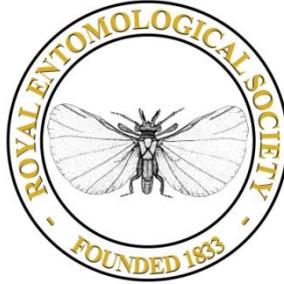


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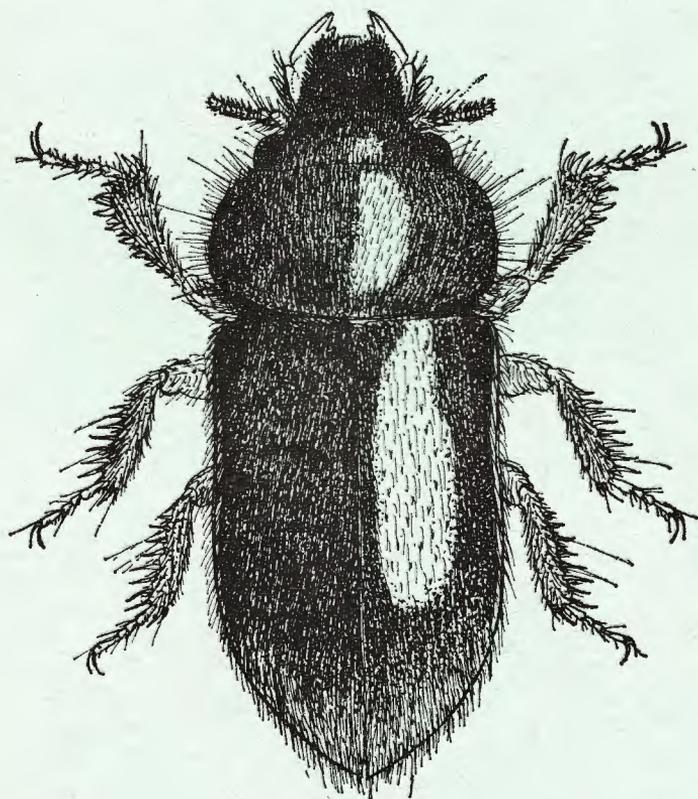
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HANDBOOKS FOR THE IDENTIFICATION OF BRITISH INSECTS



COLEOPTERA

HETERO CERIDAE

By

R. O. S. CLARKE

LONDON

Published by the Society
and Sold at its Rooms

41, Queen's Gate, S.W. 7

HANDBOOKS FOR THE IDENTIFICATION OF BRITISH INSECTS

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

- | | |
|------------------------------------|------------------------|
| I. Part 1. General Introduction. | Part 9. Ephemeroptera. |
| „ 2. Thysanura. | „ 10. Odonata. |
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| „ 4. Collembola. | „ 12. Neuroptera. |
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Orthoptera. | „ 13. Mecoptera. |
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- II. Hemiptera.
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VI. Hymenoptera : Symphyta and Aculeata.
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VIII. Hymenoptera : Cynipoidea, Chalcidoidea, and Serphoidea.
IX. Diptera : Nematocera and Brachycera.
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Volumes II to X will be divided into parts of convenient size, but it is not possible to specify in advance the taxonomic content of each part.

Conciseness and cheapness are main objectives in this series, and each part is the work of a specialist, or of a group of specialists. Although much of the work is based on existing published keys, suitably adapted, much new and original matter is also included.

Parts are issued, separately paged and priced, as they become available.

A second (revised) edition of *A Check List of British Insects*, by G. S. Kloet and W. D. Hincks, is being issued as an extra, eleventh, volume in this series.

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.

COLEOPTERA

Family HETERO CERIDAE

By R. O. S. CLARKE

INTRODUCTION

THE family Heteroceridae is represented in Britain by a single genus, *Heterocerus* Fabricius, containing eight species. The European genus *Micilus* Mulsant and the Notogaean genus *Elythomerus* Waterhouse are not found in Britain.

The genus *Heterocerus* has been the subject of much controversy because of the morphological uniformity of the species. This is the first concise review of the British species since the publication of Fowler's *Coleoptera of the British Islands*, Vol. 3 (pages 383-8), but he remained unsatisfied with his conclusions, and attempted at some length (Vol. 5 Appendix: 459-64 and Vol. 6: 137-8) to clarify the status of several species.

The true taxonomic position of the genus is somewhat doubtful as it does not appear to have any marked affinity to any particular family. Crowson (1956) places the family within the superfamily Dryopoidea, but Boving and Craighead (1930-31) include the family within the superfamily Dascilloidea, basing their opinions on larval characters. The Heteroceridae may be defined as follows:

Small to medium sized species, 1.5-7.5 mm.; body somewhat parallel-sided; densely pubescent and closely punctured; head large with prominent mandibles and labrum; short 9-11 segmented antennae, usually with the last 6-7 segments forming an elongate club (except the *Phyrites*-group which has no distinct club and *Micilus* Mulsant which has only the apical segment broader); the pronotum as broad, or nearly as broad as the elytra; the elytra completely covering the abdomen; legs fossorial, with a series of spines on their lateral edges; tarsal formula 4-4-4, the apical segment bearing elongate curved claws; anterior coxal cavities open behind, posterior coxal cavities almost contiguous at base; mesosternum very short; first abdominal segment bearing stridulatory ridges.

