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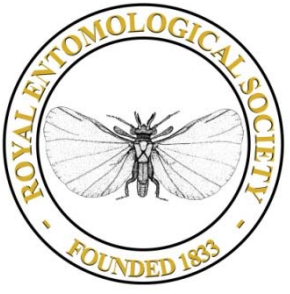

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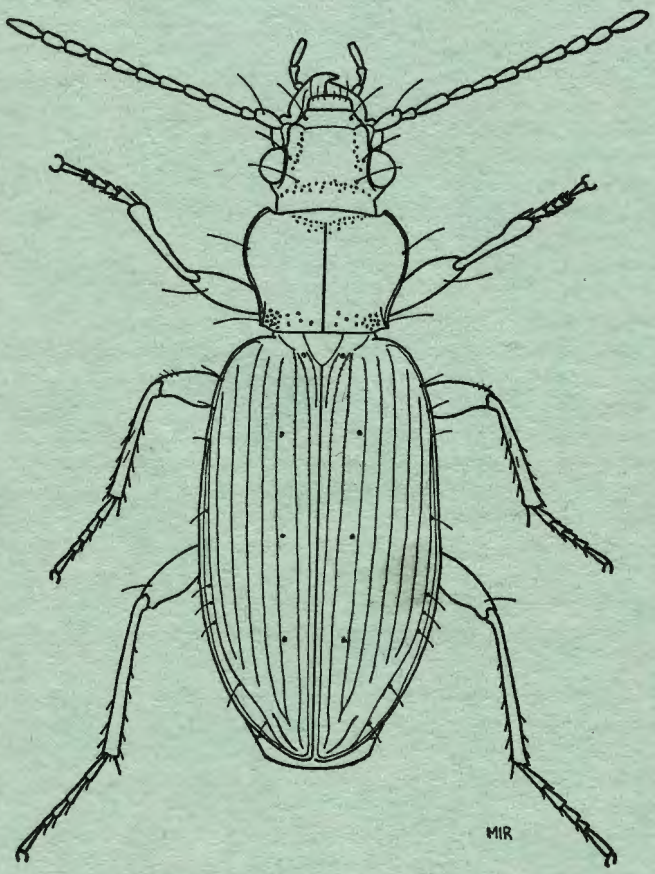

COLEOPTERA

CARABIDAE

By

CARL H. LINDROTH

LONDON
Published by the Society
and Sold at its Rooms
41, Queen's Gate, S.W. 7

August 1974

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 :

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„ 2. Thysanura.
„ 3. Protura.
„ 4. Collembola.
„ 5. Dermaptera and Orthoptera.
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Part 9. Ephemeroptera.
„ 10. Odonata.
„ 11. Thysanoptera.
„ 12. Neuroptera.
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III. Lepidoptera.
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VI. Hymenoptera : Symphyta and Aculeata.
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The Society is indebted to the Royal Society for a grant towards the cost of initiating this series of *Handbooks*.

A list of parts so far published appears on the inside and outside back covers.

CORRIGENDA to Vol IV. Part 2
COLEOPTERA – Family CARABIDAE

P14 In the key to genera, couplet 55 should be moved to follow couplet 47 and renumbered 48; the original couplet numbers 48 to 54 should all be increased by 1, both at the left and right hand side of the page.

P15 Fig. 92e, mentioned in couplets 70 and 71, should be amended to 92b.

For an alternative key to genera and most species see Forsythe (1987), below.

P22 At the end of last line insert lead number: 8.

P29 At the beginning of line 16 from bottom insert couplet number: 3.

P49 In couplet 13 transpose figure numbers 37a, c and 37b, d.

P49 Couplet 14 may mislead as some species in couplets 24 to 30 would also satisfy the first half of this couplet.

P100 In second half of couplet 12 for figs. 9c, f read figs. 71c, f.

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COLEOPTERA

Family CARABIDAE

By Carl H. Lindroth

Introduction

The family Carabidae is here treated in its widest sense, that is including also the Tiger-beetles which have often been regarded as a separate family, the Cicindelidae.

The Carabidae constitute one of the largest families of beetles, with approximately 352 species known from the British Isles (including a few that were apparently never established).

The family is usually placed at the beginning of the classification of Coleoptera, but this does not necessarily mean that it comprises the most primitive and phylogenetically oldest beetles. In fact, the family Cupedidae, not represented in the present European fauna, is much closer to this position (see Crowson, 1950–54, 1955).

Adult Characteristics

The Carabidae belong to the suborder Adephaga, characterized among other things by filiform antennae, 5-segmented tarsi, coalescent basal segments (1–3 visible; 2–4 morphologically) of the abdomen, and the backwardly produced hind coxae (fig. 2). Their closest relatives in the British fauna are the Haliplidae, Hygrobiidae, Noteridae, Dytiscidae and Gyrinidae, which are, however, all strongly adapted to an aquatic life. The Carabidae are strictly terrestrial and their legs are used for running or, in a few genera, the front pair, for digging.

A generalized diagram of a Carabid beetle is shown in fig. 1.

Other Coleoptera liable to be mistaken for Carabids are: (1) certain members of the subfamily Omaliinae (Staphylinidae) with only slightly abbreviated elytra; they are easily separated on the presence of a pair of ocelli on the frons; (2) the genera *Crypticus* (Tenebrionidae) and *Anthicus* (Anthicidae), both, however, have "heteromeran" tarsi, that is only 4 segments on the hind pair; (3) certain Cerambycidae and Chrysomelidae, with all the tarsi seemingly 4-segmented (fourth segment rudimentary).

External Anatomy of a Carabid Beetle

The *head* capsule consists of several fused sclerites of which only the foremost, the *clypeus* (cly), is usually well separated by a suture from the *frons* (fro); this, in its turn, has no clear limit against the *vertex*. Behind the *compound eyes* (eye) the head is sometimes constricted to form a *neck*. The underside of the head consists of the *labium*, divided into *mentum* (mnt) and *gula* (gul).

The movable appendages of the head are the *antennae* (ant), possessing

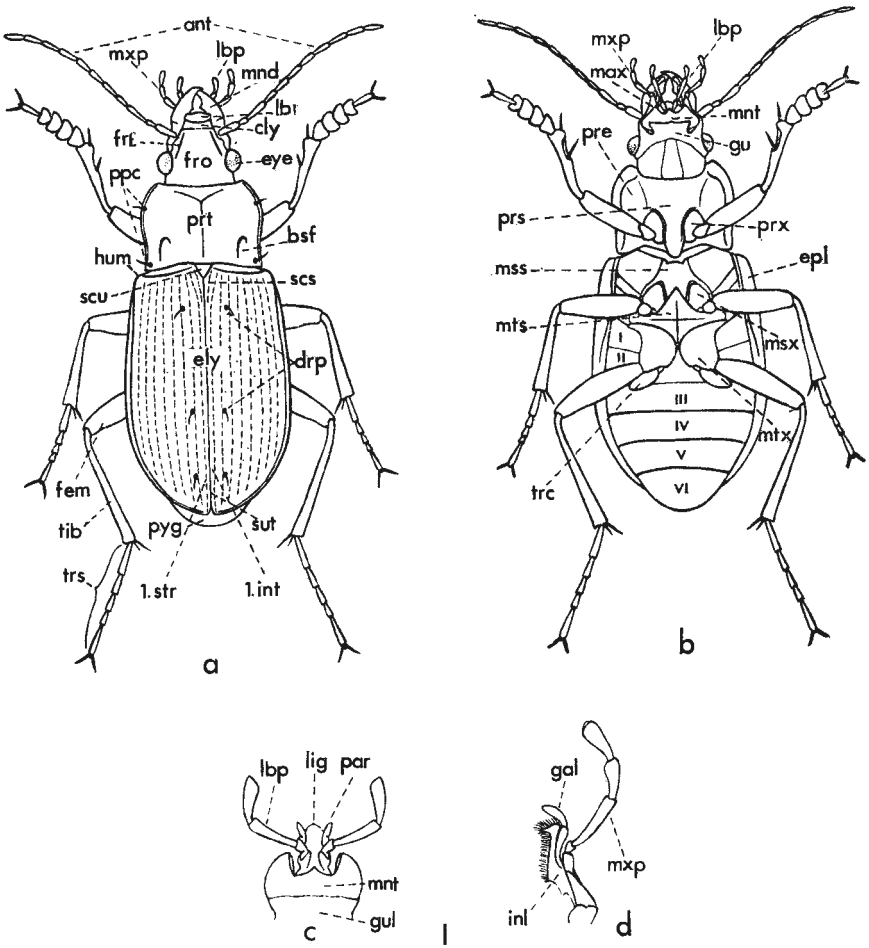

FIG. 1.—General structure of a ground-beetle (Carabidae). (a) upper side; (b) lower side; (c) labium; (d) maxilla. (a) and (b) after Joy (changed); (c) and (d) after Ganglbauer (simplified).

ant, antenna
bsf, basal fovea of prothorax
cly, clypeus
drp, dorsal punctures of elytra
ely, elytra
epl, epipleura of elytra
eye, compound eye
fem, femur (thigh)
frf, frontal furrow
fro, frons
gal, galea (outer lobe of maxilla)
gu, gula (throat)
hum, humerus (shoulder)
inl, inner lobe of maxilla
lbp, labial palp
lbr, labrum (upper lip)
lig, ligula
max, maxilla (lower jaw)
mnd, mandible (upper jaw)
mnt, mentum (chin)
mss, mesosternum
msx, meso-coxa
mts, metasternum
mtx, meta-coxa
mxp, maxillary palp
par, paraglossae
ppe, setae of prothorax
pro, pro-episterna
prs, prosternum
prt, prothorax
prx, pro-coxa
pyg, pygidium (last tergite)
scs, scutellar stria
scu, scutellum
sut, suture of elytra
tib, tibia
trc, trochanter
trs, tarsus
1. int., 1. elytral interval
1. str., 1. elytral stria
I—VI, visible abdominal sternites

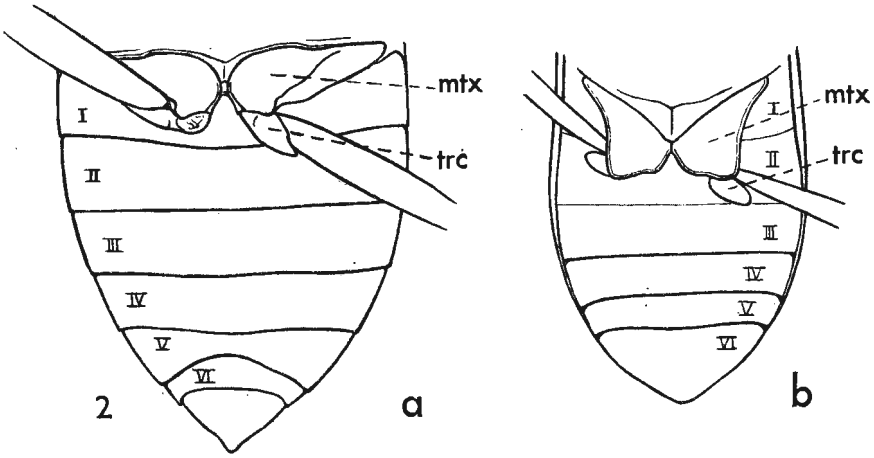

FIG. 2.—Underside of abdomen in (a) a Silphid; (b) a Carabid beetle. mtx, meta-coxa; trc, trochanter. I—VI, visible sternites.

11 segments, and the mouth-parts: on the upper side, partly concealing the *mandibles* (mnd), is the *labrum* (lbr); below the mandibles are the complicated *maxillae* (max) carrying the *maxillary palps* (mxp) and each one segmented *galea* (gal) or "outer lobe". One pair of smaller *labial palps* (lbp) is fixed to the mentum. The anterior part of this carries an unpaired *ligula* (lig), or glossa, surrounded by a pair of *paraglossae* (par) ("ligula" is sometimes used for both organs together).

The upper side of the *prothorax* (prt) should rightly be termed the pronotum, as opposed to its lower surface, *prosternum* (prs), with its two lateral *proepisterna* (pre). The wing-bearing meso- and meta-thorax are concealed under the elytra, with the exception of the *scutellum* (scu), belonging to the mesothorax. On the underside (fig. 3) the two segments are seen to consist of a central *meso-* and *meta-sternum*, respectively (mss, mts), each side bordering upon the corresponding *episterna* (mse, mte, fig. 3), to each of which usually one pair of small *epimera* (epm^1, epm^2) are joined or fused.

The elytra (ely), the fore-wings, when in repose, meet along the *suture* (sut). Their lateral, reflexed part, not visible from above, are the *epipleura* (epl). The elytral striae and intervals, if present, are numbered from the centre to the lateral margin; the usually present abbreviated *scutellar stria* (scs), inside 1 or between 1 and 2 stria, is not counted. *Dorsal punctures* (drp) are often present, usually on the third interval or attached to adjoining striae. The hind-wings, if fully developed, have a reflexed apical part. The venation undoubtedly possesses taxonomically useful characters but it has not been used in this book.

The abdomen is covered with sclerites, tergites on the upper, sternites on the lower side. Only 6 sternites (I–VI) are visible (except in *Brachinus*), the foremost of these laterally only. The last tergite, if visible, is called the *pygidium* (pyg).

The innermost part of each leg is the *coxa* (prx, msx, mtx), to which the

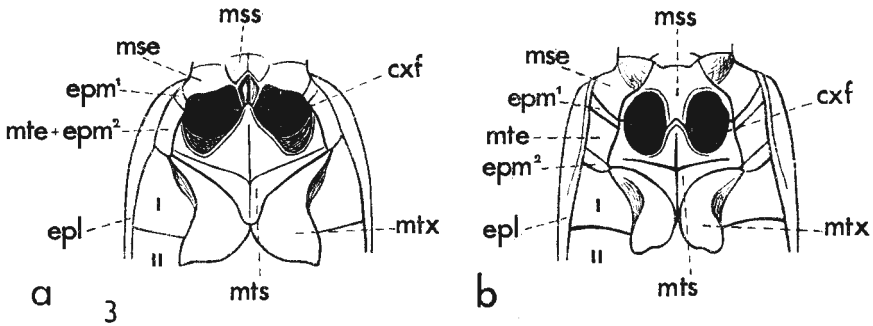

FIG. 3.—Meso- and meta-thorax of (a) *Carabus*; (b) *Pterostichus*. Meso-coxae removed. (After Ganglbauer, simplified.)

cxf, meso-coxal cavity; epm², epimeron of metasternum; mte, met-episternum; epl, spipleuron of elytra; mse, mes-episternum; mts, metasternum; epm¹, epimeron of mesosternum; mss, mesosternum; mtx, meta-coxa; I—II, first visible sternites

femur (fem) and the *trochanter* (trc) are attached. Then follow the *tibia* (tib) and the 5-segmented *tarsus* (trs) with a pair of claws in terminal position on last segment.

LARVAL CHARACTERISTICS

Carabid larvae belong to the "campodeid" type (except in the Cicindelinae and the later stages of the parasitic genera *Lebia* and *Brachinus*). They are slender, long-legged and have well developed cerci on the ninth abdominal segment (fig. 4). The larvae are agile and, in general, more pronouncedly predatory than the adults, but the concealed mode of living and their predominantly nocturnal habits have hampered a thorough study of their taxonomy and biology. The larvae are not described here but a list of known forms among the British Carabidae is given at the end of this section of the present Handbook. Much remains to be done in the field, notably by rearing from gravid females.

HABITS

The vast majority of Carabidae are ground-dwellers. Only the two species of *Calosoma* and several species of *Dromius* are arboricolous. Other species, for instance in the genera *Harpalus* and *Amara*, regularly climb herbaceous plants in search of vegetable food (seeds, pollen, etc.). Only a few of the carnivores are specialized in their choice of prey (*Cychrus* and the *Licinus* larvae on shell-bearing snails, several *Dyschirius* on Staphylinids of the genus *Bledius*); most of them are not very fastidious and some are more nearly scavengers than predators. A mixed diet of animal and vegetable matter is quite normal and the importance of Carabidae in the "biological control" of noxious insects is often exaggerated, though the larvae may be more inclined to a predatory life than the adults.

Most Carabidae are long-lived in the adult stage (*Carabus* and other large species normally live at least two years) and therefore do not show the strong seasonal fluctuation of many other insects. This is fortunate in that it allows

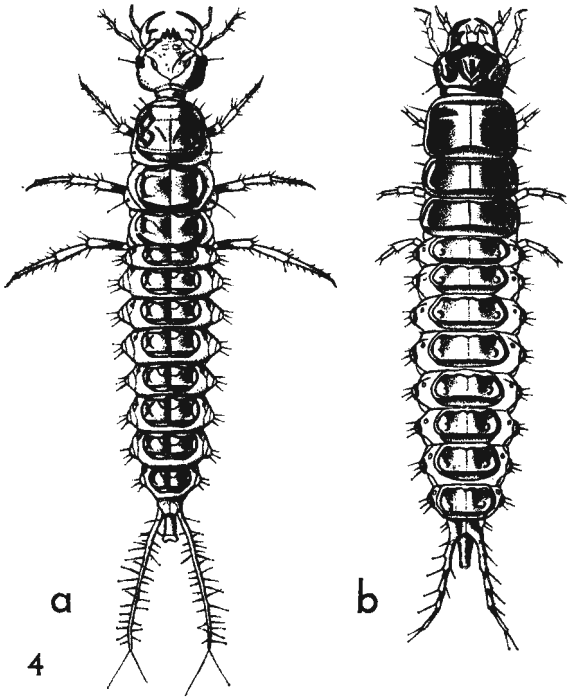

FIG. 4.—Carabid larvae. (a) *Nebria*; (b) *Agonum*. (After Schiødte, redrawn.)

a fairly exhaustive investigation of an area within a short period of time. It is, however, necessary in this context to distinguish between those species in which the larvae hibernate and those, the majority, which over-winter in the adult stage. The former (e.g. many *Amara* species) have their peak of abundance in mid-summer and are often not found at all before June. Those hibernating as adults, on the other hand, are usually scarce in the middle of the summer, the time of larval development.

The condition of the hind-wings is subject to wide variation in the Carabidae. In most species the wings are fully developed but only a few (*Cicindela*, except *germanica*; *Bembidion*, subg. *Chrysobracteon*) use them regularly for predation and escape. The main purpose of flight is to support migration into new habitats, notably between winter and summer quarters. In constantly flightless species, such as most *Carabus*, the wings are usually reduced to a tiny rudiment and the elytra may be fused along the suture (e.g. in *Cychrus*). Wing dimorphism is frequent, that is, long- and short-winged individuals are present in the same species, regardless of sex, and populations are usually mixed in this respect. It is, however, important to emphasize that all long-winged individuals and species are not necessarily able to fly as the flight muscles may be reduced and non-functional.

Since the supply of food is rarely a limiting factor in the distribution and abundance of Carabid beetles, the effect exerted by abiotic factors is usually

clearly manifested. The direct influence of climate, though of paramount importance in itself, is not easily observable except on a large scale on maps of distribution, but sun-exposure and properties of the soil, notably as reflected in the vegetation, are excellent guides to the experienced collector in search for a rare, stenotopic (fastidious) species. For instance some are associated with chalk or limestone, others are confined to the seashore or other saline localities.

Collecting

The easiest way to collect Carabidae is by turning over stones. But even in a stony field many species prefer other micro-habitats. It is also always rewarding to look for them under depressed mats of vegetation, such as heather, under the leaf rosettes of *Artemisia, Centaurea, Rumex*, etc. Some species bury themselves rather deep in the soil and may be discovered by pulling up clumps of tall plants and shaking the roots over a piece of cloth or paper. For extracting species living in the leaf-litter under trees and bushes or in not too wet moss, the ordinary insect sieve is indispensable. It is the most reliable method of collecting insects hibernating in the soil. Leaf-litter and flood refuse on the sea shore and the banks of lakes and rivers may also be thrown into the water so that the inhabitants are forced to surface and are easily caught.

Special methods are required for collecting in moist localities. Soft mats of vegetation at the margins of lakes and ponds may often be submerged entirely by treading them down into the water and the floating insects are rapidly apparent. "Treading" is also commendable in *Carex* and moss vegetation on somewhat firmer soil, for instance in *Sphagnum* bogs. On banks and shores with sparse or no vegetation most beetles are concealed under the surface (e.g. *Dyschirius*); they are immediately exposed if the habitat is profusely splashed with water.

A convenient method of collecting all kinds of beetles running on the surface of the ground is by automatically working pit falls. In firm soil it is sufficient to dig holes with perpendicular walls; in other places flower-pots or glass jars with the upper margin at the level of the ground surface may be used. Left alive in the trap, even for a few hours only, Carabids will mutilate each other; they may also be picked up by birds. It is therefore better to let them fall into some killing and preserving fluid, such as formalin (*ca.* 4 per cent) or ethylene glycol. A few drops of detergent added to the formalin lowers the surface tension of the fluid and the insects will immediately sink to the bottom, unable to escape.

Changes in the British Fauna

If the species of ground-beetles included as British in Fowler (1887), and later works, are compared, the following figures are obtained.

FOWLER (1887, 1913)	BEARE (1930)	JOY (1932)	ANDREWES (1939)	KLOET & HINCKS (1945)	MOORE (1957)	Present work
307	343	334	347	348	351	353

The increase of known species has been surprisingly low, almost negligible in the past 40 years. This is a reliable indication of how well investigated the

British fauna is. The closely similar figures may, however, be misleading: an actual addition in the form of late immigrants or previously unrecognized species has to some extent been compensated for by the removal from the list of mis-identified or doubtfully British species.

Even in the short period of time—less than two centuries—during which reliable observations of identifiable species have been made, marked changes in the Carabid fauna of the British Isles have actually taken place. As in western Europe in general, the transformation of the landscape due to human activities is the factor mainly responsible and this influence has largely been a negative one: rare beetles have become still rarer or entirely extinct. Carabid species recorded as more or less constant inhabitants of Britain during the 19th century but which have now probably disappeared are: *Agonum sahlbergi*, *Diachromus germanus*, *Harpalus honestus*, possibly *Carabus intricatus* and *Brachinus sclopeta*. These species are nevertheless included in the present work.

The opposite group, the newcomers, consists of such species as *Agonum quadripunctatum*, *Amara anthobia*, *A. cursitans* (doubtfully established), *A. montivaga*, *Dromius angustus*, *Leistus rufomarginatus*, *Omophron limbatum*, *Perigona nigriceps*, and *Pterostichus angustatus*. Their arrival must be ascribed to chance dispersal, in part by man, combined, in some cases, with the artificial transformation of the landscape, such as the removal of primary forests, planting of conifers, drainage of the ground, spreading of weed vegetation, etc., which may have increased the possibilities of colonization.

Still more radical faunal changes have occurred in earlier periods due to climatic fluctuations. Accumulated extensive fossil records in recent years, investigated primarily by the Birmingham School of geologists (F. W. Shotton, G. R. Coope, etc.), have provided ample evidence that the ice-free parts of Britain during each of the Pleistocene glaciations were largely inhabited by a true tundra fauna, including several Carabid species now, in Europe, restricted to Scandinavia and northern Russia, or known from Siberia only. As recently as after the last glaciation, in Late Glacial times, not more than about 15,000 years ago, and even later, the following cold-adapted Carabids, now absent from Britain, occurred there (Coope, 1969 : 100); *Diacheila arctica* Gyll., *Dyschirius septentrionum* Munst., *Bembidion dauricum* Mtsch., *B. hasti* C. R. Sahlb., *Pterostichus middendorffi* J. Sahlb., *Agonum consimile* Gyll., *Amara torrida* Panzer.

They have not been included in this Handbook.

Killing and Mounting

The best method of killing beetles is by ethyl acetate (acetic ether). This substance keeps the specimens soft and relaxed, easy to mount provided the collecting vial does not become dry. Since beetles collected in different localities and in different habitats should always be kept apart while collecting, it is advisable to take a good supply of glass tubes, each containing strips of filter paper or pale hardwood sawdust (poplar for preference) moistened, but not dripping wet, with acetic ether.

Large specimens may be pinned directly through the basal part of the right elytron, but the majority should be glued to a piece of cardboard: either to the tip of small triangular points (as universally used in America)

or on rectangular mounts of a larger size than the insect. The first method has the advantage of easier examination of the under surface but the insect is undoubtedly better protected on a rectangular mount and, in genera where the characters of the ventral side are important, one or two specimens of a series may always be mounted upside down. Many different kinds of glue are in use (water-soluble fish glue is excellent); it is important, if antennae and legs are spread and straightened in the meticulous way adopted by so many British coleopterists, that the upper surface is not brushed with glue so as to conceal pubescence and other subtle characters.

Genital preparations. A study of the genitalia, notably of the male, is often indispensable for the identification of taxonomically difficult Carabid species, e.g. of the genus *Bembidion*. In fresh or softened specimens these organs are easily extracted without any visible damage ensuing (fig. 5). If the outer form of the penis (median lobe) is decisive (e.g. in *Harpalus*), no further measure needs to be taken other than, after inspection, to fix the organ with glue to the same mount as the specimen. A study of the armature of the internal sac requires more complicated treatment. After about 12 hours in cold 15% KOH, the organ is carefully washed in water and then, *via* absolute alcohol, transferred to a drop of clove-oil which makes it transparent. After study, the organ may either be preserved, directly transferred from clove-oil as a permanent canada-balsam slide, between glasses; or, after passing through absolute alcohol and water, it may be dried and glued to the specimen. The latter procedure is perhaps preferable because it eliminates any risk of the genital slide being permanently separated from the beetle.

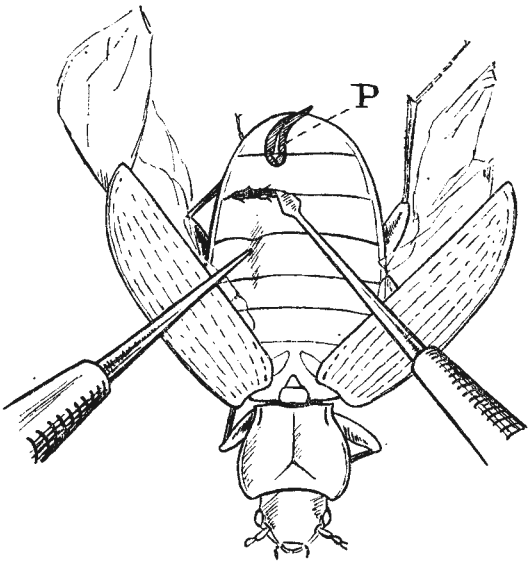

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FIG. 5.—Dissection of male genitalia. P, penis (with parameres).

Classification

Many different systems of classification have been proposed for the Carabidae. The one most commonly used was first outlined by J. L. Leconte and G. H. Horn (1883) in North America and, in modified form, introduced on the continent by L. Ganglbauer (1892), E. Reitter (1908), and others. Major changes were proposed by R. Jeannel (1941–42), who divided the family into many new ones; but his system, though containing many excellent ideas, has not been generally accepted.

In Great Britain, Fowler (1887) followed the Leconte–Horn system, with some alterations proposed by Sharp (1882). Andrewes (1939) introduced the sequence of subfamilies, tribes and genera used in the *Catalogus* of Winkler (1924) and deviating in some respects from that of Ganglbauer. Kloet & Hincks (1945) followed Andrewes. Meanwhile, Joy (1932), in his *Handbook*, had changed the arrangement of the Carabidae, and of the Coleoptera as a whole, in many fundamental respects; but this was done for purely practical purposes, without any claim to reflect relationships, and his system has not been used by others.

A slightly modified Leconte–Horn–Ganglbauer system has recently been introduced for the North American Carabidae (Ball, 1960; Lindroth, 1969). Applied to the British fauna, it implies the recognition of only four subfamilies: Cicindelinae, Omophroninae, Carabinae and Brachininae. All other suprageneric groups are regarded as tribes (with subtribes) and the traditional limit between the Carabinae (in its restricted sense) and the Harpalinae, as well as the creation of an intervening subfamily, the Scaritinae (Crowson, 1950–54) are regarded as artificial[1]. The sequence of tribes and genera differs in several respects from that of Kloet & Hincks (1945) but, since British coleopterists are already familiar with the differing arrangements of Fowler and Joy, I do not feel much harm is caused by introducing the new North American system here.

Nomenclature

It is very important, in the interests of stability and continuity, that changes of Latin names, notably at the generic and specific levels, are restricted to a necessary minimum. The new *International Code of Zoological Nomenclature* (1961), fortunately, made provision for suspension of the priority principle which had been followed too rigidly by many authors.

In the present work the use of generic names of Carabidae deviates from current British practice in only a few cases. One reason for changes is that, notwithstanding Andrewes' opinion (1937, 1939), Bonelli's names from 1810 must be considered valid (see Gaskin & Lewis, 1956). This implies that *Helobium*, *Feronia* and *Risophilus* should be replaced by *Blethisa*, *Pterostichus* and *Demetrias*, respectively. Furthermore, *Odontonyx* Stephens, 1828, cannot be accepted as valid above *Olisthopus* Dejean, 1828 (see Lindroth, 1966 : 553). *Odacantha* Payk. has been re-established as a genus separate from *Colliurus* DeG. On the other hand, the following names have been reduced to subgeneric rank (referred, in each case, to the genus named in brackets): *Aepopsis* (*Aepus*), *Eurynebria* (*Nebria*), *Lasiotrechus* (*Trechus*), *Trechoblemus* (*Trechus*).

[1] For the discussion underlying this opinion, see Lindroth, 1969 (p. XVII and following.)

Subgeneric names have been used in large genera only, in order to make the arrangement of species easier to survey.

Problems of nomenclature at specific level are discussed under the pertinent name. It should only be mentioned here that four Linnaean names have been dropped as "*nomina dubia*". As hitherto used they are not in agreement with the original descriptions and the specimens in the Linnaean collection in London (Lindroth, 1957). These are (modern generic names applied): *Amara vulgaris*, *Bembidion rupestre*, *B. ustulatum*, *Pterostichus coerulescens*, here replaced by *A. lunicollis* Schiødte, *B. bruxellense* Wesm., *B. tetracolum* Say, and *P. versicolor* Sturm, respectively.

Synonyms of specific names quoted are those used in earlier current British literature.

Notes on Identification

Many large species of Carabidae or members of small genera are easy to identify in the field, either with the naked eye or with the aid of a hand-lens (10–20×). Quite the contrary is the case in large genera such as *Bembidion*, *Tachys*, *Agonum*, *Amara*, *Harpalus*, *Bradycellus*, etc., in which species can often be reliably named only after an investigation of the male genitalia, as described above.

Another important group of characters is in the microsculpture of the upper surface. If present, it usually consists of coherent lines which either join into meshes, from isodiametric to very transverse (sometimes differing according to sex), or run very close together in a parallel arrangement, producing a more or less pronounced iridescent lustre, notably on the elytra. An investigation of the microsculpture requires a magnification of at least 100 and strong light. Best for the purpose is the so-called "ultropaque", with lamp built into the tube, or of course an electronic "scanning" microscope. But these are expensive and as a substitute the use of an ordinary compound microscope, with sideways light, is recommended.

The "chaetotaxy", the numbers and arrangements of different kinds of setae, is generally important. These setae are easily broken but their pupillate points of attachment can be recognized at high magnification.

Other characters, with appropriate names, are shown in fig. 1.

The size of a beetle is measured from the front margin of the mandible (in closed position) to the tip of the elytra or, in the so-called "Truncatipennia" with a visible last abdominal segment, to the posterior margin of the latter (in normal position).

Distribution

This is not given in detail, except for very rare species. B. P. Moore (1957*b*) has published accurate tables of the county distribution of each British species of Carabidae, to which the interested student is referred.

Acknowledgments

I am most indebted to three British colleagues who have taken the trouble to read the manuscript and have made amendments, corrections and additions from their vast experience of British Carabidae, notably concerning habitat and distribution. These gentlemen are: Mr. A. A. Allen, London; Mr. Peter

Hammond, London; and Dr. B. P. Moore, Canberra, Australia. Without their kind aid this part of the *Handbooks* series would have been incomplete, in part even erroneous.

[Some of the author's original figures, notably habitus pictures of entire beetles, incorporated shading which would have required half-tone reproduction. This would have increased the cost of the Handbook excessively. Therefore the author is not responsible for figures 9, 16, 19, 23, 25, 30, 31, 36, 39, 40, 41, 43, 50, 56, 66, 72, 80, 83, 90, 95, these being copies of the originals by Mark Russell, of the British Museum (Natural History). Students wishing to consult half-tone reproduction of the original drawings are referred to *The Ground-Beetles of Canada and Alaska*, 1–6. (*Opusc. ent.*, Suppl. **20**, **24**, **29**, **33**, **34**, **35**, 1961–69, Lund, Sweden) and to fig. 74 below (p. 105). [*Editor*]

KEY TO GENERA

Since the definitions of the tribes within the Carabid family are largely based on subtle, "difficult" structures, I have found it more useful to present a collective key for all the genera. This is based on readily observable, often quite superficial characters and is not intended to give any idea whatsoever of the relationships between the genera. An ordinary hand-lens (ca. 20×) should be sufficient for its use.

KEY TO GENERA OF BRITISH CARABIDAE

1 All elytral intervals pubescent, at least with one row of setiferous punctures....2
– Elytra glabrous (except for marginal setae and often setiferous "dorsal" punctures on intervals one to three) or with only outer intervals pubescent 19
2 Elytra with well developed striae or rows of punctures 3
– Elytra without regular striae or rows of punctures, though sometimes with shallow, impunctate furrows 17
3 Elytra with apex transversely truncate, leaving at least last abdominal tergite free.4
– Elytral apex rounded, last tergite quite or almost concealed (except in gravid females) 8
4 Elytra or entire body bright metallic, blue or green.....5
– Entire body unmetallic 6
5 Entire body metallic. Elytra conspicuously pubescent...**Drypta** Latreille (p. 133)
– Pronotum clear rufous. Elytral intervals with minute, almost invisible bristles **Lebia** Latreille (*cyanocephala*) (p. 126)
6 Less than 6 mm. Pronotum ~~glabrous~~. Fourth tarsal segment dilated (fig. 93a) **Demetrias** Bonelli (*atricapillus*) (p. 126)
– At least 8 mm. Pronotum pubescent. Fourth tarsal segment normal.....7
7 Head constricted into a neck behind eyes. Elytra each with a long pale vitta reaching behind middle .....**Polistichus** Bonelli (p. 132)
– Head not constricted. Only base of elytra pale **Cymindis** Latreille (*vaporariorum*) (p. 132)
8 Frontal furrows sharp, prolonged and semicircularly diverging behind eyes. Small species (not over 5·5 mm.) 9
– Frontal furrows not prolonged behind eyes, often obsolete. Usually larger....10
9 Less than 3 mm. Terminal segment of maxillary palpi narrow (fig. 27c). Sutural stria of elytra normal.....**Perileptus** Schaum (p. 42)
– At least 4 mm. Maxillary palpi, fig. 27b. Sutural stria recurrent at apex (fig. 27d) **Trechus** Clairville (in part) (p.43)
10 Head (fig. 88a) with very narrow neck. Elytra rufous with black cross **Panagaeus** Latreille (p. 120)
– Head without pronounced neck. Elytra differently coloured.....11
11 Upper side of tarsi and 3 basal antennal segments (except for apical setae) glabrous **Chlaenius** Bonelli (p. 121)

— Tarsi and antennae from second or third segment pubescent 12
12 Elytra without abbreviated scutellar stria ..... **Dicheirotrichus** Duval. (p. 110)
— Elytra with abbreviated scutellar stria (fig. 1) evident 13
13 Elytra with sharp bicoloured pattern 14
— Elytra unicolorous, dark (or slightly paler along the suture) 15
14 Prothorax metallic, darker than head, elytra behind middle with a common metallic, heart-shaped macula ..... **Diachromus** Erichson (p. 109)
— Prothorax clear rufous, head dark, each elytron with three black spots **Callistus** Bonelli (p. 122)
15 Head (except for supra-orbital setae) glabrous **Harpalus** Latreille (subg. *Pseudophonus* Motschulsky) (p. 98)
— Frons and temples with decumbent but dense pubescence 16
16 Basal margin of elytra curved on level of third stria. Elytra with transverse microsculpture ..... **Scybalicus** Schaum (p. 109)
— Basal margin of elytra straight; their microsculpture reticulate or obsolete **Harpalus** Latreille (subg. *Ophonus* Stephens) (p. 98)
17 Terminal segment of maxillary palpi rudimentary (as in fig. 27a). Elytra with rounded apex (fig. 31) ..... **Asaphidion** Gozis (p. 46)
— Maxillary palpi with well developed terminal segment. Elytra truncate at apex .. 18
18 Not over 2·5 mm. Body testaceous. Eyes very small. **Aepus** Samouelle (*marinus*) (p. 43)
— More than 4 mm. Body bicoloured (elytra dark). Eyes normal, protruding **Brachinus** Weber (p. 134)
19 Meso-notum (with extreme base of elytra) strongly constricted as a "peduncle" upon which the scutellum is situated (figs. 22, 24) 20
— Body not pedunculate 23
20 More than 6·5 mm. Third antennal segment twice as long as second 21
— Less than 6·5 mm. Third antennal segment shorter than second 22
21 16 mm. or more. Pronotum with 2 lateral setae. (fig. 24b) **Broscus** Panzer (p. 40)
— 8 mm. or less. Pronotum with only anterior lateral seta. (fig. 24a) **Miscodera** Eschscholtz (p. 39)
22 Lateral bead of pronotum prolonged behind posterior seta (fig. 22b). Mesotibia with strong subapical spine laterally (fig. 22c) ..... **Clivina** Latreille (p. 37)
— Lateral bead of pronotum not prolonged (fig. 22a). Meso-tibia without spine **Dyschirius** Panzer (p. 34)
23 Elytra with 11, or more, well impressed, at least basally regular striae, but without ridges or tubercles 24
— Elytra with less than 11 striae (abbreviated scutellar stria not counted) or without regular striae 26
24 Scutellum concealed by median lobe of pronotum (fig. 9). Prosternum covering mesosternum (fig. 10). Body almost circular ..... **Omophron** Latreille (p. 18)
— Scutellum visible. Mesosternum not concealed 25
25 16 mm. or more. Neck not constricted. Antennal setae normal **Calosoma** Weber (p. 24)
— Under 9 mm. Neck strongly constricted (fig. 20c). Antennal segments 2–4 with long setae ..... **Loricera** Latreille (p. 34)
26 Head with clypeus broader than distance between antennae (fig. 6a). (Elytra without striae, dark with pale spots, fig. 7) ..... **Cicindela** Linnaeus (p. 16)
— Clypeus narrower than distance between antennae (e.g. fig. 6b) 27
27 Maxillary palpi with last segment rudimentary, much shorter and narrower than penultimate segment (fig. 27a). Small species (not more than 7·5 mm.) 28
— Maxillary palpi with well developed terminal segment (at least as in fig. 27b) 29
28 Elytra without scutellar stria, sutural stria "recurrent", i.e. connected along apex with one of the outer striae (figs. 44a-c). Pro-tibia with oblique apex **Tachys** Stephens (p. 65)
— Elytra with abbreviated scutellar stria, sutural stria not "recurrent" (except in *harpaloides* and *quinquestriatum*). Pro-tibia truncate at apex. **Bembidion** Latreille (p. 47)
29 Elytra each with 3 rows of ocellate depressions but without or with strongly disturbed striae (fig. 19) ..... **Elaphrus** Fabricius (p. 32)
— Elytral sculpture otherwise 30

30 Frons with 6 sharp longitudinal carinae; eyes enormously developed (figs. 18a-b). Second elytral interval much broader than all following **Notiophilus** Duméril (p. 30)
— Frons not multi-carinate. Second elytral interval not outstanding in width.....31
31 Frons with a single seta-bearing "supra-orbital" puncture inside eye.....32
— Frons with two "supra-orbital" punctures, the posterior often behind the eye....45
32 At least 13 mm. Elytral sculpture more or less irregular, consisting of ridges, rows of granulae or foveae, or without any longitudinal arrangement (if striae suggested, there are more than 10 on each elytron).....33
— Usually smaller. Elytra with regular striae (two intervals foveate in *Pelophila*).34
33 Head very narrow, much prolonged (fig. 11). Pronotum oval, elytra inflated **Cychrus** Fabricius (p. 20)
— Forebody normal, head prolonged in one species only (*intricatus*, with almost square pronotum and flat elytra).....**Carabus** Linnaeus (p. 21)
34 Elytra each with 10 striae (that is, scutellar stria not abbreviated). Fourth and sixth intervals with foveae.....**Pelophila** Dejean (p. 26)
— Elytra with 9 striae (or less) and often with an additional abbreviated scutellar stria; only third interval sometimes foveate.....35
35 Pronotum with seta at hind-angle (if broken, the pupillate insertion is visible, though perhaps with difficulty in *Trichocellus*, with hairy eyes).....36
— Pronotum without seta at hind-angle. (Eyes glabrous).....38
36 Less than 5 mm. Outer elytral intervals and all antennal segments finely pubescent. Eyes hairy.....**Trichocellus** Ganglbauer (p. 111)
— At least 6 mm. Elytra and 4 basal segments of antennae (except for apical setae) and eyes glabrous.....37
37 Mandibles broadly flattened laterally (fig. 14a). Palpi very long and slender **Leistus** Frölich (in part) (p. 25)
— Mandibles not dilated. Palpi normal. Habitus, fig. 16. **Nebria** Latreille (p. 27)
38 Antennae with at least 3 basal segments glabrous (except for apical setae).....39
— Antennae with at most 2 glabrous basal segments.....41
39 Mandibles broadly flattened laterally (fig. 14a). Pronotum cordate. Elytral epipleura not crossed.....**Leistus** Frölich (in part) (p. 25)
— Mandibles normal. Pronotum not constricted basally. Elytral epipleura "crossed" (as in fig. 61a).....40
40 Pronotum without lateral seta. Eighth elytral stria deepened apically and reaching suture (fig. 89c). Pro-tibia normal.....**Oodes** Bonelli (p. 123)
— Pronotum with lateral seta at middle. Eighth stria not deepened. Pro-tibia very broad (fig. 69).....**Zabrus** Clairville (p. 97)
41 Base of pronotum with raised bead (sometimes obsolete at middle). Length 5·3 mm or more. (Elytra not iridescent).....42
— Pronotum with basal bead absent or developed laterally only. Species above 5·2 mm. with strongly iridescent elytra.....43
42 First segment of hind-tarsi not longer than terminal spur of tibia (fig. 77c). Elytra usually with humeral tooth.....**Harpalus** Latreille (p. 98)
— First segment of hind-tarsi longer than terminal spur (fig. 77b). Elytra without humeral tooth.....**Anisodactylus** Dejean (p. 109)
43 Antennae entirely pale. Mentum with median tooth (as in fig. 55e). Elytra without coherent microsculpture, not iridescent. Body convex (fig. 79b) **Bradycellus** Erichson (p. 111)
— Antennae dark with pale base. Mentum without tooth. Elytra more or less iridescent from transverse microsculpture (except in *A. meridianus*, with base of elytra abruptly pale). Body flatter (fig. 79a).....44
44 5 mm. or more. The row of marginal elytral punctures with pronounced gap posteriorly (fig. 81a).....**Stenolophus** Dejean (p. 113)
— 4·5 mm. or less. Marginal row of elytral punctures more or less continuous sub-apically.....**Acupalpus** Latreille (p. 115)
45 Sutural stria of elytra "recurrent" at apex (fig. 27d). Frontal furrows prolonged and semicircularly diverging behind eyes. Not over 6·5 mm.....46
— Sutural stria not recurrent. Frontal furrows not or less prolonged.....48
46 Eyes rudimentary, their diameter not exceeding one-third of the temple. 2·2–2·5 mm. (Inhabitant of the tidal zone).....**Aepus** Samouelle (*robini*) (p. 43)
— Diameter of eye at least half length of temple. Not below 3·5 mm.....47

47 Base of elytra margined just inside shoulder only ..... **Trechus** Clairville (p. 43)
— Base of elytra completely margined ..... **Thalassophilus** Wollaston (p. 43)
48 Claws denticulate or pectinate internally, at least at base 49
— Claws smooth 51
49 All tarsi pubescent above. Upper surface with metallic lustre. 13 mm. or more **Pristonychus** Dejean (p. 79)
— Tarsi glabrous above. Body unmetallic. Usually smaller 50
50 Labial palpi with pear-shaped terminal segment (fig. 55a). Basal margin of elytra only slightly arcuate ..... **Synuchus** Gyllenhal (p. 79)
— Labial palpi with almost cylindrical terminal segment. Basal margin of elytra strongly arcuate ..... **Calathus** Bonelli (p. 76)
51 Frons each side with two furrows joined by a transverse line (fig. 15c). Third and fifth elytral intervals foveate ..... **Blethisa** Bonelli (p. 32)
— Frons different. Only third interval sometimes with foveate punctures 52
52 Mandibles highly asymmetric, either the left or the right with tubercle on dorsum. 53
— Mandibles not notched 54
53 Not more than 9·1 mm. Elytra iridescent, intervals impunctate **Badister** Clairville (p. 118)
— Not less than 9·5 mm. Elytra not iridescent, intervals coarsely punctate **Licinus** Latreille (p. 117)
54 Elytral striae obsolete, except eighth stria which is deepened apicad; lateral parts finely pubescent. 2·0–2·5 mm. Habitus, fig. 60. **Perigona** Castelnau (p. 86)
— Eighth stria not deeper apically; lateral parts of elytra not pubescent 55
55 Elytral apex entire, rounded or sinuate, in normal position covering entire abdomen or leaving only a lesser part of last segment free (notably in gravid females)[1] .. 56
— Apex of elytra transversely or obliquely truncate, leaving at least most of terminal abdominal segment uncovered[1] 69
56 Elytra with epipleura "crossed" before apex (fig. 61a) 57
— Elytral epipleura not crossed (fig. 61b) 60
57 Elytra without dorsal punctures 58
— Elytra with at least one setiferous dorsal puncture on third interval (small and situated near apex in *inaequalis*) ..... **Pterostichus** Bonelli (p. 69)
58 Mandibles and first antennal segment prolonged (fig. 45b) **Stomis** Clairville (p. 69)
— Mandibles and first antennal segment normal 59
59 Elytra with two extra striae apically outside eighth stria. Pronotum (fig. 51a) **Abax** Bonelli (p. 75)
— Elytra without supernumerous striae apically ..... **Amara** Bonelli (p. 87)
60 Less than 6 mm. Pronotum with base sinuate or incised laterally (figs. 00) 61
— Usually larger. Base of pronotum not sinutae laterally 63
61 Hind-angles of pronotum removed from base (fig. 96a) **Lionychus** Wissmann (p. 131)
— Hind-angles in normal position or almost obsolete 62
62 Pronotum almost as broad as elytra (fig. 92a). Tibiae (notably the middle pair) spiny. More than 4·5 mm ..... **Masoreus** Dejean (p. 124)
— Pronotum much narrower (fig. 92c). Tibiae not spiny. Less than 4 mm. **Metabletus** Schmidt-Goebel (p. 131)
63 Head with constricted neck (fig. 25). Elytra not margined inside shoulder **Patrobus** Stephens (p. 41)
— Head much less constricted behind eyes. Elytral base margined almost to scutellum 64
64 More than 20 mm. Elytra without dorsal puncture .. **Sphodrus** Clairville (p. 78)
— Smaller. Elytra with at least one dorsal puncture on third interval 65
65 At least 14 mm. Elytra strongly iridescent **Pterostichus** Bonelli (*cristatus*) (p. 72)
— Not more than 12·3 mm. Elytra not iridescent 66
66 Frons with deep, parallel furrows. Mentum with bifid tooth. (Coastal) **Pogonus** Nicolai (p. 69)
— Frontal furrows less developed or obsolete. Mentum tooth simple or absent .. 67

[1] Doubtful cases treated under both couplets.

67 Pronotum with anterior margin produced at middle (fig. 51b). Posterior process of prosternum margined ..... **Platyderus** Stephens (p. 79)
— Anterior margin of pronotum not or barely produced. Prosternal process unmargined 68
68 Mentum without tooth. Pronotum as broad as elytra over shoulders. Second antennal segment more than half the length of third. **Olisthopus** Dejean (p. 80)
— Mentum with tooth (fig. 55e). Pronotum narrower. Second antennal segment shorter ..... **Agonum** Bonelli (p. 80)
69 Tibiae (notably the middle pair) pronouncedly spiny. Pronotum almost as wide as elytra (fig. 92a) ..... **Masoreus** Dejean (p. 124)
— Tibiae with normal setae. Pronotum narrower 70
70 Base of pronotum with sharp incision laterally (figs. 92b, 96a) 71
— Base of pronotum straight or with slight lateral sinuation 72
71 Claws pectinate. Base of pronotum lobate at middle (fig. 92b)
Lebia Latreille (p. 125)
— Claws smooth. Pronotum not lobate (fig. 96a) ..... **Lionychus** Wissmann (p. 131)
72 Fourth tarsal segment strongly bilobed (fig. 93a) ..... **Demetrias** Bonelli (p. 126)
— Fourth tarsal segment with truncate or slightly emarginate apex 73
73 Terminal segment of labial palpi dilated and truncate. All elytral intervals punctate ..... **Cymindis** Latreille (*axillaris*) (p. 132)
— Terminal segment of labial palpi almost cylindrical. At least not all intervals punctate 74
74 Pronotum narrower than head (fig. 91a), both metallic, elytra bicoloured
Odacantha Paykull (p. 124)
— Pronotum at least as broad as head. Coloration different 75
75 Base of pronotum straight or rounded (fig. 94). Last meta-tarsal segment equal to first. 3·5–7·0 mm ..... **Dromius** Bonelli (p. 127)
— Base of pronotum slightly sinuate laterally (figs. 92c, d). Last meta-tarsal segment shorter than first. 2·5–3·8 mm 76
76 Elytra with apex obliquely truncate and somewhat sinuate (fig. 92c). Third antennal segment only with subapical setae
Metabletus Schmidt-Goebel (p. 131)
— Elytral apex transversely truncate (fig. 92d). Third antennal segment with sparse pubescence ..... **Microlestes** Schmidt-Goebel (p. 131)

Subfamily CICINDELINAE

This has often been regarded as a separate family (Cicindelidae) distinct from the true Carabidae. The main differences are in the structure of the head (fig. 6): the clypeus and labrum are very broad, the former broader than the distance between the antennae; the mandibles are armed with several

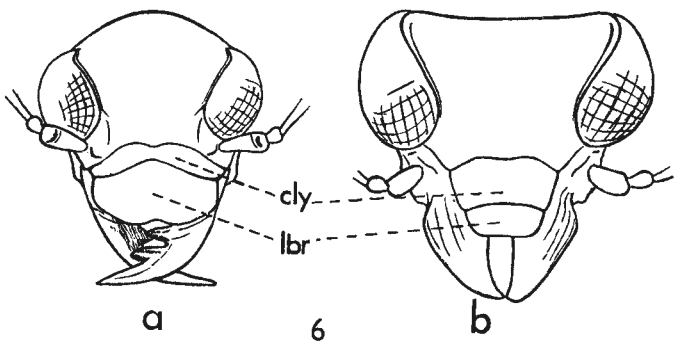

FIG. 6.—Head of (a) *Cicindela*; (b) *Elaphrus*. cly, clypeus; lbr, labrum.

sharp teeth internally. Unlike the subfamily Carabinae the parameres of the male genitalia are joined by a "basal piece". The larva lacks cerci on the ninth abdominal segment but the fifth tergite carries a pair of forwardly directed hooks which support the climbing of the larva in its burrow.

In Europe, except the extreme south, the subfamily is represented by one tribe and one genus only.

Tribe **CICINDELINI**

Genus **Cicindela** Linnaeus

(Tiger-beetles)

Medium sized species (8–19 mm.) with head, due to the large semi-globular eyes, at least as wide as pronotum. Elytra with pale spots or bands; no striae present. Male with 3 dilated pro-tarsal segments and the sixth abdominal sternite with median incision.

The Tiger-beetles are sun-loving insects, running and (except *germanica*) flying about with the utmost agility, preying upon ants, etc. The larva waits on its prey at the mouth of its vertical burrow in the ground. The development takes two years.

Key to Species

1 Labrum black with median keel. Upper surface with almost unmetallic ground colour. (Largest species of the genus. Piceous to almost black, usually, at least on forebody, with bronze hue. Of mouth-parts only base of mandibles pale. Lower surface metallic blue. Elytra with characteristic pattern (fig. 7a), without apical spot; besides the normal fine punctuation, irregularly foveate medially. 15–19 mm.) ..... (*silvatica* auctt.) **sylvatica** Linnaeus

On dry, sandy soil in sun-exposed positions on heaths or in thin coniferous forest with Calluna. S. England, Cambridge. Lacking in Wales, Scotland and Ireland. Local and usually rare.

— Labrum yellow, without keel. Upper surface usually with clear metallic reflection 2

2 Sides of prosternum (episterna) glabrous. Pale elytral markings restricted to margins. Smallest species. (Narrower than the following species, head wider than pronotum. Dull green, rarely bluish, coppery, bronze or almost black, forebody usually coppery. Mouth-parts pale, as in *hybrida*. Elytra along the suture with shallow foveae similar to those of *sylvatica;* each with 3 pale marginal spots (fig. 7e). 8–11 mm.) ..... **germanica** Linnaeus

In open grassland near the coast. The beetle does not readily take to the wing. S. England: Dorset, Devon, Isle of Wight. Very local.

— Pro-episterna with dense white hairs. Pale elytral markings more expanded. 12 mm. or more 3

3 Ground colour green, pale elytral markings not confluent. Labial palpi dark, metallic. (Bright green, rarely bluish or almost unmetallic. Lower surface bluish, labrum and base of mandibles yellow. Elytral pattern (fig. 7d) normally consisting of 5 isolated pale spots, of which the two apical ones may be confluent; no central transverse band. Female has almost always a small dark spot in anterior third near the suture. 12–16 mm.) .... **campestris** Linnaeus

An unfastidious species, with preference for sandy and heathy ground. Already active in early spring.

England, Wales, Scotland, Ireland. Generally distributed.

— Ground colour brownish, sometimes with greenish hue, pale elytral markings forming a transverse band. Two basal segments of labial palpi almost constantly pale 4

4 Transverse elytral band more or less angulate (fig. 7c). Frons with a group of erect white setae inside and behind eyes. (Closely allied to *hybrida* and formerly regarded as a subspecies or variety of it. Its specific identity is clearly established by the quite different internal sac of the penis which lacks subapical teeth (fig. 8b).

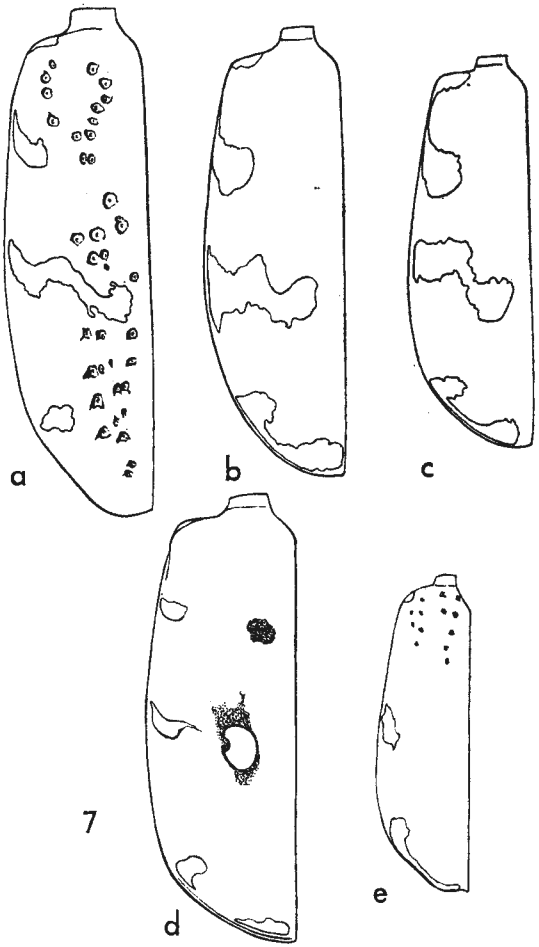

FIG. 7.—Elytron of *Cicindela*. (a) *C. sylvatica*; (b) *C. hybrida*; (c) *C. maritima*; (d) *C. campestris* ♀; (e) *C. germanica*.

