

yellowish orange. Legs mostly a nearly uniform light brown. Claws slender, strongly curved, the anterior and mid unidentate, the pulvilli rudimentary. Genitalia; basal clasp segment short, subquadrate; terminal clasp segment one half longer than the basal, distinctly swollen near the middle, strongly chitinized; dorsal plate broad, broadly and triangularly emarginate, the obtuse lobes setose; ventral plate narrow, greatly produced, narrowly rounded; setose apically. Harpes strongly chitinized.

Female.—Length 2 mm. Antennæ nearly as long as the body, sparsely haired, dark brown; 14 segments, the fifth with a stem three fourths the length of the basal enlargement, which latter has a length $2\frac{1}{2}$ times its diameter; terminal segment produced, the cylindric basal enlargement with a length four times its diameter and apically with a long, moderately stout process, the latter greatly swollen basally. Palpi; first segment irregular, the second slender, with a length four times its diameter, the third nearly as long as the second, more slender, the fourth as long as the second, slender. Mesonotum reddish brown, the submedian lines yellowish orange. Scutellum fuscous yellowish, postscutellum and abdomen mostly yellowish orange. Ovipositor short, the terminal lobes broadly oval and sparsely setose, otherwise nearly as in the male. Type Cecid a2308.

The remarkable form described above was collected by Prof. C. H. T. Townsend in and near a tent in Montaña of the Province of Jaen, northern Peru, in September, 1911, Rio Charape. The elevation was about 5,000 feet and at the upper limits of the tropical rain-forest region. This species is tentatively referred to the above named genus because it runs thereto in our key and exhibits affinities therewith on account of the greatly produced ventral plate and the strongly chitinized harpes. The greatly produced stems of the flagellate antennal segments separate this species from *K. viburni* Felt.

THE HALIPLIDÆ OF NORTH AMERICA, NORTH OF MEXICO.

BY ROBERT MATHESON,

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Family HALIPLIDÆ.

1832. Dyticea, Tribus V, Erichson, Genera Dyt., p. 46. 1836. Hydrocanthares, Tribus Haliplides, Aubé, Icon. Col. Eur., V, p. 15. 1838. Hydrocanthares, Tribus Haliplides, Aubé, Species Col., VI, p. 2. 1837. Dytiscidæ, Gruppe Haliplini, Erichs, Käf. Mk. Brandbg., p. 183. 1859. Haliploidæ, Thoms.

Skand. Col., I, 1859, p. 11; II, 1860, p. 2. 1868. Dytiscidæ, Gruppe Haliplini, Schaum, Kiesw. Naturg. Ins. Deutsch., I, 2, 9. 1873. Dytiscidæ, Subfamily Haliplides, Crotch, G. R., Trans. Amer. Ent. Soc., IV, p. 383. 1878. Dytiscidæ, Tribus Haliplinæ Régimbart, Ann. Soc. Ent. Fr., VIII (5), p. 449. 1881. Haliplidæ, Bedel, Fn. Col. Bass. Seine, I, p. 2, 219. 1881. Haliplidæ, Horn, Trans. Amer. Ent. Soc., IX, p. 94. 1883. Haliplidæ, Leconte and Horn, Classification Coleoptera North America, p. 60. Dytiscidæ, Subfamily Haliplini Seidl, Best. 19. 1885. Haliplidæ, C. Van den Branden, Catalogues des Coléoptères carnassiers aquatiques, Ann. Soc. Ent. Belg., pp. 7-12. 1892. Haliplidæ, Ganglbauer, Die Käfer von Mitteleuropa, I, p. 422. 1901. Haliplidæ, Sharp, Cambridge Natural History, VI, p. 209.

The Haliplidæ are a family of small, aquatic beetles placed by systematists close to the Dytiscidæ and probably representing a transition group between the Carabidæ and the former family. This group was first recognized as a separate family by C. G. Thomson (Skand. Col., I, 1859, p. 11). Since then the family has been variously regarded. Some workers have placed it as a tribe, others as a subfamily of the Dytiscidæ.

The family contains only three genera, the genus *Haliphus* being world wide in its distribution. The total number of known species is about one hundred and twenty-five. The genus *Haliphus* is represented in North America by about fifteen species, *Peltodytes* by nine, and *Brychius* by one. This does not in any way indicate the total number of species, for the beetles are small, not usually observed by collectors, and the family has been sadly neglected by systematists.

The Haliplidæ may be separated from the closely allied families by the following characters:

Antennæ 10-jointed, inserted on the front between the eyes, under a small ridge; filiform, almost smooth, scattered setæ being present (Figs. 1 and 2); clypeus extending laterally to the points of insertion of the antennæ, the suture separating it from the front not being very distinct, especially at the sides; gula well defined, broad behind, gradually narrowing at first and then suddenly broadly expanding in front (Fig. 11, g); eyes entire, not emarginate.

The prosternum is prolonged anteriorly, forming a prominent ridge, steeply declivous in front, into which the head fits closely (Fig. 12).

Metasternum with a well marked ante-coxal piece, the suture ex-

tending all the way across the metasternum and bordered by a row of large punctures; antecoxal piece triangular in outline, the apex extending between the posterior coxæ.

Anterior and middle coxæ globular; the posterior coxæ plate-like, extending laterally to the pleuræ of the elytra and covering the first 3-5 segments of the abdomen; between the posterior coxæ and the abdomen the dumbbell-shaped femora of the hind legs move; outer anterior ends of the posterior coxæ prolonged into knob-like structures, closely fitting into socket-like depressions in the elytra. By this means the elytra are held firmly in place.

Abdomen with six ventral segments, the first three grown together and covered by the posterior coxæ.

A more detailed discussion of the external morphology may now be given. The head is small, closely fitting into the prothorax which extends a short distance over it. The eyes are prominent, usually strongly convex, not emarginate. The clypeus is well defined, truncate in front. Labrum truncate or emarginate, its anterior edge thickly set with hairs. The mandibles (Fig. 10) are curved, pointed, each with a single tooth on its inner margin. The maxillæ consist of the typical parts well differentiated. In *Haliphus* they are more elongate and narrower than in *Peltodytes* (Figs. 3 and 5) but in general they correspond fairly well. The stipes articulates directly with the cardo and attached along the sides of the stipes are the subgalea (*sg*, Fig. 5) and the well developed palpifer (*pl*, Fig. 6). The palpifer bears the 4-segmented palpus and articulates with the dorsal edge of the lacinia (*lc*, Figs. 4, 5). On the dorsal side in *Peltodytes* it overlaps the distal end of the stipes and nearly covers the subgalea (Fig. 6). It will be noted that the palpifer is very large.

The subgalea is attached along its inner edge to the stipes while distally it bears the lacinia. Attached to the subgalea is the large adductor muscle of the maxilla (*a*, Fig. 4). The 2-segmented galea is attached to the distal outer edge of the subgalea and closely overlies the lacinia. In the figures the galea is shown somewhat separated from the lacinia. Sense pits are found scattered over the galea, more abundant towards its distal end. These sense pits are more numerous in *Peltodytes* (Fig. 5). The lacinia is a large, rather clumsy looking affair. It ends distally in a long, pointed claw and its inner edge is furnished with a row of large, somewhat lanceolate

spines. The shapes of the spines differ in the two genera (Figs. 3 and 5). The palpus is 4-segmented. In *Haliplus* the last segment is subulate, shorter than the preceding one. Sensory pits are few and scattered. In *Peltodytes* the last segment is conical, longer than the preceding one and the whole palpus bears many sensory pits (Fig. 5).

The labium is well developed. The submentum is large, trilobed, the outer lobes prominent. The median lobe is entire in *Peltodytes* (Fig. 9), emarginate in *Haliplus* (Fig. 7). In *Peltodytes* the mentum is small and the suture separating it from the glossæ and the paraglossæ is lacking. However the two prominent setæ situated near the median plane of the distal end of the labium and the lateral sutures indicate the positions of the fused glossæ. The paraglossæ are fused with the mentum at their bases. A few sensory pits are present along the distal margin of the labium. In *Haliplus* the mentum is large and separated from the distal part by a distinct suture. The glossæ and paraglossæ are fused though the two prominent setæ indicate clearly the position of the glossæ (Fig. 7). Many large, deeply sunken setæ are found on the distal portion of the labium. One is shown in detail in Fig. 8. These peculiar structures are probably sensory.

The labial palpi are 3-jointed. In *Haliplus* the last segment is subulate and shorter than the second; in *Peltodytes* it is conical and longer than the second. The palpiger is large and prominent, especially so in *Peltodytes* (Fig. 9).

The pronotum is narrowed in front, partially overlapping the head. In *Brychius* the pronotum is quadrate, not narrowed in front. The posterior margin is angulate, the projecting angle fitting closely in between the bases of the elytra and concealing the scutellum. The prosternum is large, broad, and steeply declivous in front, fitting closely over the posterior portion of the head. Posteriorly it almost conceals the mesosternum and fits closely over the projecting median portion of the metasternum. This solid union with the mesosternum beneath and the metasternum behind adds greatly to the rigidity of the skeleton. The episternum does not reach the coxa, being separated from it by the forward projection of the epimeron (Fig. 11, *em*). The epimeron is narrow. Its inner edge projects between the episternum and coxa and reaches the prosternum in front. It thus forms the lateral margin of the coxal cavity. The coxal cavities are open behind (Fig. 11, *c*).

The mesosternum (*ms*, Figs. 11 and 12) is hidden beneath the intercoxal projections of the metasternum and prosternum. It is quite solidly fused with pro- and metasterna. The episternum (*ep*, Figs. 11 and 12) is a broad, irregular sclerite. It does not reach the coxal cavity. The epimeron (*em*) is nearly quadrate in outline and extends to the coxal cavity.

The metasternum is very broad behind, narrowed in front where it extends between the middle coxæ and is solidly fused with the prosternum. The antecoxal sclerite is triangular in outline, the apex projecting between the posterior coxæ. The episternum (*ep*, Figs. 11 and 12) is a long, narrow sclerite, wide in front, narrowed behind and lies almost parallel to the median plane of the body. It extends from the meso-episternum to the posterior coxa. The epimeron is a thin, narrow sclerite lying directly laterad of the episternum.

The anterior and middle coxæ are globular. The posterior coxæ are in the form of flat plates, meeting in the middle line and covering the first three to five abdominal segments. They extend laterally to the pleuræ of the elytra. At the anterior outer end of each is a somewhat rounded knob which fits closely into a socket-like depression of the elytron. (Figs. 15 and 17.)

The anterior and middle femora are club-shaped, slightly flattened so as to increase the striking surface in swimming. The posterior femora are dumbbell-shaped, the proximal end being the larger (Figs. 15 and 17). The anterior and middle femora and tarsi of all the legs are furnished with long swimming hairs. The first three segments of the tarsi of the anterior and middle pairs of legs of the male are somewhat broadened at the distal ends and the under sides provided with hairs for clinging (Fig. 18).

