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Cover: *Bruchus atomarius* (Linnaeus) (Bruchidae) *R. W. J. Read*

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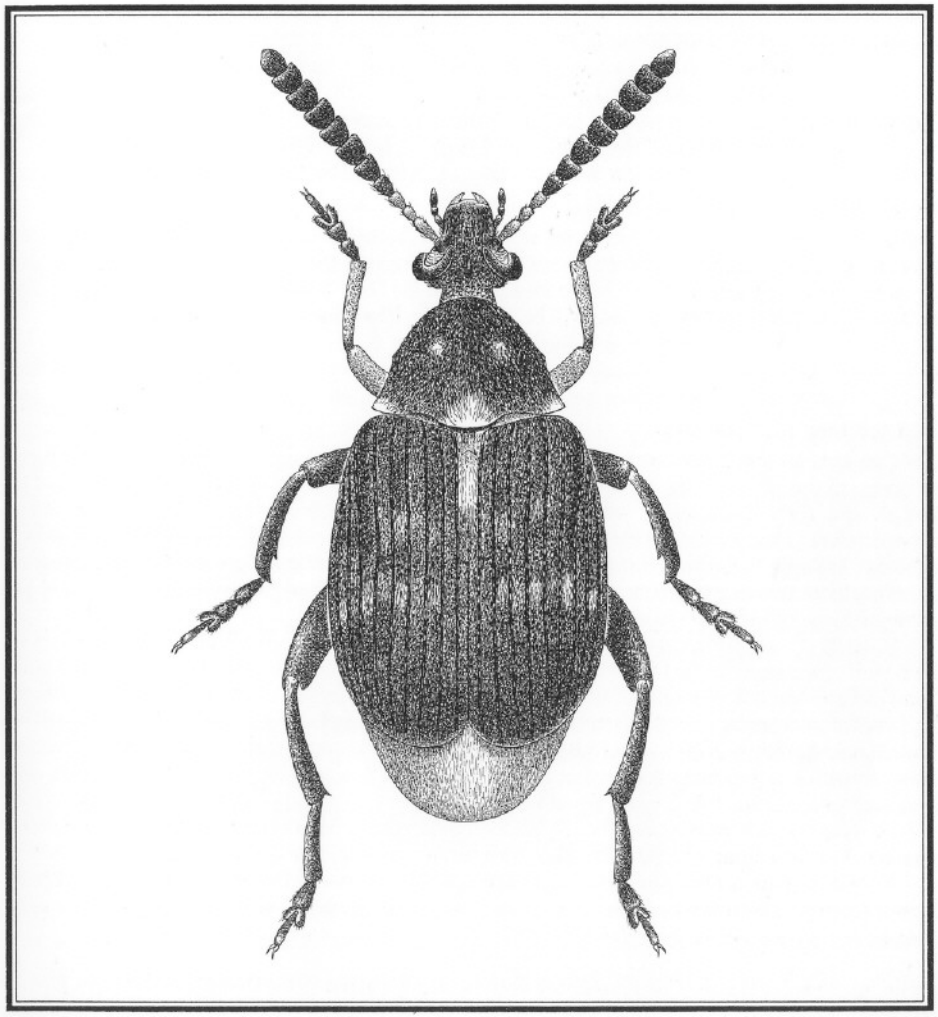

Bruchidae of Britain and Ireland
New and noteworthy Coleoptera from Wales
Notes • Review

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Notes on the natural history, distribution and identification of seed beetles (Bruchidae) of Britain and Ireland

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Introduction

The Bruchidae are a moderate-sized, world-wide family represented by about 1,300 species in 60 genera, commonly called pea or bean weevils. However, they belong to the Chrysomeloidea, not the Curculionoidea, and the name seed beetles is preferable. Recently, some workers, for example Reid (1995), gave them subfamily status in the Chrysomelidae. The majority of species occur in the New World, especially the Neotropics.

Biosystematic history

In the British Isles there are five resident *Bruchus* species, four resident *Bruchidius* species (one of which is probably extinct) and six (4 *Callosobruchus*, 1 *Acanthoscelides*, 1 *Zabrotes*) species which are introduced in stored legumes from the tropics.

Fowler (1890) and Joy (1932) provided keys to most of the British bruchid species, but the names employed are not those in current usage. That of Joy (1932) relies heavily on leg colour, which varies considerably intraspecifically so that his key is unreliable. Pope (1977) recognised 13 species in Britain. Aldridge & Pope (1986) provided a checklist with full synonymy and a key to the British *Bruchidius* species. Dobie *et al.* (1984) provided a key which included the following species on the British list: *Bruchus* spp., *Bruchidius* spp., *Acanthoscelides obtectus* (Say), *Callosobruchus analis* (Fabricius), *C. chinensis* (Linnaeus), *C. maculatus* (Fabricius), *C. rhodesianus* (Pic) and *Zabrotes subfasciatus* (Boheman). Hodge (1997) added *Bruchidius varius* (Olivier) as new to the British Isles and later added further locality records for this species (Hodge, 1998).

Two introduced species of Bruchidae are of rare occurrence and have not been included in the keys. In July 1985 a breeding infestation of *Bruchus ervi* Frölich was found in Turkish lentils in a shop in Hastings, East Sussex (D. Hance; P. Hodge, *pers. comm.*). *B. ervi* has the pronotum distinctly transverse and is most similar to *B. rufipes* Herbst. It is distinguished by the uniform dense covering of golden pubescence on the pronotum and elytra (in addition to several white markings); and the males have a single apical spur on the meso-tibiae. The second species, *Bruchidius incarnatus* (Boheman), not listed as British by Aldridge & Pope (1986), occurred in imported beans at Carlisle in 1914 (F.H. Day collection in Natural History Museum, London (NHM)); Closeburn (D. Sharp collection in NHM); and Scarborough (G.C. Champion collection in NHM). It is readily distinguished from other British *Bruchidius* species by the entirely red antennae (both

sexes) and most of the elytra, excluding the base and suture, are reddish.

Biology and economic importance

Twenty bruchid species, belonging to six genera, attack grain legumes cultivated by man. Pulses have been infested by Bruchidae since the dawn of agriculture and there is evidence of infestation of Lentils *Lens culinaris* from the Egyptian Ptolemaic period and of Broad or Field Beans *Vicia faba* in antiquity (Southgate, 1979).

Bruchus species attack crops and oviposit on the young pod, the larvae feeding in the ripening or freshly ripened pods on the plant. Most of the crops attacked are Fabaceae, and in the field the pods ripen on the plant and dehisce to scatter the seed. However, adults of those species that emerge from seeds after harvest are unable to breed further on these seeds. Other economically important species belong in the genera *Callosobruchus*, *Acanthoscelides* and *Zabrotes*. All breed successfully in harvested seeds and pass through many succeeding generations until the food reserves in the cotyledons are exhausted.

Bruchid eggs are usually a flattened ovoid, but those of *Zabrotes subfasciatus* are more spherical. The eggs are protected by a covering exuded at the time of oviposition which fixes the egg firmly to the substrate. Most species attach a single egg onto the surface of the pod or seed. However, *Acanthoscelides obtectus* simply scatters eggs among harvested seed. The emerging first-instar larva is equipped with an H-shaped plate of sclerotised chitin (the egg burster) on the first abdominal segment. This plate, coupled with the legs and a well-developed anal sphincter, help the larva to gain leverage and enable it to emerge from the egg. Most freshly hatched larvae burrow through the pod wall and enter the first available seed. According to Southgate (1979) newly hatched larvae may also eat through the chorion to immediately penetrate the wall of the pod or seed to find food. Those of *A. obtectus* need to locate suitable seed for development.

The larvae of British bruchids all pupate within the larval feeding cell inside the seed and do not construct cocoons externally. They all pupate within the seed after preparing for adult emergence by eating as close to the surface as possible without actually breaking through and thus constructing a window of thin outer integument in the testa. The pupal period is relatively short and is usually 7-28 days for the storage species of *Callosobruchus* and *Acanthoscelides* (Southgate, 1979).

Adults of the British species overwinter in hibernation sites and lay eggs in the spring when suitable host plants are available.

Adult recognition

The British seed beetles are small, oval, compact; body length 1.7-5.3 mm (with head deflexed), sombre, integument usually brown or black, clothed with uniform or variously coloured recumbent pubescence. Antennae 11-segmented, variable, usually serrate (Fig. 42) or pectinate (Fig. 41), rarely filiform, usually with segments compressed, gradually widening from fifth segment to apex, short, not usually reaching beyond elytral shoulders. Head usually deflexed, covering prosternum and procoxae, neck long, fronto-clypeus

produced into a broad, rather flat muzzle (Figs. 47-49), frons without cruciform grooves, vertex usually with median longitudinal ridge (Figs. 47-49); labium with mentum supported on the pedunculate (stalk-like) submentum, with well-developed bilobed ligula; apical palpal segments fusiform. Eyes large, with a canthus since deeply emarginate anteriorly (Figs. 47-49). Prothorax usually with lateral edges incomplete or absent. Elytra short, broad, with 10 very distinct striae, without scutellar striole; truncate, leaving pygidium exposed (Fig. 20), epipleura indistinct. Prosternum strongly sloping, reduced. Procoxae obliquely transverse, elongate, projecting, globular or conical, contiguous, their cavities narrowly open posteriorly, always closed internally. Posterior legs always more developed than anterior two pairs with the femora frequently dilated or toothed ventrally. Pro- and mesotibiae without apical spurs, metatibiae may have two apical spurs (Fig. 1). Tarsi pseudotetramerous, basal segment elongate, especially in metatarsi where it is as long as or longer than metatibia; claws usually simple or appendiculate, not connate. Abdomen with five visible sternites, none fused or connate, first visible sternite much longer than second (Figs. 30, 59-60).

Distinguishing the sexes

The males in most British genera furnish reliable characters in species recognition and consequently it is important to be able to sex bruchids.

Parnell (1965) showed that males and females of *Bruchidius villosus* (Fabricius) can be separated by the shape of the pygidium (apical abdominal tergite) and apical abdominal sternite. When viewed ventrally, the apical tergite folds around the posterior end of the abdomen, a part thus being visible below in the males. The apical abdominal sternite is indented posteriorly to accommodate the tergite (Fig. 30). When the aedeagus is extruded between these sclerites during copulation, it is directed anteroventrally. In the female, the corresponding tergite of the abdomen is barely visible in ventral view and the apical sternite is not indented posteriorly (Fig. 31). Thus when the ovipositor is extruded between these sclerites for oviposition it is directed postero-ventrally. This sexual difference also occurs in *Bruchidius olivaceus* (Germar), and *Acanthoscelides obtectus*.

Gorham (1873) pointed out sexual differences in *Bruchus atomarius* (Linnaeus), *B. loti* Paykull, *B. pisorum* (Linnaeus), *B. rufimanus* Boheman, *Bruchidius cisti* (Fabricius), *B. villosus* and *Callosobruchus chinensis*.

Male *Bruchus* species have the mesotibiae bearing one or two spurs apically/pre-apically (Figs. 13-15); these are absent in females.