Slenderer than *hybrida*, notably the pronotum, but elytra somewhat more widening in apical half. Frons less convex anteriorly. Meta-tibiae more slender and, in comparison with tarsi, longer. 12–15 mm.) . . . . **maritima** Dejean

On sterile sand, almost exclusively on the coast. England, N to Norfolk and Cheshire. Wales, N to Caernarvon. Local.

– Transverse elytral band without or with less pronounced bend (fig. 7b). Frons with only 1–3 setae inside hind-margin of each eye (in addition, as in *maritima*, a few bristles inside their anterior half). (Upper surface bronze with more or less pronounced greenish hue, lower surface mostly green. Labrum, base of mandibles and usually two basal segments of labial palpi pale. Central pale band of elytra sometimes a little more angulate than in fig. 7b. Penis (fig. 8a) with longer, arcuate apex, internal sac with 2 subapical teeth. 12–16 mm.)

hybrida Linnaeus

On open land or gravel, not confined to the coast. England: Norfolk, Cheshire, Lancashire, Cumberland. Wales: Merioneth. Local.

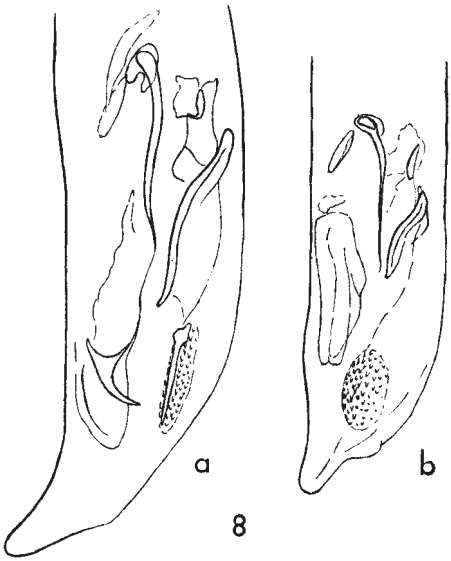

FIG. 8.—Apical half of penis in (a) *Cicindela hybrida*; (b) *C. maritima*.

Subfamily **OMOPHRONINAE**

A small uniform group, usually considered as a single genus, with the habitus of a giant *Haliplus*, which led earlier authors to regard it as a transition to the Hydradephaga. The body is almost circular (fig. 9), the pronotum immovably joined to the hindbody and covering the scutellum. The prosternum is enlarged, concealing the mesosternum (fig. 10). The elytra have supernumerous (14 or 15) striae. The penis is "open" (not sclerotized) dorsally. The larva is characterized by long so-called empodial hairs between the claws.

Tribe **OMOPHRONINI**

Genus **Omophron** Latreille

With the characters of the subfamily. Male with two pro-tarsal and one meso-tarsal segments dilated.

All species are riparian and nocturnal, during daytime burrowed in the soil.

ONE BRITISH SPECIES

Pale yellowish-brown, most of head, centre of pronotum, and 3 irregular transverse transverse bands on elytra, joined along the suture, metallic green. Elytra each with 15 complete striae. 5·0–6·5 mm. fig. 9 ..... **limbatum** Fabricius

Strictly riparian, on bare, sandy soil near freshwater, sometimes small ponds and pools. It appears immediately from its burrows after splashing with water. Sussex: Rye Harbour. Discovered in a gravel-pit May, 1969 (*R. A. Farrow & E. S. Lewis*) *and refound repeatedly in the same area. No doubt a recent immigrant.*

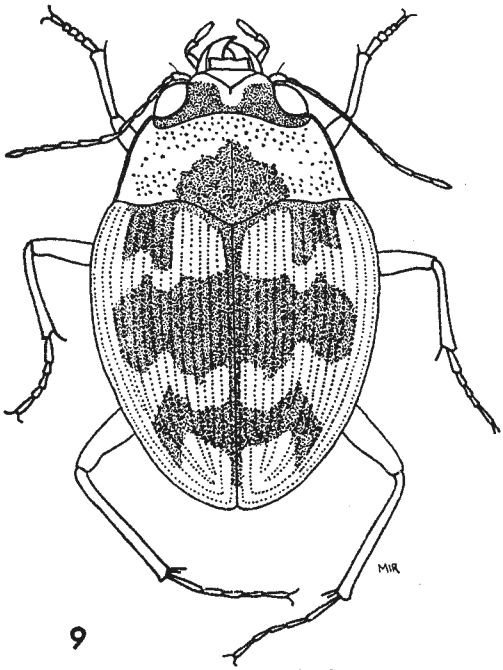

FIG. 9.—*Omophron limbatum* ♀

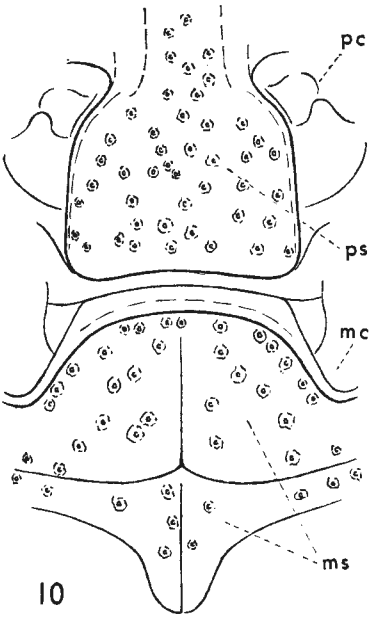

FIG. 10. Sterna of *Omophron*. mc, meso-coxa; ms, metasternum; pc, pro-coxa; ps, prosternum.

Subfamily CARABINAE

This subfamily includes the overwhelming majority of Carabid genera. For diagnostic characters, see subfamilies Cicindelinae, Omophroninae and Brachininae.

The Carabinae are divided into numerous tribes, mentioned in the text below. These are often separated on intricate features, of little use in ordinary identification work and therefore not described in this Handbook. The comprehensive key to all Carabid genera (p. 11) is intended as a more practical substitute.

Tribe **CYCHRINI**

Genus **Cychrus** Fabricius

With a single, extremely characteristic species (fig. 11), adapted for feeding upon shell-bearing snails. Forebody narrow with prolonged head and mandibles, the elytra oviform, fused together along the suture (wings virtually absent). Labrum deeply bilobed. Terminal segment of papli axe-shaped, notably in the male. Pronotum flat, rugosely punctate. Elytra granulate. Male pro-tarsi only faintly dilated.

ONE BRITISH SPECIES

Entirely black, 14–19 mm. (fig. 11). (British specimens have been referred to subsp. *rostratus* Linnaeus, which is larger than subsp. *caraboides* s.str., with more opaque lustre, better defined hind-angles of pronotum, and no (or only

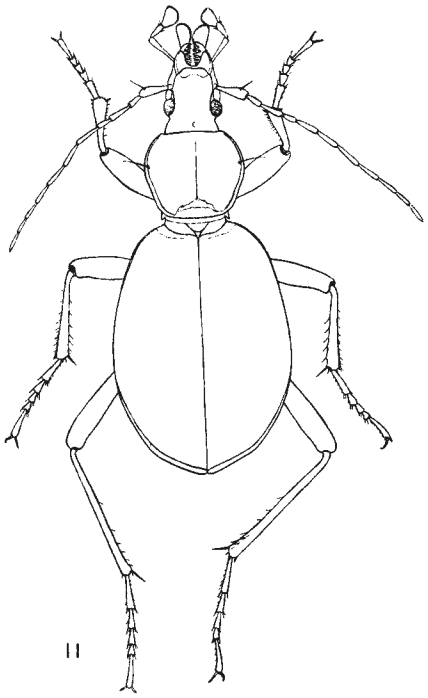

FIG. 11.—*Cychrus caraboides* L. ♀. Surface sculptures omitted.

slight) tendency of the elytral granulae to form longitudinal ridges. Subsp. *caraboides* is a northern and mountainous form on the continent; but, in Britain, even specimens from the Scottish Highlands seem to belong to subsp. *rostratus*. The two forms are, however, weak subspecies, at most, and all transitions occur.)

caraboides Linnaeus

Primarily a woodland species, occurring in shady, rather moist places. In the mountains also inhabiting open country. England, Wales, Scotland, Ireland. Generally distributed but never abundant.

Tribe **CARABINI**

Genus **Carabus** Linnaeus

This is the nominate genus of the family and the one in which Linnaeus included almost all of its members. Even as now conceived, *Carabus* is an immense genus with its main centre in the Palaearctic region.

Includes some of the largest Carabid species. Rather slender, with narrow shoulders and long legs. Elytral sculpture never regularly striate but consists of carinae, tubercles or foveae, often with interlying very dense striae, or it is almost smooth. Hind-wings quite rudimentary, except as individual exceptions (at least on the continent) in *granulatus* and *clathratus*. Male pro-tarsi with 4 strongly dilated segments.

The infraspecific variation in *Carabus*, notably of the elytral sculpture, is more pronounced than in any other Carabid genus and this has caused the creation of an almost unsurveyable abundance of names, of subspecific or lower value. They have been summarized in Breuning's monograph (1932–7); but his application of a strict quaternary, and even quintenary, nomenclature cannot be accepted. The 12 British species are morphologically rather stable.

KEY TO SPECIES

1 Elytra each with 2–4 continuous (rarely partly interrupted) elevated carinae (figs. 12a-c) 2
– Elytra without or with more numerous, less pronounced ridges (fig. 12d) 6
2 Each interval between the carinae with a single row of foveae or tubercles (figs. 12a, b) 3
– Intervals without longitudinal sculpture (fig. 12c) 5

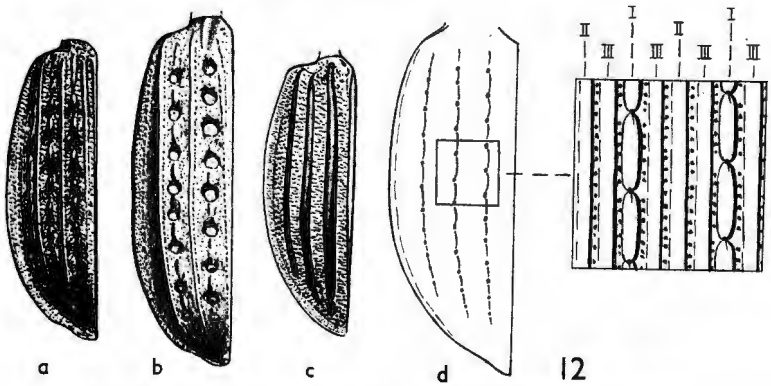

FIG. 12.—Elytron of *Carabus*. (a) *granulatus*; (b) *clathratus*; (c) *nitens*; (d) *problematicus* (generalized).
I, primary; II, secondary; III, tertiary carinae (according to Breuning).

3 Intervals foveate (fig. 12b). (Black, including appendages, upper surface almost constantly with greenish brass reflection, elytral foveae golden or coppery. Pronotum very broad with deep basal foveae and protruding hind-angles. 22–28 mm.) ..... **clathratus** Linnaeus

Hygrophilous. On muddy lake-shores, in swamps and peat-bogs, where the vegetation is luxuriant but also on less wet peaty soil. Doubtful in England (Suffolk, Norfolk). Rather widely distributed in W. Scotland and Ireland, but local and rare.

– Intervals tuberculate (fig. 12a) 4

4 Antennae with first segment rufous. Apical setae of third and fourth segments similar. (Superficially similar to *granulatus* but broader and more convex. Pronotum more densely punctate and with backwardly produced hind-angles. Upper surface with bronze or coppery lustre, strongest on pronotum. Femora sometimes rufous. Elytra of female with angulate incision of margin before apex. 20–27 mm.) ..... **cancellatus** Illiger

In open country, often on cultivated clayish soil. Occasionally introduced in Britain (e.g. in Ireland) but never established.

– Antennae entirely black. Apical setae on fourth segment denser than on 4. (Characterized among species with carinate elytra (fig. 12a) by the narrow pronotum with sides strongly elevated and sinuate in front of hind-angles. Elytral intervals with strong tubercles. Upper surface black but almost constantly with brass or greenish reflection; appendages black. Female with elytral margin deeply sinuate near apex. 16–23 mm.) ..... **granulatus** Linnaeus

In the British Isles, granulatus *is divided in two subspecies. One, subsp.* hibernicus *Lindroth* (1956), *occurs in pronounced form in Ireland, where it alone seems to represent the species. It is more strongly microsculptured, therefore opaque, and the elytral ridges are shallower. The form found in Great Britain may be referred to the nominate subsp.* (granulatus *s.str.); but transitions to subsp.* hibernicus *occur in the western parts of England.*

The species is rather hygrophilous, occurring in wet meadows or open forests, often under bark near water; also on cultivated soil. England, Wales, Scotland, Ireland.

5 Elytral carinae black, unmetallic. Appendages black. (Perhaps the prettiest of all British Carabids: black, upper surface, except elytral carinae (fig. 12c), metallic green, pronotum (almost constantly) and often head, as well as elytral margins, golden or coppery. An entirely black form occurs rarely. Antennae very short. Apex of pro-tibia hooked. Elytral intervals often interrupted, notably apically, intervals with faint transverse sculpture. 13–18 mm.) **nitens** Linnaeus

In open country, usually where heather grows, but both in dry and wet places. SW. & N. England, Scotland, Ireland. Very local.

– Elytral carinae metallic as their background. The 4 basal antennal segments, femora and tibiae rufous. (Entire upper surface bright metallic green, sides of elytra golden. Elytral intervals virtually smooth. Female elytra as in *cancellatus*. 20–27 mm.) ..... **auratus** Linnaeus

In open country, often on cultivated soil.

Occasionally introduced (England, Scotland) but not established. Expanding westward on the continent.

6 Elytra with clearly longitudinal sculpture consisting of fine ridges and rows of small tubercles and/or foveae 7

– Elytral sculpture weak and irregular, rarely, through confluence of granulae, with 3–4 faint elevated lines 11

7 Forebody very narrow, pronotum not wider than long. Distance between eyes equal to distance from centre of eye to base of labrum. (Usually bigger than any other British *Carabus*. Black, pronotum and elytra bluish or violaceous, at least laterally. Elytral sculpture coarse, the main carinae as well as intervening intervals dissolved into tubercles. Terminal segment of all palpi axe-shaped, more so in male. 25–38 mm.) ..... **intricatus** Linnaeus

In moist hardwood forests with thick humus layer, often in tree-stumps. England: Devon? Cornwall. Very rare, perhaps extinct. Doubtfully recorded from Scotland.

– Pronotum much wider than long. Distance between eyes much longer than from centre of eye to labrum 8

8 The three elytral ridges, in each interval between the 3 rows of small foveae, well developed, smooth. (Black, upper surface metallic, usually coppery. Body slender as in *violaceus* but pronotum broader, more like that of *problematicus*. Separated from both by the fine, regular elytral sculpture. 22–26 mm.)
monilis Fabricius

The British form may be referred to subsp. *monilis* s.str. (the name *insularis* Born is superfluous). Individuals with the central of the three ridges on each elytral interval more strongly developed belong to *gracilis* Küster (*consitus* auctt.) which, at least in Britain, has no subspecific validity.

In open, often cultivated country. England, Wales, Scotland, Ireland. Rare in the north, seems to have become less common everywhere.

– Elytra, on the intervals between the rows of small foveae, with weak, ± irregular ridges or otherwise sculptured 9

9 Intervals without evident ridges, sculpture irregular, scale-like. (A stout, very convex species, notably the female. Bronze to brass green, the female more dull, sides of pronotum and elytra usually violaceous. A black form known from Dartmoor. The seriate foveae of elytra very small. 22–26 mm.)
nemoralis O. F. Müller

In Britain a less syanthropic species than on the continent, occurring in forests and parks as well as in open country, and also in farmland. The species has become more abundant during the last century in many places, but in others, e.g. in the London district, has become rarer, notably in comparison with violaceus. *England, Wales, Scotland, Ireland.*

— Each interval, at least anteriorly, with 3 ridges 10

10 Penultimate segment of labial palpi with several setae. Pronotum with greatest width in anterior third, sides reflexed and elevated basally. (Black with margins of pronotum and elytra metallic: violaceous, blue, green or coppery; a faint bronze hue may extend over entire surface. Characterized by the rough, complex, more or less irregular elytral sculpture (fig. 12d): on each elytron, it consists of three "primary" ridges interrupted by small setiferous punctures, and on each interval one "secondary" and two "tertiary", less pronounced ridges; these structures are obsolete apically. 18–30 mm.)
(*catenulatus* auctt. nec Scopoli) **problematicus** Herbst

The British form has been referred to subsp. *gallicus* Géhin or separated from this as subsp. or var. *procedens* Csiki (*progressus* Lapouge). It is, however, by no means uniform and a further division may be necessary in the future.

In open, dry country, mostly on heaths, but also in thin forests; also at high elevation. England, Wales, Scotland, Shetland, Ireland. Widely distributed.

— Penultimate segment of labial palpi bisetose. Pronotum with greatest width near middle, sides not elevated. (Much varying in colour: violaceous, greenish, coppery, etc. Elytral sculpture similar to that of *problematicus* but the main ridges (interrupted by small foveae) are stronger. Pronotum flatter. 16–20 mm.)
("*arcensis*", no doubt printer's error) **arvensis** Herbst

The British form has been referred to the western subsp. *silvaticus* Dejean.

In dry, open country or thin forests, on gravel or sand; on peaty moors in the north. England, N. to Cumberland, Wales, Scotland, Ireland. Locally not uncommon.

11 Penultimate segment of labial palpi with several setae. Pronotum and elytra clearly metallic along side-margins. (Dull black, metallic hue violaceous or blue, sometimes greenish or golden; if it is faint, a confusion with *glabratus* is possible (see that species). Elytra almost smooth, with minute granulae, which are either quite irregularly distributed or joining into three faint longitudinal ridges. 20–30 mm.) ..... **violaceus** Linnaeus

This is a multiform species with many subspecies recognized on the continent. The main British form has been called subsp. *sollicitans* Hartert (*britannicus* Born) but certain populations on the south-coast differ in having more granulate elytra with longitudinal ridges more pronounced than usual; they have been referred to subsp. (or "var.") *asperipennis* Lapouge (*exasperatus* Curtis) (according to Breuning (1932–37), Lapouge's name belongs to a form of *purpurascens* Fabricius).

Both in forests and quite open country; the most abundant species, common everywhere even in parks and gardens. England, Wales, Scotland, Ireland. Widely distributed.

— Penultimate segment of labial palpi bisetose. Upper surface unicolorous, black or with faint steel-blue lustre. (A very convex species with quite reduced elytral sculpture. It may be confused with unmetallic specimens of *violaceus* but is more shiny and has a shorter pronotum with confluent, wrinkled punctuation inside hind-angles. The elytral sculpture consists of small, flat granulae, exceptionally joined to form three very obsolete raised lines on each elytron. 22–30 mm.) ..... **glabratus** Paykull

The British form has been referred to the weak subsp. *lapponicus* Born, which is smaller and more convex than the nominate subspecies of the continent.

In hilly and mountainous districts, often in forests. N. England, S. to Derby, Wales, Scotland, widely, Ireland. Scarce.

Genus **Calosoma** Weber

Closely allied to *Carabus* but the two British species are easily separated on wrinkled mandibles, very short second antennal segment (fig. 13c), and the 16 regular striae on each elytron, with three of the intervals punctate. Pronotum very short (figs. 13a, b)

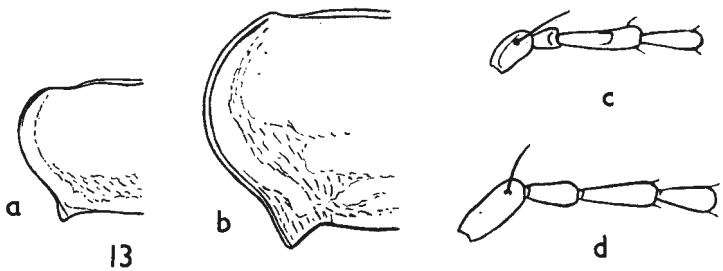

FIG. 13.—Pronotum of (a) *Calosoma inquisitor*; (b) *C. sycophanta*. Antennal base of (c) *Calosoma inquisitor*; (d) *Carabus violaceus*.

and, compared with the elytra, much narrower than in *Carabus:* hind-angles protruding. Wings always fully developed, the beetles being excellent fliers. Upper surface with pronounced metallic reflection.

Our species of *Calosoma* are arboreal rather than terricolous, climbing deciduous trees in search of caterpillers. Also, the larva is able to climb. *C. sycophanta* has been used in biological control of the Gypsy Moth (*Lymantria dispar*) in North America.

KEY TO SPECIES

1 Pronotum (fig. 13a) with lateral bead disappearing behind middle. (Black, underside greenish brass, upper surface more or less strongly bronzed, often with reddish or greenish reflection, margins of elytra usually clear green. Male with 4 dilated pro-tarsal segments. 16–22 mm.) ..... **inquisitor** Linnaeus

In open forests, notably of oak. The beetles appear at irregular intervals during outbreaks of lepidopterous larvae, usually Geometrids (Operophthera, Erannis), *in early summer; the adults then enter into subterraneous aestivation. England, N. to Cumberland. Wales, Ireland.*

— Pronotum (fig. 13b) with complete lateral bead. Dorsal punctures of elytra smaller. (Consistently larger than *inquisitor* and more brilliantly coloured: black with bluish hue, elytra bright metallic green, often with reddish reflection. Male with 3 dilated pro-tarsal segments. (24–30 mm.) ..... **sycophanta** Linnaeus

On the continent with the same habitat and biology as inquisitor. *In the British Isles a casual visitor only, notably on the south- and south-east-coast, but also in N. England and Ireland. No records in later decades.*

Tribe **NEBRIINI**

Genus **Leistus** Frölich

Rather distantly related to the two following genera and easily distinguished by the dilated, very flat mandibles (fig. 14a), the spiny lateral edges of the maxillae, slender palpi, and the constricted neck of the head. Pronotum with or without seta at hind-

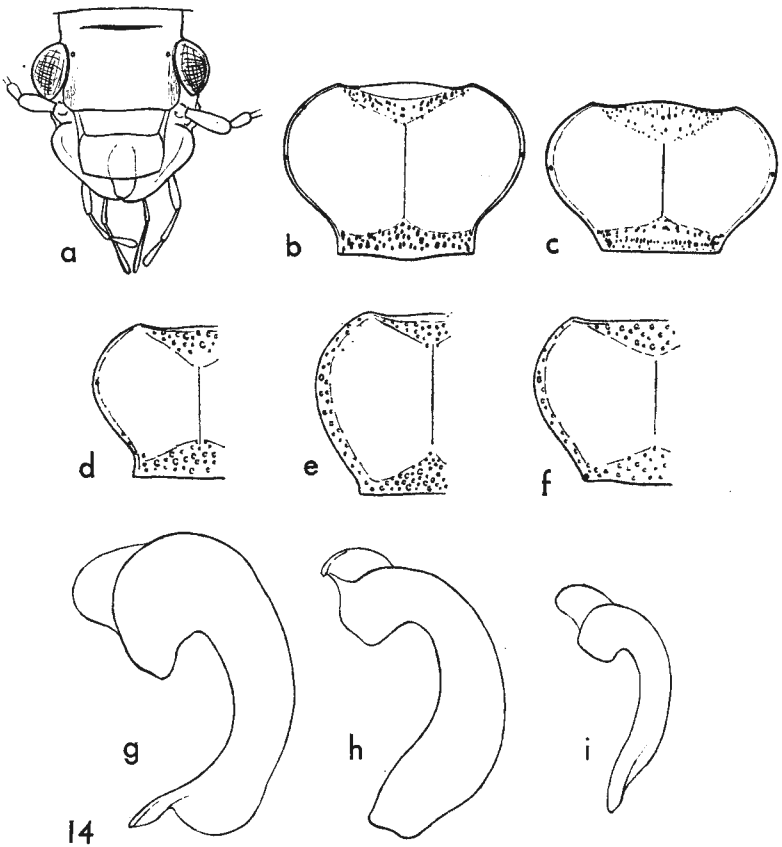

FIG. 14.—*Leistus*. (a) Head of *rufescens*; pronotum of (b) *ferrugineus*; (c) *rufescens*; (d) *fulvibarbis*; (e) *spinibarbis*; (f) *montanus*; penis of (g) *fulvibarbis*; (h) *spinibarbis*; (i) *montanus*.

angle. Hind-wings varying in size, even within a single species (*rufomarginatus*), and often non-functional; flying individuals of *spinibarbis* have, however, been observed. Male with 3 dilated pro-tarsal segments. Penis quite different from that of *Nebria* (figs. 14g–i) and much varying between species.

The members of this genus are not riparian but occur among debris in more or less shady places.

KEY TO SPECIES

1 Upper surface (at least elytra) with metallic (blue or green) lustre. Elytra entirely dark 2
– Body entirely unmetallic (or with faintest metallic hue), either pale (yellow or brown), sometimes with elytra dark apically, or dark with pale margins 4
2 Pronotum (fig. 14d) with base suddenly constricted; lateral explanation narrow; no seta at hind-angle. Metallic reflection faint, notably on forebody. (Legs rufous. Frons faintly rugoso-punctate laterally. Penis, fig. 14g. 6·5–8·0 mm.)
fulvibarbis Dejean
Usually under trees in somewhat moist places. England, widely. Wales, Scotland, local. Ireland.
– Pronotum (figs. 14e, f) moderately constricted, hind-angles obtuse or denticulate; lateral explanation broad; seta present at hind-angle. At least elytra with strong metallic reflection 3
3 Head rugulose laterally. Hind-angles of pronotum (fig. 14e) denticulate; only extreme side-margin pale. Legs piceous black with paler tarsi. (Penis, fig. 14h. 8·0–10·5 mm.) ..... **spinibarbis** Fabricius
Habitat as the preceding though less hygrophilous. England, generally. Wales, Scotland: West Lowlands, Ireland.
– Head densely, irregularly punctate laterally. Hind-angles of pronotum (fig. 14f) obtuse; lateral explanation almost entirely reddish. Legs rufous or with femora infuscated apically. (Penis very small, fig. 14i. 7–9·5 mm.)
montanus Stephens
A mountain species. In somewhat drier habitats than the two preceding. England: Cumberland. Wales: Merioneth. Scotland: East and West Highlands. Ireland. Rare.
4 Upper surface dark brown with paler margins on pronotum and elytra. Pronotum with seta at hind-angle; sides more explanate. Elytral shoulders with small tooth. (Appendages rufo-testaceous. 8·0–9·5 mm.)
rufomarginatus Duftschmid
Among leaves and mosses, usually at the base of deciduous trees, also in dark forests. S. and E. England, to Dorset and Monmouth, N. to Norfolk. Apparently a late immigrant, still extending its range.
– Upper surface either entirely pale (rarely brown) or with at most head, apex of elytra and suture darker. Pronotum without latero-basal seta. Shoulders without tooth 5
5 Unicolorous: yellow or brown. Pronotum (fig. 14b) with right hind-angles and sides parallel in front of them. (Body somewhat narrower than in *rufescens*. 6·5–8·0 mm.) ..... **ferrugineus** Linnaeus
Occurring in more open country and in drier places than other members of the genus, often in moss and grass tufts. England, widely. Wales, rare. Scotland, Ireland.
– Yellow to brown with head and abdomen black, as a rule also apex and suture of elytra dark. Sides of pronotum (fig. 14c) diverging from the obtuse hind-angles. (Eyes flatter than in *ferrugineus*. Punctuation of elytral striae sparser. 6·0–8·0 mm.) ..... (*terminatus* Hellwig) **rufescens** Fabricius
The most hygrophilous of the species. In moist, shady places among wet leaves, often under alders. England, locally. Wales. Scotland. Shetland. Ireland.

Genus **Pelophila** Dejean

Related to *Nebria*, with the same general habitus and form of pronotum Easily separated, also from *Blethisa* with similar elytral sculpture, by the presence of 10 complete striae (no. 2, corresponding to the "scutellar" stria, only slightly abbreviated apically); fourth and sixth intervals with an irregular row of foveae. Male with 3 strongly dilated pro-tarsal segments.

ONE BRITISH SPECIES

The single species is a northern element in the British fauna.

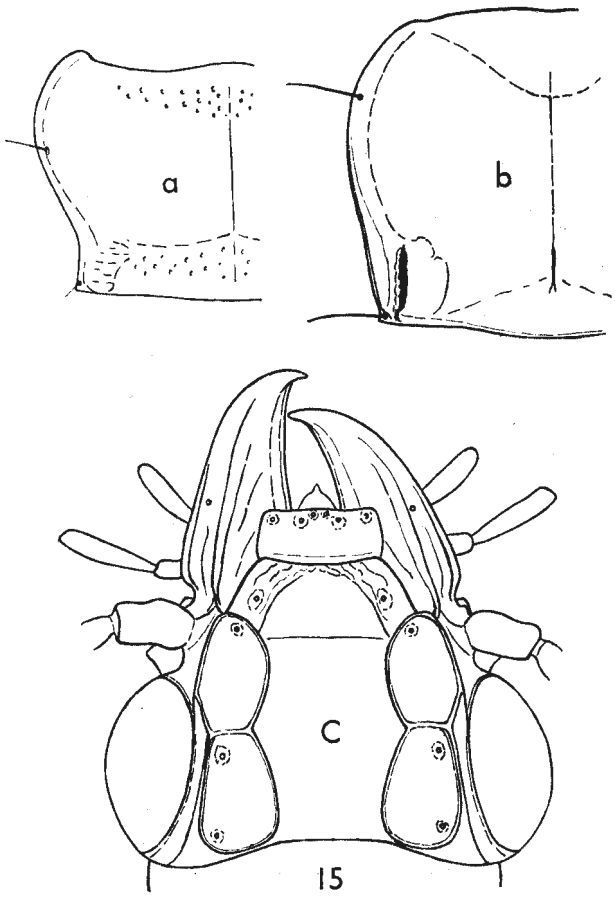

FIG. 15.—Pronotum of (a) *Pelophila borealis*; (b) *Blethisa multipunctata*; (c) head of *Blethisa*.

Black or piceous, upper surface almost constantly with metallic, brassy, rarely greenish or bluish, reflection; individuals with rufinistic elytra are rare. Appendages black to brown, sometimes legs rufous with dark knees. Pronotum (fig. 15a) cordiform with sharp hind-angles. 9–12·5 mm..... **borealis** Paykull

At the margins of fresh water, both lakes and slow-running rivers, where the soil is silty or muddy and some vegetation of Carices etc. occurs. England: Devon and Derby. Scotland: Orkney and Shetlands. Ireland, widely distributed in the north and west; doubtful in Wales (S. O. Taylor).

Genus **Nebria** Latreille

(*Helobia* Curtis, *Eurynebria* Ganglbauer)

Species of this genus are at once recognized on their short, cordiform pronotum (fig 16). All appendages very long and slender. The four basal segments of antennae without pubescence. Pronotum with two lateral setae, the posterior at hind-angle. Elytra with 9 complete striae and one abbreviated at scutellum; third interval (sometimes

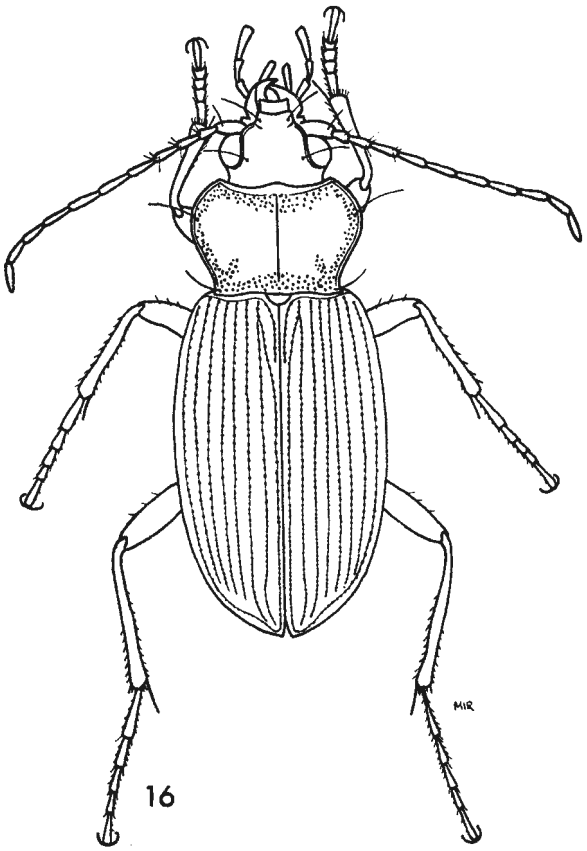

FIG. 16.—*Nebria brevicollis* ♂.

also fifth and seventh), except in *complanata*, with a few dorsal punctures. Pro-tibia of male with 3 dilated segments.

The members of this genus are generally hygrophilous, but two British species, *brevicollis* and *salina*, are independent of the vicinity of water.

KEY TO SPECIES

1 Entire body pale yellow, elytra with longitudinal black spots, confluent into irregular transverse fasciae. Third elytral interval without dorsal puncture. Penultimate segment of labial palps with several setae (subgen. *Eurynebria* Ganglbauer). (Specimens with entirely pale elytra found on the continent. 17–24 mm.) ..... **complanata** Linnaeus

In or near the tidal zone, on bare sand or sandy clay; highly gregarious, local. S.W. England. S. Wales. Ireland.

– Body with dark ground colour, head with two rufous spots, elytra unicolorous or with broadly pale margin. Third interval with at least 3 dorsal punctures. Penultimate segment of labial palps with 2 or 3 setae.....(subgen. *Nebria* s.str.) 2

2 Pronotum pale, elytra black with sides and apex broadly yellowish. (Black, pronotum except front- and hind-margin and underside pale, all appendages testaceous. The British form is "*lateralis* Fabricius", with pale elytral margin narrower. 12–16 mm.) ..... **livida** Linnaeus

On sterile banks and shores consisting of sand, often mixed with clay, usually near fresh water. It is pronouncedly nocturnal, hiding during daytime in clay cracks and under refuse or pieces of wood. England: Suffolk, Norfolk, Stafford, Yorkshire; very local.

– Pronotum and elytra unicolorous, dark, or elytra more or less rufinistic 3

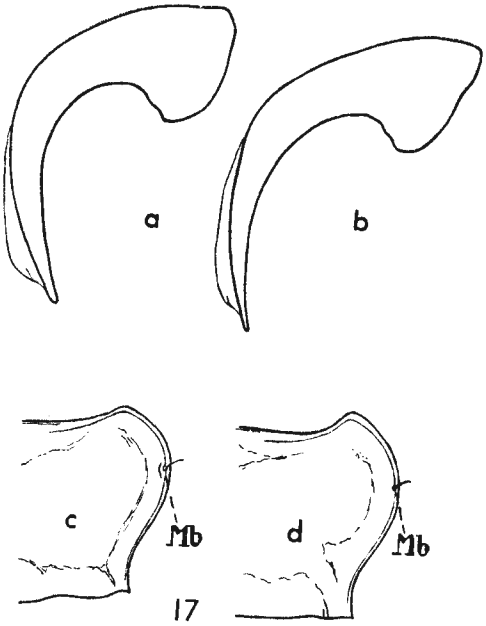

FIG. 17.—*Nebria*. Penis of (a) *brevicollis*; (b) *salina*. Pronotum of (c) *nivalis*; (d) *gyllenhali*. Mb, marginal seta.

3 Shoulder-angle of elytra sharp. Antennae and palpi entirely pale (exceptionally basal antennal segments or penultimate segment of maxillary palpi dark). (Femora darker than tibiae.) 4

– Shoulder-angle obtuse or rounded. Antennae and palpi black or piceous, basal segments of the former often slightly paler (a form of *gyllenhali*, usually with pale antennae, has entirely rufous legs) 5

4 Meso- and meta-tarsi with basal segments finely pubescent above. Elytral micro-sculpture consisting of transverse meshes, at least twice as broad as long. (Piceous or dark brown, extreme sides of pronotum and elytra somewhat translucent, appendages dark rufous but femora (in exceptional cases also base of antennae) darker. Raised marginal bead of pronotum thick. Elytral striae coarse, strongly punctate, intervals more or less convex. Penis, fig. 17a. 10–14 mm.) (fig. 16) ..... **brevicollis** Fabricius

Very eurytopic, both in deciduous forests and parks and in open country. Often under moss and bark of tree-stumps. The larva burrows in the soil. England. Wales. Scotland. Ireland. Generally distributed and usually abundant.

– All tarsi (except for apical setae on each segment) glabrous above. Meshes of elytral microsculpture only slightly transverse. (Easily confused with *brevicollis* but deviating also in the following points: body slightly flatter and elytra more parallel-sided; lateral bead of pronotum narrower, its base a little more constricted; elytral striae usually finer and more finely punctate. Penultimate segment of maxillary palpi somewhat infuscated. Penis (fig. 17b) more slender, less arcuate. 10–13·5 mm.)
(*degenerata* Schaufuss, *iberica* Oliveira, *klinckowstroemi* Mjöberg) **salina** Fairmaire

Usually inhabits drier and more open country than brevicollis; *the two species may, however, overlap, for instance at forest edges.*
England. Wales. Scotland. Shetland. Ireland. Widely distributed but usually more local and less abundant than brevicollis.

5 No ridge inside anterior seta of pronotum (fig. 17d). Femora dark, tibiae brown to piceous, or legs entirely rufous. Only third elytral interval with dorsal punctures. (More slender and usually darker than the two preceding species. Black, often with rufinistic elytra ("*rufescens* Ström"), appendages normally with palpi, tibiae, tarsi and often base of antennae piceous; but the form "*balbi* Bonelli" has the entire legs, usually also antennae and mouth-parts clear rufous. Shoulder-angle obtuse but not quite rounded. Microsculpture of last abdominal sternite consisting of transversely arranged meshes. 9–12 mm.)
(*rufescens* Ström) **gyllenhali** Schönherr[1]

Mainly on the banks of small cold-water streams. In hilly and mountainous districts. England, S. to Derby. Wales: Carnarvon. Scotland. Shetland. Ireland. Abundant where it occurs.

– Anterior marginal seta of pronotum inwardly accompanied by a minute ridge (fig. 17c). Femora rufous with dark apex (or pale at base only), tibiae black or almost so. Elytra often with dorsal punctures also on fifth interval. (Narrower than *gyllenhali*, notably the pronotum. Shoulders more rounded. Dorsal punctures more foveate. Last abdominal sternite with microsculptural meshes irregularly arranged. 9–11 mm.) ..... **nivalis** Paykull

Restricted to high altitudes (in Scandinavia almost confined to margins of snow-fields). Scotland: East and West Highlands.

Tribe **NOTIOPHILINI**

Genus **Notiophilus** Duméril

Small, parallel-sided, shiny species, extremely characteristic because of their enormous eyes and strigose frons (figs. 18a, b), as well as by the second elytral interval which is at least twice as broad as the third; fourth interval with at least one dorsal puncture. Many species exhibit wing dimorphism. Male with 3 pro-tarsal segments and terminal joint of palpi slightly dilated.

The species are heliophilous, very rapid in their movements, and occur in open country or light forests.

Key to Species

1 Second elytral interval (just behind middle) more than 3 times as wide as third. Apex of elytra often with defined pale spot. (Always 2 preapical punctures; fig. 18e) 2
– Second elytral interval about twice as wide as third. Elytra without defined apical spot (though sometimes generally rufinistic apically) 5
2 Elytra uniformly dark (black to piceous). Legs bright rufous, often with femora and apex of each tarsal segment somewhat infuscated. (Upper surface with strong brassy lustre. Habitus as *palustris* but with elytra longer and more coarsely punctate. 5·5–6·6 mm) ..... **rufipes** Curtis

Habitat as biguttatus *but usually in somewhat moister places (e.g. among leaf litter). England, N. to Durham. S. Wales.*

[1] *N. gyllenhali* Schönherr 1806 is usually kept as a *nomen conservandum*, in spite of the older name *rufescens* Ström, 1768.

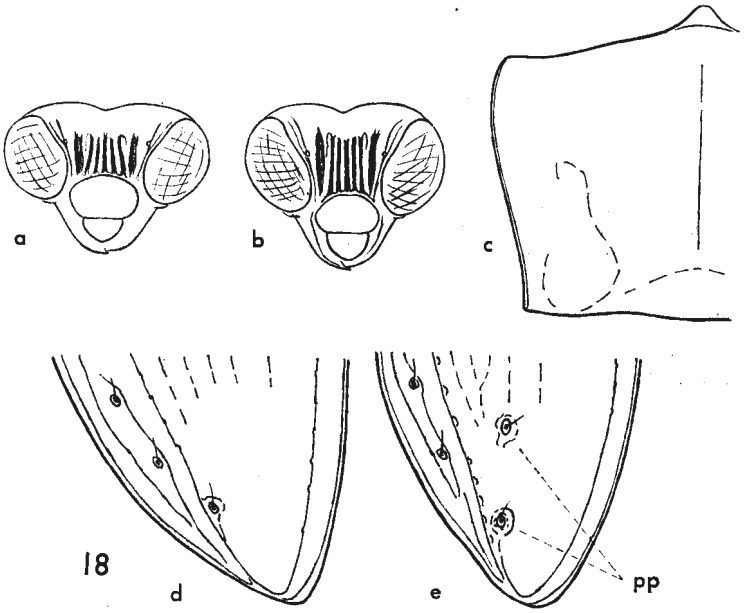

FIG. 18.—*Notiophilus*. Head of (a) *palustris*; (b) *germinyi*. Pronotum of (c) *aquaticus* species with one (d) and two (e) preapical punctures on elytra.

– Elytra with pale apical spot. Legs black, only tibiae more or less pale 3

3 Punctuation of entire upper surface fine. Elytral intervals flat, the outer dull due to very strong, granulate microsculpture, contrasting against the shiny broad second interval. (Coloured as normal *biguttatus*. Forebody narrower. 4·5–5·5 mm.) .....**substriatus** Waterhouse

In open, rather dry country. England, generally. Wales. Scotland. Ireland.

– Punctuation coarse. Outer intervals convex, not quite dull, their microsculpture irregular, not granulate 4

4 Fourth elytral interval broader than adjacent ones, almost constantly with two (exceptionally three or one) large dorsal punctures often asymmetrical in position. (Microsculpture somewhat stronger, notably at apex. Pronotum with sides only faintly sinuate posteriorly. Coloured as normal *biguttatus*. 5·0–5·5 mm.) **quadripunctatus** Dejean

Sandy places, e.g. in gravel pits. England, N. to Cumberland. Not common.

– Fourth elytral interval not or only slightly broader than third and fifth, almost always with a single, less foveate puncture. (Pronotum with sides clearly sinuate before the sharp hind-angles. Upper surface with brassy, seldom bluish, lustre; apical spot of elytra sometimes prolonged to before middle. Tibiae clear rufous. 5·0–6·0 mm.) .....**biguttatus** Fabricius

In somewhat shady but dry places. England. Wales. Scotland. Shetland. Ireland. Common everywhere.

5 Legs entirely black. Pronotum (fig. 18c) narrower with sides less rounded anteriorly.....6

– Tibiae more or less pale, at least at apex. Pronotum broader 7

6 Elytra with only one preapical puncture (fig. 18d; a rudimentary anterior puncture exceptionally present). (Head not wider than pronotum, frontal furrows parallel. Elytral intervals 3–7 quite smooth. 4·5–6·0 mm.)

(*strigifrons* Baudi, *blacki* Edwards) **aquaticus** Linnaeus

In all kinds of open, moderately to pronouncedly dry country, also at high elevation. England (local). Wales. Scotland. Shetland. Ireland. Commoner in the north.

– Elytra with two preapical punctures (fig. 18c). (Very similar to *aquaticus* but somewhat narrower and flatter. Intervals 3 7 of elytra with an irregular row of very small, flat impressions. 4–5·5 mm.)
(*pusillus* Waterhouse) **nantuana** Motschulsky
In dry places, e.g. gravel pits. England: Hants. Scotland: W. Highlands. Very rare.

7 Frontal furrows parallel or almost so (fig. 18b). Outer elytral intervals dull from dense micro-reticulation. (Head hardly broader than pronotum, which has sides less rounded anteriorly. Metallic lustre more vivid, often greenish along elytral margins. 4·5–5·5 mm.) ..... (*hypocrita* auctt.) **germinyi** Fauvel
In open, rather dry country, among grass, mosses, etc. England, N. to Yorkshire. Wales. Scotland: Highlands. Ireland.

– Frontal furrows forwardly diverging (fig. 18a). Intervals smooth, shiny. (Eyes very large, head wider than pronotum. Elytral striae coarser. 5·0–6·0 mm.)
palustris Duftschmid
In more shaded and somewhat moister spots than germinyi, though also in open country if the vegetation is dense. England. Wales. Scotland. Ireland. Widely distributed.

Tribe **ELAPHRINI**

Genus **Blethisa** Bonelli

(*Helobium* Leach)

ONE BRITISH SPECIES

Easily recognized on elytral sculpture (see, however, *Pelophila*) and the unique structure of the frontal furrows (fig. 15c). Separated from *Elaphrus* also on the broadly reflexed margins of pronotum (fig. 15b), the raised basal margin and the lack of pupillate punctures of elytra. Striae somewhat irregular because of the two rows of large foveae (on third and fifth interval) and an impression near the shoulder. Wings full. Male with 4 dilated pro-tarsal segments. Black with bronze reflection, margins of pronotum and elytra usually greenish. 10–13·5 mm.
multipunctata Linnaeus
On open, marshy lake-shores, on soft soil, usually with moss and Carex *vegetation. England. Wales. Scotland. Ireland. Widely distributed but local.*

Genus **Elaphrus** Fabricius

The elytral sculpture at once separates this genus from all other British Carabidae. The striae are replaced by alternating rows of shiny rectangular "mirrors" and of pupillate setiferous punctures, each usually surrounded by a depression. Body more or less metallic. Head (fig. 6b) with enormous, protruding eyes and therefore at least as wide as pronotum, which is coarsely punctate. Wings full. Male with 3 or 4 dilated pro-tarsal segments. Penis "open", that is, with dorsum not sclerotized; internal sac with a heavy rod.

All species occur near water and are strongly hygrophilous.

KEY TO SPECIES

1 Head (including eyes) not wider than pronotum. All tibiae entirely metallic..... 2
– Head wider than pronotum. All tibiae more or less pale (brown or yellowish), at least at middle 3

2 Elytra, except on "mirrors", quite dull from dense, strong microsculpture, sparsely punctate; pupillate punctures not surrounded by depressions. (More stretched than all following species, with narrower shoulders. Metallic lustre of upper surface variable: coppery, golden, green or bluish, pupillate punctures concolorous. All appendages dark. Prosternum hairy. Elytral sculpture smooth. 8·5–10 mm.) ..... **lapponicus** Gyllenhal
On wet moss near wells and streams or in bogs. Mostly in spring. England: Yorkshire. Scotland. Rare and local.

– Elytra shiny, microsculpture weak, punctuation dense, notably around the pupillate punctures which are situated in a depression. (Most easily recognized on the strongly rounded sides of pronotum (fig. 20a). Upper surface with variable metallic lustre but pupillate punctures always more or less violaceous. All appendages dark. Prosternum glabrous. Elytral sculpture rough. 8·5–10 mm.) ..... **uliginosus** Fabricius

At the margin of lakes and ponds without too much vegetation, also in bogs. England. Wales. Scotland. Ireland. Very local.

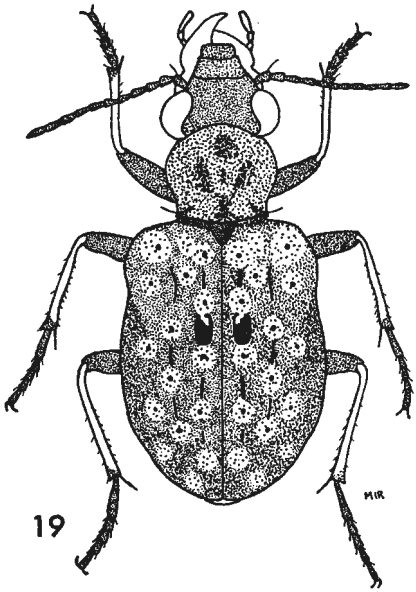

FIG. 19.—*Elaphrus riparius* ♂.

3 Tarsi blue. Elytra shiny, microsculpture weak. 8·0 mm. or more. (Somewhat flatter than *uliginosus* with more parallel-sided elytra. Bronze or greenish, pupillate punctures usually violaceous. Base of palpi and at least middle of tibiae, usually also base of femora, pale. Lateral bead of pronotum obliterating anteriorly (fig. 20b). Prosternum glabrous. 8–9·5 mm.) . . **cupreus** Duftschmid

At the margin of all kinds of standing water where some vegetation is present; also in forest swamps. England. Wales. Scotland. Shetland. Ireland. Common.

– ~~Tarsi green.~~ Elytra quite dull from dense, strong microsculpture, except on "mirrors" which are therefore much more contrasting. 8·0 mm. or less. (Smallest species, with flat and broad elytra. Upper surface normally green, rarely with yellowish, bluish or bronze lustre. Appendages pale as in *cupreus*. Prosternum hairy. Male with only 3, in preceding species with 4, dilated pro-tarsal segments. 6·5–8 mm.) (fig. 19) ..... **riparius** Linnaeus

On open, often quite barren sand or clay at the margin of freshwater. England. Wales. Scotland. Ireland. Commonest species.

Tribe **LORICERINI**

Genus **Loricera** Latreille

(*Lorocera* auctt.)

ONE BRITISH SPECIES

The single species is separated from all other British Carabidae by the 10 regular striae on each elytron, without abbreviated scutellar stria, and the excessively long setae on antennal segments 2–6 (fig. 20c). In general outline reminiscent of an *Agonum*. Male with 3 dilated pro-tarsal segments. Black with brassy or green, rarely bluish, lustre; mouth-parts, legs except femora, and parts of an-

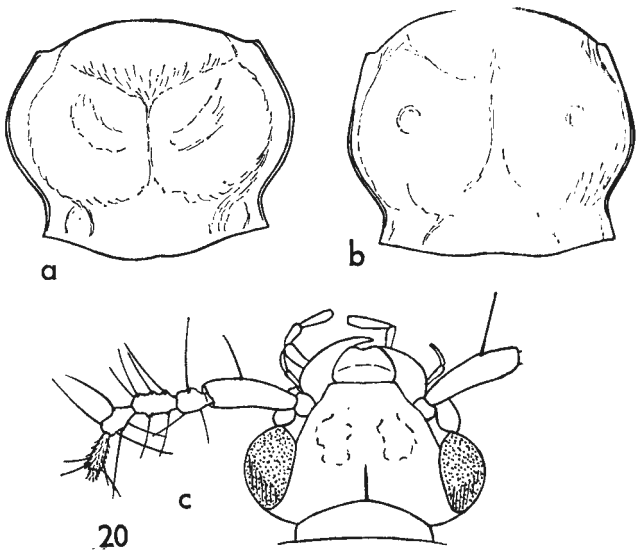

FIG. 20.—Pronotum of (a) *Elaphrus uliginosus*; (b) *E. cupreus*. Head of (c) *Loricera pilicornis*.

tennal base rufous. Elytra sometimes rufinistic. Eyes strongly protruding. Pronotum cordate. Elytra with 3 foveate punctures on fourth interval. 6·0–8·5 mm.) .....(*coerulescens* auctt.) **pilicornis** Fabricius

On moist, more or less shaded ground, usually near water. England. Wales. Scotland. Shetland. Ireland. Common.

Tribe **SCARITINI**

Genus **Dyschirius** Bonelli

Small, more or less cylindrical, "pedunculate" beetles (fig. 22a) with pro-tibiae (figs. 21a-d) broad and spiny, adapted for digging, as in *Clivina*. Separated from *Clivina* by smaller size, almost constant metallic coloration, and by the raised lateral bead of pronotum not being prolonged upon constricted basal part. Also, the meso-tibiae are unarmed. Setiferous punctures along side-margin of elytra divided into two widely separated groups (figs. 21e, f): (a) 1–3 sub-humeral foveae (sometimes wanting), each containing 2 granulae, the posterior of which carries a seta; (b) 1–3 preapical punctures. Colour of little taxonomic importance in this genus. Normally, the upper surface has a

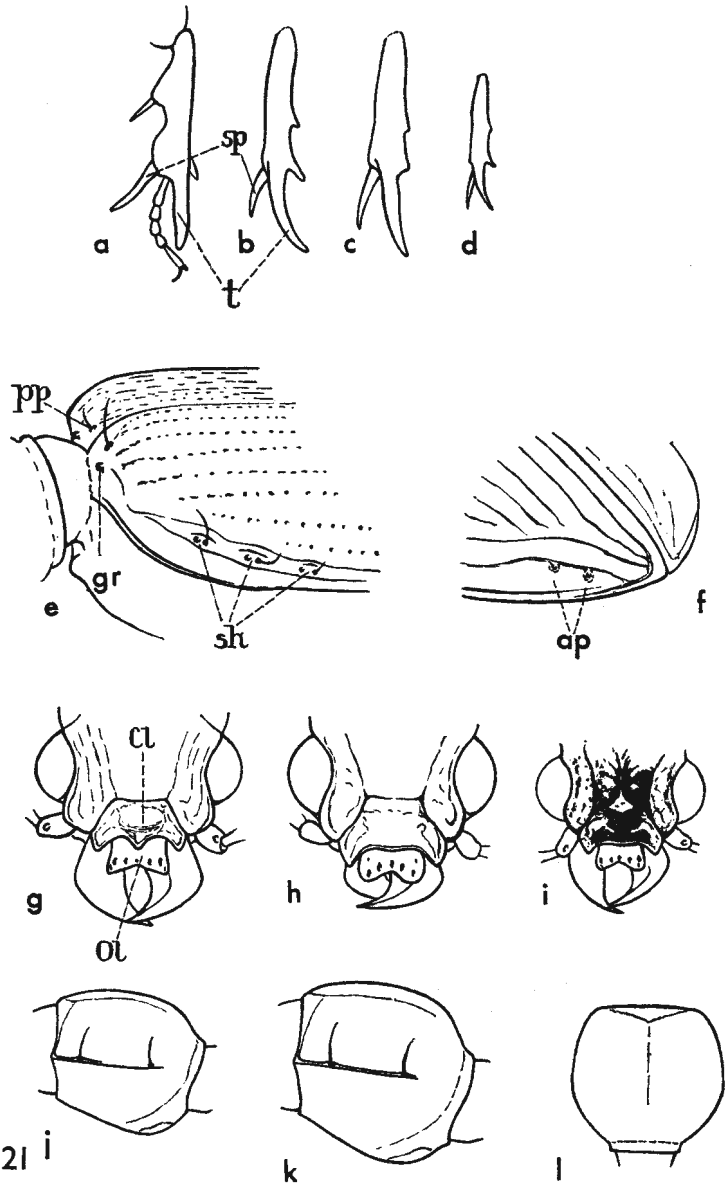

FIG. 21.—*Dyschirius*. Left pro-tibia of (a–b) *thoracicus*; (c) *politus*; (d) *globosus*. Elytral base of (e) *luedersi*. Elytral apex of (f) *impunctipennis*. Head of (g) *thoracicus*; (h) *salinus*; (i) *luedersi*. Pronotum of (j) *globosus*; (k–l) *aeneus*.

ap, preapical punctures of elytra
cl, clypeus
gr, basal granula of elytra
ol, labrum
pp, basal pore-puncture of elytra
sh, subhumeral fovea of elytra
sp, tibial spur
t, terminal spine of tibia

more or less pronounced metallic reflection but in most species also virtually black and somewhat rufinistic specimens occur. Male distinguished externally only by the somewhat broader terminal segment of the palpi.

Species of *Dyschirius* are subterranean and usually dig their burrows in sterile, sandy soil. Since most of the species are attached to Staphylinids of the genus *Bledius* for prey, they are usually riparian, some being restricted to the sea-shore or other saline places. They are most easily captured by splashing their habitat with water.

