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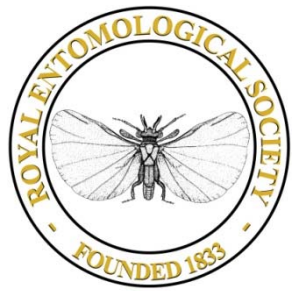

HANDBOOKS FOR

THE IDENTIFICATION

OF BRITISH INSECTS

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ROYAL ENTOMOLOGICAL
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Vol. VI. Part 2(*a*).

HANDBOOKS FOR THE IDENTIFICATION OF BRITISH INSECTS

HYMENOPTERA

2. SYMPHYTA. SECTION (*a*)

By

R. B. BENSON

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HANDBOOKS FOR THE IDENTIFICATION OF BRITISH INSECTS

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

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

II. Hemiptera.
III. Lepidoptera.
IV. and V. Coleoptera.
VI. Hymenoptera: Symphyta and Aculeata.
VII. Hymenoptera: Ichneumonoidea.
VIII. Hymenoptera: Cynipoidea, Chalcidoidea, and Serphoidea.
IX. Diptera: Nematocera and Brachycera.
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The Society is indebted to the Royal Society for a grant towards the cost of initiating this series of *Handbooks*.

A list of parts now available appears on the back cover.

Corrigenda to Sections (*a*) and (*b*).

Page 14, line 23, for " 4, 5 and 6 " read " 3, 4 and 5 ".
Page 21, top line, for " medial cell " read " cell 3R1 ".
Page 29, line 10 up and 3 up, for " basal stalk " read " apical stalk ".
Page 40, line 18 up, for " **femorata** " read " **femoratus** ".
,, line 8 up, for " **lutea** " read " **luteus** ".
Page 41, line 5, for " **connata** " read " **connatus** ".
,, line 15, for " **femorata** " read " **femoratus** ".
,, line 14 up, for " **lutea** " read " **luteus** ".
,, line 12 up, for " **connata** " read " **connatus** ".
Page 42, bottom line, for " **sylvaticum** " read " **latreillei** ".
Page 44, line 11 up, add (" (†*Morice*, 1913, Ent. mon. Mag. **49** : 143) ".
Page 45, top line, add " *and in Ireland* ".
Page 61, line 3 up, for " subfamily " read " tribe ".
Page 83, line 11 up, for " *Prince horpe* " read " *Princethorpe* ".
,, line 10 up, for " *Saun* " read " *Saunt* ".
Page 88, line 3 up, for " as broad as long " read " as long as broad ".
Page 95, line 10, delete " (var. *filiformis* Klug) ".
Page 97, line 10, for " *Perilista* " read " *Periclista* ".
Page 98, lines 25–26, delete " and hind wing with or without an enclosed cell ".
,, lines 29–30, delete " hind wing without an enclosed cell ".
Page 100, line 16 up, add " Hind wing without enclosed cell ".
,, line 10 up, add " Hind wing with an enclosed cell ".
Page 108, line 24, for " *Fenusa* " read " *Profenusa* ".
,, line 33, for " etpraea " read " petraea ".
Page 127, line 10 up, for " 231–51 " read " 231–5 ".

HYMENOPTERA
(SYMPHYTA)

By Robert B. Benson

Of the two Suborders of the **Hymenoptera** the **Symphyta** are much the smaller and are dealt with here in only four parts. The Symphyta consist of all the Sawflies, the Stem Sawflies, and Wood Wasps or Horntails. The present account is divided into four sections for convenience :

(*a*) Xyelidae, Pamphiliidae, Megalodontidae, Xiphydriidae, Siricidae, Cephidae, Argidae, Blasticotomidae, Cimbicidae and Diprionidae.

(*b*) Tenthredinidae : Selandriinae, Heterarthrinae, Blennocampinae and Tentredininae.

(*c*) Tenthredinidae : Nematinae.

(*d*) Larvae ; food-plant and other indexes.

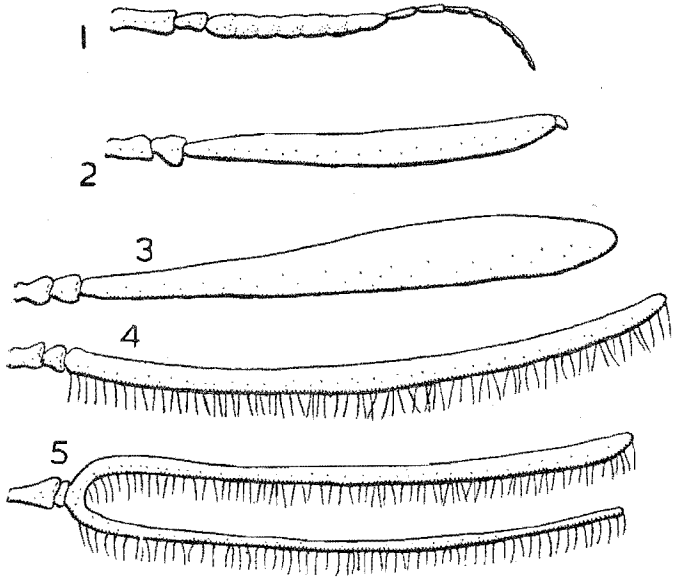
In the first draft of this paper there was included " An Introduction to the Natural History of British Sawflies." When, however, the systematic portion was converted into a handbook, the biological introduction was discarded and published as a separate paper in 1950 (*Trans. Soc. Brit. Ent.* **10** : 45–142).

An account of the general morphology of the Hymenoptera is being prepared by Dr. O. W. Richards as Part 1 of the present volume, and therefore little need be added here in explanation.

For the nomenclature of the hymenopterous wing venation many systems and modifications have been suggested ; but the latest interpretation, that of Ross (1936, The ancestry and wing venation of the Hymenoptera, *Ann. ent. Soc. Amer.* **29** : 99–111) is for the most part followed here (fig. 16). Males and females can be distinguished by looking at the last ventral plate (9th sternite) of the abdomen ; in females this is divided medially by the sawsheath ; but in males this is entire and forms a flattened pouch under the genitalia. Measurements of the total length of adults refer to the length from the front of the head (excluding the antennae) to the apex of the abdomen (excluding the sawsheath in females). Descriptions of colour are not to be taken too literally, as the nicer shade or tint is generally too ephemeral for systematic work on sawflies that have been killed in different ways and have been dead for different lengths of time. It is the pattern of dark and light colouring that is the most important ; the dark is usually near black or piceous, and the light mostly pale orange or yellow, or a green that fades to pale straw.

Roman numerals placed after the British distribution refer to the months of the year when a species can be expected to be found as an adult in Britain ; naturally the actual flight period will vary according to the season and the locality.

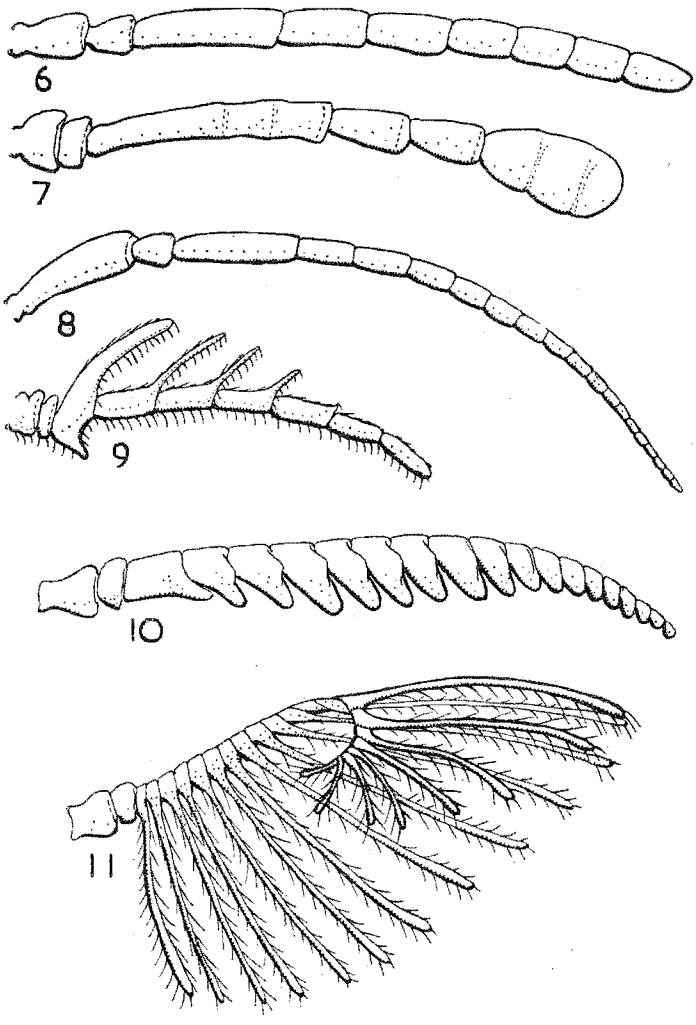
Individual references to sources of information contained in P. Cameron's work (1882–93, *Mon. Brit. Phytoph. Hym.* **1–4**, Ray Society, London) and E. Enslin's (1912–18, Die Tenthredinoidea Mitteleuropas, *Beih. Dtsch. ent. Z.* **1912–17**) are not repeated in the text here. In all species added to the British list since Cameron's monograph a reference is given in brackets and marked with a †. The only synonymy given is that needed to trace the species in the works of Cameron, Enslin and Morice.



FIGS. 1–5.—Antenna of: 1, *Xyela*; 2, *Blasticotoma*; 3, *Arge*, ♀; 4, *Arge*, ♂; 5, *Sterictophora*, ♂.

The original draft included descriptions of larvae, with keys to some of them, with the adults; but, as the larvae have been much less studied comparatively than the adults, it seemed likely that the information about the larvae would more quickly become out-of-date ; for this reason these data have been collected together into a separate part, which can be revised independently. For the names of British plants I have throughout, wherever possible, followed the British Ecological Society's check-list by A. R. Clapham (1946, *J. Ecol.* **33** : 308–347).

The major classification is a further development of that outlined in 1938 (On the classification of sawflies (Hymenoptera, Symphyta), *Trans. R. ent. Soc. Lond.* **87** : 353–84) and in special studies since. All the figures in the text I have specially drawn for the present work ; for those on the cover of this and the following parts I am indebted to Arthur Smith.



FIGS. 6–11.—Antenna of: 6, *Tenthredo*; 7, *Cimbex*; 8, *Xiphydria*; 9, *Cladius*, ♂; 10, *Diprion*, ♀; 11, *Monoctenus*, ♂.

KEY TO FAMILIES OF BRITISH SAWFLIES.

1 Antennae inserted well above the clypeus and lower margin of the eyes, and on the anterior aspect of the head. Fore wings with an anal cell present, though this may be constricted in the middle into 2 cells or petiolate; hind wing often with cross-vein r-m and/or m-cu present (fig. 16).....2

– Antennae on the ventral side of the head below the lower margin of the eyes and below the apparent clypeus. Fore wings without an enclosed anal cell; and hind wing without cross-veins r-m or m-cu

ORUSSIDAE (**Orussoidea**), p. 22.

2 (1) 3rd apparent antennal segment very long and forming the main part of the antenna (either forming the entire flagellum (figs. 3–5), which may be bifid (fig. 5), or bearing a single minute apical segment (fig. 2) or surmounted by a very slender terminal filament of 9 segments (fig. 1).....3.

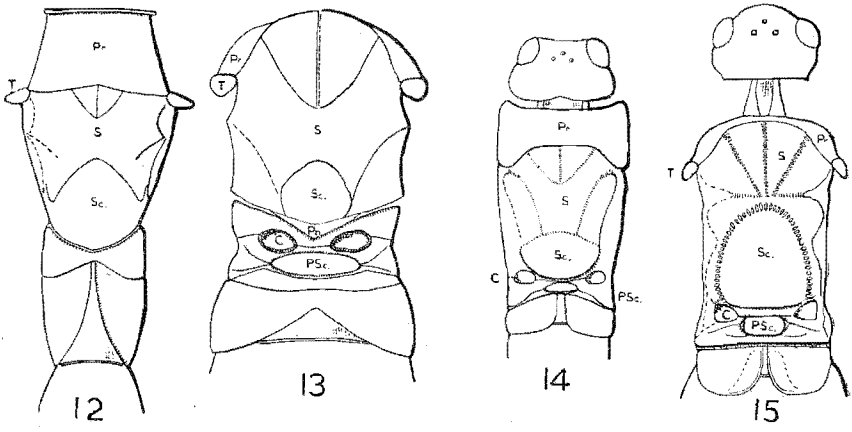
– 3rd segment not forming the main part of the antenna (figs. 6–11).....5.

3 (2) Fore wing with vein 2r present (fig. 18) and often Rs divided also (figs. 17). Antennae of more than 3 segments (figs. 1 and 2) .....4.

– Fore wing with vein 2r absent (fig. 19). Antenna of only 3 segments, of which the 3rd forms the whole flagellum and may be bifid (figs. 3–5) ARGIDAE (part of **Tenthredinoidea**), p. 29.

4 (3) Antennae of 4 segments, though the 4th is minute (fig. 2). Hind margin of pronotum strongly concave (cf. fig. 13, *pr.*). Fore wing with vein Rs not divided apically (fig. 100). Middle and hind tibiae without pre-apical spines. Larger insects (over 5 mm. long) BLASTICOTOMIDAE (part of **Tenthredinoidea**), p. 34.

– Antenna with fine apical filament of 9 small segments (fig. 1). Hind margin of pronotum almost straight (cf. fig. 12, *pr.*). Fore wing with Rs divided apically (fig. 17). Hind and middle tibiae with pre-apical spines. Very small insects (2·5–4·5 mm) ..... XYELIDAE (**Xyeloidea**), p. 7.



FIGS. 12, 13.—Thorax of : 12, Cephid ; 13, Tenthredinid.

FIGS. 14, 15.—Head and thorax of : 14, Siricid ; 15, Xiphydriid. *c*, cencher ; *p.n.*, post-tergite of mesoscutellum ; *pr*, pronotum ; *p.sc.*, meta-post-scutellum ; *s*, mesoscutum ; *sc*, mesoscutellum ; *t*, tegula.

5 (2) Pronotum with hind margin almost straight (fig. 12, *pr.*).....6.

– Pronotum with hind margin strongly emarginate (figs. 13, 14 and 15).....8.

6 (5) Strongly dorsiventrally flattened insects. Ovipositor of female very short and scarcely projecting beyond apex of abdomen. Abdomen not constricted at apex of 1st segment and cenchri present. Front tibia with 2 apical spurs..7.

– Cylindrical or laterally compressed insects. Ovipositor of female projecting well beyond apex of abdomen. Abdomen constricted at apex of 1st segment and cenchri absent (fig. 12). Front tibia with but 1 apical spur CEPHIDAE (**Cephoidea**), p. 23.

7 (6) Antenna flabellate, with long apical projections to the flagellar segments. 2nd tergite of abdomen not divided medially. Fore wing with Sc fused with R (fig. 20) ; anal cell not contracted sub-basally and thus containing the scaly patch within the cell (fig. 25). Tongue, when extended, as long as the head capsule .....MEGALODONTIDAE (part of **Megalodontoidea**), p. 15.

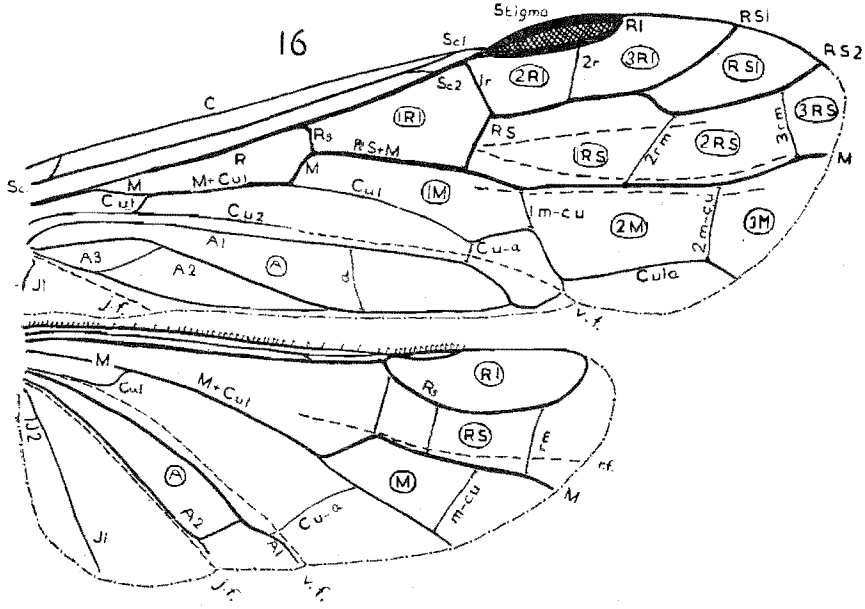
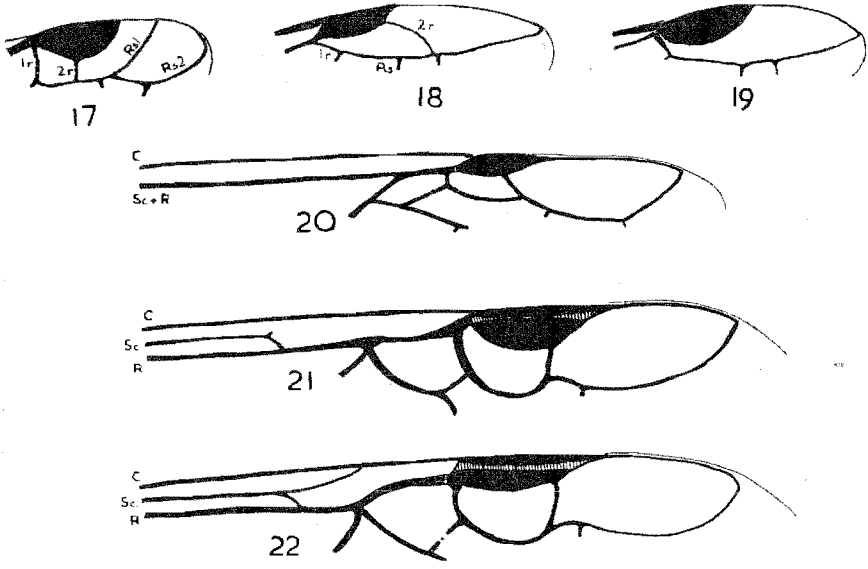
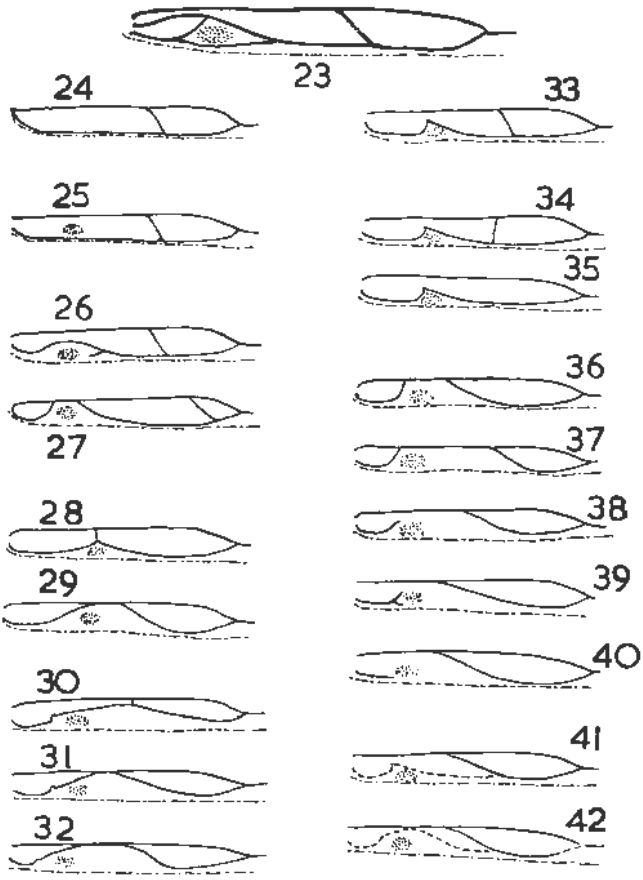


FIG. 16.—Generalized sawfly wing to show Ross's interpretation of the venation. Letters encircled refer to names of cells ; the rest are veins except for the folds : *j.f.*, jugal fold ; *r.f.*, remigial fold ; *v.f.*, vannal fold.



FIGS. 17–19.—Apex of fore wing in : 17, *Xyela* to show condition of divided RS and presence of 2r ; 18, *Tenthredo*, with 2r present ; and 19, *Nematus* with 2r absent.

FIGS. 20–22.—Front margin of fore wing in : 20, *Megalodontes*, with vein Sc fused with R ; 21, *Neurotoma*, with Sc free and joined at apex to R but not to C ; 22, *Pamphilius*, with Sc free and joined at apex to both C and R.