The antennae of male *Callosobruchus* species are sometimes pectinate (Fig. 41) or distinctly serrate (Fig. 42), whereas in the females of the corresponding species they are weakly serrate (Figs. 44 and 45, respectively). The males also have the apical abdominal sternites constricted medially so that the apical segment is greatly reduced (Fig. 59); in females the apical sternite is well developed and distinct (Fig. 60).

In *Zabrotes subfasciatus*, the males have uniform pale brown pubescence over a dark cuticle, whilst the females are strongly marked with white patterning on a dark, almost black, background.

Check List of British Species

Family BRUCHIDAE

Subfamily BRUCHINAE

BRUCHUS Müller, O.F. 1764
= LARIA sensu auct., not Scopoli, 1763
= MYLABRIS Müller, O.F., 1764
atomarius (Linnaeus, 1761)
= *fahraei* Gyllenhal, 1839
= *viciae* sensu Fowler, 1890 not Olivier, 1795
loti Paykull, 1800
pisorum (Linnaeus, 1758)
= *pisi* Linnaeus, 1767
rufimanus Boheman, 1833
= *affinis* sensu auct. Brit. not Frölich, 1799
= *velutinus* Mulsant & Rey, 1858
rufipes Herbst, 1783
= *luteicornis* sensu auct. Brit. not Illiger, 1794

BRUCHIDIUS Schilsky, 1905
= BRUCHUS sensu Fowler, 1890 partim not Linnaeus, 1767
cisti (Fabricius, 1775)
= *unicolor* (Olivier, 1795)
= *canus* (Germar, 1824)
= *debilis* (Gyllenhal, 1833)
= *cisti* "(Paykull, 1800)" sensu Joy, 1932
olivaceus (Germar, 1824)
= *canus* sensu auct. Brit. not Germar, 1824
= *unicolor* sensu Schilsky, 1905 not Olivier, 1795
varius (Olivier, 1795)
= *femoralis* Gyllenhal, 1795
= *galegae* Gyllenhal, 1833
= *inspergatus* Gyllenhal, 1833
= *tarsalis* Gyllenhal, 1833
= *magnicornis* Küster, 1845
= *ruficornis* Motschulsky, 1873
= *fulvicornis* Motschulsky, 1874
= *varius* var. *assimilis* Rey, 1893
= *submaculatus* Rey, 1893
villosus (Fabricius, 1792).
= *cisti* sensu Paykull, 1800 not Fabricius, 1775
= *ater* (Marsham, 1802)
= *fasciatus* sensu auct. not Olivier, 1795

ACANTHOSCELIDES Schilsky, 1905
obtectus (Say, 1831)
= *obsoletus* sensu auct. not Say, 1831

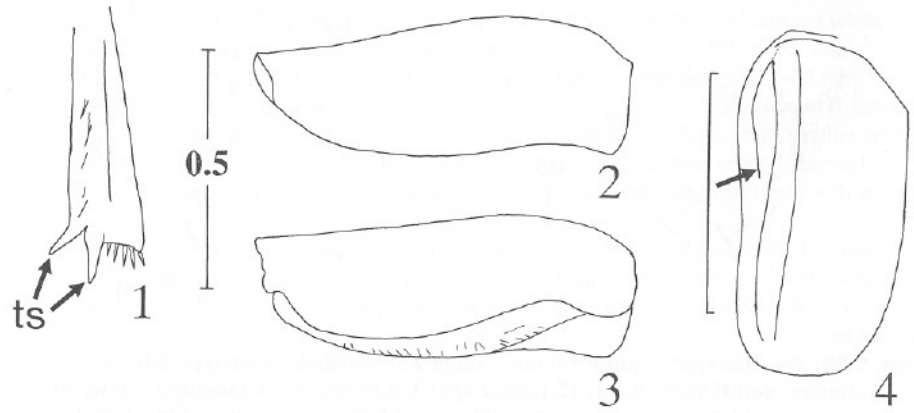
CALLOSOBRUCHUS Pic, 1902
= BRUCHUS sensu Fowler, 1890 partim not Linnaeus, 1767
analis (Fabricius, 1781)
chinensis (Linnaeus, 1758)
= *pectinicornis* (Linnaeus, 1767)
maculatus (Fabricius, 1775)
= *quadrimaculatus* (Fabricius, 1792)
rhodesianus (Pic, 1902)

Subfamily AMBLYCERINAE

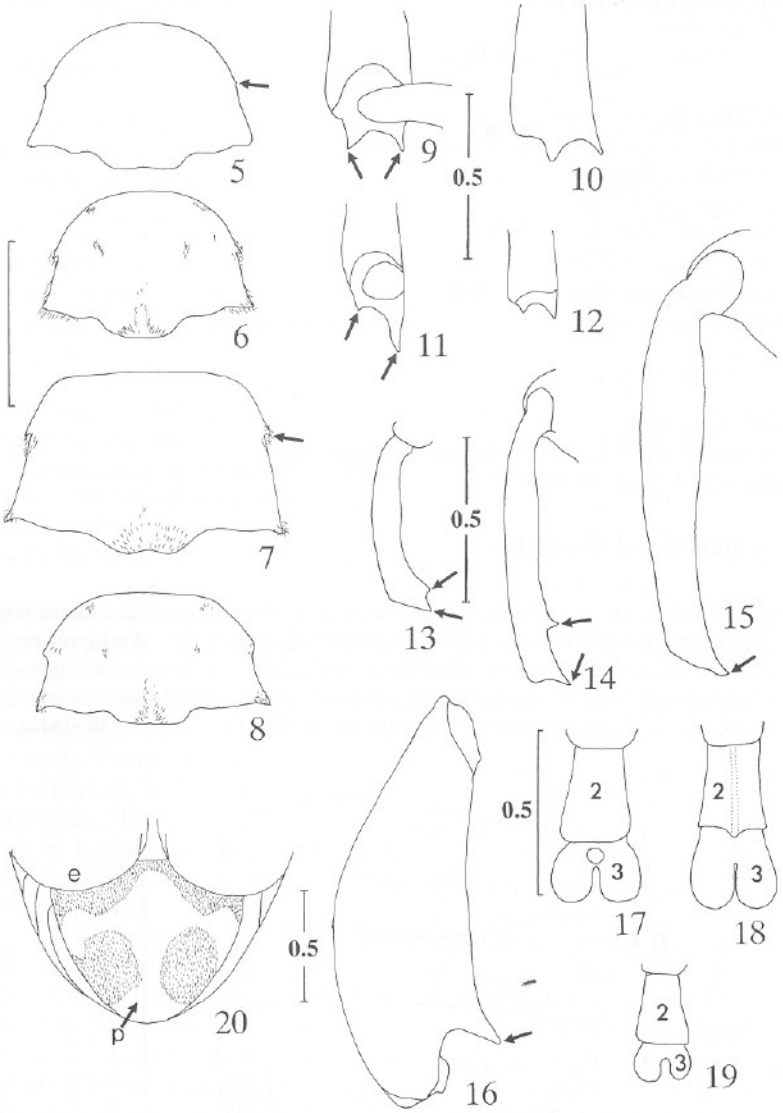
ZABROTES Horn, 1885
= SPERMOPHAGUS sensu auct. partim not Schönherr, 1833
subfasciatus (Boheman, 1833)

Key to subfamilies of Bruchidae

1. Metatibiae with two long, movable, apical spurs (Fig. 1); metacoxae about twice as broad as metafemora; metafemora narrow, without teeth ventrally (Figs. 2-3) . . **Amblycerinae** (p. 145)
- Metatibiae with either a single long, immovable, apical spur, or with two small, immovable, apical spurs (Figs. 9-12); metacoxae less than twice as broad as metafemora; metafemora thickened, with or without tooth/teeth (Figs. 16, 24, 38, 50-54) . . . . . **Bruchinae** (p. 119)



Figs. 1-4: *Zabrotes subfasciatus* male (scale = 1.0 mm except where stated otherwise): **1** right metatibial apex antero-ventral view; **2** left metafemora extero-lateral view; **3** right metafemora latero-ventral view; **4** left elytron, latero-dorsal view.
Abbreviation: ts, tibial spurs.



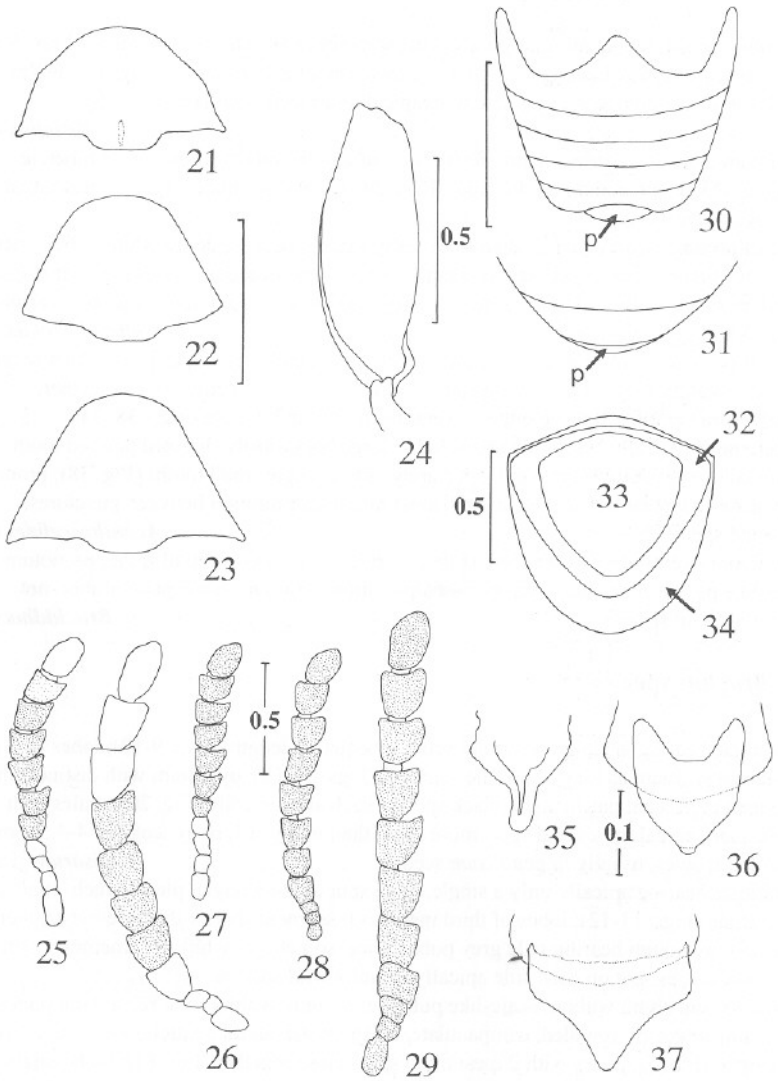
Figs. 5-20: *Bruchus* spp. (scale = 1.0 mm except where stated otherwise): **5-8** female pronotum, dorsal view; **9, 11, 12** female apex left metatibia, dorso-apical view; **10** male apex right metatibia, extero-ventral view; **13-15** male left mesotibia dorsal view; **16** male left metafemora intero-lateral view; **17, 19** female metatarsal segments 2 and 3, dorsal view; **18** female metatarsal segments 2 and 3, ventral view; **20** male pygidium dorsal view. **5, 12** *loti*. **6, 14** *atomarius*. **7, 15, 19** *rufimanus*. **8, 11, 13** *rufipes*. **9, 10, 16-18, 20** *pisorum*.
Abbreviations: **e**, elytra; **p**, pygidium.

