The Coleopterist

Volume 7 Part 2 • August 1998

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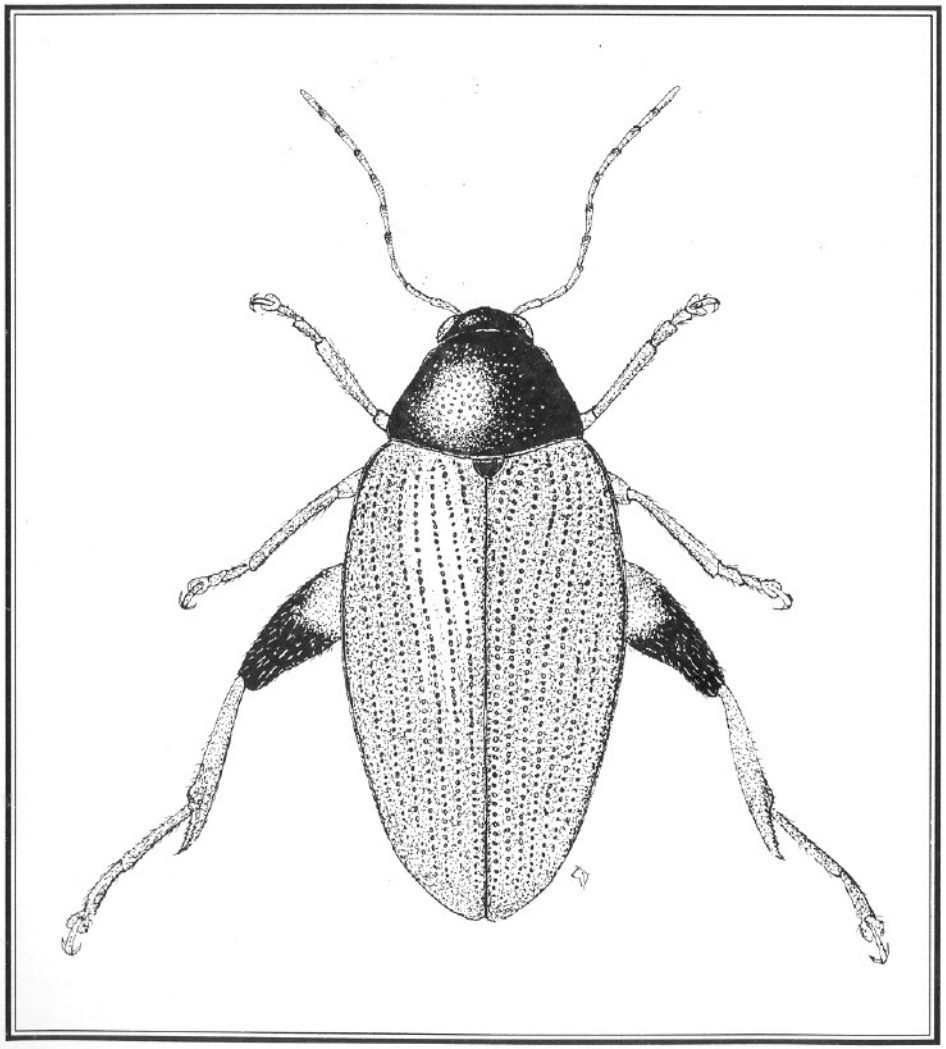

The genus *Psylliodes* in the UK
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ISSN 0965-5794

The genus *Psylliodes* Latreille (Chrysomelidae: Alticinae) in the U.K.

with keys to the adults of all species and to the larvae of those species feeding on Brassicaceae

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Introduction

The chrysomelid genus *Psylliodes* Latreille is a moderately large worldwide group of flea beetles. There are approximately 141 world species (Furth, 1983) of which the majority of over 69.5% (*c.* 98 spp.) are Palaearctic; 9.9% (14 spp.) are Oriental; 8.5% (12 spp.) are Australasian; 4.3% (6 spp.) are Neotropical; 3.5% (5 spp.) are Nearctic; and 4.3% (6 spp.) are Afrotropical (Biondi, 1996). It can be seen that *Psylliodes* seem to thrive in more temperate, rather than tropical climates, in contrast to many other alticine genera. The adults of the U.K. species are quite well known and Joy (1932) provided a key to their identification, but this included *P. luridipennis* Kutschera as a variety of *P. chrysocephala* Linnaeus, which was only later shown to be a valid British species by Shute (1975). Moreover, that key does not include *P. laticollis* Kutschera which was added to the British list (as *P. weberi* Lohse) and the specific differences between this species and *P. napi* (Fabricius) were given by Allen (1976). Cox (1995) added *P. cucullata* (Illiger) to the British list and brought the total number of British *Psylliodes* species to 15.

Information on the larvae is scanty and their feeding habits are poorly known. The larvae of nine of the 15 British species have been described, but to date a maximum of only six of these have been included in keys. The larvae of *P. luridipennis*, the Lundy endemic, are undescribed and there are no descriptions in the European literature to those of *laticollis* and *P. sophiae* Heikertinger. *Psylliodes* species are occasionally pests of various crops but some may have potential as biological control agents of weeds. A good example is *P. chalcomera* (Illiger) which has been introduced into North America to control the Musk Thistle *Carduus nutans* (Asteraceae) (White, 1996). In Britain, *P. chrysocephala*, the Cabbage Stem Flea Beetle, attacks various cruciferous crops, and *P. affinis* (Paykull) occasionally feeds in large numbers on potato *Solanum* leaves (Jones & Jones, 1984).

In the U.K., the following *Psylliodes* species are associated with various Brassicaceae: *chrysocephala*, *P. cuprea* (Koch), *laticollis*, *luridipennis*, *P. marcida* (Illiger), *napi* and *sophiae*. Final-instar larvae of all species were available, except for *sophiae* with only first- and second-instar larval exuviae of this species.

The purpose of this paper is to provide a reliable key to the adults of the 15 British *Psylliodes* species and to describe and provide diagnoses to the larvae of most of the

species known to feed in the adult and larval stage on crucifers, especially to describe the larvae of *laticollis* and *luridipennis* about which nothing has been published. The species to be redescribed are *chrysocephala*, *cuprea*, *marcida* and *napi*. The key to larvae will enable the separation of *luridipennis* and *napi* both developing in Lundy Cabbage *Coincya (= Rhynchosinapis) wrightii* on the island of Lundy, Devon. In addition, this will lend support to the recognition of *P. luridipennis* as a valid species.

Five species of *Psylliodes* are known from Lundy. *P. luridipennis* and *napi* are very regularly found on Lundy Cabbage all along the south-eastern coast of the island (SS 1443 to SS 1346) (Compton *et al.*, 1997). In addition, Brendel (1975) lists *chalcomera*, *cuprea*, and *dulcamarae*, while M. Salmon found a single *chrysocephala* in 1997 (R.S. Key, *pers. comm.*). According to Brendel (*op. cit.*), *cuprea* was collected on Lundy by N.H. Joy and J.R.leB. Tomlin; however, their specimens standing in the collection in the Natural History Museum, London, are all *luridipennis* and there are no verified records of *cuprea*, even though it is recorded from North Devon. In addition, *laticollis* has recently been found on Watercress *Nasturtium officinale* (R.S. Key, *pers. comm.*). In fact, specimens of this species from Lundy, collected by J.R.leB. Tomlin in 1906, are represented in the National Museum in Cardiff.

Biosystematic history

According to Hyman (1992), *P. luridipennis* is difficult to identify and may be confused with other members of the genus. However, the specific status of this species was clarified by Shute (1975) who recognised it as a valid species, males of which are distinguished from *chrysocephala*, *cuprea* and *P. hospes* Wollaston on the basal segment of the protarsi, the form of the metatibiae and median lobe of the aedeagi; and the females by the vertex puncturation and the spermathecae. Unfortunately, Shute did not provide a key to separate these species and the most recent is by Joy (1932), but this does not separate *laticollis* or *luridipennis*.

Klausnitzer (1994) provided the first reasonably comprehensive key to the larvae of Galerucinae-Alticinae occurring in Central Europe. A larval diagnosis for *Psylliodes* was presented by Cox (1976) but this was based on only two British species: *affinis* (first instars) and *napi* (all instars).

The larvae of several *Psylliodes* species have been described, but there are no keys in English to their separation. The larva of *affinis* was described by Tolg (1915); *P. attenuata* (Koch) by Tolg (1912) and Newton (1929); *P. hyoscyami* (Linnaeus) by Newton (1934); and *napi* briefly by Goureau (1864). Dobson (1960) described and figured those of *cuprea* and *chrysocephala* but did not really highlight the differences between them. Ogloblin and Medvedev (1971) included these species in a key with *Chaetocnema* Stephens (Chrysomelidae) spp., and apparently used the head width measurements given by Dobson (1960). Ghilarov (1964) presented a key to *Psylliodes* larvae but was unable to separate those of *napi* and *chrysocephala* which keyed out together. Klausnitzer (1994) gave a key to the larvae of seven *Psylliodes* species, including *chrysocephala* and *marcida*.

Biology and economic importance

Most *Psylliodes* species are apparently oligophagous and feed on a number of closely related hosts in one or several related families. However, some, such as *luridipennis* and *marcida* are apparently monophagous and restricted to a single host plant. *Psylliodes* has a primary food plant family, two secondary families, and a few other families with only one beetle species utilizing them. According to Furth (1983), Israeli *Psylliodes* feed on Brassicaceae (63%), Solanaceae (5%), Gramineae (11%), Chenopodiaceae (5%), and the remaining 16% have unknown hosts. Mohr (1966) gave the following percentages for Central Europe, which are similar to those of Furth: Brassicaceae (65%), Solanaceae (13%), Gramineae (9%), Asteraceae (4%), Scrophulariaceae (4%) and Moraceae (4%). In contrast, in the U.K., 46.5% are associated with Brassicaceae, 20% with Solanaceae, 6.5% with Asteraceae and 6.5% with Cannabaceae. Only the host plants of *cucullata*, *P. luteola* (Müller) and *P. picina* (Marsham) are unconfirmed. For the first, Furth (1983) listed Caryophyllaceae and Gramineae and it is suspected that the other two may be associated with Solanaceae or Lythraceae. Jolivet (1991) gave a full list of the known host plant genera of *Psylliodes*. The larvae are either root-feeders or upper/lower stem and leaf-miners.

Secondary defence chemicals present in their hosts are attractive to flea beetles and they have probably co-evolved with their food plants. The predominant secondary chemicals in the Brassicaceae as well as the Capparidaceae and Resedaceae are the thioglucosides or mustard oils. However, other secondary compounds must be involved since the crucifer feeders do not in general feed on other plant families, in contrast to some *Phyllotreta* Dejean (Chrysomelidae) species. However, this may not be strictly true, since Jolivet (1953) reported *Psylliodes pallidipennis* Rosenhauer on various crucifers as well as on White Mignonette *Reseda alba* (Resedaceae) on Corsica. The Solanaceae are known to contain toxic alkaloids and anything that feeds on them must have special detoxification or sequestering mechanisms.

Psylliodes species are sometimes of economic importance to agriculture. In Britain, *chrysocephala* occurs on various cruciferous crops. Adults appear in June and July but rarely in sufficient numbers to injure crops (Jones & Jones, 1984). Larvae can invade plants at any time from October until April the following year, although in most seasons it is the damage done by larvae invading crops in the autumn, which is thought to be the most serious (Lane *et al.*, 1995). The larvae mine the stems and petioles of spring cabbage, kale, winter oilseed rape and swede seed stecklings during autumn and winter. In addition, they have been found boring into the roots of turnips in early April. According to Edwards & Heath (1964), brussels sprouts, curly kale and turnips are also attacked. Newton (1929) also reported adults from radish and mustard. It is probably the most important autumn/winter pest of winter oilseed rape (Cooper & Lane, 1991). The larvae may completely hollow out the stalk and the stem may appear black; if the larva has left there is an exit hole in the stem close to soil level. Plants become flabby, lose their leaves, collapse and die when larval populations are high. The pest has spread more widely and

increased in importance with the increase in the area under winter oilseed rape (Jones & Jones, 1984).

P. affinis, the Potato Flea Beetle, breeds on solanaceous plants such as Bittersweet *Solanum dulcamara* and Black Nightshade *S. nigrum*. Large numbers of adults of the new generation sometimes feed on potato leaves in August. The larvae mine the roots, but serious damage rarely occurs (Martin, 1965; Jones & Jones, 1984). Apparently, the adults may also feed on tomatoes (Edwards & Heath, 1964). Perhaps a more important aspect of the attack is the possible part played by the beetle in the spread of potato mosaic virus (Murphy, 1923). The biology and immature stages were described by Newton (1929).

P. attenuata, the Hop Flea Beetle, was once an important pest of Hop *Humulus lupulus* and Hemp *Cannabis sativa* crops (both Cannabaceae) in the U.K., but since 1970 it has only been recorded from E. Kent and S.E. Yorkshire (Hyman, 1992). Its decline has probably resulted from the grubbing out and mechanised trimming of hedgerows, change in land use and the use of herbicides and insecticides. The adults hibernate under rough vegetation, emerging in late April and during May. They eat holes in the leaves and damage young shoots (Martin, 1965). The larvae probably feed at the roots of Hop and the new generation feeds on the leaves and cones in late summer. Newton (1929) described the biology and immature stages of this flea beetle.

P. hyoscyami, the Henbane Flea Beetle, was recorded as a minor pest of Henbane *Hyoscyamus niger* (Solanaceae) during the 1920s and early 1930s in the U.K. and Europe. Henbane and other medically important crops, such as Deadly Nightshade *Atropa bella-donna*, are sometimes grown commercially and both are occasionally attacked by this flea beetle. The larvae mine the petioles, almost to the leaf tip, and when overcrowded the larvae also mine the leaf blade. The central pith of the main stem is also invaded and in high infestations it is completely hollowed out. In addition, some larvae occur in the tap root (Newton, 1934). The biology and immature stages are described by Newton (1934).

Adult recognition

Psylliodes adults are readily separated from those of other flea beetles by the 10-segmented antennae (Fig. 1) and the insertion of the tarsi preapically on the metatibiae (Figs. 1, 6-8).