Many species are difficult to separate and may require high magnification (about 80×).

KEY TO SPECIES

1 Anterior margin of clypeus with median tooth (fig. 21g). (Elytra with rounded sides, base with complete margin.) 2
– Clypeus without median tooth (figs. 21h, i). (Elytral base margined only in two species with narrow, parallel-sided elytra.) 3
2 Entire upper surface dull from dense and strong microsculpture. Elytral striae smooth, or almost so. (Somewhat shorter, with more rounded sides of elytra, the striae of which are deeper, notably at apex. Legs and base of antennae usually darker. 3·5–4·6 mm.) ..... **obscurus** Gyllenhal
On fine sand with Bledius, *usually* B. arenarius *Payk. England: Rye, Sussex? Norfolk. Ireland: Lough Neagh.*
– At least elytra rather shiny, microsculpture weaker though clearly visible on forebody as well as on base and apex of elytra. Striae evidently punctate, at least anteriorly. (Usually with brassy, sometimes bluish lustre, rarely unmetallic black, or with rufinistic elytra; base of antennae, mouth-parts and tibiae rather pale. Two dorsal and one preapical punctures; no subhumeral fovea. 3·5–4·7 mm.) ..... (*arenosus* Stephens) **thoracicus** Rossi
On sterile sandy shores of fresh and salt water. Associated with Bledius arenarius *Payk.*, B. talpa *Gyll.*, &c. *England. Wales. Scotland. Ireland. Local but often abundant.*
3 Base of elytra margined from shoulder to peduncle. Third interval with a single dorsal puncture behind middle; no subhumeral fovea. (Body very narrow.) .. 4
– Base of elytra not margined inside shoulder (fig. 22a). Third elytral interval with 2 or 3 dorsal punctures; at least 1 subhumeral fovea 5
4 Frons dull from coarse rugosity and punctuation. Pro-tibiae with two small but sharp teeth externally (as in fig. 21d), the comparatively short apical spine only slightly arcuate. Smaller. (Piceous, faintly bronzed, frons anteriorly, antennal base, mouth-parts and almost entire legs rufous brown. Elytra with 1 preapical puncture. 3·0–3·4 mm.) ..... **angustatus** Ahrens
On slopes of fine sand near water. Associated with small species of Bledius.
SE. England and Cumberland. Scotland: East Highlands. Very rare.
– Frons smooth. Pro-tibiae with obliterated external teeth but with apical spine long, arcuate. (Piceous black, elytra often rufescent. Similar to *politus* in general outline but still narrower and with elytral striae more distinctly punctate. 4–5 mm.) ..... (*elongatulus* Dawson) **extensus** Putzeys
On sandy coasts, S.E. England: Kent, Sussex, Essex. Very local and rare.
5 Elytra with a single subhumeral fovea (2 preapical punctures). Pro-tibiae externally only with tubercle at base of the strong apical spine (fig. 21c) 6
– Elytra with 2 or 3 subhumeral foveae (fig. 21e). Pro-tibiae externally with at least one sharp subapical tooth (fig. 21d) 8
6 Elytral striae very strong, virtually impunctate, intervals convex throughout. Mandibles longer and more arcuate. (Almost as slender as *politus* but mandibles stronger and labrum more sinuate. Metallic reflection faint, elytra often somewhat rufinistic. 4·5–5.2 mm.) ..... **impunctipennis** Dawson
In fine sand on the sea-shore. With Bledius, *usually* arenarius *Payk. England. Wales. Scotland. Ireland. Local.*
– Elytral striae moderately impressed, evidently punctate, intervals flat or convex only near the suture 7

7 Elytral striae well impressed to apex, third interval with 3 (exceptionally 2) dorsal punctures; base smooth and shiny (Larger and slenderer than *thoracicus*. More robust than *politus*, with striae more strongly punctate. 4·5–5·5 mm.)
nitidus Dejean

Almost confined to the coast. With Bledius. *England: Dorset and Sussex to York; Cambridge, Northampton; Cheshire to Cumberland. Wales: Merioneth. Scotland: West Lowlands. Very local.*

– Elytral striae more or less obsolete towards apex, third interval with 2 dorsal punctures (none before middle); extreme, sloping base micro-reticulate. (Almost as slender as *angustatus* but much larger, with smooth frons. Brassy, rarely bluish, elytra often somewhat rufinistic; legs quite pale or with femora somewhat infuscated. Elytral striae very fine, faintly punctate. 4·0–4·9 mm.)
politus Dejean

On very fine sand, usually sparsely vegetated, e.g. in sandpits; not always near water. Associated with several species of Bledius. *England. Wales. Scotland. Ireland. Local.*

8 Pronotum with lateral bead abbreviated (fig. 21j), not at all reaching basal seta. Elytra shorter, more rounded, striae obliterating towards apex. Smallest species. (Striae strongly punctate in anterior half. Metallic lustre faint; rufinistic specimens, notably with pale pronotum, not uncommon. Elytra with 3 subhumeral foveae and 2 preapical punctures. This is the only British species with (normally) quite reduced wings. 2·2–3·0 mm.)
(*gibbus* Fabricius) **globosus** Herbst

Very eurytopic on moist ground in all kinds of open country. Not associated with Bledius.

England. Wales. Scotland. Shetland. Ireland.

– Lateral bead of pronotum at least reaching posterior seta (fig. 21k). Elytral striae evident to apex 9

9 Clypeus with straight posterior limit (fig. 21h). Pro-tibiae with stronger external teeth (as in fig. 21b). (Somewhat similar to *thoracicus* but more elongate and elytra more parallel-sided with much stronger punctuation and striae. Metallic lustre faint, elytra sometimes rufinistic. Similar to *luedersi* (fig. 21e) in the presence of a small tubercle on basal slope of elytra; foveae and preapical punctures as in *globosus*. 3·6–4·5 mm.) ..... **salinus** Schaum

On the seashore, in clayish rather than sandy places and not necessarily with Bledius. *England. S. Wales. Scotland. Ireland.*

— Posterior limit of clypeus angulate (fig. 21i) 10

10 Sloping base of elytra each side with a small tubercle (fig. 21e). Frons with median ridge anteriorly as a continuation of the clypeal angle (fig. 21i). (Metallic lustre usually strong, rarely bluish, elytra sometimes rufinistic. Antennal base, mouthparts and legs brownish. Pro-tibial teeth weaker than in *salinus*. Elytral foveae and preapical punctures as in *globosus*. 3·4–4·1 mm).
(*aeneus* and *unicolor* auctt., in part) **luedersi** H. Wagner

Usually on clay with some vegetation, most abundant near the shore. Not associated with Bledius. *England, N. to Suffolk.*

— Base of elytra without tubercle. Frons without ridge. (Formerly confused with *luedersi*. Pore-puncture on elytral base in higher position. Pronotum (figs. 21k, l) with greatest width behind (not *at*) middle. Antennal base paler. 3·1–3·6 mm.)
aeneus Dejean

On bare spots of mud or clay between vegetation near water, also in sand pits. Not with Bledius. *England. Scotland? Ireland.*

Genus **Clivina** Latreille

Elongate, cylindrical but somewhat flattened species with mesothorax constricted as a "neck" between pronotum and elytra (fig. 22b); pronotum margined to base. Frons with central fovea. Pro-tibiae broad with strong spines, adapted for digging (fig. 22d), meso-tibiae with strong subapical spine (fig. 22c). Elytra with a continuous row of setiferous punctures along side-margin. Upper surface unmetallic. Male normally with no external characteristics.

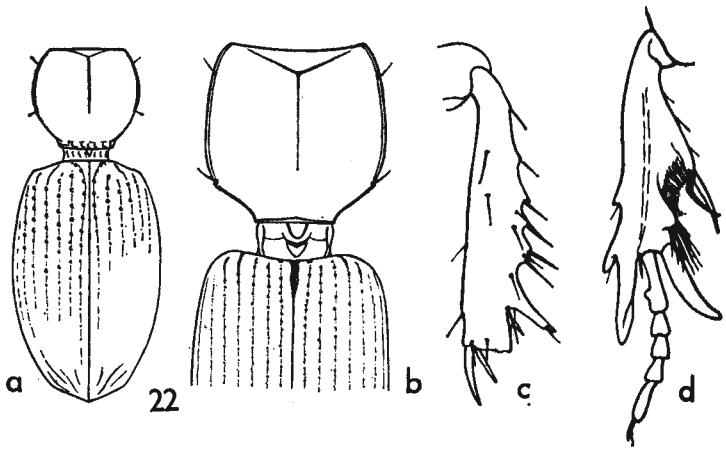

FIG. 22.—(a) *Dyschirius luedersi*; (b) *Clivina fossor*; (c) meso-tibia of *C. collaris*; (d) pro-tibia of *C. fossor*.

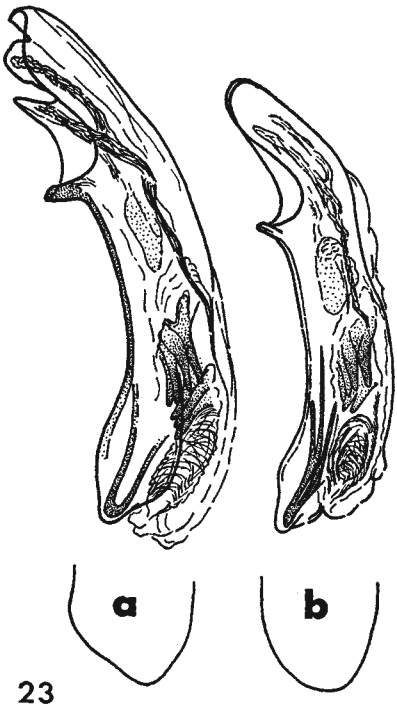

FIG. 23.—Penis with apex (dorsal view) of (a) *Clivina fossor*; (b) *C. collaris*.

KEY TO SPECIES

1 Piceous or dark brown (except from immaturity), first elytral interval often rufous. Last abdominal sternite with moderately strong microreticulation. (Appendages pale. Wings dimorphic. The 4 setae at hind-margin of last abdominal sternite more closely set medially in the male. Penis, fig. 23a. 5·5–6·5 mm.)
fossor Linnaeus

On all kinds of open, not too dry and more or less vegetated ground. England. Wales. Scotland. Shetland. Ireland. Locally common.

— Elytra paler than forebody, yellowish or reddish, usually with dark vitta along the suture; abdomen darker. Last ventral sternite dull from strong, granulate microsculpture. (Formerly regarded as a variety of *fossor* but specifically distinct beyond doubt. Somewhat smaller and flatter, elytra shorter with sides a little more rounded. Wings always full. The 4 setae of terminal abdominal sternite equidistant in both sexes. Penis (fig. 23b) shorter with apex more rounded. 5·0–5·5 mm.) .....(*contracta* Fourcroy) **collaris** Herbst

In humus-rich soil, for instance among debris in gardens also on sandy river banks. England. Wales. Scotland. Ireland.

Tribe **BROSCINI**

Genus **Miscodera** Eschscholtz

ONE BRITISH SPECIES

Like a diminutive *Broscus* but more convex with more rounded sides (fig. 24a) and almost constantly with metallic reflection. Head and mandibles less developed. Pronotum without posterior lateral seta. Each elytron with 4 basal foveae, series of punctures more or less abbreviated apically, only the first well developed. Pro-tibiae little modified (no digging habits). Wings full and functional. Male with 3 pro-tarsal and 2 meso-tarsal segments dilated. Piceous to almost black,

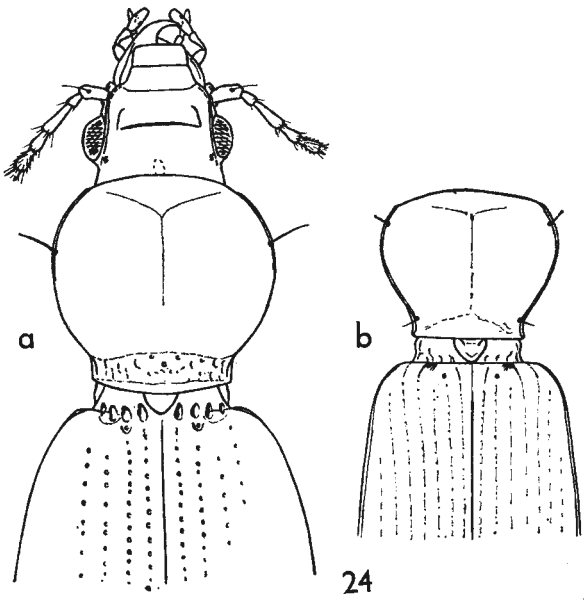

FIG. 24.—(a) *Miscodera arctica*; (b) *Broscus cephalotes* (less magnified).

upper surface usually brassy, rarely bluish or somewhat ruftuistic; all appendages rufo-piceous. 6·5–8 mm. ..... **arctica** Paykull

In open country on fine, moderatelt dry sand, usually mixed with gravel (moraine), and with cover of finest moss. Together with Byrrhus *and* Cytilus, *on the larvae of which it probably preys. A northern species. England: S. to Stafford and Shropshire. N. Wales. Scotland.*

Genus **Broscus** Panzer

ONE BRITISH SPECIES

One of our largest Carabidae, very characteristic in general habitus (fig. 24b), as well as by the dull black colour. Head almost as wide as pronotum, with enormous mandibles. Elytra transversely microsculptured, with rows of very fine punctures. Front-legs broad, notably the tibiae, adapted for digging. Wings full but normally not functioning. Male with 3 dilated pro-tarsal segments. Black, palpi, antennae and tarsi piceous. 16–23 mm. ..... **cephalotes** Linnaeus

In dry, often quite barren sand or sand-mixed soil, where it makes deep burrows. A ravenous predator. England. Wales. Scotland. Shetland. Ireland. Local but often common, almost exclusively on the coast.

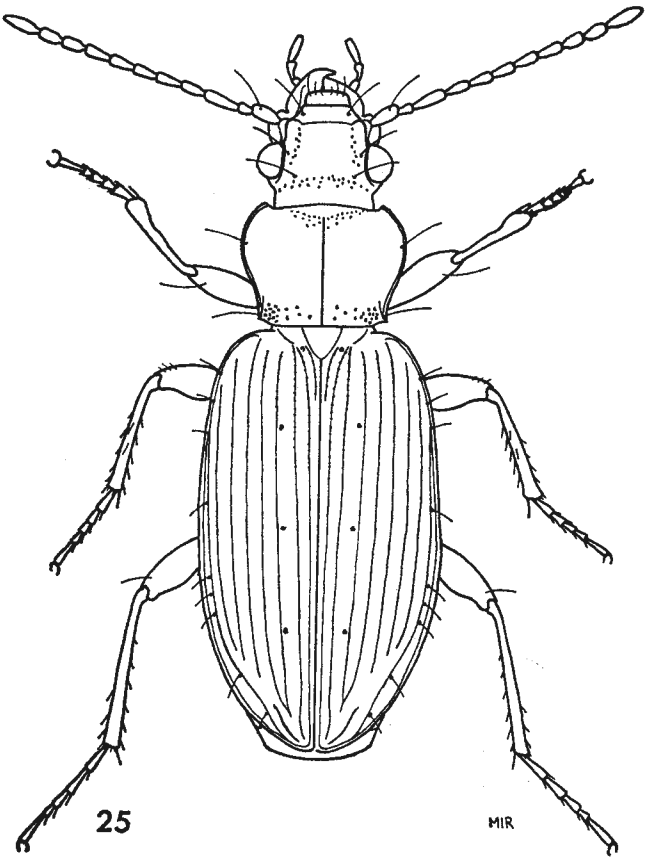

FIG. 25.—*Patrobus septentrionis* ♀.

Tribe **PATROBINI**

Genus **Patrobus** Stephens

Unmetallic species, in general habitus somewhat similar to small *Pterostichus* but easily recognized on the well delimited, constricted neck. Frontal furrows deep, somewhat converging (fig. 26). Pronotum cordiform with deep, single basal fovea. Elytra with base not margined inside shoulder, third interval with 3–4 dorsal punctures. Wings varying. Male with 2 dilated pro-tarsal segments.

KEY TO SPECIES

1 Wings fully developed (in repose with reflexed apex). Pronotum with anterior transverse impression deep, the anterior margin therefore appearing elevated. (Slenderer than the two following species, with shorter, laterally less sinuate pronotum and longer, more parallel-sided elytra. Frons intermediate between figs. 38(a) & (b). Black or piceous, appendages sometimes paler, elytra often bright rufinistic, sometimes darker along the suture. 7·4–10 mm.) (fig. 25).
septentrionis Dejean

Near water where the vegetation is rich; in the mountains less hygrophilous, also on meadows and heaths. Decidedly northern. England: Northumberland, Yorks., Lancs. Scotland: Highlands. Ireland.

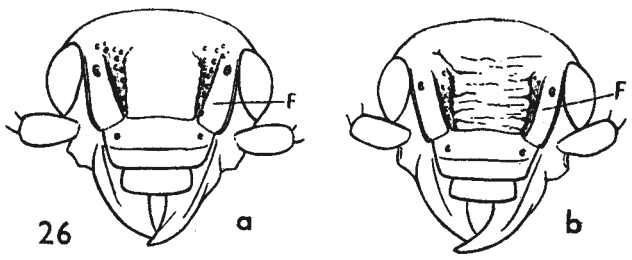

FIG. 26.—Head of (a) *Patrobus atrorufus*; (b) *P. assimilis*. F, elevated field between frontal furrow and side-margin.

– Wings rudimentary, reduced into a narrow scale shorter than half elytral length. Anterior transverse impression of pronotum less pronounced, margin hardly elevated 2

2 Head with area between frontal furrow and side-margin widening forwards (fig. 26a). Antennae slenderer, with third segment longer than first. (Reddish brown to piceous, all appendages and often elytral suture usually bright rufous. Elytra with protruding shoulders, striae more finely punctate than in *assimilis* but more evident at apex. 7·4–10 mm.) .... (*excavatus* Paykull) **atrorufus** Ström.

Usually in damp deciduous forests; mostly on clayish soil. Clearly favoured by human activities. England. Wales. Scotland. Shetland. Ireland. Rather common.

– Area between frontal furrow and side-margin parallel-sided (fig. 26b). First and third antennal segments equal. (Smallest species, narrower and more convex than *atrorufus*. Antennae shorter, segments more rounded. Head less punctate inside eyes. Basal foveae of pronotum smaller but deep. Entire forebody more or less transversely wrinkled. Elytra with rounded shoulders and striae more coarsely punctate anteriorly than in both preceding species. Coloured as *septentrionis* except that the elytra are never rufinistic. 6·8–9 mm.)
(*clavipes* C. G. Thomson) **assimilis** Chaudoir

Less hygrophilous than septentrionis, *usually on rather dry, gravelly or peaty soil. Predominantly northern. England: S. to Derby and Stafford. Wales. Scotland. Shetland. Ireland.*

Tribe **TRECHINI**

Genus **Perileptus** Schaum

(*Blemus* Laporte *nec* Stephens)

Intermediate between *Bembidion* and *Trechus* through the moderately reduced terminal segment of the maxillary palp (fig. 27c). Also, the sutural stria is not "recurrent" at apex of elytra (cf. fig. 27d), but the frontal furrows are strongly divergent behind the eyes, as in *Trechus*. Entire upper surface (including eyes) with short pubescence. Penultimate segment of pro-tarsi with long, sharp spine. Wings full. Male with the 2 basal segments of both pro- and meso-tarsi dilated.

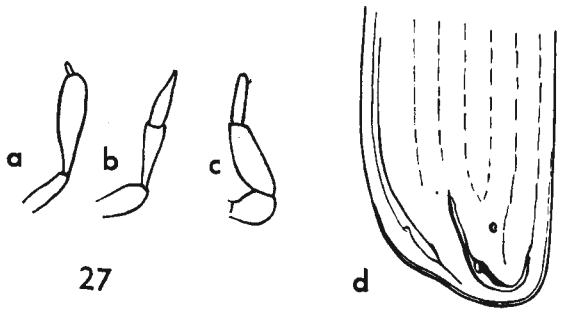

FIG. 27.—Maxillary palp of (a) *Bembidion*; (b) *Trechus*; (c) *Perileptus*. (d) Elytron with recurrent first stria in *Trechus*.

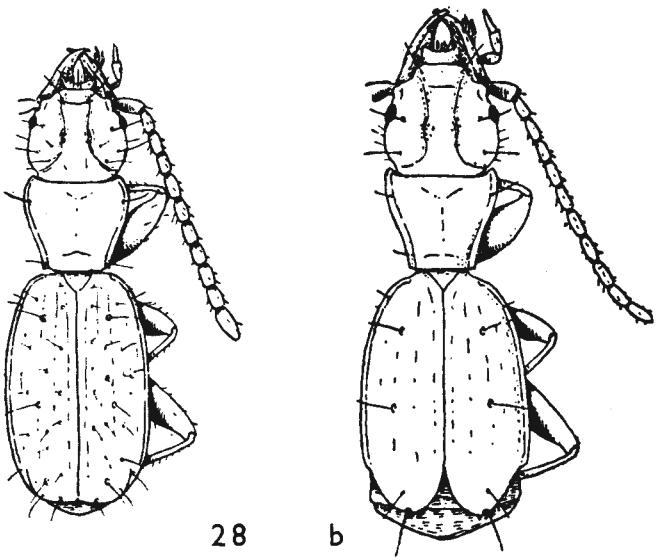

FIG. 28.—(a) *Aepus marinus*; (b) *A. robini*. (From Jeannel.)

ONE BRITISH SPECIES

Small and flat. Piceous, base of antennae, mouth-parts, legs and central part of elytra paler. Head as wide as pronotum. 2·4–2·5 mm. . . . . **areolatus** Creutz
In sterile gravel near water on the banks of rivers. England: Cornwall, Devon, Hereford, Shropshire, Lancashire. Wales: Carnarvon, Brecknock. Scotland: W. Lowlands. Ireland.

Genus **Aepus** Samouelle

(*Aepopsis* Jeannel)

Very small, flat unpigmented beetles adapted for subterraneous life in the tidal zone. Head with rudimentary eyes (fig. 28) and pubescent temples; frontal furrows semicircular, as in all Trechini. Pronotum cordiform. Elytra somewhat abbreviated, leaving at least part of last abdominal segment free (as in the *Lebiini*); striae suggested only but the sutural one recurrent at apex, 2 setiferous dorsal punctures. Wings atrophied. Male with 2 dilated pro-tarsal segments.

There is no reason to separate these two species under different generic names, as was done by Jeannel (1942).

KEY TO SPECIES

1 Elytra with truncate apex (fig. 28a), their surface with sparse erect pubescence. (Brownish yellow. Eyes extremely small. Terminal segment of all palpi cylindrical. 2·2–2·4 mm.) . . . . . **marinus** Ström
On rocky seashores in the intertidal zone; under stones and in crevices. S.W. & N. England, Hants. Wales: Glamorgan. Scotland. Ireland.

– Elytral apex lobate (fig. 28b); only the 2 ordinary dorsal punctures present. (Same coloration. Eyes larger. Terminal segment of palpi somewhat conical. 2·5 mm.) **robini** Laboulbène
Same habitat as marinus. *SW., S. & N. England. Wales: Pembroke, Angelsey Scotland. Ireland.*

Genus **Thalassophilus** Wollaston

Closely allied to *Trechus* but with base of elytra completely margined. Antennae longer and more slender, right mandible with three (not two) teeth internally, and the penis "open" (non-sclerotized) dorsally. Wings full and functional. Male with 2 dilated pro-tarsal segments.

In spite of its name, this is not a seashore genus.

ONE BRITISH SPECIES

Very flat. In general habitus somewhat similar to *Trechus micros* but glabrous, with shorter pronotum and longer antennae. Testaceous to reddish-brown, head as well as sides and suture of elytra often darker. The 3 inner striae of elytra well impressed. 3·5–4·0 mm. . . . . **longicornis** Sturm
On river banks. N.W. England: Shropshire to Cumberland. N. Wales. Scotland: W. Lowlands. Very rare.

Genus **Trechus** Clairville

A large genus with world-wide distribution (if taken in its wide sense). Its members are small, in general habitus and movements similar to *Bembidion*, but usually more subterranean in habits and therefore more or less depigmented and without metallic reflection (though often with iridescent elytra). Most important distinguishing characters are:

The well-developed terminal segment of the palpi (fig. 27b), the backwardly strongly divergent frontal furrows and the "recurrent" sutural stria of the elytra (fig. 27d; this

feature, however, in common with *Tachys* and subgen. *Ocys* of *Bembidion*). Third elytral interval with 3 dorsal punctures. All appendages pale. Wings varying. Male with 2 dilated pro-tarsal segments.

Lasiotrechus Ganglbauer and *Trechoblemus* Ganglbauer are here included as subgenera.

KEY TO SPECIES

1 Elytra with short but dense pubescence over entire surface 2
– Elytra glabrous 3
2 Pronotum also with fine, depressed pubescence. Eyes small, their diameter not exceeding distance to antennal insertion. (Narrow. Dull testaceous, centre of head and, usually, an oblong, diffuse macula on each elytron darker. Pronotum, fig. 29a. Recurrent stria at apex joining third, in all following species the fifth, stria. 4·0–4·5 mm.) ..... **micros** Herbst

Usually on the banks of running water, hidden in crevices, or in the burrows of rodents and moles. England. Wales: Merioneth. Scotland. Ireland. Local.

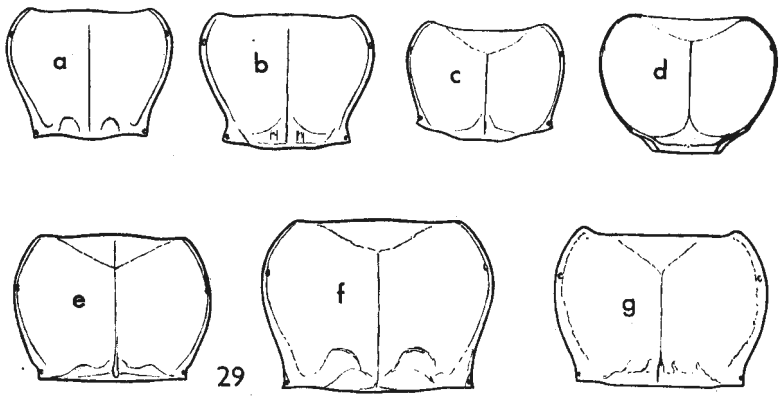

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FIG. 29.—*Trechus*. Pronotum of (a) *micros*; (b) *discus*; (c) *quadristriatus*; (d) *secalis*; (e) *rivularis*; (f) *rubens*; (g) *fulvus*.

– Pronotum glabrous. Eyes of normal size, their diameter more than twice as long as distance to antennal insertion. (Broader. Ground colour more rufous, dark spot of elytra transverse. Pronotum, fig. 29b, with more protruding hind-angles. 4·4–5·5 mm.) ..... **discus** Fabricius

Habitat as micros, *often occurring in its company. England (except the southwest), N. to Cumberland. Ireland. Very local.*

3 Base of pronotum (fig. 29d) sinuate laterally, hind-angles very obtuse, almost obsolete. (Uniformly testaceous or rufous, or with elytra infuscated apically. Shoulders very rounded, inner striae strongly punctate. Wings constantly reduced. 3·5–4·0 mm.) ..... **secalis** Paykull

In shaded and somewhat moist places, both in deciduous forests and rich meadows. England, N. to Cumberland.

– Base of pronotum straight or only slightly sinuate laterally, hind-angles evident, angulate or denticulate 4
4 Elytra with at least 6 well developed and punctate striae 5
– Elytra with 3 or 4 evident, almost imperceptibly punctate striae 7
5 Hind-angles of pronotum reduced to a denticle, sides diverging immediately in front of them. Elytra with more or less distinct subapical pale spot. (Piceous to brown, elytra also with shoulder and extreme side-margin pale. Pronotum as in *rivularis*, fig. 29c. Elytra strongly iridescent. Wings rudimentary. 4·5–5·0 mm.) **subnotatus** Dejean

Usually near the sea-shore (in Ireland in a compost heap). England: Devon, Teignmouth and Dartmoor. Ireland: near Dublin. Otherwise a Mediterranean species, probably arrived in ballast; doubtfully established.

– Pronotum with hind-angles right or acute and sides sinuate in front of them. Elytra not spotted 6

6 Eyes small and flat, their diameter not exceeding distance to antennal insertion. Elytra not iridescent, without microsculpture. (Flatter with elytra more parallel-sided and apex more abruptly truncate. Entirely testaceous. Sides of pronotum (fig. 29g) deplanate to front-angles. Elytral striae strong. Wings atrophied. 4·8–5·7 mm.) ..... (*lapidosus* Dawson) **fulvus** Dejean

Under stones on rocky or sandy sea-shores near high-water mark. England: S. & E. coast; Cheshire. S. Wales. Scotland. Shetland. Ireland.

– Eyes large, protruding, diameter much longer than distance to antennal insertion. Elytra strongly iridescent from very dense transverse microsculpture. (Reddish brown, head somewhat darker, elytra often paler. Pronotum, fig. 29f. Outer elytral striae weak. Wings full. 5·0–6·5 mm.) (*paludosus* Gyll.) **rubens** Fabricius

More or less subterranean but often flying at night. Among leaves and debris or under big stones, often near water. England. Wales. Scotland. Shetland. Ireland. Local.

7 More than 4 mm. Base of pronotum straight (fig. 29e), hind-angles sharp, denticulate. First and second elytral striae parallel also at apex. (Rufo-piceous, elytra darker, iridescent, first antennal segment and legs paler. Posterior dorsal puncture of elytra more removed from apex than in any other species. Wings dimorphic. 4·4–4·8 mm.) ..... **rivularis** Gyllenhal

In dark forest swamps with Sphagnum among damp sedge litter. England: Huntingdon and Cambridge. Very rare, but many taken in Wicken Fen.

– Usually less than 4 mm. Base of pronotum oblique laterally (fig. 29c), hind-angles somewhat blunt. Second elytral stria deviating from first before apex .. 8

8 Wings constantly full. Anterior supra-orbital puncture close to eye. Penis, figs. 30b,d. (Testaceous to brown, head and abdomen darkest, elytra slightly iridescent, usually with pale shoulders. Pronotum, fig. 29c. Specimens with reduced wings known from the continent. 3·5–4·0 mm.)

(*minutus* Fabricius) **quadristriatus** Schrank

In open, rather dry country with short vegetation. England. Wales. Scotland. Ireland. Common.

– Wings highly reduced (macropterous individuals found on the continent). Anterior supra-orbital puncture more removed from eye. Penis quite different (figs. 30a, c). (Somewhat shorter with more rounded elytral sides. Eyes somewhat smaller. Hind-angles of pronotum less pronounced. Colour more greyish. Outer elytral striae more obsolete. 3·6–4·1 mm.) ..... **obtusus** Erichson

In open country, like the preceding. England. Wales. Scotland. Shetland. Ireland. Somewhat more local.

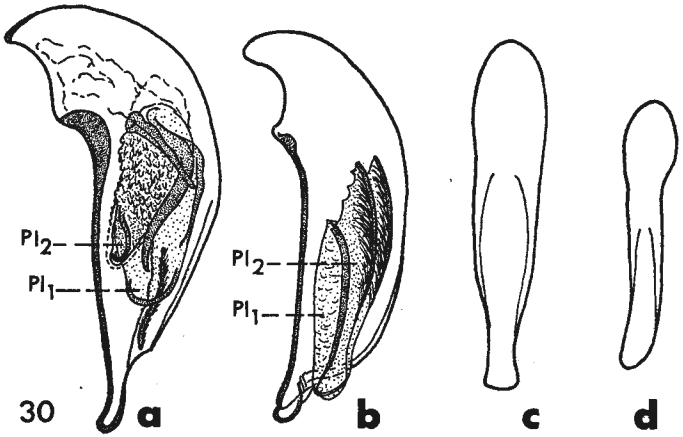

FIG. 30.—*Trechus*. Penis of (a) and (c) *obtusus*; (b) and (d) *quadristriatus*. (c) and (d) in dorsal view.

Tribe **BEMBIDIINI**

Genus **Asaphidion** Gozis

At once separated from the two other genera of the tribe by the irregularly punctate and pubescent elytra; the striae indicated only near the suture as indistinct furrows. Head very broad with protruding eyes (as in *Elaphrus*). Wings full. Male pro-tarsi with first segment strongly, second faintly dilated.

KEY TO SPECIES

1 Head not wider than pronotum, which lacks a latero-basal keel. (Black, upper surface coppery with golden or bluish spots and stripes, especially laterally on elytra. Pubescence forming patches of yellowish and silvery gray. Appendages pale but first and outer antennal segments as well as femora and tarsi infuscated, greenish. 5·0–6·0 mm.) ..... **pallipes** Duftschmid

On fine, slightly moist sand with patches of tiny moss. On the banks of streams or on sandy patches under sea cliffs. England (except the S.E.). Wales. Scotland. Ireland. Local and rare.

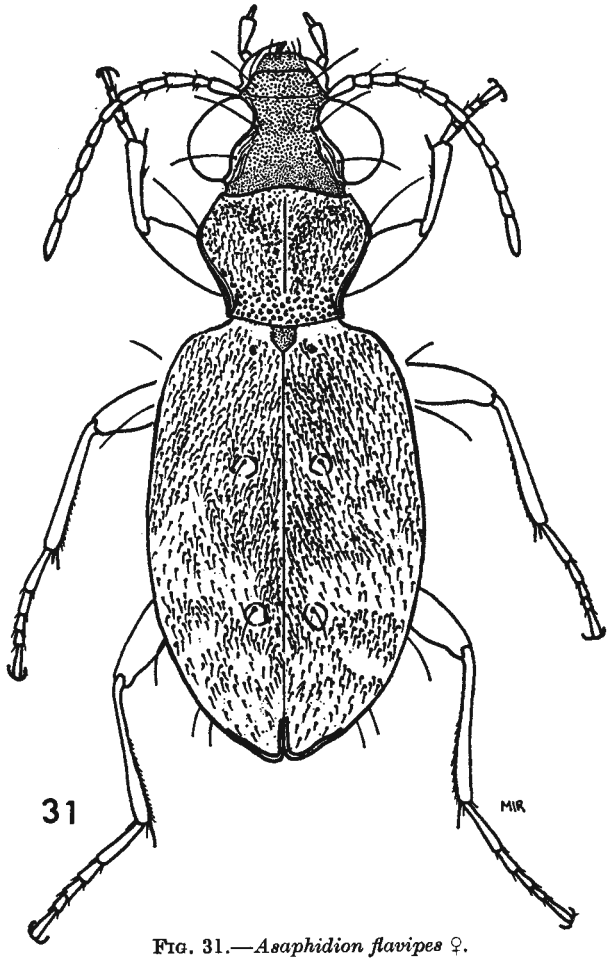

FIG. 31.—*Asaphidion flavipes* ♀.

– Head with very convex eyes and therefore wider than pronotum, which has a fine, oblique keel at hind-angle. (Smaller, shorter and flatter. Metallic lustre of upper surface less pronounced, more brassy. Legs and first antennal segment pale. Entire upper surface with punctuation more coarse and sparse. 3·9–4·7 mm.) (fig. 31) ..... **flavipes** Linnaeus

On open ground with rather moist, clayish or sand-mixed, soil. Usually near water. England. Wales. Scotland. Ireland. Not rare.

Genus **Bembidion** Latreille

(*Bembidium* auctt.)

This is the largest Carabid genus, in Britain as well as in most temperate parts of the world. It contains small species (not exceeding 7·5 mm.) with slender appendages. The upper surface is usually metallic but often with pale markings on the elytra. The most important diagnostic character is the

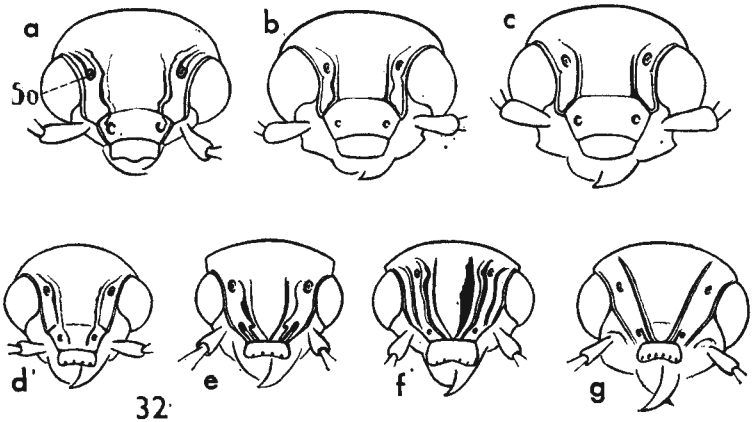

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FIG. 32.—*Bembidion*. Head with frontal furrows in (a) *nigricorne*; (b) *lampros*; (c) *properans*; (d) *minimum*; (e) *schueppeli*; (f) *assimile*; (g) *doris*. Somewhat generalized.

rudimentary form of the terminal segment of the maxillary palpi (fig. 27a), as in the two other members of the tribe (*Asaphidion*, *Tachys*) which are separated from *Bembidion* as described under each of these genera. Among other British ground-beetles, only the genus *Perileptus* has a similar, but less pronounced reduction of the palpi (fig. 27c). The other members of the tribe Trechini are also superficially similar but their frontal furrows, among other things, are semicircularly prolonged backwards behind the eye. Most species are fully winged but several are dimorphic or constantly brachypterous.

The male has 2 strongly dilated pro-tarsal segments.

The separation of species is often difficult and an examination of the internal sac of the penis often necessary (see technical advice, p. 8). External characters of particular importance are:

Frontal furrows (fig. 32), a pair of more or less well-defined sulci along the inside of each eye. They may be doubled.

Supra-orbital punctures, two on each side, situated inside the eye.

Dorsal punctures, usually 2, on third elytral interval or attached to third stria.

Preapical spot of elytra, laterally near apex. It is sometimes not visible unless the elytron is lifted.

A study of the *microsculpture*, above all on the elytra, is of outstanding value in most groups. It is often stronger in the female, and specimens of the same sex must always be compared. Width and length of microsculpture "meshes" are determined according to the long axis of the insect.

In order to facilitate a reliable identification of the species of this genus, the key—contrary to the usual practice followed in this series of *Handbooks*—has been supplemented by individual descriptions of each species.

Most *Bembidion* are strongly hygrophilous and live close to water, where they run about with great agility. Some are confined to running waters, others to shores of lakes or the sea. They are often confined to a special kind of soil. With the exception of *lunatum*, all British species seem to hibernate in the adult stage. Spring and early summer are the best periods for collecting.

For details of the synonymization of the numerous names employed by Stephens in this genus, *see* Netolitzky, 1935.

The systematic division and sequence of subgenera essentially follows Netolitzky (1943).

Key to Species

1 Third elytral interval much broader than second and fourth at middle and there with two well defined opaque fields ("silver-spots") (fig. 35a) 2
– Third elytral interval not different from adjacent ones 3
2 Elytra with fourth stria suddenly bent in front of "silver-spots"; outer intervals (at least seventh) with alternating dull and shiny fields ..... 2. **litorale**
– Fourth elytral stria not bent; outer intervals uniformly dull ..... 1. **argenteolum**
3 First elytral stria recurrent at apex (as in *Trechus*, fig. 27d). Dorsal punctures (1 or 2) situated behind middle 4
– First elytral stria not recurrent. At least foremost dorsal puncture situated before middle 5
4 Base of pronotum oblique laterally (fig. 33f). Elytra with 2 dorsal punctures 8. **quinquestriatum**
– Base of pronotum straight, hind-angles sharper (fig. 33e). Elytra with a single dorsal pucture ..... 7. **harpaloides**
5 Pronotum more or less cordiform, that is, with sides sinuate before hind-angles (least so in *nigricorne*, fig. 33c) 6
– Sides of pronotum evenly rounded to hind-angles (figs. 33d, 34g-i) 52
6 Frons and vertex with coarse, often confluent punctuation; frontal furrows therefore indistinct 7
– Frons and vertex smooth or with a group of small punctures inside and behind the eyes 9
7 Elytra yellow with transverse dark fascia ..... 11. **pallidipenne**
– Elytra unicolorous, dark 8
8 Elytral striae obsolete or evanescent at apex. Appendages dark. 10. **bipunctatum**
– Elytral striae evident to apex. At least tibiae and underside of first antennal segment pale ..... 9. **punctulatum**
9 Head not constricted behind the eyes (temples parallel). Pronotum only slightly narrower than elytra. Figs. 38a, b. (On the seashore) 10
– Head constricted immediately behind the eyes. Pronotum much narrower than elytra 11
10 Third elytral interval with 4 dorsal punctures. Forebody metallic ... 37. **laterale**
— Third elytral interval with 2 dorsal punctures. Entire body unmetallic 36. **nigropiceum**

11 Shoulder angulate: lateral bead of elytra forming a sharp angle against the abbreviated basal bead (fig. 35b). (Upper surface entirely dark, sometimes metallic) 12
— Shoulders rounded (fig. 35c) 14
12 Frontal furrows doubled posteriorly (fig. 32a). Latero-basal sinuation of pronotum shallow (fig. 33c) ..... 3. **nigricorne**
— Frontal furrows simple (figs. 32b, c). Latero-basal sinuation of pronotum deep (figs. 36) 13
13 Seventh elytral stria evident, at least anteriorly. Frontal furrows straight (fig. 32c). Penis, figs. 37a, c. ♀ ..... 5. **properans**
— Seventh elytral stria usually (not always!) obsolete. Frontal furrows somewhat arcuate externally (fig. 32b). Penis, figs. 37b, d. ♀ c ..... 4. **lampros**
14 The two dorsal punctures (at least the anterior) on third elytral interval free, not touching adjacent striae 15
— Dorsal punctures adjoining third stria or situated within it 21
15 Elytra with striae disappearing apically, entirely dark or sometimes pale in posterior half. Small (not above 3·2 mm.) 16
— Elytra with striae complete to apex, usually somewhat pale also in anterior half .. 17
16 Pronotum pronouncedly cordiform (fig. 34a), clearly wider than head, with sides strongly sinuate posteriorly ..... 17. **minimum**
— Pronotum less widened forwards (fig. 34b), narrower, sides less sinuate. Elytral striae with stronger punctures ..... 18. **normannum**
17 Entire upper surface without microsculpture, very shiny. Ground colour of elytra pale ..... 16. **ephippium**
— Upper surface microsculptured, at least forebody dull. Ground colour of elytra dark 18
18 Elytra iridescent due to the microsculpture which consists of extremely fine and dense transverse lines. The anterior supra-orbital puncture surrounded by an elevated, shiny field ..... 12. **dentellum**
— Elytra micro-reticulate, not iridescent. Frons without shiny field 19
19 Antennae with 3 or 4 pale basal segments (though sometimes with metallic hue on dorsum). Meshes of elytral microsculpture somewhat irregular. 14. **semipunctatum**
— At most first antennal segment entirely pale, second to fourth at least dark dorsally. Micro-meshes of elytra regular, arranged as bricks 20
20 Larger (4·1–5·1 mm.). Pronotum broader with more rounded sides. Elytra almost parallel-sided at middle. Apex of elytra pale, legs brownish .. 13. **varium**
— Smaller (3·0–4·4 mm.). Elytra with sides more rounded, somewhat widening posteriorly. Normally with dark elytral apex and legs almost black. 15. **obliquum**
21 Hind-angles of pronotum very sharp, somewhat in front of and separated from base by an incision (fig. 34d). (Elytra with pale macula at shoulder and usually one near apex) 22
— Hind-angles of pronotum not or very little removed from base 23
22 Antennae and femora black ..... 28. **quadripustulatum**
— Four basal antennal segments and entire legs pale (femora at most slightly infuscated) 27. **quadrimaculatum**
23 Frontal furrows sharp, prolonged upon clypeus (to base of labrum), either doubled (entirely or anteriorly, figs. 32e, f) or strongly convergent (fig. 32g). Not over 4 mm. 24
— Frontal furrows usually shallow, never prolonged upon clypeus, and more or less parallel. Usually larger 31
24 Frontal furrows not doubled, straight, strongly converging (fig. 32g) 25
— Frontal furrows doubled, at least anteriorly (figs. 32e, f), parallel on frons, converging on clypeus 27
25 Pronotum (fig. 34e) each side between basal fovea and median line with a single small fovea. Elytra dark (usually black) with pale preapical spot .... 21. **doris**
— Pronotum (fig. 34c) each side with two small impressions inside basal fovea. Elytra with pale spots also in anterior half 26
26 2·9–3·9 mm. Pronotum (fig. 34c) at base narrower than head behind eyes. Pale basal spots of elytra confluent ..... 19. **articulatum**
— 2·5–2·8 mm. Pronotum at base wider than head behind eyes. All pale spots of elytra distinct ..... 20. **octomaculatum**

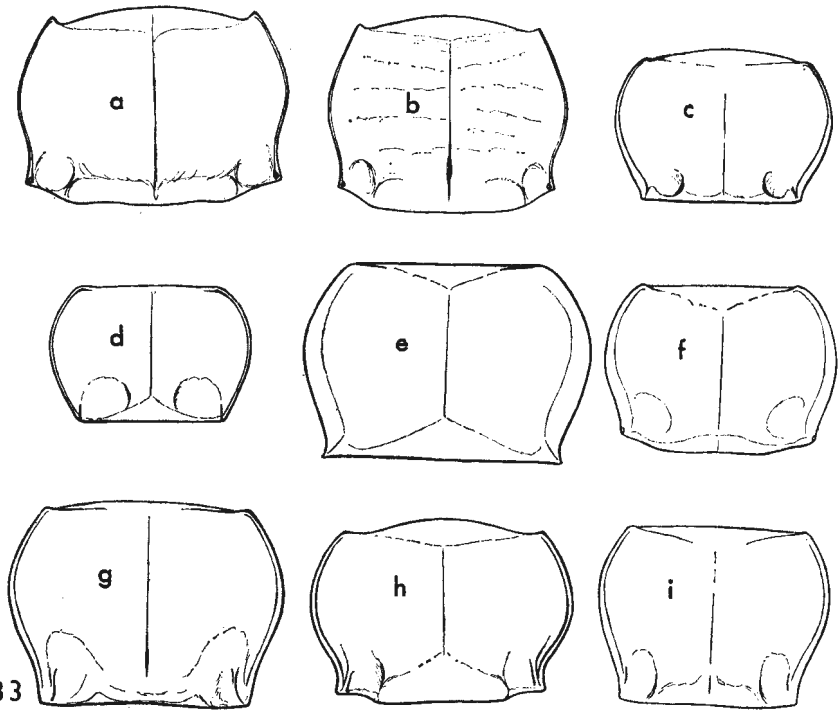

FIG. 33.—*Bembidion*. Pronotum of (a) *argenteolum*; (b) *litorale*; (c) *nigricorne*; (d) *obtusum*; (e) *harpaloides*; (f) *quinquestriatum*; (g) *dentellum*; (h) *varium*; (i) *monticola*.

27 Frontal furrows doubled in their entire length (fig. 32f) 28
— Frontal furrows doubled anteriorly only (fig. 32e) 30
28 Pronotum with microsculpture obsolete on disc and therefore shiny. Apex of elytra dark ..... 26. **clarki**
— Pronotum densely microsculptured over entire surface and therefore dull. Apex of elytra pale 29
29 3·5–4·0 mm. Elytra with distinct pale spots also in basal half. Striae shallower. Wings full ..... 24. **fumigatum**
— 2·8–3·5 mm. Elytra with basal half immaculate or with somewhat indistinct spots. Wings often reduced ..... 25. **assimile**
30 Upper surface unmetallic. Legs entirely pale. Elytra without microsculpture, strial punctures very coarse ..... 23. **gilvipes**
— Upper surface bluish green. Femora more or less infuscated. Elytra microsculptured, strial punctures finer ..... 22. **schueppeli**
31 Elytral striae (except first) disappearing behind middle; very shiny due to lack of microsculpture (each with two pale spots) 32
— Elytra with at least inner striae evident in apical half; microsculpture present .. 33
32 Pronotum (fig. 34f) longer than wide. Pale humeral spot short, not reaching side-margin ..... 38. **genei**
— Pronotum as long as wide. Humeral spot longer, reaching side-margin and sometimes connected with posterior spot ..... 39. **callosum**
33 All elytral striae evident to apex; the seventh not markedly weaker than the sixth 34

— Elytral striae usually obsolete or evanescent near apex; seventh stria rudimentary or absent 35
34 Abdominal sternites with a fringe of bristles along hind margin (fig. 35e). Elytral striae strongly punctate ..... 41. **virens**
— Abdominal sternites only with the usual single pair of setae (fig. 35f). Elytral striae almost impunctate ..... 40. **prasinum**
35 Head with a group of small but sharp punctures inside and behind eyes 36
— Head without extra punctures 37
36 4·2–5·0 mm. Pronotum smooth on disc. Elytra with evidently separated basal and preapical pale maculae ..... 56. **saxatile**
— 5·5–6·0 mm. Pronotum micro-reticulate on disc. Elytra dark or diffusely rufinistic ..... 57. **decorum**
37 Elytral striae only slightly shallower apically, second stria as strong as first. (Elytra unicolorous, dark) 38
— Elytral striae more or less evanescent apically, second stria weaker than first, often irregular or obsolete 40
38 Apex of elytra produced (fig. 38f). Microsculpture shallower, elytra therefore more shiny ..... 44. **geniculatum**
— Apex of elytra truncate (fig. 38e) 39
39 Frontal furrows deep, prolonged backwards almost to the level of the hind-margin of the eye. Base of pronotum almost straight laterally (fig. 38c) .... 42. **tibiale**
— Frontal furrows shallower, not prolonged. Base of pronotum oblique laterally (fig. 38d) ..... 43. **atrocoeruleum**
40 Eighth elytral stria deep at apex but suddenly disappearing (or continuing as a row of small, not connected punctures) behind middle. (Pronotum, fig. 42d, narrow and very convex. Elytra without defined spots.) ..... 35. **stomoides**
— Eighth elytral stria well engraved, not abbreviated but joining marginal stria in anterior half 41
41 Elytra unicolorous, from black to dark brown, with metallic hue (rarely diffusely paler in apical half but without defined spots) 42
— Elytra bicoloured, at least with a preapical pale macula, clearly defined anteriorly 45
42 Pronotum dull from dense, reticulate microsculpture, also on disc 43
— Pronotum shiny, without microsculpture on disc 44
43 Pronotum (fig. 33i) only slightly wider than head. Entire upper surface with blue-green reflection. Legs rufo-testaceous or femora faintly infuscated 45. **monticola**
— Pronotum much wider than head. Upper surface with faint metallic hue. Femora black or piceous with pale apex ..... 50. **bruxellense** var.
44 Maxillary palpi and legs rufo-testaceous. Microsculpture of elytra consisting of transverse lines without evident meshes. 5·2–6·1 mm. ..... 47. **stephensi**
— Penultimate segment of maxillary palpi and femora, except apex, dark. Elytral microsculpture (evident apically only) forming transverse meshes. .. 46. **nitidulum**
45 Elytra only with large, arcuate apical lunula, base not maculate. (Pronotum broad and convex as in *tetracolum*, fig. 42a, but seventh elytral stria virtually obsolete) ..... 48. **lunatum**
— Elytra with both basal and preapical pale spots, separated by a transverse dark fascia (sometimes diffuse in *testaceum*; the two spots joined laterally in *maritimum*) 46
46 Elytra dull from strong, reticulate microsculpture, with meshes from isodiametric to twice as wide as long. Pale elytral spots coherent laterally .. 53. **maritimum**
— Elytra shiny, their microsculpture consisting of transverse lines, usually joining into very transverse meshes. Transverse dark fascia of elytra reaching side-margin . 47
47 Pronotum (figs. 42b, c) narrower, its raised lateral bead narrow, viewed from above disappearing in anterior third. Elytra longer, more parallel-sided 48
— Pronotum with raised lateral bead visible to front-angles 49
48 Frontal furrows arcuate (concavity inwards). Pronotum devoid of microsculpture, with short latero-basal carina. Transverse dark elytral fascia sharp 55. **fluviatile**
— Frontal furrows virtually straight. Pronotum microsculptured laterally, no latero-basal carina. Transverse elytral fascia diffuse, notably anteriorly 54. **testaceum**
49 Pronotum microreticulate over its entire surface and therefore dull. Second antennal segment infuscated ..... 50. **bruxellense**

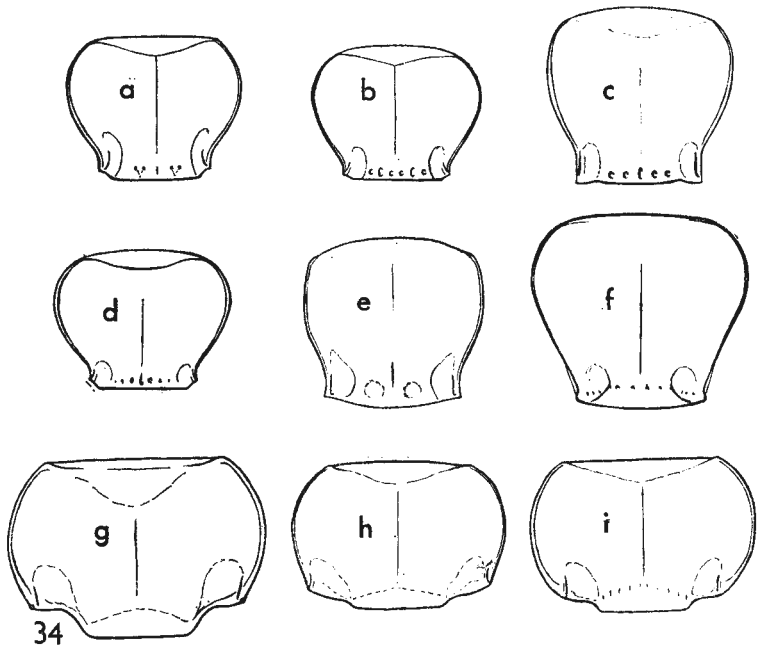

FIG. 34.—*Bembidion*. Pronotum of (a) *minimum*; (b) *normannum*; (c) *articulatum*; (d) *quadrimaculatum*; (e) *doris*; (f) *genei*; (g) *aeneum*; (h) *guttula*; (i) *unicolor*.

— At least disc of pronotum without microsculpture. Second (often also third) antennal segment pale 50

50 Seventh elytral stria evident anteriorly. Base of pronotum with rather coarse punctures. Wings usually reduced ..... 49. **tetracolum**

— Seventh elytral stria entirely obsolete or represented anteriorly by a few minute punctures. Base of pronotum impunctate or almost so. Wings full 51

51 Antennae with 3 pale basal segments. Legs entirely pale or femora with faint shadow at middle ..... 51. **andreae**

— Third antennal segment and femora clearly infuscated ..... 52. **femoratum**

52 Pronotum with base straight (fig. 33d). Shoulders angulate (as in fig. 35b). Elytra without preapical spot ..... 6. **obtusum**

— Base of pronotum sinuate laterally (figs. 34g-i). Shoulders rounded. Elytra usually with pale preapical spot 53

53 Lateral sinuation of pronotal base deep (fig. 34g). 3·4–5·5 mm. 54

— Lateral sinuation of pronotal base shallow (figs. 34h, i). 2·8–3·5 mm. 57

54 Seventh elytral stria evident, coarsely punctate anteriorly. Upper surface with strong blue-green reflection ..... 29. **biguttatum**

— Seventh elytral stria absent or faintly suggested 55

55 Pronotum densely microsculptured over its entire surface. Elytra with fine striae and flat intervals ..... 32. **aeneum**

— Pronotum with disc smooth and shiny. Elytral striae strongly punctate and intervals convex 56

56 Antennae very slender, segments 8–10 more than twice as long as wide. Elytral striae less strongly punctate (as in *biguttatum*) ..... 30. **iricolor**

— Antennae stouter, segments 8–10 less than twice as long as wide. Punctuation of elytral striae stronger than in *biguttatum* ..... 31. **lunulatum**

57 Legs and first antennal segment bright rufous. Pronotum (fig. 34i) broader, with more rounded sides. Elytra shorter, more convex. Upper surface without or with faint bluish hue, preapical pale spot absent or ill-defined. Wings always reduced ..... **34. unicolor**

— Legs and first antennal segment more brownish. Pronotum (fig. 34h) with more defined hind-angles. Upper surface with more evident, blue or green, reflection, preapical spot usually bright and distinct. Wings usually fully developed **33. guttula**

Subgenus **Chrysobracteon** Netolitzky

Separated from all other subgenera on third elytral interval, which is dilated and carries two opaque "silver-spots" surrounding each of the dorsal punctures, and, alternating with these, two or three shiny "mirrors" (fig. 35a).