Key to genera of Bruchinae

1. Pronotum broad, lateral margins emarginate, sometimes with a lateral denticle (Figs. 5-8); metafemora ventrally bearing a single large tooth on inner carina only (Fig. 16); males usually with mesotibiae bearing apical/preapical tooth/teeth/spur (Figs. 13-15). ..... ***Bruchus*** (p. 119)
- Pronotum conically narrowed anteriorly, without any lateral emergination or tubercle (Figs. 21-23, 39); metafemora different (Figs. 24, 38, 50-54); males without mesotibial tooth/teeth/spur. *2*
2. Base of pronotum with median double callosity usually bearing dense white pubescence (Fig. 39); first metatarsal segment distinctly longer than succeeding ones together (Fig. 40); metafemora ventrally usually bearing a tooth preapically on both inner and outer carinae (Figs. 50-54); imported species. ..... ***Callosobruchus*** (p. 122)
- Base of pronotum not bearing white pubescent double callosity (Figs. 21-23); first metatarsal segment slightly longer than, subequal to, or shorter than succeeding ones together; metafemora ventrally bearing either several teeth or without teeth (Figs. 38, 24) *3*
3. Metafemora ventrally bearing in apical half a large backwardly-directed pointed tooth, followed by two or three smaller teeth (rarely only a single small tooth) (Fig. 38); pronotum with scale-like pubescence obscuring distinct microsculpturation between punctures; imported species. ..... ***Acanthoscelides*** (p. 143)
- Metafemora ventrally without teeth (Fig. 24), rarely with a very small spine; pronotum without scale-like pubescence, indistinct microsculpturation between rugose puncturation not obscured; wild species. ..... ***Bruchidius*** (p. 121)

Key to *Bruchus* species

1. Metatibiae bearing apically two small spurs subequal in length (Figs. 9-10); lobes of third metatarsal segment as long as second segment (Figs. 17-18); pygidium with distinct white T-shaped pubescent patch, and a black spot on each side apically (Fig. 20); males with single sharp apical mesotibial spur, more acute than in Fig. 15; body length 3.4-4.5 mm; imported species, usually in pea *Pisum* seeds. ..... 3. ***pisorum*** (Linnaeus)
- Metatibiae bearing apically only a single, large spur at inner angle, plus a much smaller spine at outer angle (Figs. 11-12); lobes of third metatarsal segment shorter than second segment (Fig. 19); pygidium bearing pale grey pubescence, sometimes whitish, sometimes with an indistinct darker spot on each side apically; usually wild species. *2*
2. Pronotum and elytra without scale-like pubescence, only with normal recumbent pubescence; pronotum anteriorly rounded, campanulate, midpronotal lateral denticles not or only weakly developed (Fig. 5); males with 2 mesotibial spurs close together (Fig. 13); body length 1.7-2.9 mm; usually on *Lathyrus*, *Lotus*, *Vicia* spp. ..... 2. ***loti*** Paykull
- At least pronotum baso-medially and scutellum with scale-like pubescence (Figs. 6-8); elytra usually patterned with patches of scale-like pubescence; pronotum with sides rounded to anterior angles, anterior margin straight, lateral denticles well developed (Figs. 6-8). *3*
3. Pronotum distinctly transverse, width at least 1.5x greater than length (Fig. 8); mesotibiae and mesofemora in distal quarter usually rufous; very occasionally pro- and mesothoracic legs and four basal antennal segments entirely black; antennae sometimes entirely yellow or orange in males; males with two pre-apical spines on inner side of mesotibiae close together



Figs. 21-37: *Bruchidius* spp. (scale = 1.0 mm except where stated otherwise): **21-23** female pronotum dorsal view; **24** male left metafemora intero-lateral view; **26-29** male left antenna; **25** female left antenna; **30** male abdominal sternites; **31** female abdominal sternites 4 and 5; **32-34** male pygidium; **35-37** aedeagus apex of median lobe dorsal view. **21, 24, 27, 32, 35** *villosus*. **22, 28, 33, 36** *cisti*. **23, 29-31, 34, 37** *olivaceus*. **25-26** *varius*.
Abbreviation: **p**, pygidium.

with distance between their tips equal to, or less than length of longest spine (Fig. 13); body length 1.8-3.1 mm; usually on *Lathyrus*, *Vicia* spp. . . . . 5. ***rufipes*** Herbst

- Pronotum less transverse, width at most 1.4x greater than length (Figs. 6-7); mesotibiae and mesofemora entirely black, sometimes mesofemora apically reddish. *4*

4. Pronotal scale-like pubescence sparse, a dense patch around midbase, otherwise restricted to a few small spots on disc, around lateral denticles and hind angles (Fig. 6); males with tibial spur distant from inner apical angle (Fig. 14); body length usually less, 2.5-3.6 mm; usually on *Lathyrus*, *Vicia* spp. . . . . 1. ***atomarius*** (Linnaeus)

- Pronotum moderately densely covered with scale-like pubescence which is especially dense at midbase and hind angles (Fig. 7); males with long mesotibial spur at inner apical angle (Fig. 15); body length usually greater, 3.1-5.3 mm; usually on *Lathyrus*, *Vicia* spp. . . . . 4. ***rufimanus*** Boheman

Key to *Bruchidius* species

1. Pronotum and elytra with a distinct pattern of whitish, golden, pale and dark brown scale-like pubescence; legs reddish, except basal third to two-thirds of femora, apices and inner margin of metatibiae and tarsi brownish or black; males with antennae long, two-thirds of body length, segments 4-10 strongly serrate, segments 9-11 reddish orange (Fig. 25); females with antennae shorter, less than half body length, segments 5-10 subserrate, segment 11 reddish, sometimes also segment 10 (Fig. 26); usually on *Trifolium* spp. . . . . 8. ***varius*** (Olivier)

- Pronotum and elytra with uniform pubescence, without a whitish and brownish pattern; legs almost entirely blackish; males with antennae shorter, reaching at most to mid-point of elytra, segments 4/5-10 subserrate, segments 5-10 blackish (Figs. 27-29); females with antennal segments 10 and 11 blackish; usually on legumes other than *Trifolium* spp. *2*

2. Pronotum more transverse with length to width ratio almost 1:2 (Fig. 21); pygidium broad (Fig. 32); antennae short, reaching to just beyond pronotal base, four basal segments usually reddish at least ventrally, sometimes dark brown or black dorsally (Fig. 27); aedeagus with apex of median lobe spatulate (Fig. 35); usually on *Cytisus scoparius*. . . 9. ***villosus*** (Fabricius)

- Pronotum less transverse with length to width greater than 2:3, conical (Figs. 22-23); pygidium elongate (Figs. 32, 34); antennae long, reaching to about mid-point of elytra, unicolorous black (Figs. 28, 29); usually on *Helianthemum* spp. or *Onobrychis sativa*. *3*

3. Pronotal puncturation fine, the puncture diameter, depth and separation more or less uniform; dorsal pubescence short, fine, silvery white and sparse; ventral body pubescence usually concolorous with dorsal pubescence, sometimes darker with some golden setae; pygidium apically pointed (Fig. 33); aedeagus with the apex of the median lobe narrower, gradually narrowing to a rounded lobe (Fig. 36); usually on *Helianthemum* spp. . . . . 6. ***cisti*** (Fabricius)

- Pronotal puncturation coarse, not uniform, irregularly spaced, consisting of large, deeper punctures with smaller shallower punctures between; dorsal pubescence long, thick, golden and obscuring the integument; ventral body pubescence whitish silvery; pygidium rounded apically (Fig. 34); aedeagus with apex of median lobe broader, laterally concave before the apex (Fig. 37); usually on *Onobrychis sativa*. . . . . 7. ***olivaceus*** Germar

Key to *Callosobruchus* species

1. Metafemora with inner tooth small, acute (sometimes absent), much smaller than the tooth on the outer carina (Figs. 53-54); outer tooth extending much further from femora than inner tooth (Fig. 55); carina posterior to inner tooth usually bearing several very small denticles; aedeagus with apex of median lobe narrowly pointed, bearing a few setae (Fig. 65) [males with antennae subserrate (Fig. 43); females with antennae serrate (Fig. 44)] ..... 11. ***analis*** (Fabricius)
- Metafemora with inner tooth larger, almost extending as far from femora as outer tooth (Figs. 56-58); males with apex of median lobe different in shape and chaetotaxy (Figs. 62-64) *2*
2. Abdominal sternites 2-4 bearing laterally broad band of dense white pubescence, different in colour and density to general setal abdominal covering (Figs. 59-60); eyes not very deeply to moderately deeply emarginate, posterior edge of canthus separated from posterior edge of eye by 5 or more ommatidia (Figs. 47-48); two metafemoral spines not extending same distance from femora (Figs. 57-58). *3*
- Abdominal sternites 2-4 not bearing laterally broad band of dense white pubescence; eyes more deeply emarginate with about 3 or 4 ommatidia separating posterior edge of canthus from posterior margin of eye (Fig. 49); metafemora with two spines extending about the same distance from the femora (Fig. 56); [males with antennae at most subserrate (Fig. 43); apex of median lobe of aedeagus spatulate, bearing numerous setae basally (Fig. 64); females with antennae serrate, segment 11 elongate, with length more than 2x width (Fig. 46)]. .... 13. ***maculatus*** (Fabricius)
3. Metafemora with outer tooth extending slightly further from femora than inner tooth (Fig. 57); eyes not very deeply emarginate, posterior edge of canthus separated from posterior edge of eye by 6-8 ommatidia (Fig. 47); [males with antennae pectinate (Fig. 41); apex of median lobe of aedeagus spear-shaped (Fig. 62); females with antennae serrate, segment 11 oval, length distinctly less than 2x width]. ..... 12. ***chinensis*** (Linnaeus)
- Metafemora with inner tooth extending slightly further from femora than outer tooth (Fig. 58); eyes moderately deeply emarginate, posterior edge of canthus separated from posterior edge of eye by 5-7 ommatidia (Fig. 48); [males with strongly serrate antennae (Fig.42); apex of median lobe of aedeagus forming an elongate isosceles triangle (Fig. 63); females with subserrate antennae, segment 11 elongate oval (Fig. 45)]. ..... 14. ***rhodesianus*** Pic