BIOLOGICAL ADAPTATIONS AND HABITAT

The insects spend much of their time burrowing in soft earths, where they make shallow galleries in the soil, externally represented by a line of upraised wart-like soil. The insects tend to live in distinct colonies, always close to the water's edge, or in the case of saline species close to the high tide mark. Two or three species may be found in a single colony. A male and female of the same species usually occupy a single gallery. They probably feed on organic particles in the soil, sifting these out for ingestion.

The eight species of *Heterocerus* are found in the following environments:

Coastal mud flats and salt marshes: *fossor*, *flexuosus*, *maritimus*.

Sea cliffs and salt spray areas *obsoletus*, *fuscus*.

Brackish ditches, canals and marshes: *flexuosus*, *maritimus*, *obsoletus*, *fenestratus*.

Fresh water ponds, marshes and streams: *hispidulus*, *obsoletus*, *marginatus*, *fenestratus*.

The habitat is a hostile one and their uniform morphology is probably the result of natural selection operating to produce a structure best adapted to their environment. The colonies of saline species are frequently subject to submergence by the sea and usually shared with sub-littoral crustaceans. After periods of heavy rain the workings of other species may also become flooded. The dense layers of hydrophobe hairs are an important adaptation in such conditions, keeping the insects dry; during periods of prolonged submergence, the hairs may even act as a plastron, but this remains to be proved. My standard method of collecting these insects illustrates the efficiency of the system. I drop small shovel-fulls of earth into a water-filled bucket and after a few seconds the beetles shoot to the top with such speed that they come to rest standing on the surface of the water, from which they may immediately take flight. A similar adaptation is found on the legs, especially the ventral surface of the front tibiae, which are clothed with a very dense layer of such hairs. These prevent the insect from getting the legs wetted and thus becoming clogged with wet, sticky clay and obstructing excavatory activities.

The front tibiae are well adapted for digging: their apices are broad and shovel-shaped and armed with stout pointed spines, allowing the insect to obtain a purchase on the soil. The mandibles are also important for purposes of excavation, being broad and up-curved, with sharp wing-like basal pieces and stout pointed teeth for scratching away at the soil. The extent to which they participate in this activity is apparent in old specimens which frequently have teeth worn down to stumps. Purchase against the sides of the burrow is provided by the spines of the legs which form a series of pressure points against which the insect can push. At such times the tarsi are folded upwards, so as to lie against the upper surface of the tibiae where they are protected, a seemingly efficient mechanism, as I have only rarely seen specimens in which the tarsi have been damaged. The earth once loosened is passed to the back by the combined action of the femora and the tibiae. The femora have broad flattened undersides, the edge of this face being sharp and thus forming a scraper with which to scoop the soil particles backwards. The lateral spines of the tibiae are long and curved posteriorly; these may serve as rakes for the removal of soil particles in much the same way.

The head is held vertically during burrowing, presenting a broad, flat face at the front, the underside fitting closely into the front edge of the prosternum, rather like the collar used for the support of a broken neck in humans. In this way the delicate mouth-parts are shielded from damage and the fore-body is rendered rigid, allowing the bull-dozing activity of burrowing to take place.

The stridulatory mechanism is an important adaptation in many burrowing insects, being a means by which the two sexes are able to locate one another. In the Heteroceridae the ridges on the abdomen are most strongly ribbed in the male and by rubbing the hind tibiae across these ribs it can produce a distinct noise to which the female may respond.

IMMATURE STAGES AND EGG

(*H. fenestratus* only)

The small, round, straw-coloured eggs are laid in April and May. When the peg-shaped larvae hatch they remain within the burrows of the adult

colony, only making very brief sorties outside during warmer days. They are white with greyish upper surfaces, a stout head, three very broad thoracic segments and nine relatively narrow, tapering abdominal segments. There are five ocelli on each side and a pair of strongly toothed mandibles is present. The short legs each terminate in a single claw, the front legs being the shortest and the hind pair being the longest. The larva moves with a fairly rapid, jerky gait. The body is strongly setose and lacks terminal cerci.

The larvae pupate fairly deeply within the soil, adults emerging in the summer and again in the following spring.

NOTES ON KILLING, MOUNTING AND IDENTIFICATION

(1) *Killing*

Specimens should be killed with boiling water, which will remove much of the grease. After killing, specimens should be kept dry and should not be soaked in toluene as this damages the surface pubescence.

(2) *Mounting*

(a) *Preparation of the specimen*

Specimens should be mounted as soon as possible after killing, as reversing older specimens in order to brush out the appendages damages the pubescence. The head should be extended and not allowed to resume its natural, reflexed position, and the mouth parts and antennae should be spread out. Some specimens from the same colony should be mounted on their backs so as to display underside characters. As little glue as possible should be used as any excess will mask important characters and matt the pubescence.

(b) *Preparation of the genitalia*

Specimens which require dissection should be dealt with as soon as possible and they are best left alive until this can be done. The whole abdomen should be removed and after the extraction of the genitalia should be mounted ventral side up on the card below the specimen. The genitalia may be left untreated, extraneous matter being teased away by the use of fine forceps and a setting needle. The relevant parts may then be mounted on the card below the specimen and simply moistened when under examination.

The genitalia of the male (fig. 6) consist of the aedeagophore and associated plates and struts, most of which are sclerotized. The aedeagophore consists of several lobes, the most important of which is the middle lobe or aedeagus, which can be extruded during copulation and thus effect internal fertilization. The whole structure is very large for the size of the insect (about 1 mm. in length).