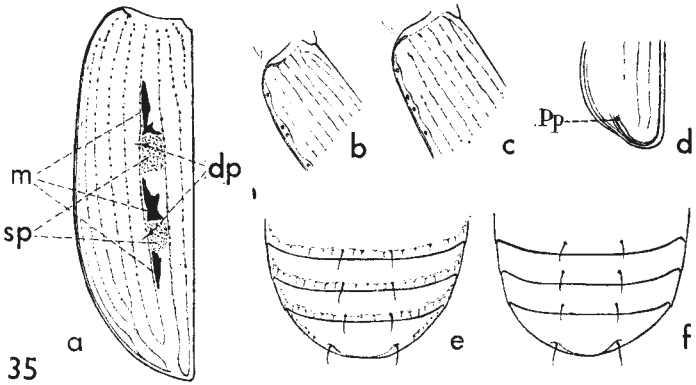

FIG. 35.—*Bembidion*. Elytron of (a) subg. *Chrysobracteon*; (b) species with angulate; (c) with rounded shoulder; (d) of *quinquestriatum*. Abdominal sternites of (e) *virens*; (f) *prasinum*. dp, dorsal puncture; m, "mirror"; Pp, preapical puncture; sp, "silver spot".

These beetles are sun-loving, rapidly taking to their wings and difficult to catch.

(1) **B. argenteolum** Ahrens. Largest species of the genus. Upper surface brassy, often with greenish, rarely bluish hue. First antennal segment, tibiae and base of femora more or less pale. Pronotum, fig. 33a. Outer elytral intervals with uniform microsculpture and lustre. 5·9–7.5 mm.

On dry, sterile sand near fresh water. Found only on the shores of Lough Neagh in Ireland.

(2) **B. litorale** Olivier (*paludosum* Panzer). Smaller and more convex, with narrower pronotum (fig. 33b). Fourth elytral stria bent at base, outer intervals with opaque, fifth and seventh usually also with shiny, spots. Colour more variegated, elytra usually coppery and grey. Appendages except underside of first antennal segment not pale. 5·6–6·2 mm.

At the margin of running, rarely standing, fresh-waters, where the soil is fine sand and the vegetation low and sparse. England (except the S.), N. to Northumberland. Wales: Glamorgan. Scotland. Shetland. Ireland. Very local.

Subgenus **Neja** Motschulsky

Shoulders angulate, as in the preceding and the two following subgenera. The frontal furrows are doubled posteriorly (fig. 32a). Wings dimorphic.

(3) **B. nigricorne** Gyllenhal. Superficially similar to *lampros* but with pronotum less sinuate latero-basally (fig. 33c) and elytral striae more coarsely punctate. Antennae entirely black, tibiae sometimes brown. 3·4–3·8 mm.

On open, dry soil with Calluna, *usually on sand. England, from Surrey to Northumberland. Ireland. Rare and local.*

Subgenus **Metallina** Motschulsky

Shoulders angulate (fig. 35b). Frontal furrows deep, simple (figs. 32b, c). Upper surface without microsculpture, very shiny. Wings dimorphic in both species.

(4) **B. lampros** Herbst (*celere* Fabricius) (fig. 36). Upper surface with metallic, usually brassy, rarely bluish, lustre. Base of antennae (at least first segment underneath) and legs reddish, but femora and tarsi often infuscated. Frontal furrows somewhat dilated at middle (fig. 32b). Seventh elytral stria lacking or consisting of a row of weak punctures anteriorly. Penis (figs. 37a, c) with external left side fold. 3·0–4·4 mm.

On dry, open soils of different kinds.—England. Wales. Scotland. Ireland. Common everywhere.

(5) **B. properans** Stephens (*velox* Erichson nec Linnaeus). Easily confused with *lampros*. Sides of pronotum more broadly depressed. Frontal furrows parallel-sided (fig. 32c). Seventh elytral stria evident, at least anteriorly. Penis (figs. 37b, d) without lateral fold, armature of internal sac much heavier. 3·5–4·2 mm.—Blue and green forms have been named as varieties, e.g. "*coeruleotinctum* Reitter" and "*cyaneotinctum* Sharp."

Habitat as lampros *but usually on less dry, clayish soil.—England, N. to Cumberland. Wales: Glamorgan. Ireland. Somewhat more local and less abundant than* lampros.

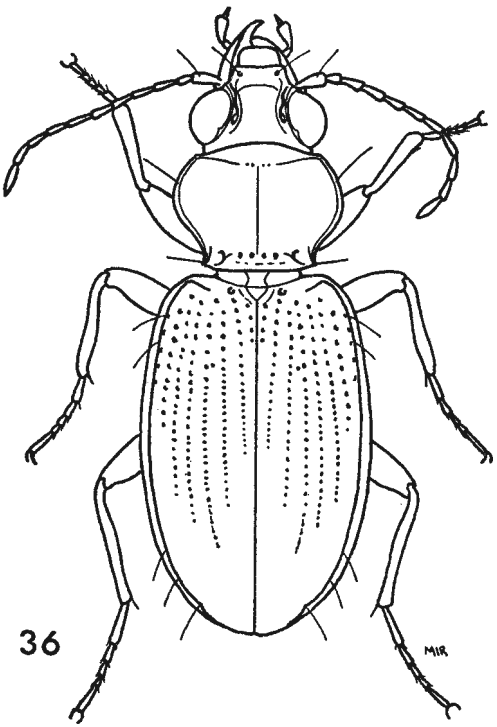

FIG. 36.—*Bembidion lampros* ♀.

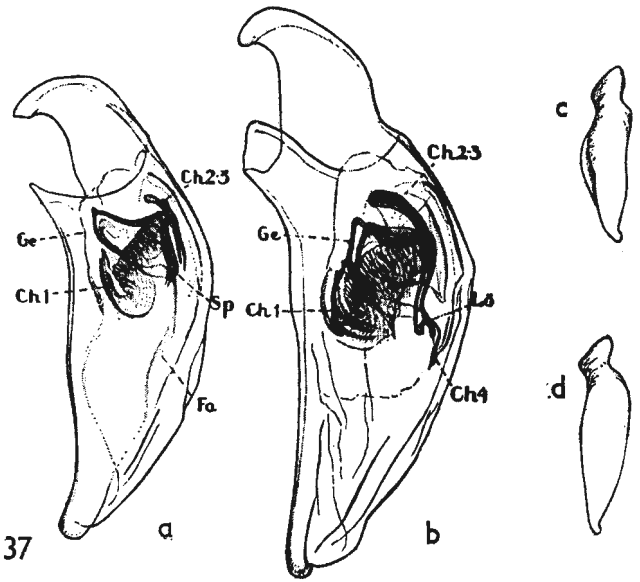

FIG. 37.—Penis of (a) and (c) *Bembidion lampros.*; (b) and (d) *B. properans.* (c) and (d) in dorsal view.

Subgenus **Phyla** Motschulsky
(*Phila* auctt.)

Shoulders angulate. Pronotum with sides not sinuate (fig. 33d) and base straight. Microsculpture lacking on pronotum, dense, transverse on elytra. Wing-dimorphic.

(6) **B. obtusum** Serville. Similar to the small species of subg. *Philochthus* in general habitus and form of pronotum, except that the base of the latter is not sinuate laterally. Piceous, elytra faintly iridescent, pronotum and elytral suture often paler, base of antennae and legs rufous, femora usually infuscated. 2·8–3·5 mm.

On open, clayish ground, often cultivated soil.—England. Wales. Scotland. Ireland. Widely distributed and usually common.

Subgenus **Ocys** Stephens

Sutural stria of elytra "recurrent", as in *Trechus* (fig. 35d), externally delimited by a keel; thus separated from all other British subgenera. Dorsal punctures of elytra (1 or 2) situated behind middle; outer elytral striae obliterated; shoulder not or barely angulate. Wings full.

(7) **B. harpaloides** Serville (*rufescens* Guérin). The only British *Bembidion* with a single dorsal puncture, adjoining third elytral stria. Base of pronotum straight, hind-angles sharp (fig. 33e). Rufous, elytra darker, at least apically, sometimes with bluish hue. Appendages pale. 4·2–6·0 mm.

Under bark and stones on clayish, rather moist ground. Immature adults observed in the nest of a jay in England.—England, N. to Northumberland. Wales. Scotland. Ireland. Widely distributed.

(8) **B. quinquestriatum** Gyllenhal. Rather similar to *Trechus quadristriatus*, also in the form of pronotum (cf. figs. 33f and 29c); but the elytral striae are evidently punctate. Piceous or reddish brown, usually with metallic lustre, appendages pale. Pronotum with hind-angles obtuse and base oblique laterally. Elytra with 2 dorsal punctures behind middle. 3·5–4·3 mm.

Pronouncedly synanthropic, occurring in dark places, like cellars and stables, under ivy on walls, etc.—England, N. to Northumberland. Wales: Glamorgan. Scotland. Ireland. Local.

Subgenus **Princidium** Motschulsky

Forebody with coarse punctuation; frontal furrows therefore virtually obsolete. Elytral striae sharp to apex. Appendages more or less pale. Wings full.

(9) **B. punctulatum** Drapiez. Black, upper surface with strong, usually bronze lustre; first antennal segment and legs pale. Differing from *bipunctatum* also by punctate disc of pronotum, more coarsely punctate elytral striae and convex intervals. 4·5–5·6 mm.

On sandy or gravelly banks of running waters, sometimes at the edge of still water.—England, N. to Cumberland. Wales. Scotland. Ireland. Rarer in the south.

Subgenus **Testedium** Motschulsky

Punctuation of head as in *Princidium*. Elytral striae evanescent apically, dorsal punctures foveate. Appendages black. Wings full.

(10) **B. bipunctatum** Linnaeus. Black (rarely with rufinistic elytra), upper surface almost constantly metallic, usually brassy or greenish, rarely bluish. Pronotum impunctate on disc. 3·6–4·7 mm.

Near water on shores and banks with sparse vegetation, inland as well as on the seaside.—England, more common in the north. Wales. Scotland. Ireland.

Subgenus **Actedium** Motschulsky

Head with coarse, confluent punctuation as in the two preceding subgenera. Forebody very much narrower than elytra. Colour variegated. Wings full.

(11) **B. pallidipenne** Illiger. Forebody black with metallic, usually greenish lustre; elytra pale yellow with a spot around scutellum and an irregular transverse fascia behind middle dark brown. Appendages pale. 4·1–4·7 mm.

On sterile sand near sea-water.—England, N. to Northumberland. Wales. Scotland. Ireland. Local.

Subgenus **Eupetedromus** Netolitzky

Larger species than *Notaphus*, with elytra iridescent from dense, transverse microsculpture. Anterior supra-orbital puncture on head surrounded by an elevated, shiny field. Wings full.

(12) **B. dentellum** Thunberg (*flammulatum* Schellenberg). Black, forebody with bronze lustre, elytra with many small rectangular pale spots, confluent basally and fusing into an irregular transverse band behind middle. Antennal base (at least first segment) and legs pale. Pronotum fig. 33g. 5·1–6·0 mm.

In marshes and on soft mud near water, in more or less shady places, where the vegetation is dense.—England, N. to Durham. S. Wales. Scotland: West Highlands. Ireland. Local.

Subgenus **Notaphus** Stephens

As in the preceding and the two following subgenera, the 2 dorsal punctures on third elytral interval (at least the anterior) are free, not touching adjacent striae. Frons without elevated field laterally. Elytra with characteristic "mozaic" pattern, usually confluent into two transverse fasciae, their microsculpture coarse, more or less reticulate. Wings full.

(13) **B. varium** Olivier (*ustulatum* Sturm). Largest species of the group but smaller than *dentellum*. Black with bronze or greenish, rarely bluish lustre. At least first antennal segment (often second to fourth underneath) and legs brown, though femora with metallic hue. Pronotum, fig. 33h. Elytral striae fine but punctate, intervals flat. 4·1–5·1 mm.

On moist clay with patchy vegetation, chiefly in salt marshes but also near fresh-water. England, N. to Northumberland. S. Wales. Scotland: West Lowlands. Ireland. Often abundant.

(14) **B. semipunctatum** Donovan (*adustum* Schaum). Smaller and broader than *varium*. Antennae with 3 or 4 entirely pale basal segments (or faintly metallic on upper surface). Base of pronotum somewhat broader. Elytral striae deeper, more

coarsely punctate, intervals more or less convex. Microsculpture of elytra more irregular (see key). 3·2–4·0 mm.

On river banks consisting of fine sand.—England: Gloucester, Hereford, Worcester, Warwick, Cambridge, Durham. Wales: Glamorgan (old record). Very local.

(15) **B. obliquum** Sturm. Varying considerably in colour. The palest specimens agree with *semipunctatum* but segments 2–4 of antennae are darker, the elytra have finer striae, and the microsculpture is as in *varium* (see key). Normally darker than both: apex and epipleura of elytra black (in the two preceding more or less pale), legs piceous. Seemingly entirely dark individuals show the characteristic mozaic pattern if the elytra are lifted and observed in transparent light. 3·0–4·4 mm.

At the margins of often acid fresh-water.—England, N. to Yorkshire. Very local.

Subgenus **Nothaphemphanes** Netolitzky

Entire upper surface, as in *Emphanes*, without microsculpture, but elytral striae complete to apex. Elytra pale. Frontal furrows sharper than in *Notaphus*. Wings full.

(16) **B. ephippium** Marsham. Black, forebody with metallic hue, elytra testaceous with indistinct dark transverse fascia behind middle. Appendages pale. 2·5–3·0 mm.

On the seashore, in salt marshes.—England: Cornwall to Essex, Suffolk, Norfolk. Locally abundant.

Subgenus **Emphanes** Motschulsky

Microsculpture lacking. Elytral striae evanescent apically. Small, dark species, only elytra pale apically. Frontal furrows single (in British species) not prolonged upon clypeus (fig. 32d; cf. the following five subgenera, figs. 32e-g). Wings full.

(17) **B. minimum** Fabricius. Black, sometimes with bluish hue, elytra with apex and/or preapical spot pale. Appendages dark but tibiae often paler. Pronotum (fig. 34a) clearly wider than head. Elytral striae with moderately strong punctures. 2·3–3·2 mm.

On moist, clayish soil near the sea, e.g. under sea-weed.—England, N. to Cumberland. S. Wales. Scotland: West Lowlands. Ireland. Often abundant.

(18) **B. normannum** Dejean. More convex than *minimum*, with narrower, somewhat less cordiform pronotum (fig. 34b), the basal margin of which is more elevated. First antennal segment and legs paler, elytra diffusely rufous towards apex. Striae more coarsely punctate. 2·5–3·2 mm.

As minimum *an exclusive seashore species.—England, N. to Cumberland. S. Wales Ireland. Locally abundant.*

Subgenus **Trepanes** Motschulsky

Frontal furrows prolonged upon clypeus, straight, strongly converging (as in fig. 32g). Pronotum with 4 small impressions along base (fig. 34c). Elytra with variegated pattern. Wings full.

(19) **B. articulatum** Panzer. A slender species with pronotum not wider than head; its sides parallel posteriorly (fig. 34c). Black, forebody metallic green, elytra with many small pale spots, confluent at base and in front of apex. Antennae with at least 3 pale basal segments. 2·9–3·9 mm.

On sterile, moist clay or sandy mud near fresh water, often hidden in cracks.—England, N. to Derby. S. Wales. Often abundant.

(20) **B. octomaculatum** Goeze (*sturmi* Panzer). Smaller than the preceding. Pronotum shorter, wider than head, sides sinuate posteriorly. Only first antennal segment pale. Elytral spots not confluent at base. 2·5–2·8 mm.

At the margin of fresh waters, often small pools, and, as a migrant, on the seashore.—England: Hampshire, Sussex, Surrey, Kent. Very local and rare.

Subgenus **Trepanedoris** Netolitzky

Frontal furrows as in *Trepanes* (fig. 32g). Pronotum with only one pair of small foveae at base, front-angles evident (fig. 34e). Elytra not variegated. Wings full.

(21) **B. doris** Panzer. Black, often with bluish hue, elytra with pale subapical spot (rarely rufinistic to a greater extent). At least first antennal segment and legs (often

except femora) dark rufous. Pronotum only slightly wider than head. Apex of penis with sharp ventral hook. 3·1–3·6 mm.

Very hygrophilous, in swamps and marshes.—England, widely but local. S. Wales. Scotland. Ireland. Locally abundant.

Subgenus **Semicampa** Netolitzky

Frontal furrows prolonged upon clypeus, arcuate, forwards converging, doubled in anterior part (fig. 32e). Small species without pale spots on elytra. Wings dimorphic.

(22) **B. schueppeli** Dejean. Black, upper surface with blue or green reflection. Only first antennal segment entirely pale, legs rufo-testaceous with femora infuscated. forebody with well developed microsculpture. 2·8–3·2 mm.

On sand mixed with detritus where the vegetation is sparse; almost confined to river banks.—N. England: Yorkshire, Durham, Cumberland. Scotland. Local but not rare.

(23) **B. gilvipes** Sturm. Black or pieceous without metallic hue, elytra usually paler along suture; legs entirely pale. Pronotum narrower at base than in *schueppeli*, elytral striae more coarsely punctate anteriorly. Upper surface without microsculpture, except at apex of elytra. 2·5–3·0 mm.

Among moss and leaves under deciduous trees or bushes, e.g. Salix, in somewhat moist places; also in "flood refuse".—England, N. to Cumberland. Ireland. Locally abundant, but becoming rarer.

Subgenus **Diplocampa** Bedel

Frontal furrows prolonged upon clypeus, doubled in their entire length (fig. 32f). Elytra at least with preapical pale spot. Wings varying.

(24) **B. fumigatum** Duftschmid. Piceous black, forebody with greenish, elytra more bluish hue; elytra with numerous, distinct pale spots, also in anterior half, behind middle usually forming a bent transverse band. Legs and base of antennae pale. Pronotum dull from dense, reticulate microsculpture. Constantly long-winged. 3·5–4·0 mm

In clayish marshes, usually near the sea, amongst wet debris.—England, N. to Yorkshire. Wales: Glamorgan.

(25) **B. assimile** Gyllenhal. Smaller and more convex than *fumigatum*, with elytral striae deeper and more coarsely punctate. Antennae and legs stouter. Same microsculpture. Elytra with pale apex and preapical macula but in anterior half without or with indistinct spots. Wings often reduced. 2·8–3·5 mm.

At the margin of standing waters and on the seashore, where the vegetation is rich, e.g. in reed beds.—England, N. to Yorkshire. S. Wales. Ireland. Often abundant.

(26) **B. clarki** Dawson. Best distinguished from the two preceding on the pronotum, which is broader, less constricted at base, and, due to obsolete microsculpture on disc, as shiny as the elytra. Pale spots of elytra often diffuse. Wings usually reduced. 3·2–3·7 mm.

Earlier regarded as a subspecies of the northern *transparens* Gebler (*contaminatum* J. Sahlberg) but quite distinct on the male genitalia (Lindroth, 1939–40, figs. 33–34).

Always inland, at the border of ponds in wooded areas.—England, widely. S. Wales. Scotland: Lowlands. Ireland. Local.

Subgenus **Bembidion** s. str.

(*Lopha* Stephens)

Base of pronotum with a short but deep incision laterally, hind-angles denticulate (fig. 34d). Frontal furrows prolonged upon clypeus, simple, moderately convergent. Elytra with pale spots, at least at shoulder. Wings full.

(27) **B. quadrimaculatum** Linnaeus (*quadriguttatum* Fabricius). A small species with very long legs. Black, forebody more or less metallic, elytra with humeral and almost constantly with preapical spot yellow, and often apex, sometimes also suture brown. Four basal antennal segments and legs rufo-testaceous (or femora slightly infuscated). Palest specimens superficially similar to *articulatum* (but see pronotum, figs. 34c, d). 2·8–3·5 mm.

On open, rather dry soil with no or thin vegetation. Often associated with lampros.—*England, N. to Yorkshire. S. Wales. Common in the south.*

(28) **B. quadripustulatum** Serville (*quadriguttatum* Olivier). Darker and larger than *quadrimaculatum*. Black with bronze hue, elytra always each with two sharp yellow spots. Antennae black (or with base of third and fourth segments pale); femora black, also tarsi and apex of tibiae infuscated. Elytra broader with more pronounced shoulders and stronger striae. 3·5–4·0 mm.

On damp, bare clay or sandy mud.—S.E. England: Sussex to Derby, W. to Gloucester. Rare.

Subgenus **Philochthus** Stephens

Well characterized by the form of the pronotum (figs. 34g-i): the sides are rounded to hind-angles but the base inside these is broadly sinuate. Frontal furrows parallel. Elytra usually with pale preapical spot. Their microsculpture transverse, usually causing pronounced iridescence.

(29) **B. biguttatum** Fabricius. Distinguished within the subgenus by the seventh elytral stria, which is well developed anteriorly, almost as coarsely punctate as the sixth. Black or piceous, upper surface with strong blue-green reflection, elytra strongly iridescent with yellow preapical macula and brown apex. First antennal segment and legs rufo-testaceous. Pronotum with deep latero-basal sinuation, dull from micro-reticulation. 3·8–4·3 mm.

In somewhat moist meadows or open forests, usually near water, among moss and leaves.—England. S. Wales. Scotland. Ireland. Common.

(30) **B. iricolor** Bedel. Largest species of the group, closely related to *lunulatum*, with the same form and microsculpture of pronotum. Antennae slenderer (see key), elytra more elongate, their striae more finely punctate in basal half. Coloration the same, except that the ground-colour of elytra is often rufo-piceous. 4·1–5·5 mm.

Confined to the seashore and inner estuaries, often under seaweed.—S. England, N. to Yorkshire. S. Wales. Local.

(31) **B. lunulatum** Geoffrey-Fourcroy (*riparium* Olivier). Shorter and more convex than *biguttatum*; bluish reflection of upper surface less pronounced. First antennal segment only indistinctly pale. Preapical elytral spot sometimes diffuse. Pronotum with shallower latero-basal sinuation and keel inside hind-angles bent outwards; disc shiny without micro-reticulation. Punctures of elytral striae very coarse anteriorly. 3·6–4·1 mm.

On clayish soil with rich vegetation near water; also on the seashore.—England, N. to Cumberland. S. Wales. Local but not rare.

(32) **B. aeneum** Germar. Pronotum (fig. 34g) broader and flatter than in the three preceding species, entirely micro-reticulate (as in *biguttatum*). Black or piceous, upper surface bronze, sometimes bluish. Antennal base indistinctly pale, legs reddish brown; elytra often with apex and sides brown but preapical spot usually indistinct to virtually obsolete. Latero-basal keel of pronotum straight. Elytral striae finer than in preceding species, faintly punctate, seventh stria barely suggested. Wings often reduced, though always with reflexed apex. 3·4–4·5 mm.

On firm, moist clay with short vegetation of grass and Carices. Primarily a seashore inhabitant but also along river estuaries.—England. S. Wales. Scotland. Ireland. Often abundant, but local.

(33) **B. guttula** Fabricius. This and the following species are the smallest of the group and deviate by the, laterally, only slightly sinuate, pronotal base (fig. 34h). A variable species. Black or piceous, upper surface bluish or greenish. Base of antennae usually pale (exceptionally also first segment infuscated), legs dark testaceous or rufous, usually with infuscated femora; preapical spot of elytra from sharp to very diffuse, also apex normally pale. Pronotum entirely micro-reticulate. Wings dimorphic, rudiment in the short-winged form at least reaching base of fifth abdominal tergite. 2·8–3·5 mm

Near fresh water, usually on clay, where the vegetation is rich; also in shaded places.—England. Wales. Scotland. Ireland. Common.

(34) **B. unicolor** Chaudoir (*mannerheimi* auctt., *haemorrhoum* auctt.). Very close to *guttula* and sometimes difficult to recognize. Broader and more convex, pronotum (fig. 34i) and elytra with sides more rounded. Upper surface pure black or with faint iridescence. First antennal segment and legs more clear rufo-testaceous, femora not darker; preapical spot absent or very diffuse. Antennae somewhat stouter. Wings always reduced, with rudiment not surpassing second abdominal tergite. 2·8–3·4 mm.

In deciduous forests or brush, in fens etc., among moss, leaves and twigs on moderately moist soil.—England. S. Wales. Scotland. Ireland. Locally abundant.

Subgenus **Synechostictus** Motschulsky

Represented by a single species, characterized by the very convex body, with narrow, strongly cordate pronotum (fig. 42d). Diagnostic feature is the short eighth elytral stria which is clearly visible only in apical third.

(35) **B. stomoides** Dejean (*atroviolaceum* auctt. nec Dufour). Piceous black, elytra rufescent, notably in apical half, legs and base of antennae rufo-testaceous. Elytral striae coarsely punctate but disappearing towards apex. Elytra with microreticulation, more regularly isodiametric in the female, obliterating basally in the male. Wings developed. 5·5–6·0 mm.

On river banks.—England: Hertford; Norfolk to Cumberland. Scotland: W. Lowlands, E. Highlands. Rare and local.

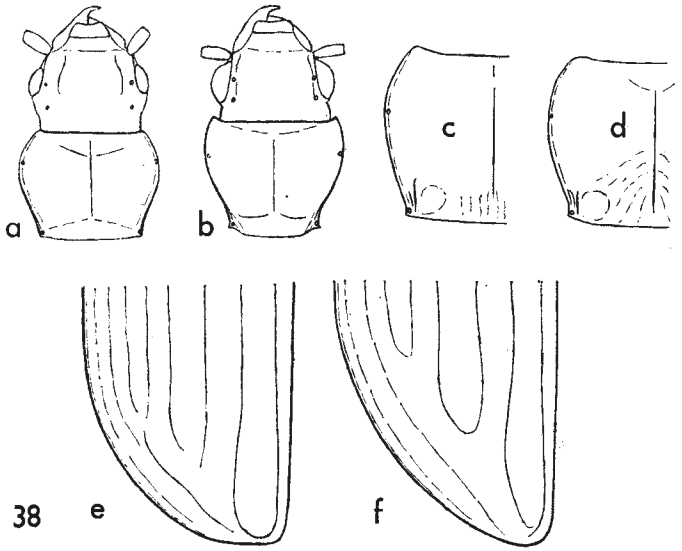

FIG. 38.—*Bembidion*. Forebody of (a) *nigropiceum*; (b) *laterale*. Pronotum of (c) *tibiale*; (d) *atrocoeruleum*. Elytral apex of (e) *atrocoeruleum*; (f) *geniculatum*.

Subgenus **Lymnaeum** Stephens

This and the following subgenus, both confined to the tidal zone, are distinguished within the genus by the small eyes, with temples long and parallel, and the barely constricted neck (fig. 38a). Head almost as broad as pronotum. Elytra with 2 dorsal punctures. Upper surface unmetallic. Appendages pale.

(36) **B. nigropiceum** Marsham. Reddish brown, disc of elytra darker. Eyes very small and flat. Elytral striae deep, punctulate, intervals very convex, dorsal punctures foveate. Microsculpture of elytra shallow, reticulate. Wings rudimentary. 3·5–4·0 mm.

On the coast. Often with Trechus fulvus.—*England: Cornwall to Suffolk. Locally abundant.*

Subgenus **Cillenus** Samouelle

The only *Bembidion* with 4 dorsal punctures on third elytral interval. Head very broad (fig. 38b), antennae short and stout. At least forebody metallic.

(37) **B. laterale** Samouelle (nec Dejean, see *callosum*). Forebody, notably head, dark with greenish reflection elytra testaceous, usually with longitudinal metallic spot.

Appendages pale. Entire upper surface dull from strong micro-reticulation. Wings dimorphic, usually quite reduced. 3·0–4·0 mm.

In the tidal zone.—England. Wales. Scotland. Ireland. Often abundant.

Subgenus **Nepha** Motschulsky

Strongly shiny species with four-spotted elytra and narrow pronotum, not wider than long. Elytral striae (except the sutural) disappearing behind middle. Frontal furrows parallel. Wings full.

(38) **B. genei** Küster (*quadriguttatum* Illiger nec Fabricius). Black, forebody usually with greenish hue, each elytron with sharp humeral and preapical spot. Base of antennae, at least underneath (including base of segments 3 and 4), and legs (except tip of femora and base of tibiae) pale. Pronotum (fig. 34f) without or with barely suggested latero-basal keel. 4·0–4·9 mm.

The typical form has a Mediterranean distribution; in Britain subsp. illigeri *Netolitzky occurs.*

On open, moist clay with sparse or no vegetation, usually near water; often associated with articulatum.*—England. S. Wales. Scotland: Lowlands. Ireland. Common in the South.*

(39) **B. callosum** Küster (*laterale* Dejean nec Samouelle). Separated from *genei* by broader pronotum, with evident keel inside hind-angle, by the backwards more produced humeral spot of elytra, and the darker antennal base, only first segment being partly pale. Elytral striae more finely punctate at base. 3·5–4·0 mm.

The presence of this species in Britain is highly doubtful. The record is based on a single specimen from Woking, Surrey, 1851 (*Fowler*, **6**, 1913).

Subgenus **Plataphus** Motschulsky

(incl. *Blepharoplataphus* Netolitzky)

Flat, dark species with immaculate elytra. Striae better developed than in the two following subgenera, evident to apex, seventh stria not markedly weaker than sixth. Wings full.

(40) **B. prasinum** Duftschmid. Black with faint greenish hue, elytra often rufinistic (*"kolstroemi"* C. R. Sahlb.); first antennal segment, at least underneath, and base of femora rufous. Elytral striae virtually impunctate. Abdominal sternites only with the usual pair of setae (fig. 35f). 4·2–5·5 mm.

On gravel banks close to running water.—England: Sussex; Monmouth to Northumberland. Wales. Scotland. Locally abundant in the north and west.

(41) **B. virens** Gyllenhal. Abdominal sternites with a fringe of bristles along hind-margin (fig. 35e) (which is the diagnostic character of subg. *Blepharoplataphus*, if recognized). Upper surface with green or brassy lustre, appendages black, elytra never rufinistic. Body more convex than in *prasinum*, elytra with sides more rounded and striae strongly punctate. 4·5–5·4 mm.

Among gravel at the border of both salt and fresh water, running as well as standing.—In Britain restricted to a single locality: Loch Maree, N.W. Scotland; apparently a stable colony.

Subgenus **Bembidionetolitzkya** E. Strand

(*Daniela* Netolitzky)

Species above average size. Upper surface unicolorous, dark, with metallic reflection. Elytral striae better developed than in subgen. *Peryphus*, with second stria well impressed to apex; but, unlike subgen. *Plataphus*, the seventh stria is rudimentary. Wings full.

(42) **B. tibiale** Duftschmid. A large, flat species with long, parallel-sided elytra. Upper surface with blue or green reflection, appendages piceous but first antennal segment, tibiae, tarsi and often apex of femora pale. Frontal furrows deep (see key). Base of pronotum (fig. 38c) very faintly oblique and/or sinuate laterally, latero-basal carina sharp. Microsculpture strong, on the elytra forming dense, very transverse meshes. Penis (fig. 39a) big and stout with ventral side straight at middle; armature of internal sac well developed. 5·5–6·5 mm.

On gravel banks along rivers.—England. Wales. Scotland. Ireland. Often abundant.

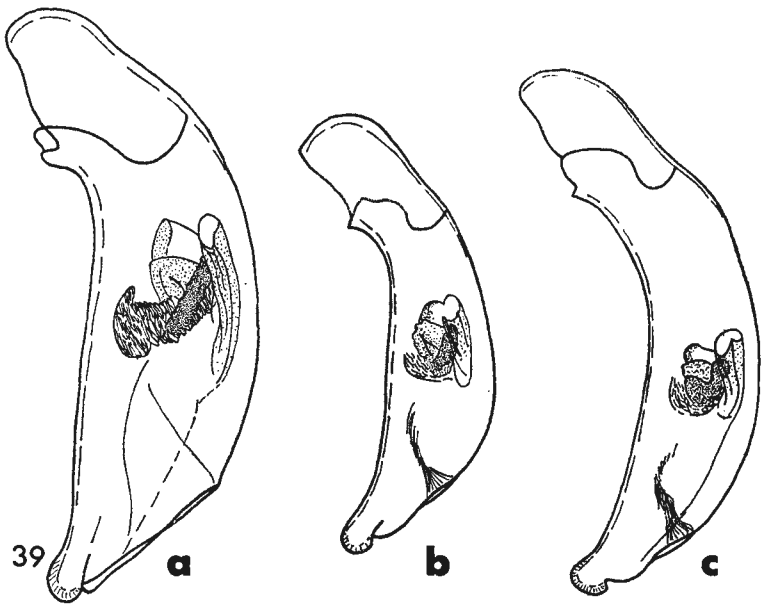

FIG. 39.—*Bembidion*. Penis of (a) *tibiale*; (b) *atrocoeruleum*; (c) *geniculatum*.

(43) **B. atrocoeruleum** Stephens. Smaller and slenderer than *tibiale*, notably the pronotum, which is only slightly wider than head. Elytra often piceous or brown, metallic reflection sometimes brassy; coloration otherwise the same. Frontal furrows short and shallow (see key). Base of pronotum (fig. 38d) oblique laterally, front angles less produced. Apex of elytra truncate (fig. 58g). Elytral microsculpture on an average with less transverse meshes. Penis (fig. 39b) small, arcuate; inner armature less developed. 4·5–5·5 mm.

Habitat as tibiale.—*England, widely. Wales. Scotland. Ireland. Locally abundant.*

(44) **B. geniculatum** Heer (*redtenbacheri* K. Daniel). Best separated from the two preceding on the acuminate apex of elytra (fig. 38f). Coloured as *tibiale* but often with more brassy reflection. Elytra shorter. Frontal furrows and base of pronotum as in *tibiale*. Elytral microsculpture more as in *atrocoeruleum*. Penis (fig. 39c) as in that species but with more dilated apex and better developed internal armature. 4·5–5·5 mm.

Habitat as tibiale.—*Only in the north. England: Yorkshire, Durham, Cumberland. Scotland: Highlands. Local.*

Subgenus **Peryphus** Stephens
(incl. *Peryphiolus* Jeannel)

The largest British subgenus, containing medium-sized species, most of them with bicoloured elytral pattern, either consisting of two pale spots (sometimes longitudinally confluent) on each elytron or of a preapical vitta only (species 48): species 45–47 and 57 have uniformly dark or rufinistic elytra. The main character of the subgenus is the apically more or less obsolete elytral striae, with the second weaker than the first (except in *saxatile*) and seventh stria absent, rudimentary or at least with finer punctures than sixth stria. Pronotum pronouncedly cordate with sides sinuate in front of hind-angles. If not otherwise stated, the microsculpture of elytra consists of very transverse meshes. Wings full, except (usually) in *tetracolum*.

(45) **B. monticola** Sturm. This is the single representative of "subg. *Peryphiolus*", characterized by the somewhat more evident second elytral stria, the strongly micro-

sculptured pronotum, and the presence of 3 (instead of 2) terminal setae on the male parameres. Bluish green, first antennal segment and legs rufo-testaceous. Pronotum (fig. 33i) only slightly wider than head. 4·5–5·0 mm.

Usually near running water in shaded position.—England, more in the north. Wales. Scotland. Locally abundant.

(46) **B. nitidulum** Marsham. Black, upper surface vividly bluish green or almost blue; antennae with 1 or 2 basal segments entirely and the two following at base, as well as legs, rufo-testaceous, but femora and penultimate segment of maxillary palpi infuscated. Elytra with striae deep, strongly punctate in basal half, the reticulate microsculpture evident near apex only. Penis, fig. 40a. 4·5–5·3 mm.

On moist, clayish soil with trickling water, e.g. in gravel pits or near small brooks.—England. Wales. Scotland. Ireland. Often abundant.

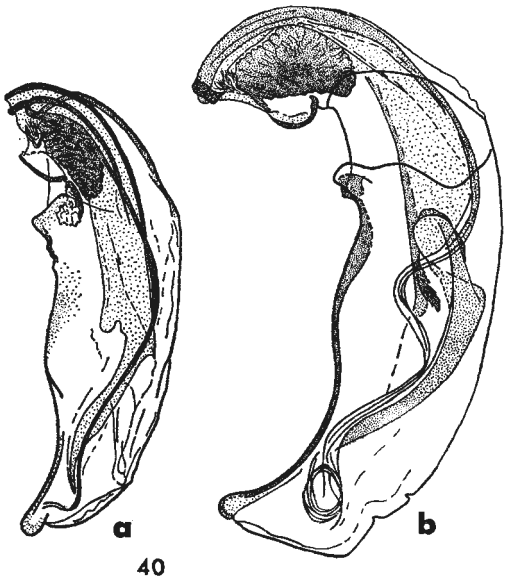

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FIG. 40.—*Bembidion.* Penis of (a) *nitidulum*; (b) *stephensi.*

(47) **B. stephensi** Crotch (*affine* Stephens nec Say). Usually larger than *nitidulum* and with elytra more oviform, dilated in posterior half. Appendages paler: antennae with 3 basal segments, entire palpi and legs rufo-testaceous. Elytral microsculpture transverse over entire surface. Penis (fig. 40b) with enormously developed armature of internal sac. 5·2–6·1 mm.

In similar habitats to nitidulum *but always in more or less shaded position, for instance on steep, barren sandy clay under bushes, especially near the coast.—England, widely. S. Wales. Scotland: Lowlands. Ireland. Local and not common.*

(48) **B. lunatum** Duftschmid. The only British *Peryphus* with pale macula only subapically. Piceous brown to almost black, upper surface with bronze hue. Elytra with large, rufo-testaceous semilunar macula near apex (in pale specimens sometimes indistinct). Appendages testaceous or antennae infuscated. Pronotum as in *tetracolum*. Seventh elytral stria virtually obsolete. 5·5–6·2 mm.

On moist, usually clayish soil, under leaves of Tussilago, etc.; especially on river banks. Hibernating as larva and therefore not appearing until late spring.—England, more in the north. S. Wales. Scotland. Ireland. Locally abundant.

(49) **B. tetracolum** Say (*ustulatum* auctt. nec Linnaeus, *litorale* auctt. nec Olivier). This and all following species (except *decorum*) have, on each elytron, two pale spots, one at base and one near apex, sometimes confluent. A stout species with broad pronotum

(fig. 42a), oviform elytra and pale parts pronouncedly reddish. Upper surface with faint aeneous lustre. Appendages pale, except that the antennae are infuscated from third or fourth segment. Elytral spots not confluent, inner striae deep, strongly punctate, seventh stria evident in basal third (as a row of punctures). Pronotum without microsculpture on disc. Wings usually reduced, though with reflexed apex. Penis, fig. 41a. 4·9–6·1 mm.

Very eurytopic. In open, moderately moist places with scattered vegetation of weeds and grasses. Independent of open water.—England. Wales. Scotland. Shetland. Ireland (*Johnson & Halbert*, 1902; *not in Moore*, 1957), *Very common.*

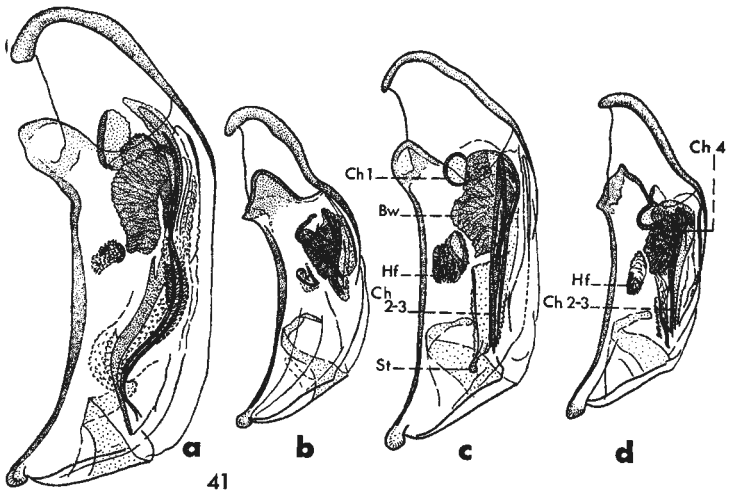

FIG. 41.—*Bembidion*. Penis of (a) *tetracolum*; (b) *bruxellense*; (c) *andreae*; (d) *femoratum*.

(50) **B. bruxellense** Wesmael (*rupestre* auctt. nec Linnaeus). Similar to *tetracolum* in general outline but smaller and darker. Separated from all other spotted species by the dull, transversely microsculptured pronotum (as on the elytra). Second antennal segment and femora more or less darkened. Elytral pale spots exceptionally so indistinct that they may be overlooked (key, coupl. 43). Striae varying but usually as in *tetracolum*. Wings full. Penis, fig. 41b. 4·0–5·2 mm.

Rather eurytopic; on all kinds of moist ground with sparse vegetation, usually near water.—England. Wales. Scotland. Shetland. Ireland. Less common in the south.

(51) **B. andreae** Fabricius (*anglicanum* Sharp). Flatter than *tetracolum*, pale parts more pure yellow. Elytral striae finer, the seventh barely suggested. Antennae with 3 pale basal segments, penultimate segment of maxillary palpi and sometimes femora (very slightly) infuscated. Forebody aeneous. Wings full. Penis, fig. 41c. 4·5–5·5 mm.

The form occurring in Britain is sbsp. *bualei* Duval. On the continent, the species constitutes a very difficult complex.

On gravel banks along running waters, sometimes on the seashore.—England, very local. Scotland. Ireland. Locally abundant.

(52) **B. femoratum** Sturm. So closely related to *andreae* that it has often been regarded as a subsp. of it. Darker and usually smaller. Only 1 or 2 basal segments of the antennae are entirely pale, also antepenultimate segment of maxillary palpi infuscated, femora almost black. Forebody without or with faint metallic hue. Penis (fig. 41d) very similar but outer form and sclerites of the internal sac are shorter. 4·2–5·2 mm.

On open, clayish or gravelly soil, e.g. in sand pits, not necessarily near water.—England, generally. Scotland. Ireland. Often abundant.

(53) **B. maritimum** Stephens (*concinnum* auctt.). Easily recognized on the longitudinally confluent pale elytral spots and their microsculpture. This is strong, its meshes are more or less isodiametric in the female, in the male about twice as broad as long. Appendages entirely testaceous or antennae slightly infuscated apically. 5.0–5·5 mm.

Confined to the seashore and river estuaries.—England. Wales. Scotland: West Lowlands. Ireland. Local.

(54) **B. testaceum** Duftschmid. Among the maculate *Peryphus* this has the least distinct elytral pattern, the transverse dark fascia being poorly delimited, notably anteriorly. Pronotum, fig. 42c, as in *fluviatile*, its lateral bead is very thin, not visible from above in anterior part. Pronotum microsculptured laterally, without latero-basal carina. Seventh elytral stria evident. Appendages pale, except penultimate segment of maxillary palpi and antennae from fourth segment. 4·5–5·5 mm.

At the border of running waters.—England, local (not in the S.E.). S. Wales. Scotland: West Lowlands. Very local.

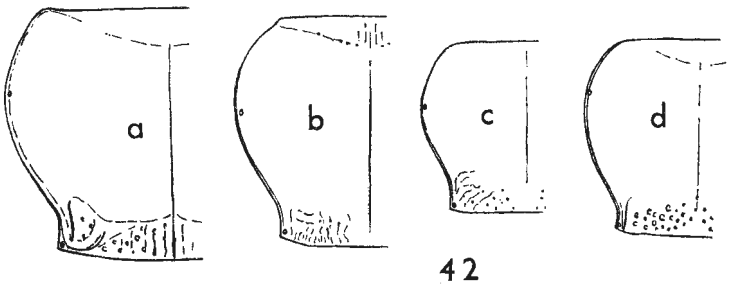

FIG. 42.—*Bembidion*. Pronotum of (a) *tetracolum*; (b) *fluviatile*; (c) *testaceum*; (d) *stomoides*.

(55) **B. fluviatile** Dejean. Larger than *testaceum* and with pronotum still narrower (fig. 42b) and more convex. Similarly coloured, except that the transverse elytral fascia is distinct, almost black. Pronotum devoid of microsculpture, latero-basal carina present. Elytra more evidently iridescent due to denser transverse microsculpture, notably in the male. Frontal furrows, see key. 5·5–6·5 mm.

On sandy or clayish river banks.—England, locally (not in the S.). S. Wales. Scotland: E. Highlands. Very local.

(56) **B. saxatile** Gyllenhal. Very flat, with long parallel-sided elytra, the striae of which are evident to apex. Frons inside posterior part of eye, as in *decorum*, with a group of small punctures. Forebody green, elytra with bluish hue, their pale spots clear reddish. Femora sometimes slightly infuscated, usually only first antennal segment entirely pale. 4·2–5·1 mm.

On barren gravel at the margin of running and standing waters, also on the seashore.—England, local. Wales. Scotland. Ireland. Local but sometimes abundant.

(57) **B. decorum** Zenker. Piceous black with aeneous tinge, elytra often rufinistic, first antennal segment and legs rufo-testaceous. Lateral punctures on frons rather strong. Pronotum without latero-basal carina, entire surface microsculptured. Elytral striae strongly punctate anteriorly, the inner deepened, but obliterating before apex; microsculpture consisting of dense, confluent transverse lines. 5·2–6 mm.

On gravelly banks of rivers.—England, widely. Wales. Scotland. Ireland. More common in the north.

Genus **Tachys** Stephens

Very small beetles related to *Bembidion* and with the same reduction of the terminal palpal segment. Easily separated (except from subgen. *Ocys*) on the recurrent sutural stria of elytra (figs. 44a-c), as in *Trechus*, and the obliquely truncate tip of the pro-tibia.

The second antennal segment is more slender, about as long as third. Outer elytral striae obliterated; no abbreviated scutellar stria; 2 dorsal punctures, situated at third stria or on fourth interval, the posterior often enclosed within recurrent stria. All British species are macropterous, except that *edmondsi* (according to Jeannel also *micros*) is dimorphic. Male pro-tarsi with 1 or 2 faintly dilated segments; genitalia are not very useful in the British species.

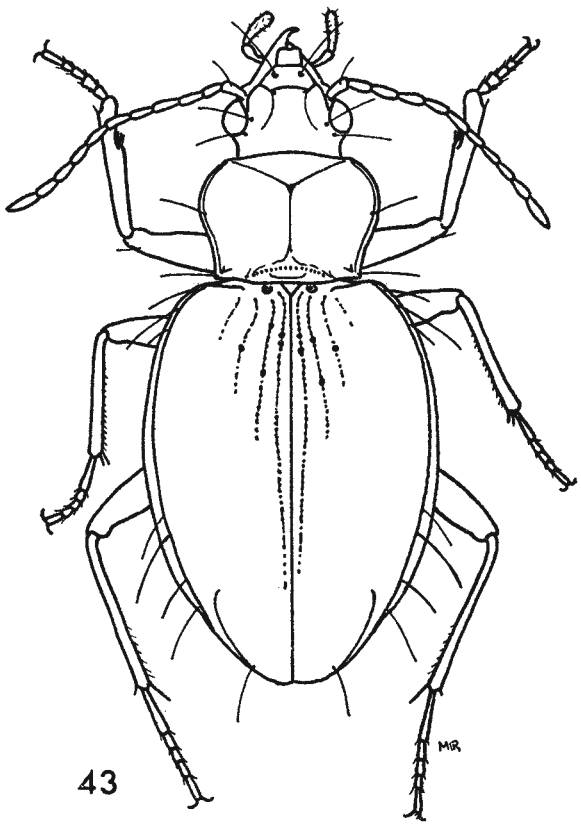

FIG. 43.—*Tachys bisulcatus* ♂.

KEY TO SPECIES

1 Posterior dorsal puncture of elytra situated well in front of recurrent stria (fig. 44a). Basal transverse impression of pronotum and at least inner elytral striae punctate. (Convex species, strongly sclerotized. Upper surface shiny, microsculpture absent or extremely fine, visible only at high magnification) 2

– Posterior dorsal puncture enclosed within the hook of the recurrent stria (figs. 44b, c). Pronotum with basal impression smooth. Elytral striae shallow, impunctate or almost so. (Flat species, notably the elytra weakly sclerotized. Upper surface dull, pronotum and elytra with dense transverse microsculpture, more or less iridescent.) 5

2 Eighth elytral stria obsolete at middle. Mentum with two deep foveae. Pronotum and elytra with extremely fine and dense transverse microsculpture, faintly iridescent. (Subgen. *Porotachys* Netolitzky) (Entirely rufo-testaceous. Pronotum with a small punctiform fovea in front of the rectangular hind-angles but without latero-basal carina. Elytra very broad, oviform, convex. 2·8–3·2 mm.) (fig. 43) ..... (*focki* Hummel) **bisulcatus** Nicolai

On the continent associated with coniferous forest, found in heaps of damp bark, etc., or swarming at night.—In Britain found only once, at South Shields, Durham, in the last century. Apparently introduced and never established.

– Eighth elytral stria entire. Pronotum and elytra devoid of microsculpture (except, in one species, close to scutellum), very shiny. Mentum without foveae. (Subgen. *Tachyura* Motschulsky) 3

3 2·5 mm. or more. Elytra each with two large yellow spots, broad, about 50 per cent wider than pronotum. (Ground colour piceous to brown, head darkest. Punctures of transverse posterior impression of pronotum, except for median fovea, very small. Elytra with 4 or 5 regularly but rather finely punctate striae. 2·5–2·8 mm.) ..... **quadrisignatus** Duftschmid

On the continent on sand near water.—A single specimen was taken long ago at South Shields, Durham, no doubt as the result of introduction.

– Not more than 2 mm. Body unicolorous. Elytra narrower. Basal impression of pronotum more strongly punctate. (Two very closely allied species, difficult to separate) 4

4 More convex, elytra with more rounded sides. Pronotum (fig. 44c) broader, more than 1·4 times as wide as long, sides less sinuate basally, latero-basal foveae obsolete. Elytra with shallow, irregular microsculpture (visible only at high magnification) between the reticulate scutellum and basal pore-puncture. (Coloured as dark specimens of *parvulus*. Elytra with 5 irregularly punctate striae. Penis very similar to that of *parvulus*. 1·8–2·1 mm.)

walkerianus Sharp

In Sphagnum.—England: Hampshire and Surrey. Locally abundant.

– Pronotum (fig. 44d) less than 1·4 times as wide as long, more constricted towards base and with greatest width closer to anterior margin; latero-basal foveae more distinct. Elytra without microsculpture near scutellum. (Piceous brown to almost black, elytra often a little paler. Elytral striae usually more distinctly punctate. 1·8–2·2 mm.) ..... **parvulus** Dejean

On open gravel often near the sea.—England: Devon, Cornwall. The records from Cheshire and Lancashire should perhaps be queried.

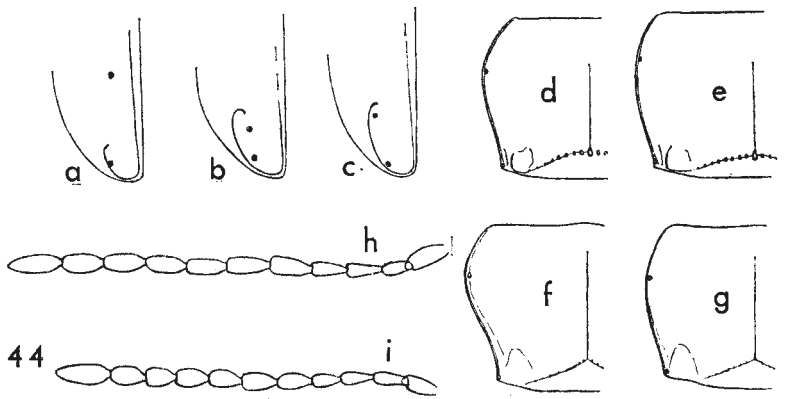

FIG. 44.—*Tachys*. Left elytron with recurrent stria of (a) subg. *Tachyura*; (b) subg. *Tachys s.str.*; (c) subg. *Eotachys*. Pronotum of (d) *parvulus*; (e) *walkerianus*; (f) *micros*; (g) *bistriatus*. Antenna of (h) *bistriatus*; (i) *edmondsi*.

5 Recurrent stria of elytra with strong hook anteriorly (fig. 44b), from which the posterior dorsal puncture is widely removed. The 4 marginal elytral punctures behind shoulder almost equidistant. Sides of pronotum not or barely sinuate posteriorly. Elytra maculate, striae somewhat more impressed (Subgen. *Tachys s.str.*) (Forebody piceous to black, elytra brownish with a triangular spot about scutellum and usually also sides and apex dark. Male with 2 dilated pro-tarsal segments. 2·0–2·7 mm.) ..... **scutellaris** Stephens

In marshes and on mud, apparently dependent upon saline soil.—England, on the S. & S.E. coast; N. to Norfolk.

– Recurrent stria less hooked (fig. 44c), ending closer to posterior dorsal puncture. The two posterior subhumeral punctures distant from the anterior pair. Sides of pronotum sinuate behind. Elytra unicolorous or almost so. (Subgen. *Eotachys* Jeannel) (Male with only first pro-tarsal segment faintly dilated) ... 6

6 Pronotum (fig. 44f) with hind-angles virtually rectangular, sides in front of them strongly sinuate, and base almost straight laterally. Rufo-ferrugineous, only head dark. (Antennae almost as short as in *edmondsi*. In Britain, both sexes have fully developed wings; cf. Jeannel, 1941. 2·0–2·4 mm.)

(*gregarius* Chaudoir) **micros** Fischer

On patches of damp sand on coastal cliffs. England: Dorset, Sussex.

– Pronotum (fig. 44g) with hind-angles obtuse, rounded at tip; sides less sinuate, base oblique laterally. Body piceous to brown, head only slightly darker. ... 7

7 Antennae more slender (also as compared with *micros*) (fig. 44h). Microsculpture of pronotum and elytra fine and dense. First meta-tarsal segment much longer than second plus third. (Piceous to brown, antennae with testaceous base. Wings full. 1·8–2·3 mm.) ..... **bistriatus** Duftschmid

On damp sand or clay at the border of standing and running fresh water, also on the coast.—England, N. to Durham. Wales: Glamorgan.

– Antennae, notably intermediate segments, much shorter (fig. 44i). Microsculpture coarser. First meta-tarsal segment only slightly longer than second plus third. (Coloured as *bistriatus*. Wings dimorphic, full or strongly reduced. Penis, in lateral view, with apex more slender, slightly constricted at tip (Moore, 1956) but internal sac very similar to that of *bistriatus*. 1·5–2·0 mm.)

(*piceus* Edmonds nec Dalla Torre) **edmondsi** Moore

In Sphagnum, associated with walkerianus.*—England: New Forest, Hampshire. This is the only Carabid species not found outside the British Isles.*

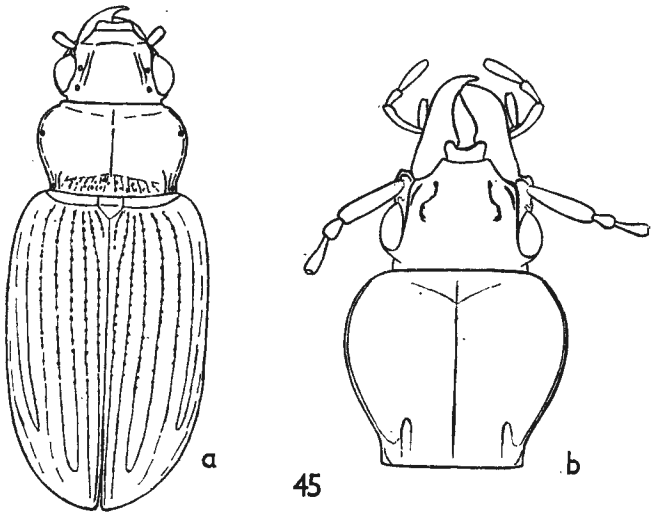

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FIG. 45.—(a) *Pogonus luridipennis*; (b) forebody of *Stomis pumicatus*.