The key by Joy (1932) is not reliable, nor does it key out *laticollis*, *luridipennis*, or *cucullata*. Consequently, a reliable key to the separation of the adults of all British *Psylliodes* species, including the seven crucifer-feeding species, is provided below.

The key by Joy (1932) largely employs: colour of the pronotum, elytra and legs; shape of elytra; shape of metatibia; and the presence or absence of the sulci behind the postantennal calli. To separate *chalcomera* from *hyoscyami*, Joy (1932) uses the relative strength of the elytral strial puncturation; to separate *sophiae* from *chrysocephala* the antennae thickened or not towards the apex. The majority of these characters vary to some extent and are therefore unreliable.

Allen (1976) tabulated the characters to separate *laticollis* from *napi*. Antennal colour is variable and unreliable to separate these two species. In addition, apparently the colour of the metatibiae is not a valid character. The body length size range given for *laticollis* should be greater, with the smallest specimens about 2.77 mm, so that there is more of an overlap with *napi*. The dorsal habitus is slightly different in the two species as stated by Allen (1976), with *napi* being more fusiform, more pointed behind and *laticollis* more elongate-oval and less pointed behind; also, the males of *napi* have the first protarsal segment distinctly broader than segment 2, whereas in *laticollis* the first protarsal segment is only slightly wider than segment 2.

Check List of British Species

In the following check list, the species marked with an asterisk are the species associated with Brassicaceae, given fuller treatment in the body of this paper.

Family CHRYSOMELIDAE

Subfamily ALTICINAE

Tribe ALTICINI

PSYLLIODES Berthold, 1827

affinis (Paykull, 1799)
attenuata (Koch, J.D.W., 1803)
chalcomera (Illiger, 1807)
****chrysocephala*** (Linnaeus, 1758)
= *anglica* (Fabricius, 1775)
= *luridipennis* sensu auct. partim not Kutschera, 1864
cucullata (Illiger, 1807)
****cuprea*** (Koch, J.D.W., 1803)
= *instabilis* sensu auct. Brit. not Foudras, 1860
dulcamarae (Koch, J.D.W., 1803)
hyoscyami (Linnaeus, 1758)
****laticollis*** Kutschera, 1860
= *weberi* Lohse, 1955
****luridipennis*** Kutschera, 1864
= *hospes* sensu auct. not Wollaston, 1854
luteola (Müller, O.F., 1776)
****marcida*** (Illiger, 1807)
****napi*** (Fabricius, 1792)
picina (Marsham, 1802)
****sophiae*** Heikertinger, 1914
= *cyanoptera* sensu auct. not Illiger, 1807

Key to the adults

1. Head concealed by pronotum in dorsal view (Fig. 1); elytra without distinct humeral calli (Fig. 1); females with spermatheca short, with bulbous nodulus, not differentiated from cornu, sclerotized part of spermathecal duct short (Fig. 89); dark bronze; body length 2.1-2.4 mm; on Corn Spurrey *Spergula arvensis* (Caryophyllaceae), South Wales. . . . 5. ***cucullata*** (Illiger)

- Head rarely partly covered by pronotum in dorsal view; elytra usually with distinct humeral calli; females with spermatheca with nodulus not bulbous, differentiated from cornu (Figs. 75-88). *2*

2. Pronotum with a mixture of coarse and fine punctures, sometimes isodiametrically microsculptured. *3*

- Pronotum without a mixture of coarse and fine punctures, usually either coarsely or finely punctured, sometimes isodiametrically microsculptured. *5*

3. Pronotum with large, distinct anterior angles with distinct tooth/angle at position of anterior setigerous pore; males with apex of median lobe of aedeagus acuminate with distinct median lip (Fig. 48). [Frontal lines usually indistinct, often obscured by punctures; pronotum evenly curved laterally; majority of femora, tibiae and tarsi dark brown; dorsally usually dark metallic blue; spermatheca with cornu with basal prominence; collum with one twist; body length 3.1-4.0 mm; on Bittersweet *Solanum dulcamara* (Solanaceae)]. . . . . 7. ***dulcamarae*** (Koch)

- Pronotum without distinct anterior angles; moderately evenly curved laterally or narrowed in an almost straight line from base to apex; frontal lines usually distinct (Fig. 2); males with apex of median lobe rounded, sometimes with indistinct median lip (Figs. 52, 56). *4*

4. Profemora usually mostly yellowish; final ventrite pale in apical half. [Head usually dull, with obvious isodiametric microsculpturation; males with median lobe of aedeagus subparallel-sided in apical third (Fig. 52); females with cornu of spermatheca of uneven thickness (Fig. 84); dorsally metallic green or bronze, sometimes coppery or blue-green; body length 2.9-3.5 mm; usually on Henbane *Hyoscyamus niger* (Solanaceae)]. . . . . 8. ***hyoscyami*** (Linnaeus)

- Profemora usually mostly brownish; final ventrite entirely dark, not pale in apical half. [Head usually shiny, without obvious microsculpturation; males with median lobe of aedeagus gradually narrowing from base to apex (Fig. 56); females with cornu of spermatheca of approximately same width (Fig. 85); dorsally usually metallic blue or greenish blue, sometimes bronze; body length 2.6-3.4 mm; usually on thistle *Carduus* (Asteraceae)]. . . . . 3. ***chalcomera*** (Illiger)

5. Frontal lines posterior to postantennal calli distinct, deep, united between eyes to form an X-shape (Fig. 3); metatibiae with outer margin usually bearing a series of 3-6 spinules basal to tarsal insertion (Fig. 6). [Vertex dull, impunctate, isodiametrically microsculptured;

pronotum coarsely punctured, dull, isodiametrically microsculptured; elytra coarsely punctate-striate; interstices shiny, coarsely regularly punctured; males with median lobe of aedeagus gradually narrowing from base to pointed apex (Fig. 60); dorsally metallic green or bronze; elytra usually with apices reddish brown, sometimes entirely green or bronze; body narrow, length 2.0-2.8 mm; usually on cultivated Hop *Humulus lupulus* (Cannabaceae)]. . . . . 2. ***attenuata*** (Koch)

- Frontal lines posterior to postantennal calli usually indistinct, if present, then metatibiae without series of 4-6 lateral spinules (Figs. 7,8). *6*

6. Metatibiae with outer margin distinctly evenly curved; metatarsi inserted laterally beneath obvious process (Fig. 7). *7*

- Metatibiae with outer margin with indistinct curve or sublinear; metatarsi inserted dorsally, not usually beneath obvious process (Fig. 8). *8*

7. Frons sparsely, moderately coarsely punctured; frontal lines usually partly missing; males with apex of median lobe almost straight, sometimes with very indistinct short median lip (Fig. 68); females with collum of spermatheca a long loop (Fig. 88); dorsally usually testaceous to reddish; body length 2.2-3.1 mm; on Bittersweet *Solanum dulcamara* (Solanaceae). . . . . 11. ***luteola*** (Müller)

- Frons usually impunctate, or with a few very fine punctures; frontal lines usually distinct, complete; males with apex of median lobe with distinct median lip (Fig. 64); females with collum of spermatheca very short (Fig. 87); dorsally usually dark chestnut brown, sometimes ferrugineous red or with pronotum red and elytra very dark brown; anterior part of head, base of antennae and prolegs reddish; body length 2.0-2.85 mm; on Purple Loosestrife *Lythrum salicaria* (Lythraceae). . . . . 14. ***picina*** (Marsham)

8. Elytra yellowish with suture narrowly pitchy black; head pitchy brown, without metallic reflection, darker than pronotum; female with collum of spermatheca usually with three twists (Fig. 82); body length 2.2-2.9 mm; on Bittersweet *Solanum dulcamara* (Solanaceae). . . . . 1. ***affinis*** (Paykull)

- Elytra variously coloured metallic blue, green, bronze, reddish, yellowish, brown with indistinct metallic reflection; if yellowish and suture infuscate, head not pitchy brown and darker than pronotum and body length 3.0-4.5 mm; female with collum of spermatheca with a single loop (Figs. 75-81). *9*

9. Elytral epipleura in basal third almost glabrous; body usually blue; head blue or sometimes reddish; male with apex of median lobe of aedeagus evely curved (Figs. 16,17), distinctly deflexed in lateral view (Figs. 17, 21). *10*

- Elytral epipleura in basal third bearing short decumbent pubescence; males with apex of median lobe of aedeagus drawn out into point, not evenly curved (Figs. 24, 28, 32, 36, 40), apex not distinctly deflexed in lateral view (Figs. 25, 29, 33, 37, 41). *11*

10. Pronotum with distinct anterior angles (Fig. 4); males with first protarsal segment distinctly wider than segment 2 (Fig. 10); dorsally usually dark blue, sometimes with greenish tinge, rarely bronze or brassy; body length 2.27-3.32 mm; on various Brassicaceae. ..... 13. ***napi*** (Fabricius)

- Pronotum with anterior angles usually rounded (Fig. 5); males with protarsal segment 1 only slightly wider than segment 2 (Fig. 9); dorsally usually deep blue, sometimes with purple tinge; body length 2.77-3.56 mm; usually on Watercress *Nasturtium officinale* (Brassicaceae)..... 9. ***laticollis*** Kutschera

11. Head with frons and/or vertex at least partly reddish or brownish..... *12*

- Head with frons and vertex entirely metallic green or bronze, sometimes blue..... *14*

12. Hind tibiae usually dorsally infuscated in central area; males with protarsal segment 1 distinctly wider than segment 3 (Fig. 11); body length 2.8-3.67 mm; usually on Flixweed *Descurainia sophia* (Brassicaceae) in East Anglia. [Pronotum usually with distinct anterior angles; elytra with interstrial puncturation coarse, also usually distinctly isodiametrically microsculptured]. ..... 15. ***sophiae*** Heikertinger

- Hind tibiae unicolorous yellowish or pale brown, not infuscated dorsally; males with protarsal segment 1 subequal in width to segment 3, sometimes slightly narrower (Figs. 12-15). *13*

13. Pronotum usually with distinct anterior angles; vertex puncturation usually coarser than elytral interstrial puncturation; pronotum usually yellowish or brownish, concolorous with elytra; apex of metatibiae broad, straight; male protarsal segment 1 slightly narrower than segment 3 (Fig. 12); median lobe of aedeagus gradually narrowing from base to apex, apex acuminate, sharp-pointed with indistinct median lobe (Fig. 36); spermatheca with collum forming a longer loop, cornu less elongate, less strongly upturned (Fig. 80); body length 3.24-3.75 mm; usually on Sea Rocket *Cakile maritima* (Brassicaceae). . 12. ***marcida*** (Illiger)

- Pronotum usually without distinct anterior angles; vertex puncturation finer or about as coarse as elytral interstrial puncturation; pronotum usually metallic blue, concolorous with elytra, sometimes yellow or brownish, as are sometimes elytra; male with protarsal segment 1 subequal in width to segment 3 (Fig. 13); median lobe of aedeagus subparallel-sided, apex acuminate, bluntly rounded (Fig. 40); spermatheca with collum forming shorter loop, cornu more elongate, more strongly upturned (Fig. 81); body length 3.0-4.54 mm; especially on winter brassicas (Brassicaceae). ..... 4. ***chrysocephala*** (Linnaeus)

14. Pronotum with anterior angles distinct; head and pronotum metallic green, bronze or blue, usually concolorous with elytra; males with median lobe in dorsal/ventral view gradually narrower from base to apex (Fig. 24), apex less drawn out in lateral view (Fig. 25); spermatheca with cornu shorter, not C-shaped (Fig. 77); body length 2.3-3.5 mm; on various Brassicaceae. ..... 6. ***cuprea*** (Koch)

- Pronotum usually without distinct anterior angles; head and pronotum usually metallic bronze, or greenish or bluish; elytra varying from brownish-yellow, usually with the suture

infuscated, through to concolorous with head and pronotum; males with median lobe in dorsal/ventral view subparallel-sided in basal two-thirds (Fig. 32), apex more drawn out in lateral view (Fig. 33); spermatheca with cornu, longer, C-shaped (Fig. 79); body length 3.1-3.7 mm; on Lundy Cabbage *Coincya wrightii* (Brassicaceae). . 10. ***luridipennis*** Kutschera

Subfamily larval recognition

Cox (1981) provided a key to the subfamilies of British chrysomelid larvae. The larvae of Alticinae closely resemble those of the Galerucinae, and key out together because of shared characters. However, they are quite distinct from those of all other British chrysomelid subfamilies, except the Orsodacninae with which they have the following characters in common: (i) head with a distinct epicranial suture; (ii) thoracic legs present; (iii) head with 1 pair of ocelli, or ocelli absent. They differ from the Orsodacninae in having the mandibles at most 5-dentate, whereas these are 6-dentate in the Orsodacninae, and the spiracles have a single opening, as compared with two openings in the Orsodacninae. Moreover, in first-instar larvae of *Orsodacne* Latreille, egg bursters are situated on the pronotum, meso- and metathorax, whereas in *Psylliodes* they may be absent, present on the mesothorax only, or on both the meso- and metathorax (Cox, 1988).

Fig. 90, showing head setal arrangement and numbers, is adapted from Cox (1976), whilst Figs. 94 and 95, showing body setae and tubercle nomenclature, is based on Cox (1976) after Kimoto (1962). The nomenclature of the body tubercles was also used by Marshall (1980). It should be noted that in some Alticinae larvae, tubercles Dai and Dpi are absent from the thorax and abdomen.

Klausnitzer (1994) provided a generic key to the larvae of the Galerucinae and Alticinae of Central Europe. In this, *Psylliodes* keys out in two places based on the presence or absence of paired abdominal urogomphi.

