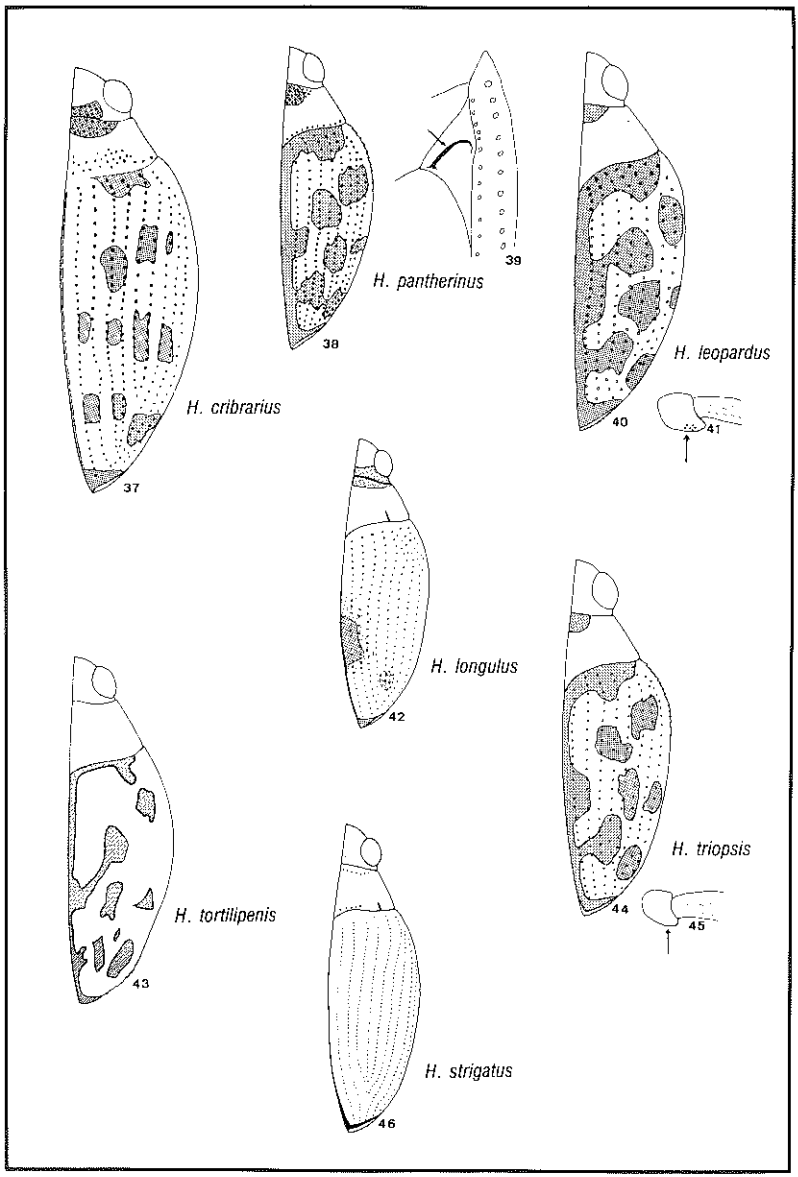
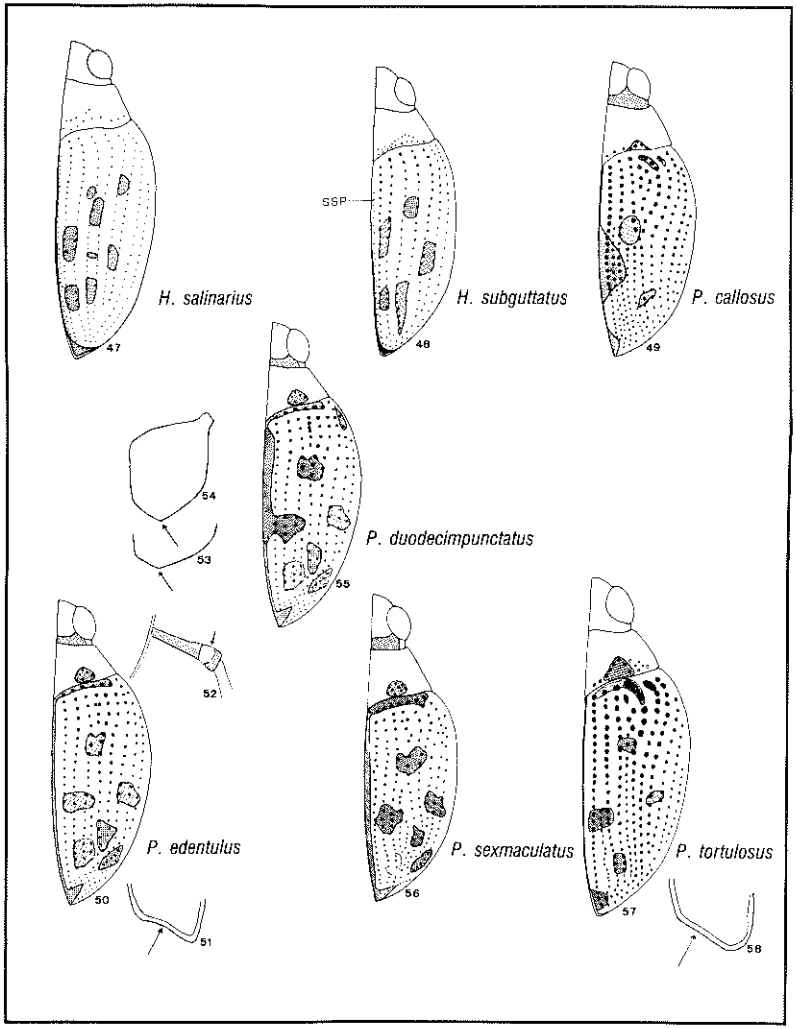