FIGS. 23–42.—Anal cell in fore wing to show the range in form throughout British sawflies from the generalized type 23; 24, *Cephus*; 25, *Megalodontes*; 26, *Xeris*; 27, *Sirex*; 28, *Cimbex*; 29, *Abia*; 30, *Tenthredo*; 31, *Macrophya*; 32, *Pachyprotasis*; 33, *Xyela*; 34, 35, *Strongylogaster*; 36, *Hoplocampa*; 37, *Hemichroa*; 38, *Eutomostethus*; 39, *Rhadinoceraea*; 40, *Blennocampa*; 41, 42, *Heterarthrus*.

– Antennal segments simple. 2nd tergite of abdomen, as well as 1st, divided medially. Fore wing with vein Sc present (figs. 21 and 22); anal cell contracted sub-basally, thereby excluding the scaly patch from the cell (fig. 33). Tongue shorter than head capsule
PAMPHILIIDAE (part of **Megalodontoidea**) p. 9.

8 (5) Antennae setaceous with at least 14 segments (fig. 8). Larger insects (over 14 mm.) either with a horn-like projection to the apical abdominal segment (figs. 64, 65 and 67), or with an exceptionally long neck (fig. 15); ovipositor of female strongly extruded. Mesonotum either with an extra transverse furrow (fig. 15), or with an extra lateral furrow cutting off an extra lateral lobe each side of the scutum (fig. 14). Fore wing with vein 2r present (fig. 18). Front tibia with only 1 apical spur .....9.

– Antennae various in form; if with more than 12 segments then the insect is either under 11 mm. long, or the antennae are serrate, plumose or clubbed. Abdomen without a hornlike projection on the apical tergite; the female

ovipositor is not strongly extruded, and the neck is not exceptionally long. Mesonotum without extra transverse lateral or transverse furrows (fig. 13). Fore wing with or without vein 2r (figs. 18 or 19). Fore tibia always with 2 apical spurs ..... 10.

9 (8) Mesonotum with a transverse furrow, and neck exceptionally long (fig. 15). Apical abdominal segment without a horn-like projection. Fore wing without an apical appendiculate cell and base of Rs not sharply angled
XIPHYDRIIDAE (part of **Siricoidea**), p. 16.

– Mesonotum not divided transversely, but with a lateral lobe divided off each side of the scutum, and neck short (fig. 14). Apical abdominal segment with a horn-like projection. Fore wing with an apical appendiculate cell and base of Rs sharply angled so that it is here in line with the transverse portion of M (fig. 09) ..... SIRICIDAE (part of **Siricoidea**), p. 17.

10 (8) Antenna either filiform, at most sub-clavate, or serrate, or plumose, and often with more than 7 segments (figs. 6, 9, 10 and 11). Abdomen not carinate along side margins and often slender with soft cuticle ..... 11.

– Antennae strongly clubbed and with not more than 7 segments (fig. 7). Strongly built insects, thickly sclerotized and either metallic or strongly pubescent, with the lateral margin of the abdomen carinate
CIMBICIDAE (part of **Tenthredinoidea**), p. 35.

11 (10) Antenna usually 9-segmented (fig. 6) and, except in male *Cladius* (fig. 9), without long apical projections to the segments; if with more than 9 segments then vein 2r is present in fore wing (fig. 18); hind wing with or without veins rm or m-cu. Scutellum with a transverse furrow cutting off an extra sclerite behind, the post-tergite (fig. 13). Inner fore-tibial spur often bifid apically TENTHREDINIDAE (part of **Tenthredinoidea**) (see Sections (*b*) & (*c*)).

– Antenna with more than 9 segments, and plumose (♂) or serrate (♀) through some of the flagellar segments being apically produced or at least strongly swollen (figs. 10 and 11). Fore wing with vein 2r absent (fig. 19); hind wing with both vein r-m and m-cu present. Scutellum without a post-tergite. Inner foretibial spur simple.
DIPRIONIDAE (part of **Tenthredinoidea**), p. 43.

Superfamily **XYELOIDEA.**

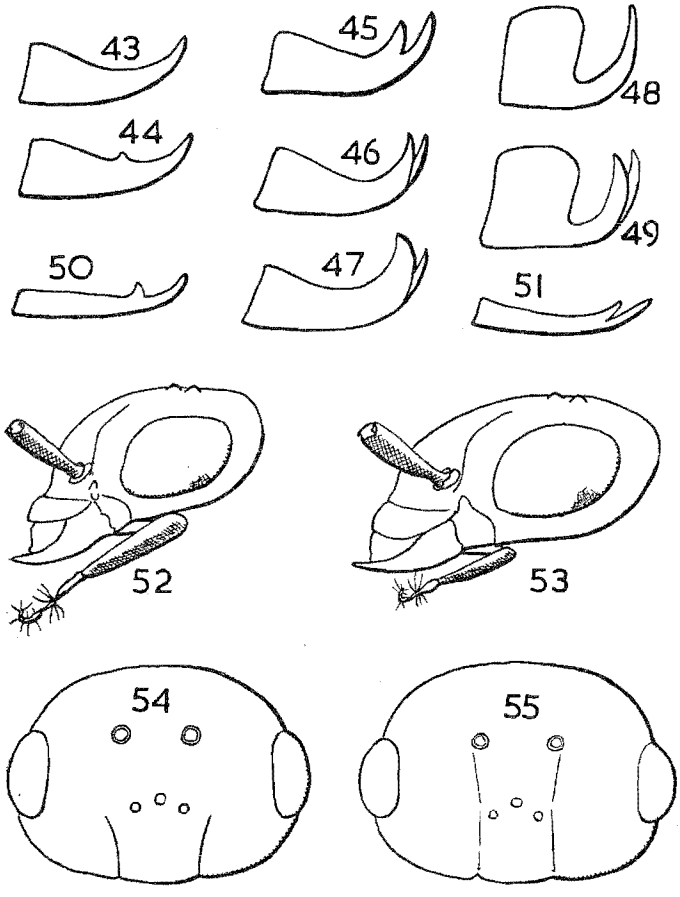
Family XYELIDAE.

Weak-flying insects of spring, characterized by an apparently very long 3rd antennal segment (actually formed by the fusion together of at least 8 segments) surmounted by a slender filament of 9 or more tiny segments (fig. 1). Head normal, open, without hypostomal bridge. Pronotum long, and behind with an almost straight margin, which is almost the shortest distance between the tegulae. Mesosternum triangular, with well-defined sutures and with a presternal bridge in front. The wing-venation is unique among Hymenoptera in having vein Rs of the fore wing divided into Rs1 and Rs2 towards the apex (figs. 16 and 17). Both middle and hind tibiae have pre-apical spines. Ovipositor of ♀ is strongly exserted. Genitalia of ♂ with parameres articulating on parameral plates and with apical cupping discs present; penis-valves trough-like; the whole is either in normal position (orthandrious) or, as in XYELINAE, twisted 180° (strophandrious).

The larva, which is polypodous, with a pair of legs to each abdominal segment including the 1st, is attached to catkin-bearing coniferous or angiospermous trees. A small family of about 40 described species in 6 genera and 4 subfamilies restricted to the Northern Hemisphere; 10 species in 3 genera and 2 subfamilies are known in Europe, and 2 species in 2 genera of one subfamily in Britain. A recent classification of the family was proposed by Benson, 1945 (*Proc. R. ent. Soc. Lond.* (B), **14**: 34–7, figs. 1–3).

Subfamily XYELINAE.

Characterized by the broad stigma (fig. 17), the vein Sc of the fore wing being fused for most of its length with R, the almost naked wing-membranes, the small size (under 5 mm. long, without ovipositor), and the very long exserted ovipositor, longer than an antenna. Larvae in staminate flowers of *Pinus*, and with obsolete legs.



FIGS. 43–51.—Form of tarsal claw : 43, simple ; 44, with small inner tooth ; 45, bifid ; 46, bifid with lateral end tooth ; 47, bifid with inner tooth longer and stouter than the end tooth, which is lateral ; 48, simple with enlarged basal lobe ; 49, bifid with basal lobe and lateral end tooth ; 50, cephoid with erect inner tooth (*Cephus cultratus*) ; 51, cephoid with parallel teeth (*Cephus pygmaeus*).

FIGS. 52, 53.—Head of Xyelidae in lateral view to show proportion of 3rd segment of maxillary palp to basal segment of antenna ; 52, *Xyela julii* ; 53, *Xyelatana piliserra*.

FIGS.—54, 55.—Head in Pamphiliidae from above to show lateral furrows of post-ocellar area in : 54, *Neurotoma* ; 55, *Pamphilius*.

KEY TO GENERA.

A. Length 2·3–3 mm. Maxillary palp much enlarged with the 3rd segment much longer than the 1st antennal segment, and, at the base, stouter than the 3rd antennal segment (fig. 52). Ovipositor in ♀ projects beyond the apex of the abdomen much less than the total length of the insect ..... **Xyela** Dalman.

B. Length 3·5–4·5 mm. Maxillary palp with the 3rd segment shorter than the 1st antennal segment, and thinner, at the base, than the 3rd antennal segment (fig. 53). Ovipositor in ♀ projects much further beyond the abdomen than the total length of the insect ..... **Xyelatana** Benson.

Genus **Xyela** Dalman.

Piceous, more or less marked with yellow but very variable in colour, punctation and development of sutures on head.

Larva in staminate flowers of Pinus sylvestris L. *Adults at flowers of various other trees, especially* Betula, *where these grow near* Pinus. *III–VI. Britain—common and sometimes extremely abundant on heaths where* Pinus *is established; also in Ireland. Probably native in the Caledonian forest relics in Scotland, where also it sometimes occurs in profusion. N. and C. Europe to Urals and W. Siberia, also in Japan* .... ♂ and ♀ **julii** Brébisson.

Genus **Xyelatana** Benson.

Piceous, but extensively marked with yellow.

Associated with Pinus sylvestris *L. in the staminate flowers of which the larvae probably feed, as in the preceding species. Discovered near Aviemore in the Spey Valley, Inverness-shire in* 1943 (*P. Harwood,* 1950, Ent. mon. Mag. **86** : 360). *III–V. Otherwise known only from Lapland and France, in a very few specimens*
♂ and ♀ **piliserra** (C. G. Thomson).

Superfamily **MEGALODONTOIDEA.**

Head closed ventrally, the clypeus being folded back underneath and joined by its lateral arms to the post-genae behind; the result of this is a capsule with 4 holes in it, one for each of the mandibles separately, one for the rest of the mouthparts in the middle, and the 4th is the occipital foramen. Pronotum long in the middle, and with an almost straight hind margin. Mesosternum triangular in shape, clearly defined by sutures and with a pre-sternal bridge in front. Abdomen strongly flattened dorsiventrally.

Male genitalia orthandrious (not twisted). Female sawsheath not exserted strongly. Larva oligopodous.

Two families: PAMPHILIIDAE and MEGALODONTIDAE.

Family PAMPHILIIDAE.

Very flat and broad species, 7–15 mm. long, sun-loving and very fast on the wing. Antennae long, thread-like and many-segmented (18–24).

Fore wings (figs. 21 and 22) with vein Sc free and 2r present. At least the middle and hind tibiae have pre-apical spines.

Abdomen with lateral carina and with the 1st as well as the 2nd tergite divided mesally; ♀ ovipositor very short and scarcely visible from above.

The larva is without abdominal legs, has setaceous thoracic legs, sub-anal processes and a setaceous 7–8 segmented antenna. It lives solitarily or socially in a web, or in a tube of a rolled leaf held by silk. On Conifers or Angiosperms (mostly Rosaceae or catkin-bearing trees). Resting stage in a deep earthen cell underground.

A small family of about 160 species of 5 genera ; restricted to the northern hemisphere. Of the 50 European species, 20 species and subspecies, in 3 genera and 2 subfamilies, are British. A recent classification of the family was proposed by Benson (1945, *Proc. R. ent. Soc. Lond.* (B) **14** : 25–33, figs. 1–11).

KEY TO GENERA.

1 Wings irregularly coriaceous apically. Claws with a small inner tooth not longer than its basal breadth (fig. 44) ; front tibia with a pre-apical spine on its inner side in addition to the apical spurs ; tibial spurs and spines with soft membranous tips. Attached to Pinaceae of Coniferae. 2 spp. (subf. CEPHALCHINAE) ..... **Acantholyda** A. Costa.

– Wing membranes apically with parallel corrugations. Claws bifid, with the inner tooth longer than its basal breadth (fig. 45) ; front tibia without a pre-apical spine ; tibial spurs and spines with acute, sclerotinous tips. Attached to woody Angiosperms, especially Rosaceae and the catkin-bearing families Betulaceae, Salicaceae, Fagaceae, etc. (subf. PAMPHILIINAE) . . 2.

2 (1) Vertical furrows bordering post-ocellar area of head as very shallow sutures diverging towards the front (fig. 54) (so that if produced forwards they would pass well outside antennal sockets) ; frontal area of head not separated from the inner orbits each side by deep furrows. Vein Sc of fore wing has an apical branch which joins R, but the one joining C is obsolete (fig. 21). Hypopygium of ♀ with an impressed medial triangle. 2 spp. **Neurotoma** Konow.

– Vertical furrows on head in the form of deep foveae, often curved, but at most only slightly diverging in front ; these furrows continue forwards to the antennae so that the frontal area is separate laterally from the inner orbits (fig. 55). Vein Sc forked apically, with one branch joining C and the other joining R (fig. 22). Hypopygium of ♀ without an impressed medial triangle. 16 spp. and sub-spp. ..... **Pamphilius** Latreille.

Subfamily CEPHALCHINAE.

Attached to Pinaceae of Coniferae. Two genera, of which only one with 2 species is represented in Britain.

Genus **Acantholyda** A. Costa (= *Pamphilius* in part and *Lyda* in part).

Differs from all other British PAMPHILIIDAE in having a pre-apical spine on the inner side of the front tibia. Larvae live communally in webs on *Pinus*. Holarctic with about 40 species, of which 2 occur in Britain.

KEY TO SPECIES OF BRITISH *Acantholyda* A. Costa.

A. Wings smoky with black stigma and other venation ; thorax and abdomen entirely metallic bluish black ; head red in ♀ (except for a patch round ocelli), but black behind the antennae in the ♂. Temples not carinate on the hind lateral margin ; 3rd antennal segment about as long as the 3 following together ; apical angle of the anal cell of the hind wing with the stub of an extra free vein. 10–12 mm.

Larvae on various species of Pinus, *including our native* P. sylvestris *L., but said to prefer* P. strobus *L. in C. Europe, where it is often a pest. As a native in Britain centred in the ancient Caledonian forest relics at Rannoch, Strath Spey, Dee, etc. ; but occasionally found elsewhere. IV–VI. C. and N. Europe to Lapland, Caucasus and W. Siberia ; also in Korea and N. America (by recent introduction).*

♂ and ♀ **erythrocephala** (L.).

B. Wings clear hyaline, slightly yellowish apically ; stigma and venation except costa, brown ; head and thorax richly marked with yellowish white on a black background ; abdomen dull black dorsally in the middle, orange at the sides and yellowish white beneath. Temples carinate behind on lateral margin ; 3rd antennal segment about as long as the 2 following segments together ; apical

angle of the anal vein in the hind wing without the stub of an extra free vein. 11–15 mm.

Larva on Pinus *spp., frequently as a pest in N. and C. Europe. As a native in Britain apparently centred in the Caledonian forest relics, but more widely dispersed from these centres than is the preceding species. V–VII. Europe, including Iberian Peninsula, to Lapland, Siberia to Irkutsk, N. Mongolia and Japan.*

(= *stellata* Christ *nec* Gooffroy, *nemoralis* Thomson *nec* L., *pinivora* Enslin).

♂ and ♀ **posticalis** Matsumura.

Subfamily PAMPHILIINAE.

Genus **Neurotoma** Konow (= *Pamphilius* in part).

Larvae single or social in webs on Rosaceae. Holarctic, with 11 species, of which 2 occur in Britain.

KEY TO SPECIES OF BRITISH *Neurotoma* KONOW.

A. Head, thorax and base of abdomen dull black with the following parts yellow : a patch between the antennae, the basal 2 or 3 segments of the antennae, the tegulae, the legs (except the coxae and, on the middle and front legs, the trochanters), a spot on the lateral hind angle of each of the abdominal tergites 3–7, and at least the hind margins of the apical sternites ; in the ♂ all the middle part of the dorsum of the abdomen, except for the 1st tergite, is orange ; and in the ♀ the 5 or 6 apical tergites may be more or less orange in the middle, but in darkest forms the abdominal tergites are entirely black except for the pale lateral spots. Wings subhyaline, with a smoky band across the fore wing under the stigma and the apex of the hind wing. Temples carinate behind. 11–14 mm.

Larvae in communal webs on Pyrus communis *L. and various other rosaceous plants such as* Cotoneaster, Crataegus, Mespilus *and* Prunus. *Local., chiefly in middle and southern England, not recorded from Scotland or Ireland. V–VII. C. Europe to Italy, Ukraine and Caucasus, also in Korea.* ..... **saltuum** (L.).
(= *flaviventris* Retz.)

B. Bluish black except for the mandibles, which are marked with yellow, and the hind tibiae, which are marked with yellowish white on the outer side. Wings uniformly subhyaline ; stigma and venation black. Temples not carinate behind. 7–10 mm.

Larvae in pairs in rolls among Quercus *leaves. England* : *Hants, New Forest,* 1907 (*P. Harwood*) and 1910 (*H. Donisthorpe*) ; *Surrey, Bookham Common,* v. 1947 (*P. W. E. Currie*) ; *and Beds, Baker's Wood, nr. Heath and Reach,* v. 1946, *etc.* (*V. H. Chambers*). (†*Morice*, 1910, Ent. mon. Mag., **46** : 160, *but see Chambers*, 1947, op. cit., **83** : 182–4). *V–VI. France, Hungary and Ukraine.*

♂ and ♀ **mandibularis** (Zaddach).

Genus **Pamphilius** Latreille.

Adults very rapid on the wing in the sunshine and not easily collected. Holarctic with 15 British species and subspecies.

Larva in a rolled leaf or tent made from the margin of a leaf of a deciduous tree or shrub.

KEY TO BRITISH SPECIES OF *Pamphilius* LATREILLE.

1 3rd segment of antenna more than 1½ times as long as 4th, and at least as long as the scape (excluding the radicle) ..... 2.

– 3rd segment of antenna at most little longer than 4th and clearly shorter than the scape ..... 13.

2 (1) Hind femora always entirely pale ; abdomen with a reddish-yellow coloured band or at least some pale markings in the middle of its dorsal surface.... 3.

– Hind femora marked with black along inner side ; abdomen entirely black above except at the extreme lateral margins and the extreme apex. 8·5 to 10 mm. long.

♀ with head (fig. 60) and thorax pale brownish yellow except for several small black markings on face, frons, post-ocellar area, temples, scape, pedicel,

pro- and mesonotum. The mesosternum, lower part of mesepisternum, metapleura, and abdomen above, are black, but the underside of the abdomen is entirely yellow except for the extreme bases of the segments. In the ♂ the antenna, head (except for the face and a small yellow streak behind each eye), whole thorax (except tegula), as well as the dorsal surface of the abdomen are black.

Larva on Quercus. *Midland and southern England, but rare*; ♂ *very rare. V–VI. C. and N. Europe to Russia* ..♂ and ♀ **sylvarum** (Stephens).
(♂ = *P. nigricornis* Vollenhoven.)

3 (2) Scape of antenna (excluding radicle) pale except at most for a small black fleck on the inner side. Frons with definite raised crests immediately in front of front ocellus; inner tooth of hind claw mostly longer and broader than end tooth .....4.

– Scape of antenna at least black-marked along the whole inner side. Frons with inconspicuous crests; inner tooth of claw shorter and narrower than end tooth .....7.

4 (3) Front lobes of mesonotum, and scutellum, marked with yellowish white; the black area across the frons from eye to eye is broken up by some included pale spots or stripes in both sexes; scutellum slightly convex but not conical .....5.

– Mesonotum and scutellum entirely black; head in ♀ entirely reddish-brown except for a small black spot surrounding the ocelli, and in the ♂ the upper frons from eye to eye is covered by a continuous black area without any included pale spots or stripes; scutellum almost conical in shape, showing a sharp angle at the apex in profile. 12–16 mm. long.
Wings of ♂ with a fuscous band below the stigma.
Larva on Populus tremula *L. C. and S. England (E. Sussex, W. Kent, Surrey, London, Herts, Beds, Northants and Warwickshire). V–VII. Europe to Iberian Peninsula, Italy, Scandinavia and Russia*
♂ and ♀ **betulae** (L.).

5 (4) Face in front of the antennae, the inner orbits, and most of the temples behind are yellow (figs. 56 and 57). Meso- and metapleura with yellow bands. Venation in basal ⅓ of fore wing yellow. Head above with shining surface between coarse punctures. Mesopleura rough with coarse round or partly confluent punctures and finely rugulous interspaces.....6.