Tribe **POGONINI**

Genus **Pogonus** Nicolai

Medium sized, metallic species confined to the seashore. Separated from *Bembidion* by well developed last segment of the maxillary palpi and the complete raised basal margin of elytra (fig. 45a); from *Patrobus* by the not constricted neck. Frontal furrows deep and straight. Base of pronotum punctate. Elytra with 3 dorsal punctures. Tarsi furrowed on dorsum. Wings fully developed. Male with 2 dilated pro-tarsal segments.

KEY TO SPECIES

1 All appendages rufo-testaceous; elytra pale testaceous though sometimes clouded on disc and/or with faint metallic hue. Forebody green. (Pronotum flatter and elytral striae stronger apically than in the two following. 6–8·5 mm.) (fig. 46a) **luridipennis** Germar

On clayish seashores, mostly in marshes under seaweed, etc.—England: Dorset to Lincoln; Gloucester. Very local.

– At least first antennal segment black or piceous; also palpi and legs more or less darkened. Entire upper surface metallic, elytra concolorous 2

2 Pronotum with anterior transverse impression punctate, base not wrinkled. Elytra much shorter, striae obsolete laterally and apically. (Bronze, brassy or greenish. Antennae more slender. Sides of pronotum and elytra more rounded. 5·5–6·6 mm.) ..... **chalceus** Marsham

Habitat as the preceding.—England: N. to Cumberland. Wales. Scotland: W. Lowlands. Ireland. Widely distributed.

– Anterior transverse impression of pronotum smooth, base with longitudinal rugosities at middle. Elytral striae evident to apex. (Coloured as *chalceus*. Notably outer antennal segments shorter. Elytra with sides parallel at middle. 7–8 mm.) **littoralis** Duftschmid

Habitat as the preceding.—England: Cornwall to Norfolk. Wales: Glamorgan. Ireland. Very local.

Tribe **PTEROSTICHINI**

(incl. *Agonini*)

A very large and heterogeneous assemblage, divided into several subtribes (by certain authors regarded as distinct tribes).

Genus **Stomis** Clairville

ONE BRITISH SPECIES

The single species is strongly suggestive of *Pterostichus minor* or a *Patrobus* but is at once separated by the straight protruding mandibles, the long first antennal segment and the cordate pronotum (fig. 45b). Elytra with deep, punctate striae; scutellar stria and dorsal punctures lacking. Wings rudimentary. Male with 3 dilated pro-tarsal segments.

Dark reddish brown, upper surface piceous, appendages rufous. 6·8–8·3 mm. **pumicatus** Panzer

In meadows and fields, often in gardens where the soil is rich in humus, also in flood refuse.—England. S. Wales. Scotland. Ireland. Not common.

Genus **Pterostichus** Bonelli

(*Feronia* Latreille[1])

A large genus containing beetles varying considerably in size (5–21 mm.), of a somewhat stout appearance, with pronotum only slightly narrower than elytra. The legs are

[1]Concerning the validity of Bonelli's 1810 names, *see* Andrewes (1937, 1939) and Gaskin & Lewis (1956).

rather long but with heavy tibiae (notably the anterior pair); claws simple. Mandibles long and sharp (fig. 62a). Pronotum with a single or double latero-basal fovea. Elytral epipleura "crossed" (as in fig. 61a), except in *cristatus*; third interval with at least one dorsal puncture. The status of the hind wings is very variable in this genus. Male with 3 segments of pro-tarsi strongly dilated and sometimes with other characters.

Most species occur in open, not too dry country. Those with metallic coloration are diurnal.

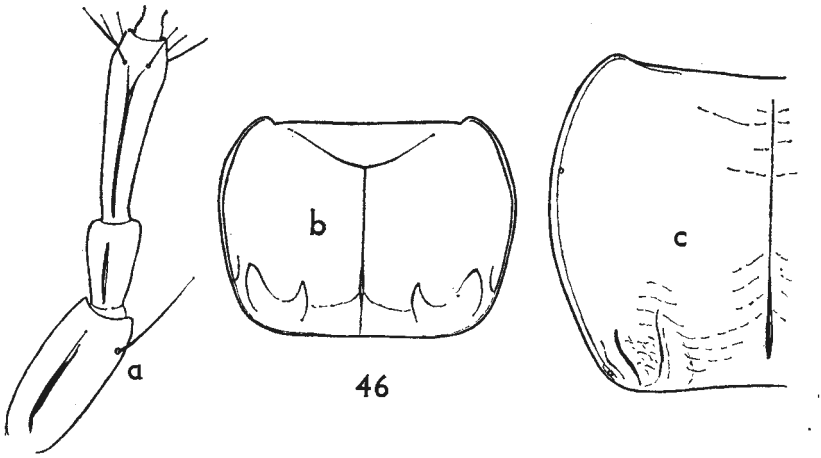

FIG. 46.—*Pterostichus*. (a) Antennal base in subg. *Poecilus*. Pronotum of (b) *aterrimus*; (c) *madidus*.

KEY TO SPECIES

1 The 3 basal segments of antennae with longitudinal keel above (fig. 46a). Entire body almost constantly with brilliant metallic reflection (Subg. *Poecilus* Bonelli) 2
– Basal antennal segments not keeled. Body black to piceous, sometimes with faint metallic hue 5
2 Antennae entirely black. (Upper surface unicolorous but extremely variable: from coppery, green or bluish to virtually black; elytra of female dull. Pronotum (fig. 47a) not depressed at hind-angles, basal foveae parallel, narrow and very deep, the outer delimited externally by a strong convexity. Elytral striae almost impunctate. Wings usually quite reduced. 11–15 mm.)
lepidus Leske
On open, dry, usually sandy soil, e.g. on moraine or in sandy heath.—England, N. to Cumberland. S. Wales. Scotland. Ireland. Local.
– Antennae with the two basal segments brown or rufous, at least underneath.....3
3 Pronotum with sides not explanate behind. The two basal antennal segments brown, usually darker above. (Similar to *lepidus* but usually bicoloured, with coppery forebody and green elytra, very rarely entirely black. Pronotum similar but with basal foveae shallower. Elytral striae evidently punctate, intervals flatter apically. Wings full. 12–14 mm.)
(*dimidiatus* Olivier nec Rossi) **kugelanni** Panzer
On sandy or gravelly heaths, also on the coast.—England: Devon to Norfolk. Wales: Glamorgan. Rare.
– Sides of pronotum broadly explanate behind middle (figs. 47b, c). Two basal segments of antennae bright rufous 4

4 Head evidently punctate. Deepest part of external pronotal fovea situated closer to side-margin than to inner fovea (fig. 47b). (Shorter than the two preceding, with broader elytra. Upper surface with somewhat dull metallic lustre, rarely black. Femora sometimes rufous ("*affinis* Sturm"). Pronotum not wider than elytra over shoulders. 11–13·4 mm.) ..... **cupreus** Linnaeus

In open, not too dry meadows and fields, sometimes near water.—England. Wales. Scotland. Ireland. Common, but local.

– Head almost impunctate. External pronotal fovea situated half-way between side-margin and inner fovea (fig. 47c). (Shorter than *cupreus*, with pronotum wider than elytra over shoulders. More shiny and more variable in metallic lustre, from bluish to golden, often mottled. Spines along inside of metatibiae stronger. 9–12·2 mm.) .... (*coerulescens* auctt. nec Linnaeus) **versicolor** Sturm

More xerophilous than cupreus, *in all kinds of open fields.—England. Wales. Scotland. Ireland. Common but possibly becoming rarer.*

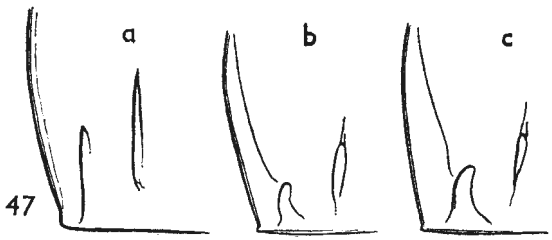

FIG. 47.—*Pterostichus.* Hind-angle of pronotum in (a) *lepidus*; (b) *cupreus*; (c) *versicolor*.

5 Hind-angles of pronotum completely rounded (figs. 46b, c) 6

– Hind-angles of pronotum evident, at least represented by a small denticle (figs. 48, 49) 8

6 Third elytral interval with 3 or 4 strongly foveate dorsal punctures. Outer striae obsolete anteriorly. (Subg. *Omaseus* Stephens) (Coal black, very shiny, appearing varnished. Anterior transverse impression of pronotum deep, basal fovea single, large (fig. 46b). Wings full. 13–15 mm.) ..... **aterrimus** Herbst

Very hydrophilous. At the border of ponds and lakes, on soft muddy or peaty soil.—England: Hampshire, Huntingdon, Cambridge, Norfolk. Ireland. Very rare.

– Elytra with 1 to 3 fine, not foveate dorsal punctures. All striae well impressed. Wings strongly rudimentary. (Subg. *Steropus* Stephens) 7

7 Third elytral interval with 3 dorsal punctures. Basal fovea of pronotum obscurely delimited externally. (Black, appendages piceous. Elytral intervals convex, striae impunctate. Basal segments of meta-tarsi with deep external furrow. Penultimate abdominal sternite of male with transverse carina. 12–14 mm.) **aethiops** Panzer

On hills and mountains under stones.—England: Cornwall to Somerset; Lancashire to Cumberland. Wales. Scotland.

– Third elytral interval normally with a single dorsal puncture (rarely 2, exceptionally 3). Basal fovea of pronotum delimited externally by a blunt carina (fig. 46c). (Black, legs either dark or, usually, with rufous femora ("*concinnus* Sturm"). Elytral intervals almost flat, striae punctulate. Tarsal furrow obsolete. Last abdominal sternite of male with transverse carina. 13–17 mm.) **madidus** Fabricius

In open country, often on cultivated soil, in gardens, etc.—England. Wales. Scotland. Ireland. Very common.

8 Elytra with epipleura not crossed, strongly iridescent. (Subgen. *Pterostichus s. str.*) (Black. Pronotum fig. 48e, cordate with sides strongly sinuate, hind-angles sharp, almost rectangular, inner basal impression deep and linear, arcuate, the outer obsolete. Elytral striae deep, almost impunctate, third interval with 3 or 4 dorsal punctures. Wings reduced. Male with longitudinal ridge on last abdominal sternite. 14–18 mm.).....**cristatus** Dufour
A multiformous species on the continent. British specimens belong to subsp. *parumpunctatus* Germar.
In rather moist places, both in the open and in forests.—England: Durham, Cumberland, Northumberland. Very local but sometimes abundant.

– Elytral epipleura crossed (as in fig. 61a). Elytra without or with faint iridescence. 9

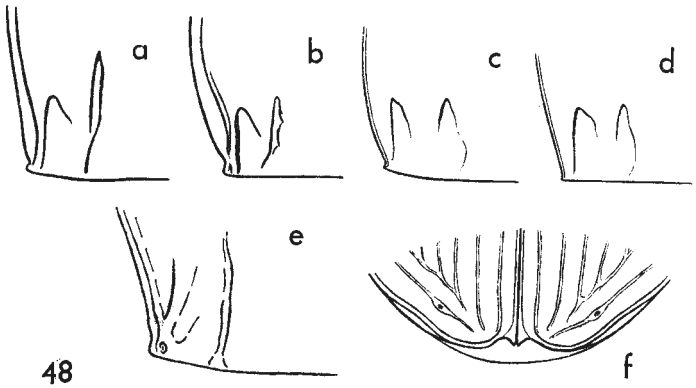

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FIG. 48.—*Pterostichus*. Hind-angle of pronotum in (a) *niger*; (b) *melanarius*; (c) *nigrita*; (d) *anthracinus*; (e) *cristatus*; (f) apex of elytra in *P. anthracinus* ♀

9 Elytra with a single dorsal puncture near apex. Abdominal segments 4–6 with transverse impression. (Subgen. *Pedius* Motschulsky) (Similar to *vernalis* and like this species without, or with quite rudimentary, scutellar stria. But the sides of pronotum are sinuate behind and the tarsi are not furrowed. Piceous to brown with rufous appendages. Pronotum with extensive punctuation at base; hind-angles sharp, right, basal fovea single, linear. Elytral striae deep, strongly punctate, also intervals faintly punctulate. Wings rudimentary. 5–6 mm.
(*inaequalis* Marsham nec Panzer) **longicollis** Duftschmid
In open, damp places, often on limestone.—England, N. to Yorkshire. Wales: Glamorgan. Local.

– Third elytral interval with at least 2 dorsal punctures. Abdominal sternites not impressed.....10

10 Tarsal segments longitudinally furrowed above. Elytra without scutellar stria. (Subgen. *Lagarus* Chaudoir) (Piceous to black, elytra faintly iridescent, appendages in part pale. Pronotum (fig. 49d) with hind-angles denticulate and sides not sinuate, base extensively punctate; outer basal fovea obsolete or evanescent. Elytra with 3 dorsal punctures, striae strong, punctate. Wings varying, though always with reflexed apex. 6–7·5 mm.).....**vernalis** Panzer
Usually in moist meadows with Carex and grasses, often near water; also in flood refuse.—England. Wales. Scotland. Ireland. Rather common.

— Tarsi not furrowed. Abbreviated scutellar stria present.....11

11 Pronotum (fig. 49a) strongly constricted at base. The posterior of the 3 dorsal punctures very fine, situated close to apex. (Subgen. *Adelosia* Stephens) (Very flat with long, parallel-sided elytra. Piceous to brown, legs rufous. Outer basal fovea of pronotum small or obsolete. Elytral striae well incised but smooth, intervals almost flat. Wings full. 11–15 mm.)
(*picimanus* Duftschmid) **macer** Marsham
In open country on rather moist soil, rich in humus, in parks, etc., often subterraneous or under bark.—England, N. to Durham. Wales: Glamorgan. Ireland. Local.

— Pronotum less constricted. Posterior dorsal puncture well removed from apex . . 12
12 Pronotum each side with two basal foveae, the outer separated from lateral bead by a keel (figs. 48, 49e) 13
— Basal fovea of pronotum simple (figs. 49b-c, f-g) (If rudiment of an external fovea present, it is not delimited by a convexity) 18
13 Last (claw-bearing) tarsal segment setose underneath. Elytra with 2 dorsal punctures. Lateral bead of pronotum strongly widening basad (fig. 48b) (Subgen. *Euferonia* Casey, syns. *Omaseideus* Jeannel, *Omaseus* auctt.) (Black. More convex and shiny than *niger*, antennae shorter. Ninth elytral interval much wider than tenth. Meta-tarsi without lateral keel. Wings usually quite rudimentary. 12–18 mm.) . . . . . (*vulgaris* auctt. nec Linnaeus) **melanarius** Illiger
In all kinds of open, not too dry country.—England. Wales. Scotland. Shetland. Ireland. Common though somewhat local.
— Last tarsal segment glabrous underneath. Elytra with 3 dorsal punctures. Lateral bead of pronotum less dilated basally (figs. 48a, c, d, 49e) 14
14 15 mm. or more. Inner basal fovea of pronotum prolonged forwards (fig. 48a). Outermost (tenth) elytral interval as wide as ninth (Subgen. *Platysma* Bonelli) (Dull black. Elytral striae deep, intervals very convex. Meta-tarsi with basal segments keeled externally. Wings fully developed. The name "subsp. *scotus*" Jeannel (1942) for small specimens from Scotland is superfluous. Wings fully developed. 15–20·5 mm.) . . . . . **niger** Schaller
Usually in parks, thin forests, etc., on not too dry soil, often under bark.—England. Wales. Scotland. Shetland. Ireland. Common.
— Under 13 mm. Inner pronotal fovea not or little prolonged (figs. 48c, d, 49e). Ninth elytral interval about twice as wide as tenth. (Subg. *Melanius* Bonelli) . 15
15 Hind-angles of pronotum denticulate (fig. 48c), in front of which the sides are rounded. (Black, shiny. Microsculpture of elytra reticulate. Wings always full. Last abdominal sternite of male with small tubercle or keel; female without sutural tooth. 8·8–12·8 mm.) . . . . . **nigrita** Paykull
In damp places, usually near water.—England. Wales. Scotland. Shetland. Ireland. Common everywhere.
— Pronotum with sides straight or sinuate posteriorly and hind-angles not denticulate (figs. 48d, 49e) 16
16 Abdominal sternites with dense, fine, more or less confluent punctuation. Last segment of male with longitudinal fovea. Elytra of female with sutural tooth (fig. 48f). (Black. Flatter and narrower than *nigrita*. Pronotum, fig. 48d. Elytral intervals less convex, with microsculpture denser and more transverse. Wings dimorphic, full or highly reduced. 10·5–17·5 mm.) . . **anthracinus** Illiger
On damp, somewhat shaded ground, often mud, near water.—England, N. to Cumberland. Scotland: W. Lowlands. Ireland. Local.

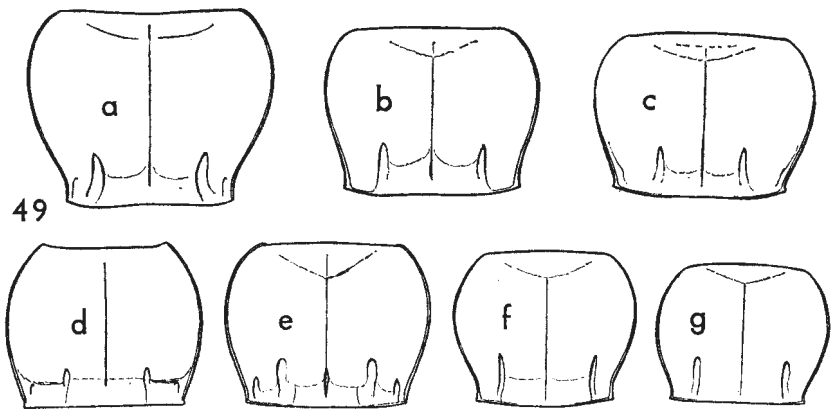

FIG. 49.—*Pterostichus*. Pronotum of (a) *macer*; (b) *oblongopunctatus*; (c) *adstrictus*; (d) *vernalis*; (e) *minor*; (f) *strenuus*; (g) *diligens*.

— Abdominal sternites not or obsoletely punctate; last segment of male keeled or **unarmed**. Female without sutural tooth 17

17 Inner pronotal fovea hardly prolonged. Elytra clearly iridescent, microsculpture very dense, transverse. Last abdominal sternite of male smooth. (Similar to *anthracinus* in the form of pronotum. Pure black. Wings always full. 8·5–10 mm.) ..... **gracilis** Dejean

On wet, vegetated soil near water.—England, N. to Yorkshire. Scotland: East Highlands. Ireland. Local.

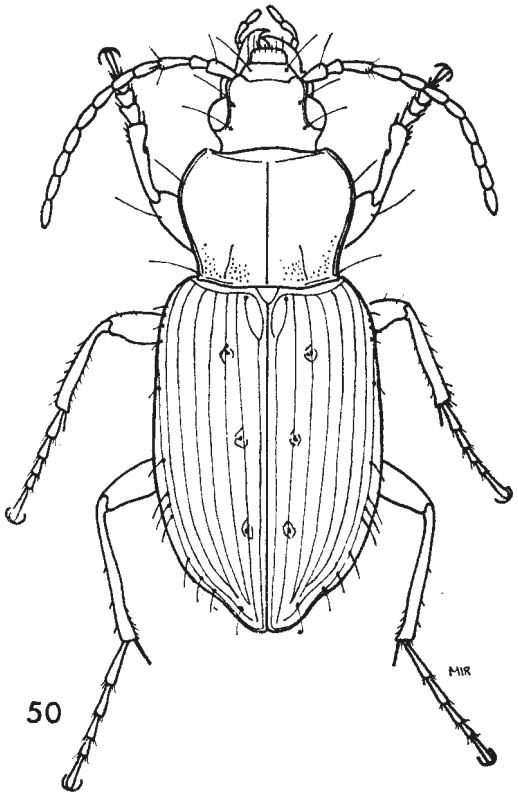

FIG. 50.—*Pterostichus angustatus*. ♂.

— Inner pronotal fovea prolonged forwards (fig. 49c). Elytra at most quite faintly iridescent, microsculpture weak, more irregular. Last sternite of male with longitudinal keel. (More piceous than black, base of antennae somewhat paler. Wings often reduced. 6·8–8·7 mm.) ..... **minor** Gyllenhal

At the margin of water, on different soils.—England. Wales. Scotland. Ireland. Common.

18 More than 9 mm. Dorsal punctures of elytra foveate, usually 4 or more in number. Wings full. (Subg. *Bothriopterus* Chaudoir) 19

— Less than 7·5 mm. Dorsal punctures shallow, not foveate, 3 in number. Wings usually reduced. (Subg. *Argutor* Stephens) 21

19 Base of pronotum oblique laterally. Dorsal punctures of elytra 3 or 4; no setiferous puncture at apex of first stria. First antennal segment much shorter than third. (Black, upper surface sometimes faintly bronzed, appendages somewhat paler. Elytral striae evidently punctate. 9·5–11 mm.) (fig. 50)

angustatus Duftschmid

On burnt soil, like Agonum quadripunctatum*; rarely on heaths without evidence of burning.—England: Dorset to Essex; Nottingham to Yorkshire. Known only from this century; apparently a newcomer.*

— Base of pronotum almost straight (figs. 49b, c). Usually 5, or more, dorsal punctures; 1–3 setiferous punctures at apex of first stria, as a rule. First antennal segment barely shorter than third 20

20 Pronotum (fig. 49b) with sides more sinuate posteriorly; lateral bead evident almost to front-angles. Tibiae pale. (Black to dark piceous, upper surface with brassy lustre, at least in the male, rarely bluish or greenish. Elytral foveae usually 4 (sometimes up to 7) in number. 9·5–12·6 mm.) . . **oblongopunctatus** Fabricius

A forest species; on all kinds of soil, often under bark.—England, N. to Yorkshire (lacking in the S.E.). Wales. Scotland. Ireland. Common, but local.

— Pronotum, fig. 49c; lateral bead evident only in posterior half. Tibiae black or piceous. (More pure black, rarely with faint bronze hue. Sides of pronotum more depressed posteriorly. Elytra more elongate and parallel-sided. 10·4–13 mm.) . . . . . (*vitreus* Dejean, *orinomus* Stephens) **adstrictus** Eschscholtz

In more open, usually mountainous country.—England, in the N.: Derby to Northumberland. Wales. Scotland. Shetland. Ireland.

21 Pronotum (fig. 49f) with longer sinuation in front of hind-angles, shiny, without microsculpture on disc. Prosternum coarsely punctate. (Piceous, appendages reddish brown. Elytral striae punctate. Wings often reduced. 6·0–7·2 mm.) (*erythropus* Marsham) **strenuus** Panzer

In shady places, mostly in damp deciduous forests on clayish soil, among moss and leaves.—England. Wales. Scotland. Shetland. Ireland. Common.

— Pronotum (fig. 49g) dull, with reticulate microsculpture. Prosternum impunctate. (Pure black, at least femora infuscated. Elytral striae almost impunctate. Wings nearly always rudimentary. 5·3–6·7 mm.) (*strenuus* Dawson, et al.) **diligens** Sturm

On all kinds of moist ground, often in bogs.—England. Wales. Scotland. Shetland. Ireland. Common.

Genus **Abax** Bonelli

Distinguished from *Pterostichus* by the convex or carinate seventh elytral interval behind shoulder and the well developed ninth stria in posterior half. Pronotum very broad with two basal foveae each side (fig. 51a). Elytra without dorsal puncture, shoulder-tooth protruding. Wings quite reduced. Male with 3 strongly dilated protarsal segments.

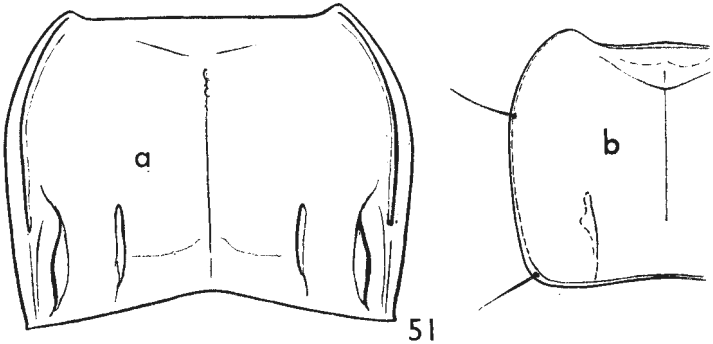

FIG. 51.—Pronotum of (a) *Abax parallelepipedus*; (b) genus *Platyderus*.

KEY TO SPECIES

1 Last tarsal segment setose underneath. Seventh elytral interval carinate behind shoulder. (Black, shiny, elytra dull in the female. Basal fovea of pronotum deep, linear, fig. 51a. Shoulder-tooth strong, hooked. 18–22 mm.)
(*ater* Villers, *striola* Fabricius) **parallelepipedus** Piller & Mitterpacher
In shaded places as deciduous forests and gardens.—England. Wales. Scotland. Ireland. Common.

— Last tarsal segment glabrous. Seventh elytral interval somewhat convex but not carinate anteriorly. (Smaller and narrower. Both sexes shiny. Basal foveae of pronotum shallow. Shoulder-tooth less developed. 14–18 mm.)
parallelus Duftschmid
This species is known in Britain only from the Scilly Islands (Power coll., Brit. Mus.), probably as a result of occasional introduction. On the continent in mountain forests.

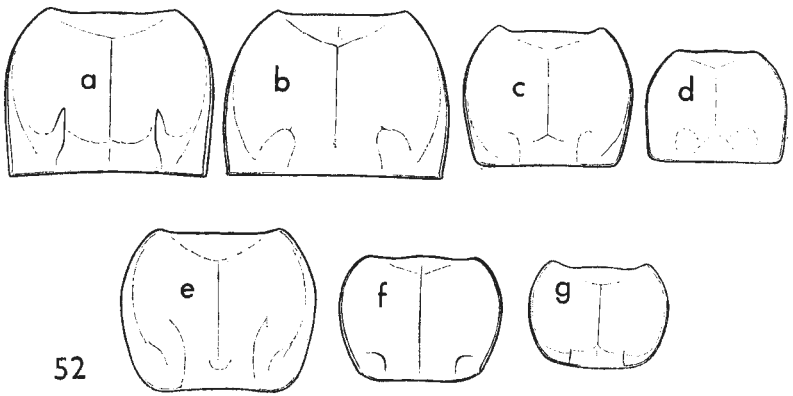

FIG. 52.—Pronotum of (a) *Calathus erratus*; (b) *ambiguus*; (c) *micropterus*; (d) *melanocephalus* (typical); (e) *piceus*; (f) *Synuchus nivalis*; (g) *Olisthopus rotundatus*.

Genus **Calathus** Bonelli

Medium sized, slender species with long legs (running with great speed). They are characterized by the ventral side being more convex than the upper surface. Tarsal claws serrate (as in fig. 55c). Pronotum with sides straight or very little rounded, parallel or convergent in basal half. Elytra with at least 2 dorsal punctures on third interval. Wings highly variable. Elytra of female more or less dull. Male protarsus (except in *piceus*) with 3 dilated segments. Right paramere of aedeagus very long and slender, usually hooked at apex.

All species are more or less xerophilous and most of them are found in open country with sparse vegetation.

KEY TO SPECIES

1 Pronotum (fig. 52e) with hind-angles completely rounded and base much narrower than elytra over shoulders. Male pro-tarsi not modified. (Subgen. *Amphigynus* Haliday). (Dark piceous, all margins and usually elytral suture somewhat translucent; appendages rufous but femora sometimes darker. Somewhat reminiscent of *Synuchus* but with cylindrical terminal segment of labial palpi and with at least 4 dorsal punctures on elytra. Wings probably dimorphic, as on the continent. Right paramere of male hooked at apex. 8·5–10·5 mm.)
(*rotundicollis* Dejean) **piceus** Marsham
A forest species, usually under deciduous trees, notably beech, also in gardens.—England. Wales. Scotland. Ireland. Fairly common.

– Pronotum (figs. 52a-d) with hind-angles well marked; base not or barely narrower than elytra over shoulders. Male with 3 dilated pro-tarsal segments. (Subgen. *Calathus s.str.*) 2

2 Elytra with dorsal punctures also on fifth interval. Basal foveae of pronotum coarsely punctate. (Largest member of the genus. Black, antennae, with pale first segment, and mouth-parts dark rufous, legs varying from almost black to rufous, though apex of tarsal segments always dark. Wings constantly rudimentary. 10–14·4 mm.) ..... (*cisteloides* Panzer) **fuscipes** Goeze

In moderately dry meadows and grassland, often on cultivated soil; also in thin forests.—England. Wales. Scotland. Shetland. Ireland. Common.

– Only third interval with dorsal punctures. Basal foveae of pronotum smooth or finely punctate 3

3 Hind-angles of pronotum sharp, almost rectangular (figs. 52a, b). Third elytral interval almost constantly with only 2 dorsal punctures 4

– Hind-angles of pronotum rounded at tip (figs. 52c, d). Third elytral interval with 3 or more punctures 5

4 Greatest width of pronotum before middle (fig. 52a). First meta-tarsal segment without internal furrow but keeled externally. (More slender and flatter than *fuscipes*. Black to piceous, margins of pronotum translucent, elytra sometimes faintly greenish or bluish, all appendages rufo-testaceous. Pronotum with oblique depression inside hind-angles, basal foveae clearly impressed. Basal margin of elytra strongly arcuate. Penis (fig. 53a) with apical disc. Wings either full or strongly reduced. 8·5–11·8 mm.)

(*fulvipes* Gyllenhal) **erratus** C. R. Sahlberg

On dry, usually sandy ground with sparse vegetation.—England. Wales. Scotland. Ireland. Common.

– Greatest width of pronotum behind middle (fig. 52b), often close to base. First meta-tarsal segment with shallow internal furrow. (Broader than *erratus*, more dull pieceous, margins of pronotum more widely translucent, elytra never metallic, all appendages pale testaceous. Antennae thinner. Pronotum flatter with basal foveae obsolete. Basal margin of elytra less arcuate. Penis (fig. 53b) without defined apical disc. Wings always full. 8·4–11·6 mm.)

(*fuscus* Fabricius) **ambiguus** Paykull

Habitat as erratus *with which it is often associated; also in chalk pits.—England. Wales: Glamorgan. Scotland. More local than* erratus.

5 Pronotum clear rufous (contrasting against the black head), if infuscated, then also appendages, at least tarsi, more or less darkened. Right paramere (figs. 53i-k) widened and hooked at tip. (Easily recognized in typical coloration; in this all appendages are pale; elytra always black. Specimens with varying degree of melanism may be confused with *mollis* or *micropterus*: the pronotum is infuscated, from possessing only a faint cloud on centre to being black with only narrowly translucent margins; but then also the appendages are melanistic, at least tarsi brown, often also main part of legs and palpi, as well as middle antennal segments. Pronotum, fig. 52d (though somewhat varying). Wings normally reduced into a narrow scale; macropterous individuals are very rare (also in these the met-episterna are short, on an average about 1·6 as long as wide). Penis (fig. 53e) with apex slightly bent ventrad. 6·0–8·8 mm.)

melanocephalus Linnaeus

On all kinds of open, moderately dry soil with grass, meadow or weed vegetation.—England. Wales. Scotland. Shetland. Ireland. Common.

– Head and disc of pronotum concolorous (or head very little darker): black, piceous or brown. All appendages entirely pale. Right paramere not widened at apex (figs. 53f-h) 6

6 Piceous black, only margins of pronotum paler; its sides converging basad, hind-angles clearly obtuse (fig. 52c). Right paramere (fig. 53l) with apex arcuate. (Constant in coloration. Pronotum and elytra with narrower base and the latter with more rounded sides than in the two related species. Wings constantly reduced. Penis (fig. 53c) with long straight apex. 6·5–8·8 mm)

micropterus Duftschmid

Predominantly a forest species, living among humus litter both under deciduous and coniferous trees, but also on open ground.—S.W. & N. England. Wales: Carnarvon. Scotland. Ireland.

– Piceous to brown with paler margins of pronotum and elytra. Sides of pronotum barely converging basad, hind-angles right or almost so (as in *melanocephalus*). Right paramere (fig. 53f-h) unarmed or with very small hook at apex. (Head never quite black and not, or little, contrasting against disc of pronotum. More slender than *melanocephalus*, with longer legs, and, due to stronger microsculpture, with upper surface more dull. Described as "apterous" by Fowler, but macropterous specimens also occur in Britain (in these, the met-episterna average longer, index ca. 1·8, against ca. 1·6; cf. *melanocephalus*). Penis, fig. 53d. 6·6–9·2 mm.) ..... **mollis** Marsham

Britain is inhabited by the dark forma typica *described above. Subsp.* erythroderus *Gautier, of the continent, has the pronotum entirely rufous. On dry, sandy ground with sparse vegetation, especially near the coast.—England. Wales. Scotland. Ireland. Locally abundant.*

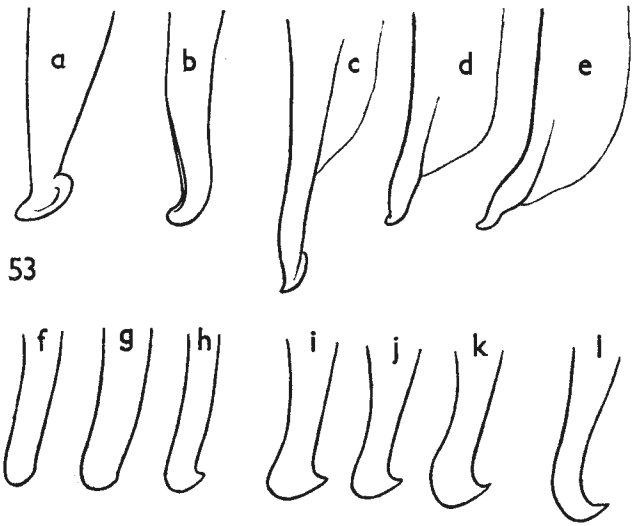

FIG. 53.—*Calathus*. Penis apex of (a) *erratus*; (b) *ambiguus*; (c) *micropterus*; (d) *mollis*; (e) *melanocephalus*. Apex of right paramere in (f-h) *mollis*; (i-k) *melanocephalus;* (l) *micropterus*.

Genus **Sphodrus** Clairville

A single, large, uniformly dark beetle, somewhat reminiscent of a *Pterostichus* (e.g. *P. niger*), but with strongly cordiform pronotum (fig. 54a) which has the side-margin crenulate basally, and very long and slender legs. Characters separating it from the following genus are described there. Elytral striae extremely fine, punctate basally, third interval without dorsal puncture. Tarsi glabrous above, claws smooth. Wings full. In the male, 3 pro-tarsal segments are dilated and the meta-trochanters are prolonged into a sharp spine. Parameres similar to those of *Calathus*.

ONE BRITISH SPECIES

Piceous to almost black, rather dull and without any trace of metallic reflection; palpi, base of antennae and tarsi somewhat paler. 20–26 mm.

(*planus* Fabricius) **leucophthalmus** Linnaeus

Exclusively synanthropic, occurring in cellars, stables, mills, etc. Much less frequent than in former days.—England. Wales: Glamorgan. Scotland: West Lowlands. Ireland.

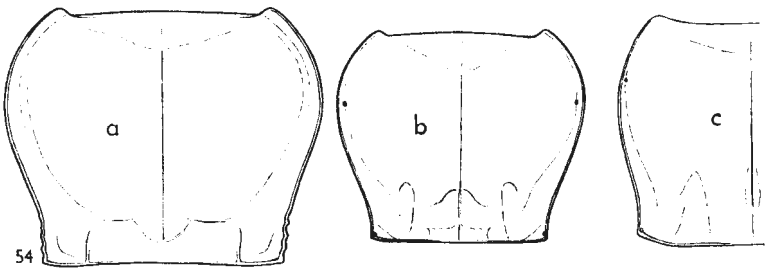

FIG. 54.—Pronotum of (a) *Sphodrus leucophthalmus*; (b) *Pristonychus terricola*; (c) *P. complanatus.*

Genus **Pristonychus** Dejean

(*Laemosthenes* Schaufuss)

Two species, rather similar to *Sphodrus* but elytra with well impressed striae and metallic reflection; all tarsi pubescent above, claws feebly denticulate at base. Sides of pronotum not crenulate, less deplanate anteriorly than in *Sphodrus*. The male has 3 or 4 dilated pro-tarsal segments but the meta-trochanters are simple.

KEY TO SPECIES

1 Meta-tibiae in apical half covered with dense pubescence internally. Pronotum more cordate (fig. 54b), constricted at base. (Black, underside and appendages piceous brown, elytra with bluish or violaceous lustre. Eyes small and flat. Wings reduced into a tiny scale. Male with 4 dilated pro-tarsal segments and curved meso-tibiae. 13–17·5 mm.) .....(*subcyaneus* Illiger) **terricola** Herbst
In and around houses, in cellars, stables, etc., also outdoors under bark.—England. Wales. Scotland. Ireland. Rather rare.

– Meta-tibiae without internal brush. Pronotum with less rounded sides (fig. 54c). (Coloured as *terricola*. Body somewhat more slender with narrower pronotum. Eyes more prominent. Wings full. Male with 3 dilated pro-tarsal segments and straight meso-tibiae. 13–16 mm.) .....**complanatus** Dejean
Originating from N. Africa, this species has been dispersed by trade to ports in most continents.—England. Wales. Scotland. Ireland. On the coast.

Genus **Platyderus** Stephens

A single species reminiscent of a small *Pterostichus*. The most characteristic feature is the median production of the anterior margin of pronotum (fig. 51b); the vertex underneath has a microsculpture of transverse granulae (apparently a stridulatory organ). Basal fovea of pronotum single, linear. Elytral epipleura not crossed; 3 dorsal punctures present. Claws simple. Male with 3 dilated protarsal segments. The reduced right paramere of the aedeagus seems to place the genus near *Synuchus*.

ONE BRITISH SPECIES

Piceous to brown, head usually darker, appendages pale. Shoulders angulate, striae sharp, impunctate. Wings reduced. 5·5–8 mm.....**ruficollis** Marsham
Usually in open country among leaves and moss. It seems to prefer sandy or chalky soil.—England, widely, N. to Durham. Ireland.

Genus **Synuchus** Gyllenhal

Similar to *Calathus* with serrate claws (fig. 55c) and liable to be confused with *C. piceus* (see that species). Foremost diagnostic character is the dilated, almost pear-shaped terminal segment of the labial palpi (fig. 55a). Pronotum convex with rounded sides (fig. 52f). Third elytral interval with 2 dorsal punctures. Male with 3 dilated

pro-tarsal segments. Unlike *Calathus*, both parameres are short and rounded, the right very small, fiddle-like.

ONE BRITISH SPECIES

Brownish black, margins of pronotum and suture of elytra somewhat paler; appendages rufous. 6·0–8·5 mm. . . . . (*vivalis* auctt.) **nivalis** Panzer

In open, not too dry country, usually on sand or gravel. Hibernating exclusively as larva.—England. Wales. Scotland. Ireland. Not common.

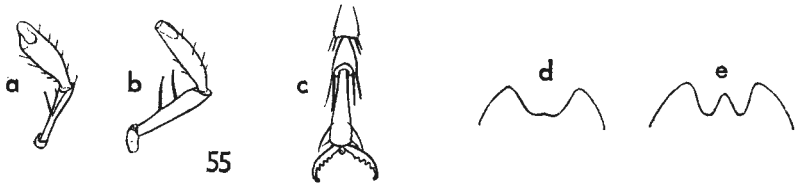

FIG. 55.—Labial palp of (a) *Synuchus nivalis*; *Calathus piceus*. (c) Terminal tarsal segments of *Synuchus nivalis*. Mentum of (d) *Olisthopus*; (e) *Agonum*.

Genus **Olisthopus** Dejean

(*Odontonyx* auctt. nec Stephens; see Lindroth, 1966, p. 553)

Superficially similar to *Synuchus* but separated on metallic hue, simple claws, non-dilated labial palpi, and the presence of 3 dorsal punctures on third elytral interval. Mentum (fig. 55d) without tooth (cf. *Agonum*). Pronotum (fig. 52g) with strongly rounded sides, broader as compared with elytra than in any British species of *Agonum*; base strongly punctate. Elytral striae finely punctate. Male with 3 dilated pro-tarsal segments. Parameres as in *Agonum*.

ONE BRITISH SPECIES

Brown to piceous, upper surface bronzed, base of antennae and legs pale. Wings either full or strongly reduced. 6·4–7·8 mm.

(*rotundicollis* Marsham) **rotundatus** Paykull

On dry, open, often sandy ground, e.g. under Calluna.—England. Wales. Scotland. Fair Isle. Ireland.

Genus **Agonum** Bonelli

(*Anchomenus* Bonelli, *Platynus* Bonelli)

A large genus, notably in warmer regions, with species of medium size (4·5–12·3 mm.). They have a characteristic, rather uniform appearance, looking like large copies of *Bembidion*: the pronotum is small and narrow, the appendages long, notably the tibiae markedly more slender than in *Pterostichus*. Mentum with median tooth (fig. 55e). Claws simple. Elytra with at least 3 (in *albipes* only 2) dorsal punctures; epipleura not crossed. Wings usually full (exceptions recorded). Male pro-tarsi with 3 dilated segments. The two parameres similar, rather oval, though the right one smaller.

Most species are hygrophilous and occur near water.

KEY TO SPECIES

1 Elytra bicoloured: bright rufo-testaceous with a large dark, metallic macula across the suture. (Subgen. *Anchomenus* Bonelli, syns.: *Clibanarius* Gozis, *Idiochroma* Bedel) (Forebody with vivid green reflection. Base of antennae and entire legs rufo-testaceous. 6·0–8·2 mm.) (fig. 56)

(*prasinum* Thunberg) **dorsale** Pontoppidan

The least hygrophilous of all Agonum, *occurring in open meadows and grassland, usually on gravelly or clayish often chalky soil.—England. Wales. Scotland. Ireland. Somewhat local but often abundant; often large aggregations under stones in spring.*

– Elytra unicolorous or with pale margins 2
2 Third antennal segment, except for the ordinary apical setae, glabrous (fig. 58a) .. 3
– Third antennal segment pubescent, at least in apical half (fig. 58b) (Subgen. *Europhilus* Chaudoir) 17
3 Hind-angles of pronotum sharp, about rectangular (figs. 57a–c). Body unmetallic . 4

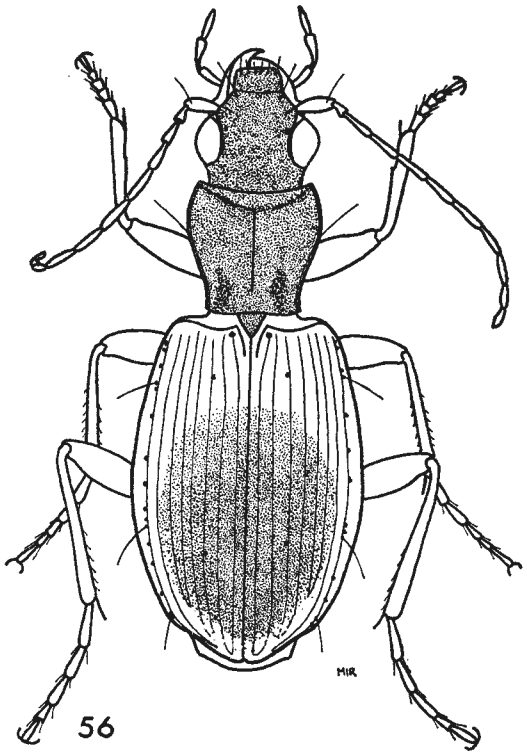

FIG. 56.—*Agonom dorsale* ♂.

– Hind-angles of pronotum strongly obtuse or entirely rounded. Body often with metallic lustre 6
4 Tarsi with median furrow. Third elytral interval with 2 dorsal punctures. (Subgen. *Paranchus* n.)[1] (Piceous, sides and suture of elytra usually brown, all appendages pale testaceous; immature individuals long retain a rufous colour. Base of pronotum strongly punctate, fig. 57a. Elytral striae fine, impunctate, subapical sinuation of sides wanting. 6·8–9 mm.)
(*ruficorne* Goeze) **albipes** Fabricius
On open, damp, often barren soil, usually clay, near water; often on the seashore.—England. Wales. Scotland. Shetland. Ireland. Locally abundant.
– Tarsi not furrowed. Elytra with 3 dorsal punctures 5

[1] Since the type of subgen. *Anchomenus* Bonelli is *dorsale* Pont., designated by Westwood (1840), and not *albipes* F., the latter is herewith designated as type of the new subg. *Paranchus* mihi.

5 Pronotum narrow, only slightly wider than head, lateral bead very narrow (fig. 57b). Elytral striae strongly punctate. Small; body largely pale. (Subgen. *Anchus* Leconte) (Piceous, elytra yellowish brown, palest at shoulder, forebody sometimes rufous, appendages testaceous. Wings usually quite reduced. 5–6·6 mm.) ..... (*oblongum* Fabricius) **obscurum** Herbst

In damp deciduous forests and in densely vegetated marshes, among leaves and mosses.—England, N. to Durham. Wales: Glamorgan. Ireland. Somewhat local, common in the South.

– Pronotum much wider than head, sides broadly depressed (fig. 57c). Elytral striae punctulate. Large; body black. (Subgen. *Platynus* Bonelli) (Appendages dark piceous. Elytra very broad, widening behind middle; striae deep, intervals convex. 8·7–12·3 mm.) ..... (*angusticolle* Fabricius) **assimile** Paykull

In shady places, usually deciduous forests, often under bark.—England. Wales. Scotland. Ireland. Local.

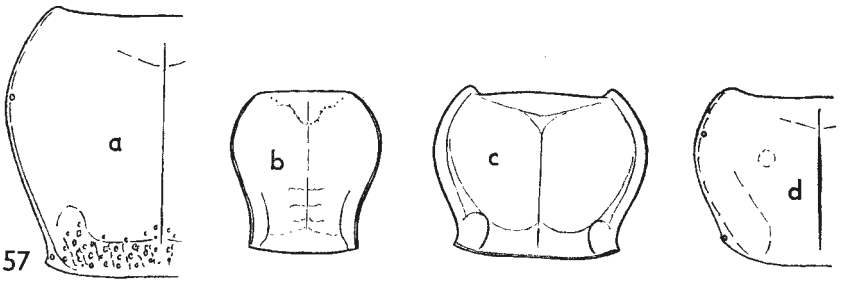

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FIG. 57.—*Agonum.* Pronotum of (a) *albipes*; (b) *obscurum*; (c) *assimile*; (d) *quadripunctatum*.—Varying magnification.

6 Head constricted behind eyes, with transverse impression visible also dorsally. (Subgen. *Batenus* Motschulsky) (Narrow, somewhat reminiscent of *Patrobus* but with entirely rounded hind-angles of pronotum. Piceous, head almost constantly with two rufous spots; appendages dark rufous but apex of each antennal segment and often in part legs infuscated. Elytral striae fine. 7·8–10·5– mm.) ..... **livens** Gyllenhal

Very hygrophilous. In marshy deciduous forests, often alder, among leaves and Sphagnum *mosses.—England: Hampshire to Nottingham. Local and usually rare.*

– Head not constricted 7

7 Elytra with dorsal punctures strongly foveate, occupying more than width of third interval. Below 6 mm. (Subgen. *Sericoda* Kirby) (Dull black with bronze hue, tibiae more or less piceous. Pronotum short (fig. 57d), hind-angles obtuse but evident. Elytra with 3–5 dorsal punctures. 4·5–5·8 mm.) **quadripunctatum** DeGeer

Like Pterostichus angustatus, *this species is attracted by forest fires, notably of conifers, and is often taken under bark.—England. From the 19th century only a single specimen from Newcastle upon Tyne, possibly a straggler; several were taken at Woking, Surrey, in* 1900, *and later in Dorset, Berkshire and Kent. Apparently a late arrival in Britain.*

– Dorsal punctures not foveate. Larger. (Subgen *Agonum s.str.*) 8

8 Elytra metallic with sides broadly yellow. (Black, upper surface, except sides of elytra, with vivid, green or brassy reflection. First antennal segment and legs brown, tibiae paler. Uneven intervals of elytra somewhat convex. 8·8–10·4 mm.) ..... **marginatum** Linnaeus

On soft, wet clay or sand with little vegetation on the seashore as well as at the margins of lakes and ponds.—England. Wales. Scotland. Ireland. Common, except in the north.

– Elytra unicolorous or with variegated metallic reflection 9

9 Basal foveae of pronotum with coarse, confluent punctuation. Dorsal punctures of elytra 5 or more (rarely 4). Antennae black.....10

– Basal foveae of pronotum impunctate or almost so. Usually 3 dorsal punctures (4–6 in *gracilipes*, with pale first antennal segment).....11

10 Normally with strong colour contrast between forebody and elytra. Pronotum with greatest width about middle. Wings full. (Black, forebody green, rarely bluish, elytra coppery red, usually with greenish margins. Almost unicolorous, even black, individuals extremely rare. All angles of pronotum rounded. Dorsal punctures 4–8, usually 6 or 7. Elytral microsculpture regularly isodiametric. 7·6–10 mm.).....**sexpunctatum** Linnaeus

On open, moist, sparsely vegetated peaty soil with Carex *or grasses; on bare spots.—England, N. to Cumberland. Wales: Glamorgan. Local.*

— Entire upper surface unicolorous or almost so. Pronotum more constricted basad, greatest width before middle. Wings reduced, though with reflexed apex. (Extremely variable in colour: golden green, coppery, bluish, rarely black. All angles of pronotum less rounded. Dorsal punctures 4–7. Elytral microsculpture more irregular. 6·5–8 mm.).....**ericeti** Panzer

In peat-bogs with Sphagnum, *on moist spots.—England: Dorset, Hampshire, Lancashire to Northumberland. Wales: Cardigan, Merioneth. Scotland: Lowlands and East Highlands. Very local but sometimes abundant in spring.*

11 Elytral striae very fine to apex, almost impunctate, intervals entirely flat.....12

— Elytral striae deeper, at least apically, where the intervals are clearly convex....14

12 Elytra with 4–6 dorsal punctures, basal margin strongly arcuate. Lateral depression of pronotum more sharply delimited, hind-angles more evident. Appendages very slender. (Upper surface bronzed. First antennal segment and on legs at least tibiae and tarsi reddish brown. Elytral striae extremely fine. 7–8·5 mm.) (*elongatum* Dejean) **gracilipes** Duftschmid

In Britain only single specimens found, usually on the coast and probably stragglers.—England: Cambridge, Suffolk, Norfolk, Yorkshire. Ireland.

— Dorsal punctures 3 (rarely 4). Basal margin moderately arcuate.....13

13 Forebody normally vividly green, contrasting against the brassy elytra. Microsculpture of elytra consisting of transverse meshes. (Unicolorously metallic specimens are rare. First antennal segment rufous, tibiae and at least base of femora yellowish brown. 7·2–9·5 mm.)..(*parumpunctatum* Fabricius) **muelleri** Herbst

On open, clayish, moderately dry, often cultivated soil.—England. Wales. Scotland. Ireland. Local.

— Upper surface unicolorous, from green or coppery to almost black. Elytral microsculpture almost regularly isodiametric. Pronotum narrower and flatter with lateral reflection more pronounced basally. (Appendages darker. Basal margin of elytra less arcuate. Lateral furrows of basal meta-tarsal segments stronger. 7·5–8·3 mm.).....(*archangelicum* J. Sahlberg) **sahlbergi** Chaudoir

Apparently riparian. Found only in Scotland on river Clyde below Glasgow, repeatedly but not after 1914. (*Found as fossil in England and possibly a relict; see* 1960, *Entomologist's mon. Mag.* **96**: 44–47).

14 First antennal segment dark rufous also on dorsum; tibiae and usually elytral epipleura likewise pale. Intervals almost flat in basal half. Lateral furrows of meta-tarsi shallow (fig. 58c).....15

— First antennal segment black or pale underneath only; tibiae and epipleura black or piceous. Elytral intervals more convex. Lateral furrows of meta-tarsi better developed (fig. 58d) restricting the interlying smooth dorsum to a keel (at least at base of each segment).....16

15 Reflexed border along lateral bead of pronotum extremely narrow, virtually obsolete near front-angles. Elytral microsculpture irregularly isodiametric. (Black, sometimes with faint bronze hue, elytral epipleura and usually first interval paler; of appendages at least first antennal segment and tibiae dark rufous. Greatest width of pronotum before middle. A confusion with members of subgen. *Europhilus*, coupl. 17 a.f., may be avoided by observing the non-pubescent third antennal segment, see fig. 58a. 7–9 mm.)

(*dahli* Preudhomme, *atratum* auctt. nec Duftschmid) **nigrum** Dejean

On marshy places with soft soil, among sedges and grasses, often on river banks.—England, widely, N. to Cumberland. Wales: Glamorgan. Scotland: West Lowlands. Ireland. Not common.

— Reflexed border of pronotum broader, extending to front-angles. Elytral microsculpture consisting of transverse lines. (Black, upper surface almost constantly with bronze, sometimes greenish or bluish, lustre, epipleura usually pale; first antennal segment and tibiae more or less dark rufous. Greatest width of pronotum in or just behind middle. 7–8·6 mm.) ..... **versutum** Sturm
At the margin of fresh water, usually among Carex *and mosses.—England, N. to Yorkshire. Scotland. Ireland. Not common.*

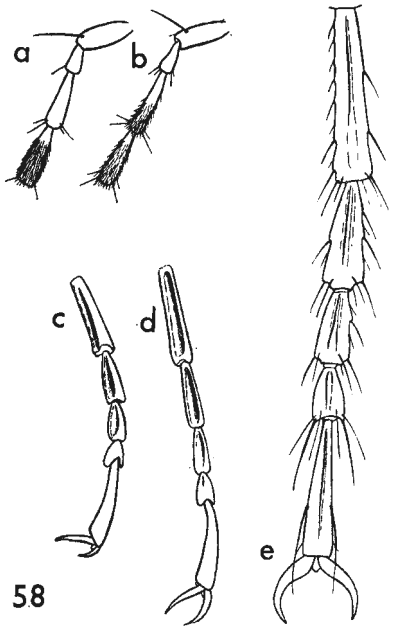

FIG. 58.—*Agonum.* Antennal base of (a) subg. *Agonum s.str.*; (b) subg. *Europhytus.* Hind-tarsus of (c) *versutum*; (d) *viduum*; (e) *thoreyi.* (greater magnification).

16 Upper surface metallic (best visible laterally behind shoulder). Microsculpture obsolete on disc of pronotum. (Deep black with greenish or bronze, rarely bluish, lustre; first antennal segment and tibiae black or piceous. Pronotum larger, with sides more rounded than in *versutum*, greatest width before middle. Elytral intervals more or less convex. Dorsal keel of basal meta-tarsal segments strong only basally (fig. 58d). Microsculpture of elytra forming elongate meshes arranged in transverse rows. Penis, fig. 59b. 7·7–9·6 mm.)
viduum Panzer
At the margin of all kinds of fresh water, where the vegetation is rich.—England. Wales. Scotland. Ireland. Common.
— Unmetallic black. Microsculpture of pronotum forming evident meshes. (First antennal segment and tibiae often dark piceous, as in *viduum*. Depressed lateral part of pronotum somewhat less pronounced. Elytral intervals a little less convex. Dorsal keel of meta-tarsi sharper. Microsculpture of elytra usually with less clearly transverse arrangement. Penis, fig. 59a, with ventral side less arcuate. 7·9–9·4 mm.) .....(*emarginatum* Gyllenhal) **moestum** Duftschmid
This species was long regarded as a subsp. or "variety" of viduum. *Same habitat, but usually on clayish soil.—England, N. to Cumberland. Wales. Ireland. Common.*

17 All tarsal segments with median furrow on dorsum (fig. 58e). Elytral microsculpture consisting of isodiametric meshes without transverse arrangement. (This species appears in two colour forms: one ("*puellum*") is almost unicolorous, piceous black to dark brown, or with elytra only slightly paler; the other ("*thoreyi s.str.*") has pale, yellow or light brown elytra, usually somewhat clouded along suture. First antennal segment and all other appendages more or less pale, more so in "*thoreyi s.str.*". Pronotum narrower, with sides less explanate, than in all following species. 6–8 mm.)