Larval generic diagnosis

Head. Elongate-oval, hind margin without a deep median incision, only weakly emarginate; pale brown, dark brown with paler areas on the frons and gena, usually concolorous with pronotal and apical dorsal abdominal plates. Body usually not much darker than whitish or cream-coloured with tubercles usually pale, weakly sclerotized; small intertubercular plates present; abdomen with three transverse rows of tubercles in the dorsal region; abdominal segments without gland openings in the summit of the dorso-lateral tubercle. Epicranial, frontal, median (endocarinal) sutures distinct, epicranial stem moderately long, frontal sutures almost reaching ocellar spots, sometimes visible posterior to antennae. Frons bearing 1 short seta (f_2), 3 long setae (f_1, f_3, f_6), plus one sensillum dorsal to f_3. Vertex bearing 4 long setae (v_2, v_3, v_4, v_6), v_1 and v_5 reduced, indicated by sensilla, another sensillum dorsal to ocellar spots on each side. Upper part of epicranium bearing about 6 sensilla on each side. Gena bearing 4 long setae, plus one short seta on each side. Antennae cream-coloured, short, apparently 2-segmented although second segment not clearly delimited, apparently bearing 2 minute setae plus 3 campaniform sensilla, first segment pillbox-shaped, bearing a well-developed accessory

conical process. Post-clypeus bearing 2 short setae, plus 2 sensilla on each side. Mandibles subtriangular, apically 5-dentate, teeth 2 and 3 largest, 1 and 5 smallest, inner margin towards base bearing a penicillus of 3 stout spines; dorsally bearing 2 medium-long setae, plus a sensillum. Labrum dorsally bearing 2 long slightly curved setae, plus a median sensillum on each side; anterior margin bearing 6 curved setae on each side, outer 2 setae the longest, medially bearing numerous flattened, apically pointed spicules. Labium with submentum bearing 2 long, plus one minute setae on each side; premental sclerite distinct, horseshoe-shaped; mentum bearing 1 long seta at the base of the palpi; antero-medially to palpi bearing 2 minute setae, plus 3 sensilla on each side; ligula with crazy-paving-like microsculpturation; palpi 2-segmented, the basal segment short; maxillae with the cardo large, unisetose; stipes bearing 1 long, plus 1 medium-long setae; palpifer bearing 2 long setae; palpi short, 3-segmented.

Thorax. Prothorax and pronotum concolorous with other tubercles or darker; bearing 8 or 9 long setae (usually 8), plus one slightly shorter and two very short setae, plus about 6 sensilla on each side; tubercles EPp, T, P, unisetose; As, Ps absent; Es-Ss fused, also fused across the mid-ventral line, bisetose on each side. Meso- and metathorax with tubercles Dai and Dpi absent; tubercles Dae and Dpe fused across the mid-dorsal line, Dae unisetose on each side, Dpe bearing 1 long and 1 short setae, and 1 sensillum on each side; DLai small, sometimes missing on the mesothorax, bearing a short seta; DLpi variable, either bearing 1 long seta or 2 long and 1 short setae (also sometimes bearing egg bursters in L1); DLae-DLpe fused, bearing 3 long, 1 short and 2 minute setae; EPa unisetose, bearing a spiracle on the mesothorax; EPp unisetose; T bearing 2 minute setae; P unisetose; Es fused across the mid-ventral line, bearing 2 long and 1 minute setae on each side; Ss unisetose; legs quite well developed, pale grey brown, slightly darker or the same colour as the tubercles, claws with pulvilli.

Abdomen. A1-8, tubercle Dai unisetose, sometimes fused across the mid-dorsal line, Dae unisetose, Dpe fused across mid-dorsal line, unisetose on each side; DLai, DLpi and DLae unisetose; DLpe trisetose bearing 1 long and 2 short setae; T-P trisetose, either bearing 2 long and 1 short setae, or 1 long and 2 short setae; As-Ps bisetose, either 1 seta distinctly longer than the other or the 2 subequal in length; Es fused across the mid-ventral line, unisetose on each side, or sometimes separate; Ss bisetose, 1 seta long, the other short. A9 with the dorsal plate bearing 7 long setae on each side; posterior margin of the plate bearing a pair of sublinear or sickle-shaped and usually upturned protuberances (urogomphi) each provided with an extero-median sensillum; ventral plate bearing 2 long setae. Urogomphi are present in all larval instars of the crucifer-feeding species (Figs. 101-112) but absent in larvae of *affinis*, *attenuata*, *chalcomera*, *dulcamarae* and *hyoscyami*.

Key to final instar larvae of British *Psylliodes* associated with Brassicaceae

1. Tubercle DLpi on meso- and metathorax bearing 2 long setae (Fig. 95); tubercle Dpe on meso- and metathorax bearing 2 setae on each side (Fig. 95). *2*

- Tubercle DLpi on meso- and metathorax bearing 1 long seta, plus 2 very short setae (Fig. 97); tubercle Dpe on meso- and metathorax usually bearing 1 long, rarely 2 long setae plus 2 sensilla on each side (Fig. 97). *3*

2. Tubercle DLai on mesothorax missing, or if present, small, about one-quarter width of tubercle DLpi (Fig. 95); gena, vertex, and upper half or two-thirds of frons dark brown; ocellar spot visible just posterior to antennae; usually on Lundy Cabbage *Coincya wrightii*. . . . . 10. ***luridipennis*** Kutschera

- Tubercle DLai on mesothorax, present, larger, about half width of tubercle DLpi (Fig. 98); gena, vertex, frons uniformly pale brown; ocellar spot not visible just posterior to antennae; usually on Sea Rocket *Cakile maritima*. . . . . 12. ***marcida*** (Illiger)

3. Tubercle Es fused across mid-ventral line on A1-8 (Fig. 95); head width 0.38-0.47 mm. *4*

- Tubercle Es separate, not fused across mid-ventral line on A1-8 (Fig. 99); head width 0.54-0.62 mm. . . . . 4. ***chrysocephala*** (Linnaeus)

4. Tubercle Dai on abdominal segment 2 separate, not fused across mid-dorsal line (Fig. 95). . . *5*

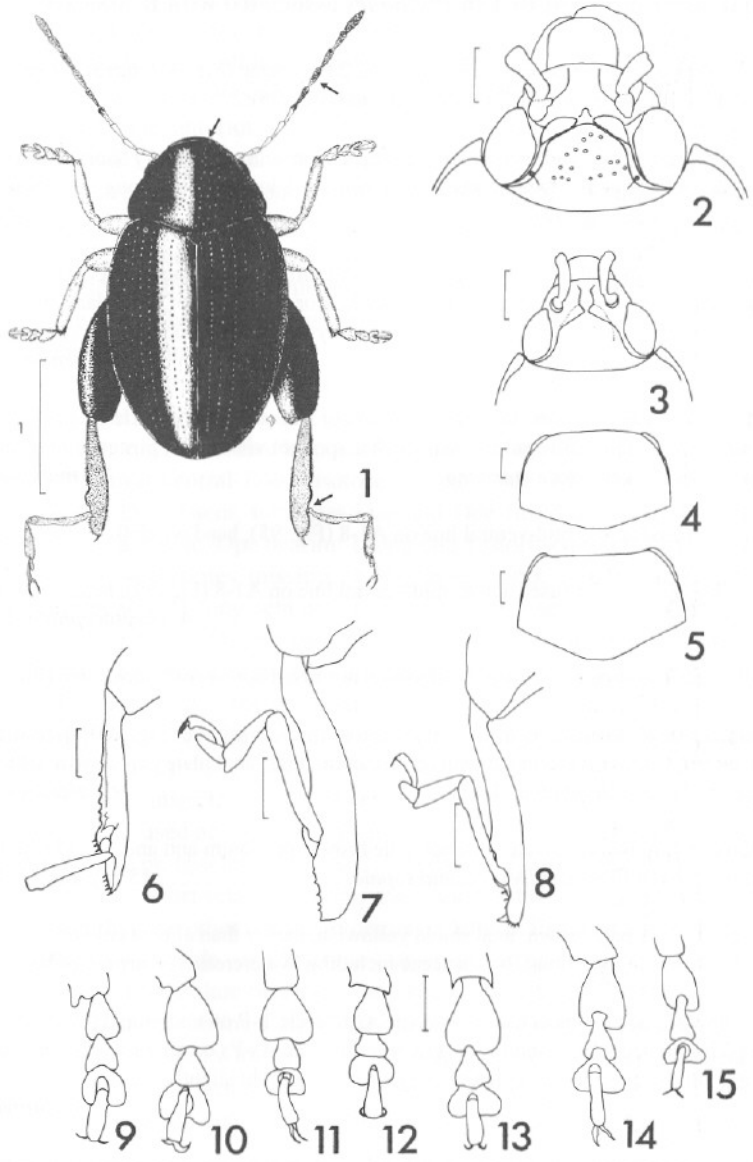
- Tubercle Dai on abdominal segment 1 fused across mid-dorsal line (Fig. 100). [Head dark brown, except yellowish around antennae; pronotum, legs, anal plate pale brown; usually on Watercress *Nasturtium officinale*]. . . . . 9. ***laticollis*** Kutschera

5. Head dark brown, body tubercles distinct, pale brown, pronotum and anal shield slightly darker; in stems of Flixweed *Descurainia sophia*. . . . . 15. ***sophiae*** Heikertinger

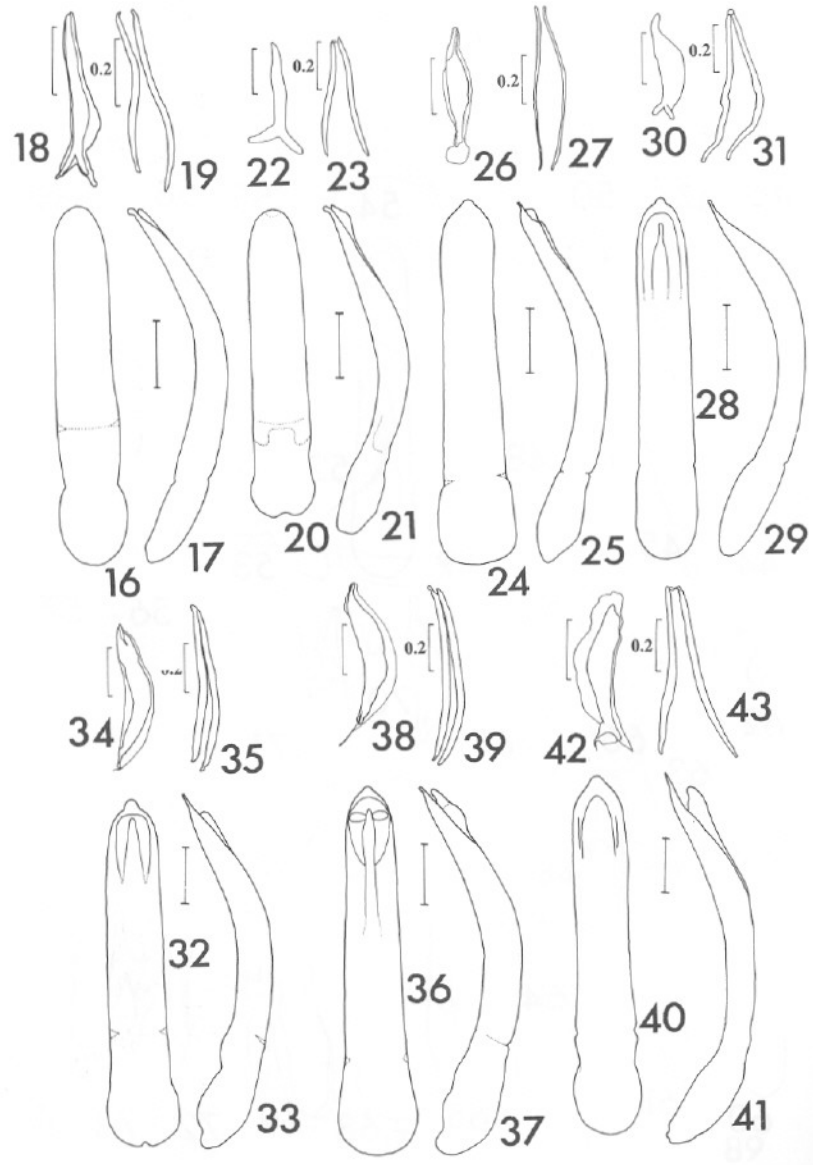
- Head yellowish or pale brown; anal shield yellowish, darker than almost colourless pronotum and body tubercles; in various Brassicaceae including Watercress *Nasturtium officinale*. . . . *6*

6. Head yellowish; ocellar spots usually indistinct; tubercle T-P on abdominal segments 1-8 bearing 2 long setae, plus 1 short seta (Fig. 95); tubercle As-Ps on abdominal segments 1-8 bearing 2 long setae subequal in length (Fig. 95); urogomphi slightly longer. . . . . 6. ***cuprea*** (Koch)

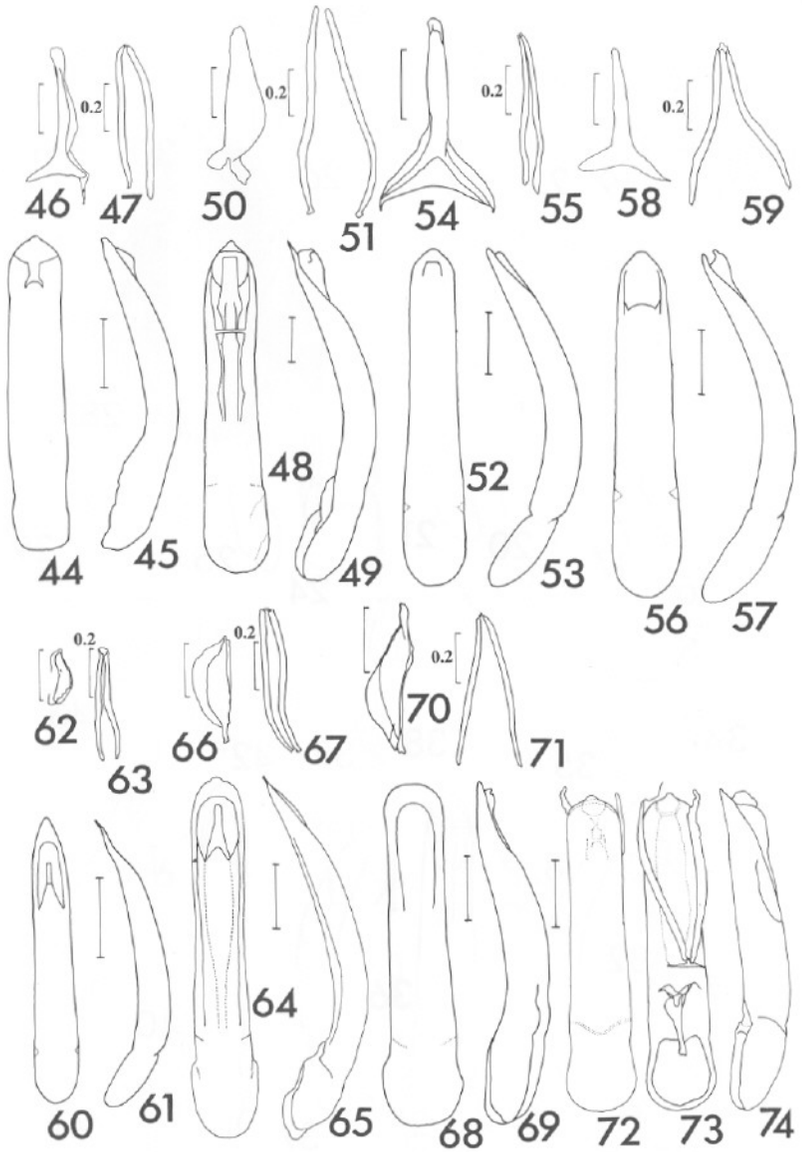
- Head pale brown; ocellar spots distinct; tubercle T-P on abdominal segments 1-8 bearing 1 long, plus 2 shorter setae (Fig. 99); tubercle As-Ps on abdominal segments 1-8 bearing 1 long and 1 shorter seta (Fig. 99); urogomphi slightly shorter. . . . . 13. ***napi*** (Fabricius)