– Face in front of the antennae, the inner orbits and most of the temples behind are black (fig. 61). Meso- and metapleura mostly entirely black. Venation in whole of fore wing dark brown (except for yellow costa and stigma). Head above with fine coriaceous or rugulous surface sculpture between sparse shallow punctures. Mesopleura with oblique rugae covered with fine rugulae. 10–11 mm. long.
Larva on Salix caprea *L. and* aurita *L. Singly in C. and S. England, but also Mid Perth in Scotland (Rannoch,* vi.1931) († *Morice,* 1905, Ent. mon. Mag. **41** : 63). *V–VI. C. and N. Europe to Lapland and Russia.*
♂ and ♀ **gyllenhali** (Dahlbom).

6 (5) Temples and post-ocellar area almost impunctate. Abdominal tergites from the 3rd mostly marked with yellow. Frons has a deep round puncture in front of the front ocellus, in the yellow mark above the antennae (♀, fig. 56). 11–13 mm. long.
Larva on Populus tremula *L. Kent, Herts, Beds and Staffs in England; Glamorgan in Wales; and Inverness in Scotland. V–VII. C. and N. Europe to Caucasus, E. Siberia and Kamtchatka.* ♂ and ♀ **histrio** (Latreille).
(= *flaviventris* Retzius, Stephens *nec* Retzius.)

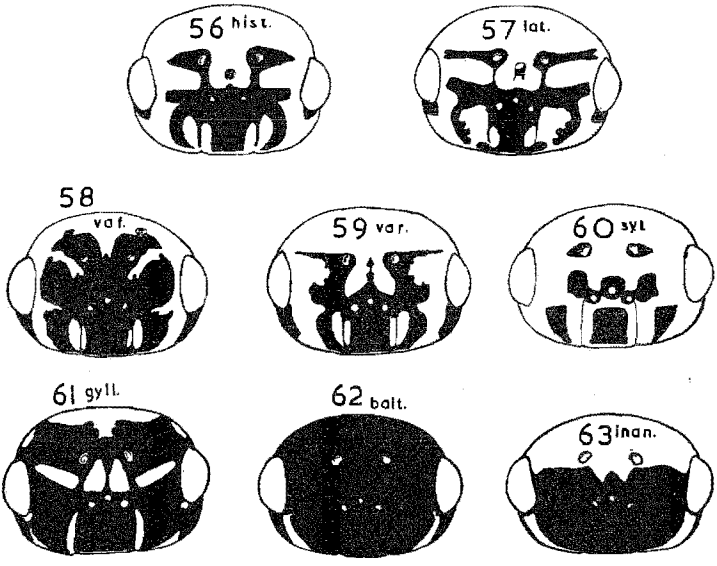
– Temples and post-ocellar area distinctly, though not densely punctured. Abdominal tergites darker, the yellow being limited to the centre of some of the middle segments. In the yellow mark above the antennae on the frons there is a raised dark spot, rather like an ocellus in appearance (♀, fig. 57). 11–13 mm. long.
Larva on Populus tremula *L. Surrey, Middlesex, Herts and Beds.* († *Benson,* 1936, Ent. mon. Mag. 72 : 203). *V–VI. N. and C. Europe.*
♂ and ♀ **latifrons** (Fallén).

7 (3) 3rd segment of antenna longer than scape or than 4th + 5th .....8.

– 3rd segment of antenna about as long as scape and shorter than 4th + 5th.

Head and thorax black with yellowish-white markings; pattern on head much as in *P. vafer* (♀, fig. 58), but yellow less profuse. Abdomen of ♀ black above with an orange band covering tergites 3–5 and with pale hind margins to the apical tergites; underneath, the sternites, except the 2 entirely black basal ones, have black bases and yellowish-white apices. In the ♂ there is a yellow stripe each side of the post-ocellar area in addition to the stripe behind each eye; also the abdomen is mostly yellowish-white beneath and the mesopleura bear a yellow mark. Head with the post-ocellar area shining between scattered punctures and with scattered long pubescence. 7–10 mm.

Larva on Rosa. *Only known from Mid-Perth and Inverness in Scotland. VI. N. and subalpine Europe, and Siberia...* ♂ and ♀ **stramineipes** (Hartig). (= *arbustorum* F., Cameron.)



FIGS. 56–63.—Head from above to show pattern in ♀ *Pamphilius* species: 56, *histrio*; 57, *latifrons*; 58, *vafer*; 59, *varius*; 60, *sylvarum*; 61, *gyllenhali*; 62, *balteatus*; 63, *inanitus*.

8 (7) Post-ocellar area with large scattered punctures and scattered pubescence at least as long as ½ diameter of front ocellus. Frontal area in front of ocelli, together with lateral crests, rough and dull. ..... 9.

– Post-ocellar area shining with but very sparse and feeble punctures, and sparse pubescence shorter than ½ diameter of front ocellus. Frontal area and lateral crests shining between the punctures.

Head and thorax black, but profusely marked with yellowish white; in the ♀ a projection of the yellow colour of the clypeus behind and between the antennae is divided into 2 lobes like cotyledons (fig. 59). The pale fleck on the meta-scutellum is contracted behind. Abdomen normally reddish yellow above, but tergites 1 and 2 are entirely black, so also is a small lateral spot on each side of the other tergites, but sometimes the apical margins or even most of the tergites are black. In the ♂ the fore wings have a fuscous band under the stigma and the apical tergites are more or less blackened. Specimens from N. Britain often approach *pallipes* in having less profuse pale markings on the head and thorax, stronger punctation and more black on the abdomen. 10–13 mm.

Larva on Betula. *Britain and Ireland, commoner in S.E. England. V–VI. C. and N. Europe, Siberia to Kamtchatka*. . ♂ and ♀ **varius** (Lepeletier).
(= *vafer* L. auctt. *nec* L.)

9 (8) Stigma of fore wing more or less piceous, at least on margins (which are thus mostly at least as dark as the venation at the apex of the wing) . . . . . 10.

– Stigma pale throughout (so that even the margins are mostly paler than the venation at the apex of the wing) . . . . . 12.

10 (9) Stigma with the centre more or less pale. White stripe from each eye reaching almost to hind margin of head (♀, fig. 62). Antenna dark above and with segment 3 = 4 + 5 + 6. Abdomen of ♀ with tergites 4 and 5 pale only in the middle, black at sides and margins; ♂ mostly with tergites 4 and 5 entirely pale. 9–11 mm.

Larva on Rosa. *Widespread in England and Scotland. V–VI. C. and N. Europe to Italy, and Siberia to Kamtchatka* . . ♂ and ♀ **balteatus** (Fallén).
(= *cingulatus* Latreille, Cameron.)

– Stigma entirely black. Head black with at most a small white spot at hind margin of each eye. Antenna with flagellum not dark above and with segment 3 less than 4 + 5 + 6. Abdomen of ♀ with at least tergites 4 and 5 entirely reddish yellow; ♂ and ♀ with front lobe of mesonotum entirely black. 10–11 mm.

Larva on Rubus idaeus L. *2 races in Britain. V–VI. C. and N. Europe, and Sakhalin* . . . . . 11.

11 (10) Abdomen with tergites 4, 5 and 6 all reddish yellow.

Central Europe and England . . . . . ♂ and ♀ **hortorum hortorum** (Klug).

– Abdomen with only tergites 4 and 5 reddish yellow.

Scandinavia and Scotland. († *Benson*, 1945, Ent. mon. Mag. **84** : 104.)
♂ and ♀ **hortorum bicinctus** Benson.

12 (9) Abdomen usually beyond 1st tergite in ♀ and 2nd in ♂ entirely fulvous above except for row of lateral black spots; ♂ and ♀ with pale fleck on scutellum and metanotum, the latter fleck being parallel-sided. Less densely punctate and sculptured; for example the face between the antennal socket and the eye with an entirely smooth and shining impunctate strip. 7–10 mm. Head ♀, fig. 58.

Larva on Alnus. *Widespread in England and Scotland. V–VI. C. and N. Europe to the Urals*. . . . . ♂ and ♀ **vafer** (L.).
(= *depressus* Schrank.)

– Abdomen very variable in colour, but always with at least tergites 1 and 2 and most of 3 infuscate; ♂ without pale fleck on scutellum and metanotum; ♀ has these flecks, but that on metanotum is contracted behind. More densely punctate and sculptured; for example, the face between the antennal socket and the eye margin is dull and rugulose between punctures near the antennal socket. 8–11 mm.

Larva on Betula. *Widespread in S. England, but occurs also in Scotland and Ireland. V–VI. C. and N. Europe to Lapland, and Siberia to Japan and Kamtchatka* . . . . . ♂ and ♀ **pallipes** (Zetterstedt).

13 (1) Abdomen black except at apex. Scutellum yellow. Face in front of antennae black. Stigma of fore wing unicolorous piceous. . . . . 14.

— Abdomen in ♀ with 4 middle segments reddish yellow right round; and in the ♂ marked above laterally with reddish yellow on the middle segments and entirely yellow beneath. Scutellum black. Face yellow in front of antennae (♀, fig. 63). Stigma with basal half yellow and apical half brown. 9–11 mm.

Larva on Rosa. *Widespread in England and occurs also in Scotland and Ireland. V–VI. C. and N. Europe, and Siberia to Kamtchatka*
♂ and ♀ **inanitus** (Villers).

14 (13) Scape of antenna entirely yellow. Wings greyish hyaline, with veins, except in costal region, piceous. Frons in front of ocelli dull with rugose sculpture, and each side with an oblique transverse ridge that is not, however, carinate. Yellow spot behind eyes obsolete. 10–11 mm.

Larva on Corylus avellana *L. Probably confused with the following, but known to occur in Herts, Beds, E. Norfolk and Staffs. V–VI. England, Latvia and Finland.* († *Benson*, 1935, Ent. mon. Mag. 71 : 244.)
♂ and ♀ **fumipennis** (Curtis).

– Scape of antenna marked with piceous at base of inner side. Wings yellowish hyaline with brown veins becoming yellow at the base of the wings. Frons in front of ocelli shining and each side with an oblique carinate transverse ridge, which is continued round on the inner side of each eye to join the margin of the clypeus. Head usually with a conspicuous yellow spot behind each eye. 8–10 mm.

Larva on Crataegus, Prunus *and* Sorbus. *The commonest species in the genus. Probably throughout Britain and Ireland. V–VII. All Europe to Caucasus and Urals* ..... ♂ and ♀ **sylvaticus** (L.).

Family MEGALODONTIDAE.

Flat-bodied flower-haunting species, very fast on the wing.

Characterized by their many-segmented flabellate antennae, with flattened prolongations from the apices of the flagellar segments. Whole insect very broad and flat, pamphilioid in form, with wasp-like colouring and yellowish-brown marked wings. The tongue when extended is almost as long as the whole of the head capsule. Pronotum with an almost straight hind-margin. Fore wings with vein Sc fused with R (fig. 20); anal cell not contracted basally so that the scaly patch on the membrane is not included within the anal cell (fig. 25). Abdomen with the propodeum very short and broadly emarginate behind, leaving a large oval unsclerotized area; 2nd tergite not divided medially; ovipositor very short and scarcely projecting beyond the apex of the abdomen.

Larvae, as in PAMPHILIIDAE, of the oligopod type without abdominal legs, with setaceous thoracic legs, sub-anal processes, and a comparatively long 7–8 segmented antenna. They live socially in webs on herbaceous plants: *Megalodontes* on Umbelliferae; *Rhipidiocerus* on Rutaceae (cf. Stritt, 1937, *Beitr. naturKund Forsch. Südwestdeutschl. Karlsruhe* 2 : 217–220). About 43 species described, divided into 4 genera, restricted to Europe and Asia, concentrated in the steppes.

Genus **Megalodontes** Latreille.

Of the 35 species of the genus recognized by Gussakovsky, 3 extend their range into N.W. Europe and were recorded as British in former times. The evidence that any of these were actually found in Britain is inconclusive (see Benson, 1943, *Ent. mon. Mag.* **79** : 5–7). These 3 can be distinguished as follows:

M. spissicornis Klug (= *klugii* Leach), has an all-black mesonotum and the projections on the middle segments of the antennae each as long as the 2 following segments together. 10–13 mm. (Larva on *Laserpitium*, *Peucedanum* and *Seseli*, etc.).

M. cephalotes Fabricius has 4 yellow flecks on the mesonotum and the antennal projections on the middle segments each little longer than the following segment. 11–12 mm. (Larva on *Peucedanum*.)

M. plagiocephala Fabricius has mesonotum all black and antennal projections short as in *M. cephalotes*. 10–12 mm. (Larva on *Peucedanum*.)

Superfamily **SIRICOIDEA.**

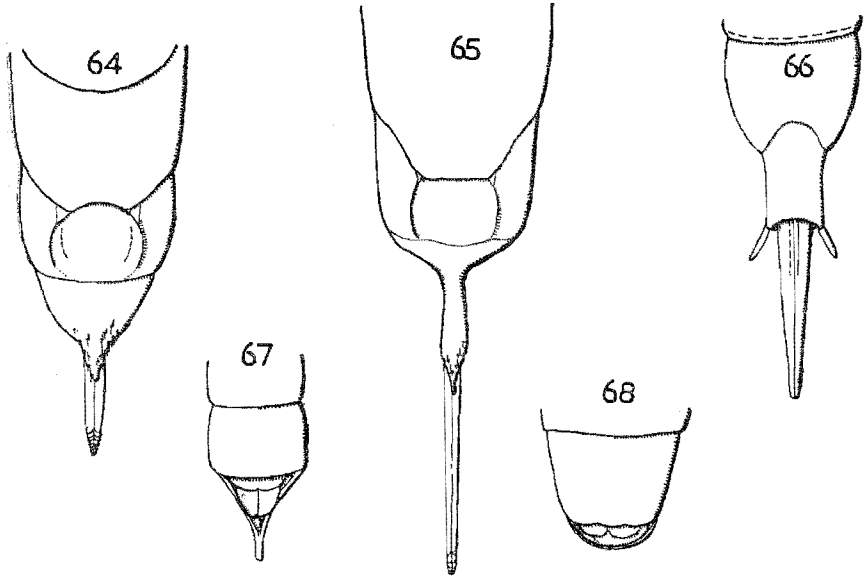
Head with hypostomal bridge separating oral cavity from occipital foramen behind; labrum spatulate. Pronotum short medially and emarginate behind (figs. 14 and 15); mesosternum triangular, usually with pre-

sternal bridge in front, though the sutures are usually obsolete. Male genitalia orthandrious ; parameres articulating on the parameral plates and moved by special muscles, and with apical cupping discs. Female ovipositor strongly exserted. Larva of reduced oligopod type.

Three families : XIPHYDRIIDAE, SIRICIDAE and *SYNTEXIDAE.

Family XIPHYDRIIDAE.

Large insects usually over 14 mm. long. Antennae setaceous and 13–19 segmented, with a long curved 1st segment at least as long as 3rd. Neck long (fig. 15) ; cervical sclerites viewed from the side appear longer than



FIGS. 64–66.—Apex of ♀ abdomen from above in Siricoidea : 64, *Sirex* ; 65, *Urocerus*; 66, *Xiphydria*.

FIGS. 67, 68.—Apex of ♂ abdomen from above in : 67, *Sirex* ; 68, *Xiphydria*.

broad. Mesonotum with a transverse furrow. Fore wings corrugated apically, and without an appendiculate cell ; vein 2r present, and base of Rs not angled sharply near its base, so that its basal portion is not in a line with M.

Tibiae without pre-apical spines ; front tibia with only one apical spur. Last abdominal segment without an apical horn-like projection (figs. 66 and 68).

Larvae white with only vestigial thoracic legs ; and they bore in the wood of deciduous trees (Betulaceae, Salicaceae and Ulmaceae). Worldwide, with about 70 known species, of which 6 in 2 genera occur in Europe, and 2 belonging to one genus in Britain.

* Not British.

Genus **Xiphydria** Latreille.

Mouth parts with maxillary palp 4- and labial palp 3-segmented (1st segment elongate, and 3rd without a sensory cup). Claws with a small subapical tooth. Fore wing with an anal cell that is contracted but not divided in the middle (fig. 26).

KEY TO SPECIES OF *Xiphydria* Latreille.

A. Abdomen black with a red band in the middle (usually covering tergites 3–5 in ♀ and at least 4 in ♂) and a row of small white lateral spots; legs of ♀ red with the bases of all tibiae and the hind basitarsus white, and apical hind tarsal segments infuscate; legs of ♂ piceous. Antenna with 2nd segment about as long as 4th. Hind basitarsus much longer than the three following tarsal segment together. Abdomen of ♂ with tufts of brown hairs on the sternites, especially on the 5th and 6th. 6–18 mm.

Larva in Salix *(on the Continent also recorded from* Populus *and* Ulmus*). Local in England and mostly confined to the S.E. of a line drawn from the Wash to Hampshire to include Oxon and the New Forest, but has also been found in Notts and Hereford. VI–VIII. Europe to Lapland and Caucasus, and S.W. Siberia and Heptapotamia* ..... ♂ and ♀ **prolongata** (Geoffroy).
(= *dromedarius* F.)

B. Abdomen with lateral white spots but without any red middle segments. Legs of ♀ entirely red except for the infuscate apical tarsal segments; ♂ legs piceous. Antenna with 2nd segment much shorter than 4th. Hind basitarsus only about as long as the three following tarsal segments together. Abdomen of ♂ without tufts of hair on the sternites. 10–21 mm.

White stripes bordering post-ocellar area not reaching to back of head. *Larva in* Alnus *and* Betula. *Local in England, Wales and Scotland. V–VIII. Europe to Asia Minor, Lapland and to E. Siberia, Sakhalin and Kamtchatka* ..... ♂ and ♀ **camelus** (L.).

Family SIRICIDAE.

Large insects, generally over 14 mm., with exserted ovipositors, and differing from all other Hymenoptera in their minute tegulae.

Mouthparts with maxillary palp 1-segmented; labial palp 2- to 3-segmented, the last segment enlarged and bearing a large apical sensory cup, and the 1st segment not enlarged.

Antenna setaceous, 17–30-segmented, with a long curved 1st segment at least as long as the 3rd. Neck short (fig. 14) (cervical sclerites viewed from the side appear higher than long). Pronotum strongly emarginate behind. Mesonotum not divided transversely, but with a lateral lobe divided off each side of the scutum.

Fore wings with the membrane corrugated at the apex and with a large apical appendicular cell (fig. 69). Tibiae without pre-apical spines, and front tibia with only one apical spur. Abdomen cylindrical and contracted at base of 1st segment, which is medially divided; last segment with a horn-like projection, called the cornus (figs. 64, 65 and 67).

The larvae are white with only vestigial thoracic legs; they bore in wood.

The family is a small one, with only about 70 known species and subspecies divided into 8 genera in 2 subfamilies, mostly in the holarctic and oriental regions, but introduced elsewhere; 15 species and subspecies in 4 genera occur in Europe. Of these the 3 whose larvae live in Pinaceae of the Coniferae (= subfamily SIRICINAE) are found in Britain (in 11 species and subspecies), whither they are frequently introduced in timber.

The adults are about from V–IX, but mostly from VII–IX. They fly mostly in bright sunshine. Females are usually more abundant than males. Males resort to the tree-tops or high ground, where pairing takes place.

It seems probable, however, that the Siberian form of *Urocerus gigas* and possibly *Sirex juvencus* are indigenous to the Caledonian forest relics in N. Britain. For a recent discussion on these problems together with keys to world genera and European species see Benson, 1943 (Studies in SIRICIDAE, especially of Europe and Southern Asia (Hymenoptera, Symphyta), *Bull. ent. Res.* **34** : 27–51).

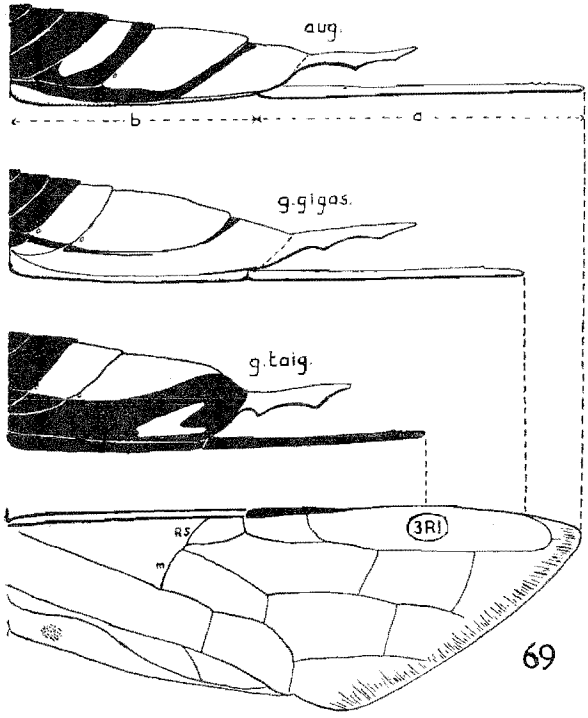


FIG. 69.—Lateral view of ovipositor (*a* = sawsheath, *b* = basal plate) of *Urocerus* compared to length of fore-wing in: *aug.* = *augur*; *g.* gigas = *gigas gigas*; *g. taig.* = *gigas taiganus*.