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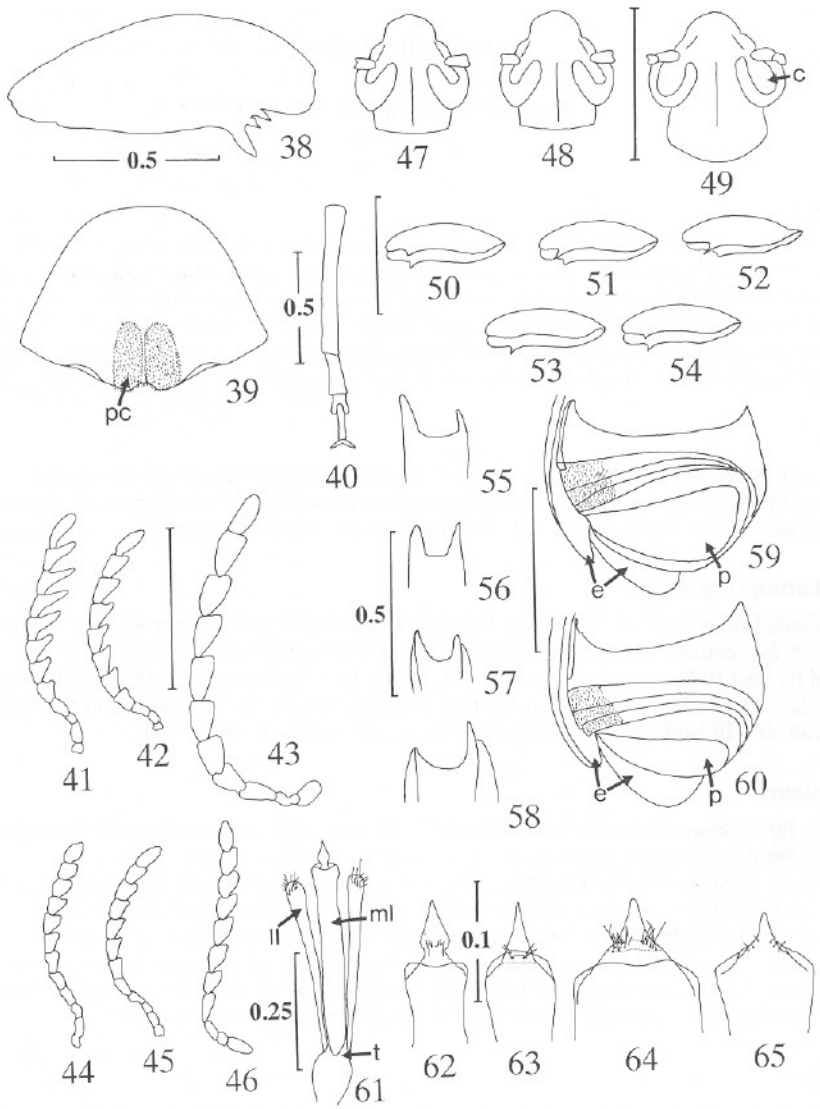
Figs. 38-65: Bruchinae (scale = 1.0 mm except where stated otherwise):
38 *Acanthoscelides obtectus* female right metafemora, intero-lateral view;
39-65 *Callosobruchus* spp. **39** male pronotum dorsal view; **40** male left metatarsus dorsal view; **41-43** male left antenna; **44-46** female left antenna; **47-49** male head dorsal view; **50-54** male metafemora; **55-58** left metafemoral spines, antero-ventral view; **59** male abdominal sternites, latero-apical view; **60** female abdominal sternites, latero-apical view; **61** aedeagus; **62-65** aedeagus apex of median lobe dorsal view. **39-41, 44, 47, 50, 57, 59-62** *chinensis*. **42, 45, 48, 51, 58, 63** *rhodesianus*. **43, 46, 49, 52, 56, 64** *maculatus*. **53-55, 65** *analis*.
Abbreviations: **c**, canthus; **e**, elytra; **ll**, lateral lobe; **ml**, median lobe; **p**, pygidium; **pc**, pubescent callosity; **t**, tegmen.



Species accounts

In the following species notes, under Distribution, various 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).

Subfamily Bruchinae

1. *Bruchus atomarius* (Linnaeus)

(Figs. 6,14,66)

Habitats

B. atomarius is a widespread but local species, known from a variety of habitats as follows. Woodland: ancient pasture-woodland; native beech woodland with areas of scrubby grassland; mixed deciduous woodland and glades; forests and parkland. Heathland: wet heath, mire with tall herb communities/scrub, alongside acidic grassland and base-rich streams. Grassland/Meadows: limestone pasture and scrub; herb-rich road verges; by rivers; acidic grassland; downs. Wetland: marshes; broads. Coastal: sea cliff grasslands with flush. Disused/Reclaimed: disused railway lines.

Status

Hyman (1992: 88) gave this species Notable B status. The major threats are loss of unimproved grassland through improvement by reseeding or by the application of fertilisers, or by conversion to arable agriculture. Development and natural succession are further threats.

Distribution (Fig. 66)

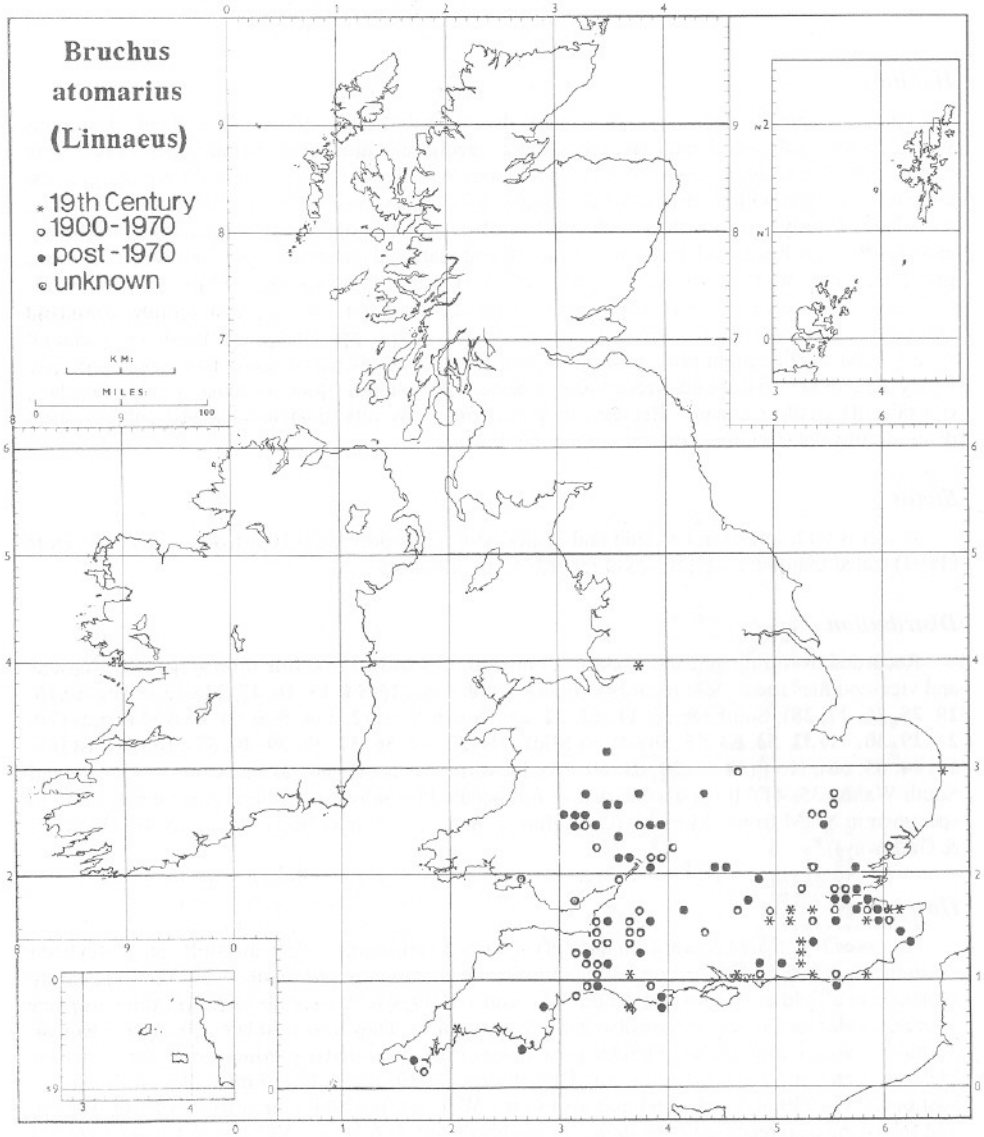
Recorded from England, Wales and Eire (Co Kerry and Waterford), but apparently there are no records for Scotland. In England, it is known from the following NCC Regions and vice-counties (in bold for post 1970 records): South East (**13**, **14**, **15**, **16**, **17**); East Anglia (**18**, 19, 25); South (**7**, 11, 12, **22**, **23**); South West (**1**, 2, **3**, **6**, **9**); East Midlands (**20**, **24**, **29**, 55); West Midlands (**33**, **34**, **36**, **37**, **38**, **40**). In North Wales (**49**); Dyfed-Powys (**43**); and South Wales (41).

Host plants

Very little is known concerning the host plants of *B. atomarius*. Adults are recorded from vetches *Vicia* in Stanford-le-Hope, South Essex, v.1951 (P.M. Hammond, *pers. comm.*) and Llandaff, Glamorgan. According to Hyman (1992: 88), this species is known from Common Vetch *Vicia sativa*, Tufted Vetch *V. cracca* and Bush Vetch *V. sepium*. Philp (1991) and Bullock (1992) added *Lathyrus* spp. Luk'yanovich & Ter-Minasyan (1957: 178) listed the following leguminous hosts: *Vicia sativa*, *V. sepium*, *V. angustifolia*, *V. faba*, *V. cracca*, *V. dumetorum*, *Lathyrus pratensis*, *L. tuberosus*, *L. montanus* and *L. vernus*. It has been noted as a pest of Peas *Pisum sativum* and Lentils *Lens culinaris* (=*esculenta*), but these observations require confirmation.

Biology

The adults occur from April to November, with most records being for June, followed by May, with few in July and very few from August to November. They also occurred on Wild Parsnip *Pastinaca sativa* flowers (A. Halstead, *pers. comm.*). In addition, adults occurred on Gorse *Ulex europaeus* at Barcombe, East Sussex in May, 1928. The larvae develop in pods of *Vicia* spp.



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(Hyman, 1992). The adults are collected by sweeping or beating leguminous vegetation.

2. *Bruchus loti* Paykull

(Figs. 5,12,67)

Habitats

This widespread species occurs in very diverse habitats as follows. Woodland: deciduous woodland on chalk; woodland (oak, birch, alder, hazel); relic old woodland hazel/ash coppice with mature oak standards; mixed woodland; deciduous woodland; fly ash with willows and grasses; coppice woodland with floristically rich verges; deciduous woodland with scrub at sides of rivers; woodland, mainly with conifers with patches of deciduous coppice with standards. Heathland: moorland; sandy heathland; heath with bracken and marginal oak-birch woodland; wooded heath; grazed heath; wet heath with mire with tall herbs and scrub; urban grassy heath. Grasslands/meadows: wet meadows; ungrazed herb-rich wet grassland; roadside verges/embankments; railway cuttings/ embankments; acidic grassland; river meadows. Wetland: mire/fen; basin sphagnum mire grading to poor fen and sallow carr at periphery; grazing marsh; valley fen; dykes, fish ponds; reservoirs. Coastal: saltmarshes; dune systems; shingle beaches; coastal cliff chalk grassland. Reclaimed: gravel pits; clay pits; quarries; disused colliery sites; disused railways; reclaimed pit tip; derelict land.

