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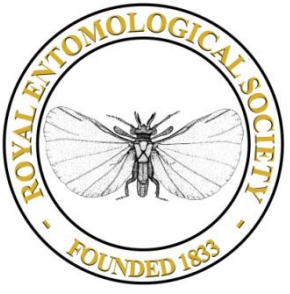

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THE IDENTIFICATION

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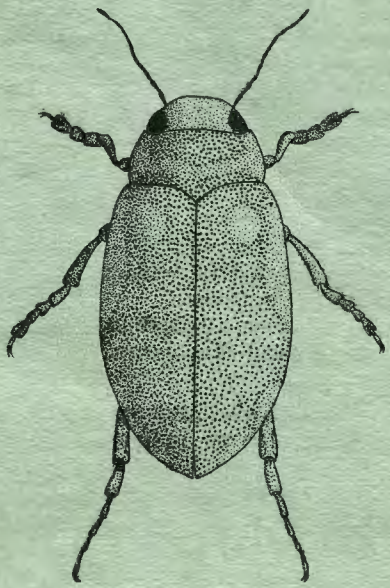

COLEOPTERA

HYDRADEPHAGA

By

F. BALFOUR-BROWNE

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HANDBOOKS FOR THE IDENTIFICATION OF BRITISH INSECTS

The aim of this series of publications is to provide illustrated keys to the whole of the British Insects (in so far as this is possible), in ten volumes, as follows :

I. Part 1. General Introduction.
„ 2. Thysanura.
„ 3. Protura.
„ 4. Collembola.
„ 5. Dermaptera and Orthoptera.
„ 6. Plecoptera.
„ 7. Psocoptera.
„ 8. Anoplura.
Part 9. Ephemeroptera.
„ 10. Odonata.
„ 11. Thysanoptera.
„ 12. Neuroptera.
„ 13. Mecoptera.
„ 14. Trichoptera.
„ 15. Strepsiptera.
„ 16. Siphonaptera.

II. Hemiptera.
III. Lepidoptera.
IV. and V. Coleoptera.
VI. Hymenoptera : Symphyta and Aculeata.
VII. Hymenoptera : Ichneumonoidea.
VIII. Hymenoptera : Cynipoidea, Chalcidoidea, and Serphoidea.
IX. Diptera : Nematocera and Brachycera.
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COLEOPTERA
(HYDRADEPHAGA)

By F. BALFOUR-BROWNE.

THIS might be described as an abstract of *British Water Beetles* published by the Ray Society in 1940 and 1950 as most of the Keys and Illustrations are from those two volumes, and I have to thank the Council of the Ray Society for allowing me to use them. I have corrected several mistakes that occurred in those volumes and hope that I have not made any more! Not all the keys are identical with the earlier ones and that to *Hydroporus* is entirely new and, I hope, an improvement.

As the idea of the *Handbooks* is to provide ways as easy as possible for identifying the species I have confined myself entirely to this object, and the figures are solely for the purpose of illustrating the determining characters, except for the first, which gives the names of the various structures and parts to aid those whose knowledge of morphology of the beetle is lacking.

In a number of cases references in the keys are to figures not showing the particular species of even the genus to which the key refers, but showing the type of structure mentioned. Thus the antecoxal sclerite is figured for the Haliplidae, but the same figure is quoted under Hygrobiidae as illustrating an antecoxal sclerite. Under *Deronectes* 12-*pustulatus* reference is given to a figure that illustrates the post-coxal process in an Hydroporine, indicating that the same type occurs in both genera.

I have followed the classification used by Sharp, Fowler and others, the Adephaga being one of six series and being the most primitive of these series. It is divided into the Carnivorous Land Beetles, the GEODEPHAGA and the Carnivorous Water Beetles, the HYDRADEPHAGA, and the latter includes four families, HALIPLIDAE, HYGROBIIDAE, DYTISCIDAE and GYRINIDAE, although by some the Noterines are separated from the DYTISCIDAE as NOTERIDAE and the Gyrinids are raised to Gyrinoidea.

There seems to be a tendency in many of those who concentrate on smaller groups to raise the rank, and the splitting up of families, tribes, genera and species has become a very serious matter, e.g., the number of genera with one species tending to make classification ridiculous.

Although the "hair-splitters" regard our arrangements of species as creating a "natural classification," I cannot recognise anything natural in most of our lower divisions, e.g., in the subgenera of *Hydroporus* or *Agabus*, and in the latter genus I have not thought it necessary to use them, even though they are only artificial groups.

The distribution of species is constantly changing, and with its invasion of a new locality a species may change its type of habitat so that, although statements as to habitats in which to search for them may be fairly accurate to-day, they may become inaccurate at any time. We do not know enough about distribution and habitat, and what have been described as " mere collectors " may do useful work by keeping careful records of when, where and in what kind of environment they find their species.

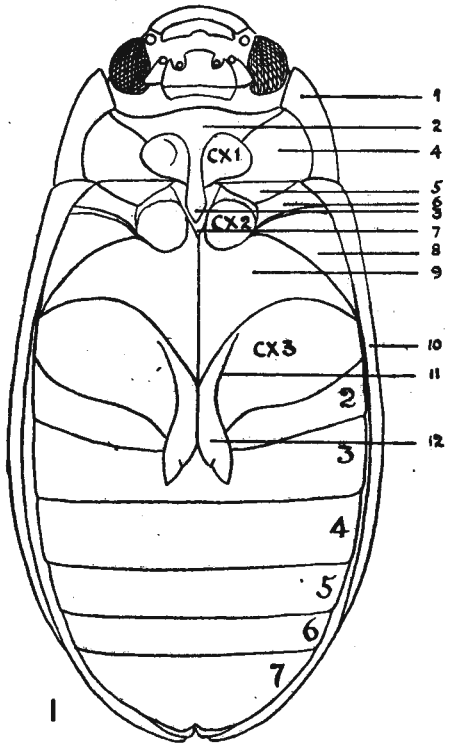
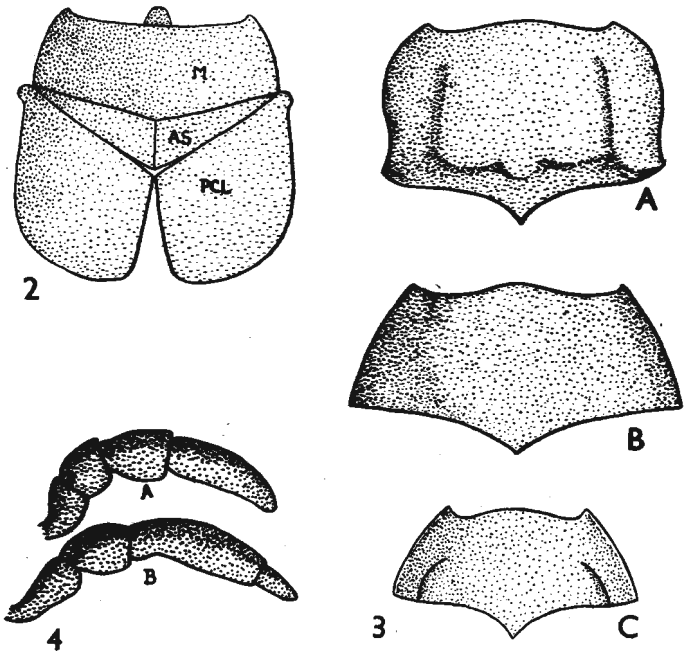


FIG. 1.—Diagram of underside of Dytiscid beetle with parts named that are referred to in the keys. cx1 and 2 are 1st and 2nd coxal cavities. cx3 is 3rd coxa fused to metasternum. (1) Overlap or epipleuron of pronotum; (2) prosternum; (3) prosternal process; (4) epimeron of prosternum, the episternum not usually being cut off from the prosternum; (5) and (6) meso-episternum and meso-epimeron; (7) apex of mesosternal groove; (8) met-episternum, the met-epimeron being under the elytron and on upper side of body; (9) metasternum; (10) elytral epipleuron; (11) post-coxal line or suture; (12) post-coxal process. The visible abdominal sterna 2–7.

The four families of the British Carnivorous Coleoptera can be distinguished as follows :

1 Antecoxal sclerite present (fig. 2).....2.
No such sclerite.....3.
2 Post-coxae with large ventral plates (fig. 2).....HALIPLIDAE
No ventral plates.....HYGROBIIDAE
3 Antennae filamentous ; eyes undivided.....DYTISCIDAE
Antennae bulging ; eyes divided into upper and lower sections.....GYRINIDAE



FIGS. 2–4.—2. Metasternum of *Haliplus obliquus* to show antecoxal sclerite (*as*) and meta- or post-coxal plates (*pcl*), metasternum (*m*). 3. Pronotum of (A) *Brychius elevatus* Panz., (B) *Haliplus fulvus* F., (C) *H. lineatocollis* Marsh. 4. Maxillary palpus of (A) *Peltodytes ;* (B) *Haliplus.*

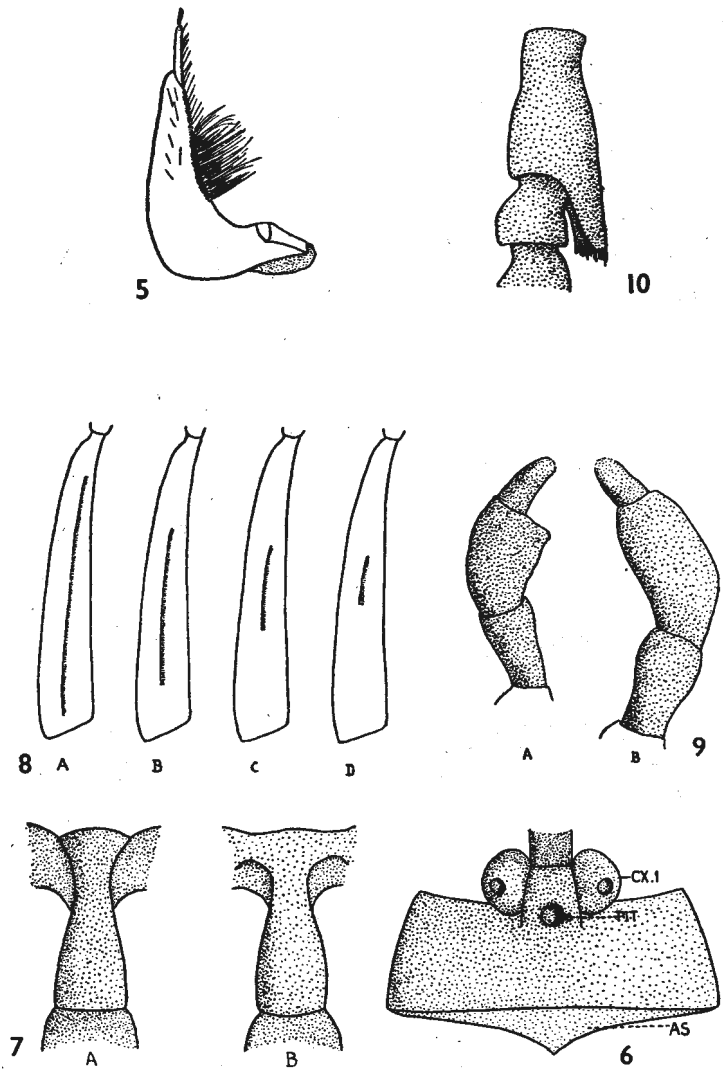
HALIPLIDAE.

At once recognisable by two underside characters : (1) the antecoxal sclerite and (2) the large post-coxal plates concealing the bases of the posterior legs. There are three genera distinguished as follows :

1 Pronotum square (fig. 3A) ; elytra with longitudinal ridges and grooves **Brychius** Thomson
Pronotum expanding from anterior to posterior margins (fig. 3B).....2.
2 Apical segment of maxillary palp long and conical .....**Peltodytes** Régimbart
That segment small and tapering (fig. 4).....**Haliplus** Latreille

Brychius Thomson.

B. elevatus Panzer. The only species. (*Common in running water but less so in the north.*)



FIGS. 5–10.—5. Left paramere of *Haliplus fulvus* F. to show the extra piece at the apex, characteristic of all the *fulvus*-group species except *laminatus* Schall. 6. Metasternum of *Haliplus fulvus* F. showing the pit present in all the species of the *fulvus*-group excepting *mucronatus* Steph. CX1, ant. coxa ; AS, antecoxal sclerite. 7. Prosternal process of (A) *Haliplus fulvus* F. and (B) *flavicollis* Sturm. 8. Diagrammatic drawings of left metatibia (inner face) showing relative lengths of the series of spine-bearing pits in (A) *Haliplus mucronatus* Steph., (B) *H. flavicollis* Sturm, (C) *H. fulvus* F., (D) *H. variegatus* Sturm. 9. Labial palpus of (A) *Haliplus laminatus* Sturm, (B) *H. flavicollis* Sturm, showing the difference in the second segment. 10. Basal segments of mid-tarsus of *Haliplus laminatus* Sturm, ♂, showing the shovel-shaped basal segment.