(3) *Identification*

Most of the work necessary for the correct determination of the species can be done by means of a $\times 10$ or $\times 15$ dissecting lens, the intelligent use of light being a more important consideration. A 60 watt bulb is sufficient for this purpose.

Pubescence. Although this may be of considerable specific importance, I have refrained where possible from using it as a determinate character as

it is often, especially in museum collections, badly damaged. In many of the species it consists of three distinct layers, forming a very dense layer over the whole of the upper surface and to a lesser extent the under surface as well. The shortest hairs lie close to the body surface and are relatively broad and glistening. The longest hairs are fine, less dense, upright and often only present at the sides of the pronotum and towards the apex of the elytra. An intermediate layer of dense hairs is usually present, these being fine and somewhat upright. The colour of the hairs has been used as an important specific character but such differences are often difficult to appreciate.

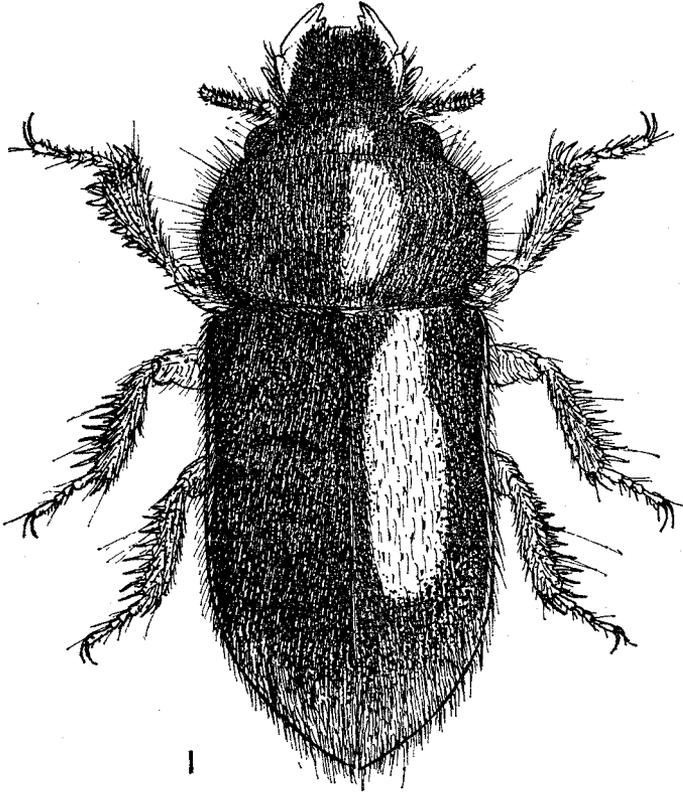


FIG. 1.—*Heterocerus flexuosus* Stephens. $\times 20$.

Microsculpture. The dorsal surface in all the species is closely, although finely punctured, the larger, sometimes double punctures being interspersed with extremely fine, simple punctures on the pronotum and elytra. The punctures at the sides of the metasternum are often somewhat raised and granular, between which the surface may be strigose.

Thorax. The pronotum is or is not demarcated at its base from the posterior face by a distinct ridge (figs. 1, 3). It is often stated that this ridge is present in all species, only varying in its expression between the species,

but this is quite incorrect. No ridge is present in the species of the *flexuosus*-group but along this line the pubescence tends to alter its direction and the surface at this point is usually smooth and shining, so that, when viewed at certain angles, it appears as if a ridge is present. There should be no confusion if the insect is viewed obliquely from the side with the light coming from directly above.

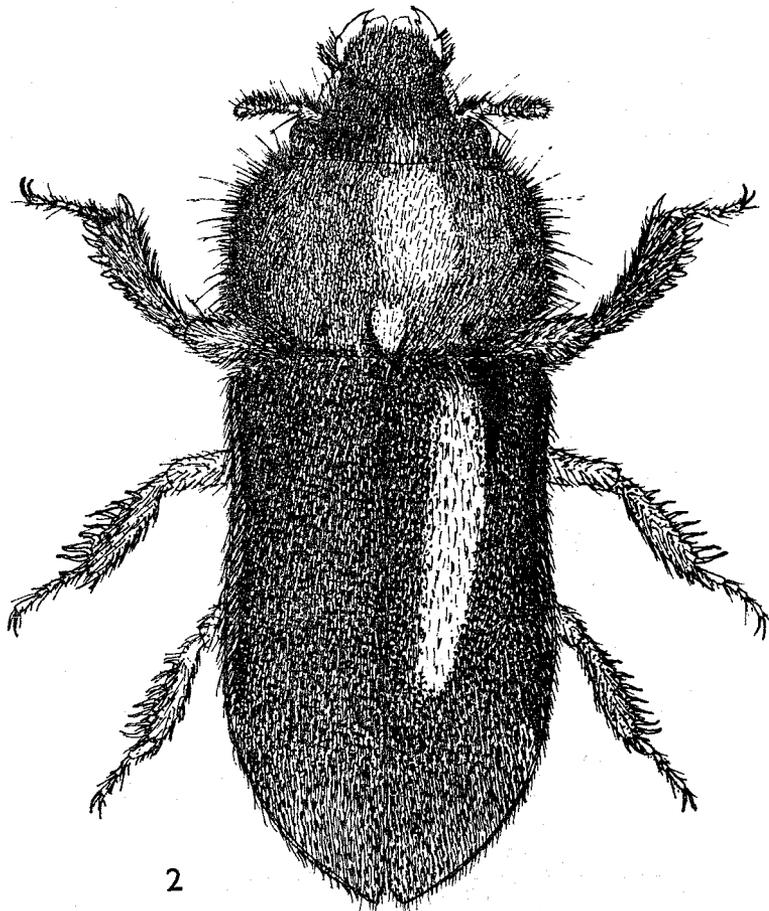


FIG. 2.—*Heterocerus maritimus* Guérin-Meneville. $\times 40$.