Status

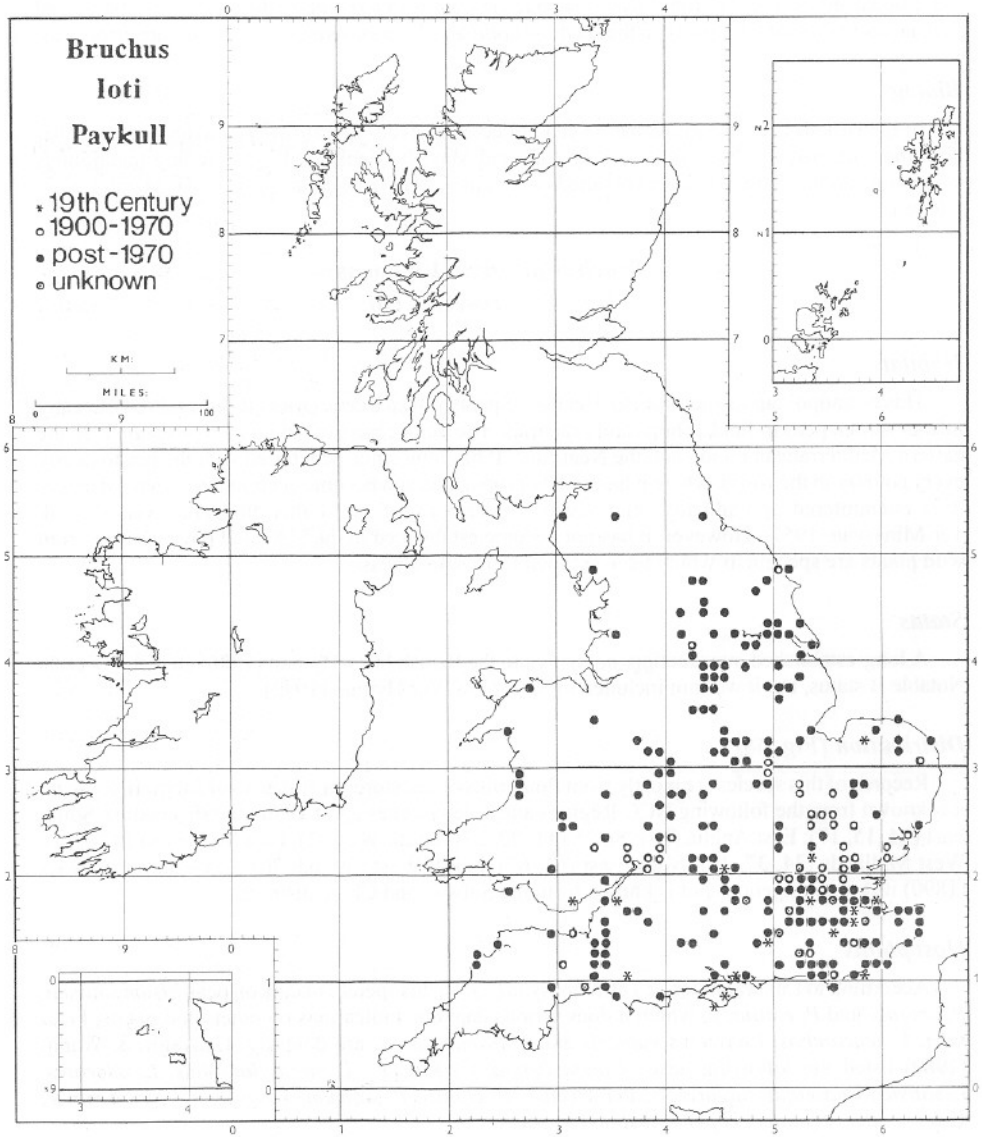
B. loti is widespread in England and Wales with many post 1970 10-km square records. Duff (1993) stated that there are sub-fossil records from Somerset.

Distribution (Fig. 67)

Recorded from England and Wales. In England, it is known from the following NCC Regions and vice-counties (post 1970 records in bold): South East (**13**, **14**, **15**, **16**, **17**, **21**); East Anglia (**18**, **19**, **25**, **26**, **27**, **28**); South (**8**, 10, **11**, **12**, **22**, **23**); South West (**2**, **3**, **4**, **5**, **6**, **9**); East Midlands (**20**, **24**, **29**, **30**, 31, **32**, **53**, **54**, **55**, **56**); West Midlands (**33**, 34, **36**, **37**, **38**, **39**, **40**, **57**); North East (**61**, **62**, **64**, **65**, **66**); North West (**59**, **63**, **69**, **70**). In North Wales (**49**, **50**); Dyfed-Powys (**43**, **46**); and South Wales (**35**, **41**). It is possible that *B. loti* occurs in southwest Scotland since there is an old specimen in NHM from "Merich" (coll. Murray, no date; this may be Merrick (NX 48; Dumfries & Galloway)).

Host plants

Adults of *B. loti* are known from non-larval hosts. Donisthorpe (1939) swept *B. loti* adults from "*Ranunculus acer*" (?= Meadow Buttercup *Ranunculus acris*) and Cuckoo Flower *Cardamine pratensis* in a field at Northwood, Middlesex, end v.1939; adults were also beaten from hawthorn *Crataegus* blossom at this site and also in the Windsor area. They have also been taken from Rowan *Sorbus aucuparia* blossom (H. Mendel, *pers. comm.*). The recorded leguminous host plants include Meadow Vetchling *Lathyrus pratensis*; Donisthorpe (1939) found *B. loti* most plentifully on this host on 27.vi.1939 at Northwood and also in the Windsor, Berkshire, area from May to August. The following also recorded *L. pratensis* as the host plant: F.T. Grant (VC 16); N. Cowen (VC 21) and W. Dolling (VC 61), *pers. obs.*; Philp (1991); Bullock (1992). *Lotus corniculatus* was also listed by Philp (1991) and Bullock (1992) as a host plant. Duff (1993: 185) cited the host plant as vetch *Vicia* [on *V. sepium* vi.1990, leg. A.J. Parsons - *Ed.*]. Non-British workers, such as Luk'yanovich & Ter-Minasyan (1957: 188) stated that *B. loti* develops on different species of



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vetchling (*Lathyrus pratensis*, *L. tuberosus*, *L. vernus*), and on the milk-vetch *Oxytropis uralensis*. This information may have been taken from Reitter (1912) who gave the following as larval hosts: *Lathyrus pratensis*, *L. tuberosus*, *Oxytropis uralensis* and *Lotus corniculatus*. Luk'yanovich & Ter-Minasyan also listed it from *Vicia tenuifolia* and *Lathyrus montanus*. However, they considered that indications of development on the seeds of *Lotus* and *Lens culinaris* (=*esculenta*) are erroneous.

Biology

In the British Isles the adults have been collected in every month from January to November with most records for June, followed by July and May. It is collected by sweeping leguminous vegetation. Adults have also been collected under elm *Ulmus* bark in late August (H. Mendel, *pers. comm.*)

3. *Bruchus pisorum* (Linnaeus)

(Figs. 9,10,16-18,20,68)

Habitats

This cosmopolitan species, the Pea Beetle or Spanish Bean Beetle (Jones & Jones, 1984), usually infests garden peas in fields, shops and granaries. The main centre of origin of *B. pisorum* is in the eastern Mediterranean region and the Near East. It has long since penetrated with the pea to nearly every country in the world, where it has widely propagated and become acclimatized. In most places it is encountered sporadically, and always in regions of pea cultivation (Luk'yanovich & Ter-Minasyan, 1957). However, it has not become established in the U.K. and those records from wild plants are specimens which have escaped from stored peas.

Status

A long-established introduction, not native to the British Isles. Hyman (1986) gave this species Notable B status, but it was not included in Shirt (1987) or Hyman (1992).

Distribution (Fig. 68)

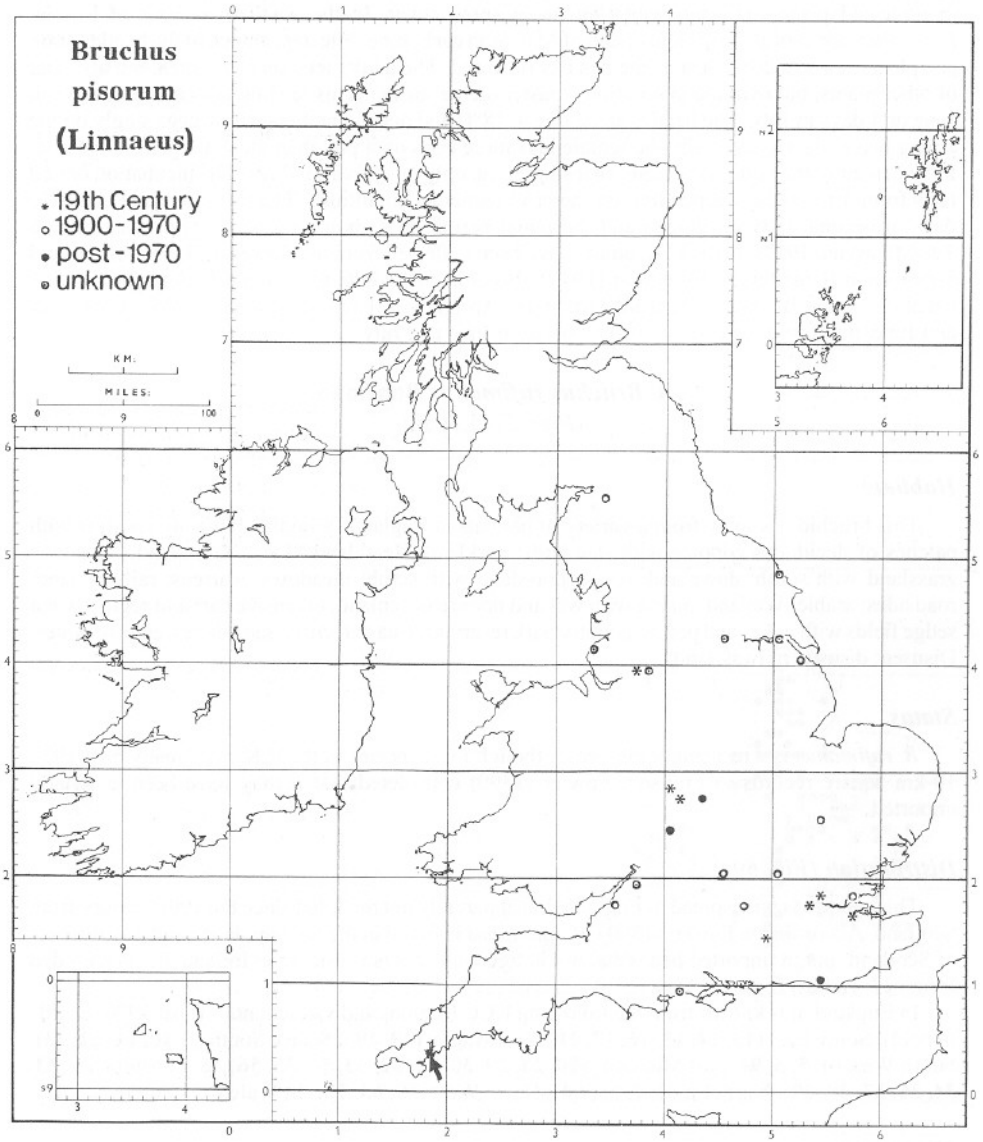
Records of this species are mostly from flour mills or pea stores in granaries or shops. In England it is known from the following NCC Regions and vice-counties (post 1970 records in bold): South East (**14**, **15**, **17**); East Anglia (**18**); South (**11**, **22**, **23**); South West (**2**); East Midlands (20,29,54); West Midlands (34, **37**, **38**); North East (61, 62), North West (59, 63, 70). According to Fowler (1890) it is not indigenous but is known from the Solway and Clyde districts.