Peltodytes Régimbart.

P. caesus Duftschmidt. The only species. (*Mostly in ponds in south and south-east England.*)

Haliplus Latreille.

16 species divided into four " species-groups " thus :

1 Upper and lower surfaces of body with fine but distinct punctuation **Confinis**-group (p. 5).
At least the lower surface without fine punctation ..... 2.
2 No pronotal striae. Post-tibiae with spine-bearing pits on upper face. Left paramere with a small apical segment (fig. 5) (except in *laminatus*) **Fulvus**-group (p. 5).
Striae present. No spine-bearing pits on post-tibiae. No apical segment on left paramere ..... 3.
3 Striae short, less than one quarter length of pronotum ..... **Ruficollis**-group (p. 5).
Striae long and curved ; about half length of pronotum (fig. 3c) .. **Lineatocollis**-group (p. 9).

Key to Species of *Confinis*-group.

Pronotum without striae. Elytral colouring somewhat blotchy .. **obliquus** Fabricius
(*Stagnant water. Widely spread in England, less common in Scotland : scattered about Ireland.*)
Striae present. Colouring linear ..... **confinis** Stephens
(*Fairly common in ponds and lakes throughout Britain and Ireland.*)

Key to Species of *Fulvus*-group.

Five species.

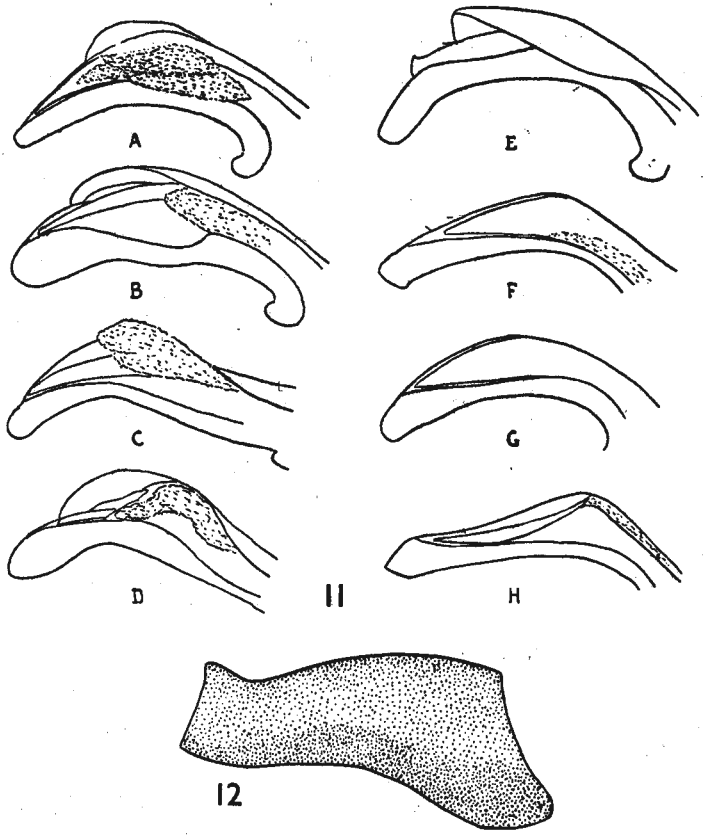
1 Anterior projection of metasternum with a pit (fig. 6) ..... 2.
No pit ..... **mucronatus** Stephens
(*Mainly south and south-east England and mostly in gravel or silt ponds.*)
2 Prosternal process with a definite ridge across base and with side lines well marked to base (fig. 7a). Series of spine-bearing pits on inner face of metatibia of not more than half the length (fig. 8c, d) ..... 3.
Prosternal process with at most a faint indication of a line across base (fig. 7b). Spine-bearing pits series more than three-quarters length of metatibia (fig. 8a) ..... 4.
3 Size larger, 3·5–4·0 mm. long. Spine-bearing pits with 10 or more spines, the series about one-third the length of the tibia (fig. 8c) ..... **fulvus** Fabricius
(*Common throughout Britain and Ireland.*)
Size smaller, 2·5–3·0 mm. long. Series one-quarter or less the length of the tibia and with few spines (fig. 8d) ..... **variegatus** Sturm
(*More frequent in east and south-east England than elsewhere ; four Irish county records. Stagnant water.*)
4 Size smaller, 2·5–3·0 mm. long. Second segment of labial palp enlarged on inner side (fig. 9a) ..... **laminatus*** Schaller
(*So far, only found in England and mostly in south and east. Rivers, canals, silt ponds.*)
Size larger, 3·5–4·0 mm. Labial palp with normal second segment (fig. 9b) **flavicollis** Sturm
(*Common in England and south Scotland, scattered farther north. Common in Ireland. Stagnant and running water.*)

Key to Species of *Ruficollis*-group.

Eight species. The males are separated from the females on one, two or three visible characters : (1) the thickened basal segment of the mid-tarsus ; (2) the anterior tarsi usually are thicker and in some spp. the anterior tarsal claws are unequal ; (3) in some

* *H. laminatus* ♂ differs from all the rest of the *fulvus*-group in having the basal segment of the mid-tarsus shovel-shaped (fig. 10).

species the female elytra are finely punctured all over or towards the apex. The males are most easily distinguished from one another by the differences in the aedeagus (fig. 11).



FIGS. 11–12.—11. The aedeagus of each sp. of the *Haliplus ruficollis*-group. (A) *H. ruficollis* Deg.; (B) *H. wehnckei* Gerh.; (C) *H. lineolatus* Mannerh.; (D) *H. heydeni* Wehncke; (E) *H. immaculatus* Gerh.; (F) *H. apicalis* Thoms.; (G) *H. fluviatilis* Aubé; (H) *H. furcatus* Seidl. 12. Basal segment of mid-tarsus of ♂ of *Haliplus lineolatus* Mannerh. showing the excised under edge.

Having separated the sexes, use the following keys:

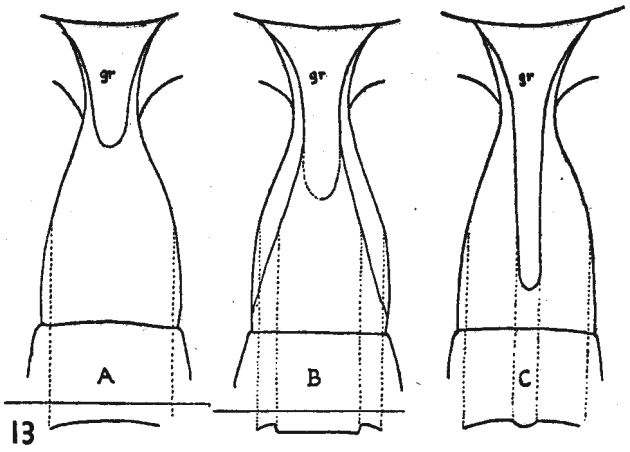
Males.

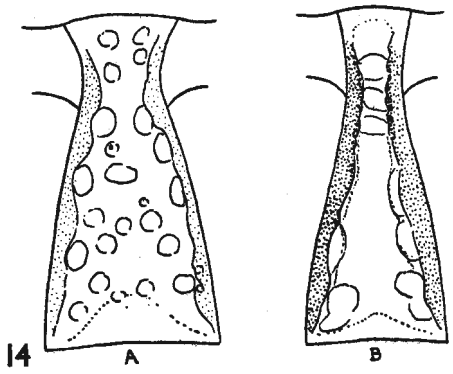
1 Anterior tarsi with claws equal or subequal.....2.
Anterior tarsi with inner (anterior) claw shorter than outer and strongly curved inwards.....3.

2 Basal segment of mid-tarsus not excised.....5.
Basal segment excised (fig. 12).....**lineolatus** Mannerheim
(*Throughout Britain, but mostly in lakes, where it is common. The northern form* (nomax) *is not known south of about Yorks. Common in several parts of Ireland and probably all over.*)

3 Basal segment of mid-tarsus not excised.....4.
Basal segment excised (see fig. 12).....**immaculatus** Gerhardt
(*Common in England, Scotland and Ireland in lakes, canals, ponds and marshes.*)

4 Thoracic striae long and straight, about one-quarter length of pronotum. Prosternal process with a median groove from base almost to apex (fig. 13C)
wehnckei Gerhardt
(*Widespread in Britain and Ireland in ditches, ponds, canals and rivers.*)
Thoracic striae short and usually slightly curved. Prosternum with a median groove extending only a little way on the process (fig. 13A)....**ruficollis** Degeer
(*Common.*)





FIGS. 13–14.—13. Three types of prosternal process seen in the 8 spp. of the *Haliplus ruficollis* group. In the simplest (A) there is a groove (*gr*) anteriorly occupying little more than the length of the prosternum and very little of the process, e.g., *H. ruficollis, heydeni.* In the next type (B) the groove is longer and spreads into a wide depression covering most of the width and all the length of the process, e.g., *H. apicalis, furcatus, immaculatus, lineolatus.* In the third type (C) the groove extends almost to the apex of the process without expanding, e.g., *H. fluviatilis, wehnckei.* A transverse section of the upper face is shown below each type. 14. Prosternal process of (A) *Haliplus fluviatilis* Aubé and (B) *H. furcatus* Seidl., similar in type but differing in width and depth of depression.

5 Thoracic striae long and curved, about one-third length of pronotum. The process with a groove expanding into a depression to, or almost to, apex (fig. 12B) ..... **apicalis** Thomson
(*Brackish water; scattered round coasts of England and south-west Scotland and Co. Down, Ireland. Also in ponds in Warwick and Worcester above salt mines.*)
Thoracic striae short ..... 6.

6 Body short and rounded. Prosternum with short median groove and smooth process ..... **heydeni** Wehncke
(*An "English" species. Not uncommon when found. Inhabits mainly grassy ponds and ditches.*)
Body long. Prosternum not as in *heydeni* ..... 7.

7 Body widest behind shoulders. Width of elytra compared with length 4:5. Prosternum nearly twice as long as wide. Sculpture of process rather vague, perhaps mostly towards 13B. (See fig. 14A) ..... **fluviatilis** Aubé
(*Common in England and south Scotland and with a scattered distribution in Ireland. Running water, mostly rivers.*)
Body more evenly curved. Width of elytra to length 3:4. Prosternum 2½ times as long as wide (fig. 14B) ..... **furcatus** Seidlitz
(*So far, only two records for this species, both in Somerset. Stagnant ponds.*)
Note.—The aedeagophore is the only safe character for separating these two species.

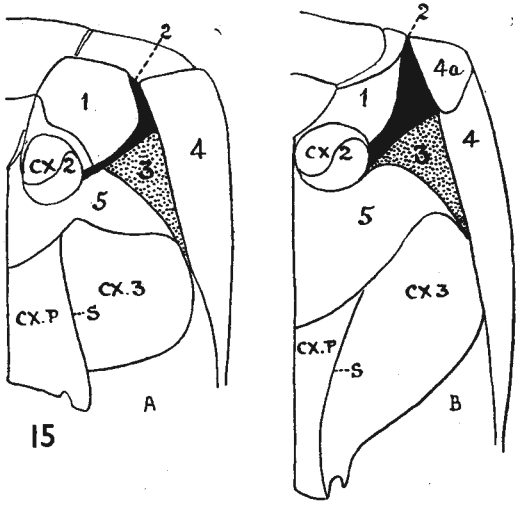


FIG. 15.—Part of underside of (A) a Noterine and (B) a Dytiscine. In (A) the mesepimeron, 2 (black), is narrow and bent and the metepisternum, 3 (dotted), does not reach the mid-coxa (CX2). In (B), 2 (black) is wide and may be triangular or quadrilateral, and 3 (dotted) does reach the mid-coxa. In (A) the post-coxal process (CXP) is expanded laterally and overlaps part of the metacoxa (CX3), while in (B) the coxal margin or line (S) is fused on to the CX3. Mesepisternum (1); Mesepimeron (2); metepisternum (3); elytral epipleur (4) with a "bordered pit" (4*a*); metasternum (5).

Females.

8 Elytra with interstrial punctuation from apex to base ..... 9.
Interstrial spaces either without punctuation or only on apical half ..... 13.