Each elytron is provided with ten rows of punctures which vary considerably in depth and size in the various species. In the greater number of species the elytra are marked with black spots or lines which are very characteristic of this family. (See photographs, Plate xv.) These markings, however, usually exhibit considerable range of variation within the same species.

A discussion of the habits, life-histories, etc., follows in the second part of this paper.

The three genera may be readily separated by the following key.

- A. Terminal joint of palpi small, subulate, shorter than the preceding. Posterior coxæ concealing only the first three segments of abdomen.
- B. Pronotum quadrate, widest in front of the middle; two lateral basal impressions present extending more than half the length of the pronotum. Fourth tarsal segment scarcely shorter than the first. *Brychius* Thomson.
- BB. Pronotum strongly narrowed and truncate in front, widest at the base, above strongly convex. Fourth tarsal segment much shorter than the first *Haliplus* Latreille.
- AA. Terminal joint of palpi large, conical, longer than the preceding. Posterior coxæ concealing all but the last segment of abdomen. Pronotum strongly narrowed and truncate in front, convex above. Fourth tarsal segment shorter than the first..... *Peltodytes* Regimbart.

BRYCHIUS Thomson.

Brychius Thomson, C. G. Skand. Col. II, 1859, p. 8.

Type.—*Dytiscus elevatus* Panz. Fn. Germ., XIV, p. 9.

The genus *Brychius* is easily distinguished from the other two genera through the quadrate form of the pronotum and the narrow, more elongate form of the body. The sides of the pronotum are sinuate, widest just in front of the middle. Well marked basal impressions (striola of some authors) are present, reaching beyond the middle of the pronotum. The elytra are marked with ten rows of punctures. The tarsi are five segmented, long and slender. The claws are long.

The genus contains five European and one North American species. So far as known they all live in running water.

Brychius hornii Crotch.

Brychius hornii Crotch. Trans. Amer. Ent. Soc., IV, 1873, p. 383.

General color pale yellow with black markings on elytra. Length 3.5-4 mm.

Head pale yellow, punctate; antennæ yellowish; labrum emarginate, rounded at the sides, a row of small setæ on the anterior margin.

Pronotum quadrate, the lateral margins sinuate, basal impression present and exceeding one half the length of pronotum, punctate, the disc smooth. Prosternal ridge margined, not grooved, convex laterally and longitudinally, punctate, sharply declivous in front, the sides constricted in the region of the prothoracic legs, widening anteriorly. Legs yellowish, posterior coxæ punctate, rounded behind, not reaching the fourth segment of abdomen. Abdominal segments shining, punctate.

Elytra yellowish with ten rows of black punctures, intervals rarely punctate. Posterior half of the margins of the elytra denticulate.

Described from specimens received from Prof. H. F. Wickham, Iowa City, Iowa. Collected at Kalispel, Montana. Prof. E. T. Cresson, Jr., has kindly compared my specimens with the type.

Type.—In the museum of the Philadelphia Academy of Sciences, Philadelphia, Pa.

Habitat.—California and Montana.

HALIPLUS Latreille.

Haliphus Latreille, Hist. Nat. Ins., III, 1802, p. 77.

Cnemidotus Illiger non Erichson. Illiger Mag., 1802, p. 373.

Hoplitus Clairville, Ent. Helv., II, p. 218.

Type.—*Dytiscus ruficollis* DeGeer. Memoires Ins., 1774, p. 404.

Terminal segment of the palpi subulate, shorter than the preceding; palpi with but few sensory pits. Submentum trilobed, the median lobe strongly emarginate. Pronotum truncate, strongly narrowed in front, convex above, widest at the base. Elytra with the rows of punctures regularly arranged; intervals with fairly regularly arranged smaller punctures. The posterior coxæ conceals the first three segments of the abdomen. Hind tarsi as long as or longer than the tibiae; first tarsal joint longer than the fourth; claws small.

This genus contains by far the largest number of species, in all over one hundred, widely distributed. They live in pools, stagnant water, etc., and are abundant usually where there is a supply of filamentous algæ growing. The habits of the adults, their life-histories, etc., will be fully discussed in the second part of this paper.

KEY TO THE SPECIES OF HALIPLUS.

A. Pronotum with paired basal impressions (striolæ).

B. Prosternum deeply grooved; elytral spots distinct, prominent; basal impressions less than one third the length of pronotum.

ruficollis DeGeer.

BB. Prosternum not deeply grooved; elytral spots usually indistinct, small, or sometimes entirely wanting; basal impressions more than one third the length of the pronotum.....*longulus* Leconte.

AA. Pronotum without paired basal impressions.

C. Prosternum not margined, flat or slightly convex or concave laterally.

D. Species entirely rufous, punctures on elytra, especially at base, being slightly dark*vancouverensis*, n. sp.

DD. Species not entirely rufous, yellowish in color with black markings always present.

- E. Disc of pronotum without a transverse depression; elytral punctures deep and prominent*cribrarius* Leconte.
- EE. Disc of pronotum with a prominent transverse depression; elytral punctures shallow; species smaller, paler colored.
nitens Leconte.
- CC. Prosternum distinctly margined.
- F. Metasternum with a deep square impression..*tumidus* Leconte.
- FF. Metasternum without such a deep, square impression.
- G. Species entirely rufous, without black markings.
- H. Species small, not exceeding 2.5 mm.; no definite rows of interstitial punctures on elytra..*concolor* Leconte.
- HH. Species larger, 3.5-4 mm.; interval with definite rows of small punctures*mimeticus*, n. sp.
- GG. Species not entirely rufous; black markings always present.
- I. Species small, not exceeding 3 mm.
- J. Apices of elytra strongly sinuate..*borealis* Leconte.
- JJ. Apices of elytra not strongly sinuate.
- K. Pronotum with a small rounded rufous spot on anterior margin; elytra with prominent black markings, their apices obliquely truncate.
deceptus, n. sp.
- KK. Pronotum immaculate; markings on elytra indistinct and more or less confluent; apices of elytra rounded*lewisii* Crotch.
- II. Species larger, none shorter than 3.5 mm.
- L. Anterior margin of pronotum with a large, oval, black spot.
- M. Species bright rufous with black markings; disc of pronotum punctate; apices of elytra rounded; species larger, 4-4.5 mm.*punctatus* Aubé.
- MM. Species never bright rufous, pale yellow with black markings; disc of pronotum smooth; apices of elytra very obliquely truncate; species smaller, 3.5 mm.*triopsis* Say.
- LL. Pronotum immaculate.
- N. Prothorax broad; elytral spots large, usually not connected; sutural stripe broad, the portion in front of the median spot always extending to the first row of large punctures; apices of elytra not denticulate.
fasciatus Aubé.
- NN. Prothorax narrow; elytral spots smaller, nearly always connected by fine black lines; sutural stripe narrow, never reaching the first row of large punctures; apices of elytra denticulate.
connexus, n. sp.

Haliphus concolor Leconte.

Haliphus concolor Leconte. Ann. Lyc. Nat. Hist., V, 1852, p. 201.

Species entirely rufous. Length 2.5 mm.

Head sparsely punctate, the punctures very small; labrum truncate, the anterior margin with a row of fine setæ.

Pronotum with a pair of small, basal, dark areas, punctate, the disc sparsely so, punctures of the sides and front smaller than those of the base. Prosternal ridge margined, deeply grooved in front, punctate. Posterior coxæ rounded behind, punctate, reaching the fourth segment of the abdomen; abdominal segments shining, smooth, a few scattered punctures being present.

Each elytron with ten rows of punctures of the same color as the elytra; punctures not so deeply impressed towards the tip; intervals with few small punctures; apices of elytra rounded, not sinuate.

Re-described from one specimen collected at Brownsville, Texas. In the collection of Prof. H. F. Wickham, Iowa City, Iowa.

Habitat.—Colorado River (Leconte); Texas (Brownsville, H. F. Wickham).

Type.—In the Museum of Comparative Zoology, Cambridge, Mass. Described originally by Leconte from one specimen from the Colorado River.

Haliphus connexus, new species.

Color pale yellow, rarely rufous, with black spots and margins on elytra. Length 4 mm.

Head punctate except a small area on vertex; eyes nearly circular in outline; labrum emarginate, rounded at the sides, a row of fine setæ on anterior margin; antennæ testaceous.

Thorax entirely pale yellow, rarely rufous; pronotum punctate except a linear transverse area on disc, the punctuation stronger at base than at sides and front; punctures of same color as thorax; paired basal impressions wanting; prosternal ridge margined, convex transversely and longitudinally, not grooved, sharply declivous in front, sides slightly constricted in region of prothoracic legs, widening again anteriorly. Abdominal segments smooth and shining, the last one triangular in outline and punctate at apex and sides, the base impunctate; the remaining segments except the third, each with a row of punctures on posterior margin. Legs pale yellow, posterior coxæ punctate, rounded posteriorly, extending to the fourth segment of abdomen.

Elytra with black spots and margins more or less connected by fine lines as shown in Plate XV, the spots and margins not so large and more connected than in *H. fasciatus* Aubé. The sutural stripe never reaches the first row of large punctures in front of the median black spot as it always does in *fasciatus* and this makes one of the most available characters for separating these closely allied species. Each elytron has ten rows of shallow punctures

of the same color as elytra; intervals with fairly well defined rows of small punctures; margin of elytra not sinuate before the apex, denticulate.

Habitat.—Canada (Nova Scotia); Mass. (Amherst); New York (Ithaca); Michigan (Lansing); Illinois (Lake Forest).

Type.—In the entomological collection of Cornell University, Ithaca, N. Y.

***Haliplus longulus* Leconte.**

Haliplus longulus Leconte. Lake Superior, Agassiz and Cabot, Note 31, 1852, p. 211.

General color rufous to pale yellow with black markings on elytra, these markings indistinct or sometimes wanting.

Head punctate; eyes oval; labrum slightly emarginate, rounded at the sides, a row of small setæ on the anterior margin.

Pronotum punctate, the disc sparsely so, punctures of the same color as the pronotum; paired basal impressions present, exceeding one third the length of the pronotum. Prosternal ridge not grooved, or only slightly so in front, punctate, sharply declivous in front. Abdominal segments shining, smooth, each except the last with an indefinite row of small punctures near the apex; last segment triangular in outline, punctate. Legs rufous; posterior coxæ punctate, reaching the fourth segment of abdomen.

Elytra rufous to almost pale yellow with the black markings indistinct or sometimes wanting. Each elytron with ten rows of punctures, the outer two rows usually the same color as elytra, the others black; intervals with a few scattered, black punctures, sometimes arranged in fairly definite rows; apical margins of elytra rounded.