Host plants

According to Luk'yanovich & Ter-Minasyan (1957) this species occurs on peas *Pisum sativum*, *P. arvense* and *P. elatius*, to which it does serious damage. Indications on other food plants, *Vicia faba*, *V. leucanthos*, *Phaseolus vulgaris* and *Lathyrus sativus* are doubtful. Udayagiri & Wadhi (1989) listed the following hosts: *Cassia fistula*, *Cytisus* sp.; *Lathyrus latifolius*, *L. odoratus*, *L. sativus*; *Phaseolus vulgaris*; *Pisum arvense*, *P. elatius*, *P. sativum*; *Vicia faba*, *V. faba minor*, *V. leucantha*, *V. minor*, *V. peregrina* and *V. sativa*.

Biology

In southern Russia the adults overwinter beneath plant waste or under tree bark, especially of plane *Platanus*. In northern areas the beetles often overwinter in corn granaries. They are highly



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resistant to cold, and outside the pea they begin to die off at -9.5°C, but beetles inside the pea are hardier, since at -21°C only 50% of them had perished after 12 days. According to Whitehead (1930) and Larson *et al.* (1938) in North America, the beetle is able, even in nature, to survive a hard winter in protected places or when wintering under snow cover. In the southern regions of Russia, *B. pisorum* appears at the middle or end of May or in early June. The appearance of the beetles upon pea plants starts at 20°C, just as the pea has flowered. The adults feed on pea pollen, but also that of other plants, but ovariole maturation is faster on the former. This feeding lasts about 16 days in June or 4 days in July. The beetles are active at 18°C and deposit amber-yellow eggs singly on the young pea pods. Occasionally the female lays more eggs on a pod than there are peas in the pod, but when more than one larva feeds on a single pea, only one larva survives. The incubation period lasts from 4 to 10 days depending on the environmental conditions. The larvae require about 40 days to become fully developed and the pupal period lasts about two weeks (Luk'yanovich & Ter-Minasyan, 1957). In the U.K. adults have been collected from the flowers of Umbelliferae and *Sisymbrium* (Cruciferae). Verdcourt (1949) also collected adults from apple *Malus* blossom in a small orchard at Boxmoor, Hertfordshire in late April, 1946. They occur in the field in April, May and June, but in storage conditions they occur in June and July.

4. *Bruchus rufimanus* Boheman

(Figs. 7,15,19,69)

Habitats

This bruchid is known from a variety of habitats in England. Woodland: mainly conifers with patches of deciduous coppice with standards; parkland. Heathland/Moors. Grassland: limestone grassland with scrub; downland; rough grassland with scrub; meadows; warrens; railway land; roadsides; arable. Wetland: marsh with wet and dry areas; fenland; extensive carr and regularly cut sedge fields with dykes and ponds; country park reservoir. Coastal: cliffs; sand dunes, edge of dunes. Disused: disused railway land.

Status

B. rufimanus is a resident, widespread, though local species in the U.K. with many post 1970 10-km square records in England. Fowler (1890) considered that it may have been originally imported.

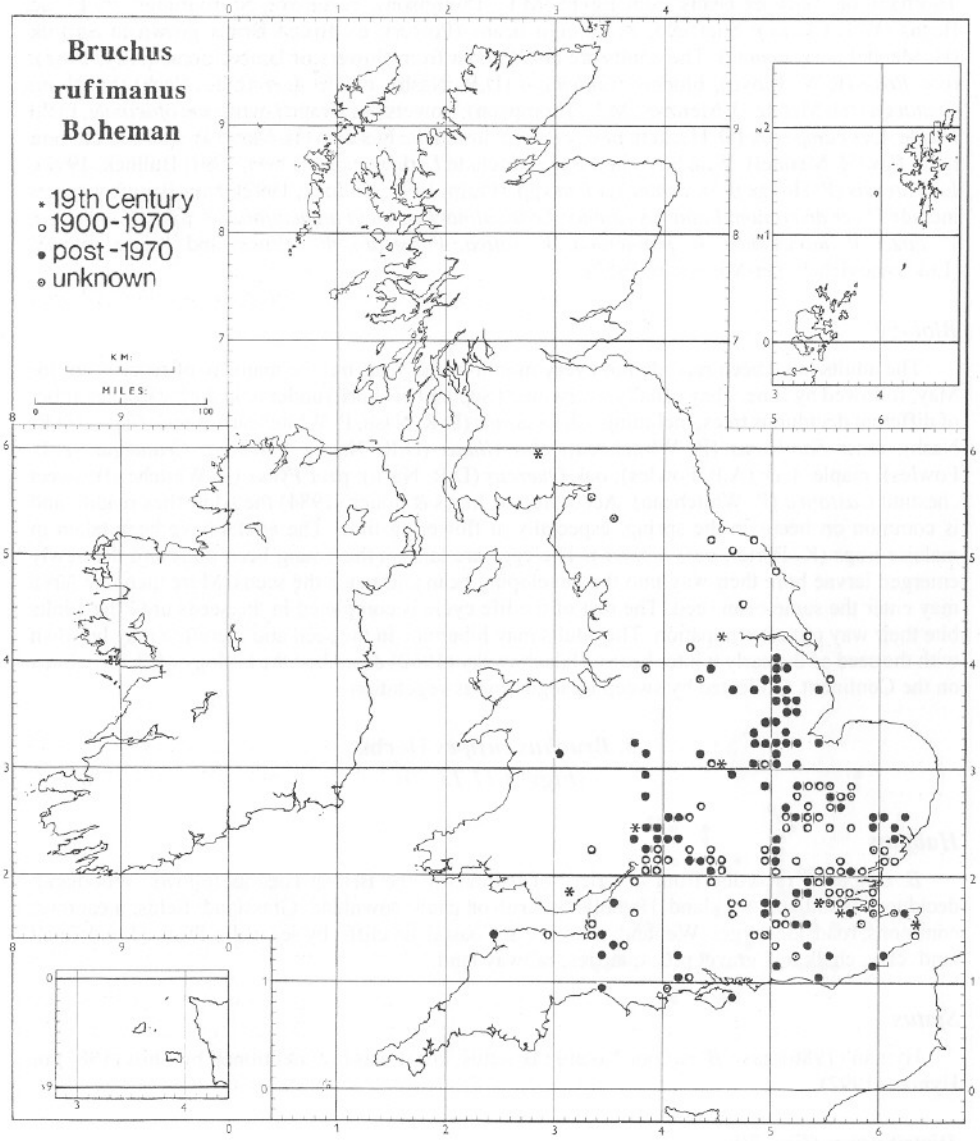
Distribution (Fig. 69)

This species is widespread in England, but apparently not recorded since the 19th Century from Scotland. According to Fowler (1890), *B. rufimanus* is found in the Solway, Forth and Tay districts of Scotland, but in imported beans and not indigenous. It is not resident in Ireland, but is recorded from near Belfast (Fowler, 1890).

In England, it is known from the following NCC Regions and vice-counties (post 1970 records in bold): South East (**13**, **14**, **15**, **16**, **17**, **21**); East Anglia (**18**, **19**, **25**, **26**); South (**8**, **10**, **11**, **22**, **23**); South West (**4**, **5**, **6**, **9**); East Midlands (**20**, **24**, **29**, **30**, **31**, **32**, **53**, **54**, **55**, **56**); West Midlands (**33**, **34**, **36**, **37**, **38**, **39**); North East (61, 62, **64**); North West (59, **63**, 70). In Wales, Dyfed Powys (**47**).

Host plants

B. rufimanus the Broad Bean Weevil (Duff, 1993 [following North American economic entomology usage - *Ed.*]) or Bean Seed Beetle (Jones & Jones, 1984), has some economic importance as a pest of various stored beans (Balachowsky, 1962). According to Jones & Jones



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(1984), it lives in the seeds of Broad or Field Beans *Vicia faba* and is common in Great Britain. In the British Isles it is recorded from Field Beans at Offchurch, Warwickshire (Gimingham, 1922); Broad Beans at Boxmoor, Hertfordshire (Verdcourt, 1949); beans at Thornhill, Scotland (D. Sharp); Thornaby on Tees, ex beans from Egypt (M.L. Thompson); Falsgrove, Scarborough, ex Broad Beans (W.J. Clarke); Sheffield, ex foreign beans (Power); ex Broad Beans grown in Suffolk (H. Mendel *pers. comm.*). The adults are also known from flowers of Umbelliferae (Atty, 1983); rose *Rosa* (R.W. Lloyd), bluebell *Endymion* (D.R. Nash), maple *Acer* (D.R. Nash), hawthorn *Crataegus* (H. Mendel; I. Menzies; M.L. Thompson); flowers of Lovage *Levisticum officinale*, Field Maple *Acer campestre* (D. Hackett, *pers. comm.*); lime *Tilia* blossom (H. Mendel); also beaten from holly *Ilex* (H. Mendel). Wild hosts in the U.K. include *Lathyrus* spp. (Philp, 1991; Bullock, 1992), *L. pratensis* (P. Hodge *pers. comm.*); *Vicia* spp. (Philp, 1991; Bullock, 1992). Non-British workers include *Cicer arietinum*; *Lathyrus sativus*; *Lens culinarius*; *Vicia angustifolia*, *V. faba*, *V. hyrcana*, *V. lutea*, *V. monanthos*, *V. pannonica*, *V. sativa*, *V. vestita*, *V. villosa*; and *Pisum sativum* (Luk'yanovich & Ter-Minasyan, 1957)

Biology

The adults have been recorded in every month of the year, but the majority of records are for May, followed by June. They usually overwinter (September-April) under or in the bark of a number of different deciduous trees, including ash *Fraxinus* (D.R. Nash, P. Whitehead); beech *Fagus* (D.R. Nash); elder *Sambucus* (P. Whitehead); elm *Ulmus* (D.R. Nash); hawthorn *Crataegus* (A.P. Fowles); maple *Acer* (A.P. Fowles); oak *Quercus* (D.R. Nash); pear *Pyrus* (P. Whitehead); sweet chestnut *Castanea* (P. Whitehead). According to Jones & Jones (1984) the adult flies readily and is common on beans in the spring, especially at flowering time. The adults have been taken in malaise traps (K. Porter, *pers. comm.*). The eggs are laid on the young bean pods and the newly emerged larvae bore their way into the developing bean and reach the seeds. More than one larva may enter the same bean seed. The rest of the life cycle is completed in the seeds until the adults bite their way out after pupation. The adults may hibernate in the seed and therefore may be sown with the seed of the early winter beans. Balachowsky (1962) described the biology of *B. rufimanus* on the Continent. Collected by sweeping leguminous vegetation.