Elytron. The reflexed side of the elytron is known as the epipleuron and in several of the species the base of the epipleuron has a crease running obliquely from the side edge towards the shoulder (fig. 4.) Although this crease is somewhat variable in its expression and sometimes difficult to see, it is a good specific character. It is best seen with the insect on its back and the light coming from the side at an angle of 45° .

Metasternum. This is the ventral plate of the underside lying between the middle and hind coxae. Its convexity is of importance in some of the species, being flattish, roof-shaped or regularly convex. Posteriorly a distinct transverse ridge is usually present which delimits the posterior antecoxal sclerites from the metasternum itself. On each side the posterior mesocoxal ridge (fig. 4) runs obliquely from the hind border of the mesocoxa towards the metepisternum which it joins towards the middle of its side. Although the ridge varies in its strength in a single species, its line of direction is important, either being curved or straight.

Stridulatory ridges. The ridges are situated on the surface of the first abdominal sternite (fig. 4). On each side these run from the base near the outer side towards the hind edge of the sternite; in some species the ridges then run forward again towards the front edge of the sternite close to the central process. The ridges are or are not notched depending on the sex and the species. They are best viewed with the light coming from the side at a low angle.

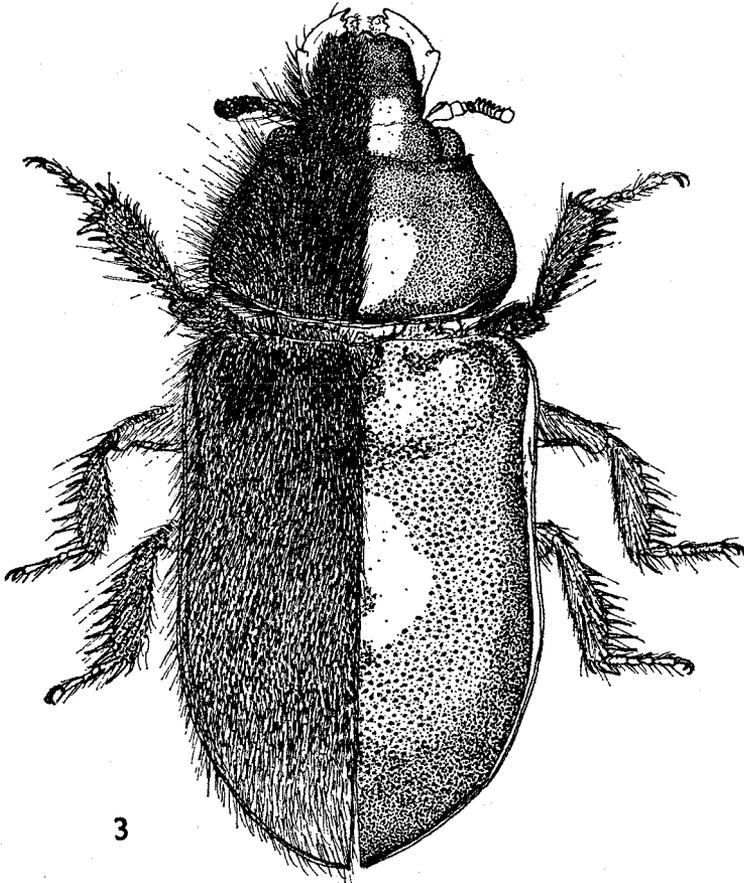


FIG. 3.—*Heterocerus obsoletus* Curtis. $\times 20$.
(Half of surface pubescence omitted to show details of microsculpture.)

Colour. Specimens within any one species vary from completely pale immature examples to almost completely dark individuals. Immature specimens are particularly difficult to identify because of their lack of pigment and also because they lack full adult characters. The distribution of pigment on the pronotum and the elytra is a very useful guide to the separation of many of the species as long as it is realized that there is considerable intra-specific variation. Charpentier (1965) has been followed in naming the different spots and bands of the elytral pattern (fig. 5).

Size. There is a certain amount of intra-specific variation but even though the sizes of the species overlap it is a useful distinction upon which to separate the species.

GENITALIA

The male has the typical internal sclerotised structures of the reproductive system in beetles but the whole system in the female is membranous, without sclerotised parts.