Re-described from specimens which were compared with the type of Leconte.

Habitat.—Canada (Nova Scotia); Mass. (Cambridge); New York (Pike, Kerner, Ithaca); Indiana (Pine, Lake Co., Broad Ripple, Marion Co., Blatchley, 1910); Mich.; Wis. (Three Lakes, Dane Co., W. S. Marshall); Isle Royale (Lake Superior, H. F. Wickham); Colorado; Cal. (Arcata, Humboldt Co., E. C. Van Dyke).

Type.—In the museum of Comparative Zoology, Cambridge, Mass

***Haliplus fasciatus* Aubé.**

Haliplus fasciatus Aubé. Species des Col., VI, 1838, p. 30.

General color rufous to pale yellow with black spots and margins on elytra. Length 4–4.5 mm.

Head punctate except a small area on vertex; eyes nearly circular in outline; labrum slightly emarginate, rounded at the sides, a row of setæ on its anterior margin; antennæ rufous.

Thorax rufous to pale yellow; pronotum strongly punctate except a

linear transverse area across the disc; punctuation stronger at the base than in front or at sides; paired basal impressions wanting. Prosternal ridge margined, convex transversely and longitudinally, sharply declivous in front, sides straight, slightly widening in front, punctate. Abdominal segments smooth and shining; third segment punctate at sides, fourth and fifth each with a row of punctures along posterior margins; the last segment triangular in outline, punctate at tip and sides. Legs rufous to pale yellow; posterior coxæ strongly punctate, rounded posteriorly, reaching the fourth segment of the abdomen.

Elytra with large well-defined black spots and margins. These markings are fairly constant in this species as compared with other species in this genus. Each elytron has ten rows of large punctures of the same color as the elytra; each interval with a well defined row of small punctures; apical margins of elytra not denticulate.

Habitat.—Mass. (Amherst); New York (Esopus, one specimen); Pa.; Georgia (Spring Creek, Decatur Co., J. C. Bradley); Texas (Dallas).

***Haliphus lewisii* Crotch.**

Haliphus lewisii Crotch. Trans. Amer. Ent. Soc., IV, 1873, p. 384.

General color pale yellow with dark markings on head and elytra. Length 2.5 mm.

Head punctate, infusate on vertex; antennæ pale yellow; labrum slightly emarginate, a row of small setæ on its anterior margin.

Pronotum punctate, the disc only slightly so; punctures of the base slightly larger than those of the sides and apex; punctures of the same color as the thorax. Prosternal ridge margined, punctate, not grooved, sharply declivous in front. Abdominal segments smooth, shining, punctate on their apices. Posterior coxæ punctate, rounded posteriorly, reaching the fourth segment of the abdomen.

Elytra pale yellow with dark markings. Each elytron with ten rows of punctures of the same color as elytra; intervals sparsely punctate; apices not sinuate, rounded, slightly denticulate.

Re-described from specimens from Dane Co., Wis. (W. S. Marshall).

Habitat.—Texas (G. R. Crotch; Cameron Co., H. F. Wickham); Indiana (Broad Ripple, Marion Co., Blatchley).

—In the Entomological Collection of the Philadelphia Academy of Sciences, Philadelphia, Pa.

***Haliphus deceptus*, new species.**

General color pale yellow with darker spots on elytra and pronotum. Length 3 mm.

Head punctate; labrum emarginate, rounded at the sides, a row of setæ on its anterior margin; antennæ pale yellow.

Pronotum pale yellow with a rounded rufous spot on its anterior margin, punctate, the disc sparsely so. Prosternal ridge margined, not grooved, convex laterally and longitudinally, sharply declivous in front. Abdominal segments smooth, shining, each with a row of punctures on its posterior edge. Posterior coxæ punctate, rounded behind, reaching the fourth segment of the abdomen.

Elytra with well-defined black spots (Plate XV); each with ten rows of shallow punctures of the same color as the elytra; intervals with fairly well defined rows of small punctures; apices obliquely truncate, not sinuate, denticulate.

This species is readily separated from *H. borealis* Lec. by the apices of the elytra not being sinuate and from *H. lewisii* Crotch by the presence of the rufous spot on the apex of the pronotum and the well-defined arrangement of the black spots on the elytra.

Described from two specimens from Texas. From the collection of the Michigan Agricultural College, East Lansing, Mich.

Habitat.—Texas.

Type.—In the entomological collection of Cornell University, Ithaca, N. Y. Paratype in the collection of the Michigan Agricultural College, East Lansing, Mich.

***Haliphus punctatus* Aubé.**

Haliphus punctatus Aubé. Spec. des Col., VI, 1838, p. 32.

General color rufous with black markings on thorax and elytra. Length 3.75–4 mm.

Head punctate except for a small area on vertex; labrum emarginate, rounded at sides, a row of setæ on its anterior margin; antennæ rufous.

Pronotum with a large, black spot on its anterior margin; punctate except the disc which is sparsely so; punctures of the same color as thorax, smaller on sides and anterior margin; prosternal ridge punctate, concave laterally, convex longitudinally, the sides nearly straight, steeply declivous in front; metasternum with a narrow, longitudinal groove along its median plane; posterior coxæ punctate, reaching the fourth segment of abdomen, the hind margins somewhat sinuate. Abdominal segments smooth and shining, each, except the last, with a row of small punctures on its posterior margin; the last segment triangular in outline, punctate at its apex.

Elytra with ten rows of punctures, shallow, of the same color as the elytra; intervals with a definite row of small punctures; black markings present and arranged as shown in Plate XV. Apex of each elytron obliquely truncate, slightly denticulate.

Habitat.—Middle and Southern States (G. R. Crotch, 1873).

***Haliplus borealis* Leconte.**

Haliplus borealis Leconte. Lake Superior, Agassiz and Cabot, 1850, p. 212.

General color pale yellow to rufous with black markings on elytra. Length 2.5–3 mm.

Head punctate, infusate to black on vertex; labrum rounded at the sides, slightly emarginate, a row of small setæ on the anterior margin; antennæ pale yellow.

Pronotum without basal impressions, punctate except on the disc, the basal punctures largest. Prosternal ridge margined, convex longitudinally and laterally, punctate. Abdominal segments smooth and shining, punctate along their posterior margins. Posterior coxæ punctate, rounded posteriorly, reaching the fourth segment of the abdomen.

Each elytron with ten rows of black punctures, the intervals with but few small, scattered punctures. Apices of elytra strongly sinuate. This latter character is probably the most specific and easily used for identification.

Habitat.—Lake Superior (Leconte); Indiana (Laporte Co., Blatchley); Iowa (Iowa City, H. F. Wickham); Wis. (Dane Co., W. S. Marshall).

Type.—In the Museum of Comparative Zoology, Cambridge, Mass.

***Haliplus vancouverensis*, new species.**

General color bright rufous. Length 4.5 mm. Head and antennæ bright rufous; head punctate; labrum strongly emarginate, rounded at the sides, a row of small setæ on its anterior margin.

Pronotum punctate, the punctures larger on the posterior portion, few and scattered on the disc. Prosternal ridge not margined, flat, strongly punctate, sharply declivous in front. Legs rufous; posterior coxæ rounded behind, punctate, reaching the fourth segment of the abdomen. Abdominal segments shining, punctate along their posterior margins.

Elytra with ten rows of punctures of slightly darker color than elytra, the intervals with few small punctures; elytral margins faintly sinuate before the tip.

Described from one specimen from Vancouver Island, B. C.

Type.—In the collection of Professor H. F. Wickham, Iowa City, Iowa.

***Haliplus mimeticus*, sp. nov.**

General color rufous. Length 3.5 mm.

Head strongly and densely punctate except a small area on vertex; labrum emarginate, rounded at the sides.

Pronotum densely and strongly punctate, not so strongly on the disc; a semicircular depression across the disc, the hind margin convex posteriorly. Prosternal ridge strongly margined, densely punctate, convex longitudinally and laterally, the anterior margin squarely truncate and sharply declivous.

Abdominal segments shining, sparsely punctate. Posterior coxæ punctate, attaining the fourth segment of the abdomen.

Elytra each with ten rows of large shallow punctures, intervals each with a definite row of small punctures; apices of elytra obliquely truncate (Plate V).

Described from one specimen (female) from the Pacific Slope.

Type.—In the Entomological Collection of Cornell University Ithaca, N. Y.

***Haliplus ruficollis* DeGeer.**

Dytiscus ruficollis DeGeer. Memoires, IV, 1774, p. 404.

Dytiscus impressus Fabricius. Mant. Ins., I, 1787, p. 193.

Haliplus immaculicollis Harris. New England Farmer, VII, 1828, p. 164.

Haliplus americanus Aubé. Species des Col., VI, 1838, p. 26.

General color rufous to reddish-yellow with black spots and markings on elytra. Length 2.5–3 mm.

Head rufous, slightly infusate behind; punctate; eyes broadly oval; labrum slightly emarginate, a row of setæ on its anterior margin; antennæ testaceous.

Thorax rufous; pronotum punctate, punctures of same color as pronotum, less densely punctate on sides and front; disc sparsely punctate; paired basal impressions present, never as long as one third the length of the pronotum; prosternal ridge grooved, convex longitudinally, steeply declivous in front; sides constricted in region of prothoracic legs, not widening anteriorly; abdominal segments smooth, shining, each except the last, with a series of punctures near posterior margin; last segment triangular in outline, punctate. Legs rufous; posterior coxæ punctate, reaching the fourth segment of the abdomen.

Elytra with ten rows of punctures, the outer two rows of same color as elytra, the remainder black; intervals with irregularly placed punctures; black spots and margins distributed as shown in Plate XV. There is considerable variation in the arrangement and extent of the black markings. Apical margins of elytra rounded, not sinuate.

Habitat.—Common probably all over North America.

***Haliplus triopsis* Say.**

Haliplus triopsis Say. Trans. Amer. Phil. Soc. II, 1825, p. 106.

Haliplus pantherinus Aubé. Spécies des Col. VI, 1838, p. 29.

General color pale yellow to reddish-yellow with black markings on pronotum and elytra. Length 3.75–4.25 mm.

Head punctate except a small area on the middle of vertex; eyes circular in outline; labrum slightly emarginate, a row of setæ on the anterior margin, rounded at the sides; antennæ reddish-yellow to pale yellow.

Thorax pale yellow; pronotum with an oval black spot on its anterior

margin, strongly punctate except a linear transverse area on disc; paired basal impressions wanting. Prosternal ridge margined, convex transversely and longitudinally, sharply declivous in front, sides nearly straight, slightly constricted in the region of the prothoracic legs, punctate. Abdominal segments smooth and shining, punctate at their apices. Legs pale yellow; posterior coxæ punctate, rounded posteriorly, reaching the fourth segment of the abdomen.