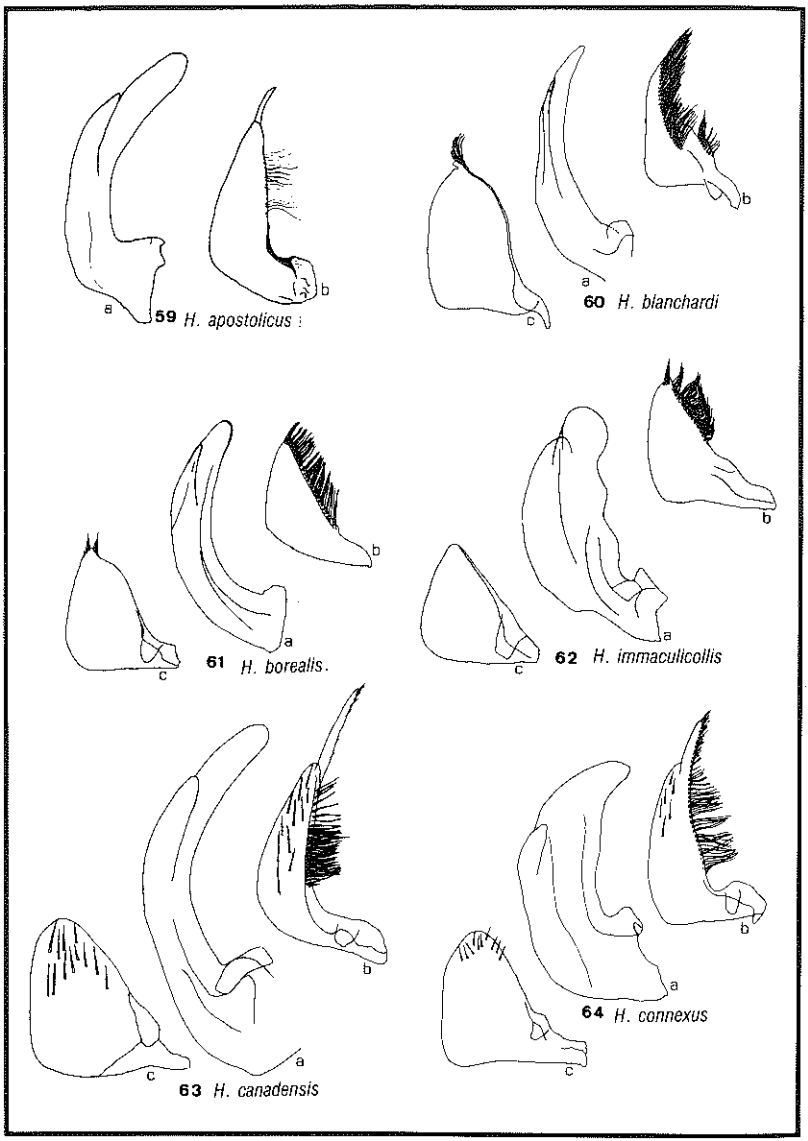
Figures 25-36. 25, 27-29, 31, 33, 34, 36. Dorsal views of *Haliplus* spp. 26. Mid-metasternal plate. 30, 32, 35. Lateral view of left elytron.