Males of these woodwasps are not yet well differentiated, probably just as much through lack of material for study as through any intrinsic difficulties in them, though the genitalia seem of slight and doubtful significance.

KEY TO BRITISH GENERA OF SIRICIDAE.

1 Head above with a white or yellow spot present behind each eye. Cornus, at apex of ♀ abdomen, constricted towards base and broadened apically (fig. 65) ..... 2.

— Head above without a pale spot behind each eye. Cornus of ♀ may be shouldered, but it is never constricted towards the base and then broadened apically (fig. 64). 4 spp. ..... **Sirex** L.

2 (1) Head without a genal carina present on lateral hind margin. Pronotum entirely black, and, in dorsal view, is truncate in front with the medial length less than the length of the head behind the eyes. Hind tibia with 2 apical spurs. 3rd antennal segment shorter than 4th. ♀ ovipositor shorter than abdomen + cornus and not longer than a fore wing. 6 spp. and subspp.
Urocerus Geoffroy.

– Head with a genal carina present on lateral hind margin. Pronotum with a pale dorsal stripe each side and, in dorsal view, the front is strongly emarginate, projecting forward at the angles, with its medial length at least as long as the length of the head behind an eye. Hind tibia with only 1 apical spur. 3rd antennal segment longer than 4th. ♀ ovipositor longer than abdomen + cornus and about 1½ times as long as a fore wing. 1 sp.
Xeris Costa.

Genus **Urocerus** Geoffroy (= *Sirex* L. in part).

Holarctic, with about 20 species and subspecies, of which 8 occur in Europe and 6 have been found in Britain. 12–40 mm. long.

Associated with Pinaceae.

KEY TO SPECIES OF *Urocerus* THAT HAVE BEEN FOUND IN BRITAIN.

Females.

1 Abdomen entirely black, or with at most white cornus and white flecks at the sides of some of the tergites
Legs black except for white bases of tibiae and basitarsus.....2.

– Abdomen banded with yellow or brown .....3.

2 (1) Abdomen entirely dull black. Wings yellow with yellow venation. Antennal flagellum yellow entirely
Native of Pacific coast of N. America, recorded once from imported timber, but not established in Britain († *Benson*, 1945, Ent. mon. Mag. **81** : 67)
♀ **californicus** (Norton).

– Abdomen black with white cornus and white flecks at the sides of some of the tergites. Wings more or less smoky with black venation. Antennal flagellum white except for the black apex and two or three basal segments.
N. American species occasionally introduced into Britain in timber, but not established here.....♀ **albicornis** F.

3 (1) Head behind the eyes yellow except at most for the infuscate medial furrow of the post-ocellar area. Hind tibia with at least the apical half black. Stigma concolourous with the costa. Ovipositor about as long as a fore wing (cf. fig. 69).
C. and S.E. Europe. Occasionally introduced into Britain in timber, but not established here, cf. *Stephens*, 1835, *p.* 114, *and Benson*, 1938, Ent. mon. Mag. **74** : 255, *as* " Urocerus cedrorum (*Smith*). " ..♀ **augur augur** (Klug.).

– Head with the yellow behind the eyes divided into two widely separated spots by the broad black post-ocellar area. Hind tibia with at most the extreme apex infuscate. Stigma at least slightly darker than the costa. Ovipositor clearly shorter than a fore wing (fig. 69). *Forms of* gigas, *showing a certain amount of hybridization in Britain, through the bringing together of three geographical races in imported timber*.....4.

4 (3) Ovipositor sheath black and shorter (would reach only to about the middle of the cell (3R1) if stretched along front margin of fore wing from the base, cf. fig. 69). 9th tergite at least black at base.....5.

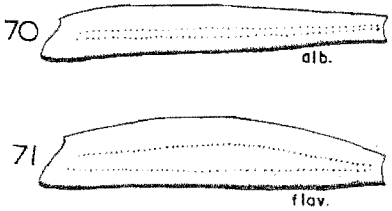
– Ovipositor sheath brown and longer (would reach to about apex of cell 3R1 of fore wing from base). 9th tergite at most black only in its basal groove.
Native only in Europe, extending N. to S. Scandinavia and S. to N. Africa. Frequently introduced into Britain in timber and now established throughout Britain, though probably not endemic.....♀ **gigas gigas** (L.).

5 (4) 9th tergite at least partly yellow above and 8th entirely yellow.
Native to N. coniferous belt in Eurasia, probably including Caledonian forest in N. Britain, but also introduced in timber (cf. *Benson*, 1943, Bull. ent. Res. **34** : 39).....♀ **gigas taiganus** Benson.

– 9th tergite entirely black and 8th mostly black.
Native of N. coniferous belt in N. America, whence it is occasionally introduced into Britain in timber, but is not established here. . ♀ **gigas flavicornis** (F.). (= *bizonatus* Stephens).

Males.

1 Abdomen with at least apex infuscate ..... 2.
– Abdomen entirely reddish yellow (not seen) ..... ♂ **californicus** (Norton).
2 (1) Head with yellow behind the eyes divided into two widely separated spots by the broad black post-ocellar area ..... 3.
– Head entirely yellow behind the eyes except for the infuscate medial furrow to the post-ocellar area..... ♂ **augur augur** (Klug.).
3 (2) Abdomen with 7th tergite black. Antenna generally infuscate apically from about the 7th segment..... 4.
– Abdomen with 7th tergite yellow. Antenna with flagellum entirely yellow ♂ **gigas gigas** (L.).
4 (3) Hind basitarsus 6·5 to 8 times as long as broad (fig. 70)..... ♂ **albicornis** F.
– Hind basitarsus 4 to 5·5 times as long as broad (fig. 71) ♂ **gigas flavicornis** (F.) and **gigas taiganus** Benson.



FIGS. 70–71.—Hind basitarsus in ♂ *Urocerus*: 70, *albicornis*; 71, *gigas flavicornis*.

Genus **Sirex** L. (= *Sirex* in part, *Paururus* Konow).

Holarctic, with about 20 species, 5 in Europe, 4 of which have occurred in Britain, one possibly as an endemic, while one or two others are probably now established. 14–30 mm. long.

Associated with Pinaceae.

KEY TO SPECIES OF *Sirex* THAT HAVE BEEN FOUND IN BRITAIN.

Females.

1 Legs mostly reddish yellow (except that the coxae and apical tarsal segment may be piceous). Wings at most only slightly infuscate. Ovipositor shorter than fore wing ..... 2.
– Legs mostly bluish black (except that the apical half of the hind coxae may be yellow). Wings dark violaceous to slightly smoky. Ovipositor about as long as a fore wing.
Native of the Rocky Mts. and Pacific coast of N. America. Occasionally introduced into Britain in timber, but not established there († *Saunt*, 1924, Ent. mon. Mag. **60** : 80) ..... ♀ **areolatus** (Cresson).
2 (1) Apical tarsal segment of all legs yellow. Sawsheath about as long as oblong plate or longer (figs. 73 and 74); ovipositor would reach beyond base of cell 3R1 if stretched along front margin of fore wing from base. Mesopleura blue green and in the middle with shining interspaces larger than the punctures. Middle tergites less densely rugulose and shining laterally. Antenna may be brown at base..... 3.
– Apical tarsal segment of all legs piceous. Sawsheath clearly shorter than oblong plate (fig. 72), and ovipositor would reach from base of wing only to

base of radial cell. Mesopleura violet and so densely punctured that in the middle the interspaces between the punctures are smaller than the punctures. Middle tergites very densely rugulose and not shining laterally. Antennae always entirely black.

Holarctic species probably only as an established alien in Britain.

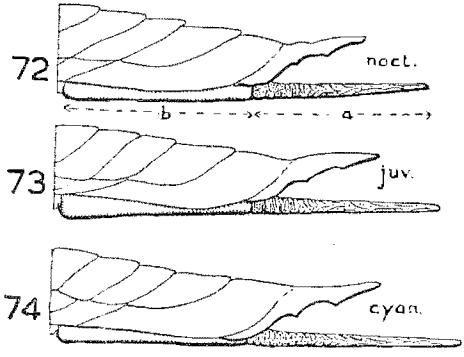
♀ **noetilio** (Fabricius).

(= *melanocerus* Thomson).

3 (2) Sawsheath longer than oblong plate (fig. 74); ovipositor would reach almost to apex of radial cell if stretched along front margin of fore wing from base. Antenna all black.

Holarctic species, generally thought to be American in origin, established in S. Britain, whither it is often imported in timber ....♀ **cyaneus** (Fabricius).

– Sawsheath as long as oblong plate (fig. 73); ovipositor would reach only to middle of radial cell from base of fore wing. Antenna often with brown basal segments.



FIGS. 72–74.—Lateral view of ovipositor in *Sirex* to show different proportions of (*a*) sawsheath to (*b*) basal plate, in: 72, *noctilio*; 73, *juvencus*; 74, *cyaneus*.

Holarctic species, the typical form, with red-based antennae, is probably in Britain confined to England, where it occurs as an established alien and as a frequent introduction in timber. Forms with entirely black antennae are apparently confined to the northern coniferous forests; I have seen specimens from Lapland, Scotland and E. Canada; they may represent a distinct race.

♀ **juvencus** (L.).

Males.

1 Head and thorax black or blue-black ..... 2.

– Head and thorax metallic green.

Posterior or sometimes all the legs, except their coxae, rufous. Abdomen, except 1 or 2 basal segments, red ..... ♂ **areolatus** (Cresson).

2 (1) Apical tarsal segment of all legs yellow. Mesopleura in the middle with shining interspaces larger than the punctures ..... 3.

– Apical tarsal segment of all legs piceous. Mesopleura so densely punctured in the middle that the shining interspaces are smaller than the punctures. Abdomen with apical sternites and tergites as well as 2 or 3 basal tergites black ..... ♂ **noctilio** (Fabricius).

(= *melanocerus* Thomson).

3 (2) Antenna with basal segments of flagellum red or brown; if infuscate, then with apical sternites and tergites black ..... ♂ **juvencus** (L.).

– Antenna entirely black and abdomen not infuscate at apex

♂ **cyaneus** (Fabricius).

Genus **Xeris** Costa.

Four known species : 1 holarctic, 2 confined to N. America and 1 to Himalayas. One British species :

15 mm. to 30 mm. (excluding ovipositor). Mostly piceous in colour.
Holarctic species. Occasionally introduced into Britain in timber, but not apparently established here ..... ♂ and ♀ **spectrum** (L.).

Superfamily **ORUSSOIDEA.**

One family.

Family ORUSSIDAE.

Very rare insects, characterized by the insertion of the antennae on the ventral aspect of the head, below the apparent clypeus and below the lower margins of the eyes ; the antenna is 11-segmented and setiform in the ♂, but in the ♀ is only 10-segmented, with the 9th segment unique in form, swollen and longer than any other segment ; head behind with a hypostomal bridge separating the oral cavity from the occipital foramen ; labrum spatulate. Pronotum strongly emarginate behind ; mesosternum triangular without presternal bridge and with sutures obsolete. The wing-venation is reduced mostly to pigmented bands ; there is no vein 2r in the fore wing and no cross veins r–m or m–cu in the hind wing. Male genitalia orthandrious ; parameres continuous with parameral plates, without muscles and without apical cupping discs ; aedeagus trough-like. Female saw-sheath exserted.

The habits of these insects are unique among sawflies in that their legless white larvae are internal parasites of wood-boring beetle larvae (BUPRESTIDAE).

The family is distributed over all the main continents. There are about 55 species known, divided by Benson (1938, *Ann. Mag. nat. Hist.* (11) **2** : 1–15) into 10 genera, of which only *Orussus* occurs in north temperate regions.

Genus **Orussus** Latreille.

Almost world-wide, with about 20 species, of which 4 have been found in Europe. One of these, *O. abietinus* (Scopoli), was supposed to have occurred in Britain in former times. It is a species from 9–15 mm. long with the head, thorax and 1st and 2nd segments of the abdomen black with white markings, and the rest of the abdomen red. This is the only European species with the abdomen red-marked.

The only known British records are those given by Stephens (1835, *Ill. Brit. Ent. Mand.* 7 : 112) : "Two examples of this fine insect have hitherto, so far as I am aware, been taken in Britain ; the first was caught in July, 1817, at Darenth Wood, by Dr. Leach, while in company with me on a collecting excursion ; the other was also taken subsequently in Devonshire, by the same distinguished naturalist." Morice (1904, *Ent. mon. Mag.* **40** : 49) records a more recent specimen claimed by a correspondent to have been taken at Hastings about 1880 ; the specimen, now in the Melville Collection at Cardiff, is, according to Mr. H. M. Hallet (*in lit.*), none other than a typical example of *Xiphydria prolongata* (Geoffroy). Europe, N. Africa and W. Asia. Very doubtfully British..... ♂ and ♀ **abietinus** (Scopoli).

Superfamily **CEPHOIDEA.**

One family.

Family CEPHIDAE.

Slender insects, with a long cylindrical or laterally compressed body. Slow on the wing.

Head with hypostomal bridge separating oral cavity from occipital foramen. Antenna long and thread-like or slightly clavate, many-segmented (16–30). Hind margin of pronotum almost straight, being nearly the shortest distance between the tegulae ; mesonotum short, never extending in front of the tegulae ; cenchri absent (fig. 12). Tibiae usually with pre-apical spines on the hind and middle legs ; fore tibia with only one modified apical spur. Fore wings with the vein M joining Rs after Rs has left Sc+R. Abdomen constricted slightly at the apex of the 1st segment (thus approaching the condition found in the suborder Apocrita, but in no other sawflies) ; ♀ ovipositor exserted and clearly visible from above ; ♂ often with some of the apical sternites fringed or with patches of modified setae ; ♂ genitalia orthandrious, parameres continuous with parameral plates, devoid of muscles and apical cupping discs, and with aedeagus tubular.

Larvae internal borers in stems or twigs of Gramineae (Cephini), or of Rosaceae or other arborescent families (Hartigiini). They are single brooded and pass their resting stage in cocoons within the host-plant. They are white and have no abdominal legs, and only vestigial unsegmented thoracic legs without any tarsal claws.

A small family with about 100 known species, divided into 11 genera and 2 subfamilies ; over 40 species occur in Europe and the Mediterranean Region. Restricted to the Northern Hemisphere except for 1 genus of 2 species in a peculiar subfamily Athetocephinae confined to Madagascar. A recent classification of the genera of the world was made by Benson in 1946 (*Trans. R. ent. Soc. Lond.* **96** : 89–108, 39 figs.).

Twelve British species in 5 genera all belonging to the CEPHINAE.

Subfamily CEPHINAE.

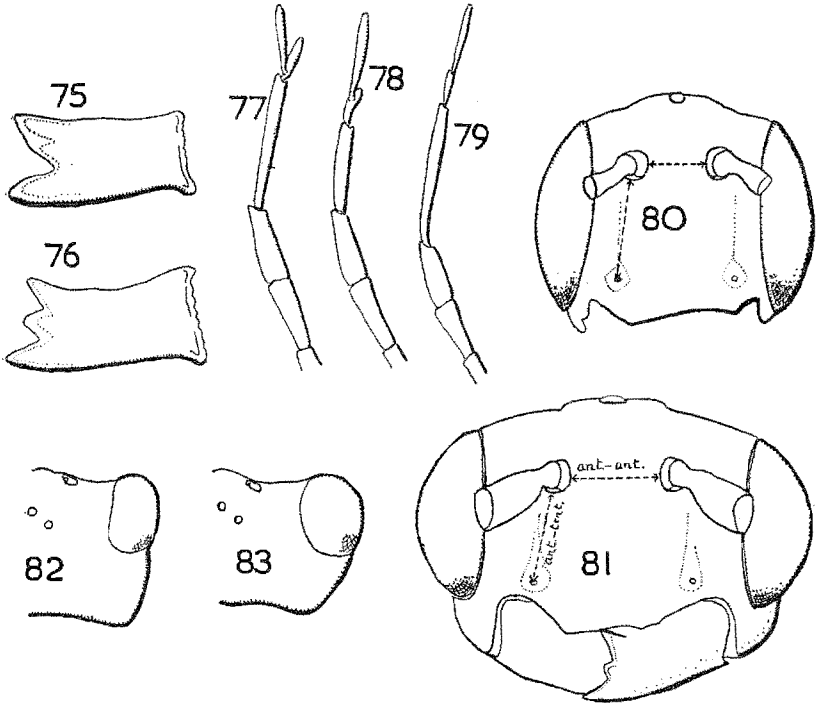
KEY TO BRITISH GENERA.

1 Antenna with 3rd segment slightly longer than 4th ; flagellum swelling very slightly after the 4th antennal segment and the following segments of almost equal thickness. Left mandible with the small tooth between the two main teeth fused to the inner tooth as a shoulder or completely absent (fig. 75). Claws bent almost at a right angle, with the inner tooth stouter and longer than the end tooth (fig. 47) ; in *Janus* there is also an acute basal lobe as well (cf. fig. 49). Hind basitarsus as long as the 3 following tarsal segments together. ♀ saw-sheath curved slightly downwards (fig. 86) ; ♂ penis-valves not fused together medially. Maxillary palp either with 4th segment scarcely longer than 6th (*Hartigia*) (fig. 78), or 6th emerging from base of 5th, which is thus flap-like (*Janus*) (fig. 77). Attached to woody plants or herbaceous Rosaceae (HARTIGIINI) ..... 2.

– Antenna with 3rd segment not longer than 4th, and usually shorter ; flagellum not swelling before the 6th antennal segment, subclavate with the subapical segments the thickest. Left mandible with a small separate middle tooth between the 2 main teeth (fig. 76). Claws only very slightly curved and

with a small slender inner tooth and no basal lobe (figs. 50 and 51). Hind basitarsus not as long as the 3 following tarsal segments together. ♀ saws-heath with the main axis straight or slightly curved upwards (figs. 87 and 88) though it may be set at an angle to the oblong plate (fig. 89); ♂ penis-valves fused medially for at least half their lengths. Maxillary palp with segment 4 much longer than 6, which emerges at apex of 5 (fig. 79).

Eyes more than 1½ times as high as long. Anal vein of fore wing more than twice its own width away from the apex of the jugal fold, and continuing thus some distance along the hind margin of the wing. Attached to Gramineae (CEPHINI) ..... 3.



FIGS. 75, 76.—Left mandible in Cephidae: 75, *Janus*; 76, *Cephus*.
FIGS. 77–79.—Maxillary palp of Cephidae: 77, *Janus*; 78, *Hartigia*; 79, *Cephus*.
FIGS. 80, 81.—Face in Cephidae to show different proportions of distance between antennal sockets (*ant.-ant.*) and between an antennal socket and the nearest tentorial pit (*ant.-tent*); 80, *Calameuta*; 81, *Cephus*.
FIGS 82, 83.—Part of head from above in: 82, *Cephus pygmaeus*; 83, *C. nigrinus*.

2 (1) Smaller species (6 to 9 mm.). Hind tibia with 2 pre-apical spines and claws with an acute basal lobe in addition to the 2 apical teeth (cf. fig. 49). Eyes more round (less than 1½ times as high as long). Maxillary palp (fig. 77) longer than front tibia and with 4th segment at least 1½ times as long as 6th; 6th emerging from base of 5th, which is thus flap-like. Left mandible without a middle tooth between the 2 main teeth (fig. 75). Anal vein 3 in fore wing hugs the apex of the jugal fold, from which it is nowhere separated by more than twice its own breadth. Attached to trees and shrubs. 2 spp. ..... **Janus** Stephens.

– Larger species (10 to 13 mm.). Hind tibia with 1 pre-apical spine and claws without an acute basal lobe in addition to the 2 apical teeth (cf. fig. 47). Eyes less round (more than 1½ times as high as long). Maxillary palp (fig. 78) shorter than front tibia and with 4th segment scarcely longer than 6th, which emerges from near the apex of 5th. Left mandible with a small middle tooth or shoulder between the 2 main teeth. Anal vein 3 in fore wing separated from apex of jugal fold by more than twice its own breadth Attached to rosaceous herbs or shrubs. 3 spp. ..... **Hartigia** Schiödte.

3 (1) Face broad (fig. 81) (eyes much further apart in front than the height of an eye; distance between an antennal socket and the middle of the anterior tentorial pit on the same side less than 1½ times as long as the distance between the 2 antennal sockets). Antenna begins to thicken at 7th segment. Pronotum usually broader, even at its narrowest part, than its length. ♀ cerci less than half as long as saw-sheath; oblong plate less than 1½ times as long as sawsheath (fig. 88 and 89). ♂ either with a setiferous pit on the 7th and 8th sternites (fig. 90), or with a fringe of modified setae on the apex of the 8th (fig. 91). Abdomen often more richly marked with yellow laterally than dorsally ..... 4.