Elytra with large, well-defined black spots and margins (Plate XV). There is great variation in these markings, the spots on one elytron differing considerably from that of the other of the same insect. Each elytron has ten rows of large punctures of the same color as elytra; intervals, each with a fairly well-defined row of small punctures; apices of elytra obliquely truncate, slightly denticulate.

Habitat.—Maine and Ontario west to Wisconsin and Colorado, south to Georgia and New Mexico.

***Haliplus cribrarius* Leconte.**

Haliplus cribrarius Leconte. Lake Superior, Agassiz and Cabot, 1850, p. 212.

Color pale yellow with a black spot on head, one on pronotum, and several on the elytra. Length 4.75–5 mm.

Head punctate except a narrow transverse area in front of the black spot on vertex; a black crescent-shaped spot behind and between the eyes; eyes broadly oval in outline; labrum emarginate, rounded at the sides, a row of small setæ on the anterior margin; antennæ pale yellow.

Pronotum with a prominent black spot on its anterior margin, punctate, with two fairly well-defined rows of large, black, basal punctures, anterior row not reaching the margin, remaining punctures of the same color as the pronotum; disc sparsely punctate. Prosternal ridge not margined, flat transversely, convex longitudinally, strongly punctate, steeply declivous in front, sides constricted in the region of the prothoracic legs. Abdominal segments smooth and shining, fourth and fifth with a transverse series of punctures near the middle. Legs pale yellow to rufous; posterior coxæ rounded behind, strongly punctate, reaching the fourth segment of the abdomen.

Elytra pale yellow with ten rows of large black punctures; intervals, each with a definite row of small punctures; black sutural stripe narrow, not extending beyond first row of small punctures; apical margins obliquely truncate.

Habitat.—Labrador (West St. Modest, one specimen); Newfoundland (Coast Plain, Bowditch; Bay of Islands, Leng); Canada (Nova Scotia); New Hampshire (Mt. Washington, Lakes of Clouds, Bowditch); New York (Ithaca); Ind. (Pine, Lake Co., Blatchley).

Type.—In the Museum of Comparative Zoology, Cambridge, Mass.

***Haliplus nitens* Leconte.**

Haliplus nitens Leconte. Lake Superior, Agassiz and Cabot, 1850, p. 212.

General color pale yellow with black markings on head, thorax and elytra. Length 3.75 mm.

Head pale straw color, a black spot on vertex, punctate except a small area just in front of the black spot; labrum slightly emarginate, rounded at sides, a row of small setæ on its anterior margin.

Pronotum with a small dark spot on its anterior margin; punctate, the punctures at the base larger and black, the others smaller and of the same color as the pronotum; disc sparsely punctate, with a transverse depression. Prosternal ridge not margined, almost flat, slightly convex transversely, convex longitudinally, strongly punctate. Abdominal segments smooth, shining; fourth and fifth, each with two irregular transverse rows of punctures near the middle; the last segment triangular in outline and punctate. Legs pale yellow; posterior coxæ punctate, rounded behind, reaching the fourth segment of the abdomen.

Elytra pale yellow with indistinct black spots and markings small and distributed as shown in Plate V. Each with ten rows of shallow punctures, the outer row of the same color as the elytra, the others black; intervals, each with a row of small punctures; margins of elytra regularly rounded to tip, not sinuate.

This species has been placed by Crotch (1873) as a pale variety of *cribrarius* Lec. From an examination of Leconte's types I feel confident that *nitens* is a good species, easily recognized by its smaller size, paler color and especially by the shallow and smaller punctures of the elytra and the transverse depression across disc of pronotum.

Habitat.—Michigan (St. Ignace, Leconte); Wis. (Bayfield).

Type.—In the Museum of Comparative Zoology, Cambridge, Mass.

***Haliplus tumidus* Leconte.**

Haliplus tumidus Leconte. Trans. Amer. Ent. Soc., 1880, VIII, p. 166.

Broadly and acutely ovate, dull yellowish red, shining; prothorax punctured, more sparsely on the disc, more coarsely near the base. Elytra rapidly widened from the base for one fifth the length, then obliquely rounded and narrowed to the tip; (widest part fully one half wider than the base of the prothorax); striæ composed of rather coarse punctures becoming smaller behind, interspaces each with a row of small distinct punctures; spots narrow, piceous, ill-defined, presenting the appearance of a sutural stripe, with two oblique interrupted branches and a marginal blotch near the tip. Prosternum coarsely punctured, perpendicularly declivous in front, deeply and broadly sulcate, strongly margined at the sides, slightly convex along the middle for the hinder half of its length; metasternum with a deep square impression, the sides of which are elevated, sparsely and coarsely punctured, coxal plates less coarsely punctured. Length 3 mm.

One specimen, Bosque Co., Texas; Belfrage. Easily known by the more ventricose form and peculiar sternal impressions; the prothoracic side pieces are sparsely punctured."

In order to make this paper complete I have copied here Leconte's description of this species.

Type. In the Museum of Comparative Zoology, Cambridge, Mass.

PELTODYTES Regimbart.

Peltodytes Regimbart, M. Ann. Soc. Ent. Fr. (5), VIII, 1878, p. 450.

Cnemidotus Erichson (non Illiger), Gen. Dyt., 1832, p. 48.

Type.—*Cnemidotus cæsus* Duft.

Terminal segment of palpi conical, longer than the preceding. Palpi with numerous sensory pits. Submentum trilobed, the medium lobe not emarginate. Pronotum truncate, strongly narrowed in front, widest at base, convex above. Elytra with nine to ten rows of punctures, the punctures of the apical half usually much more irregular and more numerous. Intervals with few scattered punctures. Posterior coxæ concealing all but the last segment of the abdomen. Hind tarsi somewhat shorter than the tibia; first tarsal joint longer than the fourth. Claws small.

Cnemidotus Illiger (1802) has been used for this genus but as has been pointed out by Regimbart (1878) it is an absolute synonym of *Haliplus* Latreille. Illiger (1802) in his genus *Cnemidotus* included only species which are congeneric with *Haliplus* Latreille (1802). Erichson (Gen. Dyt., 1832, p. 48) under Gen. 16 *Cnemidotus* Illiger cites *Dytiscus cæsus* Duft. *Dytiscus cæsus* Duft. is not congeneric with the species included in *Cnemidotus* by Illiger and Erichson's description of the genus does not apply to *Cnemidotus* in the sense of Illiger (= *Haliplus* Latreille).

Regimbart (Ann. Soc. Ent. Fr., 1878 p. 457) points out that *Cnemidotus* Erichson is not synonymous with *Cnemidotus* Illiger (= *Haliplus* Latreille) and proposes the name *Peltodytes* for *Cnemidotus* Erichson but failed to mention the included species. As Erichson mentioned only one species in his *Cnemidotus* namely *Dytiscus cæsus* Duft., this species must stand as the type of the genus *Peltodytes* Regimbart.

This genus contains twenty species, nine from North America, eight from Europe, two from the East Indies and one from Central Africa.

KEY TO THE SPECIES OF PELTODYTES.

- A. Each elytron with a prominent tubercle.....*callosus* Leconte.
- AA. Each elytron without such a tubercle.
 - B. Elytra each with nine rows of punctures.....*festivus* Wehnke.
 - BB. Elytra each with ten rows of punctures.
 - C. Femora of posterior legs entirely dark brown or rufous.
 - D. Apical margin of elytra sinuate truncate..*simplex* Leconte.
 - DD. Apical margin of elytra not sinuate truncate, at most rounded or slightly sinuate.
 - E. Median spot of elytra broadly confluent with sutural stripe; punctures of posterior half of elytra not so deep and more irregular than basal half.
 - F. Species with very large black markings on elytra, almost crowding out the pale yellow ground color; a prominent irregular line of punctures between the first and second rows of punctures extending almost to the base....*floridensis* n. sp.
 - FF. Species not with such large black markings; no such prominent line of punctures between the first and second rows of punctures, only a few scattered ones present and these are behind the median black spot.....*muticus* Leconte.
 - EE. Median spot of elytra not broadly confluent with the sutural stripe, but rarely touching it; punctures of the posterior half of elytra not as in the foregoing.
 - pedunculatus* Blatchley.
 - CC. Femora of posterior legs never entirely dark brown or rufous.
 - G. Posterior femora ringed with yellow at distal ends.
 - H. Vertex immaculate*duodecimpunctatus* Say.
 - HH. Vertex with a prominent black spot..*edentulus* Leconte.
 - GG. Posterior femora entirely yellow.....*litoralis* n. sp.

Peltodytes callosus Leconte.

Cnemidotus callosus Leconte. Ann. Lyc. Nat. Hist., V, 1852, p. 201.

General color pale yellow with black markings on pronotum and elytra. Length 3.5 mm.

Head punctate, the vertex brownish black to black; labrum not emarginate; eyes nearly circular in outline; antennæ testaceous.

Pronotum with two black basal spots, punctate, the disc sparsely so; punctures of the same color as pronotum except those between the basal black spots which are sometimes black. Prosternal ridge margined, strongly constricted in the region of the prothoracic legs, widening anteriorly, grooved at point of constriction, strongly convex longitudinally, sharply declivous in front. Posterior coxæ punctate, reaching the last segment of the abdomen; the last abdominal segment triangular in outline and impunctate.

Each elytron with a prominent tubercle or elevation at the place of the anterior black spot; with ten rows of black punctures; an irregular row of large punctures between the third and fourth rows; intervals with a few scattered punctures; the punctures behind the tubercle smaller, more numerous and not arranged in such definite rows. Apices of elytra rounded not sinuate.

Habitat.—Cal. (San Francisco, Pomona, Hills back of Oakland, E. C. Van Dyke; San Diego, Leconte); New Mexico (Albuquerque).

Type.—In the Museum of Comparative Zoology, Cambridge, Mass.

***Peltodytes simplex* Leconte.**

Cnemidotus simplex Leconte. Ann. Lyc. Nat. Hist., V, 1852, p. 201.

General color rufous with black spots on elytra and pronotum. Length 3.5 mm.

Head rufous; punctate; labrum not emarginate, anterior margin with a row of setæ, rounded at the sides; antennæ rufous.

Thorax rufous; pronotum with two basal black spots, punctate, the disc sparsely so; punctures of the same color as the pronotum. Prosternal ridge flat, not grooved, slightly constricted in the region of the prothoracic legs, widening anteriorly, steeply declivous in front. Posterior coxæ punctate, reaching the last abdominal segment. Last segment of abdomen triangular in outline, impunctate.

Elytra each with ten rows of black punctures; an irregular interrupted row of large punctures between the third and fourth rows; punctures not so irregularly placed on the apical half as in *callosus* Lec.; intervals with but few punctures; apical margins sinuate-truncate.