9 Prosternal process with at most a groove to half-way from base ..... 12.
Prosternal process either with narrow groove throughout length or with groove at base widening to apex ..... 10.

10 Thoracic striae long and straight ..... 11.
Thoracic striae very short, little more than outer border of a small pit
furcatus Seidlitz

11 Prosternal process with groove widening so that it becomes a wide space with a raised border on each side (fig. 13B) ..... **apicalis** Thomson (*striatus* Sharp)
Process with a narrow groove throughout ..... **lineolatus** Mannerheim
12 Thorax with sides almost straight; body form slightly narrowed. Prosternal process tending towards type B ..... **fluviatilis** Aubé
Thorax with sides curved and strongly convergent in front. Body widest behind shoulders. Prosternal groove short and not expanding ..... **ruficollis** Degeer
13 Thoracic striae long and straight; prosternal groove as in male (fig. 13C) **wehnckei** Gerhardt
Thoracic striae short and curved ..... 14.
14 Body form short and rounded. Prosternum with short median groove (fig. type *A*) ..... **heydeni** Wehncke
Body form long. Prosternal groove widening ..... 15.
15 Elytral punctuation limited to apical third or absent. Prosternal groove of type *B* **immaculatus** Gerhardt
Elytral punctuation extending at least over apical half. Prosternal sculpture usually weak and variable ..... **fluviatilis** Aubé
(It will be seen that the last species occurs twice in the above key. The prosternal sculpture is sometimes not unlike that of *ruficollis* and this applies to both sexes.)

Lineatocollis-GROUP.

Only the one species. *H. lineatocollis* Marsham. (*Common throughout Britain, mostly in stagnant water.*)

HYGROBIIDAE (PELOBIIDAE.)

Hygrobia Latreille.

H. hermanni F. (*Pelobius tardus* Herbst). The only species, sometimes known as "Squeak beetle" because it stridulates when excited. At once recognisable on two characters: antecoxal sclerite (*see* fig. 2) present. No post-coxal plates (*see* fig. 2). A large somewhat globular insect. For life-history see *Proc. zool. Soc. Lond.* **1922** : 79–97. (*An "English" species found in southern half of country, mostly in silt ponds.*)

DYTISCIDAE.

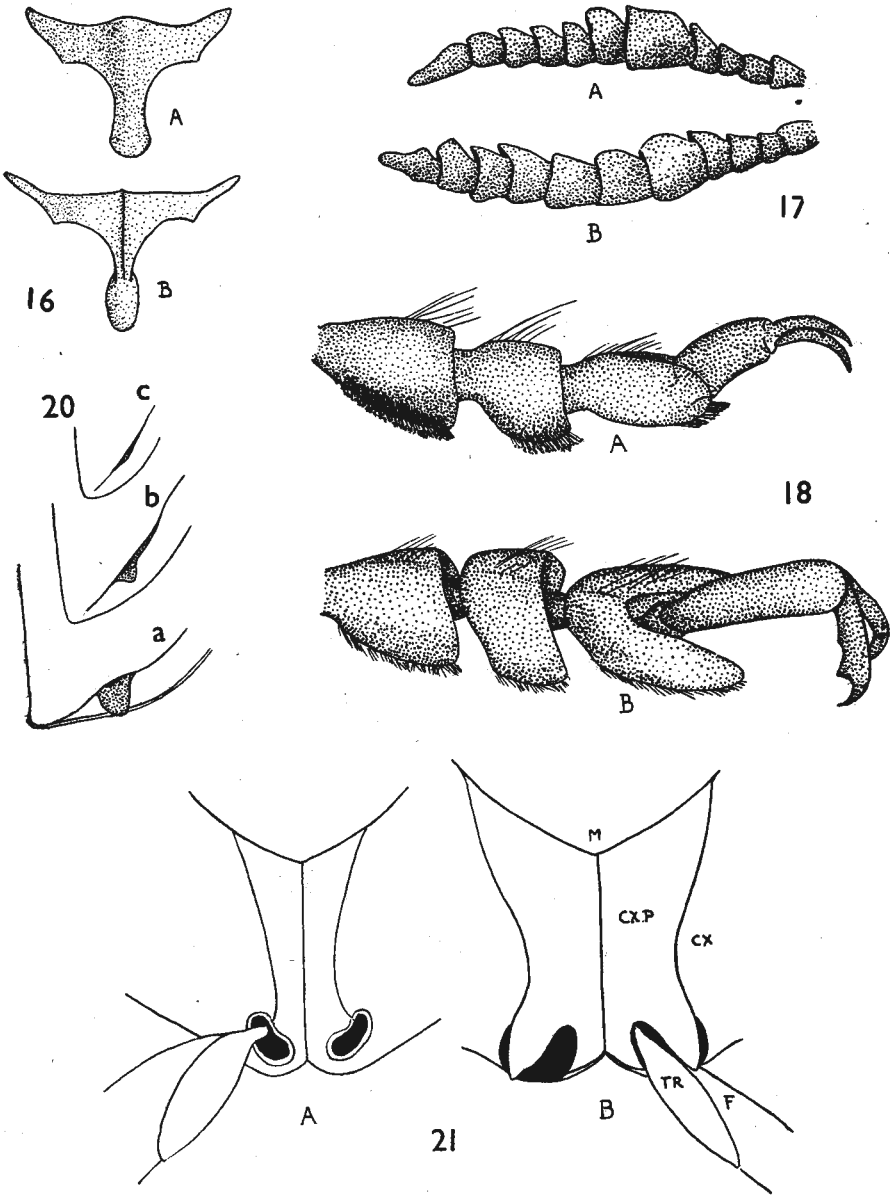
Divided into two subfamilies, Noterinae and Dytiscinae, although some authors prefer to make the Noterines a separate family.

1 Mesothoracic epimera (fig. 15B) wide, triangular or four-sided. Metathoracic episterna (fig. 15B) reaching mid-coxal cavity
DYTISCINAE (except Laccophilini) (p. 11).
Mesothoracic epimera linear and bent. Meta-thoracic episterna not reaching mid-coxal cavity (fig. 15A) ..... NOTERINAE (p. 9).

Subfamily NOTERINAE.

A large subfamily with a number of genera but represented here only by *Noterus*, the two species separated thus:

Size small, 3·5–4·0 mm. long. Prosternum without keel (fig. 16A). See also the antenna (fig. 17A) ..... **clavicornis** Degeer
(*Most parts of England as far north as Yorks. and Kirkcudbright and Fife in Scotland. Widely spread in Ireland. Stagnant water and edges of lakes and canals.*)
Size larger, 4·0–5·0 mm. long. Prosternum keeled (fig. 16B)
capricornis Herbst (*sparsus* Marsham)
(*Much the same range in England and Ireland as* clavicornis *but more common. In Scotland: Dumfries, Kirkcudbright, Fife and Raasay Island, North Ebudes.*)



FIGS. 16–18, 20–21.—16. Prosternum of (A) *Noterus clavicornis* Deg. and (B) *N. capricornis* Herbst, the first smooth, the second keeled. 17. Antennae of males of (A) *Noterus clavicornis* Deg. and (B) *N. capricornis* Herbst drawn to the same scale. 18. Anterior tarsus of (A) *Hygrotus versicolor* Schall. and (B) *Hydroporus dorsalis* F. showing the " tetramerous " and pseudo-tetramerous conditions in the Hydroporines. 20. Elytral ligula. Underside of apex of elytron of (A) *Hyphydrus ovatus* L. ; (B) *Hygrotus versicolor* Schall. ; (C) *Bidessus unistriatus* Schr. 21. Part of metasternum (M) and post-coxae (CX) of (A) *Bidessus geminus* F. and (B) *Hydrovatus clypealis* Sharp showing the closed coxal cavities (black) of the first and the open ones of the second. CX P = post-coxal process ; TR = trochanter ; F = femur.

Subfamily DYTISCINAE

Divided into four Tribes.

1 Metathoracic episterna reaching mid-coxal cavities (*cf.* fig. 15B). Parameres alike (with one exception). Mesoscutellum visible or invisible.....2.
Metathoracic episterna not reaching mid-coxal cavities. Parameres dissimilar ..... Tribe 2. LACCOPHILINI (p. 19).
2 Mesoscutellum invisible. Anterior and mid-tarsi tetramerous or pseudo-tetramerous (fig. 18).....Tribe 1. HYDROPORINI (p. 11)
Mesoscutellum visible. All tarsi pentamerous.....3.
3 Anterior border of eye excised (fig. 19A).....Tribe 3. COLYMBETINI (p. 19)
No excision of eye margin.....Tribe 4. DYTISCINI (p. 27)

Many authors place the Laccophilini as the first tribe ; some even include the Noterines in the Laccophilini. I regard the Laccophilines as a more advanced section of the Dytiscids than the Hydroporines, although I placed them as first Tribe in *British Water Beetles*.

Tribe 1. Hydroporini.

Includes eight genera separated as follows :

1 Post-coxal processes open behind (fig. 21B). Apices of elytra reduced to a fine point. Bordered epipleural pit (fig. 15B). Prosternal process as broad as long. No elytral ligula (see fig. 20).....**Hydrovatus** Sharp (p. 13)
Post-coxal processes closed behind (fig. 21A). Ligula present or absent.....2.
2 A longitudinal stria on each side of pronotum extending on to elytra. Small ligula (fig. 20c).....**Bidessus** Sharp (p. 13)
Longitudinal striae on pronotum only (*Hydroporus* subg. *Graptodytes*) ; otherwise absent.....3.
3 Post-tarsal claws unequal. Anterior and mid-tarsi tetramerous (see fig. 18A). Epipleural pit present Large elytral ligula (fig. 20A....**Hyphydrus** Illiger (p. 13)
Post-tarsal claws equal. Anterior and mid-tarsi tetramerous or pseudo-tetramerous (fig. 18).....4.

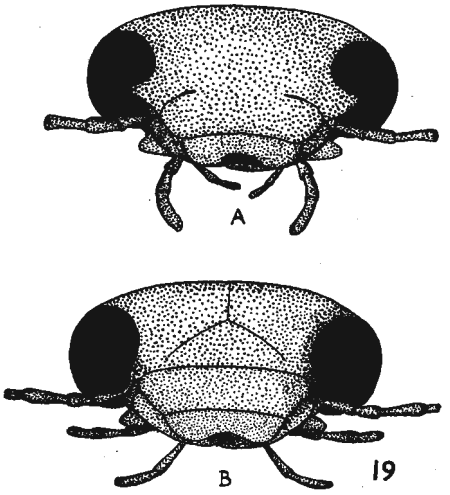
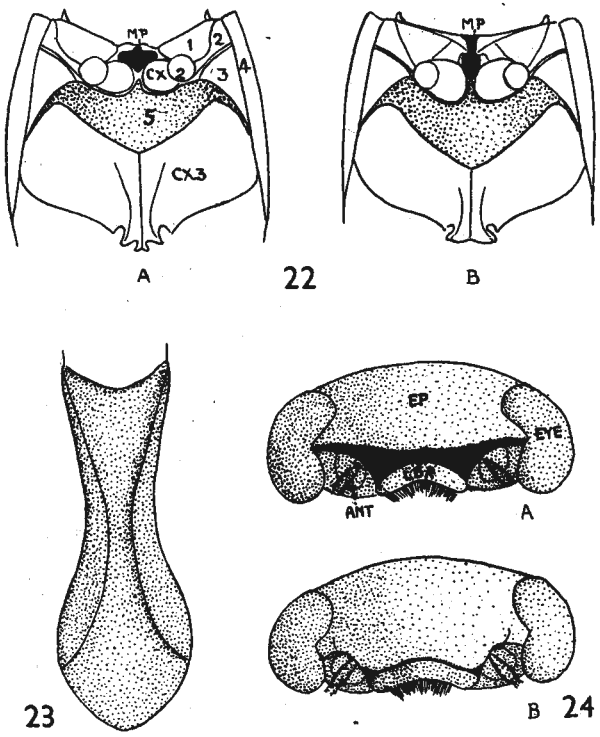


FIG. 19.—Front view of the head of (A) a Colymbetine (*Agabus*) and (B) a Dytiscine (*Dytiscus*) to show the " excised " eyes of the former.



FIGS. 22–24.—22. Underside of meso- and metasternum of (A) *Deronectes* and (B) *Hydroporus* to show the relationship between the mesosternal process (black) and the intercoxal process of the metasternum (dotted). In *Deronectes* the two do not make contact while in *Hydroporus* they do. MP = mesosternal process. Numbers and letters as in fig. 15. 23. Prosternal process of *Laccornis oblongus*, spathulate and bordered. 24. Showing difference between the two subgenera of *Hygrotus*. (A) *Hygrotus* s. str. Large clypeal area (black) and a projecting ridge between it and the epicranium (EP); (B) *Coelambus* Thoms. Ridge absent and clypeus reduced. LBR = Labrum; ANT = base of antennae; EP = Epicranium.