(*puellum* Dejean, *pelidnum* Gyllenhal) **thoreyi** Dejean

On damp, clayish soil near water, usually lakes, with dense vegetation of Phragmites, Typha, *etc., in river beds etc. The two colour forms are sometimes found together and cannot be regarded as subspp.—England: N. to Yorkshire. Wales. Ireland. Common.*

— Tarsi without median keel. Elytral microsculpture consisting of more or less elongate meshes, with a usually clear tendency of arrangement in transverse rows 18

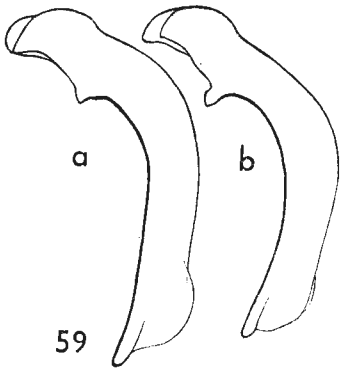

FIG. 59.—Penis of (a) *Agonum moestum*; (b) *viduum*.

18 Hind-wings strongly reduced (full-winged individuals on the continent). Pronotum much wider than one elytron; its posterior setiferous puncture well removed from hind-angle. (Black, entirely unmetallic, elytra sometimes brown or reddish; base of antennae and at least tibiae rufo-piceous. Elytra oviform and convex, widest behind middle, preapical sinuation of sides evident. Their microsculpture is more regularly "brick-like" than in other *Europhilus* species. 5·5–7·8 mm.) ..... **fuliginosum** Panzer

In moist, shady places among moss and leaves often under bushes and deciduous trees, e.g. alder.—England. Wales. Scotland. Shetland. Ireland. Common.

— Wings full. Pronotum barely wider than one elytron. Posterior setiferous puncture of pronotum situated close to hind-angle 19

19 Pronotum with reflexed margin strongly widened inside hind-angles, which are more suggested. Elytra short and convex, widest behind middle 20

— Pronotum with reflexed margin narrower. Elytra longer, almost parallel-sided at middle 21

20 First antennal segment and elytral epipleura pale brown. Greatest width of pronotum near middle. (Black or dark piceous, elytra sometimes slightly paler, upper surface almost constantly bronzed; legs dark rufous with paler tibiae. Elytra broader and somewhat flatter than in *scitulum*. 6·2–7.4 mm.)

micans Nicolai

On muddy places of lake shores and river banks, where vegetation is sparse; sometimes under willow bushes.—England, N. to Northumberland. Wales. Ireland. Local.

— Antennae piceous, first segment hardly paler. Pronotum constricted basally, greatest width before middle. (Black, upper surface almost constantly with faint brassy or greenish tinge; legs piceous with darker femora. Entire body somewhat narrower than in *micans*. 5·5–7 mm.) ..... **scitulum** Dejean
On marshy ground with some vegetation.—England: Devon to Kent; Worcester, Derby, Shropshire, Yorkshire. Wales: Merioneth. Scotland: East Highlands. Ireland. More local and rare than micans.

21 Entire body black without metallic hue. (First antennal segment and tibiae sometimes piceous. Shorter and more convex than *piceum*, with sides of elytra somewhat rounded and subapical sinuation very shallow. Microsculpture meshes of elytra only slightly transverse, tendency of transverse arrangement weak. 6–7·3 mm.) ..... **gracile** Sturm
In very damp, shady places, e.g. in quagmires with Sphagnum, *but also on mossy lake shores.—England. Wales. Scotland. Ireland.*

— Elytra pale brown, forebody darker, entire upper surface usually faintly bronzed. (First antennal segment somewhat paler than the following, legs testaceous with darker tarsi. Elytra very elongate; their microsculpture meshes narrow, arranged in irregular transverse rows. Superficially similar to the pale form of *thoreyi* but tarsi not furrowed. 5·5–7·3 mm.) ..... **piceum** Linnaeus
On clayish or muddy shores with Carex, Equisetum, *etc.—England. Wales. Scotland. Ireland.*

Tribe **PERIGONINI**

Genus **Perigona** Castelnau

A single small species, somewhat reminiscent of a *Trechus* or *Acupalpus*, but elytra with fine pubescence laterally and the striae replaced by rows of minute punctures, except the eighth which deepens towards apex. Outer antennal segments very short.

ONE BRITISH SPECIES

Yellowish brown with black head, elytra usually infuscated apically and/or along the suture. 2·0–2·5 mm. (Fig. 60) ..... **nigriceps** Dejean
Among vegetable refuse, in gardens etc. Often coming to light.—England: Hampshire, Berkshire and London district. Wales. A cosmopolitan species which has spread considerably in Europe during later decades.

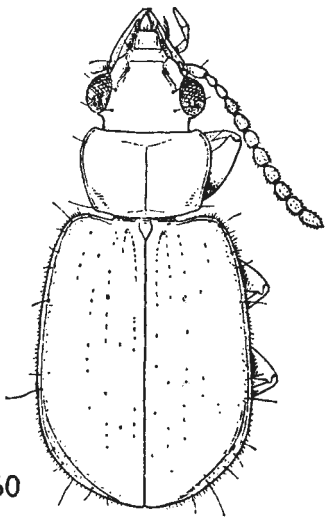

FIG. 60.—*Perigona nigriceps*. (From Jeannel.)

Tribe **AMARINI**

Genus **Amara** Bonelli

One of the largest Carabid genera and probably the one involving most obstacles in identifying the species. One of the reasons is that male genital characters are of comparatively little use in this genus. *Amara* species are similar to *Harpalus* in the stout body and short legs; but the elytral epipleura are "crossed" (fig. 61a), the head has two supra-orbital punctures, the mandibles are still blunter (fig. 62b) and the pronotum has

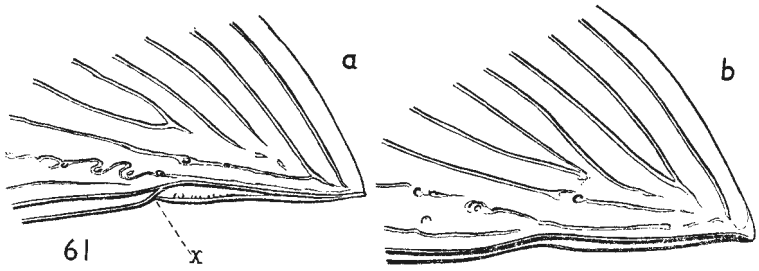

FIG. 61.—Apex of left elytron in (a) *Amara* ("crossed epipleura"; x); (b) *Harpalus*.

a long seta at the hind-angle. The third elytral interval is entirely without dorsal punctures, a distinguishing feature from *Pterostichus*, *Agonum*, and related genera; seventh stria as a rule with one or more subapical punctures (figs. 65h–j). Wings full (dimorphic in *quenseli* and *infima*).

Male with 3 dilated pro-tarsal segments and often also meso-tibial characters. Right paramere prolonged, often hooked apically (as in *Calathus*). Female usually more coarsely microsculptured and therefore dull.

The genus *Amara* has been divided into several subgenera which, however, in part (notably *Celia* and *Amara* s.str.) are poorly delimited *inter se*. The commonly used character: presence or absence of a meta-tibial "brush", in the male, is of little importance for defining relationship and should be ignored.

All species are more or less xerophilous and, with few exceptions, restricted to open country in places where the vegetation is short. They are more easily collected under dry leaves and depressed mats of plants than under stones. The food of the adults consists to a great extent of seeds and other vegetable matter.

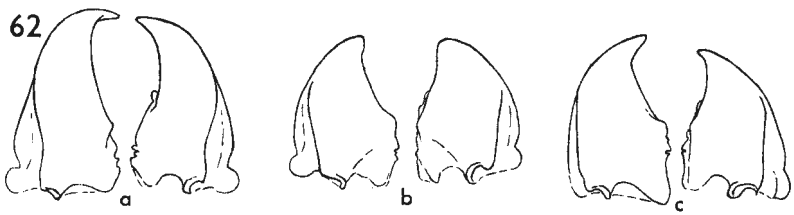

FIG. 62.—Mandibles from above of (a) *Pterostichus adstrictus*; (b) *Amara*, subg. *Curtonotus*; (c) *Harpalus aeneus*.

KEY TO SPECIES[1]

1 Elytra with pore-puncture at the base of the abbreviated scutellar stria.....2
– Scutellar stria without pore-puncture.....10
2 Terminal spur of pro-tibia trifid (fig. 63a).....3
– Terminal spur of pro-tibia simple (fig. 63b).....4
3 Under 8 mm. Pronotum with sides obliquely depressed posteriorly. Abdominal sternites smooth. (Black, upper surface with brassy, sometimes greenish or bluish lustre, antennae with 3 basal segments and base of fourth rufo-testaceous, tibiae yellowish brown. Pronotum with protruding front-angles, base strongly sinuate laterally. Similar to *similata* but smaller and narrower, with deeper basal foveae of pronotum. 6·3–7·8 mm.).....**plebeja** Gyllenhal
Usually on firm clay, often near water among grass and Carices.—England. Wales. Scotland. Ireland. Common.

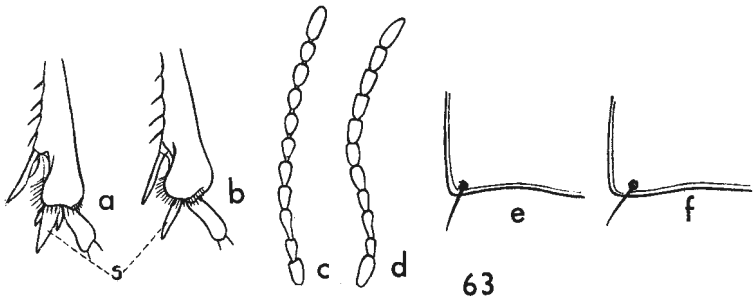

FIG. 63.—*Amara*. Apex of front-tibia in (a) *plebeja*; (b) *similata*. (S, terminal spur). Antenna of (c) *infima*; (d) *tibialis*. Hind-angle of pronotum in (e) *ovata*; (f) *nitida*.

– 8 mm. or more. Pronotum not depressed laterally. Basal abdominal sternites punctate laterally. (Coloured as *plebeja* but larger and more convex, notably the pronotum, which has the front angles less protruding and the base less sinuate; hind-angles more rounded at tip. 8–9·5 mm.)
strenua Zimmermann
In salt marshes on the coast.—England: Somerset, I. of Wight, Kent, Essex; doubtful from Derby. Very local and rare.
4 Antennae entirely pale. Upper surface unmetallic. Pronotum coarsely punctate at base. (Piceous, all appendages pale. Pronotum with hind-angles almost rectangular. Similar to *bifrons* but shorter, with broader pronotum, notably in the male; also, the punctuation of the pronotal base is interrupted at middle and there is no incision of side-margin at hind-angle. 6·2–8·2 mm.)
(*rufocincta* C. R. Sahlberg) **praetermissa** C. R. Sahlberg
On gravelly, often chalky soil, usually moraine; in open country, often under dry leaves.—England, local. Wales. Scotland. Ireland. Not common.
– Antennae infuscated, with 3 or 4 pale basal segments. Upper surface almost constantly metallic. Base of pronotum smooth or with fine punctures.....5
5 Less than 7 mm. Legs entirely pale. (Very similar to *familiaris* but, besides the elytral pore-puncture, separated by more convex eyes and the less produced front-angles of pronotum. Right paramere of male with small hook at tip. 5—6·8 mm.).....**anthobia** Villa
Usually on sandy, often cultivated soil.—England, N. to Stafford and Durham. No doubt a late immigrant in Britain.
– More than 7 mm. Femora more or less infuscated.....6

[1] The key is not based on the subgeneric division. However, "good" subgenera are: *Curtonotus* Stephens (*aulica, convexiuscula, alpina*), *Bradytus* Stephens (*apricaria, fulva, consularis*), *Percosia* Zimmermann (*equestris*), and *Zezea* Csiki (syn. *Triaena* Leconte) (*plebeja, strenua*).

6 Almost constantly above 10 mm. Elytral striae fine throughout. (Black, upper surface brassy, coppery or greenish, antennae with segments 1 to 3 and base of fourth rufo-testaceous. Broad and flat. Inner basal fovea of pronotum small but deep, the outer obliterated. Elytral striae fine as in *aenea* and its relatives but the basal pore-puncture is decisive; intervals alternating between quite flat and slightly convex. 9·5–12·6 mm.) (*acuminata* Paykull) **eurynota** Panzer
On open, light often cultivated ground among weeds etc.—England. Wales. Scotland. Ireland. Local.
– Not above 10 mm. Elytral striae deepened toward apex with all intervals becoming more convex 7
7 Basal pore-puncture of pronotum well removed from side-margin (fig. 63f) 8
– Basal pore-puncture situated close to side-margin (fig. 63e) 9

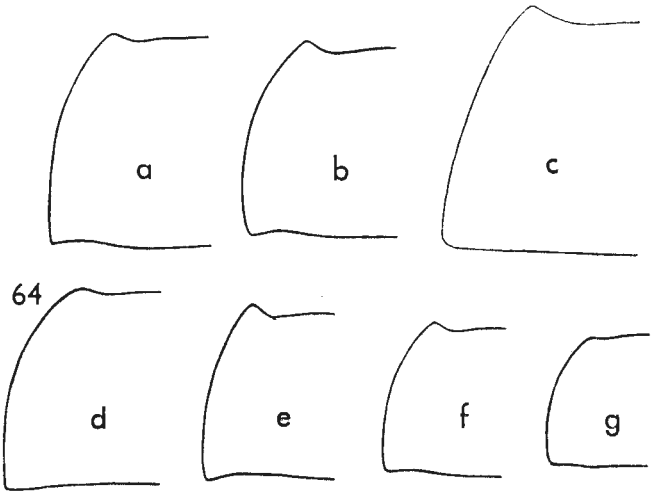

FIG. 64.—*Amara*. Pronotum of (a) *similata*; (b) *ovata*; (c) *montivaga*; (d) *nitida*; (e) *communis* (typical); (f) *familiaris*; (g) *lucida*.

8 Tibiae entirely pale, rufous. Front-angles of pronotum broadly rounded, little protruding (fig. 64d). (Black, upper surface with brassy, sometimes greenish, rarely bluish, reflection; 3 basal antennal segments and base of fourth rufo-testaceous, tibiae reddish brown. Pronotum with antorior margin almost truncate, which is the best distinguishing character from *communis;* base almost constantly more or less punctate, fovea usually evident. Specimens without basal pore-puncture on elytra are called "*imbella*" Reitt. 7·2–8·5 mm.)
nitida Sturm
On moderately dry gravel, usually mixed with clay, where the vegetation is sparse.—England: Somerset, Dorset, Middlesex, Warwick, Lincoln. (Knowle, Warwick, seems to be the only permanent locality.)
– Tibiae black or piceous. Pronotum with more angulate, somewhat protruding front-angles (fig. 64c). (Very broad and convex, notably the pronotum which is shorter than in related species. Black, upper surface with, usually strong, blue or green reflection, antennae with 3 basal segments and base of fourth rufo-testaceous; legs entirely dark. Pronotum with greatest width near hind-angles, sides strongly rounded and converging forwards, base impuntate with almost obsolete foveae. Elytra with greatest width near shoulder, basal pore-puncture always present. 7·8–9·2 mm.) ..... **montivaga** Sturm
On dry gravel, chalk and sand with weed vegetation, usually near human habitations.—England: in the south from Cornwall to Essex and Buckingham. Scotland. Apparently arrived in Britain during the last quarter century.

9 Pronotum (fig. 64a) with sides almost straight in basal half. Tibiae paler, often rufous. (Black, upper surface with, sometimes faint, brassy or greenish, rarely bluish, reflection; antennae with segments 1 to 3 and base of fourth rufo-testaceous, at least base of tibiae pale. Hind-angles of pronotum, due to the laterally sinuate hind-margin, acute, base punctate, at least inner basal fovea evident. Elytra constantly with basal pore-puncture, seventh stria with 3 preapical punctures. 7·8–10 mm.) ..... **similata** Gyllenhal

On open, moderately dry ground with Cruciferous plants and other weeds.—England. Wales. Scotland: West Lowlands. Ireland. Common.

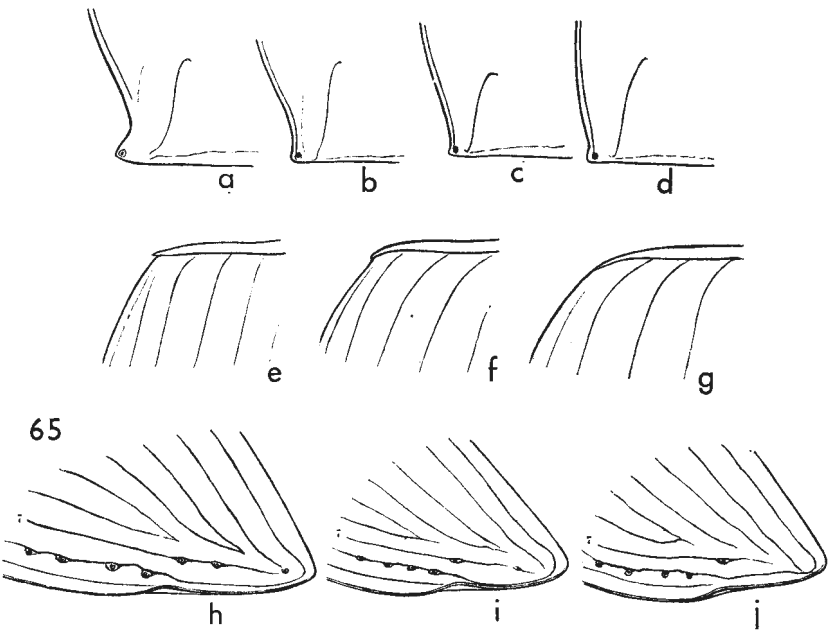

FIG. 65.—*Amara*. Hind-angle of pronotum in (a) *aulica*; (b) *convexiuscula*; (c–d) *alpina*. Shoulder of (e) *fulva*; (f) *aulica*; (g) *convexiuscula*. Elytral apex with preapical punctures in (h) *lunicollis*, etc.; (i) *spreta*, etc.; (j) *apricaria*, etc.

– Pronotum (fig. 64b) with sides evenly rounded. Tibiae black or piceous. (Closely related to *similata* with which atypical specimens are easily confused. Broader, elytra shorter, as compared with pronotum. Coloration the same but the metallic reflection is often less pronounced and more bluish. Pronotum broader (notably in the male) with sides more arcuate and hind-margin usually less sinuate inside the almost rectangular hind-angles, base impunctate or almost so, foveae more or less obliterated. Elytra with 3 or 4 subapical punctures. 8–9·5 mm.) ..... (*obsoleta* Dejean) **ovata** Fabricius

On open, rather dry, gravelly ground with sparse but often tall vegetation, e.g. in gravel-pits and on railway embankments.—England. Wales. Scotland. Ireland. Often abundant.

10 Abbreviated scutellar stria (between first and second entire elytral striae) rudimentary, interrupted and weak, or entirely lacking. Below 6·5 mm..... 11

— Scutellar stria well developed, not interrupted and not shallower than adjoining striae. Usually larger 13

11 Distal antennal segments oviform (fig. 63c). Elytral microsculpture regularly isodiametric. (A taxonomically isolated species. Piceous with faint metallic hue, appendages reddish brown. Scutellar stria absent or barely suggested. Broader and more convex than *tibialis* and *lucida*, besides through antennal structure and elytral microsculpture separated from the former by less pronounced outer pronotal fovea, from the latter on the elytral striae, which are evidently punctate and not deepened apically. Wings often quite rudimentary. 4·9–5·7 mm.) ..... **infima** Duftschmid

On dry, open, sandy or gravelly soil, under mats of Calluna, Arctostaphylos, *etc.*—*England: Dorset, Hampshire, Surrey, Kent, Bedford, Lincoln. Rare and local.*

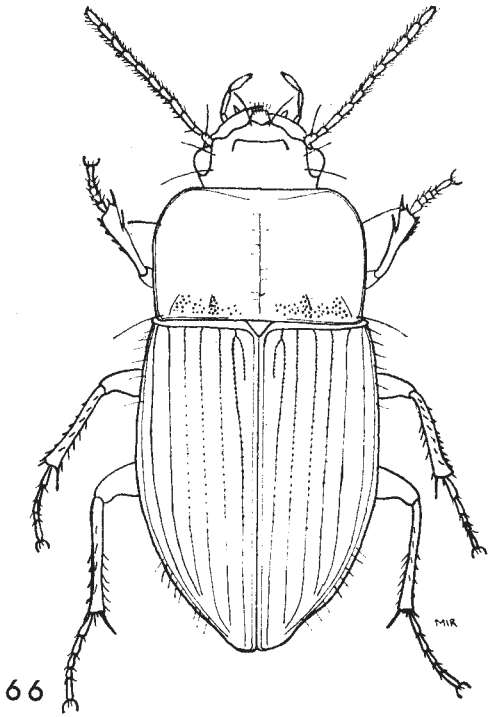

FIG. 66.—*Amara consularis* ♀.

— Antennal segments virtually conical, as usual (fig. 63d). Elytral microsculpture consisting of transverse meshes 12

12 Legs entirely pale. Outer basal fovea of pronotum more or less obliterated (*lucida* Duftschmid; see coupl. 28)

— Femora more or less infuscated. Outer basal fovea small but deep and sharply defined. (A small species with parallel-sided elytra, at once recognized on the deep basal foveae of pronotum. Black, upper surface with brassy or greenish, rarely bluish lustre; antennae with 3 basal segments and usually base of fourth pale but third segment often clouded apically. Elytral striae fine but usually with more evident punctuation than in related species, less deepened apically than in *lucida*; scutellar stria incomplete and often interrupted, sometimes wanting. 4·6–5·7 mm.) ..... **tibialis** Paykull

In dry, open, usually sandy country with low vegetation.—England. Wales. Scotland. Ireland. Common but somewhat local.

13 Seventh elytral interval with a single preapical puncture (fig. 65j). Hind-angles of pronotum more or less protruding (figs. 65a-d, 67a, b). Meso-tibia of male with a spine and/or 2-3 small tubercles internally 14

— Seventh elytral stria with 2 or more preapical punctures (figs. 65h, i), the posterior of which sometimes removed to apex of second or first stria. Hind-angles of pronotum rarely protruding. Meso-tibia of male unarmed 19

14 Elytra (viewed from above) with sharp, protruding shoulder-tooth (fig. 65e). Anterior margin of clypeus elevated. Meso-tibia of male only with tubercles, prosternum with central punctate area 15

— Elytra without or with much less pronounced shoulder-tooth (figs. 65 f, g.). Clypeus with flat anterior margin. Meso-tibia of male with one or more spines, prosternum smooth 17

15 The convexity delimiting outer pronotal fovea oblique (fig. 67b) and interrupted before base by the lateral pore-puncture. Pronotum almost twice as wide as long 16

— The lateral convexity of pronotum not or less oblique (fig. 67a), pore-puncture situated laterad of this. Pronotum narrower. (Cylindrical, very convex, distinguished on cordiform pronotum and anteriorly strongly punctate elytral striae. Piceous to brown, upper surface darker, usually bronzed; all appendages pale, reddish. Pronotum with deep, coarsely punctate basal foveae. 6·5–9 mm.) **apricaria** Paykull

On open, dry places, usually with weed vegetation and on the whole favoured by human activities. It comes regularly flying to light.—England. Wales. Scotland. Shetland. Ireland. Common.

16 Yellow or pale brown, upper surface usually with greenish lustre. Eyes flat. Sides of pronotum sinuate behind middle. (Broad and flat. Because of the pale colour possible to confuse only with immature specimens of *consularis*. Male more shiny than female; appendages pale. Pronotum (fig. 64b) with sharp hind-angles and oblique outer basal fovea. Elytral striae finely punctate. 8–10·4 mm.) ..... **fulva** O. F. Müller

Almost confined to dry sand, sometimes mixed with gravel or clay; buried below surface during daytime. It avoids continuous vegetation.—England. Wales. Scotland. Ireland. Local, seems to be disappearing in the south.

— Piceous to black (except from immaturity), not metallic. Eyes semiglobular. Pronotum with hind-angles denticulate, sides not sinuate. (General habitus as in *fulva* but less flat. Underside dark brown, appendages reddish. Pronotum with front-angles less produced than in *fulva*, base with stronger punctuation, outer fovea less oblique, elytral intervals more convex at apex. 8–9·4 mm.) (fig. 66) **consularis** Duftschmid

In open country on sand and gravel, sometimes with mixture of humus; often in gravel-pits.—England. Scotland. Ireland. Very local.

17 Raised lateral bead of pronotum not reaching hind-angle which is strongly protruding (fig. 65a). Shoulder-tooth blunt but evident (fig. 65f). (Largest species of the genus, stouter than the two following. Easily recognized on the basally interrupted lateral bead and the acute hind-angles of pronotum. Piceous, upper surface faintly bronzed, antennae, palpi and often also legs rufous. Elytra broadest behind middle. Male meso-tibia with 3 spines. 11–14·3 mm.) (*spinipes* Schiødte) **aulica** Panzer

On meadow ground, notably where Compositean plants are abundant, which the beetles climb during night in search of fruits.—England. Wales. Scotland. Shetland. Ireland. Common.

— Lateral bead of pronotum reaching hind-angle, which is much less protruding (figs. 65b–d). Shoulder-tooth lacking or almost so (fig. 65g) 18

18 Usually above 11 mm. Antennae entirely pale, first segment more than twice as long as wide. Lowland species. (Slenderer, more cylindrical than *aulica*. Uppper surface usually more clear bronze, legs more bright rufous. Lateral bead of pronotum (fig. 65b) thinner, well developed throughout. Shoulder, fig. 65g. Male meso-tibia with 2 spines. 10·8–12·2 mm.) ..... **convexiuscula** Marsham

Apparently halobiontic, occurring under seaweed and among sparse vegetation on sand near the shore; also on waste ground farther inland.—England. Wales. Scotland. Ireland. Local.

— Not above 11 mm. Palpi infuscated and only 1 to 3 basal antennal segments pale; first segment at most twice as long as wide. Mountain species. (Black to piceous often with greenish or bronze lustre, elytra usually rufinistic, often bright red with suture and sides dark; legs varying in colour. Pronotum (figs. 65c, d) with sides not or barely sinuate before the denticulate hind-angles, 8–11 mm.)
alpina Paykull

On heaths and in dry meadows. An arctic element of the British fauna, restricted to the high mountains.—Scotland: East and West Highlands. Very scarce.

19 Antennae entirely pale or very slightly infuscated toward apex[1] 20
— Antennae piceous with 1 to 3 (rarely 4) basal segments (at least first segment underneath) pale[1] 24

20 Eyes flat. Pronotum with sides obliquely depressed, front-angles protruding (fig. 67d). (Piceous to brown, upper surface with bronze, sometimes greenish or bluish hue, notably in the more shiny male; appendages rufous or pale brown, antennae rarely quite slightly infuscated apically. Sides of pronotum with a minute incision immediately before hind-angles, as in *bifrons*. Elytral striae very fine. Prosternum between pro-coxae, unlike all related species, with 2 or 4 setae. Wings either full or highly reduced. 6·4–8·8 mm.) **quenseli** Schönherr

A broad, flat, dull and often paler form occurring on sand, especially in coastal dunes, has been called silvicola *Zimmermann on the continent; it may be regarded as a continental subsp.*

A xerophilous species confined to open country with sandy or gravelly soil, often moraine, and sparse vegetation.—In Britain only in the East Highlands of Scotland.

— Eyes convex. Lateral depression of pronotum lacking or suggested only, front-angles rounded 21

21 Outer pronotal fovea separated from side-margin by a strong callosity (fig. 67c). Prosternal process (between pro-coxae) with 6 or more erect setae. (A big, stout species without metallic reflection. Brown to almost black, sides of pronotum rufescent, appendages rufous. Pronotum with lateral bead coarse, sides almost straight in basal half, foveae deep, punctate. Elytra with 2 preapical punctures (as in fig. 65i). 8·2–10·5 mm.)
(*patricia* Duftschmid) **equestris** Duftschmid

On dry, sandy or chalky soil, either in open or lightly wooded country, at roots of grass or often under dry leaves.—England, N. to Cumberland. Wales. Scotland. Local and rare.

— Pronotum without lateral callosity. Prosternal process glabrous 22

22 Entire base of pronotum (fig. 67e) equally punctate (or a little less densely so at middle). Legs pale testaceous. (Very pale: yellowish or reddish brown, upper surface with faint bronze hue, all appendages entirely pale. Sides of pronotum with minute inicision close to hind-angle, as in *quenseli*; basal foveae shallower, the outer less sharply delimited than in the two following species. 5·3–7·4 mm.)
(*livida* Schiødte) **bifrons** Gyllenhal

A xerophilous species, usually on sand with very sparse vegetation.—England. Wales. Scotland. Shetland. Ireland. Often abundant.

— Basal punctuation of pronotum restricted to the vicinity of the foveae or at least very sparse medially. Legs more rufous 23

23 Palpi and outer antennal segments more or less infuscated. (Piceous with bronze hue. Similar to *quenseli* but also femora more or less infuscated, eyes more convex, front-angles of pronotum less protruding, lateral depression barely suggested. Prosternum without setae. 7–8·8 mm.)
(*fuscicornis* Zimmermann) **cursitans** Zimmermann

On the continent usually on cultivated ground with weed vegetation.—England: London area, 2 specimens (1956, *Entomologist's mon. Mag.* **92**: 215); *doubtfully established.*

— Palpi and antennae entirely pale. (Very similar to *cursitans* but with all appendages entirely pale, or only femora slightly infuscated. Pronotum broader, as compared with elytra, hind-angles usually less prominent. Body more convex. 8–8·8 mm.) ..... (*complanata* Dejean) **fusca** Dejean

On dry, sandy or gravelly soil with sparse vegetation; not clearly favoured by human activities.—England: Sussex, Kent; doubtfully in the North. Wales: Swansea. Very rare.

[1] Doubtful species under both halves of couplet.

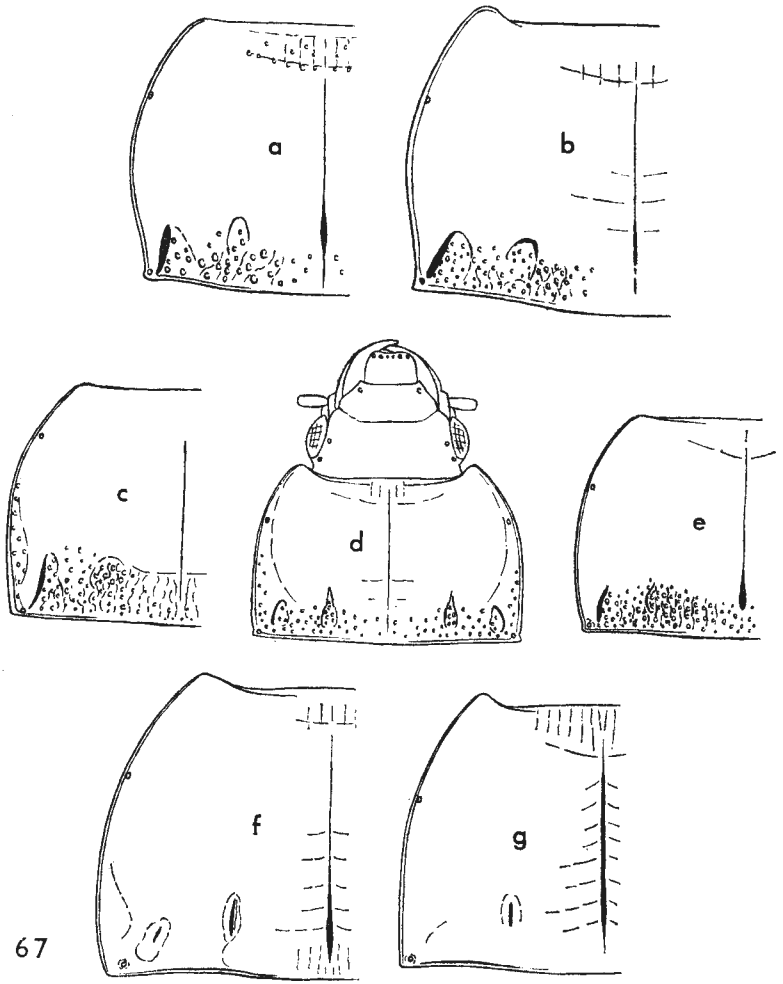

FIG. 67.—*Amara*. Pronotum of (a) *apricaria*; (b) *fulva*; (c) *equestris*; (d) *quenseli*; (e) *bifrons*; (f) *lunicollis*; (g) *aenea*.

24 Pronotal foveae deep, the outer triangular, strongly delimited externally. Antennae only slightly infuscated 25

— Outer pronotal fovea either poorly delimited to entirely lacking, or linear to punctiform, not triangular. Antennae darker, the from 1 to 3 (—4) pale basal segments strongly contrasting 26

25 Eyes flat. Pronotum with sides obliquely depressed, front-angles protruding (fig. 67d) ..... (*quenseli* Schönherr; see couplet 20)

— Eyes convex. No pronounced lateral depression of pronotum, front-angles rounded (*cursitans* Zimmermann; see couplet 23)

26 Antennae with 3 (rarely 4) pale basal segments, third sometimes infuscated apically 27

— Only 1 or 2 basal antennal segments pale, third entirely dark 33
27 Legs entirely pale 28
— At least femora more or less infuscated 29
28 Front-angles of pronotum protruding, angulate (fig. 64f). Larger. (Piceous, upper surface with brassy, greenish or bluish lustre; antennae with 3 or 4 pale basal segments, legs bright rufous. Eyes much flatter than in *communis*. Basal foveae of pronotum obsolete, impunctate or almost so. Elytral striae deepening towards apex. Right paramere of male without apical hook. 5·6–7·2 mm.)
familiaris Duftschmid

On all kinds of open ground: in meadows, on waste places among weeds, etc.—England. Wales. Scotland. Fair Isle. Ireland. One of the commonest members of the genus.

— Front-angles of pronotum rounded, little protruding (fig. 64g). Smaller. (Very similar to *familiaris* but somewhat narrower. Eyes more convex. Scutellar stria of elytra sometimes rudimentary; such specimens are separated from *tibialis* on the obsolete pronotal foveae, from *infima* on the antennae (fig. 63d). 4·6–6·4 mm.) ..... **lucida** Duftschmid

On dry grassland, often on sand dunes near the coast.—England. Wales. Scotland. Ireland. More local and rarer than familiaris.

29 Elytral striae fine throughout, intervals quite flat. Inner pronotal fovea forming a sharp streak (fig. 67g). (Easily recognized on the combination of pale antennae, extremely fine elytral striae and the absence of a basal pore-puncture (cf. *eurynota*). Black, metallic lustre of upper surface usually strong, brassy or green, rarely somewhat bluish; antennae with segments 1–3 and base of fourth clear rufo-testaceous, legs dark with pale tibiae. Head smaller than in *communis*, with eyes flatter. Outer pronotal fovea more or less obliterated. Elytra with 3 preapical punctures (as in fig. 65h). Last abdominal sternite of female with 4 setae. 6·2–8·8 mm.) ..... (*trivialis* Gyllenhal) **aenea** De Geer

A xerophilous species, inhabiting open, usually sandy ground with sparse vegetation.—England. Wales. Scotland. Ireland. Common.

— Elytral striae deepened towards apex and intervals becoming more convex. Inner pronotal fovea less sharp 30
30 Elytra with only the 2 ordinary preapical punctures in seventh stria (fig. 65i). Posterior lateral setiferous puncture of pronotum very close to side-margin.
(*curta* Dejean; see couplet 35)
— Elytra with 3 preapical punctures, one at apex of second or first stria (fig. 65h). Posterior pronotal puncture more removed from side-margin 31
31 Front-angles of pronotum broadly rounded, little protruding (fig. 64d). Antennae with entire third segment and base of fourth pale (*nitida* Sturm; see couplet 8)

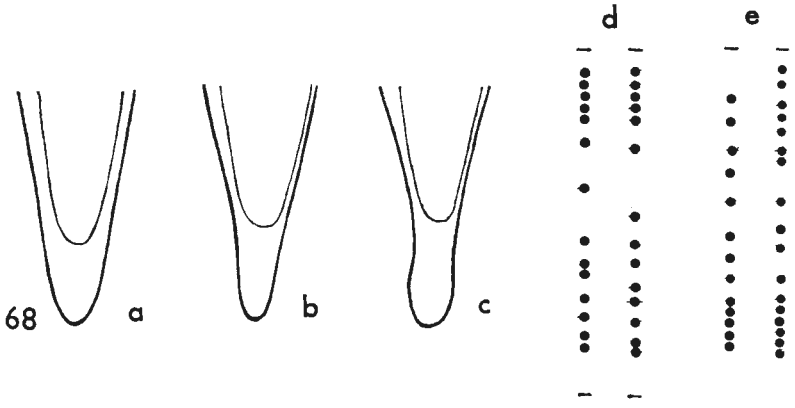

FIG. 68.—*Amara*. Penis apex of (a–b) *communis*; (c) *convexior*. Arrangement of lateral elytral punctures, from shoulder (top) to apex, in normal specimens of (d) *communis*; (e) *convexior*.

— Front-angles of pronotum angulate, protruding (fig. 64c). Entire fourth antennal segment dark and apex of third usually clouded 32

32 Lateral row of punctures, in eighth elytral stria, somewhat more open at middle but not interrupted (fig. 68e). Penis, fig. 68c). (Closely related to *communis*. Somewhat more convex and more parallel-sided, that is, pronotum narrower in comparison with elytra, the difference being most pronounced in males. Front-angles of pronotum slightly less produced, basal foveae usually better impressed and with more expanded puncturation. Penis constricted near apex. 7–8·2 mm.)
(*continua* C. G. Thomson) **convexior** Stephens
This species prefers gravelly soil and is often found in gravel-pits.—England. Wales. Scotland. Ireland. More local but sometimes commoner than communis.

— Lateral row of elytral punctures usually with wide interruption at middle (fig. 68d). Penis, fig. 68a, b. (A rather small, shiny species. Black, upper surface with metallic, usually brassy, sometimes greenish or bluish, lustre; 3 basal segments of antennae clear rufous but third always more or less clouded apically and fourth segment not paler at base, tibiae more or less pale reddish brown. Head large with convex eyes (by which also immature specimens may be separated from *familiaris*). Pronotum somewhat broader in the male, rather varying in form, punctuation and basal foveae, but always with triangularly produced front-angles (fig. 64e). Elytral striae clearly deepened apically, seventh with 3 preapical punctures (fig. 65h). Last abdominal sternite of female with 2 setae. Penis (figs. 68a, b) more or less evenly tapering in dorsal view. 6–8 mm.)
communis Panzer
A eurytopic species, occurring in all kinds of moderately dry, open country and in thin forests. Often under moss and dry leaves.—England. Wales. Scotland. Ireland. Not common (formerly confused with convexior).

33 Elytral striae fine throughout, intervals quite flat; apex, in side view, flat 34
— Elytral striae deepened towards apex and intervals becoming more convex; apex steeply sloping (as in *communis*) 35

34 Antennae with 2 bright red basal segments. Base of pronotum punctate, at least around inner fovea. Last sternite of female with 2 setiferous punctures. (Closely allied to *aenea* but broader and flatter. Same coloration, except that third antennal segment is dark (rarely also second segment slightly clouded). Pronotum with deeper foveae, base sinuate inside hind-angles which therefore are more acute. Elytra almost constantly with 2 preapical punctures (fig. 65i). 7·8–9·5 mm.) ..... **spreta** Dejean
On dry, loose sand, especially in dunes near the coast.—England: Dorset to Suffolk; Worcester, Stafford, Durham. Wales: Glamorgan, Merioneth. Very local. . .

— Second antennal segment somewhat darker than first, usually black. Base of pronotum impunctate or with a few punctures at inner fovea. Last sternite of female with 4 punctures. (Related to *spreta*. Somewhat narrower and more convex. Colour usually less bright; unmetallic black specimens occur. Eyes flatter. Sides of pronotum less depressed basally, foveae usually deeper, hind-angles almost rectangular. Elytra almost constantly with 2 preapical punctures. 6·6–9 mm.) ..... **famelica** Zimmermann
On dry sandy heaths.—England: Hampshire, Berkshire, Surrey. Rare.

35 Usually above 8 mm. Elytra with 3 preapical punctures (fig. 65h). Last abdominal sternite of female with 2 setiferous punctures. (A stout, convex species with broad pronotum. Black, upper surface with brassy or green, rarely bluish, lustre, strongest in the male; appendages dark, except that 1 or 2 basal antennal segments are more or less rufous, often also base of tibiae. Pronotum (fig. 67f), notably in the male, with sides strongly rounded and somewhat obliquely depressed inside hind-angles; basal foveae as a rule more impressed than in *communis* and *convexior*, the outer usually consisting of an oblique streak. Elytral striae clearly, as a rule strongly, deepened towards apex, seriate punctures in eighth stria as in *convexior*. 7·3–9 mm.)
(*vulgaris* auctt., e.g. Andrewes, nec Linnaeus) **lunicollis** Schiødte
In meadows, gardens and in open forests, often on peaty soil. Also under moss-carpets on rocks and in heaps of straw.—England. Wales. Scotland. Shetland. Ireland. Somewhat local.

— Below 7·5 mm. Elytra with 2 preapical punctures (fig. 65i). Last sternite of female with 4 punctures. (A small species, similar to *familiaris* in general habitus but with darker appendages. Black, upper surface dull bronze, rarely bluish; antennae with 1 or 2 rufous basal segments (rarely also with part of third segment pale), legs brown with black femora. Head and eyes smaller than in *communis*, but the latter more convex than in *familiaris*. Antennae, notably outer segments, strikingly short. Basal foveae of pronotum small, linear, or almost evanescent; the laterobasal seta closer to side-margin than in *communis*. 5·8–7·4 mm.) ..... **curta** Dejean

On dry, stony sand or gravel with sparse vegetation, for instance in gravel-pits and in sand-hills near the coast.—England: Hampshire, Sussex, Kent, Derby, Lancashire, Yorkshire. Ireland. Rare and very local.

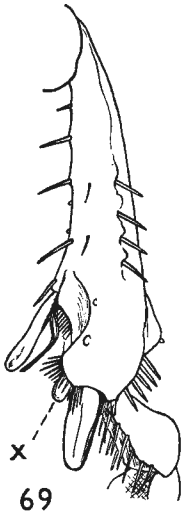

FIG. 69.—*Zabrus tenebrioides*. Left front-tibia from above. X, extra apical spur.

Tribe ZABRINI

Genus **Zabrus** Clairville

A single big, stout species somewhat reminiscent of a giant *Amara equestris*. Diagnostic character is the small extra pro-tibial spur inside the ordinary apical one (fig. 69). The elytra have crossed epipleura and lack dorsal punctures, as in *Amara*, but the head has only one pair of supra-orbital punctures, as in *Harpalus*. Wings full. Male protarsi with 3 dilated segments.

ONE BRITISH SPECIES

Piceous black, appendages rufo-piceous with darker femora. Pronotum strongly narrowing forwards, lateral bead thick basally, base densely punctate. 14–16 mm. (*gibbus* Fabricius) **tenebrioides** Goeze

In meadows and cultivated fields. On the continent known as a pest on wheat, rye and other cereals, the adults climbing the plants and feeding on the grains; the larva devours the tender shoots.—England, N. to Leicester. Wales: Glamorgan. Very local and much rarer than formerly.

Tribe **HARPALINI**

Genus **Harpalus** Latreille

One of the largest Carabid genera, most abundant in dry regions. The stout body with short legs suggests *Amara* but from this genus *Harpalus* is easily separated on the presence of only one supra-orbital puncture on head, the absence of a seta at hind-angle of pronotum, and the uncrossed elytral epipleura (fig. 61b). Except in species with more or less pubescent elytra, and in *vernalis*, third elytral interval has at least one "dorsal puncture" in apical half. Antennae pubescent from third segment. First meta-tarsal segment short in comparison with apical spine of tibia, as well as with the following segments (fig. 77c).

Both pro- and meso-tarsi are dilated in the male and carry two rows of scale-like hairs underneath (fig. 76a). Parameres short and broad, penis usually with complicated inner armature.

Certain species groups are very "difficult", notably in subgen. *Ophonus*, where a reliable identification usually requires investigation of the male genitalia.

Like the *Amara* species, the members of *Harpalus* are more or less xerophilous and usually confined to open country, often sandy soil, where most species remain buried during daytime. Their food, to a large extent, consists of vegetable matter (seeds, fruits, etc.).

Key to Species

1 All elytral intervals punctate and pubescent, though the inner ones sometimes less densely so 2
– At least inner elytral intervals entirely smooth and glabrous 17
2 Head with frons and temples pubescent. Pronotum coarsely punctate on disc. (Subgen. *Ophonus* Stephens) 3
– Head glabrous. Pronotum with dense, confluent punctuation at base but almost smooth on disc. (Subgen. *Pseudophonus* Motschulsky) (Piceous to almost black, appendages rufo-testaceous. Base of pronotum finely pubescent. Elytral vestiture dense, yellowish. Tarsi pubescent above. 10–16·7 mm.)
(*ruficornis* Fabricius, *pubescens* O. F. Müller) **rufipes** DeGeer
In open country, often cultivated fields and on waste places. Known as a pest e.g. on strawberries.—England. Wales. Scotland. Ireland. Very common.
3 Pronotum with sides not (or just visibly) sinuate before hind-angles, which are strongly obtuse or entirely rounded. Upper surface usually (at least elytra) with strong metallic lustre. Shoulder without tooth 4
– Pronotum with sides more or less sinuate posteriorly, hind-angles angulate, least so in *parallelus* (fig. 70i). Upper surface bright metallic only in *punctatulus*, with strong shoulder-tooth 7
4 At least 9·5 mm. Pronotum with hind-angles entirely rounded or strongly obtuse, poorly marked; base not margined. Elytral shoulders rounded 5
– Smaller. Pronotum (fig. 70a) with well-marked, obtuse hind-angles, rounded at tip, and raised basal bead. Shoulders forming an obtuse angle. (Piceous black, upper surface almost constantly with strong green, sometimes violaceous or bluish, reflection. Appendages rufo-testaceous. The unmetallic form, called "*similis* Dejean", caused the wrong record for *subquadratus* Dej. from Britain (1956, *Entomologists' mon. Mag.* **92**: 143); it may also be confused with *parallelus* (see that species). Wings dimorphic. 6·2–9·2 mm.) **azureus** Fabricius
In open, quite dry country with short vegetation, mainly in chalky districts.—England, N. to Nottingham. Wales: Glamorgan. Local.
5 Pronotum with sides almost straight, though oblique, in basal third, hind-angles very obtuse and rounded but quite evident. (Black, forebody often with faint, elytra with strong, blue or greenish, reflection. Their pubescence brownish, subapical sinuation of side-margin only suggested. 12–17 mm.)
sabulicola Panzer
On dry, sandy ground, often chalk, near the coast.—S. England, N. to Cambridge & Suffolk. Wales: Glamorgan. Very rare.

– Pronotum with entire sides rounded, hind-angles quite or virtually obsolete.....6

6 Elytra slightly diverging at extreme tip, subapical sinuation of sides evident; pubescence blackish. (Metallic reflection of forebody more pronounced, as a rule, than in related species. Hind-angles of pronotum barely suggested. 13–17 mm.).....(*stictus* Stephens) **obscurus** Fabricius

On chalk or limestone.—England: Dorset, Essex, Oxford, Gloucester, Cambridge. Very local, but sometimes in numbers.

– Elytra not diverging apically, subapical sinuation only suggested; pubescence brownish. (Forebody often unmetallic. Hind-angles of pronotum completely obsolete. 9·5–13 mm.)

(*rotundicollis* auctt. nec Kolenati) **ardosiacus** Lutshnik

In open fields with limestone or chalk, also on clay in saline habitats.—England, N. to Norfolk; Yorkshire. Wales: Glamorgan. Locally abundant.

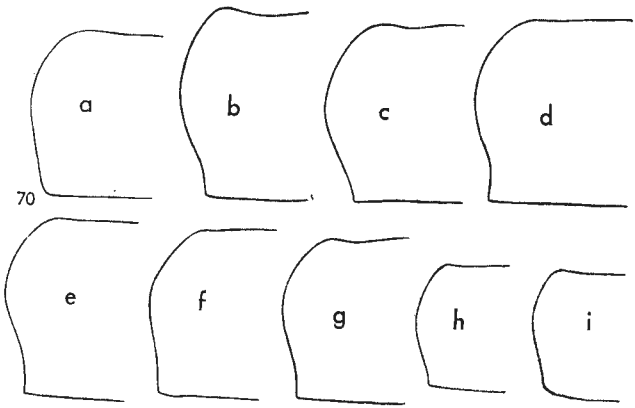

FIG. 70.—Pronotum of *Harpalus* subg. *Ophonus*. (a) *azureus*; (b) *rupicola*; (c) *schaubergerianus*; (d) *rufibarbis*; (e) *puncticollis*; (f) *puncticeps*; (g–h) *melleti*; (i) *parallelus*.

7 Entire upper surface metallic blue or green. Elytra with strong shoulder-tooth. (Black, paler underneath, elytra dull. Pronotum broad with sharp, rectangular hind-angles and base entirely margined. Elytral punctuation fine and dense. 8·5–11 mm.).....**punctatulus** Duftschmid

On open, dry, often slightly shaded ground, usually on chalky soil.—England, N. to Nottingham. Wales: Glamorgan. Ireland. Very local.

– Only elytra sometimes with faint metallic hue. Shoulders rounded or with small tooth 8

8 Pronotum without any trace of raised basal margin[1] 9

– Pronotum with raised basal bead, though often incomplete (best seen from in front with light from behind)[1].....13

9 Shoulders rounded, not clearly angulate. Pronotum (fig. 70b) narrower, lateral sinuation short but rather deep, often reddish. Elytra usually with bluish or greenish hue, their microsculpture obsolete in the female, virtually absent in the male. (Body slender and parallel, as in *cordatus*. Piceous, brown underneath, first elytral interval and forebody more or less pale. Punctuation of pronotum and elytra sparse but very strong. Penis (fig. 71a) stout with strong transverse disc at apex. 7–9 mm.).....**rupicola** Sturm

On open, gravelly ground, often chalk, with sparse but often tall vegetation.—England, N. to Yorkshire. Local.

[1] Doubtful species under both halves of couplet.

— Shoulders angulate, often protruding as a denticle. Pronotum with lateral sinuation longer or shallower. Entire body unmetallic. Elytral microsculpture evident in both sexes.....10

10 Pronotum (figs. 70f-h) less transverse, usually with sides less rounded anteriorly and less sinuate in basal half; sides with a single longer seta just before middle (rarely a second in front of this). Penis (figs. 71e, 72) with apical disc.....11

— Pronotum (figs. 70c, d) pronouncedly transverse, with 2–4 (easily broken) setae in anterior half. Penis (figs. 71b, f, g) without apical disc 12

11 Pronotum (fig. 70f) narrower compared with elytra, sides obliquely depressed inside hind-angles, base usually slightly oblique laterally. Elytral intervals densely punctate (as in *schaubergerianus*). Microsculpture of pronotum stronger. Penis fig. 71e .....(*puncticeps* Steph.; see couplet 15)

— Pronotum (figs. 70g, h) with sides not depressed, base straight. Pronotum and elytra more sparsely punctate. Penis, fig. 72a ....(*melleti* Heer; see couplet 16)

12 Entire upper surface with denser and usually stronger punctuation: on the disc of pronotum not markedly sparser than laterally; on the inner intervals of elytra with 4 rows of punctures in most places. Penis (figs. 71b, g) more slender, with ventral side somewhat arcuate and apex twisted so that the apical ostium is removed to the left. (Ground-colour more piceous, forebody somewhat paler, appendages usually more clear rufous. Posterior sinuation of pronotal sides less deep (fig. 70c). The armature of the internal sac consists of a big ventral tooth just before middle and an anterior, and a posterior, elongate field of more than 20 slender spines each, widely separated. 7·6–10 mm.)
(*brevicollis* auctt. nec Serville; *rufibarbis* auctt. nec Fabricius) **schaubergerianus** Puel

On chalk and sand. Generally in more open country than rufibarbis.—*England, N. to Cambridge.*

— Punctuation of pronotum much sparser on disc than laterally; on the elytra only 2–3 rows, or less, on each interval. Penis (figs. 71c, f) almost symmetrical, seen from the dorsal side, ventral side virtually straight. (Piceous black, forebody rarely paler, appendages usually brownish. Pronotum (fig. 70d) somewhat shorter, usually with deeper lateral sinuation. Internal sac with similar armature but the two "fields" contain less than 10 spines each and the basal one hardly extends beyond the level of the big tooth. 6·2–9·5 mm.)
(*subpunctatus* Stephens, *seladon* Schauberger, *brevicollis* auctt. nec Serville) **rufibarbis** Fabricius

In open or somewhat shaded places with humus-mixed soil.—England, N. to Yorkshire. Wales: Pembroke. Scotland. Ireland. Often abundant.

13 Pronotum similar to that of *rupicola* (fig. 70b) with strongly rounded sides and very short basal sinuation, but still more constricted basally. Elytral striae finely punctate, shoulders without tooth. Penis without apical disc. (Piceous to brown or dark rufous, femora sometimes slightly infuscated. Pronotum with hind-angles right or somewhat obtuse, basal margin fine but complete, punctuation of disc strong and dense. 7·5–10 mm.) .....**cordatus** Duftschmid

In dry, open country, usually on coastal sand dunes.—England: Dorset to Kent; Gloucester. Rare.

— Pronotum less constricted, with longer basal sinuation. Elytral striae smooth or with rudiments of punctures, shoulders with protruding denticle. Penis with apical disc 14

14 Pronotum (fig. 70e), in comparison with elytra, strikingly broad, cordiform, with sides strongly rounded anteriorly and posterior sinuation long and deep. Punctuation on disc sparse (as in *rufibarbis*) but very coarse. Penis (fig. 71d), in dorsal view, somewhat widening before apex. (Almost pure black, appendages more clear rufous than in all following species. Basal bead of pronotum strong and continuous. Penis big and dark with strong apical disc, internal sac with a tooth at middle and a single field of strong, slender spines in apical 2/3. 7–10 mm.)
puncticollis Paykull

In open country, probably always on chalk or limestone.—England: Somerset, Dorset, Berkshire, Cambridge. Rare.

— Pronotum narrower, less cordiform; punctuation on disc denser.—Penis without subapical dilatation. (Basal bead of pronotum often incomplete.) 15

15 Pronotum (fig. 70f) very narrow, widest part usually clearly narrower than elytra over shoulders; inside hind-angles with a faint oblique depression. Apex of penis (fig. 71e) very slender with ill-defined apical disc. (Piceous, pronotum with somewhat paler margins, appendages brownish testaceous. The pronotal depression suggests *smaragdinus* but is weaker; basal bead very fine, often incomplete or lacking, base usually slightly oblique laterally. Elytra proportionally longer than in any other *Ophonus*, intervals densely punctate, as in *schaubergerianus*. Penis, in side view, more clearly serrate dorsally than in related species; internal sac without tooth but with two widely separated fields of very dense and slender spines. 6·5–9 mm.).

(*angusticollis* J. Müller, *rectangulus* Sharp nec C. G. Thomson) **puncticeps** Stephens

On open, often cultivated ground, under weeds, etc.—England, N. to Norfolk; Yorkshire. Wales: Pembroke. Ireland. Often abundant.