Habitat.—California (San Diego, Leconte; Guernville, Hills back of Oakland, E. C. Van Dyke).

Type.—In the Museum of Comparative Zoology, Cambridge, Mass.

***Peltodytes edentulus* Leconte.**

Cnemidotus edentulus Leconte. New Species of N. A. Col., I, 1863, p. 21.

General color pale yellow with black markings on head, thorax and elytra. Length 3.5–4 mm.

Head testaceous with a large crescent-shaped black spot on vertex between the eyes; punctate except a small area on vertex in front of the black spot; labrum not emarginate, a row of small setæ on anterior margin; antennæ testaceous; eyes nearly circular in outline.

Pronotum with a pair of black basal spots; punctate; punctures on sides and front smaller than on the base: disc sparsely punctate; punctures of same color as pronotum. Prosternal ridge margined, punctate, sides constricted in region of prothoracic legs, widening anteriorly, sharply declivous in front. Legs pale yellow except femora of posterior legs which are brown or black ringed with yellow at their distal ends. Posterior coxæ reaching the last segment of abdomen, punctate, not or only very slightly angulate on their

posterior margins; last abdominal segment triangular in outline, sparsely punctate.

Elytra with ten rows of punctures, the anterior part of outer two rows of same color as elytra, the others black; between the third and fourth rows is a partial row interrupted by the anterior black spot; apical margins sinuate-truncate.

Habitat.—Ont.; Mass. (Amherst); New York (Ithaca, Golden, Pike); Mich. (Lansing); Indiana (Lake Laporte, Marshall and Fountain Cos., Blatchley, 1910); Ill. (Lake Forest, J. G. Needham, Beach, Ill.); Iowa (Iowa City, H. F. Wickham); Wis. (Dane Co., H. F. Wickham and Wm. S. Marshall); Kansas (Leconte).

Type.—In the Museum of Comparative Zoology, Cambridge, Mass.

***Peltodytes duodecimpunctatus* Say.**

Cnemidotus duodecimpunctatus Say. Trans. Amer. Phil. Soc., II, 1825, p. 106.

General color pale yellow to reddish-yellow with black markings on pronotum and elytra. Length 3.5–4 mm.

Head punctate; labrum not emarginate; a row of setæ on its anterior margin; antennæ testaceous.

Pronotum with two basal black spots, punctate; punctures of same color as pronotum; punctures of front and sides smaller than those of base. Prosternal ridge margined, grooved; constricted in the region of the prothoracic legs, widening anteriorly, punctate, steeply declivous in front. Posterior coxæ angulate on hind margin; punctate; reaching the last segment of abdomen. Last abdominal segment triangular in outline, impunctate except on apical margin.

Legs pale yellow except the femora of the hind legs which are dark brown ringed with yellow at their distal ends.

Elytra, each with ten rows of punctures; intervals with a few scattered punctures; black spots and margins arranged as shown in Plate V. Apical margins of elytra strongly sinuate-truncate.

Habitat.—Canada (Ont. & Que., H. F. Wickham); New York (Poughkeepsie, Flushing, L. I., Ithaca); Indiana (Blatchley, 1910); Ill. (Lake Forest, J. G. Needham); Wis. (Dane Co., Wm. S. Marshall); Pa. (South Western, Hamilton, 1895); Kentucky.

***Peltodytes pedunculatus* Blatchley.**

Cnemidotus pedunculatus Blatchley. Coleoptera of Indiana, 1910, p. 204.

General color pale yellow with black spots on pronotum and markings on elytra. Length 3.5 mm.

Head closely and finely punctate; labrum not emarginate, a row of fine setæ along its anterior margin, rounded at sides; antennæ pale yellow; eyes nearly circular in outline.

Pronotum with two basal black spots, punctate; punctures of base larger than those of sides or front. Prosternal ridge margined, not grooved, nearly flat, punctate, sides slightly constricted in region of prothoracic legs, widening anteriorly, steeply declivous in front. Legs pale yellow except femora of hind legs which are black; posterior coxæ attaining the last segment of abdomen. Last segment of abdomen triangular in outline, impunctate.

Elytra, each with ten rows of black punctures; an irregular, interrupted row of large punctures between the third and fourth rows; spots, stripes, and punctures arranged as shown in Plate V; punctures of apical half of elytra smaller, irregularly arranged but not so numerous as in *muticus* Lec.; apical margins sinuate-truncate.

This species is closely related to *muticus* Lec. and it may prove only a variety when the distribution of the species is more fully known.

Habitat.—New York (Ithaca); Mich. (Lansing); Ind. (Laporte; Marshall, Fountain, Marion and Laurence Co's. Blatchley, 1910); Ga. (Spring Creek, Decatur Co., J. C. Bradley); La. (Covington, H. F. Wickham); Texas (Brownsville, H. F. Wickham).

***Peltodytes muticus* Leconte.**

Cnemidotus muticus Leconte. New Species N. A. Col. I, 1863, p. 21.

General color pale yellow, rarely reddish-yellow with black markings on pronotum and elytra. Length 3.5–4 mm.

Head punctate; labrum not emarginate, a row of setæ on its anterior margin; eyes broadly oval; antennæ testaceous.

Pronotum with a pair of basal black spots, punctate, the disc sparsely punctate; punctures of the same color as the pronotum except the few which are between the basal black spots which are black. Prosternal ridge flat, margined, sharply declivous in front, sides constricted in the region of prothoracic legs, widening anteriorly. Posterior coxæ punctate, reaching the last abdominal segment; hind femora reddish-brown, not ringed with yellow. Last abdominal segment triangular in outline, impunctate.

Elytra each with ten rows of black punctures; an irregular, interrupted row of black punctures between the third and fourth rows; intervals with a few scattered, small punctures; black markings arranged as shown in Plate XV; median black spot broadly confluent with the sutural stripe; apical margins rounded, not sinuate-truncate.

Habitat.—Canada (Ont. and Que., H. F. Wickham); Mass. (Amherst); R. I. (Providence); New York (Ithaca, Golden, Flushing, L. I.); Pa. (Phila. Neck); Ga. (Offerman, Thelman, J. C. Bradley); Florida; Indiana (Common, Blatchley, 1910).

Type.—In the Museum of Comparative Zoology, Cambridge, Mass.

Peltodytes festivus Wehncke.

Cnemidotus festivus Wehncke. Stett. Ent. Zeitg., 38, 1876, p. 356.

Rotundatus, brevis, pallide testaceus, prothorace sparsim punctato, basi utrinque foveolato, elytris-striatus, interstitiis rugoso-punctatis, basi, sutura et maculis 14 piceis. Long 2.75 mm.

A beautiful, bright yellow species, near to *P. duodecim-punctatus* Say. It is about one half smaller, of more rounded form and distinguished by two depressions, one situated on each side of the base of the pronotum.

The head is small and possesses moderately large projecting eyes. The space between the ocelli is finely punctate. The pronotum is short, widest at the middle, strongly and densely punctate at the sides; at the base there is found on each side a deep pit formed by a large puncture.

The elytra are gradually rounded to the tip, finely and rugosely punctate; nine rows of punctures present, the punctures largest at the base, becoming smaller towards the tip. The base, the tip, a common spot at the tip, as well as seven spots (one behind the shoulder at the side, another before the middle, two behind this and three at the tip forming a triangle) dark brown.

Underside and legs with the exception of the brownish posterior coxæ, yellow.

Habitat.—Texas.

As I have not seen any specimens of this species I here reproduce the original description translated for the benefit of future workers.

Peltodytes floridensis new species.

General color pale yellow to rufous with black markings on pronotum and elytra. Length 3.5 mm.

Head finely punctate; labrum not emarginate, rounded at sides, a row of small setae on anterior margin; eyes prominent; antennæ testaceous to rufous.

Pronotum pale yellow to rufous with two basal, black spots, punctate, the punctures larger at base than at front or sides; disc with few scattered small punctures. Prosternal ridge margined, punctate, nearly flat from side to side, convex longitudinally, sharply declivous in front. Posterior coxæ large, extending to the last abdominal segment, slightly angulate on the posterior margin; femora of posterior legs entirely rufous to black, not ringed with yellow.

Elytra with ten rows of black punctures; an irregular row between the first and second rows extending to near the base of elytra; many large, irregularly placed punctures between third and fourth rows; the remaining intervals with scattered punctures; punctures smaller and more irregular on apical half of elytra; sutural black stripe in front of median black spot extending to first row of punctures; apical margins obliquely truncate to rounded.

This species is closely related to *muticus* Lec. but differs in the points mentioned above. It is a darker, southern form and may prove

to be connected with *muticus* Lec. and this again with *pedunculatus* Blatchley.

Described from four specimens from Sanford, Florida. From the collection of Prof. William Marshall, Madison, Wis.

Habitat.—Florida.

Type.—In the Entomological Collection of Cornell University, Ithaca, N. Y. Paratypes in the collection of Prof. W. S. Marshall, Madison, Wis.

***Peltodytes litoralis* new species.**

General color pale yellow to reddish yellow with black markings on elytra and prothorax. Length 3.5 mm.

Head pale yellow, punctate except on vertex; eyes large, protruding, strongly convex, circular in outline; labrum scarcely emarginate, a row of small setæ along anterior margin, rounded at the sides; antennæ pale yellow.

Pronotum pale yellow with two basal black spots, punctate, the punctures smaller on front and sides; disc sparsely punctate. Prosternal ridge strongly margined, grooved, sparsely punctate, steeply declivous in front. Legs pale yellow to rufous; posterior coxæ punctate, subangulate on their hind margins, reaching the last segment of the abdomen.

Each elytron with ten rows of punctures, the anterior part of the outer two rows of the same color as the elytra, the others black; the rows 1, 2, 8, 9, and 10 of small punctures, the other rows of much larger punctures; an interrupted row of black punctures between the third and fourth rows.

Described from 5 specimens.

Habitat.—Texas (Dallas); Kansas (Douglas Co., 900 ft. elevation).

Type.—In the entomological collection of Cornell University, Ithaca, N. Y. Paratype in the collection of the Michigan Agricultural College, East Lansing, Mich.

THE NATURAL HISTORY OF THE HALIPLIDÆ.

Very little has been written regarding the habits, ecology, etc., of the adult Haliplidæ. Schiodte ('61-'72) has given us rather extensive and detailed descriptions of the larvæ and pupæ of several species. This small family of aquatic beetles has been neglected although the commoner species are widely distributed, often very abundant, and easily collected. The genera, *Haliphus* and *Peltodytes*, occur almost everywhere in small pools, particularly those that are spring feed and contain filamentous algæ and other aquatic plants.