5. *Bruchus rufipes* Herbst

(Figs. 8,11,13,70)

Habitats

B. rufipes is recorded from a variety of habitats in the British Isles as follows. Woodland: deciduous woodland; parkland. Heathland: scrub on chalk downland. Grassland: fields; meadows; commons; roadside verges. Wetland: near rivers. Coastal: on cliffs; by sea walls. Disused/reclaimed land: clay, chalk and gravel pits; quarries; railway land.

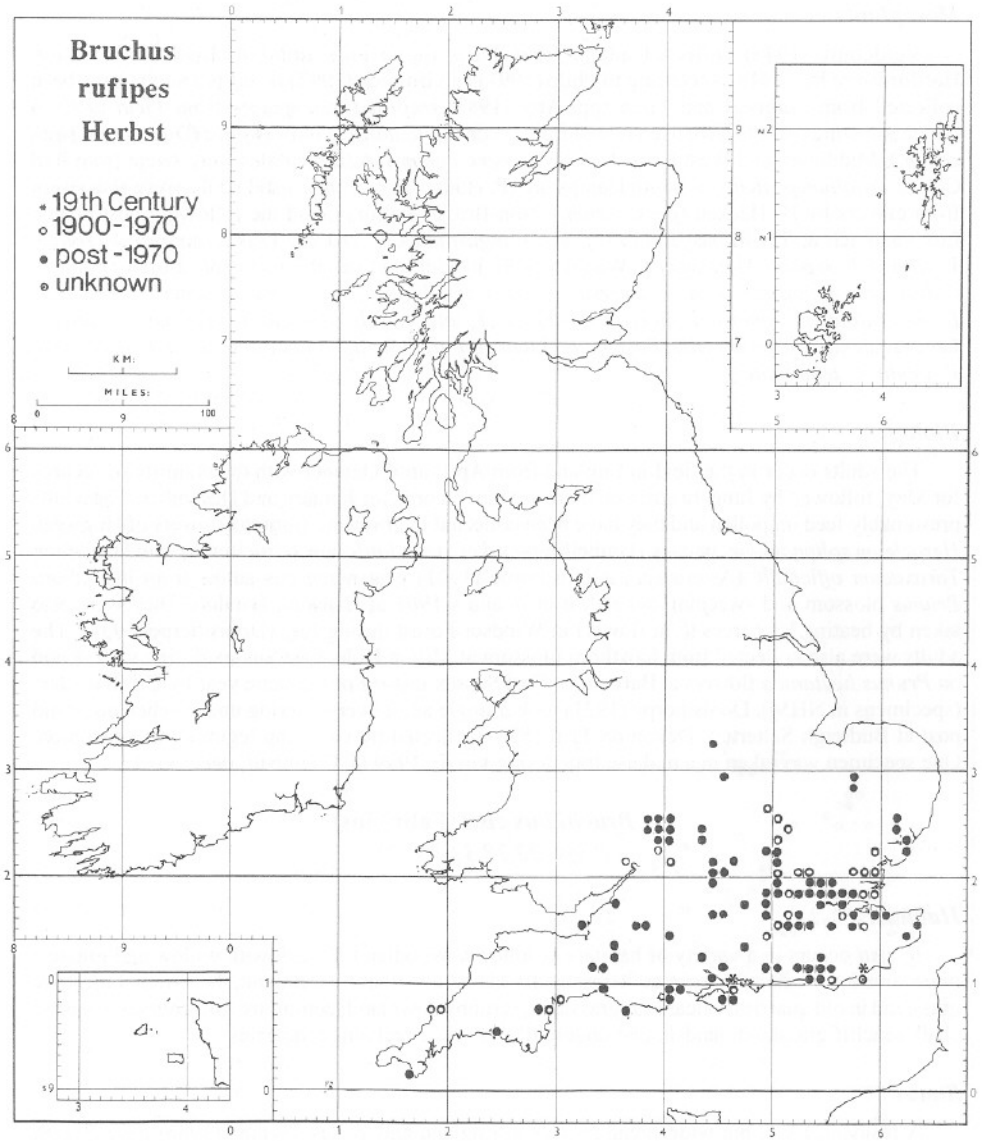
Status

Hyman (1986) gave *B. rufipes* Notable B status, but it was not mentioned by Shirt (1987) or Hyman (1992).

Distribution (Fig. 70)

This species is not recorded from Wales, Scotland or Ireland.

In England, it is known from the following NCC Regions and vice-counties (post 1970 records in bold): South East (**13**, **14**, **15**, **16**, **17**, **21**); East Anglia (**18**, **19**, **25**, **26**, **28**); South (**8**, **10**, **11**, **12**,



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22, 23); South West (**1, 2, 3, 5, 6, 9**); East Midlands (**20, 24, 30, 55**); West Midlands (**33, 37, 38,** 40 (Lettycon? Shropshire 1969) (not on map)).

Host plants

Verdcourt (1949) collected adults from *Vicia sativa* in a small orchard at Boxmoor, Hertfordshire in v.1946. According to Philp (1991) and Bullock (1992) *B. rufipes* adults have been collected from *Lathyrus* and *Vicia* spp. Atty (1983) recorded this species from *Vicia lutea* in Gloucestershire. Adults have been reared from seeds of *Vicia sativa* in Berkshire (D.A. Jones, *pers. comm.*), Middlesex and West Kent (N. Cowen, *pers. comm.*). Adult females were swept from Red Clover *Trifolium pratense* in South Hampshire (P. Hodge, *pers. comm.*) and adults were also swept from clovers by D. Hackett (*pers. comm.*). Non-British authors noted the following host plants: Luk'yanovich & Ter-Minasyan (1957), *Vicia angustifolia, V. cracca, V. macrocarpa, V. sativa, V. villosa, V. sepium*; Udayagiri & Wadhi (1989), in addition to all the *Vicia* spp. aforementioned, *Calycotome spinosa*; *Coronilla emersus*; *Cytisus sessilifolius, C. triflorus*; *Lathyrus angulatus, L. angustifolius, L. aphaca, L. cicerea, L. hirsutus, L. latifolius, L. odoratus, L. pratensis, L. sativus; Lens esculenta*; *Pisum arvense, P. sativum*; *Vicia ervilia, V. faba, V. hirsuta, V. lutea, V. peregrina, V. sicula, V. tenuifolia.*

Biology

The adults occur in the field in England from April until October with the majority of records for May, followed by June. In addition there are rare records for January and December. The adults presumably feed on pollen and they have been collected in grassland from the flowers of Hogweed *Heracleum sphondylium*, parsley (Umbelliferae); *Lepidium latifolium* (Cruciferae); and Dandelion *Taraxacum officinale* (Asteraceae). Donisthorpe (1921) beat numerous adults from blackthorn *Prunus* blossom and sweeping beneath it in iv and v.1901 at Hanwell, London. They were also taken by beating lime trees (? in flower) in Windsor Forest during July (Donisthorpe, 1938). The adults were also collected from hawthorn blossom at Milton Hide, East Sussex during v.1938 and on *Prunus lusitanica* flowers at Barcombe, East Sussex in June of the same year by C.J. Saunders (specimens in NHM). Donisthorpe (1921) took a single adult overwintering under lichen on an old post at Budleigh Salterton, Devon on 11.ii.1896. Collected by sweeping leguminous vegetation. One specimen was taken in a malaise trap during viii./ix.1999 (J. Campbell, *pers. obs.*).

6. *Bruchidius cisti* (Fabricius)

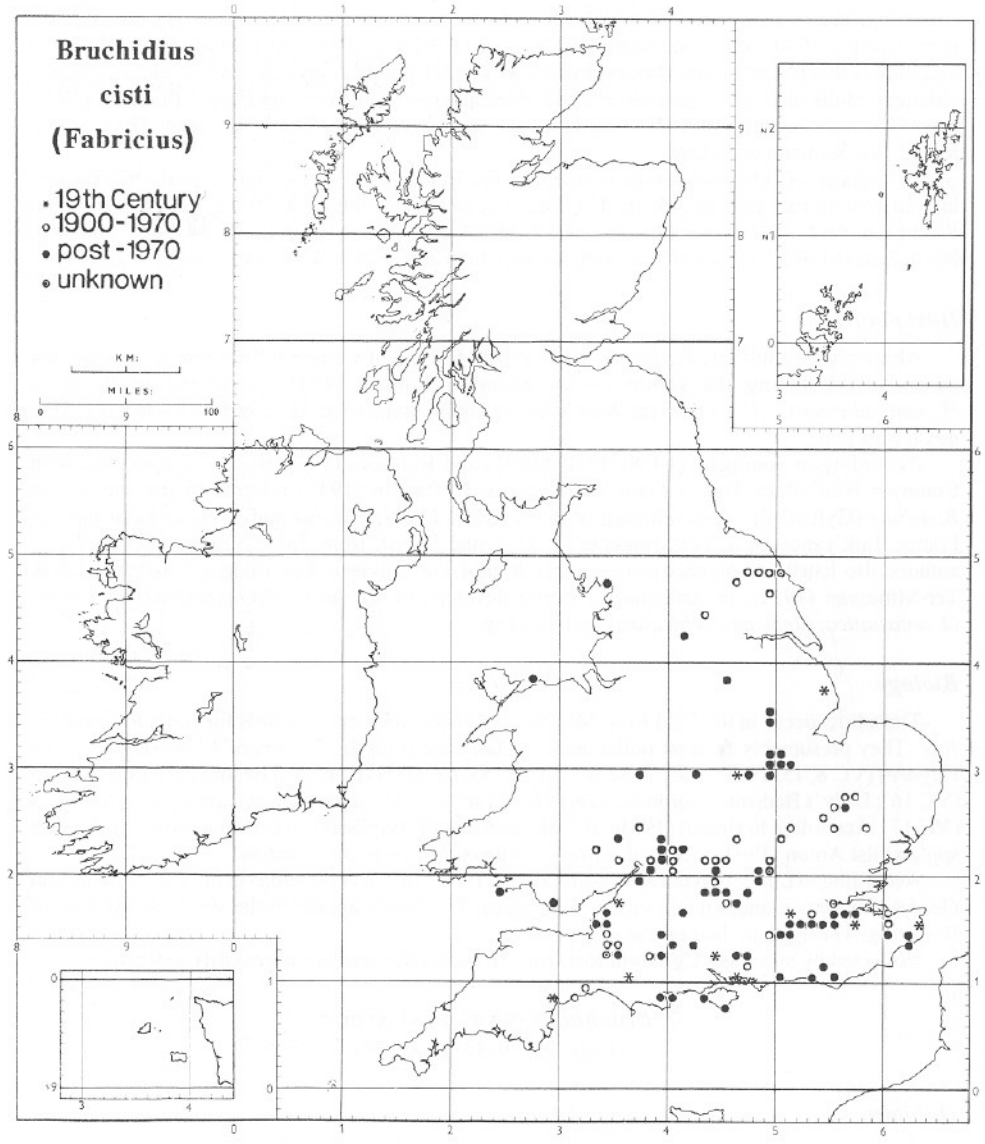
(Figs. 22,28,33,36,71)

Habitats

B. cisti occurs in a variety of habitats as follows. Woodland: fly ash with willow and grasses; birch-invaded heathland; forests. Grasslands: chalk downland; heathland; herb-rich limestone grassland in old quarries; calcareous grassland; scrubby downland; commons; golf courses. Coastal: chalk seacliff grassland; landslipped undercliffs. Disused/reclaimed: quarries.