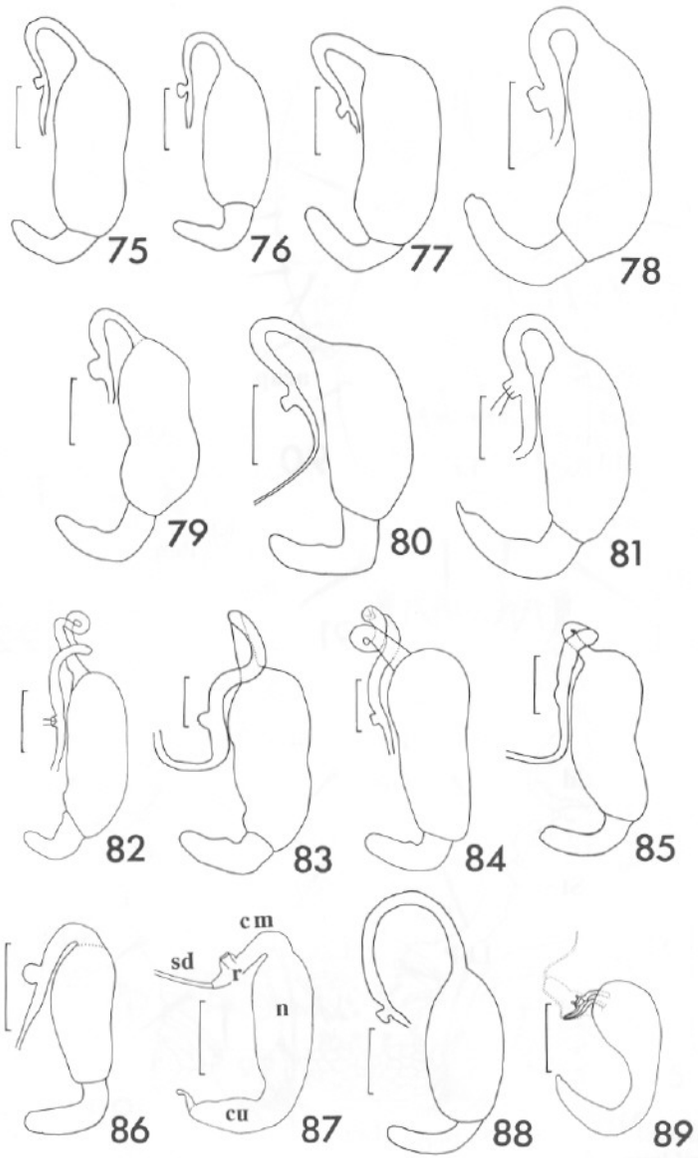
Figs. 1-15: *Psylliodes* head and body parts (scale = 0.2 mm except where stated otherwise). **1** *cucullata* dorsal habitus *G. du Heaume*. **2-3** head frontal view; **2** *hyoscyami*, **3** *attenuata*. **4-5** pronotum dorsal view; **4** *napi*, **5** *laticollis*. **6** *attenuata* left metatibia. **7-8** left metatibiae and tarsi; **7** *luteola*, **8** *affinis*. **9-15** right protarsus males; **9** *laticollis*, **10** *napi*, **11** *sophiae*, **12** *marcida*, **13** *chrysocephala*, **14** *luridipennis*, **15** *cuprea*.



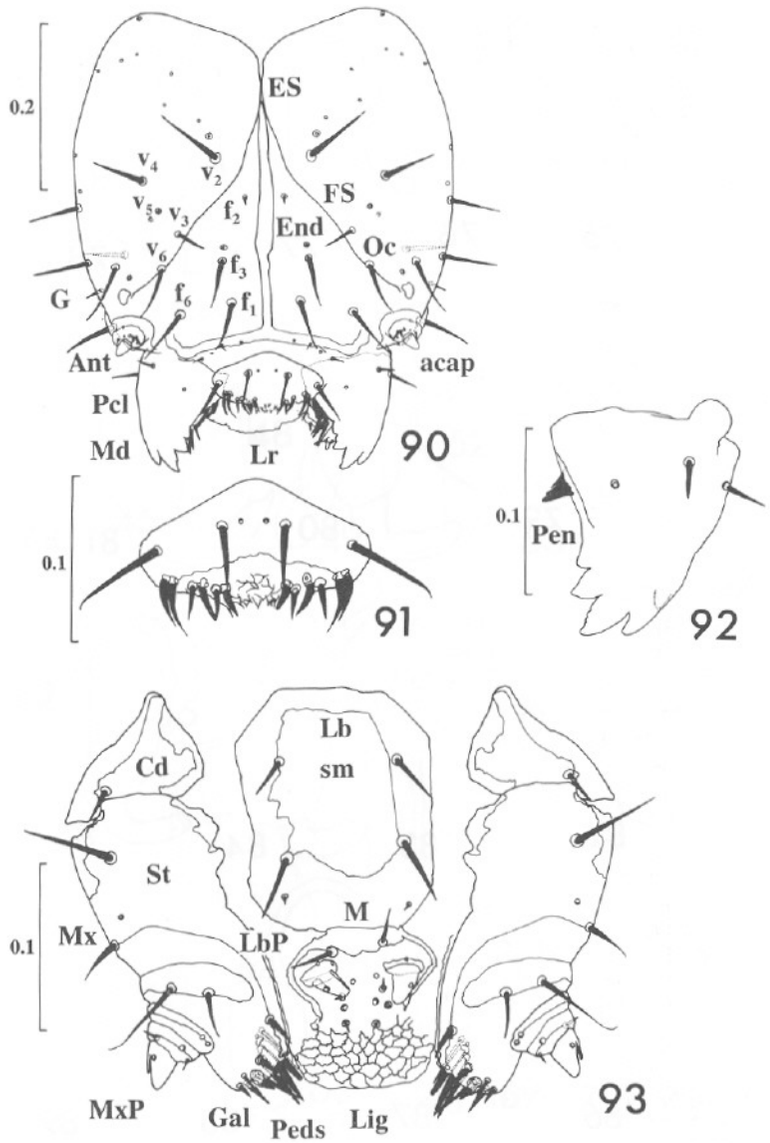
Figs. 16-43: *Psylliodes* spp. (crucifer associated) male genitalia (scale = 0.1mm except where stated otherwise): **16, 20, 24, 28, 32, 36, 40** median lobe dorsal view; **17, 21, 25, 29, 33, 37, 41** median lobe lateral view; **18, 22, 26, 30, 34, 38, 42** tegmen; **19, 23, 27, 31, 35, 39, 43** parameres.
16-19 *laticollis*. **20-23** *napi*. **24-27** *cuprea*. **28-31** *sophiae*. **32-35** *luridipennis*. **36-39** *marcida*. **40-43** *chrysocephala*.



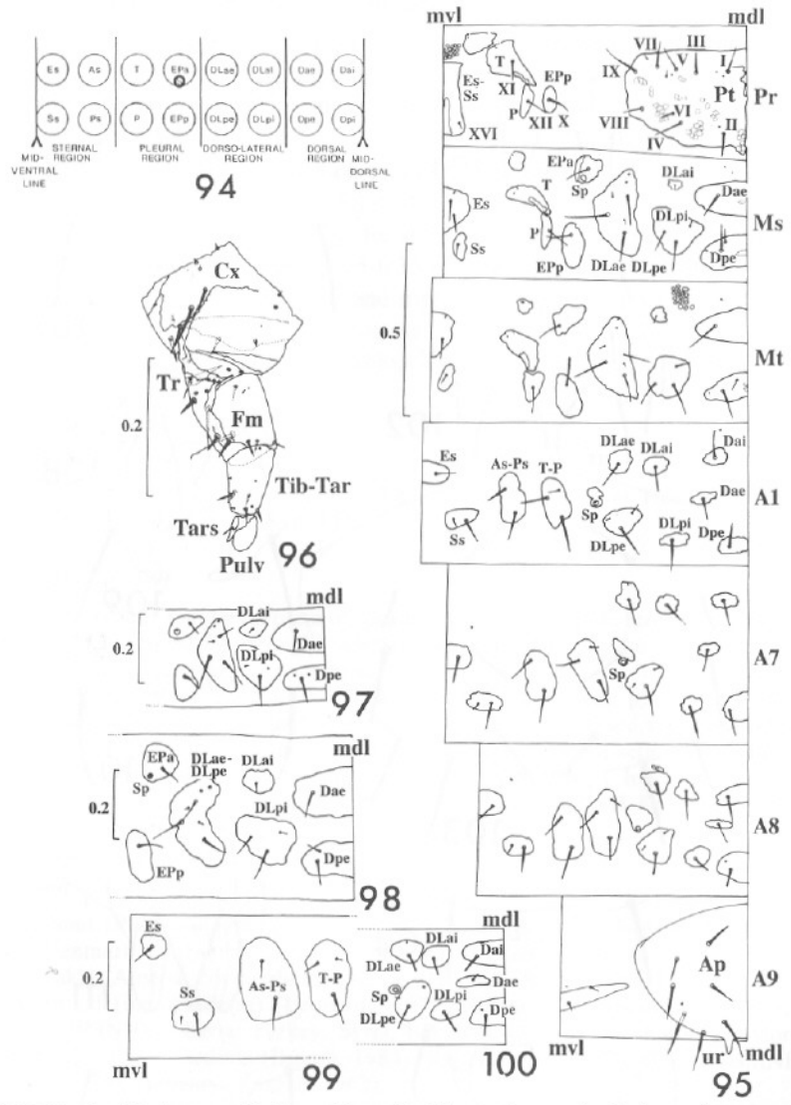
Figs. 44-74: *Psylliodes* spp. male genitalia (scale = 0.1 mm except where stated otherwise): **44, 48, 52, 56, 60, 64, 68, 72** median lobe dorsal view; **45, 49, 53, 57, 61, 65, 69, 74** median lobe lateral view; **73** median lobe ventral view; **46, 50, 54, 58, 62, 66, 70** tegmen; **47, 51, 55, 58, 63, 67, 71** parameres.
44-47 *affinis*. **48-51** *dulcamarae*. **52-55** *hyoscyami*. **56-59** *chalcomera*.
60-63 *attenuata*. **64-67** *picina*. **68-71** *luteola*. **72-74** *cucullata*.



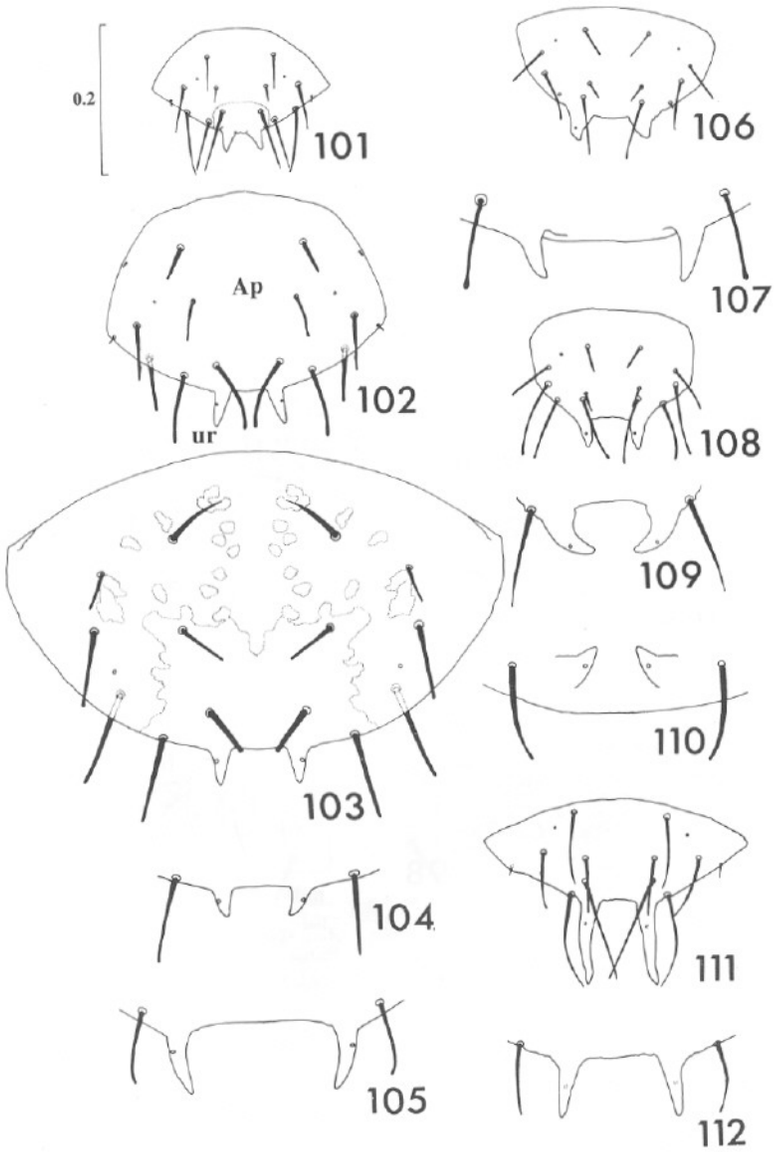
Figs. 75-89: *Psylliodes* spp. spermathecae (scale = 0.1 mm).
75 *laticollis*. **76** *napi*. **77** *cuprea*. **78** *sophiae*. **79** *luridipennis*. **80** *marcida*.
81 *chrysocephala*. **82** *affinis*. **83** *dulcamarae*. **84** *hyoscyami*. **85** *chalcomera*.
86 *attenuata*. **87** *picina*. **88** *luteola*. **89** *cucullata*.
Abbreviations: **cm**, collum; **cu**, cornu; **n**, nodulus; **r**, ramus; **sd**, spermathecal duct.