They prefer shallow pools although wherever there are sufficient growths of *Nitella* or *Chara* they may be found in the deeper parts. In amongst the aquatic plants near the shores they may be found, often very abundant and a single sweep of a small water-net may bring up a dozen or so. It may also be noted that these beetles are not found abundantly in all small pools but only here and there one meets with them as one of the more dominant forms. I have found them most abundant in spring fed pools which do not dry up during the summer. In such pools some of the species are very abundant. In a single pool I have taken the following species, listed according to their relative abundance: *H. ruficollis* DeG., *H. connexus* Matheson, *P. edentulus* Lec., *P. muticus* Lec., *H. triopsis* Say, *H. cribrarius* Lec.

The adult Haliplids are poor swimmers and are never found in the open water except when forced there. They live amongst the plants bordering the shores and occupying the shallow waters. Here they are found clinging to the stems of aquatic plants, swimming short distances, or walking over the algæ on which some species feed. They swim by means of their legs, which are furnished with long fringes of hairs. The tarsi of all the legs and the tibia of the first and second pairs are provided with these fringes (Figs. 13, 14, 15). The fringes are long and supported by short, stiff setæ (Fig. 14). The hind legs are the chief organs of locomotion and in swimming move backwards with a slightly downward sweep. This is brought about by the limiting action of the coxal plates which overlap the first three to five abdominal segments (Figs. 11, 12). The hind legs move alternately in swimming and so far as I can determine, all the legs move in the same manner as they do in walking. They swim but slowly. On land they walk or run with considerable ease and agility, raising the body clear from the surface and placing the weight on the tarsi of all the legs. I have never found these beetles at electric lights nor have I seen them use their wings in flight, though they probably do fly.

Their method of respiration is rather unique and nothing like it has been described so far as I know. The elytra are firmly held in place not only by the groovings in the pleura but also by the knoblike structures on the anterior outer ends of the posterior coxæ (Fig. 12). These knob-like structures fit closely into socket-like de-

pressions of the elytra (Figs 11 and 12). At first I was led to suppose that these insects secured their air supply as in the Dytiscidæ, by breaking the surface film with the tip of the abdomen and carrying an air supply under the elytra. I was led to this belief from seeing many of them with an air bubble attached to the posterior end of the body. But as the elytra are rather firmly held in place by the knob-like structures it seemed doubtful if these beetles could open the tips of the elytra and not at the same time allow the entrance of water.

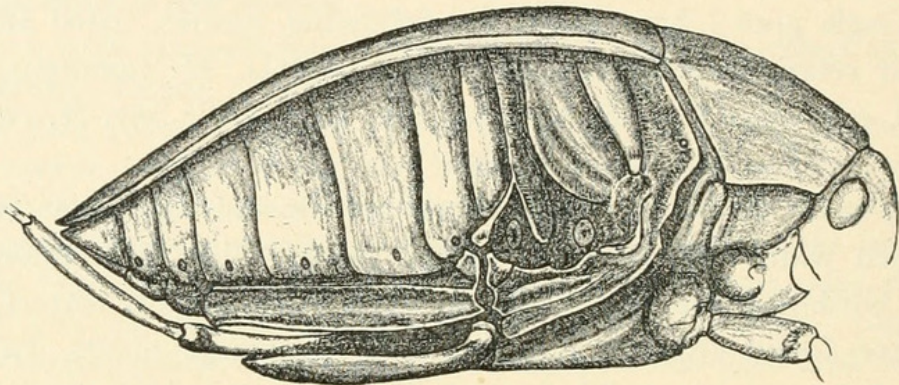


FIG. A. Lateral view of *H. triopsis* with wing cover removed to show method of respiration.

However on close observation it was soon seen that the air supply was carried under the broad coxal plates, at the posterior end of which an air bubble is usually found. As the femora move back and forth through this air supply I could not quite determine how the air reached the spiracles. On examining beetles from which the elytra were removed it was soon seen how the air supply became available. In text figure (Fig. A) a beetle is shown in side view with one elytron removed. Leading from the anterior end of the posterior coxa is seen a narrow groove in the pleurum. This widens at first, then narrows and finally divides into two branches. One branch passes backwards and opens directly near the second abdominal spiracle. This air supply reaches all the abdominal spiracles. The other branch passes forward and conveys an air supply into a large depression in which are located the first abdominal and meta-thoracic spiracles. These spiracles are much enlarged. The first abdominal spiracle is very large, oval in outline and is almost closed by long, fine setæ. This condition of the enlargement of the first abdominal spiracles is in marked contrast to that found in the Dytiscidæ. The meso-

thoracic spiracle is small and probably functions to some extent as air can reach it. Thus these beetles carry their air supply under the elytra but obtain it by way of the coxal plates and lateral grooves leading under the elytra. These grooves are lined with fine short setæ, all pointing towards the entrance and prevent the ingress of water.

Structural Adaptations.—The Haliplidæ are undoubtedly closely related to the Carabidæ on the one hand and to the Dytiscidæ on the other. Whether they can be considered as a transition group is a question I do not care to discuss at this point. The adaptations of the diving beetles have been well discussed by Needham and Williamson (1907). The same kinds of adaptations there pointed out are found in this family though not carried to such perfection of development. The demands for aquatic life are: (1) Rigidity of structure. (2) Diminished resistance. (3) Efficiency in swimming. The rigidity of bodily form is brought about by the close fitting and adjusting of the parts of the external skeleton. As in the Dytiscidæ the head fits closely into the prothorax, the parts of the thorax are quite solidly joined together, and the elytra are closely applied to the sides of the body and to each other on the mid-dorsal line.

The close-fitting of the head into the prothorax has been brought about not by the flattening of the head as in the Dytiscidæ but by the development of the prosternum to form a deep ridge into which the head fits (Fig. 12). The prosternum is firmly fused and almost completely conceals the mesosternum. The metasternum is prolonged forward between the middle coxæ and fits firmly into a socket-like depression in the prosternum (Fig. 11). The elytra fit closely to the sides of the body and their bases meet the sinuate margin of the pronotum closely and firmly, making a water-tight and smooth juncture. The scutellum is wanting. Posteriorly the elytra are held in place by the knob-like prolongations of the posterior coxæ (Fig. 12). This kind of an adaptation is, so far as I know, not met with in any other of the families of the Coleoptera.

The necessity for a diminished resistance has been met to some extent and along the same lines as in the Dytiscidæ. The antennæ are filiform, reversed, and each lies in a small groove directly below the eye; the eyes are not so prominent as in the Carabidæ; the contours of the body are rounded; and there is a lessening of sculpturing

and a partial loss of hair. The shape of the body is also deeper and narrower than in the Dytiscidæ, a form better fitted for movement through the water, but lacking the means of rapid propulsion.

The swimming efficiency is very feeble as compared with the more specialized Dytiscidæ. Instead of a soldering fast of the posterior coxæ and the formation of a solid joint, as in the Dytiscidæ, there is a remarkable plate-like development of the coxæ. By this means the hind legs are moved in one plane and their efficiency as swimming organs increased though their horizontal range of movement is, if anything, lessened. There is also a development of long fringes of hairs on the tarsi of all the legs and the tibia of the first and second pairs. These fringes are in some measure supported by short, stiff setæ (Fig. 14). There is no shortening of the proximal joints of the legs, nor the lengthening or flattening of the tarsi as in the Dytiscidæ.

The modifications for the securing and storage of an air supply have already been fully discussed.

Feeding Habits.—Little is known regarding the feeding habits of many of the adult aquatic Coleoptera. In most cases it is taken for granted that they are carnivorous. Unfortunately I have not much information regarding the adult Haliplidæ. In my aquaria *H. ruficollis*, *H. connexus*, and *H. cribrarius* were observed feeding greedily on the contents of *Nitella*, the softer portions of *Chara* and other filamentous algæ. They crush open the *Nitella* stems with their mandibles and devour the contents, leaving the cell wall. *H. cribrarius* was especially greedy and a dozen or so would destroy considerable quantities of *Nitella* in a very short time. Whether they feed on animal matter or not I am not prepared to say, though I have observed them destroying dead specimens of their own kin in my aquaria. This may have been due to the lack of sufficient vegetable food. For in the case of *H. cribrarius* and *H. connexus* it was found that when freshly placed in aquaria with *Nitella*, they greedily attacked the young and tender tips. *H. ruficollis* also fed readily on the smaller filamentous algæ and *Nitella*.

Egg-laying Habits.—Nothing has been written regarding the eggs or egg-laying habits of any species belonging to this family. During the past two years I reared two species of *Peltodytes* and one of *Haliphus*. In the genus *Peltodytes* the eggs are fastened to the strands of filamentous algæ, particularly *Nitella* and *Chara*, while in *Haliphus*

(*H. ruficollis*) the eggs are deposited within the dead stems of *Nitella*. I shall describe separately the life-history of each species studied.

***Peltodytes muticus* Lec.**

The Egg.—Brownish in color, broadly oval, with faint roughened markings, a small knob on the anterior end. Length .466 mm.; width .254 mm. The eggs are attached to the stems of aquatic plants, particularly *Nitella* and *Chara* (Fig. 33). Mating takes place in the water during the early part of spring, the latter part of April and May, and egg-laying begins a short time later. The average time for the hatching of the eggs is about two weeks, varying of course according to the weather conditions. From eggs laid on May 9, 1910, the first larvæ appeared on May 24. The larvæ break their way out by a longitudinal split through the anterior end of the egg.

First Instar.—Length including the caudal setæ, 2 mm.; caudal setæ .6 mm. Head prominent. Eyes, each of six ocelli arranged in two vertical rows on a prominent chitinous projection on the lateral aspect of the head. Antennæ 2-segmented, with a terminal spine, the proximal segment the longer. Thorax consists of three segments, abdomen of nine. Each segment except the last, provided with four long, jointed spines, two dorsal and two lateral. The prothoracic segment has four small, unjointed spines on its anterior margin. The last abdominal segment possesses two long caudal setae. The caudal setæ are two-jointed, the second segment short and fine. The dorsal and lateral setæ are two-jointed, the second joint long and slender. The mesothoracic dorsal spines are .6 mm. long, the first joint .2 mm. The other spines average about the same length. The legs except the first pair are long and fitted for walking over filamentous algæ. The first pair are short and modified into grasping organs. The structure of the legs will be fully discussed later. Spiracles are absent.

Second Instar.—The first molt takes place about six days after hatching. Not much change is to be noted except increase in size and in the length and number of the joints of the spines covering the body. Length 3.6 mm. (including the caudal spines); caudal spines 1.5 mm. The antennæ are now three jointed with a terminal spine. The first joint is very short and inconspicuous. Each segment except the penultimate is furnished with spines as described for

the first instar only they are much longer and each one consists of many more joints. The penultimate segment now possesses only the dorsal spines and the basal joint of each of the lateral spines. The mesothoracic dorsal spines are now over 2 mm. in length and 9-jointed. The other spines are about the same length and also 9-jointed. At the side of the proximal joint of each spine is a short, stout, lateral spine. This spine is longer than the thickness of the large spine while in *P. edentulus* Lec. it is shorter (Figs. 28, 29). This serves as a good separating character from the second stadium to the end of the larval life. Spiracles are wanting. The second stadium occupies on the average, about nine days.