– Face narrow (fig. 80) (eyes in front scarcely further apart or even closer together than the height of an eye; distance between an antennal socket and the middle of the anterior tentorial pit on the same side more than 1½ times the distance between the 2 antennal sockets). Antenna begins to thicken at 7th segment. Pronotum usually as long or longer than its narrowest breadth. ♀ cerci at least ½ as long as sawsheath and reaching almost to its apex (fig. 87); oblong plate about twice as long as sawsheath, which tapers behind. ♂ apical sternites without setiferous pits or fringe of modified setae, bearing only a small patch and fine fringe of simple setae. 2 spp. ..... **Calameuta** Konow.

4 (3) ♀ sawsheath broadening slightly towards the apex, where it is broader than the apex of a tibia (fig. 84); ♂ with a deep setiferous pit on the 7th and 8th sternites (fig. 90). 2 spp..... **Trachelus** Jurine.

– ♀ sawsheath tapering evenly behind, where it is narrower than the apex of a tibia (fig. 85); ♂ without deep pits on the 7th and 8th sternites, but the 8th has an apical patch of broadened spines and an apical fringe of flattened setae (fig.91). 3 spp..... **Cephus** Latreille.

Tribe Hartigiini.

Genus **Hartigia** Schiödte (= *Phylloecus* E. Newman, *Macrocephus* Schlechtendal).

Holarctic, with about 13 species, of which 3 occur in Britain (cf. Stritt, 1941, Die deutschen Arten der Halmwespengattung *Hartigia* Schdte. (Hym. Tenthr.), *Beitr. naturkundl. Forshung. Oberrhein.* **6**: 116–124).

KEY TO BRITISH SPECIES OF *Hartigia* SCHIÖDTE.

1 Head and pronotum dull with close dense punctures. Pronotum all black. Costa and stigma brown. Abdomen with very little yellow, usually only 2 tergites being banded apically and no sternites. Antenna simple, the individual segments not being broadened apically. 11–15 mm.
Larva in stems of Rubus idaeus *L., etc. England, but mostly in M. and S. counties. IV–VI. C. and S. Europe, to Corfu and Sardinia, S.E. to Crimea, N. to Finland, E. to Saratov and N. China* ..... ♂ and ♀ **nigra** (Harris). (= *satyrus* Panzer.)

– Head and pronotum shining with at most scattered punctures. Pronotum usually marked with yellow on the hind margin. Costa, subcosta and front of stigma yellow. Abdomen generally profusely marked with yellow, usually with at least 4 tergites banded apically and all the sternites marked laterally. Antenna sub-serrate, the apex of each segment being broader than the base of the following segment. 12–18 mm..... 2.

2 (1) Face with scattered punctures. Interantennal furrow more or less obsolete. 4th antennal segment about $\frac{2}{3}$ length of 3rd, or even less. Face of ♀ usually entirely black, though sometimes with yellow flecks. 12–18 mm.
Larva in stems of Filipendula ulmaria (*L.*) *Maxim. Tring and Hemel Hempstead in Herts, Woodwalton Fen in Hunts, and no doubt elsewhere in S. England, though confused in collections with the following. V–VIII. C. Europe* ..... ♂ and ♀ **xanthostoma** Eversmann.

– Face shining without punctures. Interantennal furrow usually deep enough to contain the front ocellus inverted. 4th antennal segment about $\frac{3}{4}$ length of 3rd or even more. Face of ♀ usually copiously marked with yellow 10–13 mm.
Larva in stems of Agrimonia eupatoria *L. S. England to Yorks and Wales. V–VI. Europe including Mediterranean, N. Africa, Asia Minor, Caucasus and S. Siberia, N. to Sweden* ..... ♂ and ♀ **linearis** (Schrank).

Genus **Janus** Stephens.

Holarctic and oriental with about 13 known species, of which 2 occur in Britain.

KEY TO BRITISH SPECIES OF *Janus* STEPHENS.

A Hind femur red in both sexes. Head shining to coriaceous above, with very shallow ill-defined punctures. Tegula yellow, but pronotum not edged with white behind. ♂ with at most apical tergite and sternite brown. 6–9 mm.
Larva in twigs of Quercus. *England, S.E. of Wash/Severn line. V–VI. C. Europe, N. to Sweden and S.E. to Caucasus* .... ♂ and ♀ **femoratus** Curtis.
(= *cynosbati* F. *nec* L., Morice.)

B Hind femur red in ♂, but black in ♀. Head above with definite and dense punctures. Tegula black or brown and pronotum edged with white behind. ♂ with yellow apical sternite and with 3 or more apical tergites marked with yellow. 6–9 mm.
Larva in young shoots of Salix, Populus *and* Viburnum. *England, common locally S. of Wash/Severn line and in Glamorgan* (*Morice*, 1903, Ent. mon. Mag. **39** : 277 and † 1908, op. cit. **44** : 100). V–VII. *C. and S. Europe, to Caucasus and N. to Finland* ..... ♂ and ♀ **luteipes** (Lepeletier).

Tribe Cephini.

Adults partial to yellow and blue flowers of various families, where they feed on pollen and on which they pair. Holarctic, but concentrated in Eurasian steppes and Mediterranean. About 55 known species and 7 of these in 3 genera occur in Britain.

Genus **Cephus** Latreille.

Holarctic with about 25 species, of which 3 occur in Britain and one has been introduced into N. America.

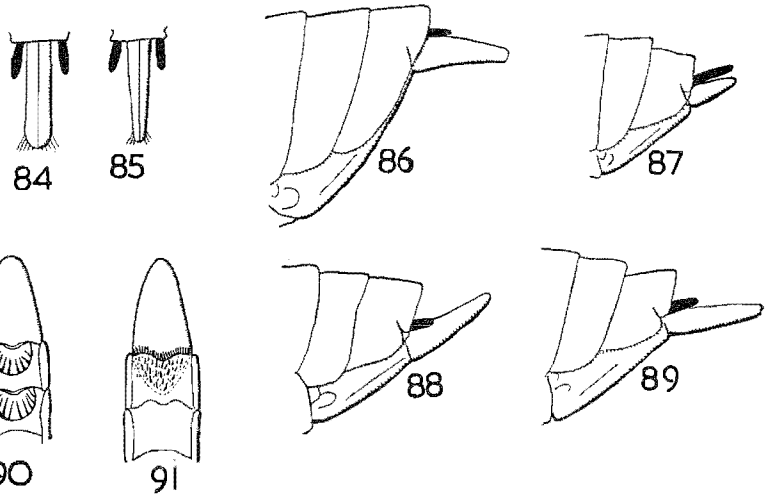
KEY TO BRITISH SPECIES OF *Cephus* LATREILLE.

1 Abdomen marked conspicuously with yellow, at least tergites 4 and 6 usually with transverse bands. Head at most only slightly contracted behind the eyes, and as long here in dorsal view as the length of an eye (fig. 82) .... 2.

– Abdomen all black or at most with yellow flecks on the lateral margins of some of the tergites. Head strongly contracted behind the eyes and shorter here in dorsal view than the length of an eye (fig. 83). 7–10 mm.
Black except for the yellow-marked mandibles, palps, 1st perapterum, bases of tibiae and tarsi. In some British specimens there are yellow flecks on the sides of some of the tergites and they thus resemble *C. brachycercus* Thomson, but this has not been found in Britain, and is distinguished by its

slightly broader flagellum (with its pre-apical segments broader than long instead of longer than broad), by its more infuscated wings, and by its saw-sheath not being set in a direct line with the oblong plate (cf. fig. 89) as it is in *C. nigrinus* (cf. fig. 88).

Larva in Poa pratensis *L. Seems to be a woodland species in Britain. Known to me only from Warwick, Brinklow,* 1932–4, *J. W. Saunt* († *Saunt,* 1933, Ent. mon. Mag. **69** : 275) ; *Bucks, Beaconsfield,* 1935, *J. F. Perkins, and Dancers End, nr. Aston Clinton,* 1947, *R. B. B.* ; *and Kent, Blean Woods,* 1935, *W. H. Daltry. V–VII. C. Europe, N. to Finland, Siberia to Irkutsk*..... ♂ and ♀ **nigrinus** Thomson.



FIGS. 84, 85.—Sawsheath from above in : 84, *Trachelus* ; 85, *Cephus.*

FIGS. 86–89.—Apex of ♀ abdomen from the left side in : 86, *Janus* ; 87, *Calameuta* ; 88, *Cephus pygmaeus* ; 89, *C. cultratus.*

FIGS. 90, 91.—Apex of ♂ abdomen from below in : 90, *Trachelus tabidus* ; 91, *Cephus pygmaeus.*

2 (1) Antenna with less swollen club (no flagellar segments broader than long). Hind tibia yellow with at most the apex ringed with piceous. ♀ sawsheath set at an angle with the oblong plate (fig. 89). Claws with an erect inner tooth (fig. 50). 7–9 mm.
Coloured otherwise as in *C. pygmaeus.*
Larva in such grasses as Phleum pratense L. *England, S.E. of Humber/ Severn line, common. V–VII. C. Europe N. to Finland and E. Baltic, Crimea, Russian steppes and Caucasus*..... ♂ and ♀ **cultratus** Eversmann.
(= *pusillus* Stephens, *pilosulus* Thomson.)

– Antenna with a more swollen club (pre-apical segments broader than long). Hind tibia with piceous only on inner side at apex or occasionally spread over the whole of the tibia. ♀ sawsheath set in a direct line with the oblong plate (fig. 88). Claws bifid at the apex, the inner tooth being almost parallel with the end tooth (figs. 51). 5–10 mm.
Variable in colour, but abdomen always has broad yellow bands on tergites 4 and 6, and generally bands on 3, 7 and 8, and in ♂ also rarely on 5 and 9.
Larva notorious pest in wheat, rye, oats and various forage grasses. Known to attack the following genera : Agropyron, Avena, Bromus, Hordeum, Phleum, Secale *and* Triticum. *Common in pastures and cornfields in S. England to Yorks and Lancs, and in Wales. V–VII. Europe, N. to S*

Scandinavia, S. to Mediterranean, N. Africa, S.E. to Asia Minor, Syria, Palestine, N. Persia, Caucasus and Turkestan. Introduced into N. America. ♂ and ♀ **pygmaeus** (L.).

Genus **Trachelus** Jurine (= *Cephus* in part, *Astatus* Panzer).

Seven species confined to Europe, the Mediterranean Region and Eurasian steppes; 2 reach Britain and 1 has been introduced into N. America.

KEY TO BRITISH SPECIES OF *Trachelus* JURINE.

A. Larger species, 10–14 mm. Abdomen in both sexes black with yellow apical margins to tergites 4, 6 and sometimes also 3, 5 and 7, or even 2 and 8 as well. Wings yellowish with venation brown, and costa and stigma yellow. Hind tibia (except at apex) and tarsus yellow.

Larva sometimes pest of rye (Secale cereale *L.*) *in C. Russia. Recorded by Stephens from London district and near Hertford, but not found since. VI. C. and S. Europe and Mediterranean, including Iberia and Morocco, S.E. to Caucasus, and N. to Finland*..... ♂ and ♀ **troglodyta** (Fabricius).

(= *niger* Cameron.)

B. Smaller species, 7–10 mm. Abdomen in both sexes black with only a row of yellow flecks each side (on the lateral margins of tergites 2–8). Wings grey with venation and stigma black. Hind legs all black.

Larva well-known pest of wheat, barley, rye and various wild grasses. England chiefly S.E. of the Humber/Severn line, but also in Glamorgan. Common in the fens. V–VII. Europe chiefly C. and S., including Iberia; N. Africa, Egypt, Asia Minor, Caucasus and S.W. Asia. Introduced and established in N. America..... ♂ and ♀ **tabidus** (Fabricius).

Genus **Calameuta** Konow (= *Cephus* in part).

Holarctic, with 21 species, concentrated in the Eurasian steppes, with 2 British species.

KEY TO BRITISH SPECIES OF *Calameuta* KONOW.

A. Larger species (9–12 mm.). Hind tibia entirely black. ♂ and ♀ with similarly coloured abdomens, black with narrow yellow apical margins to tergites 4, 5 and 6 and sometimes (especially in ♀) 3 and 7. Claws with minute subapical tooth.

In marshes, fens and damp woods. Larva in Calamagrostis epigejos (*L.*) *Roth., small stems of* Phragmites communis *Trin. and in various grasses, such as* Agropyron repens (*L.*), Arrhenatherum elatius (*L.*) *J. and C. Presl, and* Phalaris arundinacea *L. Locally common in England S.E. of Humber/Severn line (including Notts and Warwick). V–VII. C. Europe, N. to Finland, E. to Caucasus, Kirghiz Steppes, Chinese Turkestan and Irkutsk in Siberia*..... ♂ and ♀ **filiformis** Eversmann.

(= *arundinis* Giraud)

B. Smaller species (4–10 mm.). Hind tibia mostly yellow. ♂ with abdominal tergites 4, 5 and usually 6 broadly margined apically with yellow; ♀ with abdomen entirely black. Claws bifid at apex.

Larva unrecorded. Widely distributed in England, Wales and even reaches C. Scotland. V–VII. C. Europe, N. to Sweden and Finland, S. to Greece. ♂ and ♀ **pallipes** (Klug).

(= *phthisicus* F.)

Superfamily **TENTHREDINOIDEA.**

Head usually open without hypostomal bridge. Pronotum very short medially and strongly emarginate behind (fig. 13); mesopleura with epimeron divided into upper convex and lower concave portion; mesosternum trapezoidal without presternal bridge and sutures often obsolete.

Male genitalia strophandrious ; parameres articulating on the parameral plates, movable with special muscles, but without apical cupping discs ; ♀ sawsheath usually abbreviated, but sometimes exserted.

Larvae polypodous or oligopodous.

Six families : ARGIDAE, BLASTICOTOMIDAE, CIMBICIDAE, *PERGIDAE, DIPRIONIDAE and TENTHREDINIDAE.

Family ARGIDAE.

Slow, heavily-built insects.

Distinguished from all other families by the *flagellum of its antenna being fused into a single long segment* ; this segment is sub-clavate in the ♀ (fig. 3), but in the ♂ is either uniform in thickness with a brush of short setae below (ARGINAE) (fig. 4), or bifid like a tuning-fork (STERICTOPHORINAE) (fig. 5).

Fore wing with vein 2r absent (figs. 19 and 92–4).

Cenchri very large (separated from each other by much less than the breadth of one). Tibiae with or without pre-apical spines ; front tibia with two unmodified apical spurs.

Larvae free feeding, polypodous, with 6–8 pairs of abdominal legs. Attached mostly to woody Angiosperms, especially Rosaceae, Salicaceae and Betulaceae (ARGINAE and *Sterictophora*), but *Aprosthema* is attached to Papilionaceae.

The family is world-wide in distribution, with some 400–500 described species divided into 44 genera (Malaise, 1941, *Ent. Tidskr.* **62** : 131–140). Benson (1938) proposed 10 subfamilies. Represented in Europe by over 40 species in 4 genera and in Britain by 17 species and subspecies, belonging to 3 genera of 2 subfamilies concentrated in S. England.

KEY TO BRITISH GENERA.

1 Vein R_1 not meeting Rs at apex in either fore or hind wing (fig. 92) ; and transverse part of Sc missing in fore wing. Hind tibia without a pre-apical spine. Face short and antenna set on face below level of middle of eyes (figs. 95 and 96) ; ♂ antenna with a bifid flagellum (fig. 5) (STERICTOPHORINAE) ..... 2.

– Vein R_1 meeting Rs at apex in both fore and hind wing, leaving a small apical cell (figs. 93 and 94) ; and transverse part of vein Sc present in fore wing. Hind tibia with a pre-apical spine. Face longer with the antenna set above the level of the middle of the eyes (fig. 97) ; ♂ antenna with the flagellum simple (fig. 4). Attached to Rosaceae, Salicaceae, Betulaceae and Fagaceae. 14 spp. and subspp. (ARGINAE) ..... **Arge** Schrank.

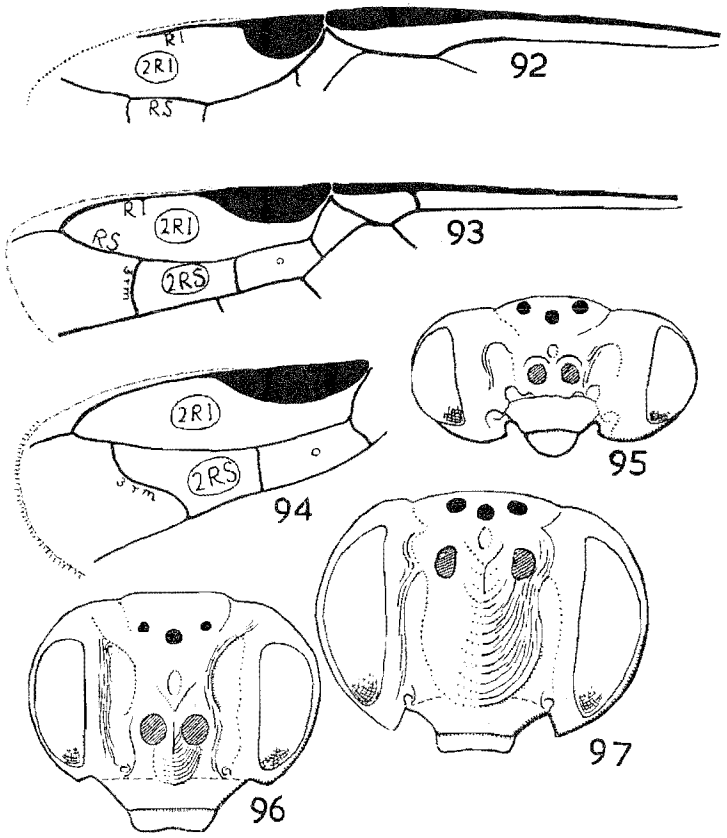
2 (1) Head in front view twice as broad as high (fig. 95) (the height being measured from the front of the clypeus to the top of a posterior ocellus) ; space between the antennal sockets flat and about as wide as the distance between an antennal socket and the top of the clypeus. Anal cell of fore wing petiolate (fig. 40) ; anal cell of hind wing shorter, so that its basal stalk is more than twice as long as the cell is broad. Attached to Papilionaceae. 1 sp.
Aprosthema Konow.

– Head in front view only 1½ times as broad as high (fig. 96) ; space between the antennal sockets raised into a crest and much narrower than the distance between an antennal socket and the top of the clypeus. Anal cell of fore wing widely constricted in the middle into an apical and a basal portion (cf. fig. 37) ; anal cell of hind wing longer, so that its basal stalk is not longer than the cell is broad. Attached to Rosaceae. 2 spp.
Sterictophora Billberg.

* Not British.

Subfamily STERICTOPHORINAE.

Probably the most numerous of the subfamilies of ARGIDAE, with 29 genera. Concentrated in the neotropics with 2 genera occurring in Europe and both reaching Britain.



FIGS. 92–94.—Portion of left fore wing in Argidae : 92, *Sterictophora* ; 93, *Arge nigripes* ; 94, *Arge gracilicornis*.

FIGS. 95–97.—Face in Argid genera : 95, *Aprosthema* ; 96, *Sterictophora* ; 97, *Arge*.

Genus **Aprosthema** Konow.

Holarctic. The actual number of valid described species is uncertain, as it is apparent that some of the common species are polymorphic in colour pattern. Enslin, for example, recognized 20 European species, many of them rare in collections and based on a very few examples. These probably represent colour forms of 5 or 6 good species (cf. Conde, 1934, *Folia zool. hydrobiol. Riga* 7 : 20–30). Attached, so far as known, to Papilionaceae.

The single British species would run, by its colour pattern, to *A. dalmatica* (Mocsary) in Enslin's key, but does not appear to differ structurally from *A. melanura* (Klug).

Black with the following parts yellow; side lobes of pronotum suffused, tegulae, abdomen from 2nd tergite (except the extreme apex of sawsheath), legs (except bases of coxae and extreme bases of femora). Wings strongly and uniformly infuscate in ♀ with black venation; subhyaline in ♂ with yellow to piceous venation. ♀ antennae longer than breadth of head between the eyes (1·2 : 1·0). Head from above slightly contracted behind the eyes. 6–7 mm.

Larva on Lathyrus pratensis *L. and* L. tuberosus *L., etc. In Britain so far only known from Hants, New Forest,* 1 ♂ and 1 ♀, 18–23.vii.1907 (*J. J. F.X. King*) *and Berks, Cothill,* 1 ♂, 1.viii.1944 (*L. H. Woollatt*) († *Benson,* 1938, Ent. mon. Mag. **74** : 256 *and Woollatt,* 1945, op. cit. **81** : 154). *N. and C. Europe to Siberia, and Ukraine to Caucasus* . . ♂ and ♀ **melanura** (Klug).

Genus **Sterictophora** Billberg (= *Schizocera* Lepeletier).