Figs. 90-93: *Psylliodes luridipennis* head and mouthparts, final instar larva (scale in mm).
90 head, frontal view; **91** labrum; **92** left mandible; **93** labium and maxillae.
Abbreviations: **acap**, accessory sensory appendage; **Ant**, antenna; **Cd**, cardo; **End**, endocarina; **Es**, epicranial suture; **f1-f3**, **f6**, frontal setae 1-3, 6; **G**, gena; **Gal**, galea; **Lb**, labium; **LbP**, labial palpus; **Lig**, ligula; **Lr**, labrum; **M**, mentum; **Mx**, maxilla; **MxP**, maxillary palpus; **Oc**, ocellar spot; **Pcl**, postclypeus; **Peds**, pedunculate seta; **Pen**, penicillus; **Sm**, submentum; **St**, stipes; **v2-v6**, vertex setae 2-6.



Figs. 94-100: *Psylliodes* spp., body and leg, final instar larvae (scale in mm).
94 tubercle nomenclature for typical body segments of generalized chrysomelid.
95-96 *luridipennis*; **95** body, left hand side, from mid-dorsal to mid-ventral line; **96** left metathoracic leg, dorsal view. **97** *napi* dorsal part of mesothorax. **98** *marcida* dorsal part of mesothorax. **99** *chrysocephala* ventral part of abdominal segment 3. **100** *laticollis* dorsal part of abdominal segment 2.
Abbreviations: **A1**, **A2**, **A7-A9**, abdominal segments 1, 2, 7-9; **Cx**, coxa; **Fm**, femur; **mdl**, mid-dorsal line; **Ms**, mesothorax; **Mt**, metathorax; **mvl**, mid-ventral line; **Pt**, pronotum; **Pulv**, pulvillus; **Sp**, spiracle; **Tars**, tarsungulus; **Tib-Tar**, tibio-tarsus; **Tr**, trochanter; **ur**, urogomphus.



Figs. 101-112: *Psylliodes* spp., anal plate and urogomphi, larvae (scale in mm): **101, 106, 108, 111** first instars; **102, 112** second instars; **103-105, 107, 109-110** final instars. **101-103** *luridipennis*. **104** *marcida*. **105** *cuprea*. **106-107** *laticollis*. **108-109** *napi*. **110** *chrysocephala*. **111-112** *sophiae*.
Abbreviations: **Ap**, anal plate; **ur**, urogomphus.

Species notes on the crucifer-feeding species

In the following species notes, under Distribution, varius NCC regions are referred to. These relate to the old Nature Conservancy Council regional structure as it was prior to April 1991 and for a map showing these regions refer to Hyman (1992).

4. *Psylliodes chrysocephala* (Linnaeus)

(Figs. 99, 110)

First instar material was unavailable for study. According to Dobson (1960) the body length is 1.1-2.8 mm, head width is 0.25-0.33 mm and the larva bearing egg bursters on tubercles DLpi (Pl. IV) of the meso- and metathorax. The urogomphi are not clearly illustrated by Dobson (1960: Fig. 7). However, Bonnemaison & Jourdheuil (1954: Fig. 4) clearly showed that they are well developed and approximately half the length of the anal plate.

Larval measurements

Body length (mm): L2, 2.80 (n=1); L3, 2.85-7.45, $\bar{x}$=5.22 (n=11). Head width (mm): L2, 0.40 (n=1); L3, 0.54-0.62, x=0.58 (n=11).

Third instar (Fig. 99)

Head, prosternum and dorsal plate of abdominal segment 9 pale brown, but mottled with dark brown, thus appearing strongly sclerotized; small dark ocellar spot usually absent, sometimes visible just posterior to antennae.

Tubercle DLpi on meso- and metathorax bearing 1 long seta, plus 2 very short setae (Fig. 97); tubercle Dai on abdominal segments 1-8 separate, not fused across mid-dorsal line (Fig. 95); tubercle T-P on abdominal segments 1-8 bearing 1 long seta, plus 2 shorter setae (Fig. 99); tubercles As-Ps on abdominal segments 1-8 bearing 1 long and 1 shorter seta (Fig. 99); tubercle Es separate, not fused across mid-ventral line on A1-8 (Fig. 99). Urogomphi short, about one tenth (0.10-0.11x) length of anal plate (Fig. 110).

Distribution

Throughout Europe, including the Channel Islands (BMNH); Finland, USSR, Sweden, Norway, Denmark (Silfverberg, 1992), Spain, the Balkans, Sicily; Germany, Poland, Czechoslovakia, Austria, Switzerland, France, Belgium, Netherlands, Luxembourg (Lucht, 1987); Portugal (inc. Madeira) (Leonardi, 1975); Russia (Medvedev & Shapiro, 1965); Uzbekistan (BMNH); Siberia; Turkey; Syria; Lebanon; Cyprus; Israel; Jordan, Morocco to Tunisia (Furth, 1983); Sardinia (Biondi, 1984); Italy (Biondi, 1990); Greece (BMNH); Iran (Medvedev, 1975); Hungary (Kaszab, 1962).

Apparently, it has been introduced into Newfoundland, Canada, since specimens were collected there in July 1953 (BMNH). Balachowsky (1963) also refers to its recent occurrence there. According to Campbell *et al.* (1989) this species was first recorded in North America at St. John's and Topsail, Newfoundland, about 1950. According to Downie & Arnett (1996), *P. chrysocephala* is also now in New York State, USA.

Recorded from England, Wales, Scotland and Ireland (Northern Ireland and Eire) (Johnson & Halbert, 1902). In England, it is known from the following NCC Regions (and vice-counties): South East (all VCs); East Anglia (all VCs); South (all VCs except 12); South West (all VCs); East Midlands (all VCs); West Midlands (all VCs), North East (all VCs except 68); North West

(59, 63, 70). In North Wales (50); Dyfed-Powys (42, 44, 45, 46, 47); and South Wales (41). In Scotland from South West (73, 100); South East (83); and North East (96).

Host plants

This species and its colour varieties are recorded from the following cruciferous food plants: *Barbarea minor* (Furth, 1983); Rape/Cole/Swedish Turnip/Swede *Brassica napus*, Wild Cabbage *B. oleracea* (Heikertinger, 1925); Black Mustard *B. nigra*, Turnip/Navew *B. rapa* (Furth, 1983); Shepherd's Purse *Capsella bursa-pastoris* (Nonveiller, 1960); White Wall Rocket *Diplotaxis erucoides* (Furth, 1983); *D. tenuisiliqua* (as *D. auriculata*) (Peyerimhoff, 1926); *Erucaria boveana*, *E. myagroides* (as *hispanica*) (Furth, 1983); *Erucastrum elatum* (Peyerimhoff, 1926); *Erysimum goniocaulon*, *E. verrucosum* (Furth, 1983); Hoary Mustard *Hirschfeldia incana* (Furth, 1983); Wild Radish *Raphanus raphanistrum* (Peyerimhoff, 1926); Garden Radish *R. sativus* (Furth, 1983); Perennial Bastard Cabbage *Rapistrum perenne*, Bastard Cabbage *R. rugosum* (Furth, 1983); Charlock *Sinapis arvensis*, White Mustard *S. alba* (Furth, 1983), *S. pubescens* (Doguet, 1994); Hedge Mustard *Sisymbrium officinale* (Heikertinger, 1925); Field Pennycress *Thlaspi arvense* (Furth, 1983).

Biology

The eggs are ovoid, varying in width from 0.9 to 0.96 mm and in width from 0.40 to 0.43 mm; pale orange with the chorion bearing fine polygonal microsculpturing. They are laid singly or in batches of 2-6 or up to 16 in the soil. Oviposition probably starts about the first week in August and continues during the winter until the end of March when the majority of adults have died.

Hatching probably occurs from the third week in August. However, those laid on 14th February did not hatch until May (incubation 75 days) whilst under laboratory conditions they hatched in 22-24 days (Newton, 1929). After hatching the larvae bore into the tender stems of the hypocotyl at ground level and mine within the stems. Börner and Blunck (1920) observed second instar larvae in February and fully grown larvae appeared by the end of March. In the U.K. final instar larvae occurred in Essex, 28.i.1949, mining the petioles of Swedes; in Lincolnshire, 5.iv.1940, boring in roots of sweet turnip; and in Gloucestershire during April mining the stems of winter oilseed rape (BMNH). In Algeria, Jolivet (1967), recorded the larva mining the stems and leaves of *Brassica gravinae* and *Sinapis pubescens*. The full-grown larvae leave the plants in February and pupate within earthen cells. As to be expected, larvae from spring eggs have a shorter feeding season than those from autumn eggs (Williams & Carden, 1961).

New generation adults emerge from about the end of May until the beginning of July. The adults after emergence feed for 8 to 10 days and then according to Bonnemaison & Jourdheuil (1954) enter a period of aestivation or summer diapause during which they become inactive. They resume activity at the beginning of August and disperse by flight to the seedlings of winter crucifers. Börner & Blunck (1920) concluded that there is one generation annually in north Germany and this is probably the situation in the U.K. The egg laying period of six months leads to the occurrence of different stage larvae at the same time.

6. *Psylliodes cuprea* (Koch)

(Fig. 105)

No first- or second-instar material was available for study. According to Dobson (1960) the first-instar larvae vary in body length from 1.1 to 1.5 mm, and in head width from 0.18 to 0.22 mm. They also lack egg bursters on tubercles DLpi of the meso- and

metathorax. Final-instar larvae, ex *Erysimum* sp. from Holmegaards Mose, Denmark, 29.v.1939, with one adult male reared 1.vii.1939 (BMNH), were used in this study.

Larval measurements

Body length (mm): L3, 3.69-5.93, $\bar{x}$=4.65 (n=17). Head width (mm): L3, 0.38-0.44, $\bar{x}$=0.41 (n=17).

Third instar

Head yellowish, ocellar spots usually absent, sometimes indistinct, pronotal, prosternal and body tubercles very lightly sclerotized, almost colourless, anal plate yellowish with urogomphi slightly darker. Tubercle DLpi on meso- and metathorax bearing 1 long seta (Fig. 97); tubercle Dpe on meso- and metathorax bearing 1 long seta on each side (Fig. 97); tubercle Dai on abdominal segment 2 separate, not fused across mid-dorsal line (Fig. 95); tubercle T-P on abdominal segments 1-8 bearing 2 long setae, plus 1 short seta (Fig. 95); tubercle As-Ps on abdominal segments 1-8 bearing 2 long setae subequal in length (Fig. 95); tubercle Es fused across mid-ventral line on A1-8 (Fig. 95); urogomphi widely separated, usually by more than urogomphus length, about one-fifth (0.20-0.23x) length of anal plate (Fig. 105).

Distribution

Throughout Europe, including Sweden, Denmark (Silfverberg, 1992); Germany, Poland, Czechoslovakia, Austria, Switzerland, France, the Benelux countries (Lucht, 1987); The Netherlands (Beenen & Winkelman, 1993); Italy, Portugal (Leonardi, 1971); Romania (BMNH, 1925); Hungary (Kaszab, 1962); Russia (Medvedev & Shapiro, 1965); Ukraine; Mongolia; Turkey; Iran; Syria; Cyprus; Lebanon; Israel; Jordan; Morocco to Tunisia (Furth, 1983); Sardinia (Biondi, 1984); Mongolia (Leonardi, 1975); Malta (BMNH, 1927); Iraq (as Mesopotamia; BMNH, 1905).

Recorded from England, Wales, Scotland and Ireland (Northern Ireland and Eire) (Johnson & Halbert, 1902). In England, it is known from the following NCC Regions (and vice-counties): South East (all VCs); East Anglia (18, 19, 28); South (10, 22, 23); South West (all VCs except 3); East Midlands (20, 24, 29, 31); West Midlands (33,34,37); North East (61,62,64,65,67); North West (59,63,70,71). In North Wales (49, 50, 52); Dyfed-Powys (42, 43); and South Wales (41). In Scotland, from South East (82, 83, 85); North East (95); and North West (110).

Host plants

This species is recorded from the following food plants: *Alyssum* (Mohr, 1966); *Brassica fruticulosa* (Doguet, 1994); *B. rapa* (BMNH); *B. nigra* (Heikertinger, 1925); *Barbarea minor* (Furth, 1983); *Descurainia sophia* (Doguet, 1994); *Diplotaxis erucoides* (Furth, 1983); Wall Rocket *D. muralis* (Kaszab, 1962); *Erucaria boveana*, *E. myagroides* (as *hispanica*) (Furth, 1983); *Erysimum goniocaulon*, *E. ?repandum*, *E. verrucosum* (Furth, 1983); *Fibigia macrocarpa*, *Hirschfeldia incana* (Furth, 1983); *Isatis lucitanica* (Furth, 1983); *I. canescens*, Woad *I. ?tinctoria* (Heikertinger, 1925); *Ochtodium aegyptiaca* (Furth, 1983); *Raphanus rostratus* (Furth, 1983); *Rapistrum rugosum* (Furth, 1983); *Sinapis alba*, Charlock *S. arvensis* (Furth, 1983); Hedge Mustard *Sisymbrium officinale* (Jolivet, 1953, 1967).