Third Instar. The Mature Larva.—The second molt occurs eight to ten days after the first. The larva is now in its last stage. This stage lasts from seven to ten days, dependent largely upon the food supply. Length, excluding the caudal setæ, 6 mm., caudal setæ 4 mm. Antennæ are now 4-jointed with a terminal spine. The last segment consists of two closely united pieces, placed side by side (Fig. 26). Ocelli six, placed on a prominent lateral elevation. The larva consists of twelve segments. Each segment except the first and the penultimate with the spines arranged as in the preceding instar. The prothoracic segment now has six jointed spines, two lateral and four dorsal (Fig. 34). The extra two spines develop during the second stadium and appear at the time of the molt. These two extra spines are smaller and fewer jointed (11-jointed). The mesothoracic spines are 18-jointed and 4 mm. long. It is rather difficult to be certain regarding the number of segments in these long, delicate spines as they break off very easily. The other spines range about the same length with varying number of segments. The penultimate segment has two dorsal spines and only the reduced basal segment of the lateral spines. Spiracles are wanting.

The mouth parts and legs are practically identical with those of *P. edentulus*. These are described in detail further on.

Pupation.—When mature the larvæ leave the water in search of a place in damp soil to pupate. They begin entering the soil about a week to ten days after the second molt. Here they hollow out a small cavity within which they transform (Fig. 37). The prepupal period lasts about a week to ten days.

Pupa.—Length 3.5 mm. entirely white (Fig. 38) and remains so

except for the eyes, till the time of the emergence of the adult. The head lies curved under the prothorax and between the developing forelegs, smooth except for two setæ placed between the eyes. Pro-

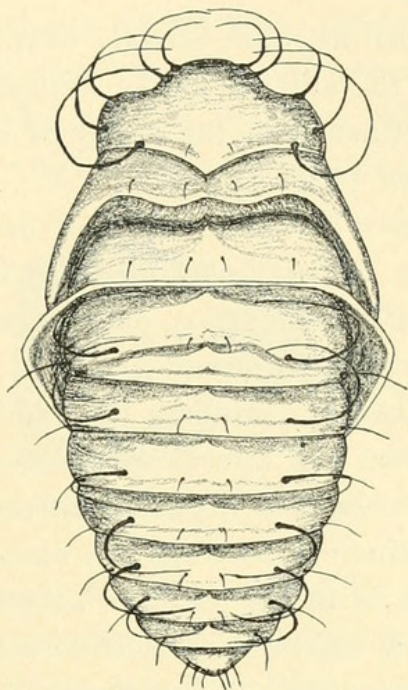


FIG. B. Pupa of *P. edentulus*, dorsal view.

notum with ten long, curved, unjointed spines, four on the anterior, two on each lateral and two on the posterior, margins. These spines prevent the anterior end of the pupa from touching the soil in its pupal chamber. Abdomen of eight segments, each bearing on its dorsal surface four long, unjointed spines, two lateral and two dorsal. Between the dorsal spines are two shorter, small spines present on each segment except the last two. These long, curving spines prevent the delicate abdomen from touching the soil. Ventral surface of abdomen smooth. The pupa lies on its back in its pupal chamber and the spines just described support and protect it from contact with the soil. The caudal end of the pupa is also provided with a few short spines. There are two thoracic and seven abdominal spiracles present.

Adult.—The pupa changes to the adult about two weeks after pupation. The adult is at first perfectly soft and colorless except for the pigmented eyes. It requires several days before the adult beetle has attained its full color and is ready to leave the pupal chamber. In

my rearings the adults emerged on July 5, 1910, just seven weeks after the eggs were laid. Unfortunately I had to stop my work at this time and no further rearings have been made.

***Peltodytes edentulus* Lec.**

The Egg.—Brownish in color, broadly oval, with roughened markings, a small knob on the anterior end. Length .466 mm.; width .233 mm. The eggs are attached to the stems of aquatic plants, particularly *Nitella* and *Chara* (Fig. 33).

It will be unnecessary to discuss the time of hatching, the different instars, or the number of stadia as they are identical with those of *P. muticus* Lec. It will be necessary only to point out the differences between the mature larvæ of the two species.

Mature Larvæ.—Length, excluding the caudal setæ, 6 mm.; caudal setæ, 4 mm. The dorsal and lateral spines are arranged similarly to those in *P. muticus*. Not the slightest difference can be observed. The only point of distinction between the mature larvæ of these two closely related species is in the relative lengths of the short spines present on the proximal segment of each dorsal spine. In *P. muticus* the lateral spine is longer than the thickness of the large spine while in *P. edentulus* it is shorter (Figs. 28, 29.) Spirals are absent.

Pupation.—The time of pupation, the pupal chamber, the length of the prepupal and pupal life are identical with that found in *P. muticus*. So far as I can discover there are absolutely no differences between the pupæ of the two species.

***Haliphus ruficollis* DeG.**

This is the only species of the genus that I have succeeded in rearing and of this species I have not yet been successful in securing pupæ. In 1910 many larvæ died in trying to find suitable places in which to pupate and I had to give up the work before I could secure the necessary conditions for pupation in this species.

As with the species of *Peltodytes* mating takes place in the water. I found them freely copulating in spring-fed pools on May 9, 1910. Several pairs in copula were placed in aquaria with abundance of algæ, particularly *Nitella*. On May 16 I found eggs placed within the dead, hollow cells of *Nitella*. The female cuts an opening with her mandibles and then deposits several eggs within the cell through this hole (Fig. 32). This is continued till quite a large number of eggs are laid.

The Egg.—The egg is pure white in color, oval. Length .365 mm.; width .22 mm. In my aquaria these eggs hatched in ten to twelve days after oviposition.

First Instar.—Length including caudal setæ, 2.5 mm.; caudal setæ .4 mm. The larva consists of thirteen segments, exclusive of the head. Each segment, except the last, with several two-jointed spines. The last segment is prolonged into two long spines, each terminating in a short seta. This stage occupies about nine days.

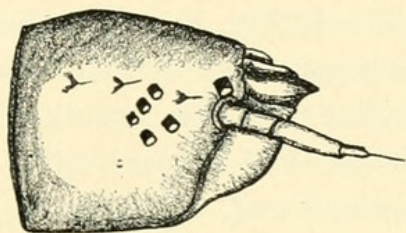


FIG. C. Lateral view of head of larva of *H. ruficollis*.

Second Instar.—Owing to the small number of larvæ in my aquaria I did not reserve any specimens of this instar for detailed description. This stage lasts from eleven to twelve days.

Third Instar. The Mature Larva (Fig. 36).—Length, including the anal appendages, 9 mm. The head is strongly chitinized, somewhat depressed. Ocelli, six, arranged as shown in figure C. Antennæ four-jointed, with a short terminal spine. The last segment consists of two closely approximated pieces.

Excluding the head the larva consists of three thoracic and ten abdominal segments. The legs, except the first pair, are fitted for walking. The last abdominal segment is prolonged, ending in two unjointed spines. Each spine ends in a single long seta. Length of last segment, exclusive of spines, 1.2 mm., spines, .38 mm. Each segment, except the last, with two dorsal chitinous plates. These plates meet on the mid-dorsal line. Those of the eighth and ninth abdominal segment are each fused into one. These plates are closely set with many, short, stout spines. The ventral surface of each segment is more or less chitinized and provided with numerous short, stout spines.

Spiracles are present on the meso- and meta-thoracic and the first seven abdominal segments. The spiracles are located in the pleura between the lateral and ventral chitinous areas of each segment.

This stage lasts from five to seven days before the larvæ begin entering the soil to pupate. In my aquaria the second molt occurred on June 15 and the larvæ began entering the soil on June 20. Unfortunately none of these larvæ had pupated when I had to give up the study for other work which called me away.

The Larval Mouth Parts.—The mouth parts of *P. edentulus* and *P. muticus* are practically identical. I shall describe the mouth parts of *P. edentulus*.

The mandibles are rather powerful chitinized structures. Each ends in a sharp hollow projection (Fig. 20). On the inner face just below the projection is a prominent tooth-like elevation. Each mandible is pierced by a hollow, cylindrical tube opening into the mouth at the base and at its tip in the hollow projection. The tube gradually widens towards its proximal end. In Figs. 20, 21, the hollow tubes are shown in dotted lines. Powerful muscles are attached to the inner face of each mandible. Each mandible bears five long setæ on its outer edge.

The maxillæ are rather complicated structures (Fig. 23). Each consists of a basal segment and a large distal one bearing a two-jointed palpus and a chitinous projection on its inner face. This projection bears many small setæ. Setæ are found scattered over the maxillæ. The labium consists of a submentum and a mentum bearing a single jointed palpus (Fig. 23).

The mouth parts of *H. ruficollis* are well figured and described by Schiodte in his *De Metamorphosi Eleutheratorum*, Vol. I, p. 72, Plate VIII, Figs. 5, 6, and 7.

The Larval Legs.—The larval legs with the exception of the first pair, are practically identical in the two genera studied. The first pair are fitted for grasping and are held forward and closely applied to the lower surface of the head. The other two pairs are long and slender, well fitted for walking over filamentous algæ. Each leg consists of five segments and a single claw (Fig. 27). The claw bears a short basal spine. The prothoracic legs are remarkably adapted for grasping. In *H. ruficollis* the penultimate segment is prolonged on its inner side and bears two large lateral and apical spines (Fig. 24). Against this prolongation fits the last segment while the claw falls between the last pair of spines. In *P. edentulus* and *P. muticus* the prolongation bears, besides the spines, a series of sharp serrations

while the terminal claw bears a few setæ (Fig. 25). This makes an ideal arrangement for grasping and holding filamentous algæ.

Feeding Habits of the Larvæ.—Although Schiodte has given us much detailed information regarding the structural characters of these larvæ he made no observations on their habits. His detailed studies on the larval mouth parts led many to conclude that they are carnivorous. What was my surprise when I found what had always been considered carnivorous species eagerly devouring the algæ amongst which they were living! My chief fear in attempting to rear these larvæ was the securing of a food supply. However, this difficulty was quickly removed when I found the larvæ eagerly devouring filamentous algæ. I have previously described the remarkable modifications of the first pair of legs. I have also described the sharply curved mandibles each pierced by a small tube, similar to that found in the larvæ of the Dytiscidæ. These larvæ feed exclusively on filamentous algæ, *Spirogyra*, *Zygenma*, *Muogeotia*, etc. It is a remarkable sight to see one of the long spined larvæ of *Peltodytes* eagerly grasp a strand of algæ and by means of its forelegs push it backwards like a sailor hand over hand until it reaches a broken end. Then by puncturing the cell wall with its sharp mandibles the larva sucks the contents into its mouth. By means of a hand lens or low power of the microscope one can easily observe the chloroplasts pass through the hollow mandibles. The front legs are used to hold and push the filament forward as fast as the contents are removed by the mandibles. When the larva finishes the strand it will again pass the alga backwards hand over hand or rather foot over foot, while the mandibles secure any of the contents not previously obtained.