4 Bordered pit on elytral epipleur present (fig. 15B). Elytral ligula present and distinct (fig. 20B). Anterior and mid-tarsi tetramerous (fig. 18A)
Hygrotus Stephens (p. 13)
No bordered pit. Elytral ligula absent or very small. Anterior and mid-tarsi tetramerous.....5.

5 Meso- and meta-sterna not connected in the middle line (fig. 22A). Ventral face of post-femur with a scanty coating of short hairs.....**Deronectes** Sharp (p. 14)
Meso- and meta-sterna connected (fig. 22B). Ventral face of post-femur with a median line of long hairs and shorter lines, one on each side.....6

6 Pronotum with a depression on each side behind and also a transverse depression between these.....**Oreodytes** Seidlitz (p. 14)
Pronotum without any depression or with only the side ones or the transverse....7.

7 Posterior margin of pronotum slightly curved and in mid-line projecting backwards into a slight point. Sides of elytra rounded or more or less parallel. Prosternal process never approaching same width as length....**Hydroporus** Clairville (p. 15)
Posterior margin of pronotum of two almost straight lines meeting in mid-line without projection into a point. Elytra definitely parallel-sided. Prosternal process spathulate and bordered; width approaching length (fig. 23)
Laccornis Des Gozis (p. 19)

Hydrovatus Motschulsky.

H. clypealis Sharp. The only species. (*Confined to southern England, chiefly in Dorset and South Hants. Ponds, lakes and canals.*)

Bidessus Sharp.

1 Head without transverse groove behind eyes. Elytral striae, which form a continuation of pronotal striae, very short, less than one-eighth of length of elytra **geminus** Fabricius
(*Covering most of England; in silt ponds and drains on marshes.*)
Head with transverse groove. Sutural striae less than length of elytra.....2.
2 Form oval, tapering to a point. Elytral striae less than one-third length of elytra. Sutural striae not more than half length of elytra.....**unistriatus** Schrank
(*A south-east English species; both in brackish and freshwater ponds.*)
Form parallel-sided. Elytral striae about half the length of elytra. Sutural striae more than half the length of elytra.....**minutissimus** Germar
(*A south-west and west species ranging from Devon up west coast to south-west Scotland. Usually in rivers amongst gravel. July–September.*)

Hyphydrus Illiger.

H. ovatus L. The only species. (*Common throughout England, Wales and south Scotland. Stagnant water.* A small red oval beetle.)

Hygrotus Stephens.

Eight species, usually divided into two subgenera, *Hygrotus* s. str. and *Coelambus* Thomson distinguished thus:

1 Clypeus (epistome) with thickened anterior border and a transverse ridge near the front (fig. 24A). All the species globular.....**Hygrotus** (p. 13)
Clypeus smoothly rounded without thickened border and transverse ridge (fig. 24B). Three species elongate, one globular.....**Coelambus** (p. 13)

Subgenus **Hygrotus.**

1 Elytral punctuation with large and small punctures, the large much scarcer than the small. Punctures on elytral epipleurs (see fig. 1(10)) much smaller than those on metasternum (see fig. 1(9)). Metepisternum (see fig. 1(8)) shagreened **versicolor** Schaller
(*An "English" species more common in the south. Rivers, lakes, canals and slow-flowing drains.*)
Elytral punctuation without the small punctures, the large ones being closely packed. Epipleural punctures about same size as those of metasternum. Metepisternum shining or shagreened.....2.
2 Metepisternum shining.....**decoratus** Gyllenhal
(*South-east English species with a range extending as far north as Yorks. A detritus pond species.*)
Metepisternum shagreened.....3.
3 Punctuation on elytra almost uniform Elytral colouring more black than testaceous and more blotchy than linear.....**inaequalis** Fabricius
(*Common and generally distributed.*)
Punctuation slightly irregular, a proportion of the punctures being rather smaller but not enough to suggest the difference seen in *versicolor*. Clypeal border narrow, especially in the middle. Elytra usually marked with broad black and testaceous longitudinal bands.....5-**lineatus** Schaller
(*British records few and scattered but mostly in the north. In lakes, rivers and canals.*)

Subgenus **Coelambus.**

1 Form globular. Upperside colour pale testaceous. Epipleural pit (see fig. 15B) elongate longitudinally.....**confluens** Fabricius
(*Typical silt pond species "English," but just reaching southern Scotland.*)
Form elongate. Upper side dark. Epipleural pit as wide as long.....2.

2 Metepisternum shagreened and with irregular deep punctures. Elytra with 3 deeply punctured striae ; punctures of interstrial spaces very coarse and rather elongate ..... **impressopunctatus** Schaller
(*England and south-west Scotland. Stagnant water, fresh and brackish.*)
Metepisternum shagreened but lightly punctured with more or less circular pits. Elytral striae faintly marked and interstrial punctures close but fine and not elongate ..... 3.

♂ Length 4 mm. Sides of pronotum curved. Elytral epipleurs thickly punctured and closing down to very narrow strips at first abdominal sternum **9-lineatus** Stephens
(*Mostly in Scotland and northern England. In lakes, usually over gravel or sand but also in peat lochs.*)
Length 5 mm. Sides of pronotum straight. Epipleurs moderately punctured and extending wide beyond first abdominal sternum ..... **parallelogrammus** Ahrens
(*Mainly in south-east England and in brackish water but also inland.*)

Deronectes Sharp.

1 Elytral sculpture double ; of simple punctures and of punctures sunk in pits. Prosternal process narrow and keeled ..... **latus** Stephens
(*Scattered about Britain except in East Anglia and inland of that area. Running water, mostly amongst gravel.*)
Sculpture simple ..... 2.

2 Median line between post-coxal processes extending back beyond process-lobes (see fig. 26c). Prosternal process broad and flat ..... **12-pustulatus** Olivier
(*Mostly in moving waters and lakes. All over Britain.*)
Median line not extending back beyond process-lobes. Process narrow and slightly raised in mid-line ..... 3.

3 External face of post tibiae thickly punctured ..... **canariensis** Bedel
(*Two specimens now in Brit. Mus. (Nat. Hist.) from Outer Hebrides in* 1935, *from a small loch on Barra.*)
External face with a longitudinal row of punctures only ..... 4.

4 Elytra with a small tooth near apex ..... 5.
Elytra without tooth ..... **griseostriatus** Degeer
(*Only in Scotland and Wales and usually on mountains in lochs and large peat holes. Common where it occurs.*)

5 Length 4·5–5·2 mm. Sides of pronotum strongly curved so that angle between side of pronotum and elytron is well marked ..... **depressus-elegans** F.
(*This is a long series of variations from* depressus *to* elegans Panz., *the former being the northern, the latter the southern form. Both occur in running water and in lakes.*)
Length 4·0–4·3 mm. Sides of pronotum only slightly curved so that angle is scarcely noticeable ..... **assimilis** Paykull
(*Common in Scotland and northern England, but found also in the south. Ponds, marsh drains and lakes.*)

Oreodytes Seidlitz.

1 Upperside almost glabrous, with scattered punctures. Underside finely reticulate in some impunctate areas ; elsewhere shagreened between punctures ..... 2.
Upperside pubescent and densely punctured ; underside punctured but not shagreened ..... **halensis** Fabricius
(*Only Lincs. and East Anglia. Marsh drains, usually moving water. Odd specimens elsewhere.*)

2 Length 4 mm. or more. Elytra rather thickly punctured ..... **davisii** Curtis
(*Mostly Scotland and north England. Rocky or gravelly beds of streams and rivers. Common where it occurs.*)
Length less than 3·5 mm ..... 3.

3 Length about 3 mm. Broad oval, only slightly arched. Elytra finely reticulate with small inconspicuous scattered punctures ..... **rivalis** Gyllenhal
(*All over England and Scotland except some of the south-eastern counties. In small gravelly burns and rivers.*)
Length 3·2–3·5 mm. Oblong oval, only slightly arched. Elytra exceedingly finely reticulate with large distinct scattered punctures **septentrionalis** Gyllenhal
(*All over Scotland and down western England in streams, rivers and lakes.*)

Hydroporus Clairville.

Thirty-three species arranged in five groups named, for convenience, subgenera. These groups are :

1 Pronotum with two longitudinal striae, long or short, one on each side near lateral border.....2.
Pronotum without striae.....3.
2 Elytra with fine reticulation and scattered punctures..I. **Graptodytes** Seidlitz (p. 15)
Elytra without reticulation and very closely punctured
II. **Stictonotus** Zimmermann (p. 15)
3 Prosternal process lanceolate and without lateral border (fig. 25A)
III. **Suphrodytes** Des Gozis (p. 16)
Prosternal process hastate, with lateral border (fig. 25B).....4.
4 Post-coxal processes rounded, with at most a blunt point. Median suture shorter than lobes (see fig. 26B). Double elytral punctuation
IV. **Scarodytes** Des Gozis (p. 16)
Post-coxal processes truncate. Median suture as long as or longer than lobes. Elytral punctuation single.....V. **Hydroporus** s. str. (p. 16)

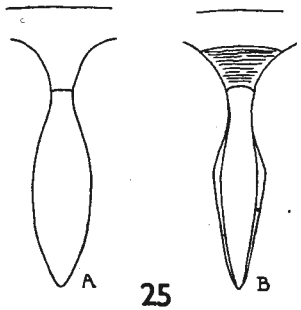


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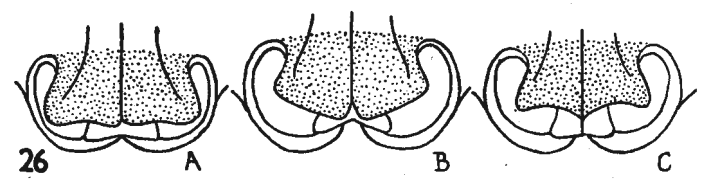
FIG. 25.—Prosternal process of (A) *Hydroporus* (*Suphrodytes*) *dorsalis* F. and (B) *Hydroporus* (*H*) *rufifrons* Dufts. to show the "lanceolate" type smoothly rounded in (A) and the "hastate" type with lateral border in (B). Note also the transverse grooves across the base in (B).

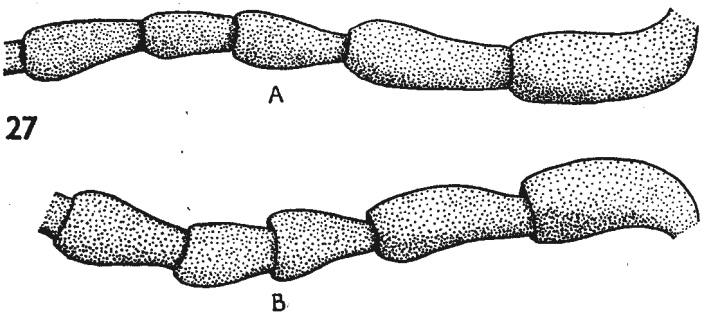
I. **Graptodytes.**

1 Form short oval, Head reddish. Elytra with colours in blotches. Apical segment of labial palps bilobed.....**pictus** Fabricius
(*All over Britain but scarcer in north Scotland. Ponds and ditches.*)
Form long oval. Head pitchy or black. Elytra coloured in lines. Apical segment of labial palps not bilobed.....2.
2 Elytra with 5 longitudinal yellow lines.....**flavipes** Olivier
(*South England and Wales. Stagnant water*)
Elytra with at most one line and with yellowish lateral borders.....3.
3 Length 2·3–2·7 mm. Form long. Middle segments of antennae distinctly longer than wide. Male with anterior tarsal claws unequal, the inner much longer
bilineatus Sturm
(*Somerset, Essex, Kent and Sussex. A pond species not averse to brackish water.*)
Length 2·0–2·3 mm. Form short. Middle segments of antennae nearly as wide as long. Male with anterior claws equal or subequal.....**granularis** Linnaeus
("*English*" *with a few records in west Scotland. Stagnant water.*)

II. **Stictonotus.**

H. lepidus Olivier. The only species. (*Widely spread but scarcer in north Scotland. Clear waters, more usually running streams.*)





FIGS. 26–27.—26. Post-coxal processes of three species of *Hydroporus*: (A) *H. gyllenhalii* Schiöd., (B) *H. melanarius* Sturm and (C) *H. longulus* (and *longicornis*) to show the median suture reaching a line drawn across the outer ends of the post margins of the processes (A); not reaching such a line (B); reaching beyond such a line (C). The last also shows the "sinuate" type. 27. Projection drawings of the 5 basal segments of an antenna of (A) *Hydroporus neglectus* Schaum and (B) *H. umbrosus* Gyll. to show the proportion of length to width in the middle segments, a character used several times in the keys.