9. *Psylliodes laticollis* Kutschera

(Figs. 106, 107)

Döberl (1995) synonymized *P. weberi* Lohse, 1955, with *P. laticollis* Kutschera, 1860. One first-, one second- and three final-instar larvae were available for study. These occurred within the flower stems of Watercress *Nasturtium officinale* near Stakes Bridge, Cumbria (NY 056066) on 24.vi.1997.

Larval measurements

Body length (mm): L1, 1.68 (n=1); L2, 2.74 (n=1); L3, 2.52-2.91, $\bar{x}$=2.74 (n=3). Head width (mm): L1, 0.21 (n=1); L2, 0.31 (n=1); L3, 0.43-0.47, $\bar{x}$=0.45 (n=3).

First instar

Head, pronotal and anal plates uniformly dark brown. Ocellar spot not visible behind antennae. Egg bursters missing on tubercles DLpi of meso- and metathorax. Tubercles Dai fused across mid-dorsal line on abdominal segments 1-8. Urogomphi moderately short, stout (Fig. 106).

Third instar

Head dark brown, except genal area around antenna, lower part of frons, antennae, labium and maxillary palpi pale yellowish brown; dark ocellar spot visible behind antennae; pronotal and anal plates pale yellowish brown, spotted with dark brown; anal plate with small dark brown spot anterior to urogomphi, plus another similar antero-laterally; anal plate slightly concave between and anterior to urogomphi, concavity extending about half length of plate; urogomphi separated by about 0.19 mm. Tubercle DLpi on meso- and metathorax bearing 1 long seta. Tubercles Dai on abdominal segment 1 fused across mid-dorsal line; tubercles T-P on abdominal segments 1-8 bearing 1 long and 2 short setae; tubercles As-Ps on abdominal segments 1-8 bearing 1 long, plus 1 short seta. Tubercles Es fused across mid-ventral line. Urogomphi widely separated, 0.15-0.17x length of anal plate (Fig. 107).

Distribution

This species has the following distribution: Germany and the Benelux countries (Lucht, 1987); The Netherlands (Beenen & Winkelman, 1993); France (inc. Sardinia), Switzerland, Italy (inc. Sicily), Spain, Morocco, Algeria, Tunisia, Madeira (Portugal), Bulgaria, Greece (Döberl, 1995). Peyerimhoff (1915) recorded it as widespead in North Africa. Gruev (1992) reported it additionally from Croatia (Yugoslavia). In Spain it is known to occur up to 600 m. There is a long series from Malta collected during June 1902 (BMNH).

In the U.K. it is recorded from England, Wales and Scotland. In England it is known from the following NCC Regions (and vice-counties): South East (all VCs); East Anglia (all VCs except 26); South (all VCs); South West (all VCs except 5); East Midlands (20, 24, 29, 53); West Midlands (all VCs except 57, 58); North East (66, 68); North West (63, 70). In North Wales (49, 51); and Dyfed-Powys (45, 46). In Scotland only from South East (82, 83). It was recently recorded in Ireland for the first time from emergent vegetation at the edge of Lough Gash, Newmarket on Fergus, Co. Clare (VC H9; R 3968), but is not included in the revised and annotated list of Irish Coleoptera by Anderson *et al.* (1997).

Host plants

It usually occurs on Watercress *Nasturtium officinale* but also on Garlic Mustard *Alliaria petiolata* (I. Menzies, *pers. comm.*). Koch (1992) listed this species as oligophagous on Watercress and Brooklime *Veronica beccabunga* (Scrophulariaceae).

Biology

Peyerimhoff (1915) recorded the larvae mining the leaf petioles of *N. officinale*, often prolonging the mines into the principal vein.

10. *Psylliodes luridipennis* Kutschera

(Figs. 90-93, 95, 96, 101-103)

The paired urogomphi on the dorsal plate of A9 differ in size and distance apart from instar to instar. In L1 (Fig. 101), they are short, about half the length of those in L2 (Fig. 102) and L3 (Fig. 103), and they are much closer together. They are subequal in length in L2 and L3, but more widely separated in L3 (Fig. 103).

Larval measurements

Body length (mm): L1, 1.00-2.29, $\bar{x}$=1.47 (n=20); L2, 1.80-3.62, $\bar{x}$=2.57 (n=20); L3, 2.46-5.18, $\bar{x}$=3.71 (n=29). Head width (mm): L1, 0.19-0.22, $\bar{x}$=0.21 (n=20); L2, 0.27-0.35, $\bar{x}$=0.32 (n=20); L3, 0.40-0.50, $\bar{x}$=0.45 (n=29).

First instar

Egg bursters missing on tubercle DLpi of meso- and metathorax. Urogomphi short, not strongly upwardly curved, about one quarter length of anal plate (Fig. 101).

Third instar

Head (Fig. 90) elongate-oval, pale brown, concolorous with dorsal plate of A9; epicranial, frontal, median (endocarina) sutures distinct, epicranial stem moderately long, frontal sutures almost reaching ocellar spots. Frons bearing 1 short seta (f_2), 3 long setae (f_1, f_3, f_6), plus sensillum dorsal to f_3. Vertex bearing 4 long setae (v_2, v_3, v_4, v_6), v_1 and v_5 reduced, indicated by sensilla, another sensillum dorsal to ocellar spots on each side. Upper part of epicranium bearing about 6 sensilla on each side. Gena bearing 4 long setae, plus one short seta on each side. Ocellar spot situated posterior to antennae. Antennae cream-coloured, short, apparently 2-segmented, although second segment not clearly delimited, apparently bearing 2 minute setae, plus 3 campaniform sensilla, first segment pillbox-shaped, bearing a well developed accessory conical process. Post-clypeus bearing 2 short setae, plus 2 sensilla on each side. Mandibles (Fig. 92) subtriangular, apically 5-dentate, teeth 2 and 3 largest, 1 and 5 smallest, inner margin towards base bearing a penicillus of 3 stout spines; dorsally bearing 2 medium-long setae, plus a sensillum. Labrum (Fig. 91) dorsally bearing 2 long, slightly curved setae, plus a median sensillum on each side; anterior margin bearing 6 curved setae on each side, the outer 2 setae longest, medially bearing numerous flattened, apically pointed spicules. Labium (Fig. 93) with submentum bearing 2 long, plus one minute seta on each side; premental sclerite distinct, horseshoe-shaped; mentum bearing 1 long seta at the base of the palpi; antero-medially to palpi bearing 2 minute setae, plus 3 sensilla on each side; ligula with crazy-paving-like microsculpturation; palpi 2-segmented, the basal segment short; maxillae

(Fig. 93) with the cardo large, unisetose; stipes bearing 1 long, plus 1 medium-long seta; palpifer bearing 2 long setae; palpi short, 3-segmented.

Thorax (Fig. 95). Prothorax and pronotum, the same colour as other tubercles or darker, bearing 9 long setae, 2 very short setae, plus about 6 sensilla on each side, tubercles EPp, T,P, unisetose; As, Ps absent, Es-Ss fused, also fused across the mid-ventral line, bisetose on each side. Meso- and metathorax, tubercles Dae, Dpe fused across the mid-dorsal line, Dae unisetose on each side, Dpe bearing 1 long and 1 short setae and a sensillum on each side; DLai small, bearing a short seta; DLpi trisetose, with 2 long and 1 short setae; DLae-DLpe fused, bearing 3 long, 1 short and 2 minute setae; EPa, unisetose, bearing a spiracle on the mesothorax; EPp unisetose; T bearing 2 minute setae; P unisetose; Es fused across the mid-ventral line, bearing 2 long and 1 minute setae on each side; Ss unisetose; legs (Fig. 96) quite well developed, pale grey-brown, slightly darker or the same colour as tubercles, claws with pulvilli.

Abdomen (Fig. 95). A1-8, tubercle Dai present, separate, not fused across the mid-dorsal line on A1-7, fused across the mid-dorsal line on A8, unisetose, Dae unisetose, Dpe usually fused across the mid-dorsal line, unisetose on each side, sometimes separate; DLai, DLpi, DLae, unisetose; DLpe trisetose bearing 1 long and 2 short setae; T-P trisetose, with 2 long and 1 shorter setae; As-Ps bisetose, both setae long; Es fused across the mid-ventral line, unisetose on each side; Ss bisetose, 1 seta long, the other short. A9 with the dorsal plate bearing 7 long setae on each side; the posterior margin of the plate bearing a pair of sickle-shaped protuberances (urogomphi) each provided with an extero-median sensillum; urogomphi usually less than one-eighth (0.09-0.15x) the length of the anal plate (Fig. 103); ventral plate bearing 2 long setae.

Distribution

The species is apparently endemic to Lundy, North Devon and can be numerous where found. It was first collected by Wollaston in 1844 and has since been taken by various collectors during the last three decades. It is known from the south-eastern 3.5 km of the coast of Lundy (SS 1443-1346) on vertical granite and slate sea cliffs and sparsely vegetated granite outcrops, cliff grassland and, in the small valley of Millcombe, among brambles *Rubus* and gorse *Ulex*, never more than 300 m from the sea.

P. luridipennis was considered a RDB1 (Endangered) species in Shirt (1987), but later revised to a vulnerable endemic by Hyman (1992).

Host plant

The only foodplant, Lundy Cabbage *Coincya wrightii* Schultz is listed as RDB3 (Rare) in Perring and Farrell (1983). This plant is threatened by invasion by *Rhododendron ponticum* and by grazing by sheep and goats (Compton *et al.*, 1997).

Biology

The adults of *P. luridipennis* occur from April until August, with teneral adults occurring in mid-June. The larvae were reared at the end of August from the leaf petioles and stems of Lundy Cabbage by Dr Roger S. Key, so they are not external or internal root-feeders during the winter as previously suggested (Hyman, 1992).

12. *Psylliodes marcida* (Illiger)

(Figs. 98, 104)

The first-instar larvae lack egg bursters on tubercles DLpi of the meso- and metathorax.

Larval measurements

Body length (mm): L1, 0.78-3.14, $\bar{x}$=1.67 (n=30); L2, 1.85-5.04, $\bar{x}$=2.58 (n=30); L3, 2.46-7.73, $\bar{x}$=5.86 (n=30). Head width (mm): L1, 0.16-0.20, $\bar{x}$=0.18 (n=30); L2, 0.25-0.31, $\bar{x}$=0.28 (n=30); L3, 0.39-0.48 $\bar{x}$=0.41 (n=30).

Third instar (Fig. 98)

Head with gena, vertex and frons uniformly pale brown; ocellar spot not visible posterior to antennae. Tubercle DLai on mesothorax large, about one-half the width of DLpi (Fig. 98); tubercle DLpi on meso- and metathorax bearing 2 long, plus 1 short setae (Fig. 95); tubercle Dpe on meso- and metathorax bearing 1 seta on each side (Fig. 100); tubercle Dai on abdominal segment 2 not fused across the mid-dorsal line (Fig. 95); tubercle T-P on abdominal segments 1-8 bearing 2 long and 1 short setae (Fig. 95); tubercle As-Ps on abdominal segments 1-8 bearing 2 long setae, subequal in length (Fig. 95); urogomphi very short, less than one-tenth (0.07-0.075x) the length of the anal plate (Fig. 104).

Distribution

Throughout Europe, including Finland, USSR, Sweden, Denmark (Silfverberg, 1992); France (BMNH); Russia (Medvedev & Shapiro, 1965); Germany, Poland, the Benelux countries (Lucht, 1987); The Netherlands (Beenen & Winkelman, 1993); north to Baltic, S. Scandinavia, S. Finland, south to Mediterranean (coastal and islands), from Spain to Ionian Islands of Greece, Black Sea coast of Bulgaria, coastal Atlantic from Portugal to Scotland; Italy (Leonardi, 1975; Biondi, 1990); Turkey (Medvedev, 1975); Israel, Lebanon, Morocco to Tunisia (Furth, 1983).

Recorded from England, Wales, Scotland and Ireland (Eire) (Johnson & Halbert, 1902), also from Londonderry, Northern Ireland (Roy Anderson, *pers. comm.*). In England it is known from the following NCC Regions (and vice-counties): South East (13, 14, 15); East Anglia (all VCs except 26); South (11); South West (1, 2, 3, 4, 6, 9); East Midlands (54); North East (61, 62, 66, 67, 68); and North West (all VCs except 63, 71). In North Wales (48, 49, 52); in Dyfed-Powys (44, 46); and South Wales (41). In Scotland from North West (107, 110).

Host plants

This species usually occurs on Sea Rocket *Cakile maritima*, but also on the following food plants: *Cochlearia* (BMNH); Sweet Alison *Lobularia maritima* (as *Alyssum maritimum*) (Jolivet, 1967); Sea Kale *Crambe maritima* (Koch, 1992); Hedge Mustard *Sisymbrium officinale* (R.W.J. Read, *pers. comm.*).

Biology

Larvae in all instars were collected mining the leaves and stems of *Cakile maritima* at South Gare, Redcar, Co. Cleveland in early July 1987.

13. *Psylliodes napi* (Fabricius)

(Figs. 97, 108, 109)

The var. *hignetti* of *P. napi*, described by Donisthorpe (1940) should be considered a synonym of *P. napi*. The two female syntypes in the BMNH have distinct anterior pronotal angles which confirm them as *napi*, rather than *laticollis*.

Apparently, the Lundy adults of *P. napi* differ from their mainland counterparts since they are invariably (out of over 100 examined) short-winged, varying from acutely brachypterous with only a small scale instead of a wing, to a wing about three-quarters the normal length. Apparently, they are also somewhat broader in body shape than mainland *napi* (R.S. Key, *pers. comm.*)

Larval measurements

Body length (mm): L1, 0.78-1.79, $\bar{x}$=1.16 (n=35); L2, 1.57-3.75, $\bar{x}$=2.29 (n=38); L3, 2.69-5.49, $\bar{x}$=4.19 (n=5). Head width (mm): L1, 0.21-0.23, $\bar{x}$=0.22 (n=35); L2, 0.27-0.34, $\bar{x}$=0.30 (n=38); L3, 0.38-0.43, $\bar{x}$=0.40 (n=5).

First instar

Egg bursters are absent on tubercles DLpi of the meso- and metathorax.