Confined to N. temperate regions with about 8 known species concentrated in Eurasian steppes. Mostly associated with Rosaceae. Two occur in C. Europe, and both reach Britain.

KEY TO BRITISH SPECIES OF *Sterictophora* BILLBERG.

1 Abdomen with at most the 1st and base of 2nd tergite black; ♀ with thorax red except for mesosternum, metapleura above and metanotum; ♂ with thorax entirely black. Thorax shining and without surface sculpture; scutellum flat, smooth and unpunctured. Wings smoky throughout. 5–7 mm.

Larva unknown, but adults associated usually with Rubus. *Very rarely taken in Britain; only known from Kent, Chattendon Roughs,* 1896 (*Chitty*); *Oxford, Marston, Cherwell Meadows,* 1941 (*P. M. Miles*); *Somerset, Bristol* (*J. F. Stephens coll.*); *Worcester, Wyre Forest,* 1890 (*C. J. Wainwright*); *and Durham, Winlaton Mill,* 1924 (*G. B. Walsh*). *V–VI. C. and S. Europe, including Mediterranean region, N. Africa and Asia Minor.*

♂ and ♀ **furcata** (Villers).

– Abdomen black with a bronze sheen (at most 1st tergite in ♂ pale behind). Mesonotum and mesopleura dull with surface sculpture and punctures; large punctures on the mesopleura and in the furrows dividing the mesonotal lobes; scutellum strongly convex and with a medial carina and dull with dense fine and irregular punctures. Wings subhyaline, generally with a transverse infuscate band below the stigma. 6–7 mm.

Larva on Rosa. *Local throughout Britain and Ireland. V–VII. C. and N. Europe, E. to Kamtchatka and Ussur, S.E. to Transcaspia.*

♂ and ♀ **geminata** (Gmelin).

Subfamily ARGINAE.

Genus **Arge** Schrank (= *Hylotoma* Latreille).

Africa and northern hemisphere with about 200 described species, mostly in temperate regions; 14 species and subspecies in Britain. Attached to Rosaceae and *Salix, Betula* and *Quercus*. Adults favour flowers of Umbelliferae.

KEY TO BRITISH SPECIES OF *Arge* SCHRANK.

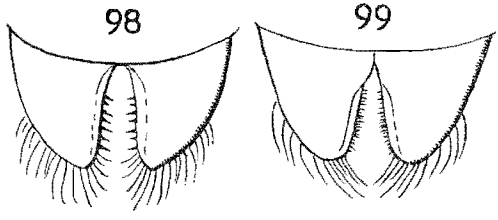
1 Abdomen mostly yellow ..... 2.
– Abdomen metallic blue, green, bronze or black ..... 6.
2 (1) C and R black, or at least dark brown; cell C opaque and infuscate ..... 3.
– C and R yellow; cell C yellowish-hyaline ..... 5.
3 (2) Pronotum and tegulae clear yellow; legs clear yellow with definite black-ringed apices to tibiae and tarsi; wings yellowish. ♀ sawsheath strongly narrowed behind in dorsal view, and black at the apex with straight hairs. Cell 2RS in fore wing about as long above as below (cf. fig. 93). 7–10 mm.

Larva on Rosa. *Locally common in England S. of Wash/Severn line. VI–VIII. 1–2 broods. All Europe, W. and C. Siberia, Syria, Caucasus, N. Persia and Transcaspia* ..... ♂ and ♀ **ochropus** (Gmelin).
(= *rosae* (L.) auctt.)

– Pronotum, tegulae and usually part of the legs suffused with black; wings usually more or less smoky. ♀ sawsheath broad and slightly emarginate apically in dorsal view, entirely yellow and with outer apical hairs curved. Cell 2RS in fore wing much longer above than below (cf. fig. 94). 7–9 mm.
Larva on Rosa. *Forms of* pagana ..... 4.

4 (3) Fore wings densely smoky at base but only slightly so at apex and on hind wings. Head, thorax and legs entirely black.
Recorded by Stephens from Darenth Wood, Kent, and possibly introduced from time to time. All Europe, S. to Iberian Peninsula, and Siberia E. to N. China, Japan and Kamtchatka. Replaced by other closely related forms in C. and S.E. Asia ..... ♂ and ♀ **pagana pagana** (Panzer).

– Fore wings uniformly slightly smoky to hyaline. Head, thorax and legs more or less marked with yellow on the labrum, middle and hind coxae, femora and tibiae, and sometimes upper parts of mesopleura and even pronotum and sides of mesonotal lobes.
Locally common in England S.E. of Humber/Severn line. V–IX. 2 broods. Endemic British race ..... ♂ and ♀ **pagana stephensii** (Leach).



FIGS. 98, 99.—Sawsheath from above in: 98, *Arge melanochroa*; 99, *A. cyanocrocea*.

5 (2) Fore wing yellow at base with a black smudge under the stigma extending more or less right across the wing, and with the apex slightly smoky. Hind femur yellow with a black apex. Hind wing with the discoidal cell scarcely more than ½ length of the cubital cell. ♀ sawsheath, in dorsal view, with numerous small teeth on the inner surface of each valve (fig. 99), the teeth being shorter than the basal breadth of an apical tibial spur. 7–8 mm.
Hind legs yellow with black apices to femur, tibia and tarsus in *A. c. cyanocrocea*, though the amount of black varies considerably. In parts of S. Europe the legs are very dark, and approach, in this character, the form *A. c. syriaca* (Asia Minor), which has all the legs entirely black. The latter form is, however, distinguishable (on the basis of specimens from Cyprus) by its sooty pubescence on the face and by the discoidal cells in the hind wing being more than half the length of the cubital cell.
Larva on Rubus. *Common in S. England on Umbelliferae, also in Ireland and N. England less commonly, and not recorded from Scotland. V–VII. Throughout Europe, replaced in Caucasus, Asia Minor, N. Persia and Turkmen by* A. c. syriaca (*Mocsary*) ..... ♂ and ♀ **cyanocrocea** (Förster).

– Fore wings slightly yellow or brown throughout, the smudge under the stigma not extending beyond the radial cell. Hind femur entirely black. Hind wing with discoidal cell more than ½ cubital. ♀ sawsheath in dorsal view with the teeth on the inner face of the valves few and large (fig. 98) (much longer than the basal breadth of a tibial spur). 7–8 mm.
Some forms of this species in S.E. Europe are scarcely distinguishable in colour from the forms of the preceding species in the same region. *Larva unknown; possibly a borer in twigs. England, only known in S. and S.E.; Cornwall, Hants, Surrey, Herts, Cambs, Beds, and Suffolk. VI–VII. C. and S. Europe, Caucasus and Asia Minor* ... ♂ and ♀ **melanochroa** (Gmelin).

6 (1) Wings more or less strongly infuscated and with a black stigma. Pubescence on face and mesopleura piceous. Legs entirely black or piceous. .....7.

– Wings subhyaline, yellowish or brownish. Pubescence, at least on face and mesopleura, silvery white. Legs usually partly pale .....9.

7 (6) Vein 3rm in fore wing straight, angled or curved, but the cell 2RS is about as long above as below (fig. 93); apical margins of wings naked.....8.

– Vein 3rm in fore wing almost sigmoid in shape, so that the cell 2RS is longer above than below (fig. 94); apical margins of wings finely ciliate. 5–8 mm. long.

Larva on Rubus idaeus *L., etc. Throughout Britain and in Ireland, but commonest in S.E. England. V–VI and sometimes VII–IX.* 1–2 *broods. All Europe, S.E. to Caucasus, and Siberia, E. to Japan and Kamtchatka.*

♂ and ♀ **gracilicornis** (Klug).

(= *coerulescens* Geoffroy *nec* Fabricius)

8 (7) Vein 3rm of fore wing straight; apex of fore wing beyond stigma subhyaline, and strongly contrasting with the deeply infuscate base. ♀ sawsheath very bluntly rounded apically in dorsal view when the two valves are touching. 8–10 mm.

Larva on Salix. *England, recorded from Coombe Wood, Surrey, by J. F. Stephens; one or two more recent records from other parts need confirmation. V–VI. Europe, N. to Scandinavia, S. to Pyrenees, S. E. to Asia Minor and Caucasus, and Siberia E. to Japan* .....♂ and ♀ **enodis** (L.)

(= *coeruleipennis* Retz.)

– Vein 3rm of fore wing curved; apex of fore wing little clearer than the base. ♀ sawsheath with acute apex in dorsal view when the two valves are touching. 9–11 mm.

Larva on Rosa. *England and S. Scotland. IV–VII. Europe, N. to Scandinavia, S. to Iberian Peninsula, S.E. to Caucasus, E. to E. Siberia. Replaced in high Swiss Alps by the closely related* A. alpina *Konow, with hyaline wings and silvery pubescence*.....♂ and ♀ **nigripes** (Retzius).

(= *enodis* L. auctt. *nec* L.)

9 (6) Thorax and abdomen with metallic reflections. Cell 2R1 of fore wing not darker than rest of wing. ♀ abdomen with blotch between 1st and 2nd tergites less conspicuous and tergites never yellow-margined apically in the middle. Cell RS of hind wing about twice as long as M. 7–10 mm.....10.

– Thorax and abdomen dull black without metallic reflections. Cell 2R1 of fore wing infuscate, at least at apex, where it is darker than the rest of the wing. Basal abdominal tergite of ♀ deeply emarginate behind leaving a large pale blotch and the apical margins of several of the middle tergites are yellow in the middle. Cell RS of hind wing almost as long as M. 9–11 mm.

Larva on Quercus. *England, local in the larger oak-woods, chiefly S.E. of the Wash/Severn line. V–VI. Europe, S. to Iberian Peninsula, S.E. to Asia Minor, Caucasus and Transcaucasia, N. to Scandinavia; also in E. Siberia (Ussur)* .....♂ and ♀ **rustica** (L.).

(= *atrata* Förster.)

10 (9) Wings usually yellowish or brownish infuscate, with the blotch under the stigma of the fore wing extending at least into the cells 1R1 and 1RS; cell 1RS shorter than, or as long as, but never longer than 2RS. Tibiae of all legs generally pale at base; if the front and middle tibiae are all black, then so also are the hind tibiae .....11.

– Wings usually almost entirely hyaline, with the blotch under the stigma absent or not extending beyond the cell 2R1; cell 1RS longer than 2RS. Hind tibia white at base but front and middle tibiae entirely infuscate. Stigma, costa and venation entirely black. 7–9 mm.

Larva on Filipendula ulmaria *(L.) Maxim. Throughout Britain and Ireland, but very local. V–VI and VII–VIII. C. and N. Europe, S.E. to Caucasus, Siberia to E. to Mongolia, Manchuria and Kamtchatka.*

♂ and ♀ **ciliaris** (L.).

11 (10) Stigma dark brown or black. (In some ♂♂ the disc is pale towards the apex, but then there is always a dark apical margin and the vein Sc+R is dark brown) .....12.

– Stigma clear yellow at the apex, dark brown only at base ; Sc+R pale yellow as costa.
Wings hyaline to yellow. Abdomen metallic blue or green. 7–10 mm.
Larva on Salix, Betula and Crataegus. *Throughout Britain and Ireland. V–VII. Throughout Europe from Lapland to Iberian Peninsula and Caucasus, E. across Siberia to Japan* ..... ♂ and ♀ **ustulata** (L.)

12 (11) Thorax and abdomen bronze. Flagellum of antenna clear yellow in ♀, though it may be suffused with black in ♂. Fore wing at least in ♀ with a dark band under the stigma reaching right across the wing. Hind tibia white at the base while the apex together with the tarsus is brown. 7–9 mm.
Larva on Betula. *So far in British Isles only known from a few examples in Counties Wicklow and Cork in Ireland* († *Stelfox*, 1928, Ent. mon. Mag. **64** : 14–5). *VI. N. and C. Europe, Siberia E. to Sakhalin and Kamtchatka.*
♂ and ♀ **metallica** (Klug).

– Thorax and abdomen blue or green metallic. Flagellum of antenna black in ♂, but in ♀ the underside may be brown. Fore wing with at most a small dark patch under the stigma. Hind legs entirely black, or, if the hind tibia is white, then the apex together with the tarsus is dark brown to black. 8–11 mm.
Larva on Betula *and* Salix. *Forms of* A. fuscipes (see †Benson, 1945, *Ent. mon. Mag.* **81** : 104) 13.

13 (12) Vein C of fore wing black in both sexes ; ♂ with entirely black hind tibia.
England. V–VI. N. and C. Europe, S.E. to Caucasus, and Siberia E. to Korea, Sakhalin and Japan ..... ♂ and ♀ **fuscipes fuscipes** (Fallén).

– C and Sc (= front ½ of Sc+R) pale in ♀ ; ♂ with hind tibia white at base.
N. and C. Scotland and Ireland. VI–VII. Sub-arctic and sub-alpine in C. and N. Europe ; *E. Siberia, Mongolia*
♂ and ♀ **fuscipes expansa** (Klug).

Family BLASTICOTOMIDAE.

Adults obscure and very rarely collected.

Characterized by their short 4-segmented antennae, of which the elongate 3rd segment forms almost the entire flagellum except for the minute (and sometimes obsolete) 4th segment. Scutellum without a post-tergite ; the wing-venation (fig. 100) is unique in the pear-shaped cell IM of the fore wing, rounded apically ; the stigma is large and almost semi-circular in shape ; vein Sc without a transverse branch joining C ; vein 2r present ; and the anal cell has an oblique cross-vein ; the wing-membranes are corrugated at their apices. The legs are without pre-apical tibial spines and the front tibia has 2 apical spurs, the inner one of which is bifid apically. The abdomen is carinate laterally, as in CIMBICIDAE, and the ovipositor is of the exserted type, about half as long as the abdomen, though the apical projecting part, the sawsheath, is very much shorter than the basal plate.

The *larva* is a stem-borer in Filicales and is of the oligopodous type, with no abdominal legs.

The presence of larvae in a district is detected by the conspicuous balls of froth, about the size of a walnut, exuding from the exit-hole of a fern-stem inhabited by a larva. The adults are very rarely found.

An archaic Tenthredinoid family with 2 genera and 6 known species and subspecies, all except one of which are restricted to Japan and neighbouring parts of E. Asia. Also represented among the N. American Miocene fossils of Colorado (Benson, 1942, *Psyche* **49** : 47–8), but not known to occur in N. America to-day.

Genus **Blasticotoma** Klug.

The single European species is about 8 mm. long and mainly black with yellowish femora, tibiae and tarsi, and venter. Wings slightly infuscate with piceous stigma and venation.

In Britain only known from the Royal Horticultural Society's Gardens, Wisley, Ripley, Surrey († 1934, *Benson*, Ent. mon. Mag. **70** : 203–4), *where records show that the larvae were first found as long ago as* 1905, *that is to say before the gardens, with their famous fernery, were taken over by the R.H.S., but the nature of the insect remained unrecognized. In* 1922 *and subsequently Mr. G. Fox Wilson found the larvae boring in stems of* Matteucia struthiopteris (*L.*), Athyrium filix-femina (*L.*) *Roth., and* Dryopteris *spp. In* 1928 *the larvae were abundant in July, but the species has dwindled since then and most unfortunately no adults have been secured. Holland, Germany, Sweden and Finland, with the subspecies* pacificus *Malaise and* 3 *other related species in Japan* ..... ♂ and ♀ **filiceti** Klug.

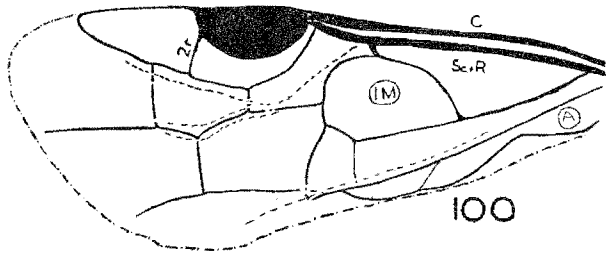


FIG. 100.—Fore wing of *Blasticotoma*.

Family CIMBICIDAE.

Stout fast-flying insects with strongly clubbed antennae and broad, laterally carinate, abdomens, arched above and flat beneath, so that they can be curled right down under the thorax at rest.

Fore wing vein 2r present. Tibiae without pre-apical spines and front tibia with pair of unmodified apical spurs.

Larvae free-feeding, with 8 pairs of abdominal legs.

The CIMBICINAE (*Cimbex* and *Trichiosoma*) are attached to woody Angiosperms (especially Rosaceae, Salicaceae and Betulaceae); *Zaraea* of the ABIINAE is attached mainly to climbing Caprifoliaceae (*Lonicera*, etc.), while *Abia*, and probably CORYNINAE are attached to herbaceous families.

Males of the CIMBICINAE have enlarged hind legs and mandibles, which they use in fights with rival males for the possession of the females.

The family is a small one with less than 130 known species divided into 19 genera and 4 subfamilies, of which the CIMBICINAE, ABIINAE and CORYNINAE are restricted to the Northern Temperate Regions and Tropical Asia, while the PACHYLOSTICTINAE are restricted to S. America.

Represented in Europe by some 45 species in 7 genera and in Britain by 12 species belonging to 4 genera in 2 subfamilies, with some additional earlier records that require confirmation.

KEY TO GENERA.

1 Smaller species (4·5 to 12 mm. long). Clypeus narrower than distance between eyes in front (figs. 104–6) Anal cell of fore wing divided into two by a medial constriction (fig. 29). Axillary sclerites far apart in the middle and tending to fuse with the lateral arms of the presternum. ♂♂ without excessively enlarged mandibles and hind legs compared to their respective ♀♀. (Mandibles almost evenly curved throughout) .....2.

– Larger species (13·5 mm. to 28 mm. long). Clypeus enlarged so that it is much broader than the distance between the eyes in front (figs. 102–3). Anal cell of fore wing crossed near the middle by a straight vein (fig. 28). Axillary sclerites nearly meet in the middle line in front and partly obscure the presternum. ♂♂ usually with grotesquely enlarged hind legs and mandibles compared to their respective ♀♀. (CIMBICINAE) .....4.

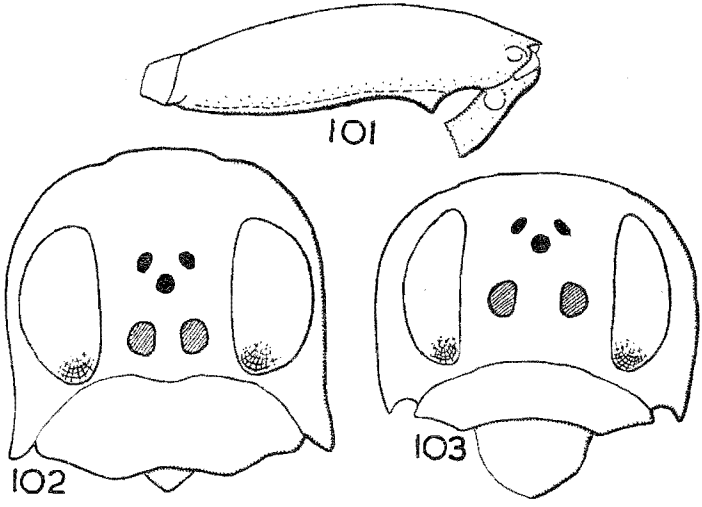


FIG. 101.—Hind femur of ♂ *Trichiosoma*.

FIGS. 102, 103.—Face of: 102, *Cimbex*; 103, *Trichiosoma*.

2 (1) Larger species (9 mm. to 12 mm. long), often metallic and with fuscous or yellowish band beneath the stigma of the fore wing. Antennae about as far from front of clypeus as breadth of the clypeus. Clypeus separated by a deep furrow from the frontal area behind. Head well developed behind the eyes (so that the distance between the hind ocelli is much less than the distance from an ocellus to the back of the head), and with the hind surface convex without an occipital carina, and eyes strongly converging behind (figs. 104–6). Front and lateral lobes of mesonotum separated by clearly defined furrows. Mouthparts much shorter than total length of head capsule. ♂♂ often with velvety patches on the middle of some of the tergites (fig. 108) Hind coxae contiguous. Legs with membranous and blunt tips to spines and spurs. (ABIINAE) .....3.

– Smaller species (4·5 to 8 mm. long) mostly dull black with wings not clearly banded. Very long face, so that antennae are about twice as far from front of clypeus as the breadth of the clypeus. Head very short behind the eyes (the distance between the hind ocelli is greater than the distance of one of them from the back of the head); hind surface of head concave and fitting close on to the thorax; occipital carina sharp and continuous. Front and lateral lobes of mesonotum scarcely defined, the furrows being almost obsolete. Mouth-parts produced into a long tongue, longer than the total length of the head-capsule. Eyes not strongly converging behind. ♂♂ never with velvety

patches on the tergites. Hind coxae not contiguous. Legs with sharp sclerotinous tips to spines and spurs. (CORYNINAE)
Corynis Thunberg.* (= *Amasis* Leach).