III. Suphrodytes.

H. dorsalis Fabricius. The only species. (*"English" but less common in the west than elsewhere. A fresh-water insect and usually in stagnant water.*)

IV. Scarodytes.

H. lineatus Fabricius. The only species. (*"English" with a few Scottish records. Apparently less common in the west than elsewhere. Stagnant waters.*)

V. Hydroporus.

1 Elytra micro-reticulate throughout.....2.
Elytra at most micro-reticulate at apex.....22.

2 Post-coxal processes either with straight or rounded apices; not angled or sinuate (fig. 26A).....3.
Post-coxal processes with apices at a distinct angle to one another or sinuate (fig. 26B and C).....7.

3 Body outline more or less parallel-sided.....4.
Body outline rounded.....11.

4 Antennae with fifth and following segments long (fig. 27A).....5.
Antennae with same segments globose or short (fig. 27B)..... **melanarius** Sturm
(*Widespread in Scotland and north England, more scattered in south. A few scattered Irish records. Stagnant pools, often on mountains, and preferably peaty but not necessarily acid.*)

5 Black above. Pronotum without lateral depressions.....**memnonius** Nicolai
(*Fairly common throughout Britain and Ireland; stagnant water.*)
Brown. Pronotum with lateral depressions.....6.
6 Prosternum without transverse grooves. Third anterior tarsal segment not twice as long as second.....**obsoletus** Aubé
(*Most records are for north England and south Scotland, but it is scattered about from Devon to Outer Hebrides. In Ireland a few records from north-east and south-west.*)
Prosternum with grooves (see fig. 25B). Third segment of anterior tarsus twice as long as second.....**ferrugineus** Stephens
(*Scattered about Britain; common in a few centres, mostly in springs. Unknown in Ireland.*)
7 Sides of body parallel or nearly so.....8.
Sides of body rounded.....9.
8 Upper surface shining, micro-reticulation not strong. Body wide, elytra very slightly bulging at sides. Antenna with fifth and following segments globose **longulus** Mulsant (*celatus* Clark)
(*Scattered about Britain and Ireland in springs, wells and trickling, mossy water.*)
Upper surface somewhat dull, micro-reticulation strong. Mid-segments of antenna slightly elongate, i.e., short but less wide.....**longicornis** Sharp
(*Very rare: peat pools in 6 or 7 counties.*)

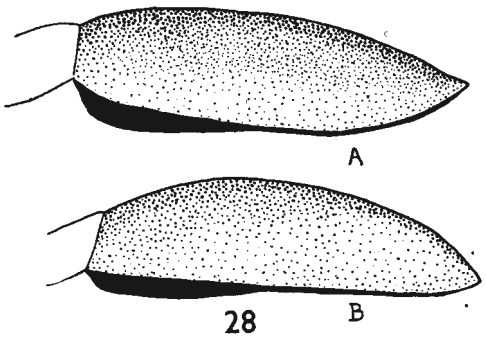


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FIG. 28.—Side view of an elytron of (A) *Hydroporus palustris* L. and (B) *H. rufifrons* Dufts., the elytral epipleurs in black; showing the curved edge of the elytron at the base in (A) and the almost straight edge in (B).

9 Post-coxal processes not sinuate. Pronotum red.....10.
Post-coxal processes sinuate (fig. 26C). Pronotum black.....**neglectus** Schaum
(*An "English" species not known north of Yorks, and with a scattered distribution. Not common, but more frequent in eastern counties. Swampy moss.*)
10 Length up to 2 mm. Basal segment of metatarsus about same length as third **scalesianus** Stephens
(*A south-eastern species that used to be found as far north as Askham Bog, York. Otherwise, with a few exceptions, it is definitely south-eastern. Mossy swamps.*)
Length 3 mm. Basal segment of metatarsus definitely longer than third (3rd not more than two-thirds length of basal).....**angustatus** Sturm
(*Widely spread over Britain and Ireland. Mossy swamps and mossy patches in marsh drains.*)
11 Prosternum without transverse grooves.....12.
Prosternum with transverse grooves (see fig. 25B).....13.
12 Antennae with 5th and following segments long (see fig. 27A) Elytral micro-reticulation normal.....**palustris** Linnaeus
(*Common everywhere.*)
Antennae with mid-segments short. Elytral micro-reticulation weak, almost obsolete.....**tessellatus** Drapiez (*lituratus* Brullé)
(*All over England, but scattered in Scotland. All over Ireland. Stagnant water, acid or otherwise.*)

13 Side view of pronotum and elytron shows distinct bend (fig. 28A).....15.
Side view shows weak angle (fig. 28B).....14.

14 Insect black .....**nigrita** Fabricius.
(*Much more common in the north but found all over England. Scotland. Many gaps in Irish distribution. Ponds, ditches and peaty places.*)
Insect red.....**obscurus** Sturm
(*More common in Scotland and north England and widely scattered in Ireland. Largely favours peaty ground, but either acid or basic.*)

15 Apex of median suture of post-coxal processes extends to but not beyond a line across the apices of the processes (see fig. 26).....18.
Apex extends beyond line (see fig. 26c).....16.

16 Length 3 mm. Pronotum not much narrowed in front.....**tristis** Paykull
(*Widespread in Scotland and north England; more scattered in south. Ireland, mostly in north. Stagnant pools, preferably peaty.*)
Length 4–5 mm. Pronotum narrowed in front.....17.

17 Length 4 mm. Lateral margins of pronotum with narrow, not very distinct, borders. Upper side with long hair (except when old)..**erythrocephalus** Linnaeus
(*Common everywhere.*)
Length 5 mm. Upper surface more or less glabrous. Lateral margins of pronotum with distinct borders.....**ruficrons** Müller
(*Scattered through Britain; very local. Stagnant ponds and ditches, peaty or otherwise.*)

18 Length 2·5 mm. Elytra dark brown. Pronotum with weak borders. Mid-segments of antennae short and thick (see fig. 27).....**umbrosus** Gyllenhal
(*All over Britain but fewer records in the south. All over Ireland but with many gaps. Stagnant water, mostly ponds and ditches.*)
Length 3·2 mm. and upwards. Elytra brown or black. Mid-antennal segments long .....19.

19 Body shining black. Length 3·2 mm. Elytra gradually widened. Widest part about one-third from apex. Pronotum with distinct lateral borders..**morio** Aubé
(*Scotland and northern half of England. Mainly coastal in Ireland. Mostly a mountain species. Peaty pools.*)
Body dark brown with or without light markings. Pronotal borders distinct or weak.....20.

20 Upperside self-coloured, brown, glabrous. Pronotum and elytra covered with large punctures.....**gyllenhalii** Schiödte
(*A common peat pool species found also in other types of stagnant water.*)
Upperside brown, light or dark, usually with distinct light markings. Not glabrous .....21.

21 Length 3·6 mm. Body somewhat flattened and broad and covered with short, not very obvious hair. Pronotum usually reddish at sides and elytra with light markings at base and sides.....**incognitus** Sharp
(*Records scattered about Britain; probably more common in north. Prefers peaty water but not necessarily acid.*)
Length 3·2 mm. Body arched and narrow. Pronotum usually dark but may have light markings. Elytra with or without light markings
striola Gyllenhal (*vittula* Erichson)
(*Throughout Britain and Ireland. Stagnant and slow-flowing waters.*)

22 Elytral punctuation very close, punctures of medium size
marginatus Duftschmidt
(*South England; running water.*)
Elytral punctuation not close, punctures large.....23.

23 Last visible abdominal sternum micro-reticulate between punctures.....24.
Last visible sternum shining between punctures
pubescens Gyllenhal (? *melanocephalus* Marsham)
(*Everywhere in Britain and Ireland. High and low elevations, fresh and brackish water.*)

24 Length 3·5–4·5 mm. Body elongate but broad. Elytra dark brown. Prosternum without transverse grooves or with very faint indications of them. Mid-antennal segments elongate or subovoid.....25.
Length 3·0–3·5 mm. Body square-shaped. Elytra black and shining. Mid-antennal segments sub-ovoid (see fig. 27B). Prosternum with transverse grooves (see fig. 25B).....**discretus** Fairmaire
(*Scattered over Britain and Ireland but found mainly in spring water.*)

25 Mid-antennal segments sub-ovoid. (see fig. 27B) Pronotum finely reticulate. Prosternum obsoletely grooved ..... **foveolatus** Heer
(*Only found in one or two peat pools on a mountain in Rhum.*)
Mid-antennal segments elongate. Fine reticulation confined to anterior margin and sides of pronotum; disc and base clear. Prosternum not grooved
planus Fabricius
(*Widely distributed over Britain and Ireland. Rock pools, salt marshes, ponds and running water.*)

Laccornis Des Gozis.

L. oblongus Stephens. The only species. (*Found in 7 English, 1 Scottish and 2 Irish counties. Mostly in acid water in peat pools or in stagnant ditches with decaying vegetation. Not even common where it occurs.*)
(For shape of prosternum, see fig. 23.)

Tribe 2. Laccophilini.

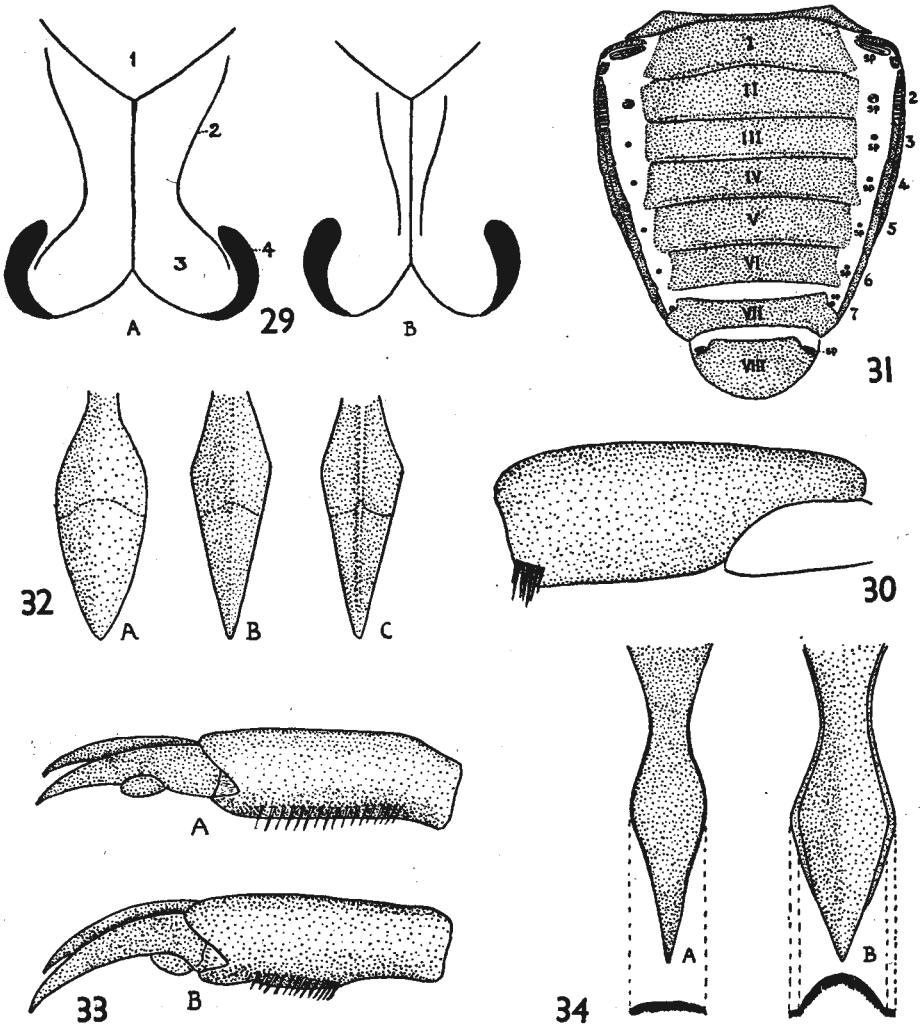
Represented here by the one genus **Laccophilus** Leach which includes three British species distinguished as follows:

1 Colour above, greenish or olive-brown, with or without paler flecks on the elytra. Prosternal process short; the groove in the intercoxal process of the metasternum which receives it not extending beyond a line drawn across the posterior margins of the mid-coxal cavities ..... 2.
Colour black or mottled with brown, with pale yellow flecks on elytra. Prosternal process long, the metasternal recess that receives it extending back beyond the line referred to ..... **variegatus** Germar
2 Pronotum with a very wide obtuse angle in the middle of the posterior border. A " stridulatory file " on each post-coxa in both sexes
hyalinus Degeer (*interruptus* Panzer)
Pronotum with a distinct angle in the middle of the posterior border. No file.
minutus Linnaeus (*obscurus* Panzer)

Tribe 3. Colymbetini.