Third instar (Fig. 97)

Head pale brown; anal plate yellowish, urogomphi slightly darker, pronotum and body tubercles very pale, weakly sclerotized, indistinct; dark ocellar spot visible posterior to antennae. Tubercles DLpi on meso- and metathorax bearing only 1 long seta (Fig. 97); tubercle Dpe on meso- and metathorax bearing 1 seta on each side (Fig. 97); tubercle Dai on abdominal segment 2 not fused across the mid-dorsal line (Fig. 95); tubercles T-P bearing 1 long, plus 2 shorter setae (Fig. 99); tubercles As-Ps on abdominal segments 1-8 bearing 1 long and 1 shorter setae (Fig. 99); tubercle Es fused across the mid-ventral line (Fig. 95; urogomphi less than one-fifth (0.16-0.20x) the length of the anal plate (Fig. 109).

Distribution

Throughout Europe, including Finland, Sweden, Norway, Denmark (Silfverberg, 1992); Russia (Medvedev & Shapiro, 1965); Germany, Poland, Austria, France, Switzerland, Czechoslovakia, the Benelux countries (Lucht, 1987); The Netherlands (Beenen & Winkelman, 1993); Hungary (Kaszab, 1962); Romania; Italy (Leonardi, 1971; Biondi, 1990); Adriatic Islands, Bosnia-Herzegovina, Croatia, Montenegro, Serbia, Slovenia, Albania, Bulgaria, Greece, Caucasus, Kazakhstan, Morocco, Algeria (Furth, 1983).

Apparently introduced to the USA, since specimens were collected in New York State in April 1970 (BMNH). It is not known if it has become established, since Downie & Arnett (1996) did not mention it as occurring in NE North America.

Recorded from England, Wales, Scotland and Ireland (Northern Ireland and Eire) (Johnson & Halbert, 1902). In England it is known from the following NCC Regions (and vice-counties): South East (all VCs); East Anglia (all VCs); South (all VCs except 7); South West (all VCs; East Midlands (20, 24, 29, 30, 32, 56); West Midlands (all VCs); North East (all VCs); North West (59,69,70,71). In North Wales (48, 49, 50); in Dyfed-Powys (44, 45, 47); and in South Wales (41). In Scotland from South West (72, 73); South East (78, 86, 88); North East (95); and North West (104, 105, 107).

Host plants

This species is recorded from the following food plants: Garlic Mustard *Alliaria petiolata* (Heikertinger, 1925 (as *A. officinalis*); R.W.J. Read *pers. comm.*); Winter Cress *Barbarea vulgaris* (Doguet, 1994); *Brassica*, *Sinapis* (Leonardi, 1975); Large Bittercress *Cardamine*

amara (Doguet, 1994), Wood Bittercress *C. flexuosa* (I. Menzies *pers. comm.*), Narrow-leaved Bittercress *C. impatiens* (Doguet, 1994); *Crambe maritima* (Doguet, 1994); *Erysimum ochroleucum* (Jolivet, 1967); Watercress *Nasturtium officinale* (Peyerimhoff, 1911); *Coincya wrightii* (R.S. Key, *pers. comm.*); *Rorippa* spp. (Doguet, 1994); and *Sinapis pubescens* (Peyerimhoff, 1911).

Biology

Larvae were reared on Watercress *Nasturtium officinale* during April and May 1974 from adults collected at Castlemorton Common, Worcestershire. The larvae also mined the leaf petioles of *Coincya wrightii* during July on Lundy (R.S. Key, *pers. comm.*).

The eggs are oval, mean length 0.72 mm, mean width 0.34 mm (n=18). The chorion is very thin and colourless containing a yellow developing embryo. The eggs were laid in threes and fours on the leaves and roots of Watercress. Oviposition in the U.K. probably occurs from mid-April until the end of May. Incubation required between 12 and 13 days at 19°C.

Hatching probably occurs from about the end of April until mid-June. The larvae mined the leaves and stems of the foodplant and were fully developed in three weeks at 19°C. Larvae are probably fully grown by the end of May and pupation occurs within an earthen cell. The first pupae probably occur about the first week in June.

New generation adults probably emerge in mid-July continuing up to late August. Teneral specimens were collected on 3rd and 5th August. There is one generation annually and the adults overwinter in moss etc. Reappearance of adults the following year commences about 28th March (Cox, 1976). Final instar larvae developed by 13th July from a single female collected from Lundy Cabbage, on the Eastern Sidelands, Lundy on 4.vi.1997 and sleeved on a potted plant two days later. The larvae caused very extensive mining of the petioles and midribs (R.S. Key, *pers. comm.*).

15. *Psylliodes sophiae* Heikertinger

(Figs. 111, 112)

Final-instar larvae were unavailable for study. However, several first- and second-instar exuviae were dissected from inside, especially the pithy, flowering stems of Flixweed *Descurainia sophia* of about 3-4 mm diameter, collected at the end of July 1997 at Bodney Camp, on the edge of Stanford Training Area, West Norfolk (TL 8477).

Larval measurements

No meaningful head and body length measurements could be made from the exuviae.

First instar

Bearing egg bursters on tubercles DLpi of the meso- and metathorax. Head, pronotum, tubercles, anal plate and urogomphi dark brown. Urogomphi long, upwardly curved, 0.72-0.77x the length of the anal shield, moderately closely inserted (Fig. 111).

Second instar

Tubercle DLpi on meso- and metathorax bearing 1 long seta. Tubercle Dai on abdominal segments 1-8 separate, not fused across the mid-dorsal line. Tubercle T-P on abdominal segments 1-8 bearing 1 long, plus 2 shorter setae. Tubercle As-Ps on abdominal segments 1-8

bearing 1 long plus 1 short setae. Tubercle Es fused across the mid-ventral line (Fig. 95). Urogomphi less than one-third (0.26-0.32x) the length of the anal plate (Fig. 112).

Distribution

Recorded from Finland, Sweden, Norway, Denmark, Karelia, Estonia, Lithuania (Silfverberg, 1992); Russia (Medvedev & Shapiro, 1965); Belgium (Derenne, 1963); Germany, Poland, Czechoslovakia, Austria (Lucht, 1987); Switzerland (Döberl, 1995); Hungary (Kaszab, 1962); Italy, Spain, Balkan Peninsula, Caucasus, Afghanistan (Leonardi, 1975); Iran (Warchalowski, 1967); Turkey, Lebanon, Israel, Morocco, N. China (Furth, 1983); Siberia, Kazakhstan, Kirghizia, Ouzbekistan (Doguet, 1994). From an examination of specimens in the BMNH, I was able to confirm *P. sophiae* in the U.K., Germany, Daghestan and Turkey, with all other specimens misidentified; they are in fact *P. chrysocephala*.

In the U.K. it is only recorded from England. It is known from the following NCC Regions (and vice-counties): East Anglia (26, 28); East Midlands (29, 31); and West Midlands (34). This is a characteristic Breckland species, though there is an old record, which is possibly erroneous, from West Gloucestershire. The most recent records of this species are from Bodney Camp on the edge of Stanford Training Area, West Norfolk (1996/97), but also apparently from Lakenheath Warren, West Suffolk (1993/94) and Pashford Poors Fen, a Suffolk Wildlife Trust Reserve (1997). It was last recorded from Barton Mills, West Suffolk, in 1996.

It frequents disturbed ground, particularly on sandy soils and probably also grassland. According to Howard Mendel (*pers. comm.*) its occurrence is sporadic, as is its host, and it occurs on sandy or chalky-sandy soils on disturbed ground and probably also grassland.

Host plants

P. sophiae is known from the following food plants: Flixweed *Descurainia sophia* (as *Sisymbrium sophia*), Eastern Rocket *Sisymbrium orientale* (as *S. columnae*) (Heikertinger, 1925); *Alyssum baumgartnerianum*, *Barbarea minor* and *Erysimum verrucosum* (Furth, 1983); *Isatis tinctoria* (Doguet, 1994). Koch (1992) listed this species as monophagous on Flixweed.

Biology

The stems had small holes which presumably had been made by the final-instar larvae emerging to pupate in the soil earlier in the season. Teneral new generation adults collected during June at Ramsay, Huntingdonshire, suggests that oviposition and larval development occur during April and May. This is supported by data from Howard Mendel (*pers. comm.*) who started to take adults in pitfall traps at Wangford, W. Suffolk (TL 78) during the period 6th-21st June 1998.

Discussion

This study of the adults and crucifer-feeding larvae of British *Psylliodes* species supports the findings of Shute (1975) that *P. luridipennis* is a valid species. The larva of this species is certainly distinct from those of the other crucifer-feeders and most closely resembles that of *marcida* in the key characters of chaetotaxy of the tubercles DLpi and Dpe on the meso- and metathorax. The urogomphi of the final-instar larvae are very similar in these two species. In addition, the adult characters of median lobe and tegmen of the male genitalia and the spermatheca are also similar in *luridipennis* and *marcida*. Moreover, they both feed on littoral host plants, and their distribution is therefore coastal.

The parameres of the male genitalia are similar in form in all species. However, there are differences in the morphology of the tegmen, enabling species groups to be recognised. In *chalcomera* and *hyoscyami*, very similar externally, the apical arms of the tegmen are well developed and form a Y-shape. The apical arms are somewhat shorter, but still Y-shaped in *laticollis*, *napi*, *dulcamarae*, *picina* and *cucullata*, and T-shaped in *affinis*. They are short in *chrysocephala* and *sophiae*, and apparently missing in *attenuata*, *luridipennis* and *marcida*. The apex of the median lobe is evenly curved in the closely related *laticollis* and *napi* and distinctly deflexed downwards in lateral view.

The spermathecal morphology is similar in the seven crucifer-feeding species (Figs. 75-81) with the cornu moderately long and uncoiled. The Solanaceae-feeders *affinis*, *dulcamarae* and *hyoscyami* (Figs. 82, 83, 85) have the collum with one to three coils and it is also usually three-coiled in the Asteraceae-feeding *chalcomera*. In contrast, *luteola*, which is apparently associated with Solanaceae, has the spermatheca with a very long, arched, uncoiled collum. *P. attenuata* on Cannabaceae and *picina*, supposedly on Lythraceae, have similar spermathecae with a short, simple collum. The spermatheca of *cucullata*, which probably feeds on Caryophyllaceae, is distinct, since the nodulus is bulbous and not differentiated from the cornu and the collum is very short.

Egg bursters are present on the meso- and metathorax in *chrysocephala* and *sophiae*, but absent in all of the other crucifer-feeding species. They are also present in *affinis* and *dulcamarae* which feed on *Solanum dulcamara*. However, they are absent in *attenuata*, *chalcomera*, *cuprea*, *hyoscyami*, *marcida*, *napi* (Cox, 1994) and *laticollis*.

Paired urogomphi are present on all instars of those species feeding on Brassicaceae, but missing on the larvae of *affinis*, *attenuata*, *chalcomera*, *dulcamarae* and *hyoscyami*.

The larvae of the crucifer-associated species feed within the stems (sometimes flowering), leaf-petioles or leaf tissue proper. In addition, those of *chalcomera* feed in the meristematic tissues of the apical buds of thistles *Carduus* (Dunn & Rizza, 1976), whilst those of *hyoscyami* feed in the petioles, leaves or central pith of the main stems of Henbane *Hyoscyamus*. The larvae of *attenuata* and *affinis* feed within or externally on the roots of their host plants (Tolg, 1913, 1915) and it is probable that those of *dulcamarae* are also root-feeders in the soil. The presence or absence of urogomphi is apparently not related to the larval feeding position and may be a useful apomorphy. The urogomphi exhibit isometric growth in *Psylliodes* species. In *luridipennis*, *laticollis* and *napi* the urogomphi increase in size from the first to second instar, but then remain about the same size in the final instar. However, in *sophiae* and also apparently in *chrysocephala* (Bonnemaison & Jourdheuil, 1954), they actually decrease in size by about 30% from the first to second instar.

Egg bursters may have been lost in some leaf or stem-mining *Psylliodes* species because the first-instar larvae bite their way through the chorion adjacent to the leaf/stem surface and mine directly into the food substrate rather than hatching onto the leaf surface (Cox, 1994). The eggs of *chrysocephala* are usually laid singly or in groups of 2 to 6 in the soil interstices on the soil surface or at little depth in the immediate vicinity of seedling crucifer stems (Bonnemaison & Jourdheuil, 1954) and the larvae need to hatch and crawl

in the soil to locate the host plants stem. However, according to the account of hatching in *chrysocephala* given by Bonnemaison & Jourdheuil (1954) the egg bursters are not used, but the larva bites a hole in the chorion using the mandibles, so this cannot explain the presence of egg bursters in this species. Moreover, the eggs of *sophiae* are probably laid on the stems of *Descurainia*, which is surprising in that the first-instar larvae have well-developed egg bursters. Perhaps, their presence in *chrysocephala* and *sophiae* reflects the close relationship between these two species by this synapomorphy.

Acknowledgements

I would like to thank Dr Roger Key of English Nature for providing larval specimens of *luridipennis* and *napi*, John Read for larvae of *laticollis*; and Martin Collier and Howard Mendel for flowering stems of Flixweed from which larval exuvia of *sophiae* were procured. Moreover, grateful thanks go to Dr Rory Post, Keeper of Entomology, The Natural History Museum, for allowing the use of facilities in the Entomology Department.

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More records for *Bruchidius varius* (Olivier) (Chrysomelidae)

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This species was added to the British List on the strength of specimens collected at Ditchling Beacon and Plumpton, East Sussex (Hodge, 1997). With a cluster of new records from the Southampton district, it is tempting to suggest that the British stock may have originated in South Hampshire rather than in East Sussex, but with no previous records this is pure speculation. The following new sites can now be recorded for this beetle (all coll. and det. PJH):

East Sussex: Kingston, nr Lewes (TQ 391086), 18.v.1998, females swept off Red Clover *Trifolium pratense*.
East Sussex: Barcombe Mills (TQ 421148), 24.v.1998, 1 female swept off Red Clover.
North Hampshire: Eelmoor Marsh, Farnborough (SU 8453), 23.v.1998, females swept off Red Clover.
South Hampshire: Netley Common (SU 4711), 27.iv.1998, one male beaten off Gorse *Ulex europaeus*.
South Hampshire: West Wood, Netley (SU 4509), 17.v.1998, females swept off Red Clover.
South Hampshire: Claylands N.R., Bishops Waltham (SU 5418), 17.v.1998, females swept off Red Clover.
South Hampshire: The Moors, Bishops Waltham (SU 558169), 19.v.1998, females swept off Red Clover.
South Hampshire: Keyhaven Marshes (SZ 315920), 1.vii.1998, one female swept off Sea Club-rush *Scirpus maritimus*.
Surrey: Colley Hill, Reigate (TQ 248520), 12.vi.1998, one female swept off Red Clover.
West Sussex: Hoyle (SU 907187), 13.viii.1997, one female swept in dry grassland.