3 (2) Mesopleura and mesonotum clothed in long pubescence (the longest hairs on the mesonotum longer than the apical breadth of the fore-tibia), which is predominantly pale and woolly. Hind basitarsus shorter than the two following tarsal segments together. Claws simple, or with an inner tooth that is shorter and slenderer than the end tooth. Dark violaceous or coppery green species always with mostly black antennae. Attached mainly to Caprifoliaceae (*Lonicera* spp., *Symphoricarpos*, etc.) 3 spp. (ZARAEINI) ..... **Zaraea** Leach.

– Mesopleura and mesonotum clothed only in short pubescence (the longest hairs on the mesonotum shorter than the apical breadth of the fore-tibia), which is predominately dark and bristly. Hind basitarsus at least as long as the two following tarsal segments together. Claws with a large inner tooth stouter and longer than the end tooth. Bright metallic and mostly green species, with antennae usually partly fulvous. Attached to herbs. such as Dipsaceae and Compositae. 2 spp. (ABIINI) ..... **Abia** Leach.

4 (1) Abdomen with propodeum deeply emarginate behind, leaving exposed a large pale gap of unsclerotized intersegmental membrane in front of the 2nd tergite (figs. 112–3). Labrum small and occupying at most one quarter of front margin of clypeus (fig. 102); mandibles shorter and more evenly curved throughout, the right more strongly curved than the left. Claws with a very small inner tooth beside the main tooth and in addition to the basal lobe. Abdomen with at most very short pubescence. Hind coxae not contiguous. 3 spp. (Cimbicini) ..... **Cimbex** Olivier.

– Abdomen without a pale gap of unsclerotized membrane between the propodeum and the 2nd tergite. Labrum larger and occupying about ½ front margin of the clypeus (fig. 103). Claws without inner tooth. Mandibles longer and curved only towards their tips. (TRICHIOSOMINI) ..... 5.

5 (4) Hind femur with a tooth near the apex beneath (fig. 101). Antenna with 5 segments before the club. Hind coxae not touching and in the ♂ much enlarged, as are also the femora. Abdomen densely pubescent and, though the tergites may be more or less rufous laterally, they never have yellow apical margins. Clypeus and labrum black. 5 spp..... **Trichiosoma** Leach.

– Hind femur without tooth. Antenna with only 4 segments before the club. Hind coxae contiguous, and neither hind coxae nor hind femora much enlarged in ♂. Abdomen much less pubescent, and in the ♀ with yellow apical margins to some of the apical tergites.
Pseudoclavellaria W. A. Schultze.†
(= *Clavellaria* Lam. auctt., *nec* Lam.)

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* Contains only the one genus, *Corynis* Thunberg, with about 20 species concentrated in the Mediterranean Region and restricted to Eurasia. Two species, *C. crassicornis* (Rossi) (= *jurinae* Lepeletier) and *obscura* (Fab.), are supposed to have occurred in Britain in former times. Stephens (1835, *Illust. Brit. Ent. Mand.* 7 : 15) says of *C. crassicornis*, "The only examples I have seen of this pretty species are in the British Museum; they were taken near Bristol." The species is common to-day in the Mediterranean Region, extending north into central Europe. Of *C. obscura*, Stephens (*loc. cit.*) says, "Said to have been found in Lincolnshire; the only specimens I have seen are in the British Museum." This species extends north into Scandinavia and Siberia, and would not be very surprising as a member of the British fauna. Both species in Central Europe are usually found in flower-heads of *Ranunculus* or larger *Geranium*, such as *G. pratense* L., but their larvae are unknown.

† The only known species in this genus, *P. amerinae* (L.), has a wide Eurasian distribution reaching from Spain, N. to Scandinavia, E. to Japan and S.E. to Asia Minor. Curtis (1825, *British Entomology* 2 : 93) records the species as having been taken at Windsor by a Mr. Griesbach in June, but the species has never been found there since, though, of course, it may still occur.

Subfamily ABIINAE.

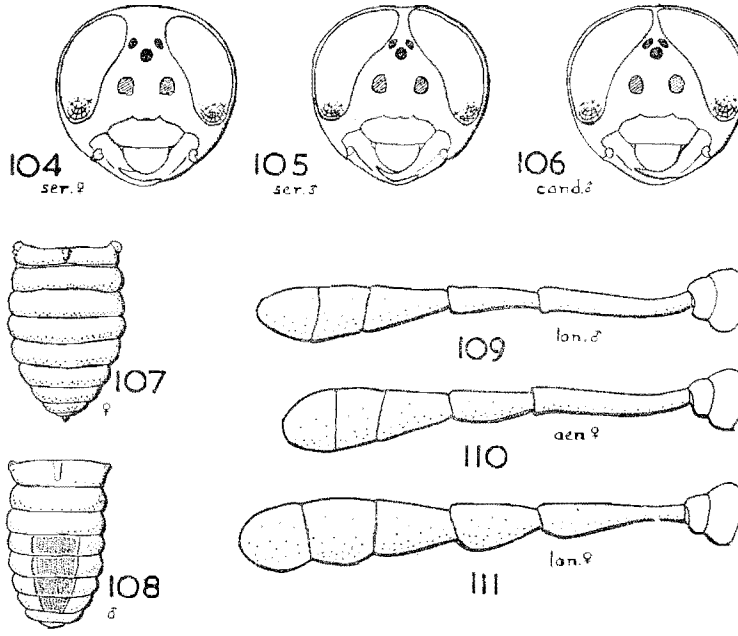
Tribe Zaraeini.

Genus **Zaraea** Leach (= *Abia* Leach in part).

Holarctic with about 25 known species, of which 7 occur in Europe and 3 in Britain. 9–12 mm. long.

KEY TO BRITISH SPECIES OF *Zaraea* LEACH.

1 Body violaceous black, except, in the ♀, for the white propodeum and metanotum; ♂ (very rare) without velvety patches on the tergites. Claws simple. Pubescence black on dark parts. Fore wing with a triangular



FIGS. 104–106.—Heads of *Abia* from in front: 104, *sericea* ♀; 105, *sericea* ♂; 106, *candens* ♂.
FIGS. 107, 108.—Abdomen of *Abia sericea*: 107, ♀; 108, ♂.
FIGS. 109–111.—Antennae of *Zaraea*: 109, *lonicerae* ♂; 110, *aenea* ♀; 111, *lonicerae* ♀.

uniformly fuscous patch under the stigma. Antenna of 6 segments, of which 4, 5 and 6 are almost of equal length. ♀ antenna not differing from that of ♂, segment 5 being more than 3 times as long as high. Mesopleura with dull opaque minutely sculptured surface.

Larva on Lonicera *and various cultivated Caprifoliaceae, such as* Symphoricarpos, Leycesteria, *etc. Mainly parthenogenetic, with only very occasional* ♂♂. *Local throughout Britain to Inner Hebrides and Ireland. IV–VIII.* 1–2 *broods. C. and N. Europe, Siberia E. to Kamtchatka..* ♂ and ♀ **fasciata** (L.).

– Body bluish-green; ♂ (as common as ♀) with each of tergites 4–6 modified medially by the presence of a conspicuous velvety patch of dense hairs. Claws with a large medial inner tooth. Pubescence black on face, but elsewhere pale, golden in ♀, silvery in ♂. Fore wing with a yellowish-brown

triangular patch under the stigma, but this has a sub-hyaline patch in the middle. Antenna of 7 segments, though 6–7 may be fused, but then 6–7 is much longer than 5 ..... 2.

2 (1) Mesonotum and particularly mesopleura shining between clearly defined punctures. Scutellum flattened in the middle. Antenna of ♀ (fig. 111) differs from that of the ♂ (fig. 109) in that the 3rd segment is incrassate apically, and the 4th segment so swollen that it is only about twice as long as high (it is 3 times as long as high in the ♂).

Larva on Lonicera *and* Symphoricarpos. *S. England, not common. IV–VI. Apparently an Atlantic species (Holland and France)* (cf. Z. *aenea*) (see *Benson*, 1946, Ent. mon. Mag. **82** : 101–2) ..... ♂ and ♀ **lonicerae** (L.).

(= *nigricornis* Leach, *nec lonicerae* L. Enslin.)

– Mesonotum and especially mesopleura with dense coriaceous surface sculpture between large punctures. Scutellum evenly convex in the middle. Antenna in ♀ (fig. 110) with 3rd and 4th segments not much more swollen than in ♂, being $2\frac{1}{2}$ to 3 times longer than its greatest height.

Larva on Lonicera *and* Symphoricarpos. *Known only from a single* ♀ *taken in E. Dartmoor, Lydford*, 900 ft., 25–31.iv.1947 (*R. C. L. Perkins*) (†Benson, 1948, *Ent. mon. Mag.*, **84** : 119). *C. and E. Europe, including France, Germany, Czechoslovakia.* (cf. Z. lonicerae *L*).

♂ and ♀ **aenea** Klug.

(= *lonicerae* L. Enslin *nec* L.)

Tribe Abiini.

Genus **Abia** Leach.

Eurasian with about 13 known species, of which 5 occur in Europe and 2 in Britain. 9–12 mm. long.

KEY TO SPECIES OF *Abia*.

A. In ♀ abdomen metallic green and thorax purple ; in ♀ apical $\frac{1}{3}$ of tergites 4–7 with fine surface sculpture between numerous punctures. Antennae of ♂ and ♀ usually unicolorous, entirely reddish brown, though they may be uniformly or partly dark, even black, but never with segment 3 black at base and pale at apex. In ♂ eyes behind as far apart as diameter of an ocellus (fig. 105), and thorax as well as abdomen metallic green. Face of ♀ see fig. 104.

♂ *commoner than* ♀. *Larva on* Succisa pratensis *Monch.*, Knautia arvensis (*L.*) *Coult. etc. Common throughout Britain and Ireland. V–VIII.* 2 *broods in S. England. All Europe from Scandinavia to Iberian Peninsula, to Asia Minor and N. Persia, Caucasus and Transcaucasia.*

♂ and ♀ **sericea** (L.)

B. With both thorax and abdomen metallic green or bluish-green in ♂ and ♀ ; ♀ with apical $\frac{1}{3}$ of tergites 4–7 smooth and shining between scattered punctures. Antenna of ♂ and ♀ with basal and apical segments piceous and much darker than the yellow middle segments ; segment 3 is black at base and pale at apex. In ♂ eyes behind only about as far apart as half diameter of an ocellus (fig. 106).

♂ *excessively rare in Britain, so that our race must be mainly thelytokously parthogenetic. Larva not described. Throughout Britain and Ireland, frequently occurring with the preceeding, but less commonly. V–VIII.* 2 *broods. N. and C. Europe to Caucasus, but apparently absent from Mediterranean* ..... ♂ and ♀ **candens** Konow.

Subfamily CIMBICINAE.

The systematics of some of the genera in this subfamily, notably *Cimbex* and *Trichiosoma*, are notoriously difficult. The trouble does not here lie in the absence of characters to work on, but in the extreme individual variability in nearly all the structural characters so far examined.

Firstly, with the larvae we find that different forms have been described by different authors, and we do not know how much to allow for larval variability and authors' idiosyncrasy. On the surface it would appear that a number of different species of *Cimbex* and *Trichiosoma* exist, and that these can be readily distinguished on biological characters, larval form correlated with host-plant. Some of them appear to be geographical races (cf. larval geographical races in *Palaeocimbex quadrimaculata* (Müller). The difficulty, in the absence of bred material, is to correlate the adults with the larvae.

Intensive study with bred material is required. Genitalia studies, as so often in groups where the external characters break down, give little help except in the saws of *Cimbex*. The following keys to *Cimbex* and *Trichiosoma* adults must, therefore, be treated with the utmost scepticism, and those to the males with indulgence.

Tribe Cimbicini.

Genus **Cimbex** Olivier.

Holarctic with about 17 recognized species, of which 4 occur in Europe and 3 in Britain. 20–28 mm. long.

KEY TO SPECIES OF *Cimbex*.

Females.

1 Wings yellowish throughout, if the apex of the fore wing is somewhat darker, the colour here darkens gradually and not in the form of a clearly defined band. Abdomen mostly dull yellow or orange above, with at most the 4 basal tergites and the extreme apical one black ; from the 3rd tergite dull with dense fine pubescence and surface sculpture all over. . . . . 2.

– Wings only slightly yellowish at the base but with a clearly defined fuscous band on the apical margin of both fore and hind wings. Body normally mostly shining black, but may be more or less, even sometimes entirely, reddish brown or yellow. Abdomen shining with but very short and sparse pubescence, becoming almost obsolete on the sides of tergites 3–5.
Head behind the eyes and scutellum smooth and shining with only sparse punctures and hairs. Teeth in the middle of the saw rounded apically and about as far apart as their greatest breadth (fig. 115).
Larva on Betula. *Common throughout Britain to Inner Hebrides and Ireland, but the larvae are more frequently met with than the adults as in the others of this family. V–VIII. All Europe to Caucasus and Siberia to Sakhalin* . . . . . ♀ **femorata** (L.).
(= *sylvarum* Fabricius.)

2 (1) Abdomen usually entirely yellow above and below, and even in the darkest forms (fig. 112) the 3rd tergite has only a small dark spot in the middle and the venter is mostly yellow. Post-ocellar region and scutellum dull with a rough surface and densely clothed in long hairs. Saw with small blunt teeth which, in the middle of the saw, are 1½–2 times as far apart as their greatest breadth (fig. 114).
Larva on smooth-leaved Salix *and* Populus. *England and Scotland to Inner Hebrides, but the adults are not often found. V–VII. All Europe including Iberian Peninsula, Siberia E. to Kamtchatka and Japan* . . . . . ♀ **lutea** (L.).

– Abdomen yellowish-white above at the apex, but 1st and 2nd tergites entirely and 3rd, except for a small pale spot each side, are violaceous black (fig. 113), so also is the venter. Post-ocellar area and scutellum shining with sparse punctures and scattered pubescence. Saw with larger rounded teeth, closer together in the middle of the saw than their greatest breadth (fig. 116).
Larva attached to Alnus. *In addition to the ancient Stephens records for the south of England (Kent, Surrey and Sussex), and Cameron's mention of Devon-*

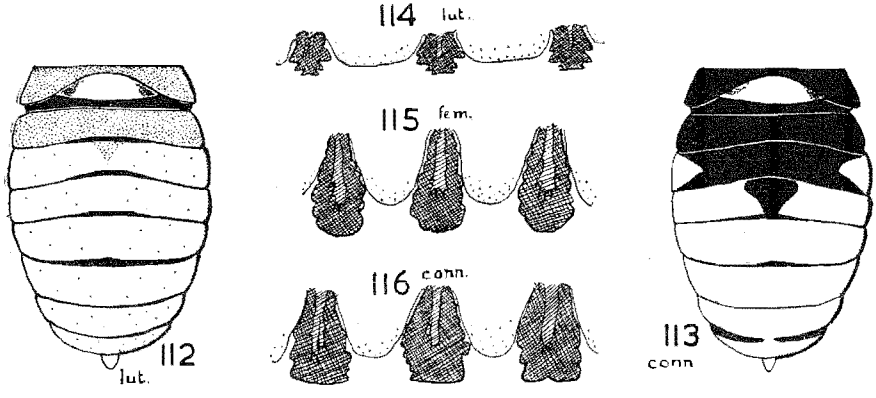
shire, Plymouth (Bignell), it has been found more recently in Cornwall, Mount Edgcombe and E. Looe Valley (J. Clark, 1909); Devon, Leighan Valley, 3 larvae, x,1947 (P. W. E. Currie); E. Suffolk, Freston (Morley, 1905); and Ireland, W. Cork and S. Kerry (A. W. Stelfox). V–VI. All Europe.

♀ **connata** (Schrank).

Males.

1 Abdomen dull, with dense close pubescence on the sides of the middle tergites. Wings yellowish hyaline with the fuscous apical band less defined or absent. Base of scutellum and often head post-ocellar region with rough surface sculpture or close punctures ..... 2.

– Abdomen shining with sparse short hairs on the sides of the middle tergites. Wings hyaline with a clearly defined apical fuscous band. Base of scutellum and post-ocellar region shining between almost obsolete punctures. Abdomen may be entirely black, or with the middle tergites more or less reddish yellow ..... ♂ **femorata** (L.).



FIGS. 112, 113.—Abdomens of *Cimbex* ♀: 112, *lutea*; 113, *connata*.

FIGS. 114–116.—Marginal teeth from middle of saw in *Cimbex*: 114, *lutea*; 115, *femorata*; 116, *connata*.

2 (1) Abdomen entirely dull orange to entirely black. Scutellum and post-ocellar region dull with a rough surface and conspicuously hairy .... ♂ **lutea** (L.).

– Abdomen entirely or at least mostly black. Post-ocellar region and base of scutellum shining between the punctures ..... ♂ **connata** (Schrank).

Tribe Trichiosomini.

Genus **Trichiosoma** Leach.

Holarctic, with about 20 supposed species, 5 in Europe all recorded from Britain. In need of intensive study before their status can be decided. 13–24 mm. long.

KEY TO SPECIES OF BRITISH *Trichiosoma* LEACH.

Females.

1 Abdominal tergites 3–4 covered mainly with piceous pubescence. Attached to Rosaceae ..... 2.

– Abdominal tergites 3–4 with hairs predominately pale. Attached to Salicaceae and Betulaceae ..... 3.

2 (1) Abdomen with 4 apical tergites clothed in dense, fine, silky, white, adpressed pubescence, so that the specimens appear mouldy. Hind tibia coloured the same as the hind tarsi; pubescence above the hind femur is mostly piceous. Pale pubescence on head and thorax white.

Larva on Sorbus aucuparia L. *Throughout Britain, but mostly in W. and N., where it extends to Outer Hebrides and Ireland. V–VII. C. and N. Europe to Lapland and Russia* .....♀ **sorbi** Hartig.

(= *scalesii* Leach, Cameron, *nec* Leach.)

– Abdomen with the pale apical pubescence outstanding and mainly confined to the two apical tergites. Hind tibia usually darker than the tarsi; pubescence above hind femur pale. Pale pubescence on head and thorax reddish brown in S. Britain; white in the only ♀ seen from Ireland (Armagh and Down, Poyntzpass, 11.v.1911, W. F. Johnson).

Larva on Crataegus. *England, Wales and Ireland. V–VI. C. and. N. Europe to Finland, Siberia E. to Sakhalin and Japan* ....♀ **tibiale** Stephens.

(= *betuleti* Klug, Cameron, *nec* Klug.)

3 (1) Abdomen mainly black, but often more or less reddish beneath and sometimes even laterally above, but the pubescence on the scutellum and base of the abdomen is not so dense as to obscure the punctation and has grey hairs intermingled with the pale ones. 2 apical tergites not closely covered in pale silky adpressed pubescence. Pale pubescence reddish brown or yellowish white .....4.

– Abdomen reddish brown beneath and at the sides above. Scutellum and base of the abdomen very densely covered with pale hairs that obscure the punctation. 2 apical tergites densely covered with very fine short silky pale adpressed hairs. Pale pubescence yellowish white.

Larva on Salix. *Throughout Britain and in Ireland, but rarely found. Beyond the Stephens specimens (Darenth Wood, Kent, and Coombe Wood, Surrey) and others without data from the Clifton and Cameron Collections I have seen no specimens other than a single ♀ I captured at Brandon, Suffolk in* v.1945. *N. and C. Europe to Finland, Siberia E. to Kamtchatka.*

♀ **vitellinae** (L.).

(= *laterale* Leach.)

4 (3) Pale pubescence reddish brown to yellowish white. Abdomen entirely black above and below except at most for neighbourhood of sawsheath.

Larva on Betula *and* Salix. *Common in England and occurs in Ireland, but is apparently a southern species, as I have seen no specimens from Scotland, where it is replaced by the following species. V–VI. C. Europe N. to Lapland and Siberia, E. to Kamchatka, but some of these records may refer to other species* .....♀ **lucorum** (L.).

– Pale pubescence white or grey without yellowish tinge. Abdomen beneath and sometimes also laterally at least edged with brown on some segments.

Larva on Betula *and* Salix. *Apparently mainly a northern species being fairly common in Scotland and Ireland; I have seen no English specimens other than Leach's types. V–VII. C. and N. Europe to Finland and Lapland, and Siberia to Kamtchatka* .....**latreillei** Leach.

(= *scalesii* Leach, *lucorum* L., Cameron (*in parte*) *nec* L.)

Males.

1 Abdomen more or less rufous at least below; pale pubescence white; apex with fine silky pale pubescence well developed.....2.

– Abdomen entirely black above and below; pale pubescence usually yellowish, though it may be white in N. Irish forms of *T. tibiale*; abdomen with the coarse outstanding pubescence predominating and obscuring the finer intermingled silky pubescence.....♂ **lucorum** (L.) and ♂ **tibiale** Stephens.

2 (1) Abdomen with the venter entirely rufous and usually with the apex and sides above also. Scutellum with very dense and long pubescence obscuring the punctation .....♂ **vitellinae** (L.).

– Abdomen usually less richly marked with rufous. Scutellum less densely pubescent, so that even in fresh specimens the punctation is clearly visible ..3.