This organ system, in insects so similar in external appearance, is remarkably diverse, and examination of the system in the male ensures a correct identification. In *H. maritimus*, *H. hispidulus* and the species of the *flexuosus*-group the aedeagus is narrow and elongate, less sclerotised and almost completely surrounded by the sheath of the tegmen. The tegmen has a distinct projecting basal piece, little narrower than the tube itself. The flagellum is elongate and normally held to the inside of the middle lobe (aedeagus). The

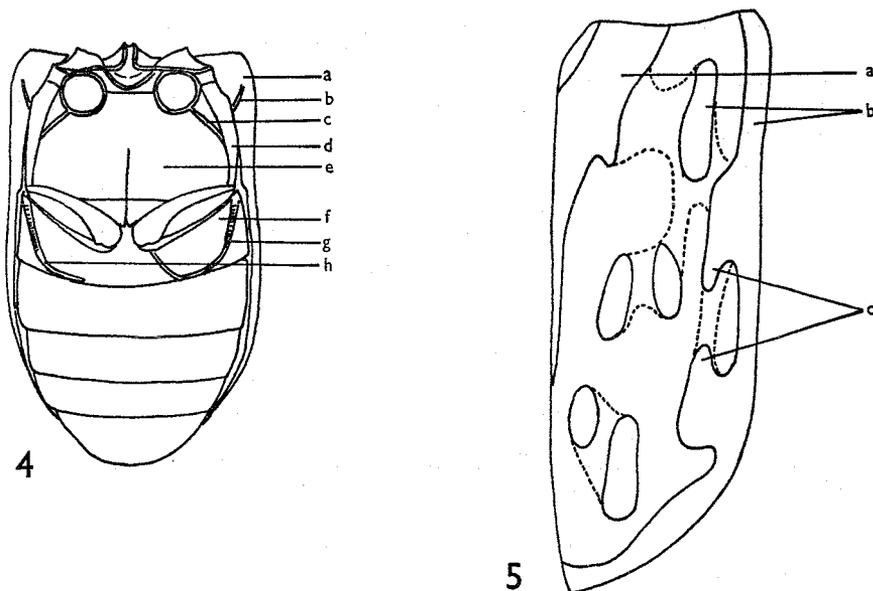


FIG. 4.—Diagram of underside of a schematized *Heterocerus* (after Charpentier). (a) elytral epipleuron; (b) epipleural ridge; (c) postmesocoxal ridge; (d) metepisternum; (e) metasternum; (f) first abdominal sclerite; (g) complete stridulatory ridge; (h) incomplete stridulatory ridge.

FIG. 5.—*H. fenestratus*: Elytral pattern, illustrating distribution of markings. (a) scutellar mark; (b) U-shaped humeral mark; (c) lateral marks.

aedeagophore in the *flexuosus*-group, as first pointed out by Charpentier, has turned 180 degrees round its longitudinal axis so that the middle lobe is situated ventrally to the tegmen; in other groups it lies dorsal to the tegmen.

In the *obsoletus*-group the aedeagophore is generally much broader, rounder and less elongate in structure, with well defined lateral lobes and proportionately narrow basal piece. The aedeagus is almost spherical and bound to the tegmen by membranous connectives and articulating with the lateral lobes by a hook and socket arrangement. The flagellum is coiled within the aedeagal bulb.

The aedeagal struts are similar in all species, consisting of a pair of narrow calliper-like structures, their length also being species-specific.

I have measured the aedeagophore with an eyepiece graticule, 20 units representing 1 mm. The measurements given are for the length of the tegmen. It is measured from its apex to the end of its basal piece (fig. 6). Exact measurement is necessary for the successful determination of the species of the *flexuosus*-group.

SEXING OF SPECIMENS

In the genus *Heterocerus* as a whole there do not seem to be any constant external characteristics for distinguishing the sexes. In the past the length of the clypeus and mandibles has been used for this purpose but this can be extremely misleading. It has also been claimed by numerous workers that the pronotum of the male is considerably broader than that of the female and broader than the elytra. No such correlation however exists and the pronotum in most species, when measured carefully, is a little narrower than the elytra at their base. The characteristics of the stridulatory file seem a better directive for many of the species (see key), but differences do not exist between the sexes of all the species. In summary it may be said that the males are usually smaller, more slender insects, with more pronounced mandibles and clypeus and with the stridulatory file usually distinctly notched but that these characters are not always to be depended upon.

ACKNOWLEDGEMENTS

This handbook would not have been possible without adequate material and for this I am indebted to the following: C. Johnson (Manchester University Museum), E. C. Pelham-Clinton (Royal Scottish Museum, Edinburgh), R. D. Pope (British Museum, Nat. Hist.) and numerous private collectors who placed their specimens at my disposal. I am also indebted to those friends of mine who patiently tested the keys for me and made many constructive criticisms. Finally I should like to thank Dr. R. Charpentier (University of Lund, Sweden) for much valuable information and for reading my manuscript.

KEY TO SPECIES GROUPS

- 1 Posterior face of pronotum not separated from the dorsal surface of the pronotum by a raised ridge (fig. 1) 1. *flexuosus*-group
- Posterior face of pronotum separated from the dorsal surface of the pronotum by a distinct ridge (fig. 3) 2
- 2 Smaller, 2.5-3.3 mm. Insects when mature completely pale to pitchy or nearly black. Elytra with or without well-defined paler marks. Antennae light with at most apex of club dark. First abdominal sternite with the stridulatory ridge recurved from hind edge to middle of front margin (fig. 4) 2. *maritimus*-group
- Larger, 2.9-5.7 mm. Pale marks on elytra usually forming a distinct pattern. Club of antennae dark, only the basal segments of the antennae pale. Stridulatory ridge not recurved from hind margin towards front margin (fig. 4) 3. *obsoletus*-group

KEY TO SPECIES

1. The *flexuosus*-group

Species of this group lack the ridge at the base of the dorsal surface of the pronotum. They are more elongate, less robust species (fig. 1); very variable in size and colour.