Reference

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Ground Beetle (Carabidae) Recording Scheme news

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The ground beetle recording scheme has been running since 1974, in which period a database of 141,695 records has been compiled and validated. A *Provisional atlas of the ground beetles (Coleoptera, Carabidae) of Britain* (Luff, 1998) has just been published.

After a stalwart 24 years as scheme organiser, Martin Luff has handed the responsibility on to me. However, Martin has kindly offered to continue to make his identification expertise available to recorders.

I hope that the publication of the atlas will fuel enthusiasm for carabid recording, and welcome all records of ground beetles from Britain at the address below. Please also use this address for any queries about carabid identification, taxonomy, nomenclature or literature, and for blank record cards. I will also supply copies of BRC reference maps of the vice-counties and 100 km squares on request. Please note that although I would prefer to receive mail at my work address, my activities as scheme organiser will not form part of my work for BRC.

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Recorders wishing to have their identifications checked may contact Martin Luff. Please follow the usual courtesies of seeking permission to send specimens, and of including return postage.

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Since the production of the RA29 carabid recording card in 1974, there have been several changes to the British carabid list. Some further nomenclatural changes are overdue. A revised 'interim' checklist of British carabids is planned, following which a new recording card will be issued. However, in the meantime recorders are asked to note the following:

Agonum ruficorne	should be	*A. albipes*
Bembidion atroviolaceum	should be	*B. stomoides*
Harpalus aeneus	should be	*H. affinis*
Harpalus subpunctatus	should be	*H. rufibarbis*
Anthracus consputus	is more usually retained in genus	*Acupalpus* (subgenus *Anthracus*)

The recording card refers to *Pterostichus nigrita*, *Calathus melanocephalus*, *Microlestes maurus* and *Asaphidion flavipes*, all of which are now recognised to be species complexes (Luff, 1990; Anderson & Luff, 1994; Eversham & Collier, 1997; Speight, Martinez & Luff, 1986). Recorders should use the 'Other species' box on the reverse of the card to record these species. Please specify with, for example, records of *P. nigrita*, whether your determination refers to *P. nigrita* sensu stricto or sensu lato.

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A further record of *Hadrognathus longipalpus* (Mulsant & Rey) (Staphylinidae) from West Cumbria

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Hadrognathus longipalpus (Mulsant & Rey) was first added to the British List by Lott (1989), who discovered three specimens in the Clints Quarry Nature Reserve, near Egremont (NY 01), during the Coleopterists' Field Meeting held in West Cumbria on 27th June 1987.

I found two specimens of this very distinctive staphylinid while on a brief visit to Jobbygill Wood, near Frizington (NY 0107), on 4th January 1998. The beetles were extracted from a small sample of leaf litter and humus collected from around the base of a mature Scots Pine *Pinus sylvestris* growing in a small area of scrub by the edge of the wood. The specimens were initially identified from the description and illustration given in Lott (1989), and by comparing my specimens with a single individual of *H. longipalpus* in the collection of local Coleoptera in the Tullie House Museum, Carlisle, which was donated by Derek Lott in 1995.

Acknowledgement

I wish to thank Mr Stephen Hewitt, Keeper of Natural Science at Carlisle Museum, for kindly allowing me access to the Coleoptera collections.

Reference

LOTT, D.A. 1989. *Hadrognathus longipalpus* (Mulsant & Rey) (Coleoptera: Staphylinidae) new to the British Isles. *Entomologist's Gaz.* **40**: 221-222.

Melanophthalma suturalis Mannerheim (Lathridiidae) on ivy in Surrey

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A few years ago, Colin Johnson (Johnson, 1986) showed that two closely related species — *Melanophthalma curticollis* (Mannerheim) and *M. suturalis* (Mannerheim) — were confused (in Europe) under the name *M. transversalis* (Gyllenhal). Specimens under the name "*transversalis*" in Gyllenhal's collection were found to be examples of *Cortinicara gibbosa* (Herbst).

Fowler (1889) and Joy (1932) both recorded '*M. transversalis*' (i.e. *M. curticollis* and *M. suturalis* jointly) as "very local" but Hyman (1994) considered only *M. curticollis* to be rare enough for inclusion in his national review, where it is graded Red Data Book K - Insufficiently Known.

In Joint Nature Conservation Committee's RECORDER database *M. suturalis* has been given the status 'common' but this does not seem to be a correct assessment since the species appears to be very scarce, or at least infrequently found by British coleopterists. Until recently, neither of us, in spite of a combined total of more than 60 years of collecting British beetles, had ever come across the species and, in keeping with this, Tony (A.A.) Allen has told us that, in his many years of collecting, he has only encountered a single example (Allen, 1989).

In view of the uncertainty of its status, it seems worth recording that, during November and December 1997, we obtained several examples of *M. suturalis* by beating ivy *Hedera* growing on hawthorn *Crataegus* bushes at Field Common, Surrey (TQ 1367; known locally as Molesey Heath). The identity of our specimens has been confirmed by dissection and the records are as follows: PJH, one male on 13.xi.1997; JAO, one male on 22.xi.1997, one female on 28.xi.1997, one male on 12.xii.1997, two females on 29.xii.1997. Additional examples have been taken by colleagues, viz.: N. Heal, one male on 22.xi.1997; A.J.W. Allen, one (sex not determined) on 28.xi.1997.

With the key provided by Joy (1932), *M. curticollis* and *M. suturalis* both run down to '*transversalis*'. In this key, the identification of '*transversalis*' depends largely on comparative observations, as is often the case in Joy's keys. Anyone attempting to use this key and facing uncertainty should refer to the key given by Rücker (1992) which provides unambiguous characters for distinguishing *Melanophthalma* Motschulsky from related genera. Figures of genitalia allowing separation of *M. suturalis* and *M. curticollis* are given by Johnson (1986) and Rücker (1992).

Johnson (1986) drew attention to the fact that *M. curticollis* and *M. suturalis* have different habitat requirements, the former occurring in dry situations, the latter in damp places. It may therefore be relevant to note that there is a small watercourse with emergent vegetation not far from the ivy-covered bushes. It is interesting that Fowler (1889) also noted that '*transversalis*' occurred in two types of habitat: "in haystack refuse, moss &c" on the one hand and "in and amongst rushes on sand-hills near the sea" on the other, not realising that two species were involved. The specimens of *M. suturalis* in the ivy had presumably sought a dry place in which to pass the winter. Overwintering in a bush, well above ground level, may be a regular habit of the species for Donisthorpe (1939) recorded '*M. transversalis*' "by beating old hawthorn trees" at Windsor in November.

Acknowledgements

We would like to thank Tony (A.J.W.) Allen and Norman Heal for allowing us to include their unpublished records.

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A second locality for the Rose Chafer *Cetonia aurata* (Linnaeus) (Scarabaeidae) in North Wales

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Two specimens of *Cetonia aurata* (Linnaeus) were found apparently feeding on the flowers of Creeping Thistle *Cirsium arvense* in a small field above the cliffs south of Aberdaron, Lleyn peninsula (VC 49; SH 1625), on 24th July 1992.

This would appear to be a new record for Caernarvonshire and only the second locality for this species in North Wales (Morgan, 1995).

Reference

MORGAN, M.J. 1995. Rose chafer, *Cetonia aurata* (L.) (Scarabaeidae) in North Wales. *Coleopterist* 3(3): 84.

A further record of *Anthrenus fuscus* Olivier (Dermestidae) in Scotland

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In a recent issue of this journal SB reported finding the first specimen of the dermestid *Anthrenus fuscus* Olivier recorded in Scotland (Blake, 1997). Barry Constantine has since brought to SB's notice a prior, unpublished record.

On 23.v.1993 two dermestid larvae were collected by GH from spider webs under bark on oak *Quercus* trees at Dalkeith, Midlothian (NT 3368). One larva was successfully reared and proved to be *A. fuscus*. It is likely that this species is generally more widespread than the published records suggest.

Reference

BLAKE, S. 1997. *Anthrenus fuscus* Olivier (Dermestidae) in Perthshire. *Coleopterist* **6**: 90.

Letters

Syagrius intrudens Waterhouse (Curculionidae) — a correction

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In a recent note on *Syagrius intrudens*, Hackett (1998) states that this species "is believed to originate from New Zealand" and quotes Morris (1991) as the source of this information. In fact, although, as Hackett points out, *S. intrudens* is known only from the British Isles its most likely country of origin is Australia, not New Zealand. Morris's statement is (he tells me) a *lapsus* and he is anxious to have the record put straight.

So far, nine species of *Syagrius* have been recognized (Kuschel, 1972). Although the tribe Phrynixini, to which *Syagrius* belongs, has its headquarters in New Zealand, all the species of *Syagrius* (except *S. intrudens*) were collected in eastern Australia on the coastal plain between Sydney and Brisbane. Kuschel (1972: 209) states that *S. intrudens* "must have come from Australia." Since the range of *Syagrius* is over 400 miles long and flightless weevils usually have small ranges (Thompson, 1968) the fact that *S. intrudens* has been missed is not really so remarkable.

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Stag Beetle *Lucanus cervus* (Linnaeus) (Lucanidae) flying by day

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At 8.15 a.m. on 24th June 1996 I was walking around a block of flats next to where I live, when a male Stag Beetle *Lucanus cervus* appeared in flight some 7 ft above ground. It was then attacked by a House Sparrow *Passer domesticus* which knocked it down into some short grass. The beetle then clung to the stem of a Rough Hawkbit *Leontodon hispidus* just under the flower-head. The sparrow made a half-hearted attack but then flew away. Some 35 minutes later the beetle had disappeared.

Although Stag Beetles usually only fly at dusk or at night, this was a very warm and sunny morning. Perhaps it was disturbed at this time of day?

Subscribers' Notices

This section is for subscribers to advertise requests for information, specimens wanted for loan, or entomological items wanted or for sale. **Notices of specimens for sale or exchange will not be accepted.** Notices will be repeated with each issue while space is available (or until withdrawn), newer ones appearing first, and may be edited for brevity.

Provisional atlas of ground beetles in the London Area: On behalf of the London Natural History Society, I would welcome all records of Carabidae from the London Area. This area is defined as a circle with radius 20 miles centred on St Paul's Cathedral. Please give precise grid references and habitat description where possible, along with the usual data (date, name of identifier, etc.). I shall be pleased to receive multiple records for the same species over several years as possible indication of spread or decline. Rough indications of population numbers are also helpful. Records on computer disk or by e-mail (fax by arrangement) are accepted. *Paul Mabbott* 49 Endowood Road, Sheffield S7 2LY Tel.: (0114) 201 4504. E-mail: PRMabbott@aol.com.

Data/specimens required: In an effort to understand the biotope preferences of *Quedius schatzmayri* and *Q. semiaeneus*, records are required. Data from mainland Europe, where *Q. semiaeneus* may exceed 1500 m altitude, are also welcome. Please provide date, locality and circumstances of collection, habitat in careful detail, and evidence of tenerality. I am happy to identify and return any doubtful examples given a postage stamp. All data sources will be acknowledged. I am also calling for examples of *Heterothops niger* from the British Isles; especially dissected males. Specimens may need to be retained for a short while. *P.F. Whitehead* Moor Leys, Little Comberton, Pershore, Worcs. WR10 3EH Tel.: (01386) 710533.

Lost beetle collection: The E.C. (Carey) Riggall collection was broken up in the late 1970s and the more interesting specimens sold individually. This is a tragic end to a man's life's work, especially as he specified that the collections should not go the local museum because he felt that they were unable to care for it adequately. If anyone has any specimens of beetles bearing the initials 'ECR', most likely from Lincs. or Notts., I would be grateful for the data. I will almost certainly be able to supply details of the sites involved in Lincs. *Roger Key* 67 Peterborough Road, Crowland, Lincs. PE6 0BB Tel.: (01733) 210541.

For sale: Royal Entomological Society Handbooks covering: Tenebrionidae (Brendell, 1975), Scarabaeoidea (Britton, 1956 and Jessop, 1986), Heteroceridae (Clarke, 1973), Histeroidea (Halstead, 1963), Clambidae (Johnson, 1966), Buprestidae (Levey, 1977), Carabidae (Lindroth, 1974), Rhizophagidae (Peacock, 1977) and Pselaphidae (Pearce, 1957), all in fine condition. £4 each (£5 for Jessop and Lindroth). Also: *Entomologist's Mon. Mag.* Vol. 113 (1977) complete except for index (£5) and Cumulative Index, parts 1 & 2 (1983) (£3). *T.J. James* 56 Back Street, Ashwell, Baldock, Herts. SG7 5PE.

For sale: A number of entomological books, journals and separates including many items on Diptera and Coleoptera. Write for list (SAE appreciated). *Paul Sokoloff* 4 Steep Close, Green Street Green, Orpington, Kent BR6 6DS or send e-mail to p.sokoloff@edexcel.org.uk.

The genus *Psylliodes* Latreille (Chrysomelidae: Alticinae) in the U.K.
By M. L. Cox
We expect that many coleopterists will wish to make extensive use of Dr Cox's new key to the adults and larvae of *Psylliodes*, in this issue. For those who prefer to keep their journals in mint condition, a limited number of extra copies of this issue are available for £3.50 including postage and packing. Please send payment with your order to the Hon. Treasurer: **P.J. Hodge, 8 Harvard Road, Ringmer, Lewes, East Sussex BN8 5HJ**.

Literature Notices

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—— 1997. Some records for scarcer Scolytidae (Coleoptera). *Ir. Nat. J.* **25**: 451-452.

—— 1997. *Magdalis carbonaria* (L.) (Coleoptera: Curculionidae) re-discovered in Co Wicklow. *Ir. Nat. J.* **25**: 453.

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