— Pronotum shorter, as wide as elytra over shoulders; no latero-basal depression. Elytra much shorter. Apex of penis stouter with well-developed disc.....16

16 Hind-angles of pronotum (figs. 70g, h) right or slightly obtuse, not rounded at tip; basal bead incomplete or lacking. Penis (fig. 72a) stout, apical disc protruding dorsally; internal sac with big central tooth and two small separate groups of spines. (Piceous, forebody usually paler, appendages rufotestaceous. Sides of pronotum approximately parallel before hind-angles. Shoulder with small but sharp denticle; intervals somewhat more densely and regularly punctate than in *rufibarbis*. Separated from small specimens of *schaubergerianus*, in addition to form of penis, by more sinuate sides of pronotum and the stronger, sparser elytra punctuation. 5·5–8·6 mm.)

(*rectangulus* C. G. Thomson, *rupicoloides* Sharp, *championi* Sharp, *brevicollis* Serville sensu Jeannel) **melleti** Heer

In open country, e.g. on chalk, sometimes in slightly shaded places; often associated with azureus.—*S. England, from Dorset to Kent. Rare.*

— Hind-angles of pronotum (fig. 70i) clearly obtuse, rounded at extreme tip; basal bead always evident, though sometimes briefly interrupted at middle. Penis (fig. 72b) slenderer, with apical disc more clearly transverse and protruding both dorsad and ventrad; internal sac without tooth, but with two narrow, parallel fields of slender spines. (Usually smaller than *melleti*. Sides of pronotum clearly diverging forwards from hind-angles, base somewhat arcuate laterally. Shoulder-tooth very small. Punctuation of pronotum and elytra usually denser and microsculpture more evident. A confusion with the unmetallic form of *azureus* is possible but, in that species, the sinuation of the pronotal sides is very faint or absent and the disc more sparsely punctate; the spiny fields of the internal sac are three in number. 5·7–7·3 mm.)

(*zigzag* auctt., *melleti* Jeannel nec Heer) **parallelus** Dejean

Often on chalk.—S. England: Dorset to Kent, N. to Bedford.

17 Tarsi pubescent above. Third elytral interval without dorsal puncture. (Subgen. *Pardileus* Gozis, if different from *Pseudophonus*.) (Piceous, almost black above, extreme sides of pronotum, antennae and of legs at least tarsi paler. Base of pronotum (fig. 75a) with expanded confluent punctuation. Eighth and ninth elytral intervals with very fine, easily overlooked pubescence. 10·5–14 mm.)

calceatus Duftschmid

Known in Britain only from single specimens taken in Sussex, Essex and Yorkshire, apparently stragglers. It is known as migratory on the continent.

— Tarsi glabrous above. Only our smallest species (*vernalis*) lacks dorsal puncture (Subgen. *Harpalus* s.str., in widest sense.).....18

18 Outer elytral intervals and apical (rarely also basal) part of the inner ones punctate and pubescent. (Extremely variable in colour, from strongly metallic, green, brass, coppery, bluish, to almost black, rarely more or less rufinistic; female with elytra dull. Appendages pale, legs from clear rufous to piceous. Dorsal punctures of elytra from 1 to 3; side-margin with deep subapical sinuation in the the female. 8·5–12 mm.).....(*affinis* Schrank) **aeneus** Fabricius[1].

Very common in all kinds of open country.—England. Wales. Scotland: Shetland. Ireland.

[1] Since *aeneus* was described by Fabricius already in 1775, it has priority over *affinis* Schrank, 1781.

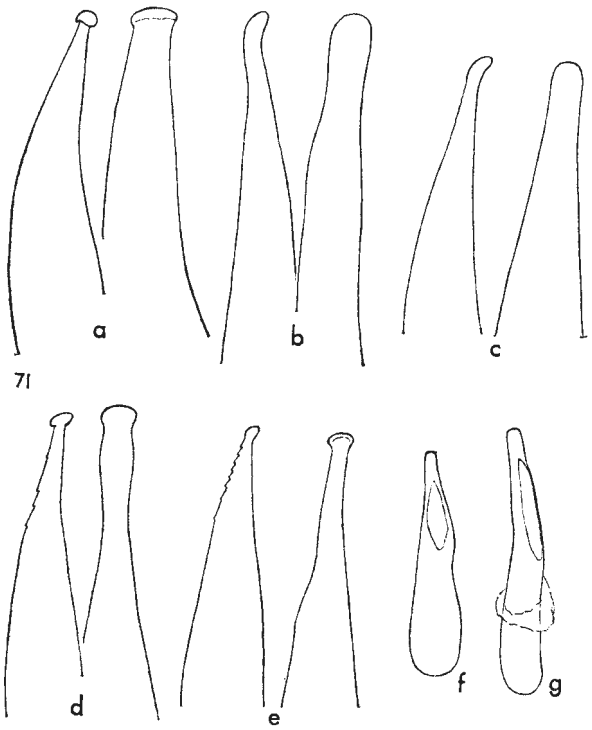

FIG. 71.—Penis apex, lateral and dorsal view, of *Harpalus* subg. *Ophonus*. (a) *rupicola*; (b) *schaubergerianus*; (c) *rufibarbis*; (d) *puncticollis*; (e) *puncticeps*. Penis in dorsal view of (f) *rufibarbis*; (g) *schaubergerianus*.

— All elytral intervals smooth and glabrous (marginal setiferous punctures not counted) 19

19 Elytra without dorsal puncture. Smallest species of the genus. Constantly short-winged. (Piceous to black, margins of pronotum and usually elytral suture paler, appendages rufo-testaceous, except that femora and apex of tibiae are infuscated. Pronotum with hind-angles entirely rounded and basal foveae very small. 5·3–6·2 mm)
(*picipennis* auctt. nec Duftschmid) **vernalis** Duftschmid
In open places with sand or gravel, usually on the coast.—S.E. England: Devon to Norfolk. Very local.

— Third elytral interval with at least one dorsal puncture in apical half. Wings usually full 20

20 Eighth or seventh elytral interval (sometimes also fifth and third) with a short row of punctures (rarely reduced to 2) at apex (figs. 73a, b) 21

— Only a single puncture apically, adjoining seventh stria 25

21 Eighth elytral interval with apical punctures (fig. 73a). Pronotum obliquely depressed inside hind-angles, as in *smaragdinus*. (Black or dark piceous, antennae and tarsi dark rufous but antennal segments 2–4 often infuscated. Narrower than *tardus*, with elytra more elongate and base of pronotum more punctate. Fourth and fifth abdominal segments with several extra setiferous punctures (as in *froelichi*). 10–11 mm.) ..... **melancholicus** Dejean
On open sand with sparse vegetation, usually near the sea.—England, N. to Norfolk. Wales. Ireland. Rare.

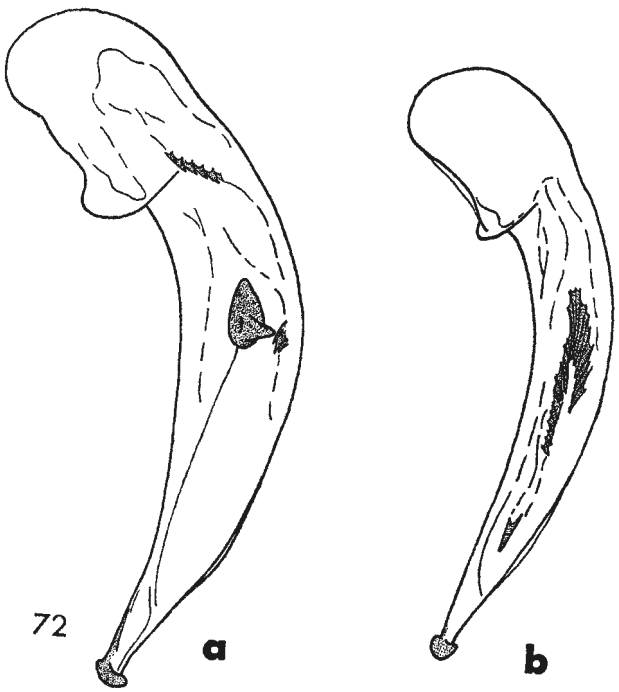

FIG. 72.—Penis of (a) *Harpalus melleti*; (b) *parallelus*.

– – Seventh elytral interval, sometimes also fifth, rarely third, with apical punctures (fig. 73b), exceptionally reduced to 2 on seventh interval. Pronotum less depressed laterally 22

22 At least 12 mm. Sides of pronotum rounded throughout, hind-angles obtuse and rounded. Also fifth elytral interval with apical punctures. Fourth and fifth abdominal sternites with several setiferous punctures laterally. (Black, pronotum usually with bluish hue, notably at base; antennae fuscous with at least one basal segment rufous. Entire base of pronotum with irregular, confluent punctuation. 12–14 mm.) ..... (*caspius* von Steven) **dimidiatus** Rossi

In open, dry country, probably confined to chalky soil.—S. England: Devon to Kent, N. to Oxford. Locally abundant.

– Almost constantly below 12 mm. Sides of pronotum straight or somewhat sinuate before the right or moderately obtuse, less rounded hind-angles. Fifth elytral interval very rarely with apical punctures. Fourth and fifth abdominal sternites without or with very few extra punctures 23

23 Antennae entirely pale. Legs pale or with femora (very rarely tibiae) infuscated. Base of pronotum densely, confluently punctate, at least between fovea and hind-angle. (Black, female dull, margin of pronotum often paler, upper surface, notably in the male, with blue or green reflection. Sides of pronotum straight or faintly sinuate posteriorly, hind-angles about right, little rounded at tip. The form with dark legs has been called "*sobrinus* Dej.". 8·5–12·2 mm.)

rubripes Duftschmid

On dry, gravelly or sandy soil with sparse vegetation.—England. Wales. Scotland. Ireland. Somewhat local.

– Antennae infuscated from second segment. Legs piceous to black with tarsi, sometimes also tibiae, brown. Punctuation of pronotum almost restricted to basal foveae 24

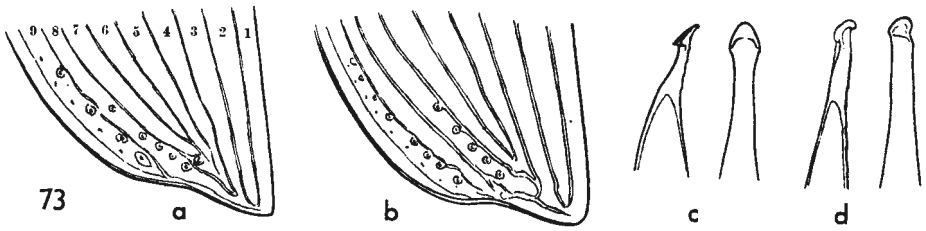

FIG. 73.—*Harpalus*. Apex of elytron in (a) *melancholicus*; (b) *rubripes*. Penis of (c) *rufitarsis*; (d) *honestus* (Austria).

24 Upper surface (at least elytra) green or bluish, brilliant in the male, opaque in the female. Pronotum more constricted towards base, before which the sides are clearly sinuate. Penis (fig. 73d) slenderer, almost straight, apex not bent with disc rounded at tip (also in lateral view). (Seventh elytral interval, on the continent, sometimes with only the normal apical puncture. Probably always with highly reduced wings. 8–11 mm.)

(*ignavus* Duftschmid) **honestus** Duftschmid

On chalk.—England: Kent and Berks. Very rare (only odd records; see Allen, 1964, *Entomologists' mon. Mag.* **100**: 155–157).

— Upper surface black or with faint steel-blue hue. Pronotum (fig. 75b) less constricted basad, sides less, often almost imperceptibly sinuate. Penis (fig. 73c) stouter, broader at middle, apex bent ventrad with tip more pointed. Seventh elytral interval with 2 or more apical punctures. Wings probably constantly full. 8–11 mm.) A small form with more obtuse hind-angles of pronotum, "*decipiens* Dejean", was regarded as a distinct species by Jeannel, 1942

rufitarsis Duftschmid

On open sandy soil.—England, N. to Norfolk and Lancashire. Ireland. Locally abundant.

25 Base of pronotum with expanded, often confluent, more or less wrinkled punctuation. It is sometimes absent medially (notably in *attenuatus*) but always present in the basal fovea and between this and side-margin 26

— Base of pronotum smooth, or punctate in the basal foveae only, sometimes with a few additional punctures close to side-margin 31

26 Fourth and fifth abdominal sternites with fine pubescence at or near middle. Pronotum obliquely depressed inside hind-angles. Upper surface metallic (except in certain females) 27

— Fourth and fifth abdominal sternites only with the usual pair of long setae. Pronotum not depressed latero-basally. Upper surface unmetallic or with very faint steel-blue hue 28

27 Entire upper surface metallic green or coppery in both sexes. Antennae infuscated from second segment. Hind-angles of pronotum somewhat obtuse, rounded at tip. (Body black, legs piceous. Oblique latero-basal depression of pronotum little pronounced. Elytra with weak shoulder-tooth, subapical sinuation of sides faint. Pubescence of abdomen removed from median line. 12–14 mm.)

cupreus Dejean

Ecology not recorded.—England. Established only on the Isle of Wight, where it has been found repeatedly about the edges of a field at Sandown. The old record from Kent is dubious (see Fowler, 1887, 1913). *Possibly originally introduced.*

— Only elytra of male with strong metallic lustre. Antennae entirely rufo-testaceous. Hind-angles of pronotum almost rectangular, sharp (fig. 74). (Piceous brown, upper surface darker but margins of pronotum and usually elytral suture more or less pale; male with strong bluish or greenish lustre, female faintly metallic; all appendages pale. Oblique latero-basal depression of pronotum strong. Shoulder-tooth of elytra protruding, subapical sinuation evident. Abdominal pubescence in median position. 9–11·4 mm.) (Fig. 74)

(*discoideus* Erichson) **smaragdinus** Duftschmid

In open, dry country on sandy soil. During daytime often at the roots of Calluna, *etc.—England, N. to Nottingham. Wales. Local, but sometimes abundant.*

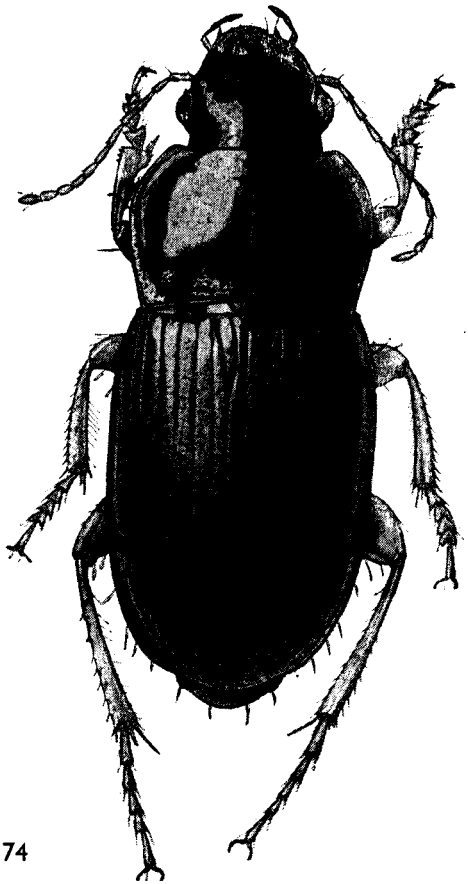

FIG. 74.—*Harpalus smaragdinus* ♂.

28 Third elytral interval with 2 or 3 dorsal punctures. Sides of pronotum more rounded in posterior half (fig. 75c). (Coloured as *latus*, except that the margins of pronotum are usually black and that the elytra of the male often have a slight steel-blue reflection. Very rarely the legs are piceous ("*montivagus* Reitt.") 9·5–12 mm.) ..... (*seriepunctatus* Gyllenhal) **quadripunctatus** Dejean
Among moss and leaves under bushes and trees, usually on gravel (moraine).—England: Northumberland. Scotland: East Highlands. Shetland. Ireland. Local.

— Elytra with a single dorsal puncture 29

29 All appendages rufo-testaceous. Head large. Sides of pronotum almost parallel-sided in basal half (fig. 75d), sometimes slightly sinuate. (Black, margins of pronotum pale. Hind-angles almost rectangular but broadly rounded at tip. The form "*metallescens* Rye" has a faint metallic hue; "*erythrocephalus* F." is no doubt based on immature specimens. 8·2–11 mm.) ..... **latus** Linnaeus
On all kinds of open or slightly shaded ground.—England. Wales. Scotland. Shetland. Ireland. Common.

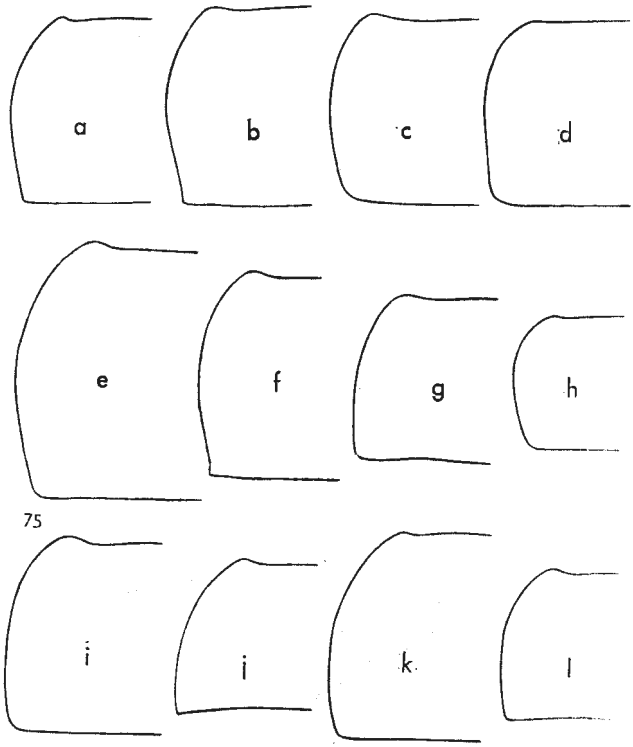

FIG. 75.—*Harpalus*. Pronotum of (a) *calceatus*; (b) *rufitarsis* (typical form); (c) *quadripunctatus*; (d) *latus* (typical); (e) *tenebrosus*; (f) *attenuatus*; (g) *froelichi*; (h) *neglectus*; (i) *tardus* (typical); (j) *servus*; (k) *serripes*; (l) *anxius*.—Various magnifications.

— At least femora black. Head rather narrower than usual. Pronotum somewhat contracted towards base 30

30 Hind-angles of pronotum obtuse, rounded at tip (fig. 75e). Middle antennal segments somewhat infuscated. (Black, elytra sometimes with slight steel-blue hue, legs dark with paler tarsi. Pronotum usually punctate also on centre of base, foveae shallow. 8–11 mm.) ..... **tenebrosus** Dejean

The British form apparently belongs to subsp. centralis *Schauberger. On open, rather dry, gravelly, sandy or chalky soil. Coastal.—England: Cornwall to Kent; Norfolk, Durham. Wales: Glamorgan. Local and rare.*

— Smaller. Hind-angles of pronotum (fig. 75f) rectangular or slightly acute, protruding as a denticle. Antennae entirely rufous. (Black, including femora, but tibiae and tarsi dark rufous. Pronotal foveae deep, well delimited externally, punctuation of base absent or reduced medially. 7–9 mm.)

(*consentaneus* Dejean) **attenuatus** Stephens

In open, sandy or chalky country, usually in dunes at the coast.—England, N. to Yorkshire. Wales: Glamorgan. Scotland: West Lowlands. Locally abundant.

31 Fourth and fifth abdominal sternites with several setiferous punctures, besides the single pair of long setae 32

— Fourth and fifth abdominal sternites only with the ordinary pair of setae 34

32 Antennae entirely rufo-testaceous. Hind-femora with more than 10 setiferous punctures along external margin. The preapical spines on external side of pro-tibia not isolated but only constituting the distal part of the row of spines on the lower surface. (Piceous black, mouth-parts and tarsi pale. A broad, convex species with short but rather narrow pronotum (fig. 75g). A confusion with *tardus* is possible, but this species has less than 10 meta-femoral setae. 8·5–10·4 mm.) ..... **froelichi** Sturm

In open, sandy fields.—England: Dorset, Essex, Suffolk, Norfolk, Yorkshire, Durham. Rare and very local.

— At least antennal segments 2–4 strongly infuscated. Hind-femora with less than 10 marginal setae. The 3–6 external preapical spines of pro-tibia isolated.... 33

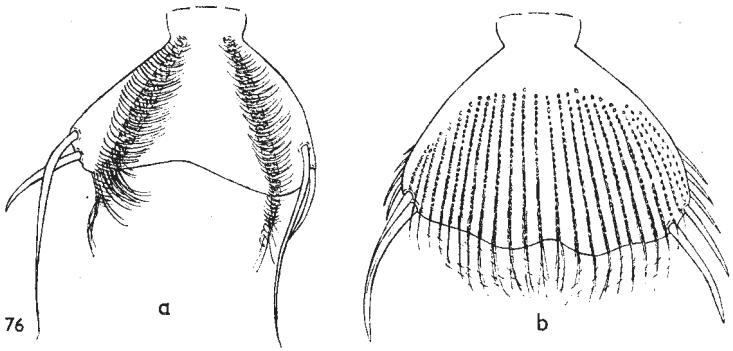

FIG. 76.—Underside of dilated front tarsal segment of ♂ in (a) *Harpalus*; (b) *Anisodactylus*.

33 Not more than 9 mm. Sides of pronotum constricted in basal half (fig. 75h). Preapical spines of pro-tibia 3. Fourth and fifth abdominal sternites with many long setae. (Black, first and outer antennal segments, and tarsi pale. Hind-angles of pronotum entirely rounded, more so than in the "*decipiens*" form of *rufitarsis*, with which it may be confused. Wings either full or strongly reduced. 7–9 mm.) ..... **neglectus** Serville

On sandy soil with sparse vegetation, especially in sand-dunes near the sea.—England: Cornwall to Hampshire; Cheshire to Yorkshire. Wales. Ireland. Locally abundant.

— More than 9 mm. Sides of pronotum rounded but not constricted in basal half (fig. 75k). Pre-apical spines of pro-tibia 4. Fourth and fifth abdominal sternites only with a few extra bristles ..... (*serripes* Quensel; see couplet 38)

34 Antennae entirely pale or very little infuscated from second segment..... 35

— Antennae strongly darkened from second segment..... 37

35 Base of pronotum almost straight, hind-angles broadly rounded (fig. 75i). Pro-tibia with 4-6 pre-apical spines along outer margin. (Black, margins of pronotum somewhat translucent, antennae and palpi rufo-testaceous, tarsi and at least base of tibiae brown. Pronotum almost rectangular with little rounded sides and about rectangular hind-angles; base impunctate or with a few punctures in basal fovea and at hind-angle. 8·4–11 mm.)

(*rufimanus* Marsham) **tardus** Panzer

On sandy and gravelly, rather dry soil. England. Wales. Scotland. Ireland. Common, except in the north.

— Base of pronotum more or less concave, hind-angles less rounded (figs. 75j, l). Pro-tibia with 3 preapical spines..... 36

36 Upper surface piceous to brown. Antennae always entirely pale. Base of pronotum strongly produced laterally, hind-angles more acute (fig. 75j). (Broad and flat, *Amara*-like. Margins of pronotum and often elytra reddish, if so, the latter sometimes with suture darker; of legs at least tarsi pale. 7·5–8·5 mm.)
servus Duftschmid

On fine sand, especially in coastal dunes, with sparse vegetation; burrowed in the ground during daytime.—England: Cornwall; Hampshire to Norfolk; Yorkshire. Wales: Glamorgan. Local.

— Ground-colour black. Antennae slightly infuscated, at least second segment not quite as pale as first. Base of pronotum less concave, hind-angles almost rectangular (fig. 75l) ..... (*anxius* Duftschmid; see couplet 38)

37 Upper surface green or bluish (though dull in the female). Pronotum with sides sinuate basally, hind-angles sharp, about right (*honestus* Duftschmid; see couplet 24)

— Upper surface black or with faintest metallic hue. Sides of pronotum not sinuate, hind-angles obtuse, more or less rounded at tip 38

38 Larger and more convex. Pronotum with base straight and sides evenly rounded (fig. 75k). Pro-tibia with 4–6 preapical spines externally. (Black, upper surface rarely with faint bluish hue; palpi somewhat infuscated, antennal segments 2–4 black, tarsi and sometimes tibiae piceous brown. Abdominal sternites rarely with a few extra setiferous punctures. 9·3–11·5 mm.) ..... **serripes** Quensel

On dry, sandy or gravelly ground, usually near the coast.—England: Cornwall to Norfolk; Cheshire. Wales: Glamorgan. Locally abundant.

— Base of pronotum somewhat concave, sides less rounded in basal half (fig. 75l). Pro-tibia with 3 pre-apical spines. (Similar to *tardus* but smaller and flatter. Coloured the same way, except that the antennae are almost constantly infuscated from second segment. 6·6–8·2 mm.) ..... **anxius** Duftschmid

On sandy soil, usually on the coast.—England: Cornwall to Lincoln; Cheshire, Lancashire, Cumberland. S. Wales. Ireland. Common in the South.

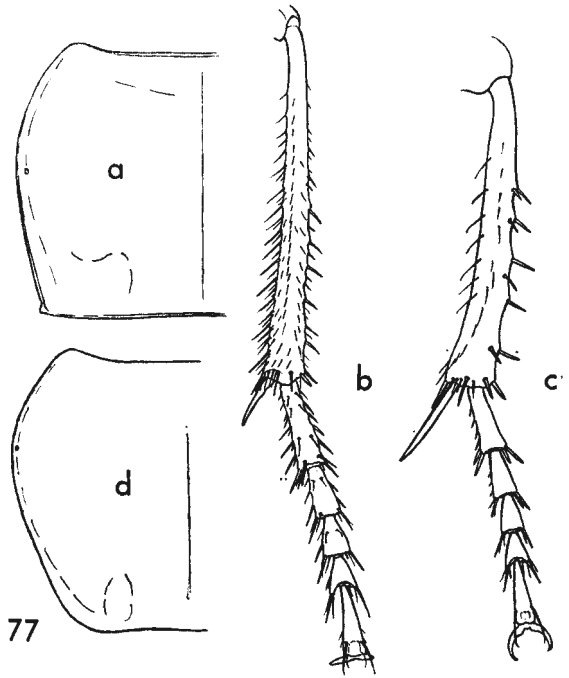

FIG. 77.—(a) Pronotum of *Anisodactylus binotatus*. Hind-leg of (b) ditto; (c) *Harpalus tardus*; (d) Pronotum of *Scybalicus oblongiusculus*.

Genus **Anisodactylus** Dejean

Species of moderate size, superficially very similar to *Harpalus*, from which they differ by much shorter apical spine of meta-tibia, notably in comparison with first tarsal segment (fig. 77b), and the multiserially arranged adhesive hairs of the male pro-tarsi (fig. 76b). Frons with a pair of small, sometimes indistinct reddish spots. Elytra with humeral tooth; outer intervals punctate and pubescent (as in *Harpalus aeneus*); 3rd interval with at least one dorsal puncture. Wings full. In the male, both pro- and meso-tarsi have 4 dilated segments.

Key to Species

1 Upper surface with metallic, usually green lustre. Apical spur of pro-tibia trifid (as in *Amara*, subg. *Zezea*; fig. 63a) (Black, underside faintly, upper surface strongly metallic: green or brassy, rarely bluish; appendages dark, except that first antennal segment is rufous, at least underneath. Pro-femora incrassated in the male. Possible to confuse with *Harpalus aeneus*, but with trifid pro-tibial spur, dark antennae, etc. 10–13·5 mm.)
(*pseudoaeneus* auctt. nec Dejean) **poeciloides** Stephens
In salt-marshes near the sea.—England: in the South, Cornwall to Essex. Local.

– Upper surface unmetallic black. Apical pro-tibial spur simple 2

2 Elytra punctate and pubescent only on the 2–3 outermost intervals. Shoulders angulate. Legs entirely rufous. (Smaller than *binotatus*. Coloured as the pale-legged form of this. Depressed area along side-margin of pronotum more narrowing forwards; hind-angles less prominent. Elytra with subapical sinuation of side-margin somewhat more pronounced. 8–10 mm.)
(*atricornis* Stephens) **nemorivagus** Duftschmid
In drier places than binotatus, *on dry sandy heaths.—England: Dorset to Middlesex, Norfolk. Wales: Glamorgan. Rare.*

– Elytral punctuation and pubescence expanding apically over all intervals. Shoulders rounded. Legs usually dark. (Black, head with two evident rufous spots; antennae with 1 or 2 basal segments red, also palpi and tarsi pale. Specimens with entirely pale legs have been named "*spurcaticornis* Dejean". Pronotum (fig. 77a) with depression along side-margin hardly narrowing in anterior half; hind-angles denticulate. 10–12·8 mm.) ..... **binotatus** Fabricius
Rather hygrophilous, occurring in open grassland on clayish soil, mostly near water. Also in arable land.—England. S. Wales. Scotland. Ireland. Common in the North.

Genus **Scybalicus** Schaum

The single species, by the punctuation and pubescence of the entire upper surface, is reminiscent of a large *Harpalus* of subgen. *Ophonus*. But the microsculpture of the somewhat iridescent elytra is transverse, not reticulate, and the dilated pro-tarsi of the male are covered with "spongy" pubescence underneath, as in *Anisodactylus*; also the meso-tarsi are dilated. A special characteristic of the genus is the sinuation of the basal margin of the elytra on the level of the third entire stria; uneven intervals with larger punctures. The tarsi are pubescent on dorsum. Wings full.

One British Species

Piceous, paler underneath, appendages dark rufous. Pronotum (fig. 77d) strongly constricted towards base, hind-angles very obtuse and rounded, basal foveae shallow. 11–13 mm. ..... **oblongiusculus** Dejean
Ecology not recorded.—England: Dorset. First found at Portland (1878), *later in other localities between St. Albans and Weymouth. No doubt originally introduced.*

Genus **Diachromus** Erichson

A single medium-sized species with entire upper surface densely punctate and with erect pubescence. It is at once recognized on the striking colour pattern. Pronotum with long seta at hind-angle. Wings full. Tarsi pubescent above, the two anterior pairs dilated in the male and with adhesive hairs of the *Anisodactylus* type underneath.

ONE BRITISH SPECIES

Black, pronotum with blue or green reflection and sides narrowly pale; head rufo-testaceous, elytra ferrugineous with a common bluish black spot near apex; appendages pale. Pronotum with sides sinuate and hind-angles about right, sharp. 7·5–10 mm. ..... **germanus** Linnaeus

On open, rather dry meadow ground.—England. Only old records from the South: Cornwall, Devon, Sussex, Kent. Now probably extinct.

Genus **Dicheirotrichus** Duval

(*Dichirotrichus* auctt.)

Two species, confined to the seashore, larger than *Trichocellus* and with entire upper surface punctate and pubescent. Pronotum with sides sinuate before the sharp, almost rectangular hind-angles. Elytra without abbreviated scutellar stria. Wings full. Male with the dilated pro-tarsal segments irregularly hairy below (almost as in *Anisodactylus*), third abdominal sternite foveate (as in *Bradycellus*).

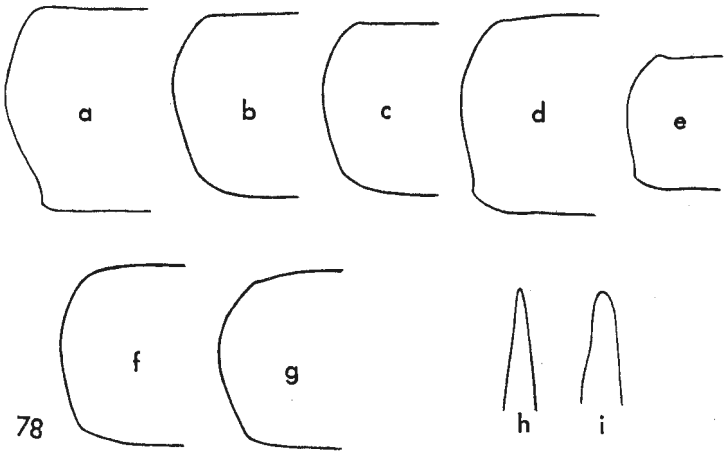

FIG. 78.—Pronotum of (a) *Dicheirotrichus gustavi*; (b) *Trichocellus placidus*; (c) *T. cognatus*; (d) *Bradycellus verbasci*; (e) *B. ruficollis*; (f) *B. harpalinus*; (g) *B. collaris*. Penis apex of (h) *B. harpalinus*; (i) *B. csikii*.

KEY TO SPECIES

1 Punctuation of upper surface coarse, on the elytra forming only 1 or 2 rows on each interval. (Sexes usually differently coloured: female entirely testaceous or with dark spot on head, pronotum and each elytron; these spots are sometimes more expanded but extreme margins of pronotum and a broad border along sides and apex of elytra are always pale; legs pale. Male entirely black or, usually, with two spots on head, margins of pronotum, shoulder, side-margins and suture of elytra rufous; legs more or less infuscated. The palest males are similar to the darkest females. Narrower than *obsoletus*, with pronotum (fig. 78a) more constricted basally. 5·2–7·5 mm.) ..... (*pubescens* Paykull) **gustavi** Crotch

On clay just above the tidal zone.—England. Wales. Scotland. Shetland. Ireland. Often abundant.

– Punctuation denser and pubescence shorter, on each elytral interval about three rows of punctures. (No sexual difference in colour: rufo-testaceous, head sometimes slightly darker, each elytron with a dark longitudinal band of varying extension, rarely indistinct. Elytral striae finer, less evidently punctate. 5·5–7·5 mm.) ..... **obsoletus** Dejean

Habitat as gustavi.—*S.E. England: Cornwall to Essex, N. to Lincoln. Scotland: West Lowlands. Ireland. Local.*

Genus **Trichocellus** Ganglbauer

Separated from *Dicheirotrichus*, of which they look like diminutive copies, by the restricted pubescence of upper surface and the quite rounded hind-angles of pronotum. Abbreviated scutellar stria of elytra entirely lacking, as in *Dicheirotrichus* and certain *Bradycellus*; from the latter genus differing by the punctuation and pubescence of lateral parts of head, pronotum and elytra. Wings full. Male with 4 dilated pro-tarsal segments.

Key to Species

1 Only first antennal segment pale, rufous. Legs more or less infuscated. Punctuation and pubescence of outer elytral intervals distinct. (Piceous to black, side-margins and base of pronotum, elytra except, on each, a large longitudinal macula, posteriorly clear ru ous; legs often with only base of tibiae pale. The dark elytral spots may expand so as to leave only margins, base and suture pale. Pronotum, fig. 78c. Elytral pubescence sometimes sparsely present also on inner intervals. 3·5–4·2 mm.) ..... **cognatus** Gyllenhal

In open country, both on sand (*see habitat of* Miscodera) *and peat, e.g. under* Calluna *and* Empetrum. *Usually in hilly and mountainous districts.—England, S. to Warwick and Cambridge; isolated* (*possibly accidental*) *in Hampshire. N. Wales. Scotland* (*generally*). *Shetland. Ireland.*

– Antennae almost constantly with 2 or 3 pale basal segments. Legs entirely pale. Punctuation and pubescence of outer elytral intervals extremely fine. (Usually larger and always paler than *cognatus*. Piceous brown, pronotum rufous or yellowish with central dark spot of varying size though not reaching any margin; longitudinal elytral spot usually occupying only third interval. Pronotum (fig. 78b) flatter, somewhat more widened anteriorly. Elytral punctuation and pubescence best visible near apex. 4–5·5 mm.) ..... **placidus** Gyllenhal

On shaded places under deciduous trees and bushes, often in fenland habitats e.g. in reed litter.—England. Wales. Scotland. Ireland. Local but sometimes abundant.

Genus **Bradycellus** Erichson

Small beetles, more convex than *Acupalpus* (fig. 79) and with entirely pale appendages. Separated from other small Harpalines by the presence of a mentum tooth (as in fig. 55e). Colour brown or piceous, to almost black with pale suture. Elytra not iridescent (cf. *Acupalpus*); scutellar stria often reduced; microsculpture absent or rudimentary. Wings often reduced. Separated from other, superficially similar

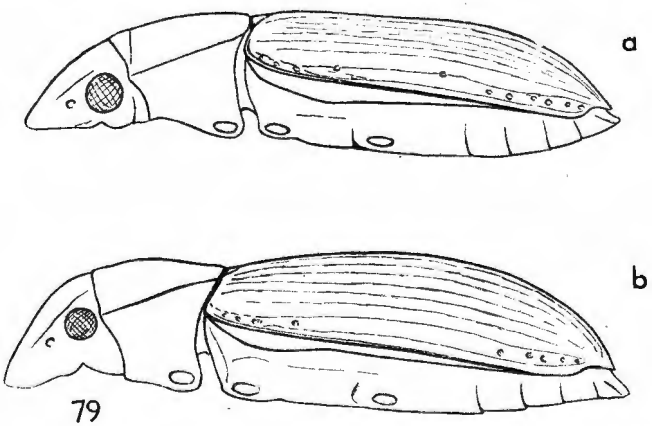

Fig. 79. Profile of body in (a) *Acupalpus*; (b) *Bradycellus*.—Somewhat generalized.

small ground-beetles as mentioned under *Acupalpus*. Male with pro-tarsi (in *ruficollis* also meso-tarsi) moderately dilated; third abdominal sternite with an oval, punctate and pubescent fovea.

The species occur in open country and are not dependent upon the vicinity of water.

KEY TO SPECIES

1 Hind-angles of pronotum (figs. 78d, e) more or less obtuse and rounded at extreme tip but always well defined, sides in front of them sinuate, though often faintly so 2

– Hind-angles of pronotum (figs. 78f, g) entirely rounded, virtually obsolete; sides not sinuate 5

2 Below 3·5 mm. Elytra almost black with suture sharp rufous. Also meso-tarsi dilated in the male. (Subgen. *Tetraplatypus* Tschitschérine) (Smallest species of the genus. Piceous black, pronotum often paler. Eyes rather flat. Pronotum (fig. 78e) with deep, more or less punctate basal foveae. Elytra with complete scutellar stria, subapical sinuation of side-margin more pronounced than in *collaris*. Wings full in specimens seen. 2·5–3·4 mm.)
(*similis* Dejean) **ruficollis** Stephens

Under Calluna *on sand, gravel or peat. Often together with* collaris.—*England. Wales. Scotland. Ireland. Common.*

– 4 mm. or more. Elytra unicolorous or with suture indistinctly paler. Only pro-tarsi dilated in the male (Subgen. *Bradycellus s.str.*) 3

3 Pronotum with fine but distinct punctuation at anterior margin. Elytra without dorsal puncture. (Rufo-piceous, forebody and suture usually slightly paler. Pronotum and elytra very convex, the former less constricted posteriorly than in *sharpi*; entire base rather strongly punctate. Wings probably dimorphic, but British specimens investigated are brachypterous. 4–4·5 mm.)
distinctus Dejean

Seems to prefer sandy soil; coastal.—England: Dorset, Hampshire, Kent, Berkshire(?), Cheshire. Wales: Glamorgan. Ireland. Very local.

– Pronotum smooth anteriorly, sometimes wrinkled or with a few punctures. Elytra with dorsal puncture on third interval, adjoining second stria, behind middle .. 4

4 Wings quite reduced. Ground-colour piceous (darker than in *distinctus*). Lateral bead of pronotum not prolonged upon base. (Less convex than *distinctus*. Forebody narrower with pronotum more constricted basally. Elytra more oviform with narrower shoulders. Suture indistinctly pale. 4–4·5 mm.)
(*distinctus* Fowler nec Dejean) **sharpi** Joy

Under leaves and moss in shaded places, usually near water.—England, N. to Cambridge and Worcester. Wales. Scotland. Ireland. Locally abundant in the South.

– Wings constantly full. Ground-colour rufo-testaceous. Lateral bead of pronotum prolonged inside hind-angle. (Elytra often clouded apically, except along suture. Forebody narrow as in *sharpi* but elytra more parallel-sided at middle and broader over shoulders. Pronotum, fig. 78d. 4·5–5·2 mm.)
verbasci Duftschmid

Usually on sandy or gravelly soil. It comes regularly to light.—England, generally. Wales: Glamorgan. Scotland. Ireland. Common.

5 Pronotum piceous to almost black with all margins more or less clearly pale 6

– Pronotum rufous or brown, unicolorous or with quite indistinct cloud at middle or posteriorly 7

6 Eyes strongly protruding, virtually hemispherical. Basal foveae of pronotum rather deep. Elytral intervals without micro-punctures. Penis (figs. 78h, 80a) with narrow, pointed apex; internal sac ventrally near apex with a group of slender spines. (Much varying in colour, from almost as pale as *verbasci* to the dark pattern of *csikii*. Hind-angles of pronotum (fig. 78f) as a rule not entirely absent, punctuation usually restricted to the basal foveae and their neares surroundings. Wings dimorphic. 3·8–4·2 mm.) ..... **harpalinus** Serville

Usually on sandy soil, often under Calluna *together with* collaris. *Regularly coming to light.—England. Wales. Scotland. Shetland. Ireland. Often abundant; has increased in recent years.*

– Eyes somewhat flatter. Basal foveae of pronotum shallower. Elytra with very sparse, irregularly arranged, shallow micro-punctures on at least some of the inner intervals. Penis (figs. 78i, 80b) with broad, blunt apex; internal sae without spines. (Always dark piceous, all margins of pronotum and suture pale. Basal punctuation of pronotum usually more expanded and hind-angles almost obsolete. Wings dimorphic on the continent; the British specimen is macropterous. 3·5–4·3 mm.) ..... **csikii** Laczó

On the continent mostly on clayish soil.—Only a single British male known: Woking, Surrey, (G. C. Champion) (Brit. Mus.).

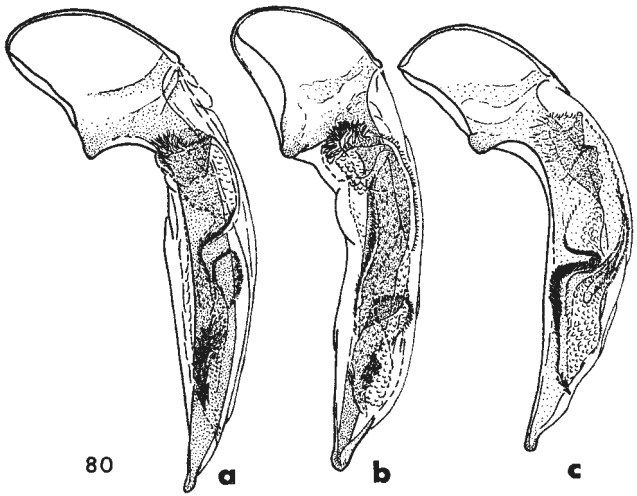

FIG. 80.—*Bradycellus*. Penis of (a) *harpalinus*; (b) *csikii*; (c) *collaris*.

7 Often 4 mm. or more. Pronotum smaller and narrower as compared with elytra; sides less rounded with marginal bead prolonged upon base, reaching fovea. (Reddish brown, head and elytra often darker. Internal sac of penis (fig. 80a) with a ventral group of spines near apex. Wings usually full.)
(*harpalinus* Serville; see couplet 6)

– Less than 4 mm. Pronotum larger, elytra narrower, entire body therefore more cylindrical. Basal bead of pronotum (outside fovea) feebly developed or almost obsolete. (Coloured as pale *harpalinus*; pronotum (fig. 78g) sometimes with faint cloud at middle or posteriorly. Wings usually quite reduced. Internal sac of penis (fig. 80c) without spines but with a characteristic folding pattern. 3·0–3·9 mm.) ..... **collaris** Paykull

On sand and gravel, often under Calluna *in company with* ruficollis *or* harpalinus. *—England, mostly in mountain areas, S. to Cambridge. Wales. Scotland. Ireland. Not rare in the North.*

Genus **Stenolophus** Dejean

Related to *Acupalpus* but of larger size (not below 5 mm.). Somewhat reminiscent of *Badister* in body proportions as well as in the strongly iridescent (transversely micro-sculptured) elytra; but the mandibles are symmetrical, only one supra-orbital puncture is present on frons, etc. Legs and base of antennae pale. Pronotum with sides rounded to hind-angles which are virtually obsolete. Last segment of maxillary palpi blunt (fig. 81c). Posterior group of marginal punctures of elytra interrupted at middle (fig. 81a). First segment of meta-tarsi with thin external keel. Wings full. Pro-tarsi and usually, though faintly, meso-tarsi dilated in the male, fourth segment of the former strongly bilobed.

Hygrophilous beetles, occurring at the margin of fresh water.

Two species reported as British should be removed from the list:

S. abdominalis Gené. Similar to *teutonus* but with abdomen rufous instead of black, hind-angles of pronotum more rounded, and penis much larger and stouter. Recorded from the Isle of Wight; I have seen no British specimen. The species is strictly Mediterranean and, if correctly identified, the British occurrence must be due to accidental introduction.

S. plagiatus Gorham (1901). Described from two specimens found at Gourock, Scotland, near the mouth of the Clyde estuary. A female in the

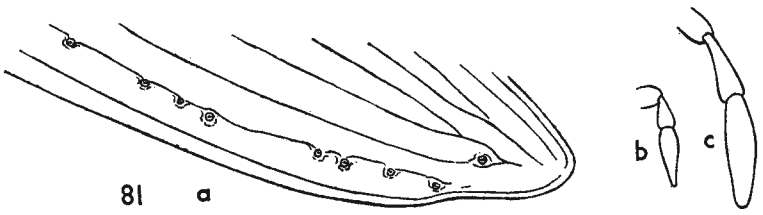

FIG. 81.—(a) Posterior group of marginal elytral punctures in *Stenolophus*. Maxillary palp of (b) *Acupalpus*; (c) *Stenolophus*.

Gorham collection, Birmingham, belongs to the North American *S.* (*Agonoderus*) *comma* F., apparently introduced and not established. (See 1971, *Entomologist's mon. Mag.* **107**: 214).

KEY TO SPECIES

1 Pronotum entirely rufous, basal foveae impunctate or with a few scattered punctures. Antennae with 2 pale basal segments 2

– Pronotum dark, only extreme margins pale, basal foveae more or less punctate. Only first antennal segment pale. (Elytra piceous black to brown, extreme margins, including suture, and often base extensively pale. Pronotum narrower than in following species, sides less rounded, base unmargined. The darkest form has been called "*ziegleri* Panzer". 5·1–5·6 mm.)

(*vespertinus* Panzer) **mixtus** Herbst

At the margin of ponds, pools and streams on moist, muddy, vegetated soil.—England, N. to Durham. Wales. Ireland. Locally abundant.

2 Lateral bead of pronotum prolonged upon base. Elytra entirely pale or indistinctly darker in apical third. (Rufo-testaceous with black head. Elytra with intervals less convex at apex, which is more produced. 5–6 mm.)

skrimshiranus Stephens

In marshy places, like the preceding; near the coast.—S.E. England, N. to Norfolk. Local and rare.

– Raised lateral bead of pronotum ceasing at hind-angle. Elytra with well-defined black macula, extending from apex to before middle. (Somewhat stouter. Colour more clear rufous. Elytral intervals very convex at apex. 5·5–6·2 mm.)

(*vaporariorum* Fabricius, *anglicus* Schiødte) **teutonus** Schrank

On moist ground, sometimes in open country, e.g. in clay pits.—S. England, N. to Gloucester and Cambridge. Doubtfully in Wales. Mostly single specimens.

Genus **Acupalpus** Latreille

Small species (not above 5 mm.), in general habitus (figs. 19a, 83) reminiscent of *Bembidion* or *Trechus*; separated from the former by well developed, pointed terminal segment of the maxillary palpi (fig. 81b), from the latter by non-recurrent sutural stria

of elytra; from both by lack of an anterior supra-orbital puncture on frons, as well as of a seta at hind-angle of pronotum. Body unmetallic but elytra (except in *meridianus*) more or less iridescent from dense, transverse microsculpture. Antennae with base (1 or 2 segments) paler than the following. Posterior group of marginal punctures of elytra continuous (cf. fig. 81a). Wings constantly developed. Meta-tarsi not carinate externally. Male with pro-tarsi and usually, though faintly, meso-tarsi dilated; abdomen without central fovea (cf. *Bradycellus*).

The species (except *meridianus*) are hygrophilous and mostly found at the margin of fresh water.

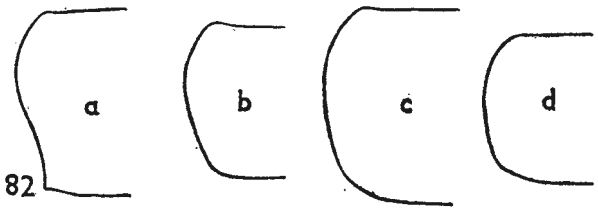

FIG. 82.—*Acupalpus*. Pronotum of (a) *consputus*; (b) *meridianus*; (c) *elegans*; (d) *dorsalis*.

KEY TO SPECIES

1 Pronotum (fig. 82a) with sides sinuate behind and posterior angles sharp rectangular. Antennae long and slender. Abdomen conspicuously pubescent. (Subgen. *Anthracus* Motschulsky) (Dark brown, head almost black, pronotum often paler, rufous, or with pale margins, elytra yellowish, each with oblong dark macula which may expand so as to leave only shoulders and margins pale. Elytra elongate, parallel-sided. This species may possibly be confused with *Badister sodalis* which, however, has asymmetric mandibles. 3·8–5 mm.)
consputus Duftschmid

Among grass and leaves in shaded places at the margin of ponds and pools, also on the coast.—England, N. to Yorkshire. Locally abundant.

– Pronotum shorter with sides not sinuate and hind-angles completely rounded. Abdomen only with short, sparse pubescence. (Subgen. *Acupalpus s.str*).....2

2 Very shiny, elytra without microsculpture. Pronotum with entire base punctate. Elytral striae with fine punctulae in basal half. (Black, pronotum often dark rufous, elytra with long, oblique shoulder-macula and suture rufo-testaceous; femora and apex of tibiae often slightly infuscated. Pronotum (fig. 82b) more constricted posteriorly than in all following species. 3·2–3·8 mm.)
meridianus Linnaeus

Not clearly hygrophilous, occurring in open, often agricultural country on clayish or sandy soil. A spring species.—England, N. to Yorkshire. Wales: Glamorgan. Common in the South.

– Elytra more or less iridescent due to very dense transverse microsculpture. Pronotum with base punctate only laterally or quite impunctate. Elytral striae smooth.....3

3 Elytra without dorsal puncture.....4

– Elytra behind middle with a dorsal puncture on third interval, adjoining second stria.....5

4 Body uniform in coloration, piceous to black, only suture (at least apically) and extreme margins of pronotum and elytra, sometimes elytra generally, notably at apex, a littler paler. Only first antennal segment pale. (Basal foveae of pronotum rather deep, punctate. Thereby separated from similarly coloured specimens of *dorsalis*. 3–3·5 mm.).....(*brunneipes* auctt.) **brunnipes** Sturm

Among moss etc., near water.—England: Dorset to Surrey, Hertford. Rare.

– Black, pronotum rufo-testaceous, elytra piceous with base and suture rufous. Antennae with 2 pale basal segments. (Pronotum with shallow, impunctate basal foveae. Separated from the palest form of *dorsalis* by shorter, more convex body, notably by the shorter elytra. 2·6–3·5 mm.) (Fig. 83)

flavicollis Sturm

Near fresh, often running water on fine, moist sand with short, sparse vegetation; also on cliffs. Rarely on peat.—England: Devon to Kent, Cambridge. Rare.

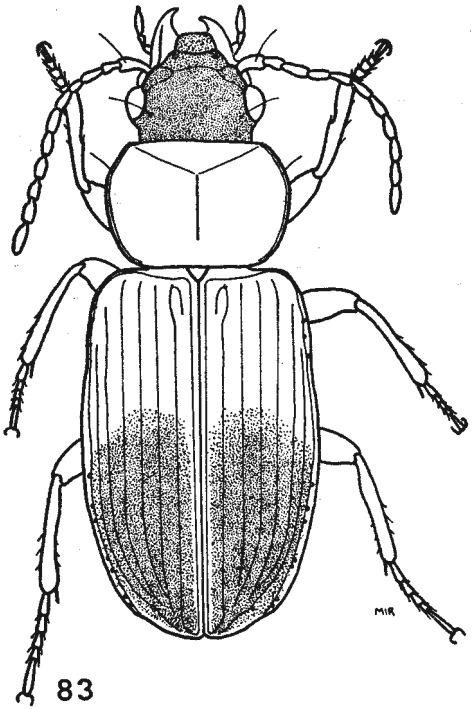

FIG. 83.—*Acupalpus flavicollis* ♂.

5 Pronotum bright rufous, sometimes with central dark spot, strongly contrasting against the black head and the dark markings of the bicoloured elytra.....6

– Pronotum from black to brown, often with paler margins, little contrasting against head and ground colour of elytra; the latter often immaculate.....7

6 Pronotum (fig. 82c) convex with strongly rounded sides and wholly obsolete hind-angles. Antennae with 2 pale basal segments. Pro-tibiae (fig. 84a) stouter, fourth tarsal segment of male deeply bilobed. (Black, pronotum rufous, sometimes dark at middle, elytra rufo-testaceous, each as a rule with oblong black macula. Internal sac of penis with about 15 big teeth. 3·5–4·5 mm.)

elegans Dejean

Confined to saline habitats on the coast; in marshes and among refuse.—S.E. England: Kent, Essex; Yorkshire. Rare.

– Pronotum (fig. 82d) flatter with less rounded sides and usually at least suggested hind-angles. Second antennal segment normally more or less infuscated. Pro-legs (fig. 84b) with fourth tarsal segment of male only emarginate at apex. (Same coloration. Internal sac of penis with less than 10 teeth. 3–4 mm.)

(*dorsalis* Fabricius; see couplet 7)

7 At least 3 mm. Elytra with well delimited pale shoulder macula. Pronotum (fig. 82d) much wider than head, with margins more or less narrowly pale. (Rather flat. Much varying in colour; pronotum from entirely rufous to black with narrowly pale margins; antennae with first, rarely also second, segment pale. Pronotum usually with hind-angles suggested, basal foveae at most very sparsely punctate. Internal sac of penis with less than 10 teeth. 3–4 mm.)
(*derelictus* Dawson) **dorsalis** Fabricius

At the margin of all kinds of fresh, sometimes acid waters, where the soil is moist and the vegetation rich.—England, N. to Yorkshire. Wales. Ireland. Locally abundant.

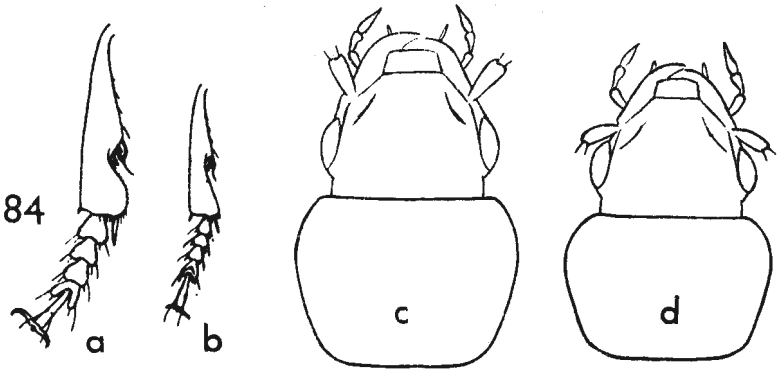

FIG. 84.—*Acupalpus*. Front tibia of ♂ in (a) *elegans*; (b) *dorsalis*. Forebody of (c) *dubius*; (d) *exiguus*.