Includes 6 genera separated as follows:

1 Post-tarsal claws equal or nearly so. Penultimate abdominal spiracles small and round ..... 2.
Post-tarsal claws definitely unequal, Penultimate abdominal spiracles enlarged or transversely widened ..... 4.
2 Post-coxal lines wide apart towards meta-sternum and slightly converging at the processes (fig. 29A). Post-femora with a series of spines on ventral (anterior) surface near apex ..... 3.
Post-coxal lines not widely separated and almost joining at the processes. (fig. 29B) No series of post-femoral spines ..... **Copelatus** Erichson (p. 26)
3 Elytral epipleurs narrow and ending about level with first abdominal segment
Agabus Leach (p. 21)
Elytral epipleurs broad and extending almost to apex of abdomen.
Platambus Thomson (p. 23)
4 Post-femora with a series of spines on ventral (anterior) surface near apex (fig. 30). Epipleurs of apparent first abdominal segment without distinct transverse rugae
Ilybius Erichson (p. 23)
Post-femora without the spine-series. Epipleurs with rugae (fig. 31) ..... 5.
5 Elytral sculpture transverse. Metasternal groove receiving apex of prosternal process shallow and indistinct ..... **Colymbetes** Clairville (p. 26)
Elytral sculpture not transverse. Metasternal groove deep
Rantus Stephens (p. 26)



FIGS. 29–34. — 29. Post-coxal processes of (A) an Agabine and (B) *Copelatus* showing the coxal lines (2) wide apart in (A) and close together in (B). (1) = metasternum ; (3) = coxal process ; (4) = coxal cavity. 30. Ventral face of left post-femur of an *Agabus* to show the characteristic series of spines of the *Agabus*-section of the Colymbetini. 31. Upper surface of abdomen of a *Rantus* sp. showing the eight terga, the spiracles in the membrane between terga and epipleurs, the epipleurs of segment 2 being " rugose," i.e., transversely grooved. 32. Types of prosternum : (A) lanceolate and arched ; (B) hastate and tectiform ; (C) hastate and carinate. The dotted lines indicate the surface shape. 33. Apical segment and claws of right anterior tarsus of male of (A) *Agabus conspersus* Marsh. and (B) *A. nebulosus* Forst. to show the position of the " tooth " on the inner claw and of the spines on the apical segment. 34. Prosternal process of (A) *Agabus arcticus* showing shape and, below, the flat surface, and (B) *A. chalconatus* with a wide border and an highly arched surface.

Agabus Leach.

Nineteen species which have been placed in several sub-genera, which are of very doubtful value, and the following key should serve to identify all the species.

1 Basal segment of post-tarsus three times as long as the second. Male with several apical segments of antennae enlarged.....**serricornis** Paykull
(*Doubtful as British; recorded by Stephens, 1828, on the authority of F. W. Hope, who gave Netley, Salop, as the locality.*)
Basal segment only twice as long as second. Male with antennae tapering to apices.....2.

2 Post-tarsus of long segments; e.g., basal segment 4 times as long as wide.....3.
Post-tarsus of short segments.....5.

3 Upperside black. Pronotum with complete set of punctures along anterior border. Prosternal process rather wide and with a very low median ridge (see fig. 32). Elytra with elongate meshes of reticulation.....**melanarius** Aubé
(*Only taken in 7 English counties and 1 Scottish. Usually found in some numbers when discovered. Shallow pools in woods amongst decaying leaves.*)
Colour pitchy. Gap in middle of row of punctures along pronotum. Prosternal process without ridge but arched. Reticulation meshes as broad as long.....4.

4 Antennae and palpi usually reddish-brown but sometimes dark. Elytral sculpture distinct; elytra slightly dull. Male with anterior tarsal claws simple **guttatus** Paykull
(*All over Britain but very local. Scattered in Ireland. Chiefly found in trickling streams, often at high altitudes.*)
Antennae and palpi pitchy. Elytra shining, the sculpture not deeply impressed. Male with inner tarsal claw toothed.....**biguttatus** Olivier
(*Scattered about Britain and in three counties in Ireland. Chiefly in springs and even deep in the gravel.*)

5 Posterior legs short and broad. Basal segment of post-tarsus about twice as long as wide.....6.
Posterior legs of medium length. Basal segment of post-tarsus nearly three times as long as wide.....7.

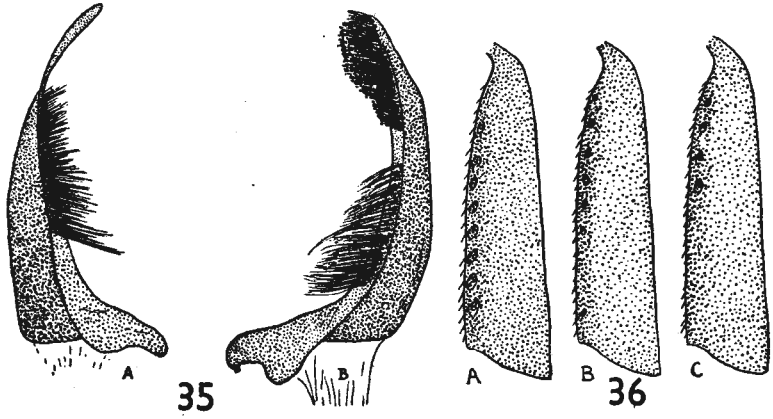
6 Upperside unicolorous, coppery-red. Base of outer face of paramere of brown chitin.....**brunneus** Fabricius
(*Confined to Cornwall, Devon, Dorset and Hants. Running water.*)
Upperside brassy-brown with light marks on elytra. Parameres without any brown chitin on outer face.....**didymus** Olivier
(*Over most of England, but so far absent from a number of counties in the west.*)

7 Upperside yellowish-testaceous; elytra spotted or blotched.....8.
Upperside black, brown olive or brassy-green.....9.

8 Bases of femora pitchy. Upper side almost unicolorous, i.e., blotches faint; no lineation in the markings. Male with elongate projection on underside of anterior tarsal inner claw. Underside of claw-bearing segment with a "brush" of spines covering most of the length (fig. 33A).....**conspersus** Marsham
(*A brackish water species mostly on the east and south coasts of England and south-west Scotland and in Ireland in east, south and south-west counties.*)
Bases of femora usually yellow, Upper surface with black spotting, usually distinctly lineated; pronotum may have two black spots. Male with blunted tooth at base of anterior tarsal inner claw and with underside of claw-bearing segment with a tuft of spines on outer half (fig. 33B).....**nebulosus** Forster
(*Over most of Britain but less common in north. Scattered about Ireland. A typical pond species, especially silt ponds.*)

9. Form short; upper surface brown. A zigzag yellow mark across base of elytra. Metasternal "wings" very narrow....**undulatus** Schrank (*abbreviatus* Fabricius)
(*An "English" species not found north of Yorks. Once common in the fen country and apparently returning there. Fen drains.*)
Form short or long. Elytra unicolorous with at most small pale marks or lighter border or base.....10.

10 Prosternal process flat (fig. 34A).....11.
Prosternal process arched or tectiform (fig. 34B).....12.



FIGS 35–36.—35. Parameres of *Agabus chalconatus*: (A) the var. *melanocornis* and (B) the type form. 36. Ventral face of the post-tibia of (A) *Agabus uliginosus* with a complete row of punctures, (B) *A. paludosus* with about half a row, and (C) *A. congener* with less than half a row.

11 Insect elongate. Male mid-tarsal segments 2, 3 and 4 about equal in length to apical segment.....**arcticus** Paykull
(*Scotland and north England, north Wales, and two counties in east Ireland. Mostly mountains.*)
Insect rather rounded at sides. Male mid-tarsal segments 2, 3 and 4 about three-quarters length of apical segment. (*Note.*—The prosternal character used in British Water Beetles is variable.).....**sturmii** Gyllenhal
(*Generally distributed over Britain and Ireland. Mostly in stagnant water.*)

12 Post-coxal lines effaced or almost faded out before reaching posterior margin of metasternum and moderately divergent. Insect brassy-green. Male with simple anterior tarsal claws (no tooth).....**chalconatus** Panzer
(Dimorphic male, see fig. 35A = var. *melanocornis* Zimmermann.)
(*So far as known at present, the variety is generally distributed over Britain and Ireland but type form confined to England from Yorks. southwards. Mostly in stagnant water, acid or otherwise.*)
Post-coxal lines distinct to metasternum and distinctly divergent in front. Insect black, olive green or brown with at most a slight brassy reflection.....13.

13 Elytral sculpture of elongate reticulation.....14.
Elytral sculpture of short meshes.....15.

14 Size large; length 9·5–11·0 mm. Male with inner anterior tarsal claw small and toothed.....**bipustulatus** Linnaeus
(*Common everywhere.*)
Size small; length about 7·0 mm. Male with simple anterior tarsal claws
striolatus Gyllenhal
(*Discovered in East Norfolk in* 1839 *and found again at the same place in* 1840, *but not seen since then.*)

15 External face of metatibia, nearer its lower edge, bearing a complete range of spine-bearing punctures (fig. 36A).....16.
External face of metatibia with only an abridged series of punctures, or none (fig. 36B and C).....18.

16 Sides of pronotum with distinct borders. Male with inner anterior tarsal claw toothed ..... **uliginosus** Linnaeus
(*Scattered over England and Scotland but seldom in one place for long. Stagnant water.*)
Sides of pronotum with inconspicuous borders ..... 17.
17 Posterior edge of metasternum with a more or less rounded arch producing a broad "wing." Insect rather parallel-sided and black ..... **affinis** Paykull
(*Scattered about England but more widely spread in Scotland and north Ireland. Mostly in acid water amongst moss.*)
Posterior edge of metasternum forming a high arch, almost pointed and producing a narrow "wing." Insect rounded at sides; black with slight aeneous reflections **unguicularis** Thomson
(*Scattered about Britain and in north and west Ireland, but more common than* affinis *and less particular about environment.*)
18 Prosternal process broad and bluntly pointed. The range of spine-bearing punctures referred to under 15 varies considerably in this species and may be complete **paludosus** Fabricius
(*Widely spread over Britain and Ireland. Mostly in narrow, flowing ditches.*)
Prosternal process narrow and elongate ..... 19.
19 Prosternal process gently arched. Ridge of prosternum not continued on process, which is smooth and shining with very fine punctuation. Metasternal "wings" rather wide ..... **congener** Thunberg
(*Mainly Scottish in the mountains but also recorded from North Wales, three southern counties and one in west of Ireland. Stagnant water.*)
Prosternal process highly arched, almost tectiform. Ridge continued to apex. Narrow "wings" ..... **labiatus** Brahm (*femoralis* Paykull)
(*Local, but widely distributed in England and Scotland, three Irish counties only.*)

Platambus Thomson.

P. maculatus Linnaeus. The only species. (*Common throughout Britain in running water: rivers and streams amongst vegetation at the banks.*)

Ilybius Erichson.

Seven species. So far as the males are concerned, the paramere is characteristic only of this genus. The species are distinguished as follows:

1 Metasternal "wings" triangular. Upper surface black or bronze. Male with post-tarsal segments with a ridge along ventral edge of outer face (fig. 37B) .... 2.
Metasternal "wings" narrow. Upperside reddish with slight bronzing. Male without ridge along ventral edge of post-tarsal segments (fig. 37A) **fenestratus** Fabricius
(*An "English" species, which, however, is not uncommon in Kirkcudbright, the only Scottish county. It inhabits lakes, marsh drains and silt ponds.*)

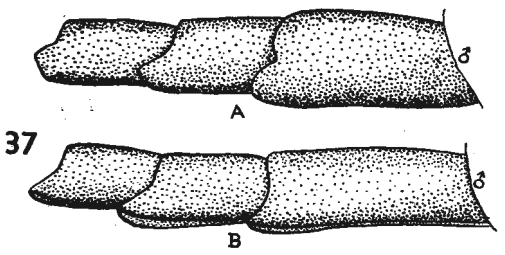


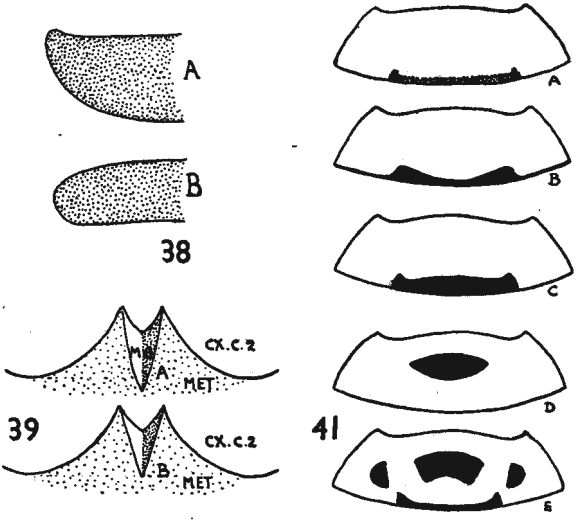
FIG. 37.—The three basal segments of the post-tibia of a male of (A) *Ilybius fenestratus* without the ventral ridge along the lower edge of the outer face, and (B) *I. fuliginosus* and all the other British spp. with the ventral ridge.