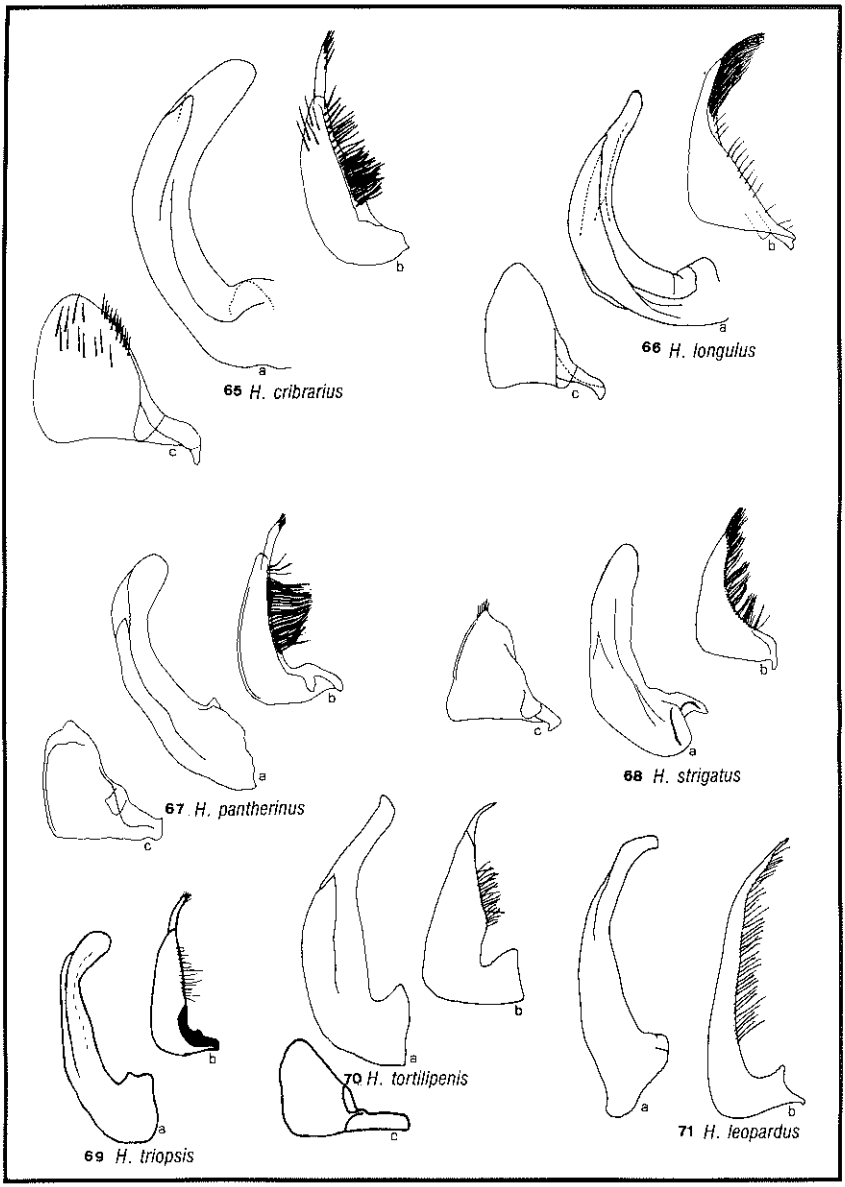
Figures 37-46. 37, 38, 40, 42-44, 46. Dorsal views of *Haliplus* spp. 39. metepisternum. 41, 45. mesotrochanter.