Only two species are found in Britain but they have in the past created a great deal of controversy and confusion, reference to Fowler (1889) indicates the taxonomic tangle which surrounded them. Older workers failed to appreciate the great variation of colour and size to be found within a single species. Consequently many new species were described which were only destined to be sunk as synonyms at a later date.

H. fossor occurs in two forms, a larger more convex form and a smaller more depressed form. Colonies examined in the south of England indicate that the two forms occur together in about equal numbers in large colonies, but that smaller colonies are predominantly composed of the smaller form. Examples examined from the north of England, Scotland and Ireland suggest that the larger form predominates. Intermediates between the two forms do occur, but these are not common. The smaller form approaches *H. flexuosus* in structure.

- 1 Apex of middle and hind tibiae completely dark. Pubescence of elytra consisting of many long, outstanding hairs mixed with the shorter, more even layer of hairs. Metasternum dome-shaped. Posterior mesocoxal ridge complete and curved for at least its basal half. Length of aedeagophore 17-20 units. Apex of aedeagus broader than its base, the flagellum close to this point not projecting beyond the limit of the aedeagal walls (figs. 8, 8a). Length 3.6-5.1 mm

(= *femorialis* Krynický) **flexuosus** Stephens

The commonest of the two species in the north of England and Scotland, less frequent in the south of England and Ireland. Recorded from Essex, Kent, Sussex, Somerset, Glamorganshire, Anglesey, Lancashire, Westmoreland, Kirkcubrightshire, Morayshire and N. Ireland. Always found associated with brackish water areas of mud and sand.

- Apex of middle and hind tibiae abruptly reddish. Pubescence of elytra with few long, outstanding hairs mixed with the shorter ground hairs. Metasternum roof-shaped to flat. Posterior mesocoxal ridge straight or incomplete. Length of aedeagophore 22-24 units. Apex of aedeagus as narrow, or narrower than, its base, the flagellum near apex of aedeagus projecting beyond the limit of the aedeagal walls (figs. 7, 7a). Length 4.4-5.9 mm.

(= *rectus* Waterhouse, *salinus* Kies. var *rectus* Waterhouse) **fossor** Kiesenwetter

The commonest of the two species in the south of England and Ireland. Recorded from all southern coastal counties of England (except Cornwall), Cardiganshire, Merionethshire, Lancashire, Yorkshire and N. Ireland. I have seen a single ex., said to have been taken inland, from Claygate in Surrey. There are no records for Scotland. In contrast to flexuosus this species is nearly always associated with salt water areas of clay and mud.

2. The *maritimus*-group

Species of this group have the recurved stridulatory ridges.

- 1 Form broad, not parallel-sided, the pronotum narrow in front and broad at base, general shape of the *obsoletus*-group (fig. 3). Antennae with a 6-segmented club. Pronotum narrower than the elytra, with sides yellowish for front half only. Posterior face of pronotum not visible when viewed directly from above. Elytra substrate, with a distinct light pattern. The short layer of hairs glistening, the longest hairs standing in distinct regular rows (best seen obliquely from the front with the light directly from above). Tibiae yellow to black, the anterior ones with 6-7 spines on their outer edges (i.e. from insertion of tarsus to base of tibia). Length 3-3.6 mm. Aedeagophore characteristic (fig. 10)

hispidulus Kiesenwetter

Recorded for the first time in Britain from Rye Harbour, Sussex. It was first taken in June 1969 by Mr. E. Lewis who found a single female. It remained unspecified until Mr. A. A. Allen took two male specimens the following August. Mr. Allen identified them correctly as *H. hispidulus*. No further exx. were found until May 1970 when numerous specimens were taken at the same spot by the author and others. The locality consists of one small water-filled sand-pit at the edge of which the species has been found burrowing. At first this would appear to be an odd habitat for a species of *Heterocerus* but on closer inspection they are found to be living in a thin band of detritus just below the surface of the sand.

- Form narrow, distinctly parallel-sided, sides of pronotum subparallel (fig. 2). Antennae with a 7-segmented club. Pronotum as broad as, or broader, than the elytra at base, the sides completely pale. Posterior face of pronotum clearly visible from above. Elytra not substrate, without a distinct pale pattern. Colour brown to reddish or almost black. Shortest hairs shining but not glistening, the longest hairs not placed in distinct longitudinal rows. Legs completely reddish, the anterior tibiae with 8-9 spines on their outer edges (unless some are missing in which case their insertions can be seen). Length 2.5-3.3 mm. Aedeagophore characteristic (fig. 9)

(= *britannicus* Kuwert, *sericans* auct. Brit.) **maritimus** Guérin-Ménéville

Widely distributed and usually common when found. Recorded from S.E. and in S.W. coastal counties of England to Cumberland, Dumfries in Scotland and Co. Antrim Ireland. I have not seen any exx. from Wales. It is found at the edge of tidal rivers, in salt marshes, beside brackish dykes etc.