I did not observe any of the larvæ studied to attack any living form, though numerous small Entomostraca were constantly present in my aquaria.

Adaptations of the Larvæ.—The adaptations of these larvæ to their aquatic environment are found in the structure of the mouth parts, the legs, and the manner of securing an air supply. The mouth parts in conjunction with the prothoracic legs seem to be especially fitted for the obtaining and handling a food supply. The meso- and meta-thoracic legs seem to be particularly adapted for walking over filamentous algæ. They are long and terminate in a single claw which bears a short, fine, basal spine. But the most remarkable adaptation

is found in the way the larvae of *Peltodytes* secure an air supply. In *Haliphus* there are present two thoracic and seven abdominal spiracles. In *Peltodytes* no spiracles are to be found till the pupal stage is reached. The larvæ as pointed out possess many, long, jointed spines. As shown by Schiodte these spines contain tracheæ which undoubtedly function for the securing of an air supply from the oxygen dissolved in the water. Fig. 30 shows a part of a segment containing a large trachea (each spine contains but a single large trachea) with numerous tracheoles arising from it. Fig. 31 shows the termination of a trachea in three tracheoles. It is by means of these tracheated spines that the larvæ of *Peltodytes* secure an air supply.

In conclusion I wish to thank Professors A. D. MacGillivray and J. Chester Bradley for criticism and advice in the preparation of the systematic part of this paper and Professor J. G. Needham for his aid in the working out of the life-histories.

SUMMARY.

The adults.—(1) The commoner species of *Haliphus* and *Peltodytes* are widely distributed and are at times locally abundant in spring fed pools.

(2) They feed almost exclusively on filamentous algæ, particularly *Nitella* and *Chara*.

(3) They are poor swimmers, the hind legs being the chief organs of locomotion. The legs are furnished with fringes of long hairs.

(4) They secure their air supply by way of the posterior coxal plates and the grooves in the pleura. The metathoracic and first abdominal spiracles are enlarged.

(5) Mating begins in the early spring and the eggs are deposited during the latter part of April, May and June. The species of *Peltodytes* attach their eggs to aquatic plants mainly *Nitella* and *Chara*, while *Haliphus* (*H. ruficollis*) places its eggs within the dead cells of *Nitella*.

The Larvæ.—(6) The larvæ have only three instars (two molts). They apparently feed exclusively on filamentous algæ (conjugatæ).

(7) The larval mouth-parts are adapted for feeding on algæ. The first pair of legs are modified into organs for grasping and handling algal filaments.

(8) In *Haliplus* the air supply is probably obtained through the two thoracic and seven abdominal spiracles. In *Peltodytes* there are no spiracles and the air supply is obtained by means of numerous, long, jointed, tracheated spines.

(9) The larval life lasts but a short time (three to four weeks). Pupation takes place in the soil in a small earthen chamber. The pupal life lasts about three weeks.

(10) There is probably more than one brood a season.

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EXPLANATION OF ABBREVIATIONS USED.

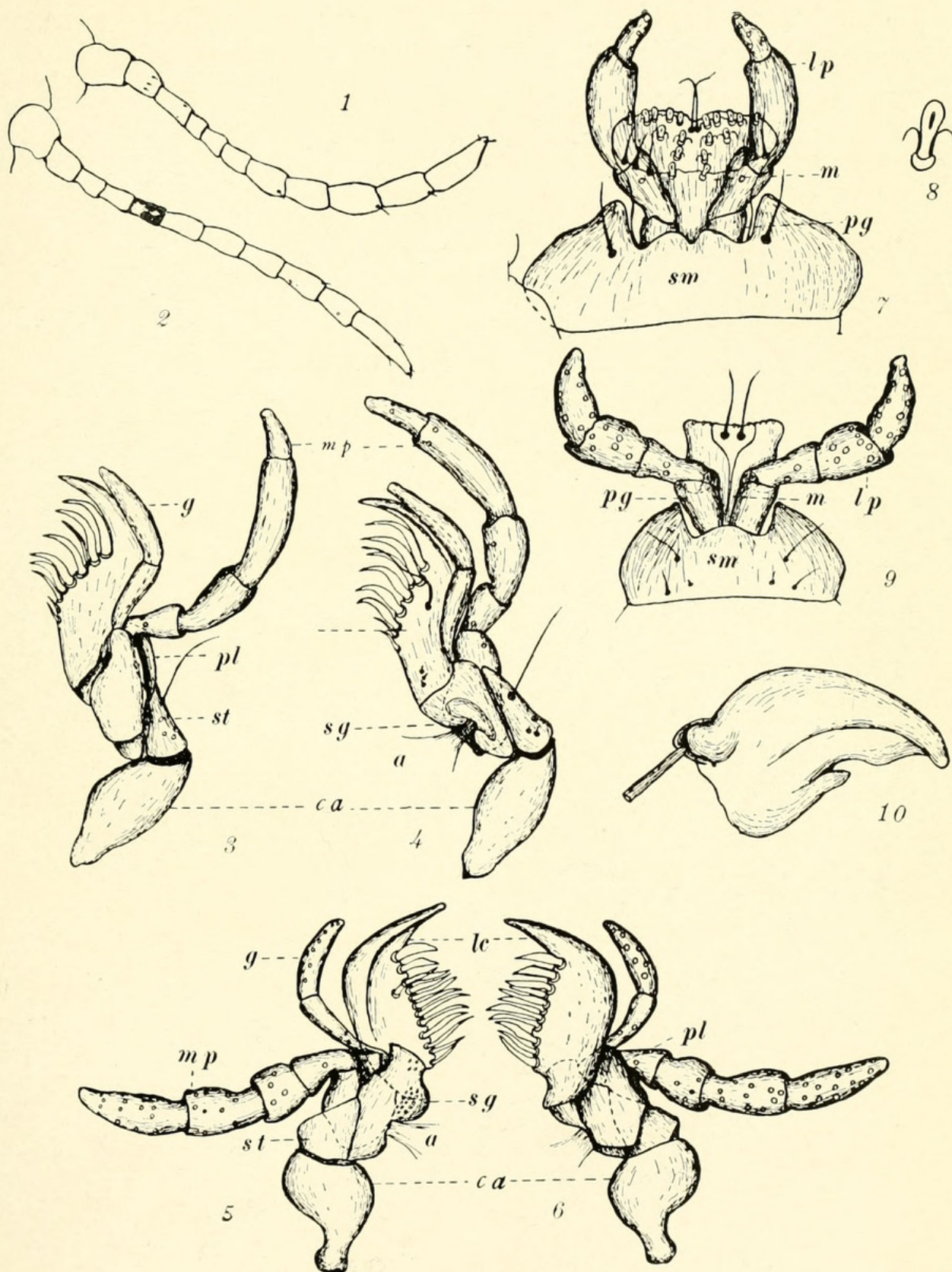
<i>a.</i> Muscle of maxilla.	<i>mc.</i> Middle coxa.
<i>ac.</i> Antecoxal piece.	<i>mp.</i> Maxillary palpi.
<i>c.</i> Coxa.	<i>ms.</i> Mesosternum.
<i>ca.</i> Cardo.	<i>mt.</i> Metasternum.
<i>e</i> Eye.	<i>pc.</i> Posterior coxa.
<i>em.</i> Epimeron	<i>pg.</i> Palpiger.

ep. Episternum.
g. Galea.
gu. Gula.
lc. Lacinia.
lp. Labial palpi.
m. Mentum.

pl. Palpifer.
ps. Prosternum.
sg. Subgalea.
sm. Submentum.
st. Stipes.

EXPLANATION OF PLATES X-XIV.

- FIG. 1. Antenna of *H. triopsis* Say.
 FIG. 2. Antenna of *P. edentulus* Lec.
 FIG. 3. Dorsal view of maxilla of *H. triopsis* Say.
 FIG. 4. Ventral view of maxilla of *H. triopsis* Say.
 FIG. 5. Ventral view of maxilla of *P. edentulus* Lec.
 FIG. 6. Dorsal view of maxilla of *P. edentulus* Lec.
 FIG. 7. Labium of *H. triopsis* Say.
 FIG. 8. Sense seta from labium of *H. triopsis* Say.
 FIG. 9. Labium of *P. edentulus* Lec.
 FIG. 10. Mandible of *H. triopsis* Say.
 FIG. 11. Ventral view of *H. Triopsis* Say.
 FIG. 12. Lateral view of *H. triopsis* Say.
 FIG. 13. Anterior leg of *H. triopsis* Say.
 FIG. 14. Middle leg of *H. triopsis* Say.
 FIG. 15. Hind leg of *H. triopsis* Say.
 FIG. 16. A setiferous pit from posterior coxa of *H. triopsis* Say.
 FIG. 17. Hind leg (dorsal view) of *H. triopsis* Say.
 FIG. 18. Anterior leg (tarsi) of male of *H. triopsis* Say.
 FIG. 19. Anterior leg (tarsi) of female of *H. triopsis* Say.
 FIG. 20. Left mandible of larva of *P. edentulus* Lec.
 FIG. 21. Right mandible of larva of *P. edentulus* Lec.
 FIG. 22. Mandible of larva of *H. ruficollis* DeG.
 FIG. 23. Labium and maxillæ of larva of *P. edentulus* Lec.
 FIG. 24. Anterior leg of larva of *H. ruficollis* DeG.
 FIG. 25. Anterior leg of larva of *P. edentulus* Lec.
 FIG. 26. Antenna of larva of *P. edentulus* Lec.
 FIG. 27. Hind leg of larva of *P. edentulus* Lec.
 FIG. 28. Dorsal spine of larva of *P. muticus* Lec.
 FIG. 29. Dorsal spine of *P. edentulus* Lec.
 FIG. 30. Portion of a dorsal spine of larva of *P. edentulus* showing the trachea and its tracheoles.
 FIG. 31. Termination of a trachea in three tracheoles in the terminal joint of a larval spine.
 FIG. 32. Eggs of *H. ruficollis* DeG. in the stems of *Nitella*.
 FIG. 33. Eggs of *P. edentulus* and *P. muticus* on *Chara*.
 FIG. 34. Larvæ of *P. edentulus* and *P. muticus* feeding on filamentous algæ.



Haliplidæ.



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