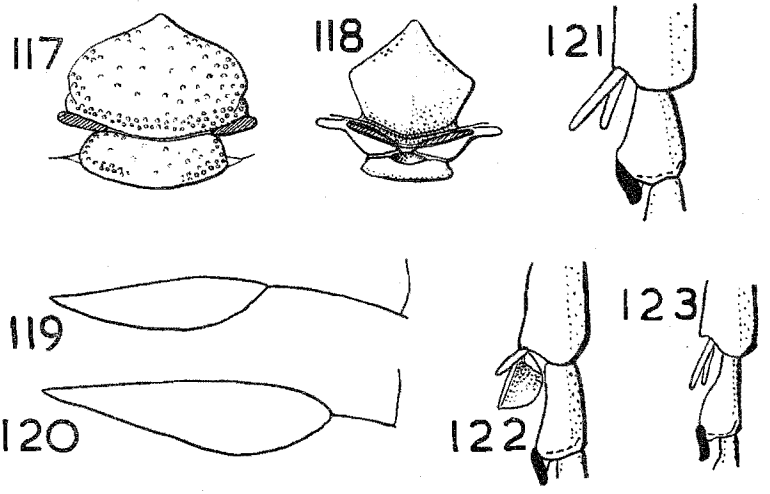
3 (2) Hind femur with pubescence above largely piceous.....♂ **sorbi** Hartig.

– Hind femur with pubescence above entirely pale .....♂ **sylvaticum** Leach.

Family DIPRIONIDAE

Stout, slow-flying insects associated with Coniferae. They are characterized by their plumose male and serrate female antennae of more than 9 segments and by the absence of vein 2r in the fore wing ; scutellum without a transverse furrow cutting off a post-tergite ; hind wing with both middle closed cells RS and M present ; tibiae without pre-apical spines and front tibiae with simple unmodified spurs.

Larvae free-living, often gregariously on needles of Coniferae. They have 8 pairs of abdominal legs (segments 2–8 and 10).



FIGS. 117, 118.—Meso-scutellum, cenchri and meta-post-scutellum in Diprionidae : 117 *Diprion* ; 118, *Gilpinia*.

FIGS, 119, 120.—Anal cell in hind wing of : 119, *Diprion* ; 120, *Neodiprion*.

FIGS. 121–123.—Hind tibial spurs in : 121, *Neodiprion* ; 122, *Gilpinia hercyniae* ; 123, *Microdiprion*.

The cocoons are double, and on emerging the adult severs a cap at one end of the cocoon and this cap is left hanging by a few threads. *Neodiprion sertifer* is exceptional in overwintering as an egg instead of as a prepupa.

The family is a small one of about 60 described species in 10 genera in 2 subfamilies restricted to the northern hemisphere (Benson, 1939, *Bull. ent. Res.* **30** : 339–42 and 1945, *op. cit.* **36** : 163–4). Represented in Europe by 16 species in 7 genera, and in Britain by 9 species (2 of which are certainly aliens) in 5 genera and 2 subfamilies.

KEY TO GENERA.

1 Anal cell of fore wing with a cross-vein near the middle (fig. 28) ; wing membranes only sparsely pubescent and with naked margins. Male antenna with 2 prolongations to each flagellar segment ; distance between antennal sockets in both sexes greater than the distance between an antennal socket and the centre of the nearest tentorial fovea. Attached to Pinaceae. (DIPRIONINAE) (= *Lophyrus* Auctt.) ..... 2.

– Anal cell of fore wing widely constricted in the middle into 2 separate cells (cf. fig. 29); wing membranes strongly pubescent and with finely ciliate margins. Male antenna with 1 very long prolongation to each flagellar segment (fig. 11); antennal sockets closer together than the distance between an antennal socket and the centre of the nearest tentorial fovea. Attached to Cupressaceae (*Juniperus*).
Scutellum longer than broad, acute in front and unpunctured. Abdomen unpunctured. 1 sp. (MONOCTENINAE) ..... **Monoctenus** Dahlbom.

2 (1) Anal cell in hind wing with very short stalk (fig. 120), (not longer than the greatest breadth of the anal cell). Abdomen shining, with at most very sparsely developed surface sculpture. Scutellum longer than broad, acutely angled in front and shining. Attached to *Pinus* ..... 3.

– Anal cell in hind wing with a stalk much longer than the greatest breadth of the cell (fig. 119). Abdomen dull, with dense rugulose sculpture. Scutellum broader than long, obtusely angled or rounded in front, and often strongly punctured (fig. 117–8). Attached to *Pinus* and *Picea* ..... 4.

3 (2) Abdomen, excluding 1st segment, shining but with fine surface sculpture. Claws without inner tooth (cf. fig. 43). ♀ and ♂ black. 1 sp.
Microdiprion Enslin.

– Abdomen, excluding 1st segment, without any surface sculpture. Claws with an inner tooth (cf. fig. 44). ♀ mostly reddish brown; ♂ black above. 1 sp.
Neodiprion Rohwer.

4 (2) Meta-post-scutellum large, being at least as long as the breadth of a single cenchrus (fig. 117); cenchri further apart than 1½ breadth of one. Very plump species. ♀ with deeply excised hypopygium. Attached to *Pinus*. 2 spp. ..... **Diprion** Schrank.

– Meta-post-scutellum shorter than the breadth of a single cenchrus (fig. 118); cenchri at least closer together than 1½ breadth of one. Less plump species. ♀ with hypopygium at most only slightly emarginate. Attached to *Pinus* and *Picea*. 4 spp. ..... **Gilpinia** Benson.

Subfamily MONOCTENINAE.

Genus **Monoctenus** Dahlbom.

Holarctic with 8 described species of which 2 occur in Europe and 1 in Britain.

Mainly black species in the ♀ with a lateral yellow band each side of the abdomen; stigma pale with dark margins; tibiae and tarsi pale. 5–6 mm. *On* Juniperus communis *L. Confined apparently to the Spey Valley, Inverness. V–VI. N. and C. Europe* ..... ♂ and ♀ **juniperi** (L.).

Subfamily DIPRIONINAE (= *Lophyrus* auctt.).

Genus **Microdiprion** Enslin.

Confined to Europe with 2 species, of which 1 has been found in Britain.

Mainly black with pale legs. 5–7 mm. *On* Pinus silvestris *L. Restricted to Caledonian forest relics in Aberdeen, Inverness and Perth. VI. N. and C. Europe, S.E. to Caucasus.* ♂ and ♀ **pallipes** (Fallén).

Genus **Neodiprion** Rohwer.

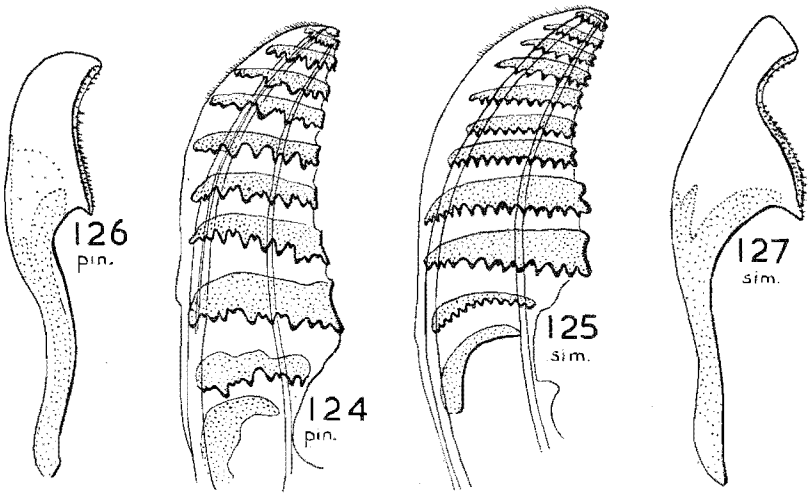
Richly developed in N. America, but with only 1 European species.

♀ mainly reddish-brown except for parts of mesonotum and base of abdomen; ♂ black except for venter of abdomen. 7–9 mm. *On* Pinus silvestris *L.*

etc. *Local throughout Britain, including Caledonian forest relics. Sometimes a pest in plantations. VII–X. Eggs survive winter. C. and N. Europe, E. to Japan.* ♂ and ♀ ..... **sertifer** (Geoffroy).
(= *rufus* Latreille)

Genus **Diprion** Schrank.

Species with yellow ground-colour more or less marked with black, especially on head, lobes of mesonotum, metanotum, mesosternum and 3rd–6th abdominal tergites. Palaearctic with only 3 known species. The 2 European species are easily distinguished on larval characters, but in the adults are so variable in external features as to be only separable for certain on genitalia structures. Larva on *Pinus*.



FIGS. 124, 125.—Saw of *Diprion*: 124, *pini*; 125, *simile*.

FIGS. 126, 127.—Penis valve of *Diprion*: 126, *pini*; 127, *simile*.

KEY TO SPECIES OF BRITISH *Diprion* SCHRANK.

A. ♀ lateral bands of saw with teeth of irregular sizes and the ventral teeth entire (fig. 124); ♂ penis-valve as in fig. 126. 7–10 mm.
Throughout Britain and Ireland local. V–VII. N. and C. Europe to Iberia and Algiers ..... ♂ and ♀ **pini** (L.).

B. ♀ lateral bands of the saw with teeth very regular and even, and the ventral teeth emarginate (fig. 125). ♂ penis-valve as in fig. 127. 7–10 mm.
Less common than D. pini; *known only from Kent, Surrey, Bucks, Herts and Beds, but probably more widespread than these records suggest. V–VII. N. and C. Europe, especially on mountains. Introduced into N. America.*
♂ and ♀ **simile** (Hartig).

Genus **Gilpinia** Benson.

Palaearctic, with 19 species, though several have been introduced into N. America. Of the 11 European species 4 have been recorded from Britain, but 2 of these are only introduced aliens.

KEY TO THE SPECIES OF BRITISH *Gilpinia* BENSON.

Females.

1 Inner apical spur of hind tibia shaped like a scale (fig. 122). Apex of sawsheath, in dorsal view, much broader than apical breadth of hind tibia....2

– Apical tibial spurs normal (fig. 123). Apex of sawsheath narrower than apical breadth of hind tibia. 7–9 mm.
Scutellum very variable in colour, and may be all black to all yellow.
On Pinus silvestris *L. In Britain was known to Cameron as native in the Black Wood of Rannoch, Perths. In the Spey Valley, Inverness, it was found by P. Harwood near Aviemore in* vi.1931. *C. and N. Europe, E. to Asia Minor, Caucasus and C. Siberia*.....♀ **frutetorum** (F.).
(= *variegatus* Hartig.)

2 (1) Mesosternum black or dark brown; underside of abdomen often with dark segmental margins. Head with a dark band reaching from eye to eye ...3.

– Mesosternum yellow or pale brown in colour; underside of abdomen with at most brownish segmental margins. Head without a complete dark band reaching from eye to eye. 7–8 mm.
On Pinus silvestris *L. In Britain apparently confined to Caledonian forest relics. Recorded by Cameron as* "virens" *from Black Wood of Rannoch, Perths, and in the Spey Valley, Inverness, it was found at Nethy Bridge* (*H. Scott,* 1907), *Garten Wood* (*J. J. F. X. King,* 1922) *and Aviemore* (*P. Harwood,* 1945 et seq.). *Probably occurs elsewhere as Stephens records it from Oban, in Argyle and Cobham, Surrey. VI. N. and C. Europe* ....♀ **pallida** (Klug).
(= *virens* Klug, Cameron and *dorsatus* Fab., Cameron.)

3 (2) Stigma yellow, often with a pale brown margin; costa yellow. Hind femur usually entirely yellow but may be brownish at base; hind tibia and tarsi yellow with brownish apices. Anal vein of fore wing swollen and angled at the basal contraction of anal cell. Antennae 18-segmented. 7·5–8·5 mm.
On Pinus silvestris *L. In Britain only known from Berks, where* 2 *larvae were found and bred by P. Harwood* (*B. Harwood,* 1913, Ent. mon. Mag. **49**: 214). *The Scottish records of Cameron refer to* G. pallida. *Europe, S. to Iberia, E. to Kamtchatka* .....♀ **virens** (Klug).

– Stigma yellow but with a black or dark brown margin and base; costa dark brown. Hind femur black except for the pale apex; hind tibia and tarsi yellowish white with black apices. Anal vein of fore wing neither swollen nor angled at the basal contraction of the anal cell. Antenna 21–22 segmented. 6–8 mm.
On Picea excelsa (*Lam.*) *Link. Established in spruce plantations in Dorset, Somerset, Hants, Berks, Bucks and Herts. VI and VII–VIII. N. and C. Europe and introduced into Canada, where it has become a serious pest. Parthenogenetic*; ♂♂ *very rare* .....♀ ***hercyniae** (Hartig).

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* Two European species were, until very recently, confused under the name *G. polytoma* (Htg.). The true *G. polytoma* has not been found in Britain and records of it refer to *G. hercyniae*. The 2 species are distinguished thus (Reeks, 1941, *Canad. Ent.* **73** : 177–188):

G. polytoma (Hartig): ♀ Labrum and venter usually more yellow than brown; hind femur usually piceous only on dorsal surface. Saw with 9–10 rows of teeth; process at proximal end of saw-support weakly developed; distal end pointed; process without carina, or at most carina only present near outer edge. ♂ (as common as ♀) with punctation on mesonotum fine. Penis-valves spatulate with distal third membranous. Cocoons in lower foliage or herbaceous growth above ground. N. and C. Europe.

G. hercyniae (Hartig): ♀ Labrum brown; venter of thorax usually more black than yellow; hind femur usually with black on both ventral and dorsal surfaces. Saw with 11–12 rows of teeth; process at proximal end of saw-support broadly rounded at apex; carina on process almost invariably extending from one side to the other. ♂ (very rare: 1 ♂ to 1000 ♀♀ in Canadian strains) with punctation on mesonotum coarse; penis valve pedate and strongly sclerotized at apex. Cocoons under debris beneath the trees. N. and C. Europe introduced into Britain and Canada.

KEY TO THE SPECIES OF BRITISH *Gilpinia* BENSON.

Males.

1 Pronotum black with at most the narrow hind edge yellow. (*Pinus.*)....2.
– Pronotum broadly marked with yellow .....3.
2 (1) Clypeus and usually labrum yellow or brown. 6–7 mm.
♂ **pallida** (Klug).
– Clypeus and labrum mostly black. 7 mm..... ♂ **frutetorum** (Fabricius).
3 (1) Abdomen red at the sides from the 2nd segment, the apical 3 tergites almost entirely red as well as the whole of the underside except sometimes the base of hypopygium. Anal vein swollen at the basal contraction of the anal cell. 6–7 mm. (On *Pinus.*).....♂ **virens** (Klug).
– Abdomen mostly black above, with at most the lateral margins of the tergites yellow. Anal vein not swollen at the basal contraction of the anal cell 6–7 mm. (On *Picea*) .....♂ **hercyniae** (Hartig).

INDEX

Numbers refer to pages. Principal references are given first; and if there are two, the former refers to the female and the latter to the male. Heavy type refers to a page with an illustration. Synonyms are in italics.

Supplement to Section (*a*).

Page 1, line 4, for " four " read " three ".

,, line 11, delete " (*d*) Larvae ; foodplant and other indexes."

Page 2, line 8 up, after " . . . independently." insert " For a recent study of European sawfly larvae together with keys to genera and species and with host plant lists see Herbert Lorenz and Manfred Kraus " Die Larvalsystematik der Blattwespen " *Abh. Larvalsyst. Insekt.* 1, viii + 340 pp., 435 figs."

Page 10, lines 8–9, delete : " front tibia with a pre-apical spine . . . spurs."

,, line 10, delete : " 2 spp."

,, line 11, for " **Acantholyda** A. Costa " *read* " 1a."

,, after couplet 1 add :

" 1 Front tibia with a pre-apical spine on its inner side in addition to the apical spurs. On *Pinus*. 2 spp. ..... **Acantholyda** A. Costa

" – Front tibia without any pre-apical spine. On *Larix*. 1 sp.
Cephalcia Jurine."

Page 11, before " Subfamily Pamphiliinae " add :

" Genus **Cephalcia** Jurine.

" Larvae live in webs on *Larix, Abies* and *Picea*.

" Of the 35 world species five or six are found in Europe and in recent years one has become established in Britain.

" Mainly black species with white flecks on head and mesonotum, and brownish underside to the abdomen. 10–11 mm.

" *Larva solitary in silken tubes on* Larix. *First found in* 1954, *Berks. : Wytham Woods* (†*J. B. Gurdon*, 1954, Ent. mon. Mag. 90 : 234 *as* C. falleni *Dalman*), *more recently at Alice Holt, in the plantations of the Forestry Commission, at Wrecclesham, Farnham, Surrey, where it has been reared from larvae. V–VI. Europe* ..... ♂ ♀ **alpina** (Klug)."

Page 12, line 7, add " and *Wales : Radnor*, 1953, *R. B. B.* ".

,, line 21 up, add " *and Inverness* (*Aviemore*, 1952, *R. B. B.*)."

,, line 14 up, after " *Beds.*" add " *Yorks.*".

Page 17, line 17, add " *Somerset* ".

Page 18, under " Key to British Genera of Siricidae " before couplet 1 add :

" 1a. Antennae filiform and long (longer than C + stigma of fore wing) and set close together (so that the distance between them is only about one and a half times as much as the distance of one from the nearest eye-margin). Eyes not more than one and a half times as broad as long. Labial palps 3-segmented. Cerci present. Anal cell of fore wing contracted from about the middle. Attached to Coniferous trees (Pinaceae) (Siricinae) 1

" – Antennae slightly swollen in middle and short (shorter than C + stigma of fore wing) and set far apart (3 times as great as the distance from one of them to the nearest eye-margin). Eyes at least twice as broad as long. Labial palps 2-segmented. Anal cell of fore wing contracted in basal third. Attached to Angiosperm trees. 1 sp. (Tremecinae)
Tremex Jurine."

Page 19, lines 34–39, delete " Hind tibia.....♀ **augur augur** (Klug) ". and add " .....6 ".

Page 20, at end of key to " Females ", add another couplet :

" 6 Hind tibia with basal two-thirds black. Abdomen with at least tergites 3–7 and 9 banded with black above. Claws with large subapical tooth (longer than its basal breadth). Ovipositor as long as fore wing.

C. and S. E. Europe. Occasionally introduced into Britain in timber but not established here, cf. Stephens, 1835 : 14, *and* Benson, 1938, Ent. mon. Mag. 74 : 255, *as* ' Urocerus cedrorum *Smith* '

(= *augur augur* Klug) **fantoma fantoma** Fabricius

" – Hind tibia all yellow with at most the extreme apex brown. Abdomen mostly yellow above with only tergites 6 and 7 banded apically with black, and sometimes 4 and 5 with lateral spots. Claws with a minute subapical tooth not longer than its basal breadth. Ovipositor only about two-thirds as long as fore wing.

Warwicks. : Leamington Spa, Lillington, 1 ♀, *vi*.1953, *emerged from imported timber* (*W. T. Taylor*). **New British record.** *C. Europe and W. Siberia*

(= *fantoma* Fabricius *auctt. nec.* Fab) **tardigradus** Cederhjelm."

Page 22, before " Superfamily **ORUSSOIDEA** ", add :

" Genus **Tremex** Jurine.

" Of the nearly 20 world species, two are known in Europe. One introduced from N. America has been found in Britain.

" 15–40 mm. long. ♀ thorax infuscate brown ; abdomen piceous with tergite 1 yellow and the following 6 each with a yellow band. Wings more or less infuscate. ♂ mainly piceous.

" *Larva bores in* Acer, Quercus, Ulmus, *etc. Devon : Seaton,* 1 ♀, *emerged from wood of imported* Ulmus thomasi *Sarg., ix*.1957 (*J. A. Richman*). *New British record. North American species*.....**columba** (L.)."

Page 26, line 5, after " *Hunts.*" add " *Oxon., Middlesex and Beds.*".

,, line 6, add " *New British record* ".

Page 27, line 8, add " *Herts., Flaunden,* 1957 (*R. B. B.*) ; *Suffolk, Brandon,* 1945 (*R. B. B.*) ".

Page 35, line 5, after " *In Britain.*" add " up till 1953 ".

,, line 13, after ". . . *secured.*" add

" *In* 1953 *discovered in Kew Gardens by Mr. A. H. G. Alston : and Goldstitch Moss, Staffordshire by Mr. James Edwards at an altitude of* 1100–1200 ft., *between Leek and Buxton, in a wild area where it must surely be a native species. In both these localities the larvae were boring in petioles of* Athyrium felix-femina (*L.*) *Roth. And from Goldstitch Moss the first British adults were obtained.*"

Page 41, line 4, add " *Hunts., Holme Fen* (*W. E. Russell,* 1954) ".

,, line 5, for " *W. Cork and S. Kerry* " read " *W. Cork north to W. Galway* ".

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