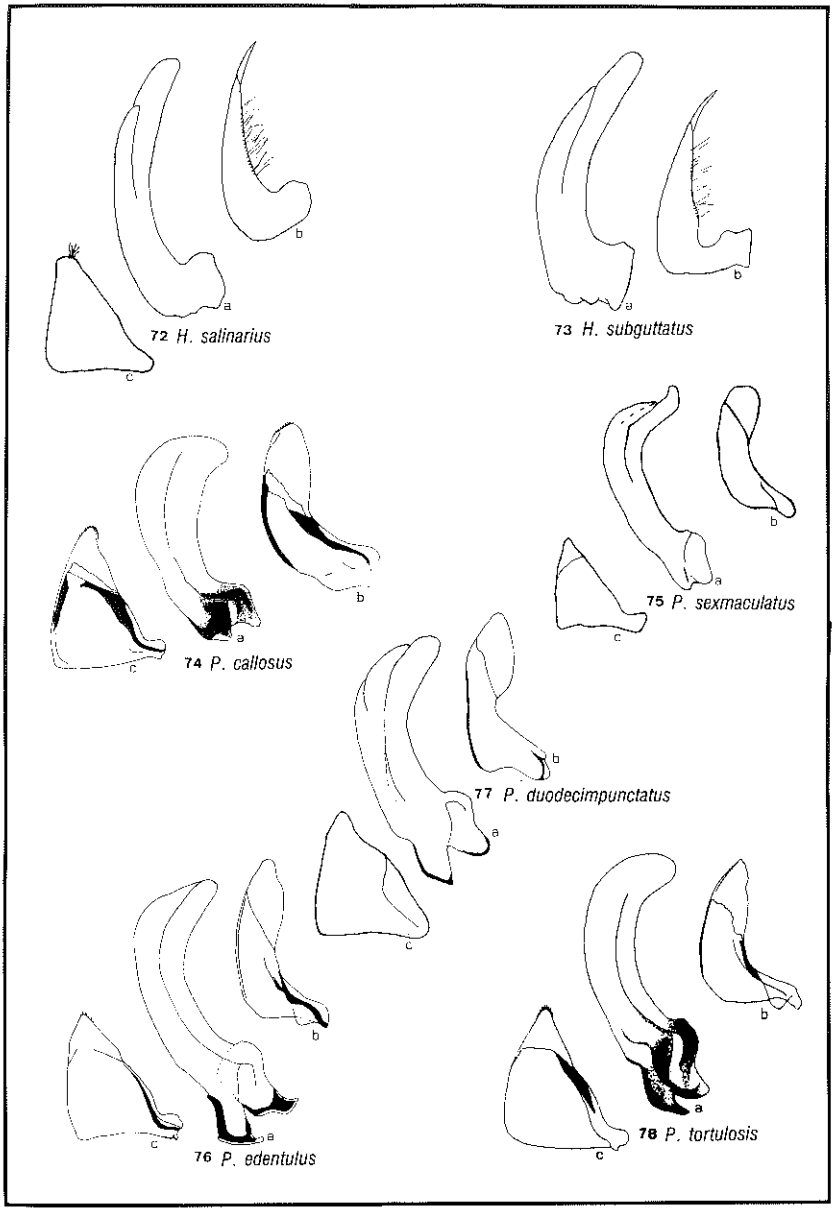
Figures 47-58. 47, 48. Dorsal views of *Haliplus* spp. 49, 50, 55-57. Dorsal views of *Peltodytes* spp. 51, 58. Dorsal view of apex of left elytron. 52. metafemur. 53, 54. metacoxa. SSP, subsutural interstrial punctures.



Figures 59-64. Male genitalia of *Haliplus* spp. a, aedeagus; b, left paramere; c, right paramere.



Figures 65-71. Male genitalia of *Haliplus* spp. a, aedeagus; b, left paramere; c, right paramere.



Figures 72-78. 72, 73. Male genitalia of *Haliplus* spp. 74-78. Male genitalia of *Peltodytes* spp. a, aedeagus; b, left paramere; c, right paramere.

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