2 Large species. Length 10·5 mm. or more. Black or bronze.....3.
Small species up to 10 mm., but usually less.....6.

3 Upperside bronzed with distinct testaceous outer margins to elytra
fuliginosus Fabricius
(*Common throughout Britain and most of Ireland. In most types of habitat.*)
Upperside black or bronzed but without light outer margins.....4.

4 Length 13–14 mm. Upperside black, with at most a faint bronze tinge
ater Degeer
(*Common throughout Britain, but less so in the north. Scattered about Ireland. Stagnant water.*)
Length not more than 11·5 mm. Black or bronzed.....5.

5 Body somewhat flattened; colour dull bronze. Male without keel on last visible sternum. Anterior tarsal claws simple or with only a slight bulge. Last abdominal sternum of ♀ with deep median excision but without median projection
subaeneus Erichson
(*Gradually extending its range, mostly up east side of Britain. First described as British in* 1839 *in the London district, but now known as far north as Forfar. Stagnant water.*)
Upper surface arched, black. Male with strong median keel on last visible sternum and with anterior tarsal claws either toothed or at least sinuate. Female with last abdominal sternum slightly excised and with blunt median projection
obscurus Marsham (*quadriguttatus* Lacordaire)
(*Most of England and Ireland but doubtful as Scottish. Stagnant water.*)



FIGS. 38, 39, 41.—38. Side view of apex of aedeagus of (A) *Ilybius guttiger*; (B) *aenescens*. 39. Ant. part of metasternum (MET) of (A) *Ilybius guttiger*; (B) *I. aenescens* showing the length of the metasternal groove (MG) which receives the apex of the prosternal process. In (A) it extends beyond a line drawn between the post. margins of the mid-coxal cavities (CX C2) while in (B) it does not. 41. The pronotum of the five British spp. of *Rantus* that are not black, showing the characteristic dark markings on a testaceous background. (A) *R. exsoletus*; (B) *adspersus*; (C) *bistriatus*; (D) *pulverosus*; (E) *notatus*.

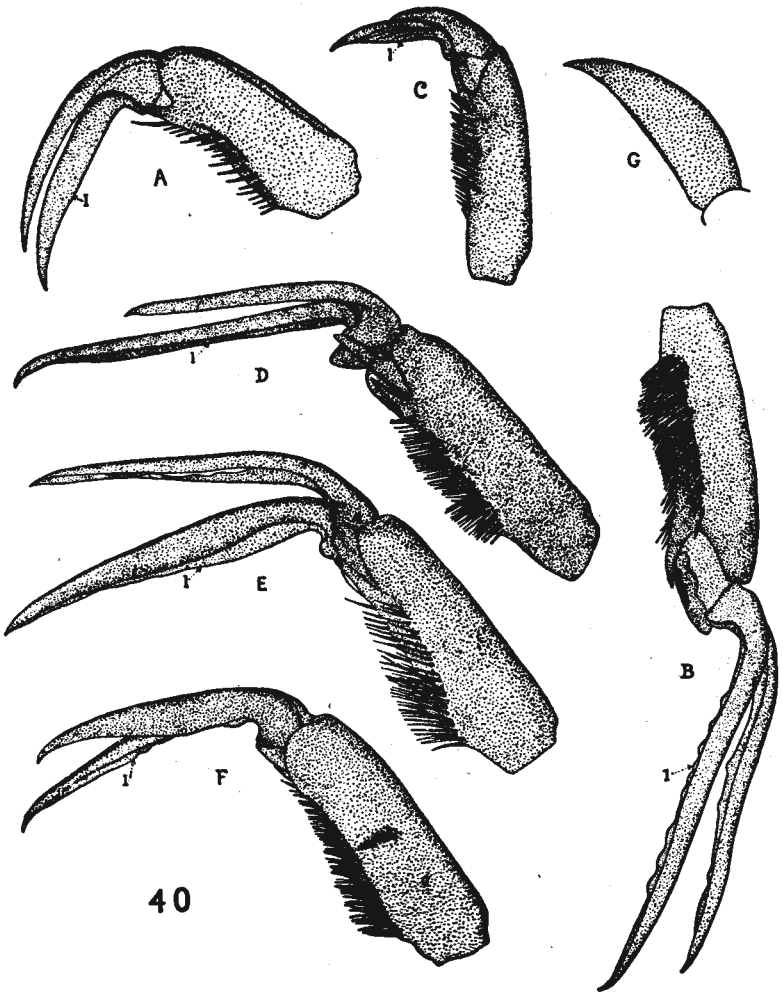


FIG. 40.—Anterior tarsal claws of the males of the six British spp. of *Rantus :* (A) *grapii;* (B) *exsoletus ;* (C) ***pulverosus ;*** (D) *notatus ;* (E) *bistriatus ;* (F) *adspersus ;* (G) inner claw of mid-tarsus of male *grapii*. The same claw is widened also in *bistriatus* and *adspersus*. (I) = inner claw.

6 Length 9·5 mm. or more. Upperside black. Male with simple and equal fore claws. Apex of aedeagus in side view shaped like the prow of a ship (fig. 38A). Female with last visible (7th) sternum with a depression on each side of mid-line at posterior margin. Metasternal groove in both sexes extending beyond a line drawn between the posterior margins of the two mid-coxae (fig. 39A) (see 1952, *Ent. mon. Mag.*, **88** : 202–204).....**guttiger** Gyllenhal
(*An "English" species only recently discovered in Scotland* (*Kirkcudbright*) *and in Ireland* (*Longford*). *Stagnant water, mossy or swampy places, either acid or otherwise.*)

Length 9 mm. Upperside usually bronzed but may be plain black. Male with outer fore claw finer than inner and greatly scooped out in basal half. Aedeagus with apex tapering to a blunt point (fig. 38B). Female without any depression on each side of last abdominal sternum. Metasternal groove in both sexes not extending beyond a line drawn between the posterior margins of the two mid-coxae (fig. 39B) ..... **aenescens** Thomson

(*The same types of habitat as the preceding species.*)

Copelatus Erichson.

C. agilis Fabricius (*haemorrhoidalis* Fabricius). The only species. (*An "English" species once, possibly twice, recorded from Scotland and occurring round the southern half of Ireland. A pond species and also in marsh drains.*)

Rantus Stephens.

Six species most easily separated on colour characters (fig. 41). The males can be recognised by the shape and size of the anterior tarsal claws and the chaetotaxy of the apical tarsal segment (fig. 40).

1 Colour black above and below ..... **grapii** Gyllenhal

(*An "English" species known as far north as Yorks. but mostly in coastal counties. In Ireland, only Wexford and Dublin. Ponds rich in vegetation.*)

Elytra testaceous, peppered with black ..... 2.

2 Underside testaceous ..... **exsoletus** Forster

(*England, Scotland and Ireland, usually common in drains and ponds, edges of lakes.*)

Underside at most with some yellow ..... 3.

3 Underside black or dark brown; no yellow ..... 4.

Underside with yellow markings ..... 6.

4 Pronotum with a dark oval or transversely elongate mark on disc (fig. 41D) **pulverosus** Stephens

(*Scattered about England; in Scotland only Kirkcudbright now, but old records for Renfrew and Forfar; Ireland, Co. Down, 1936. Stagnant or slow-flowing water, e.g., canals.*)

Pronotum with no dark mark on disc ..... 5.

5 Pronotum with a transverse dark band across middle part of post-border, and there may be a less obvious band across anterior border (fig. 41C). Underside black or dark brown ..... **bistriatus** Bergstrasser

(*Commoner in the north than in the south and a coastal species in Ireland. Mainly an acid water species.*)

Pronotum with at most traces of dark marks or clouding across middle of post-border. Underside dark or mottled (fig. 41A) **exsoletus** Forster ab. **nigriventris** Newbery and Sharp

(*Probably produced by some environmental condition. Specimens have been found in a few scattered places.*)

6 Pronotum with 3 dark marks on disc; one lens-shaped across the middle and a blotch at each side of it. Also a narrow dark band across the middle of posterior border (fig. 41E). Elytra with two yellow longitudinal lines in mottled markings ..... **notatus** Fabricius

(*Scattered about Britain and Ireland; fresh- and peaty water pools; seldom in brackish water.*)

Pronotum without dark mark on disc but with one across middle of posterior border (fig. 41B). No lines down elytra ..... **adspersus** Fabricius

(*Up to* 1829 *was known as a fen species in East Anglia, after which it disappeared until one* ♀ *specimen was found there in* 1904.)

Colymbetes Clairville.

C. fuscus Linnaeus. The only species. (*Common throughout England and southern Scotland, less so in north Scotland and fairly common in Ireland. A stagnant water species.*)

Tribe 4. Dytiscini.

Includes five genera separated as follows :

1 Post-tarsal claws equal or one absent. Posterior margin of 4 basal segments of posterior tarsi without an apical fringe of flattened spines.....2.
Post-tarsal claws unequal. Posterior margin of 4 basal segments of posterior tarsi with apical fringe of flattened spines.....3.
2 Post-tibiae much longer than wide. Apical spurs long and narrow
Dytiscus L. (p. 27)
Post-tibiae short and wide; outer apical spur much wider than inner
Cybister Curtis (p. 27)
3 Metasternal " wings " with straight side facing metepisternum.....4.
Metasternal " wings " with side facing metepisternum curved
Graphoderus Sturm (p. 29)
4 Post-tibiae at least three times as long as wide. Third antennal segment scarcely longer than second. Metasternal " wings " with parallel sides and tapering to a point (fig. 42B). Post-tibial spurs acuminate.....**Hydaticus** Leach (p. 27)
Post-tibiae little more than twice as long as wide. Third antennal segment almost twice as long as second. Metasternal " wings " bulging near apex (fig. 42A). Post-tibial spurs bifid.....**Acilius** Leach (p. 29)

Dytiscus L.

See fig. 43 showing the post-coxal processes of the six British species. (Note that in *British Water Beetles*, 2 : 273, fig. 76E and F are wrongly named.)