– Below 3 mm. Elytra unicolorous without shoulder macula, but usually with suture, rarely entire base, pale. Pronotum narrower (figs. 84c, d), margins not pale. . . 8

8 Entire body brown, head and abdomen somewhat darker, legs pale or with tibiae faintly infuscated at apex. Forebody, fig. 84c. (Pronotum often indistinctly darker at middle and base, elytra usually darker apically, except pale along suture. Pronotum with rather deep basal foveae. 2·5–2·7 mm.)
(*luridus* auctt. nec Dejean) **dubius** Schilsky

On moist and shady places, e.g. among leaves and moss in marshes and at the margin of forest pools.—England, N. to Yorkshire. Wales. Scotland: West Lowlands. Ireland. Locally abundant.

Body piceous black, unicolorous, except narrowly rufous along suture; tibiae largely dark. Head (fig. 84d), as compared with pronotum, wider than in any other species. (Pronotal foveae shallow. Superficially somewhat reminiscent of *Metabletus* but with complete elytral striae. 2·2–2·8 mm.) . . . . **exiguus** Dejean

In moist, somewhat shady places, on sand, mud and clay among debris near water; often coastal.—England, N. to Cumberland. Wales: Glamorgan. Local and not common.

Tribe **LICININI**

Genus **Licinus** Latreille

Much larger species than *Badister*, with upper surface coarsely punctate and elytra opaque, not iridescent. Also *Licinus* has asymmetric mouth-parts: both labrum and mandibles. Terminal palpal segments triangular. Pronotum (fig. 85a) broad with rounded sides and hind-angles. Elytra without dorsal punctures. Only 2 pro-tarsal segments dilated in the male.

The species occur in open, rather dry country. The main food, at least of the larva, seems to be shell-bearing snails.

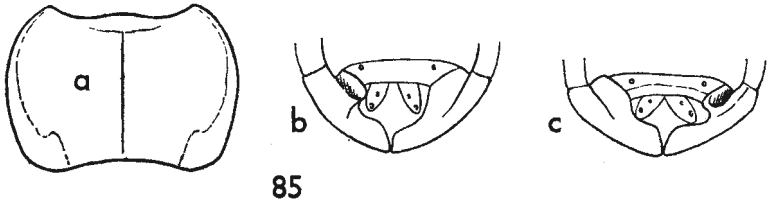

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FIG. 85.—(a) Pronotum of *Licinus depressus*. Mouthparts (generalized) of (b) *Badister s.str.*; (c) subg. *Baudia*.

KEY TO SPECIES

1 Elytral intervals wih coarse, sparse punctures, mostly forming a single row, the uneven ones more convex. Shoulders completely rounded. (Entirely black. Right mandible with dorsal notch. Wings developed. 13–18 mm.)
(*silphoides* auctt. nec Rossi) **punctatulus** Fabricius
In chalky districts, often on the coast. Mostly in the autumn.—England: Dorset to Kent; Oxford, Northampton. Locally not uncommon.

– Smaller. All elytral intervals equal, densely and rather finely punctate. Shoulders angulate though rounded at tip. (Entirely black, elytra more opaque in the female. Mandibles without notch. Pronotum more densely punctate. Subapical sinuation of elytral sides shallower. Wings quite reduced. 9·5–11·8 mm.)
depressus Paykull
On dry sand, gravel or chalk. Mostly found in the autumn.—England, N. to Durham. Wales: Glamorgan. Local and rare.

Genus **Badister** Clairville

Small species, easily recognized on their mouth-parts (figs. 85b, c): the labrum is deeply emarginate, almost cleft, and the mandibles strongly asymmetric, one (either the right or the left) with big dorsal notch. Terminal segment of maxillary palpi cylindrical. Second segment of antennae very short (about one-third of first segment). Elytra more or less iridescent from dense transverse microsculpture, striae fine and impunctate

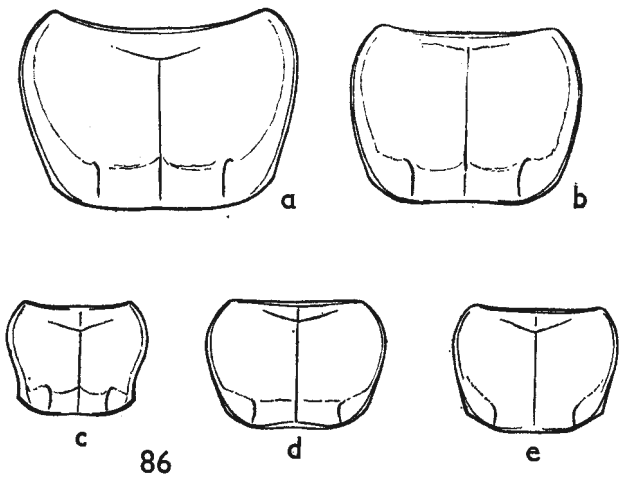

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FIG. 86.—*Badister*. Pronotum of (a) *unipustulatus*; (b) *bipustulatus*; (c) *sodalis*; (d) *dilatatus*; (e) *peltatus*.

but complete; 2 dorsal punctures. Wings with reflexed apex, somewhat reduced in *sodalis*. Male with 3 strongly dilated pro-tarsal segments. Penis peculiar: the sclerotization of its dorsum is restricted to 2 or 3 longitudinal strips.

Most species are difficult to separate and the male genitalia should always be studied.

KEY TO SPECIES

1 Pronotum bright rufous, head black; elytra pale with black markings. (Subgen. *Badister* s.str) 2
– Pronotum as dark as head, though with extreme margins somewhat paler; elytra entirely dark or with pale humeral macula 4

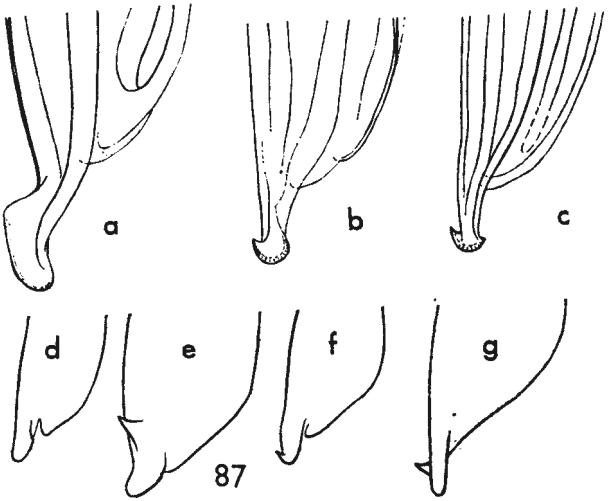

FIG. 87.—*Badister*. Penis apex, lateral view, of (a) *unipustulatus*; (b) *meridionalis*; (c) *bipustulatus*; (d) *sodalis*; (e) *dilatatus*; (f) *peltatus*; (g) *anomalus*.

2 7 mm. or more. Pronotum (fig. 86a) more dilated anteriorly. Mes-episterna (see fig. 3, *mse*) and scutellum pale as the base of elytra. (Largest species of the genus. Black, pronotum and ground-colour of elytra bright rufous, the latter each with two large black spots, one at apex, the other just behind middle, often fused along side-margin; middle of antennae and sometimes palpi infuscated, legs rufous. Elytra strongly iridescent. Head larger than in all following species. Microsculpture on centre of pronotum consisting of transverse meshes. Penis (fig. 87a) with S-shaped apex. 7–9·1 mm.) ..... **unipustulatus** Bonelli

Among leaves and moss on moist, shaded places, usually near pools.—England, N. to Nottingham. Ireland. Local.

– Rarely above 7 mm. Pronotum, fig. 86b. Mes-episterna black, scutellum almost constantly darker than surrounding parts of elytra 3

3 First antennal segment entirely rufous (exceptionally with faintest shadow apically). Microsculpture of pronotum isodiametric on disc; on the elytra transverse but rather coarse, which causes moderate iridescence. Apex of penis (fig. 87c), in side view, "hooked" both dorsally and ventrally. (Smallest species of the sub-genus. Coloured as *unipustulatus* but with scutellum and mes-episterna dark; the black markings of elytra usually more expanded, the two spots more broadly connected, as a rule. Head narrower. Pronotum, fig. 86b. 4·8–6·5 mm.)

bipustulatus Fabricius

The most eurytopic Badister, *occurring in dry as well as rather moist, in open as well as in somewhat shaded, places, e.g. under bushes and in open forests.—England. Wales. Scotland. Ireland. Common.*

– First antennal segment more or less infuscated apically. Micro-meshes of pronotum somewhat transverse; elytra strongly iridescent due to extremely fine and dense transverse microsculpture. Penis (fig. 87b) with apex "hooked" ventrally only. (Very similar to *bipustulatus*. More slender in habitus. Pale parts a little more bright rufous. Microsculpture as in *unipustulatus*. 6·2–7·2 mm.)
(*kineli* Makolski) **meridionalis** Puel
In more open country than the two preceding but probably always near water.—England: Oxford district (J. J. Walker); Tewkesbury, Gloucester (C.E. Tottenham).

4 Elytra with well defined pale humeral spot. Legs testaceous. Right mandible notched (fig. 85b). (Subgen. *Trimorphus* Stephens) (Black or piceous, margins of pronotum and elytra, including suture, pale. Pronotum (fig. 86c) with coarse microsculpture, not iridescent. Wings somewhat reduced, though with reflexed apex. Penis with simple apex (fig. 87d). 3·9–4·8 mm.)
(*humeralis* Bonelli) **sodalis** Duftschmid
Habitat as for unipustulatus *but not always near water.—England. Wales. Scotland: West Lowlands. Ireland. Local.*

– Elytra unicolorous, dark. Legs more or less infuscated. Left mandible notched (fig. 85c). (Subgen. *Baudia* Ragusa) 5

5 Hind-angles of pronotum less rounded (fig. 86e), base inside them almost rectilinearly oblique. Ventral hook of penis at or near apex 6

– Pronotum (fig. 86d) broader, hind-angles rounded, oblique lateral part of base slightly arcuate. Ventral hook of penis (fig. 87e) well removed from apex. (Stouter and usually larger than the two following. Ground-colour almost black, margins of pronotum and elytra, including suture, rufescent; appendages largely pale brownish but antennae, tarsi and apex of tibiae infuscated. Head broader. Elytral apex more suddenly rounded. 5–5·9 mm.)
dilatatus Chaudoir
Habitat as peltatus *with which it is sometimes associated.—S. England: Cornwall to Lincoln. Ireland.*

6 Elytra with somewhat impressed striae and slightly convex intervals. Hook of penis truly apical (fig. 87f). (Piceous, margins of body and partly appendages pale to the same extent as in *dilatatus* but more ferrugineous than rufous. Hind-angles of pronotum (fig. 86e) better developed. 4·3–5·4 mm.)
peltatus Panzer
Among leaves, dry reeds, etc., on somewhat shaded margins of fresh water; on clayish or muddy soil.—England: Hampshire, Sussex, Kent.

– Elytral striae very fine, intervals quite flat. Hook of penis subapical (fig. 87g). (Almost impossible to separate decisively from *peltatus* except on male genitalia. The structure of elytral striae and intervals is, however, only exceptionally similar in *peltatus*. The coloration is the same. 4–5 mm.)
(*striatulus* V. Hansen) **anomalus** Perris
Habitat as peltatus.—*England: Dorset, Sussex, Kent.*

Tribe **PANAGAEINI**

Genus **Panagaeus** Latreille

The square head, with excessively protruding eyes and broad, eccentrically inserted terminal palpal segments (fig. 88a), is very characteristic. Entire body with long, erect setae. Pronotum almost circular, very coarsely punctate. Elytra each with two bright red spots; their striae strongly, intervals more finely punctate. Wings full. Male with 2 dilated pro-tarsal segments.

Key to Species

1 Pronotum (fig. 88b) broader, more or less sinuate posteriorly. Posterior red spot of elytra almost constantly reaching side-margin. (Black, each elytron with two orange red spots. Pronotum virtually smooth between the coarse punctures. 7·5–9 mm.) .....**cruxmajor** Linnaeus
Strongly hygrophilous, occurring at the margin of standing or slowly running waters, where the soil is soft and the vegetation rich.—England, N. to Yorkshire. Wales: Glamorgan. Ireland. Very local.

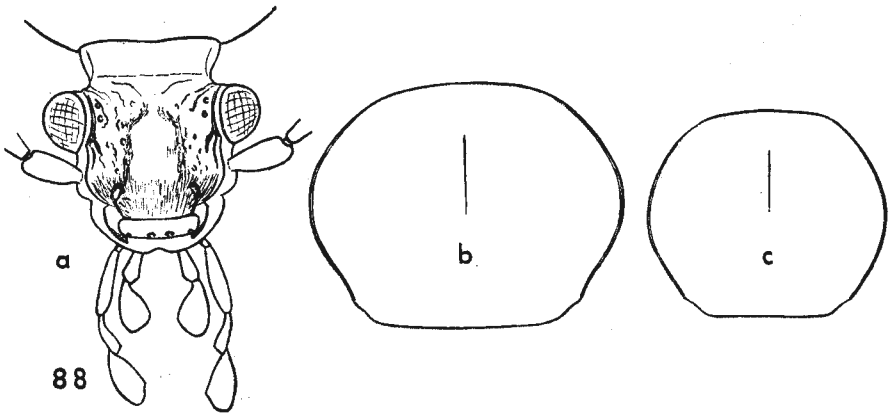

FIG. 88.—*Panagaeus*. (a) Head of *cruxmajor*. Pronotum of (b) ditto; (c) *bipustulatus*.

– Pronotum (fig. 88c) very faintly or not at all sinuate posteriorly. Posterior elytral spot separated by black from side-margin. (Smaller and slenderer. Pale spots more deep red. Head narrower with eyes less protruding. Pronotal punctures coarser, more irregular, with much finer punctures in between. Elytra with sides more rounded, shoulders less protruding, intervals with sparser but somewhat stronger punctures. Male pro-tarsi less dilated. 6·5–7·5 mm.)
(*quadripustulatus* Sturm) **bipustulatus** Fabricius

Almost xerophilous, on open, sandy or gravelly ground with short meadow vegetation; often in chalky districts. The two species are never found together.—England, to Yorkshire. Local and rare.

Tribe **CHLAENIINI**

Genus **Chlaenius** Bonelli

Rather large beetles with (in our species) entire upper surface punctate and pubescent and with more or less pronounced metallic lustre, at least on forebody. Elytra without dorsal punctures on third interval, epipleura crossed near apex. Terminal palpal segments truncate at tip. Tibiae not pubescent. Wings full. Male with 3 dilated pro-tarsal segments.

The beetles fly excellently and are sometimes found as stragglers in shore-drift. The summer habitat is close to water but hibernation takes place in dry country.

KEY TO SPECIES

1 Elytra with sides and apex yellow. Hind-angles of pronotum (fig. 89a) sharp, rectangular. (Black to piceous, upper surface green, also extreme side-margin of pronotum and elytral epipleura brownish yellow, all appendages pale. Pubescence yellowish. 8·5–11 mm.) ..... **vestitus** Paykull

At the border of water, often small ponds, on clay or muddy sand.—England, N. to Yorkshire. S. Wales. Ireland. Local but sometimes abundant.

– Elytra unicolorous, dark or metallic. Hind-angles of pronotum obtuse, rounded . . 2

2 Antennae entirely dark. Only head with evident metallic lustre. (Black, head greenish or bluish, pronotum and elytra usually faintly bronzed; legs dark. Habitus as *nigricornis* but the pronotum (fig. 89b) is narrower with shallower basal foveae and the elytra are more elongate. 11–13 mm.)
(*holosericeus* Fabricius) **tristis** Schaller

On lake-shores with clayish soil and rich vegetation; often associated with Blethisa. *—England: Huntingdon, Cambridge. Wales (doubtful). Ireland. Only old records, possibly extinct.*

– At least underside of first antennal segment pale. Entire upper surface (with very rare individual exceptions) vividly metallic 3

3 Only first antennal segment pale; palpi infuscated. (Forebody, at least pronotum, normally golden or coppery, elytra green; rarely entire body greenish or even as dark as to cause confusion with *tristis* (see that species). Specimens with rufous femora are called "*melanocornis* Dejean". Pronotum, fig. 89c. 10–12·5 mm.)
nigricornis Fabricius

Commonest species of the genus but local, occurring on several types of lake shores and river banks, often under heaps of reeds etc.—England. S. Wales. Scotland. Ireland.

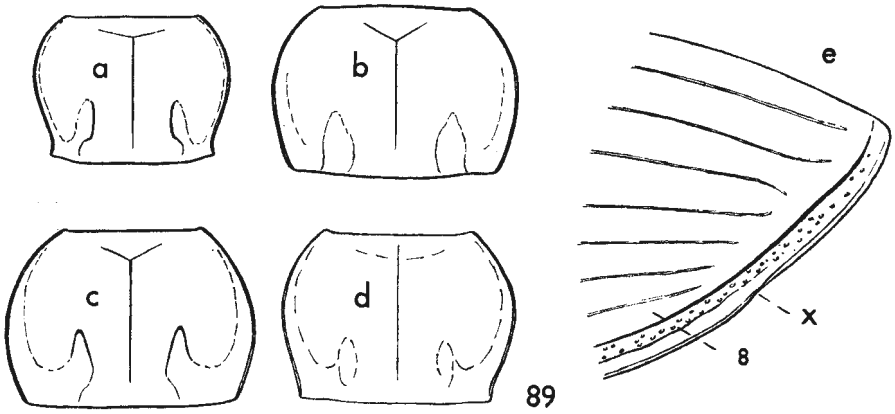

FIG. 89.—Pronotum of (a) *Chlaenius vestitus*; (b) *C. tristis*; (c) *C. nigricornis*; (d) *C. nitidulus*; (e) elytral apex of *Oodes*. X, crossing of epipleuron.

– Antennae with 2 or 3 pale basal segments; palpi entirely pale. (Very similar to the preceding but with less colour contrast between forebody and elytra than normal *nigricornis;* femora always infuscated. Pronotum (fig. 89d) with greatest width before middle and sides somewhat sinuate toward hind-angles which are pronounced. Lower surface with sparser punctuation. 10–12 mm.)
(*schranki* Duftschmid) **nitidulus** Schrank

Among grasses and mosses in silty and damp places; coastal.—England: Dorset, Isle of Wight, Sussex. Very rare.

Genus **Callistus** Bonelli

Related to *Chlaenius* and, like it, with dense pubescence over entire upper surface. Smaller and with characteristic elytral pattern. Terminal palpal segment acuminate. Elytral epipleura simple. Tibiae pubescent. Wings full Male with 3 dilated protarsal segments.

ONE BRITISH SPECIES

Black with blue or green reflection, pronotum rufo-testaceous, elytra somewhat paler with shoulder and two transverse bands black; antennae dark with 2 pale basal segments, legs variegated in yellow and black. Pubescence of body depressed. 6–7 mm. ..... **lunatus** Fabricius

In open, dry country, on chalk.—S. England: Berkshire, Surrey, Kent. Very rare.

Tribe **OODINI**

Genus **Oodes** Bonelli

A very characteristic genus with broad, laterally rounded body and dull black colour. The British species is somewhat suggestive of a water-beetle and, actually, has almost amphibious habits. The reduction of setae is remarkable: none on pronotum or labial palpi; elytra with 2 dorsal punctures. The most striking feature is the keel running along apical margin of elytra (fig. 89c). Striae very fine but complete. Wings full. Male with 3 dilated pro-tarsal segments.

One British Species

Black with mouth-parts and first antennal segment, sometimes also tibiae and pronotum near hind-angles piceous. 7·5–10 mm. (Fig. 90)

helopioides Fabricius

At the border of standing waters, where the soil is soft, rich in organic matters, and the vegetation rich. The beetle often climbs along plants under the water surface. —England, N. to Cumberland. S. Wales. Local.

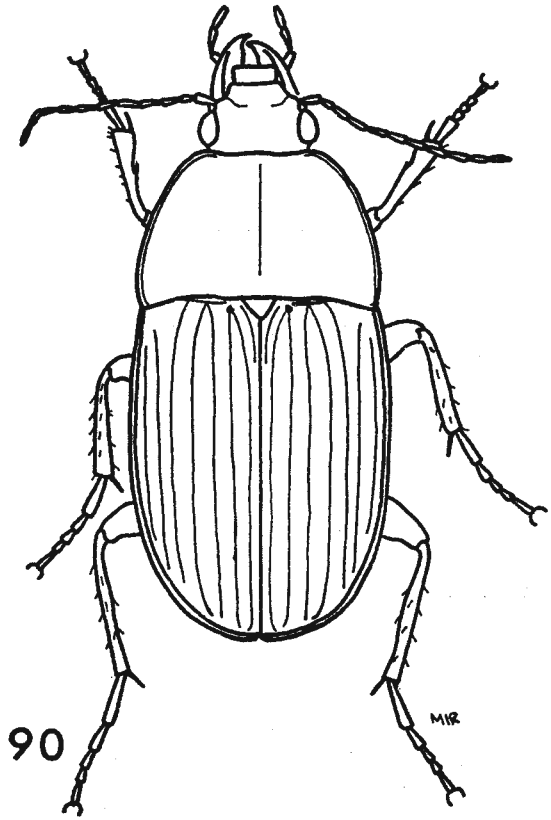

Fig. 90.—*Oodes helopioides* ♀.

Tribe **ODACANTHINI**

Genus **Odacantha** Paykull

(*Colliuris* auctt.)

The genus includes a single very characteristic species with extremely narrow forebody (fig. 91a) and striking colour pattern. Head with constricted neck. Elytra with truncate apex; striae represented by rows of punctures. Wings full. Male with 3 dilated pro-tarsal segments.

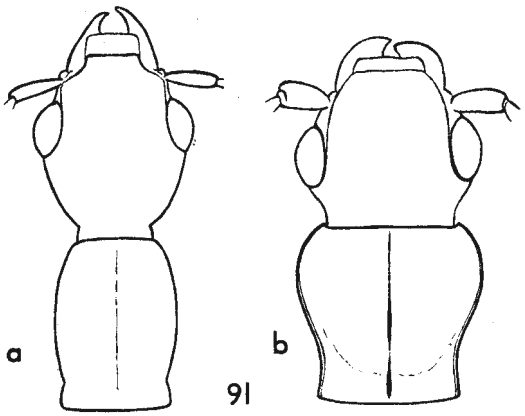

FIG. 91.—Forebody of (a) *Odacantha melanura*; (b) *Brachinus crepitans*.

ONE BRITISH SPECIES

Black with blue or green reflection, meso- and meta-sterna rufo-testaceous as the elytra, which have the entire apex black (with metallic lustre); appendages bright rufous but with antennae from fourth segment, most of palpi, apex of femora and tarsi infuscated. 6·6–7·8 mm. ..... **melanura** Linnaeus

Hygrophilous, on Phragmites, Typha *and other tall plants growing in or near water.—S. & E. England, N. to Norfolk. Wales: Glamorgan. Locally abundant.*

Tribe **MASOREINI**

Genus **Masoreus** Dejean

The single small species (fig. 92a) is somewhat reminiscent of a *Trechus* but the shape of the pronotum is characteristic and the sutural stria of elytra is not recurrent. The latter are less evidently truncate at apex than in the following genera. Tibiae, notably the middle pair, with strong setae internally. Wings dimorphic but usually quite reduced. Male with 3 dilated pro-tarsal segments.

ONE BRITISH SPECIES

Piceous or reddish brown, base of elytra and often pronotum paler; appendages testaceous. 4·7–5·6 mm. ..... **wetterhalli** Gyllenhal

A xerophilous species, occurring on sand and gravel with sparse vegetation, often near the sea. Mostly hiding under mats of Calluna, Thymus *and other depressed plants.—England: Cornwall to Essex; Norfolk. Very local.*

Tribe **LEBIINI**

Genus **Lebia** Latreille

Medium-sized beetles with elytra very broad compared with the pronotum, which has the base abruptly sinuate laterally (fig. 92b). Head with strongly constricted neck. Elytra with fine, punctate striae. Fourth tarsal segment dilated, claws dentate. Wings full. Male with 3 dilated pro-tarsal segments.

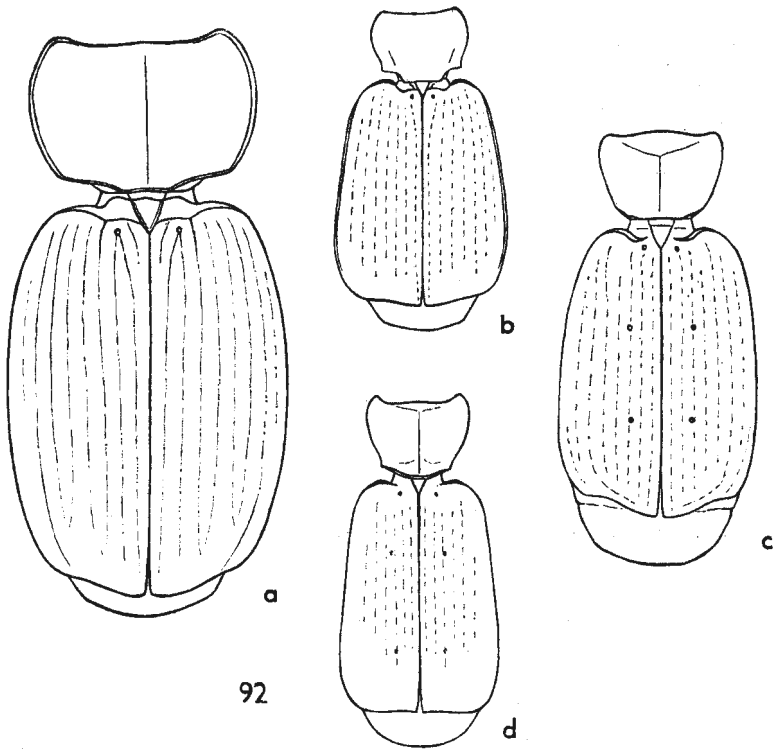

FIG. 92.—Pronotum and hindbody of (a) *Masoreus wetterhalli*; (b) *Lebia cyanocephala*; (c) *Metabletus*; (d) *Microlestes*.

The biology of *Lebia* is remarkable, similar to that of *Brachinus*. In the three cases known (among these *L. chlorocephala*), the larva is an ectoparasite of Chrysomelid pupae and this probably applies to all members of the genus. The adults occur in open country and are often obtained by sweeping the vegetation.

Two of the species mentioned in the key (*marginata* and *scapularis*) are apparently not indigenous in Britain and their earlier occurrences may have been accidental.

KEY TO SPECIES

1 Elytra unicolorous, metallic green or blue (Subgen. *Lamprias* Bonelli) 2
– Elytra with yellow-black pattern, unmetallic (Subgen. *Lebia* s.str.) 3

2 Antennae with at least 2 pale basal segments. Femora entirely pale. Elytral intervals glabrous. (Strong metallic green or blue green, pronotum, scutellum and legs, except tarsi, clear rufous. Elytra shorter and more convex, punctures on intervals fine. 5·8–8·1 mm.)
(*chrysocephala* Motschulsky) **chlorocephala** Hoffmannsegg
In meadows and grassland on light soil. The larva has been reared from pupae of Chrysomela (*syn.* Chrysolina) varians *Schaller.—England. Wales. Scotland. Ireland. The only widespread member of the genus.*
– Only first antennal segment pale (at least underneath). Apex of femora black. Punctures of elytral intervals coarser, each carrying a small bristle. (Similar to *chlorocephala* but elytra usually more blue, also scutellum, meso- and metasterna are dark. 5·7–7·8 mm.) ..... **cyanocephala** Linnaeus
On open, dry, chalky hill-sides.—England: Devon to Kent and, in a few counties, N. to Yorkshire. Local and rare.
3 Head pale, as the pronotum. Pale elytral markings restricted to apex. (Rufo-testaceous, also appendages, elytra black with complete transverse pale fascia at apex. Intervals flat, very shiny, without microsculpture. 4–4·5 mm.)
(*haemorrhoidalis* Fabricius) **marginata** Fourcroy
Only two old records from England: Wiltshire and Shropshire.
– Head black, pronotum rufous. Elytra with pale markings in anterior half..... 4
4 Palpi and scutellum pale. Elytral intervals somewhat convex, dull from reticulate microsculpture. (Elytra black with large shoulder macula, sometimes also a small apical spot and extreme side-margins, pale. 4–5·5 mm.)
(*turcica* Fabricius) **scapularis** Fourcroy
From Italy known as larval parasite on the pupa of Galerucella luteola *Müll.—Old British records from England: Sussex.*
– Palpi and scutellum black. Elytral intervals flat, very shiny, devoid of microsculpture. (Elytra rufo-testadeous with common black cross-marking, consisting of a triangle at scutellum, a broad transverse fascia behind middle, and the apical margin; these are more or less confluent. Antennae, except base, apex of femora, and tarsi infuscated. 6–7 mm.) ..... **cruxminor** Linnaeus
On meadows, often in forest districts. On the continent repeatedly found associated with Galeruca tanaceti L., *which is probably its host.—England: Cornwall to Kent; Shropshire, Cumberland. Scotland ? Ireland. Very rare.*

Genus **Demetrias** Bonelli

(*Risophilus* Leach, *Aetophorus* Schmidt-Goebel)

Similar to *Dromius* of the *linearis* type but easily recognized on the broad, deeply bilobed fourth segment of all tarsi (fig. 93a). Body flat and narrow, head at least as broad as pronotum. Ground-colour pale testaceous. Claws simple or with 1 to 3 small teeth. Male with 3 faintly dilated pro-tarsal segments.

These beetles are vigorous climbers and occur on reeds or in tufts of grass.

Key to Species

1 Temples hairy. Elytral intervals with a single row of erect setae. Claws with 3 teeth. (Coloured as *monostigma*, except that the elytra are entirely pale or only diffusely darker along suture and, sometimes, at apex and/or around the scutellum. Wings full. 4·5–5·6 mm.)..... **atricapillus** Linnaeus
Among grass, Carex, *nettles etc., not necessarily near water; also in heaps of cut twigs.—England, N. to Cumberland. Wales. Ireland. Usually abundant.*
– Temples glabrous. Only third elytral interval with 4 setiferous punctures. Claws simple or with a single tooth 2
2 Wings reduced. Claws with internal tooth. Dark elytral markings restricted to apex and often suture. (Testaceous, head black, elytra apically across the suture with a rhomboid or elongate, rarely indistinct, dark spot, often narrowly prolonged forwards. Long-winged specimens have been observed on the continent but not in Britain. 4·2–5·1 mm.)
(*unipunctatus* Germar) **monostigma** Samouelle
In tufts of Elymus *on sandy seashores, but also among reed and* Carex *near fresh water.—England, N. to Yorkshire. Wales. Very local.*

– Wings full. Claws smooth. Dark elytral pattern more expanded. (Easily distinguished on the variegated elytral pattern: along the suture a dark stripe, dilated behind middle into an oblong macula, usually connected obliquely with a similar spot at side-margin. 4·9–5·6 mm.) ..... **imperialis** Germar

Hygrophilous, on reed, Typha *and other tall plants growing in or near water, often associated with* Odacantha. *Occurrence on the seashore is probably accidental.— S.E. England, N. to Norfolk. Rare, but apparently spreading.*

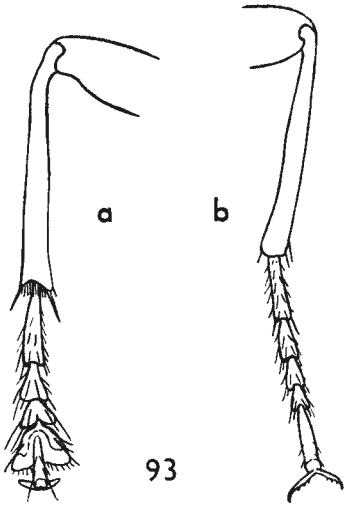

FIG. 93.—Intermediate leg of (a) *Demetrias atricapillus*; (b) *Dromius longiceps.*

Genus **Dromius** Bonelli

Flat, elongate beetles with small pronotum and more or less parallel-sided, apically truncate elytra; their striae are shallow (except in *linearis*) to almost absent. Head with constricted neck. Base of pronotum straight. Fourth tarsal segment not dilated (fig. 93b), claws dentate. Appendages pale. Wings varying in some species. Male with 3 feebly dilated pro-tarsal segments.

The genus comprises two ecological groups: one (mostly larger species) arboreal, the members of which are most easily found hibernating under bark; the other terricolous occurring on open, usually dry ground.

KEY TO SPECIES

1 Above 5 mm. (except small *linearis*). Elytral striae evident, seventh interval with 2 or more coarse punctures adjoining sixth stria; base without pore-puncture . . . 2

– Less than 5 mm. Elytral striae obsolete, seventh interval impunctate; base, on the level of apex of scutellum, with small pore-puncture. (Subgen. *Philorhizus* Hope) 7

2 Base of elytra margined laterally only (outside third entire stria). Forebody narrower (figs. 94a, b). Elytra pale, usually with dark stripe along suture. Wings varying. (Subgen. *Paradromius* Fowler) 3

– Elytra with complete raised basal bead. Elytra differently coloured. Wings full. (Subgen. *Dromius s.str.*) 4

3 Head very narrow with temples (in front of neck) much longer than diameter of eye (fig. 94a). Elytra with shallow, faintly punctate striae. (Rufo-testaceous, head and abdomen darker, elytra with a posterior dark spot, widening apicad, across suture. Frons almost smooth. Wings full 5·3–6·5 mm.)
longiceps Dejean

Among Phragmites *and* Carex *in fens and marshes. On the continent also found among* Elymus *on sandy beaches.—E. England: Cambridge to Lincoln. Very local.*

– Head much shorter, temples not longer than diameter of eye (fig. 94b). Elytral striae sharp and clearly punctate. (Coloured as *longiceps*, except that the suture is not always and then more narrowly infuscated. Frons densely wrinkled between eyes. Probably always short-winged in Britain; a few macropterous individuals found on the continent. 4·4–6 mm.) ..... **linearis** Olivier

On dry, usually sandy soil, both inland and on the coast. It climbs the plants.—England. Wales. Scotland: West Lowlands. Ireland. Common.

4 Elytra black, each with two large yellow (sometimes longitudinally confluent) spots, the posterior occupying entire apex. Entire frons strongly, longitudinally wrinkled. (Rufo-piceous, head, abdomen and often pronotum at middle darker. 5·2–6·4 mm.) ..... **quadrimaculatus** Linnaeus

On different kinds of deciduous trees, also on pine.—England. Wales. Scotland. Ireland. Common.

– Elytra uniformly dark or with pale spot in anterior half. Frons wrinkled only near eyes, or faintly so also medially 5

5 Third elytral interval with at least 5 coarse, shallow punctures. Pronotum, fig. 94c. (Rufo-piceous, elytra darker, sometimes paler at base or with diffuse pale macula ("*bimaculatus* Dejean") in anterior half. Frons almost smooth at middle. 6–6·8 mm.) ..... **agilis** Fabricius

On all kinds of trees, also conifers.—England. Wales. Scotland. Ireland. Somewhat local.

– Third elytral interval with a single puncture at apex. Deplanate lateral part of pronotum narrower, at least anteriorly (figs. 94d, e) 6

6 Frons wrinkled only inside anterior part of eyes. Deplanate lateral part of pronotum narrower basally (fig. 94d) (Narrower and with more slender antennae than all related species. Frons smooth at middle. Testaceous brown, head and elytra usually darker, the latter often with pale base or diffuse spot, as in the form "*bimaculatus*" of *agilis*. 6–6·8 mm.) ..... **angustus** Brullé

Usually on pine.—England: Devon to Surrey; Cambridge, Suffolk. Scotland: East Highlands. Very local. Probably a late immigrant in Britain.

– Wrinkles of frons expanded along entire inside of eyes and at least suggested on centre of frons. Pronotum, fig. 94e. (Coloured as *agilis*, also the same colour varieties occurring (the maculate form is "*discus* Puel"). Pronotum broader with hind-angles somewhat more obtuse and the deplanate lateral part wider posteriorly. 6–7 mm.) ..... **meridionalis** Dejean

Mostly on deciduous trees.—England. Wales. Scotland. Ireland. Rather common.

7 Pronotum with sharp, protruding, almost rectangular hind-angles (fig. 94f). Elytra with raised basal margin reaching scutellum. Apex of elytra dark. (Piceous, head black, pronotum usually dark rufous, elytra each with two yellow spots, the smaller posterior pair often confluent across the suture. Elytral striae obsolete. Full-winged. 3·8–4·6 mm.) ..... **quadrinotatus** Panzer

Usually on pine.—England. Wales. Scotland. Ireland. Local.

– Pronotum with blunt, obtuse hind-angles (figs. 94g, h). Raised basal bead of elytra developed laterally only. Apex of elytra almost constantly pale 8

8 Head with strongly constricted neck (fig. 94g). Elytra with entire base dark. (Piceous with darker head, pronotum rufous, elytra each with two large pale spots, the posterior occupying entire apex. Full-winged. 3·5–4 mm.)
quadrisignatus Dejean

On different kinds of deciduous trees; also among dead branches and twigs on the ground.—England, N. to Norfolk. Wales: Glamorgan. Scotland: East Highlands. Rare.

– Head with temples moderately, obliquely constricted (fig. 94h). Base of elytra pale (except, rarely, at suture) 9

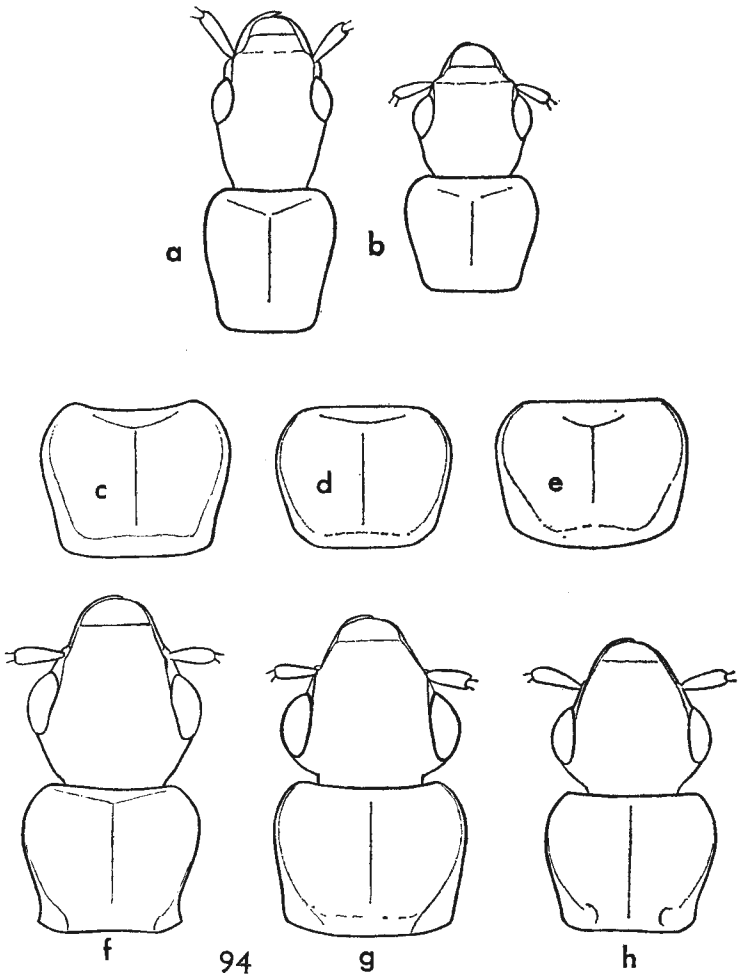

FIG. 94.—*Dromius*. Forebody of (a) *longiceps*; (b) *linearis*. Pronotum of (c) *agilis*; (d) *angustus*; (e) *meridionalis*. Forebody (higher magnification) of (f) *quadrinotatus*; (g) *quadrisignatus*; (h) *sigma*.

9 Elytra entirely pale or with narrowly infuscated suture. Macropterous. (Smallest species of the genus. Elytra more elongate and parallel-sided than in the three following. Brownish, head black, pronotum rufous, sometimes darker on disc, elytra pale testaceous with transparent dark triangle between wings at base. Abdomen often darker, sometimes as in *notatus*. 2·5–3·4 mm.)
melanocephalus Dejean
Strictly terricolous, in dry meadows or grassland; also on the shore among tall grasses.—England. Wales. Scotland. Ireland. Common.

– Elytra with irregularly transverse dark band (rarely interrupted) just behind middle. Almost constantly brachypterous 10

10 Abdomen as pale as the rest of the ventral side or slightly infuscated laterally; pronotum entirely pale. Elytra somewhat less abbreviated. Microsculpture of pronotum weaker, meshes in part approximately isodiametric. Penis apex (in lateral view, fig. 95a) with almost parallel sides. (Head black, pronotum and elytra bright rufo-testaceous, the latter with well-defined transverse dark fascia not reaching side-margin and only exceptionally prolonged inside this to apex. Long-winged specimens not seen from Britain. Internal sac of penis with two weak, narrow sclerites and two plates. 3·2–4 mm.)...**sigma** Rossi

In fens and marshes on somewhat shaded ground, usually near water. On the continent also among dune-grass on the shore.—S.E. England, N. to Suffolk; Yorkshire, Cumberland. Local and rare.

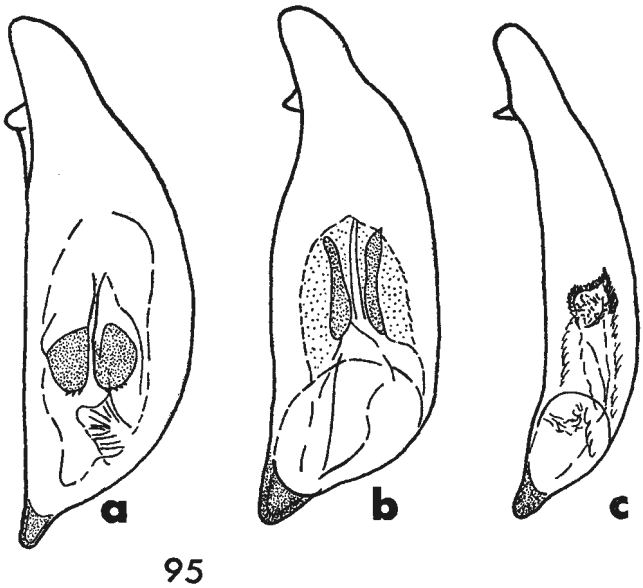

FIG. 95.—*Dromius.* Penis of (a) *sigma*; (b) *notatus*; (c) *vectensis.*

— Abdomen somewhat darker than anterior part of ventral side. Pronotum often darkened on disc. Its microsculpture strong with transversely elongate meshes. Penis apex (in lateral view) more triangular.....11

11 Ground-colour more clear rufo-testaceous, elytral fascia well defined, rarely including apex, side-margin not or barely infuscated. Abdomen infuscated but brown or pitchy rather than black. Penis (fig. 95c) very slender. (Body proportions as in *notatus* but ground-colour pale, as in *sigma*; pronotum usually quite pale. Probably constantly brachypterous. Internal sac of penis without defined sclerites. 3·4–3·8 mm.).....**vectensis** Rye

Habitat as for notatus; *seems to prefer sandy soil.—S. England: Devon to Kent. Very local.*

– Ground-colour more dirty testaceous, elytral fascia often ill-defined, prolonged to apex along side-margin, which has the bead more or less infuscated. Abdomen entirely piceous black. Penis (fig. 95b) very stout. (Pronotum usually infuscated. Internal sac with two rod-like sclerites. Wings only exceptionally full. 3·2–3·7 mm.).....(*nigriventris* C. G. Thomson) **notatus** Stephens

On dry, sandy or gravelly soil with moderately dense vegetation, chiefly on the coast.—England, N. to Cumberland. Wales. Scotland. Ireland. Common.

Genus **Microlestes** Schmidt-Göbel

(*Blechrus* Motschulsky)

A single very small black species, separated from *Metabletus* by the transversely truncate elytral apex (fig. 92d). Base of pronotum more lobate at middle. Pubescence of antennae starting on third segment. Head with longitudinally striate microsculpture. Claws faintly denticulate. Male with 3 dilated pro-tarsal segments.

One British Species

Black with faint bronze hue, legs sometimes piceous. Wings with reflexed apical part but usually too small to be functional. Penis very short, apex with ventral hook. 2·5–2·8 mm. ..... (*glabratus* auctt. nec Duftschmid) **maurus** Sturm

On dry, mostly sandy or gravelly places, among dead leaves, etc.—England, N. to Yorkshire. Wales: Glamorgan. Locally common.

Genus **Metabletus** Schmidt-Göbel

(?*Syntomus* Hope)

Small, flat beetles with obliquely truncate and slightly sinuate elytral apex (fig. 92c). Base of pronotum sinuate laterally. Antennae pubescent from fourth segment. Head with reticulate microsculpture. Claws denticulate. Wings often quite reduced. Male with 3 faintly dilated pro-tarsal segments.

Key to Species

1 Piceous brown, forebody darker, elytra with a small, obscurely delimited pale spot at shoulder and often another before apex; legs testaceous with femora more or less infuscated. Wings full. (Upper surface with faint or no metallic reflection. Dorsal punctures of elytra very small. Elytra dull from dense, granulate microsculpture. Specimens without evident elytral spots were called "*atratus* Dejean". 3–3·5 mm.) ..... **obscuroguttatus** Duftschmid

Among moss, in hay stack refuse etc., reportedly in rather moist habitats on heavy soil.—England, N. to Lincoln. Wales. Locally not uncommon.

– Ground-colour black or dark piceous, elytra not paler, immaculate; legs from black to piceous brown. Wings usually rudimentary 2

2 Black or with faint bronze hue. Dorsal punctures of elytra small. These are somewhat shiny, microsculpture not granulate. (Small and short, elytra widening behind middle. Legs mostly piceous brown. Wings sometimes developed. 2·6–3·2 mm.) ..... **truncatellus** Linnaeus

On open, firm and dry soil, usually with sparse vegetation of grasses.—England, N. to Nottingham. Ireland. Local.

– Upper surface with evident, bronze or brassy lustre. Dorsal punctures foveate. Elytra dull from granulate microsculpture. (Elytra almost parallel-sided. Legs almost black. Wings constantly reduced. 3·1–3·8 mm.)

(*foveola* Gyllenhal) **foveatus** Fourcroy

On dry, sandy fields with sparse vegetation of grasses, Calluna, *etc.—England. Wales. Scotland: West Lowlands. Ireland. Often abundant.*

Genus **Lionychus** Wissmann

Similar to *Metabletus* in general habitus. At once recognized on the structure of the pronotum (fig. 96a): the raised lateral bead is continued to base inside the dentiform hind-angles so that the sides of prosternum are partly visible from above. The apex of elytra is obliquely truncate, as in *Metabletus*. Claws smooth. Wings full. Male with 4 dilated pro-tarsal segments.

ONE BRITISH SPECIES

Deep black with faint bronze hue, also all appendages dark. Each elytron with a large spot behind shoulder and another, smaller, sometimes obsolete, rarely wanting, behind middle, bright yellow (very rarely entirely immaculate). Only the 4 inner elytral striae are well impressed, intervals with an irregular row of punctures. 3–4 mm..... **quadrillum** Duftschmid

On sand or gravel, sometimes quite dry, but often near water or near the shore.—England: Cornwall to Suffolk; Yorkshire. Rare.

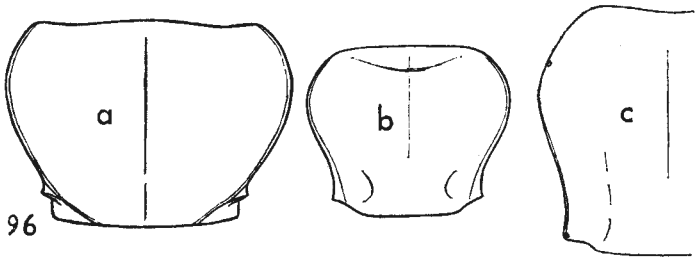

FIG. 96.—Pronotum of (a) *Lionychus quadrillum* (higher magnification); (b) *Cymindis vaporariorum*; (c) *Polistichus connexus*.

Genus **Cymindis** Latreille

A large circumpolar genus but with only two species in Britain, the largest members of the Lebiines, 8–10 mm. Entire upper surface punctate. Terminal palpal segment truncate at apex, dilated in the labial pair of the male. Temples pubescent behind eyes. Pronotum cordiform (fig. 96b). Elytra with complete striae. Claws pectinate. Wings usually reduced. Male with 3 dilated pro-tarsal segments.

Xerophilous species, truly terricolous, living in open country.

KEY TO SPECIES

1 Elytra glabrous with well defined pale humeral macula. Base with complete marginal bead. (Pronotum rufo-piceous, head and elytra almost black, humeral spot restricted to intervals 5–7. Labial palpi of male with terminal segment axe-shaped. Probably always brachypterous. 8–11 mm.)
axillaris Fabricius

Often on chalky hill-sides.—England: Devon to Lincoln. Wales: Glamorgan. Very local.

– Elytra densely pubescent over entire surface, rufous or brown across base (or with more expanded pale colour). Base margined laterally only. Punctuation generally stronger. (Piceous, pronotum not or only slightly paler than head, narrower and more cordiform (fig. 96b), with hind-angles more projecting. Labial palpi of male only faintly dilated. Wings either full or quite reduced. 8–9·6 mm.)
(*basalis* Gyllenhal) **vaporariorum** Linnaeus

In mountainous and hilly districts, usually on sandy moraine.—England: Derby to Northumberland. ?Wales. Scotland. Shetland. Ireland. Very local.

Tribe **ZUPHIINI**

Genus **Polistichus** Bonelli

(*Polystichus* auctt.)

The single British species is somewhat suggestive of *Cymindis* but deviates in several features characteristic of the tribe. The head is strongly constricted behind the eyes.

All antennal segments are pubescent and the first is stout, longer than second plus third. Pronotum (fig. 96c) narrow, cordiform with deep, linear basal foveae. Elytra with complete striae, intervals punctate, apex with membraneous fringe (as in *Brachinus*). Entire upper surface, including tarsi, pubescent. Claws smooth. Wings full. Pro-tarsi of male with 3 dilated segments.

ONE BRITISH SPECIES

Depressed, with long, parallel-sided elytra. Piceous to brown, each elytron with a large rufo-testaceous vitta, running from shoulder to one-fifth from apex. 8–10 mm. ..... (*fasciolatus* auctt. nec Rossi) **connexus** Fourcroy

Sometimes near rivers but mainly on the shore; also under bark; seems to prefer clayish soil.—England: Dorset to Norfolk. Very local. Probably more common in the past.

Tribe **DRYPTINI**

Genus **Drypta** Latreille

The *Dryptini* are obviously related to the preceding tribe but are separated, among other things, by prolonged mandibles, dilated terminal segment of palpi, head without exposed "neck", pronotum without lateral bead, and bilobed fourth tarsal segment. Antennae entirely pubescent, first segment longer than the 3 following together. Pronotum narrower than head, almost cylindrical. Claws smooth. Wings full. Male with 3 dilated pro-tarsal segments.

ONE BRITISH SPECIES

Entirely metallic blue or greenish, only mouth-parts, antennae and legs rufo-testaceous. Upper surface punctate and pubescent. 7–9 mm.

(*emarginata* Olivier) **dentata** Rossi

On or near the coast in somewhat shady places on silt.—England: Dorset, Isle of Wight, Sussex, Kent. Very local.

Subfamily **BRACHININAE**

The reason why the Bombardier Beetles are usually referred to a subfamily of their own is that they differ from all other Carabidae in the high number of visible abdominal segments: 7 in the female, 8 in the male (fig. 97). This structure is no doubt correlated with the famous crepitating mechanism of these beetles, enabling them to direct the defense spray accurately.

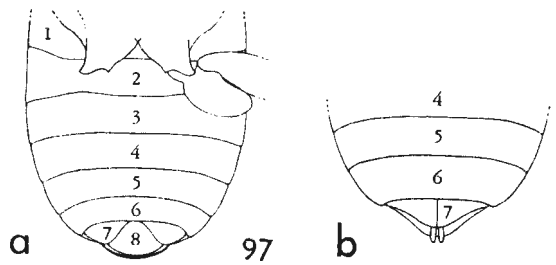

FIG. 97.—Subfam. Brachininae. Abdomen of (a) ♂; (b) ♀. Generalized. (From Habu.)

Tribe **BRACHININI**

Genus **Brachinus** Weber

(*Brachynus* auctt.)

The general appearance is uniform and very characteristic in all members of this world-wide genus. The forebody is very narrow (fig. 91b), with pronotum not or hardly wider than head. The elytra are very broad, almost square, with obsolete striae and apical membraneous fringe. The forebody is rufous, the elytra are dark, usually with metallic reflection, rarely with pale markings. Entire upper surface, including antennae, pubescent. Wings full. Male with 3 dilated pro-tarsal segments.

The development of four North American species is known. In all cases, the larva is an ectoparasite of beetle pupae (like in *Lebia*). The hosts of European species are unknown.

Besides the two species mentioned here, *B. explodens* Dft. has been recorded from Britain, apparently by mistake (Fowler, 1887).

Key to Species

1 Elytra entirely black, normally with blue or greenish reflection. Apical membrane of elytra pubescent. (Forebody rufous, underside of hindbody piceous. Antennal segments 3 and 4 more or less infuscated, legs pale. Elytral striae shallow but evident. 6·1–9·8 mm.) ..... **crepitans** Linnaeus

In open, rather dry country, usually on chalk. Often gregarious, especially in spring, and associated with Agonum dorsale.—*S. England, N. to Suffolk and Rutland. Wales: Glamorgan and Pembroke. Quite local.*

– Elytra broadly rufous along suture in anterior half, otherwise blue or greenish. Apical membrane of elytra glabrous. (Antennae and underside of body entirely pale. Elytral striae almost obsolete. 4·5–7·5 mm.) ..... **sclopeta** Fabricius

Old records only, from England: Devon, Kent, Essex, and possibly Sussex. Considering the characteristic coloration of the beetle, these can hardly all be wrong: but the species is probably now extinct in Britain.

List of described larvae of British Carabidae

In most cases one quotation only is given for each species. Incomplete records are in brackets (those by Xambeu are generally unreliable). If generic name only is listed, the larva is known from a non-British species.

Dr. M. L. Luff has kindly read and amended the list.

Abax ater:—Schiødte 1872 : 179
Acupalpus meridianus:—Larsson 1968
Aepus marinus:—Coquerel 1850
robini:—Bolivar 1923
Agonum albipes:—Kemner 1913
assimile:—Schiødte 1867 : 514
dorsale:—Kemner 1913
ericeti:—(Lindroth 1955)
fuliginosum:—Larsson 1968
marginatum:—Schiødte 1867 : 512
muelleri:—Larsson 1968
obscurum:—Larsson 1968
piceum:—Larsson 1968
thoreyi:—Larsson 1968
versutum:—Larsson 1968
viduum:—Larsson 1968
Amara aenea:—Larsson 1968
apricaria:—Schiødte 1867 : 530
aulica:—Schiødte 1867 : 530
bifrons:—Schiødte 1867 : 530
communis:—Larsson 1968
consularis:—Larsson 1968
convexiuscula:—Schiødte 1867 526
curta:—Xambeu 1902 : 8
equestris:—Schiødte 1867 : 531
eurynota:—Larsson 1968
familiaris:—Schiødte 1867 : 531
fulva:—van Emden 1942 :87 ; Larsson 1968
fusca:—Larsson 1968
lunicollis:—Larsson 1968
ovata:—Xambeu 1896 : 18
plebeja:—Larsson 1968
quenseli:—Larsson & Gígja 1959
similata:—Kemner 1912
Anisodactylus binotatus:—Bøving 1911
poeciloides:—Larsson 1968
Asuphidion flavipes:—van Emden 1942 : 61, 62, 91; Boldori 1939
pallipes:—Bøving 1911
Badister bipustulatus:—Schiødte 1872 : 186
Bembidion argenteolum:—Andersen 1966
bipunctatum:—Schiødte 1867: 518
bruxellense:—Larsson 1968
genei:—Larsson 1968
guttula:—Larsson 1968
lampros:—Larsson 1968
laterale:—Bøving 1911; Jeannel 1941 : 296
litorale:—Andersen 1966
lunatum (*?*):—Schaum 1859 : 38
nitidulum (*?*):—Rey 1887 : 139
pallidipenne:—Schiødte 1867: 521
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