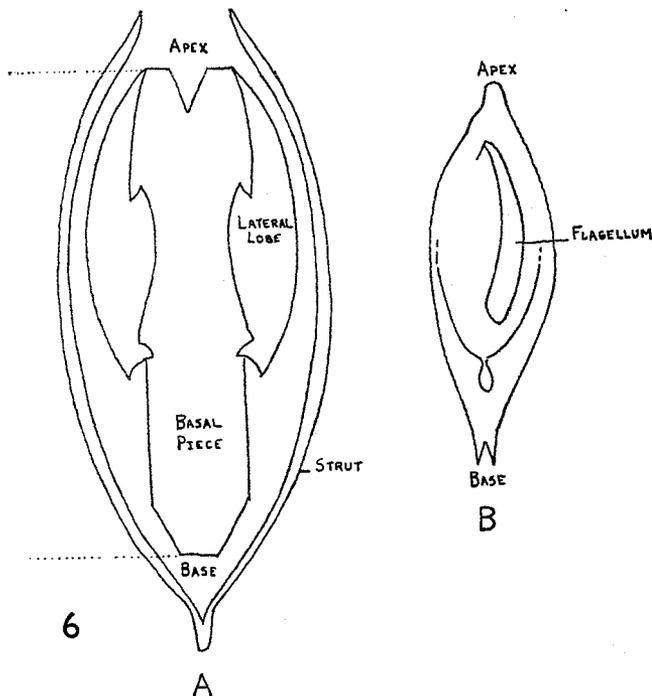
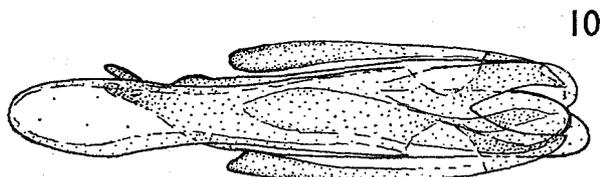
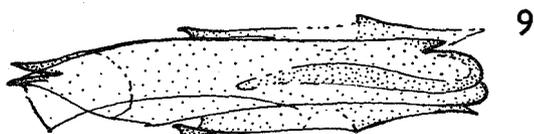
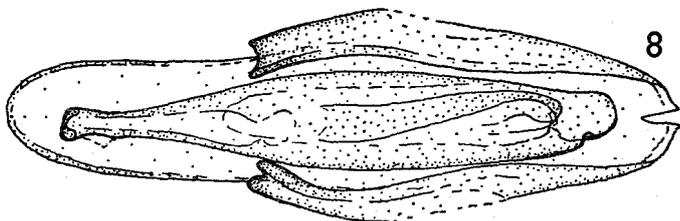
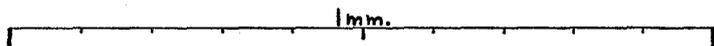
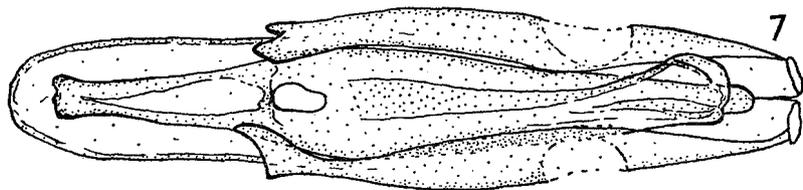


FIG. 6.—Schematized diagram of a dissociated aedeagophore, (A) Tegmen and aedeagal struts; (B) Aedeagus. The dotted lines running to the left of (A) illustrate the two points between which the length of the aedeagophore should be measured.



FIGS. 7-10.—Ventral (figs. 7-10) and lateral (figs. 7a, 8a) views of the aedeogophore of: (7, 7a) *H. fossor*; (8, 8a) *H. flexuosus*; (9) *H. maritimus*; (10) *H. hispidulus*. (All drawn to the same scale; scale line shown.)

3. The *obsoletus*-group

This species-group contains some of the commonest and most widely distributed species of the genus. They have a distinct basal ridge at the base of the pronotum but lack the recurved part of the stridulatory file.

- 1 Base of the elytra entirely dark (lacking the scutellary mark), except sometimes the extreme outer edge paler. The spaces between the punctures of the pronotum as shining as the elytra. Metasternum finely punctured at sides. Lateral part of stridulatory file notched throughout in the male, for the basal half only, in the female. Abdomen with apical sclerites and area around file more or less suffused with paler colour. Elytral epipleura more or less suffused with dark colour, with a crease running towards the shoulder (fig. 4). Length 3.2-4.4 mm. Aedeagophore characteristic (fig. 11)

marginatus Fabricius

Common and widely distributed beside fresh-water rivers, streams, ponds etc. Recorded from most counties of England south of Yorkshire. I have not seen any non-English exx.

(This species bears a strong resemblance to *hispidulus*, from which it is easily separated by the characters of the stridulatory file and the lack of distinct rows of longer pubescence on the elytra. They both occur beside freshwater and neither species has a scutellar mark on the elytra.)

- Base of elytra at least yellowish in part, usually with a scutellar mark. Pronotum less shining than the elytra. Metasternum at sides somewhat strigose or with granular punctures.....2
- 2 Larger, 4.3-5.7 mm. Antennae with basal segments dark. Pronotum black, usually with a small reddish mark close to the front angles. Elytra rarely with a typical U-shaped post-humeral band, the pattern usually made up of smaller, more globular marks. Stridulatory ridge smooth in both of the sexes, except very rarely notched in some males and then only finely so. General pubescence very long and thick, usually dark in colour, all three types of hair length present. Elytral epipleura black or pitchy, without a crease. Aedeagophore characteristic (fig. 12)

obsoletus Curtis

Easily recognized in the field by its robust shape. Fairly common in S.E. England beside brackish-water ponds, ditches etc.