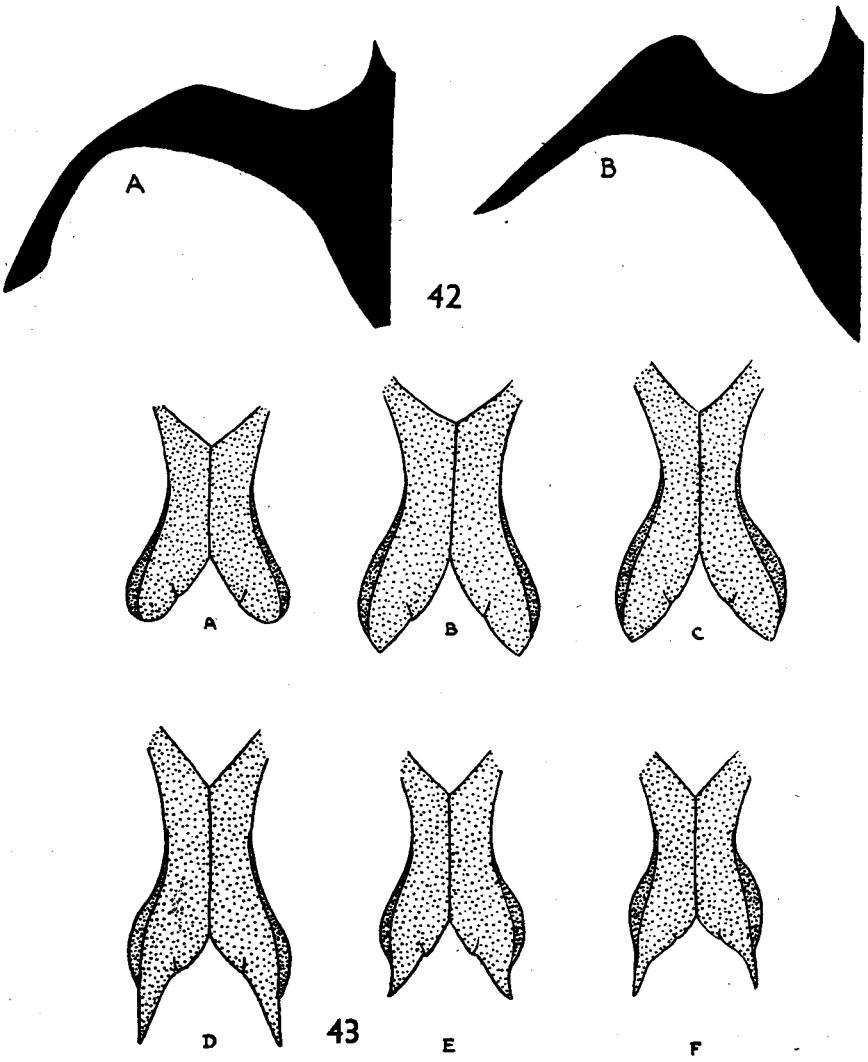
1 Underside black ; post-coxal processes blunt and rounded
semisulcatus Müller (*punctulatus* Fabricius)
(*Fairly common; stagnant water.*)
Underside entirely or mainly yellow.....2.
2 Post-coxal processes not sharply pointed.....3.
Post-coxal processes sharply pointed.....4.
3 Pronotum with all four margins yellow.....**marginalis** Linnaeus
(*More common than* semisulcatus ; *stagnant water.*)
Pronotum with only lateral margins yellow.....**dimidiatus** Bergstrasser
(*Scattered about England as far north as Yorks. Stagnant water.*)
4 Underside of abdomen yellow.....**circumcinctus** Ahrens
(*In England, same range as* circumflexus *but also found in north-east Ireland.*)
Underside with black markings.....5.
5 Size larger (26–32 mm.) ; elytra plain green or greenish-brown. Yellow margin round pronotum narrow, especially on posterior edge....**circumflexus** Fabricius
(*More common near coast than inland. Fresh and brackish water.*)
Size smaller (25–28 mm.). Elytra usually with longitudinal brownish-yellow lines. Yellow margin round pronotum broad and distinct.....**lapponicus** Gyllenhal
(*North and west Scotland and north-west Ireland (one record). Mostly in mountain tarns except in west Scotland.*)

Cybister Curtis.

C. lateralimarginalis Degeer. The only species. (*Found three, possibly four times in England (Essex and Middlesex) from* 1826 *to* 1831, *but it may occur again* !)

Hydaticus Leach.

1 Transverse yellow band, or at least a few yellow spots representing it, across base of elytra. General colouring brown.....**transversalis** Pontoppidan
(*Scattered about England as far north as Yorks. Centred on east country fens.*)
No yellow band ; general colouring black.....**seminiger** Degeer
(*Distribution much as that of* transversalis.)



FIGS. 42–43.—42. The right half of the metasternum of (A) *Acilius sulcatus*; (B) *Hydaticus transversalis*. 43. Metacoxal processes of (A) *Dytiscus semisulcatus*; (B) *D. marginalis*; (C) *D. dimidiatus*; (D) *D. circumflexus*; (E) *D. circumcinctus*; (F) *D. lapponicus*. (In *British Water Beetles*, **2** : 273, fig. 76 (E) and (F) should be (F) and (E).)

Graphoderus Sturm.

G. cinereus L. The only species. (*Until recently, only found in the fens of Cambridge and Huntingdonshire up to about* 1870. *A small colony was found in East Norfolk in* 1904–1906, and in 1952 *another colony was discovered in a bog in North Hants. It seems probable that this colony is a recent arrival from the continent.*)

Acilius Leach.

1 Size larger (16–18 mm.). Basal half of post-femora black. Female with two patches of long testaceous hair on pronotum.....**sulcatus** Linnaeus
(*Generally distributed over Britain and Ireland. Silt ponds, quarry holes, etc.*)
Size smaller (14–16 mm.) Post-femora yellow throughout. Female without hair patches.....**canaliculatus** Nicolai
(*At first only found in southern England. Now not known there but fairly common in north England and south Scotland and north-east Ireland. Stagnant water, especially peat holes in the north.*)

GYRINIDAE.

Three genera separated thus :

1 Outline of labrum more or less transverse. following the gentle curve of the clypeus. Mesothoracic episterna not reaching the elytral epipleurs. Last abdominal segment gently rounded and flattened ; sternum without median longitudinal row of hairs..... 2.
Bulging labrum projecting forward well beyond clypeus. Mesothoracic episterna extending beyond elytral epipleurs. Last abdominal segment elongate and sternum with median line of hairs.....**Orectochilus** Stephens (p. 31)
2 Pronotum and elytra with broad yellow margins. Elytra with narrow yellow grooves, not punctured striae.....**Aulonogyrus** Régimbart (p. 29)
Pronotum and elytra without yellow margins. Elytra with punctured striae **Gyrinus** Geoffroy (p. 29)

Aulonogyrus Régimbart.

A. striatus. Fabricius The only species. (*Found on Raasay Island, North Ebudes in* 1936, *in one or two small lochs. and one specimen from Baleshare Island, Outer Hebrides, in* 1938.)

Gyrinus Geoffroy.

Fig. 44 of the aedeagus in each of the British species of *Gyrinus*.

For the males, the aedeagus is the most easily recognised character for distinguishing the species.

1 Scutellum keeled ; underside orange or red.....**minutus** F.
(***More** in north England, Scotland and north Ireland than elsewhere but not **uncommon** in some more southern parts, especially in peaty water.*)
Scutellum not keeled ; underside orange, red or dark.....2.
2 **Elytral epipleurs orange**, red or dark red. Tarsal claws yellow.....3.
Elytral epipleurs metallic bronze or pitchy-red ; claws yellow or black.....8.
3 **Underside orange or red**.....**urinator** Illiger
(***Scattered about England;** unknown in Scotland except from Outer Hebrides; two specimens from Barra, in* 1939. *Scattered round Ireland in a few coastal counties. **Usually in running water.***)
Underside **mostly black with reddish** or dark red mesosternum and last abdominal sternum..... 4.
4 Body slightly **or markedly narrow and elongate**.....5.
Body short, **boat-shaped with rounded sides**.....6.
5 Apex of elytra with **outer angle rounded. Aedeagus** and ovipositor characteristic **bicolor** Fabricius
(*Scattered about **England as far north as Durham. A few Irish** records from Co. Down, and west and **south-west counties. Stagnant water**, mostly amongst vegetation.*)

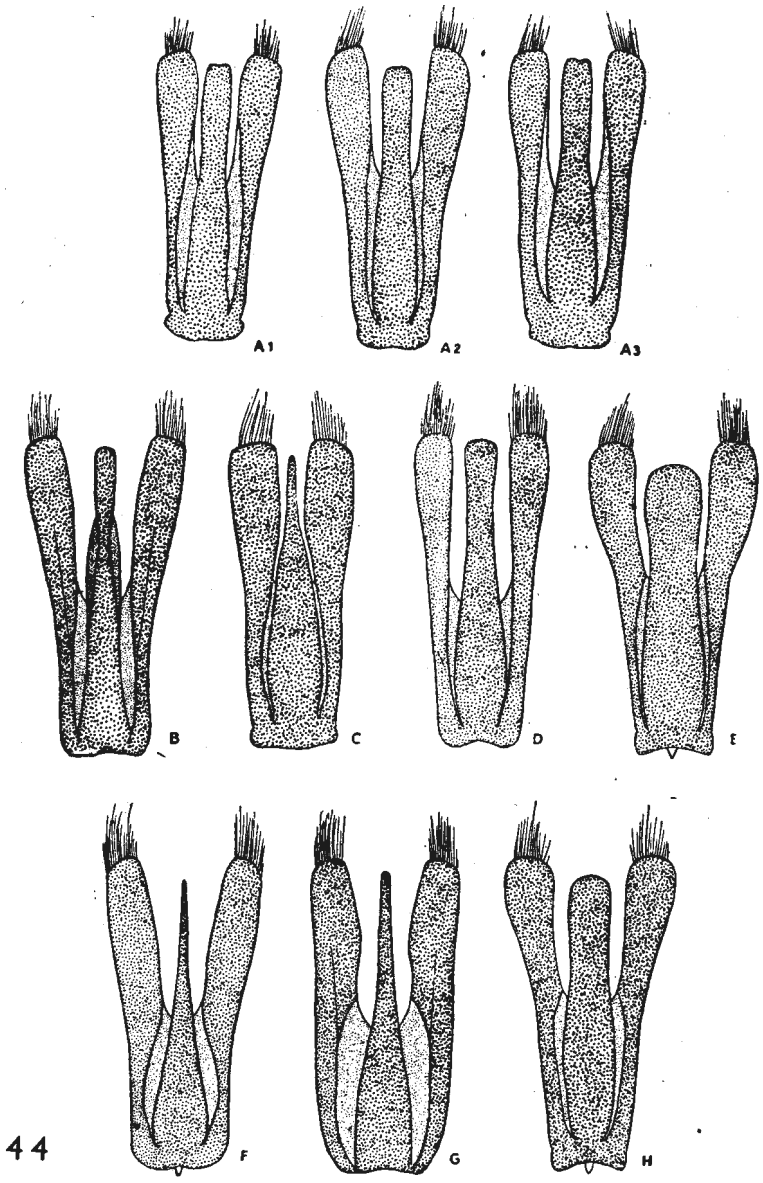


FIG. 44.—Ventral view of aedeagophore (aedeagus and parameres) of eight of the ten British spp. of *Gyrinus* in which the male genital armature is important for identification purposes. A1, A2, A3 = *G. natator*, showing the variations in length of the aedeagus in proportion to the parameres. (A1) is from the type form, and also from an intermediate between the type and the var. *substriatus*, represented by A2 and A3. (B) *G. suffriani* ; (C) *bicolor* ; (D) *caspius* ; (E) *colymbus* ; (F) *marinus* ; (G) *aeratus* ; (H) *opacus*.

Apex of elytra with angle well marked. Genital armature determinate **caspius** Ménetries (*elongatus* Aubé)

(*Scattered about Britain mostly in coastal counties. Ireland in both coastal and inland counties. Stagnant water, often brackish.*)

6 Elytral interstrial spaces distinctly and regularly punctured. Genital armature determinate..... **colymbus** Erichson

(*Sparsely scattered about England; one specimen taken in Kirkcudbright in* 1944. *Ireland, only from Kerry. May be rare or frequently passed over.*)

Elytral spaces either very irregularly punctured or impunctate or scratched....7.

7 Apical angle of elytra rounded; mesosternum orange, red or dark red. Lens-shaped group of punctures at apex of elytron distinct. Elytral striae near suture weaker than others (sometimes obsolete = var. *substriatus* Stephens) **natator** Linnaeus

(*Common everywhere on stagnant or running water.*)

Apical angle of elytra well marked; mesosternum dark red, pitchy or even black. Lens-shaped group of punctures obsolete..... **suffriani** Scriba

(*Almost entirely confined to south-east England, although David Sharp took one specimen near Dumfries* (*Maxwelltown Loch*) *about* 1869. *It haunts edges of lakes, marsh drains, etc., mostly amongst the reeds.*)

8 Apical angle of elytra rounded. Side margin rather wide behind middle; claws black; aedeagus determinate..... **marinus** Gyllenhal

(*All over Britain; perhaps rather less common in north. Scattered over Ireland. Fresh, peaty and, less commonly, brackish water.*)

Apical angle slightly marked.....9.

9 Upperside shining, but micro-sculpture on elytra may be reticulate towards apex. Claws black. Aedeagus determinate **aeratus** Stephens (*edwardsi* Sharp, *thomsoni* Zaitzev)

(*Generally distributed over the Britannic area. Rivers, lakes, canals.*)

Upperside dull. Reticulate micro-sculpture on elytra and pronotum. Claws yellow. Aedeagus determinate..... **opacus** Sahlberg.

(*Only in the north of Scotland as far south as mid-Perth.*)

Orectochilus Stephens.

O. villosus **Müller.** One species only. (*Usually in running water and seldom visible during day-time. All over Britain and Ireland.*)

INDEX

To Families, Subfamilies, Tribes, Genera and Species of Hydradephaga. Numerals in heavy type indicate pages on which illustrations occur. Synonyms are in italics.

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