- Smaller and less robust insects, 2.9-4.7 mm. Antennae with pale basal segments, only the club darker. Pronotum with front angles and sides paler, posterior face also pale. Elytra usually with a U-shaped post-humeral band, the pattern made up of larger, more elongate marks, these often in the form of scalloped transverse bands. Elytra lacking the longest hair type. Stridulatory file notched in male...3
- 3 Larger, 3.1-4.7 mm. Front margin of pronotum narrowly yellowish. Elytra with lateral marks separate or joined on their inner sides to each other (fig. 5). Femora always very pale yellow in colour—a good field character. Epipleura of elytra yellow, without a crease running towards the shoulder. Stridulatory ridge notched from base to apex in both sexes. Abdominal sclerites abruptly pale at sides. Aedeagophore characteristic, length 17 units (fig. 13)

(= *laevigatus* Panzer; **pulchellus* Kiesenwetter auct.) **fenestratus** (Thunberg)

Probably the commonest of all the species where found. Recorded from most counties in England south of Yorkshire, beside fresh or brackish-water ponds and ditches.

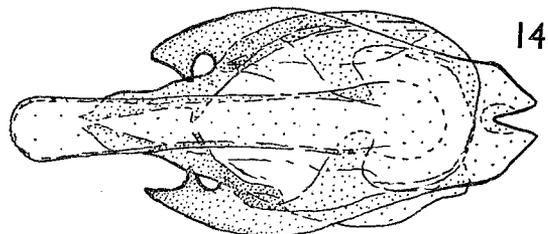
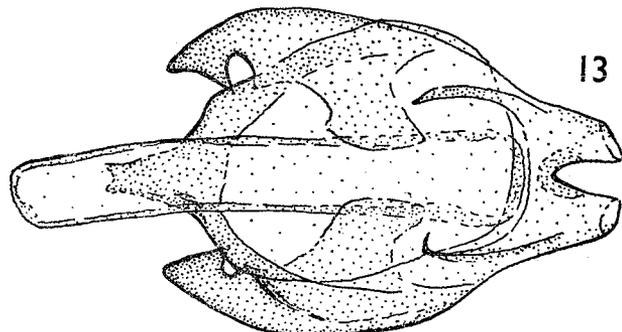
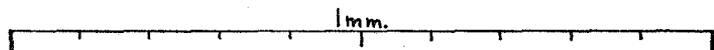
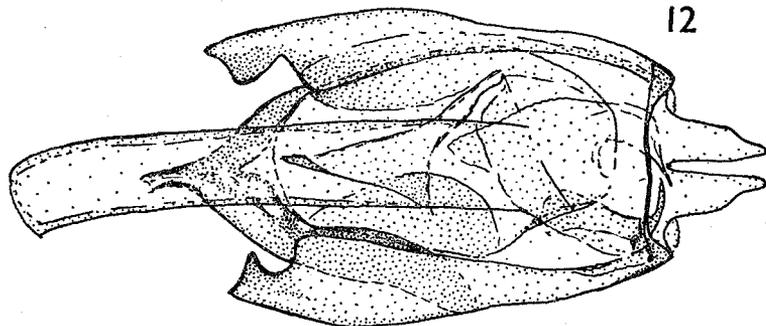
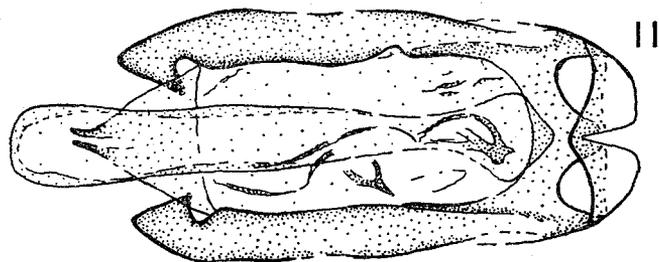
- Smaller, 2.9-3.7 mm. Front margin of pronotum broadly yellowish. Lateral marks of elytra rarely joined internally to one another. Femora fuscous or darker. Elytral epipleura fuscous with a crease running towards the shoulder (fig. 4). Stridulatory ridge notched at base in male, smooth in female. Abdominal sternites generally suffused with reddish colour. Aedeagophore characteristic, shorter, 14 units (fig. 14)

fuscus Kiesenwetter

Restricted to the south coast of England, from the Isle of Wight to Plymouth at the base of sea-cliffs in muddy ground.

(Apparently in Sweden the last two species are extremely difficult to separate and all transitions occur between them: in size, shape, colour and genitalia. The two species (if two) are often found together in mixed colonies. In Britain they are more readily distinguishable and I have never seen living mature adults of one species with the same coloured femora as the other species.)

* Kiesenwetter's type has been lost, as many of them have been. All the exx. identified as *pulchellus* Kies. seen by Dr. Charpentier and myself have been referable to *H. fenestratus* (or less often to *H. marginatus*).



FIGS. 11-14.—Ventral view of the aedeagophore of: (11) *H. marginatus*; (12) *H. obsoletus*; (13) *H. fenestratus*; (14) *H. fuscus*. (All drawn to the same scale; scale line shown.)

It is difficult to construct a key using external characters only by which to separate the species of the genus *Heterocerus*. The literature abounds with characters that are not constant or, even worse, just not true. The characters I have given in the above key should not be taken one by one but rather their total summation should be considered. Only an examination of the aedeagophore will define any species beyond doubt.

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