Status

A resident, local, but widespread species in England and Wales. Hyman (1986) gave *B. cisti* Notable B status, but Shirt (1987) and Hyman (1992) did not mention it.



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Distribution (Fig. 71)

According to Aldridge & Pope (1986) this species occurs as far north as Whitehaven, Cumbria (VC 70), but John Read has not taken this species in that vice-county after many years intensive collecting. The most northerly post-1970 record is for South-west Yorkshire (VC 63), but there are numerous pre-1970 records for North East Yorkshire (VC 62). The most westerly record from the literature is that of Devon (on Broom) by Fowler (1890), but this may refer to *Bruchidius villosus*, although adults of *B. cisti* were taken by K. Alexander (*pers. comm.*) on Broom flowers in West Kent. The most recent post-1970 records for the southwest are for North Somerset. There are no records for Scotland or Ireland.

In England it is known from the following NCC Regions and vice-counties (post-1970 records in bold): South East (**13**, **14**, **15**, **16**, **17**); East Anglia (**26**); South (**7**, **8**, **10**, **11**, **12**, **22**, **23**); South West (3, **6**, **9**); East Midlands (**24**, **29**, 30, **32**, **53**, 54, **55**); West Midlands (**33**, **34**, **36**, **37**, **38**, **40**); North East (61, 62, 64); North West (**60**, **63**, **69**). In Wales: North Wales (**49**); South Wales (**41**).

Host plants

Although the adults are frequently taken on the flowers of Common Rockrose *Helianthemum nummularium* during the summer—for example Tomlin (1910) collected adults from *H. nummularium* (as *H. vulgare*) at West Malvern and Symonds Yat, Herefordshire—this is not the larval host plant.

According to Southgate (1978), Philp (1991) and Bullock (1992), *B. cisti* is associated with Common Bird's-foot Trefoil *Lotus corniculatus*. Hoffmann (1945) referred to the species (as *B. debilis* (Gyllenhal)) as developing in the seeds of *L. corniculatus* and '*Cytisus laburnum*' in France. Luk'yanovich & Ter-Minasyan (1957) listed *B. cisti* from *Robinia pseudoacacia*. These authors also listed *Onobrychis sativa* (under *B. unicolor* Olivier). According to Luk'yanovich & Ter-Minasyan (1957), in Armenia the beetle develops in the seeds of *Onobrychis viciaefolia*, *O. antasiatica*, *Medicago orbicularis* and *Vicia* sp.

Biology

The adults occur in the field from May to September, with most records for June, followed by July. They presumably feed on pollen and regularly occur on the flowers of *H. nummularium* (= *vulgare*) (VC 8, 13, 14, 15, 17, 24, 32, 33, 34, 53, 55, 61, 62, 64), but also Broom *Cytisus scoparius* (VC 16); Lady's Bedstraw *Galium verum* (VC 37) and Clustered Bellflower *Campanula glomerata* (VC 17). According to Brandl (1981), *B. cisti* (as *B. debilis* (Gyllenhal)) is known from *Onobrychis* spp., whilst Anton (1994) recorded it from *H. nummularium* and *H. ovatum*.

According to Luk'yanovich & Ter-Minasyan (1957), the larva develops in the seeds of Sainfoin *Onobrychis sativa*, and winters in the same place. The adults appear in the spring at the time of flowering. The eggs are laid on the green pod.

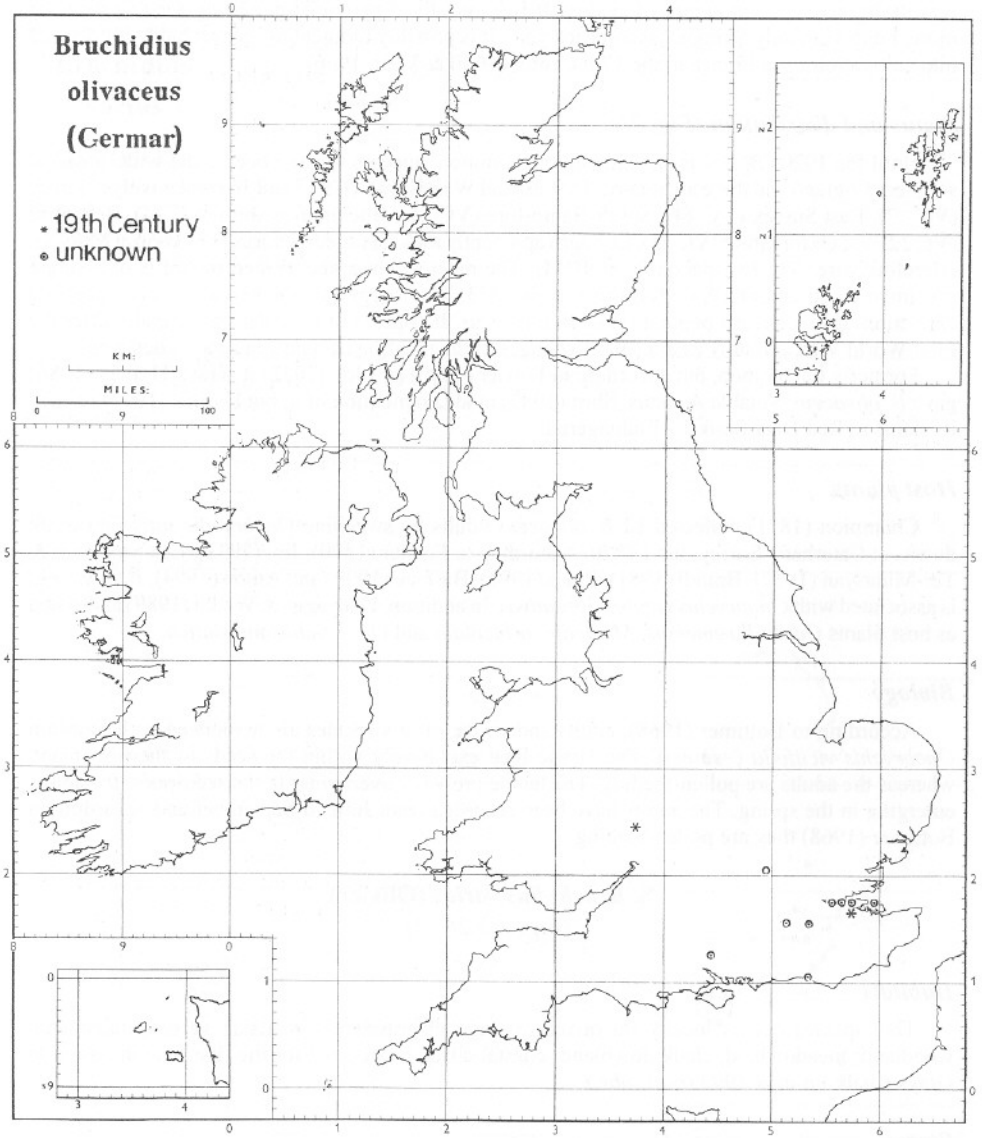
Collected by sweeping Common Rockrose *H. nummularium*, not necessarily in flower.

7. *Bruchidius olivaceus* (Germar)

(Figs. 23,29-31,34,37,72)

Habitats

Calcareous grassland and agricultural land. Apparently once associated with the arable crop Sainfoin *Onobrychis viciifolia* (=*sativa*) which was once a popular fodder crop on chalky or limestone soils, but it is now rarely seen. According to Gill & Vear (1966), Sainfoin is almost confined in Britain to the southern half of the country and to chalk and limestone soils. It is usually



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sown under corn. According to Watson & More (1962) it was largely grown on the dry, chalky and limestone soils of the Downs and Coltswolds. As it is deep-rooted and drought resistant, it thrives on light soil, but it will only grow where the climate is warm, and fails completely unless the soil is well-drained. It is intolerant of acidity. It is a long-lived perennial persisting for five years or more, but giving only a single hay cut each year. It is possibly indigenous, but probably introduced into cultivation from France in the 17th Century (Gill & Vear, 1966).

Status and distribution (Fig. 72)

Until the 1920s *B. olivaceus*, although uncommon, appears to have been quite widespread in southern England and there are records for East and West Kent (VCs 15 and 16 respectively), Surrey (VC 17), East Sussex (VC 14), South Hampshire (VC 11), Buckinghamshire (VC 24), Berkshire (VC 22) and Oxfordshire (VC 23). D. Sharp apparently took this species during viii.1866 at Malvern (Herefordshire, VC 36; specimen in NHM). The most recent authenticated record is of a single specimen taken at Cothill, Oxfordshire, in ix.1923. This suggests a decline in, or even possible extinction of, the British population of *B. olivaceus*. It appears to have declined rapidly after the First World War, possibly as a result of changes in the planting of Sainfoin as a fodder crop.

Formerly uncommon, but according to Fowler (1890) and Joy (1932) it is rare. Hyman (1986) gave *B. olivaceus* Notable A status, Shirt (1987) made no mention of it, but Hyman (1992) revised its status to Red Data Book 1 - Endangered.

Host plants

Champion (1871) collected 12 *B. olivaceus* adults by sweeping *Onobrychis sativa* on chalk downs at Caterham, Surrey, in vi.1870. According to Fowler (1890), Joy (1932), Luk'yanovich & Ter-Minasyan (1957), Brandl (1981), Philp (1991), Bullock (1992) and Anton (1994), *B. olivaceus* is associated with *Onobrychis viciifolia* (=*sativa*). In addition, Udayagiri & Wadhi (1989) also listed as host plants *Coronilla emersus*, *Medicago orbiculata* and *Onobrychis antasiatica*.

Biology

According to Bottimer (1968), adults and larvae of this species are associated with Sainfoin *Onobrychis viciifolia* (=*sativa*). The larvae feed exclusively within the seeds of the host plant, whereas the adults are pollen-feeding. The larvae probably overwinter in the seed-pods, the adults emerging in the spring. The adults have been recorded from June to September and according to Bottimer (1968) they are pollen-feeding.

8. *Bruchidius varius* (Olivier)

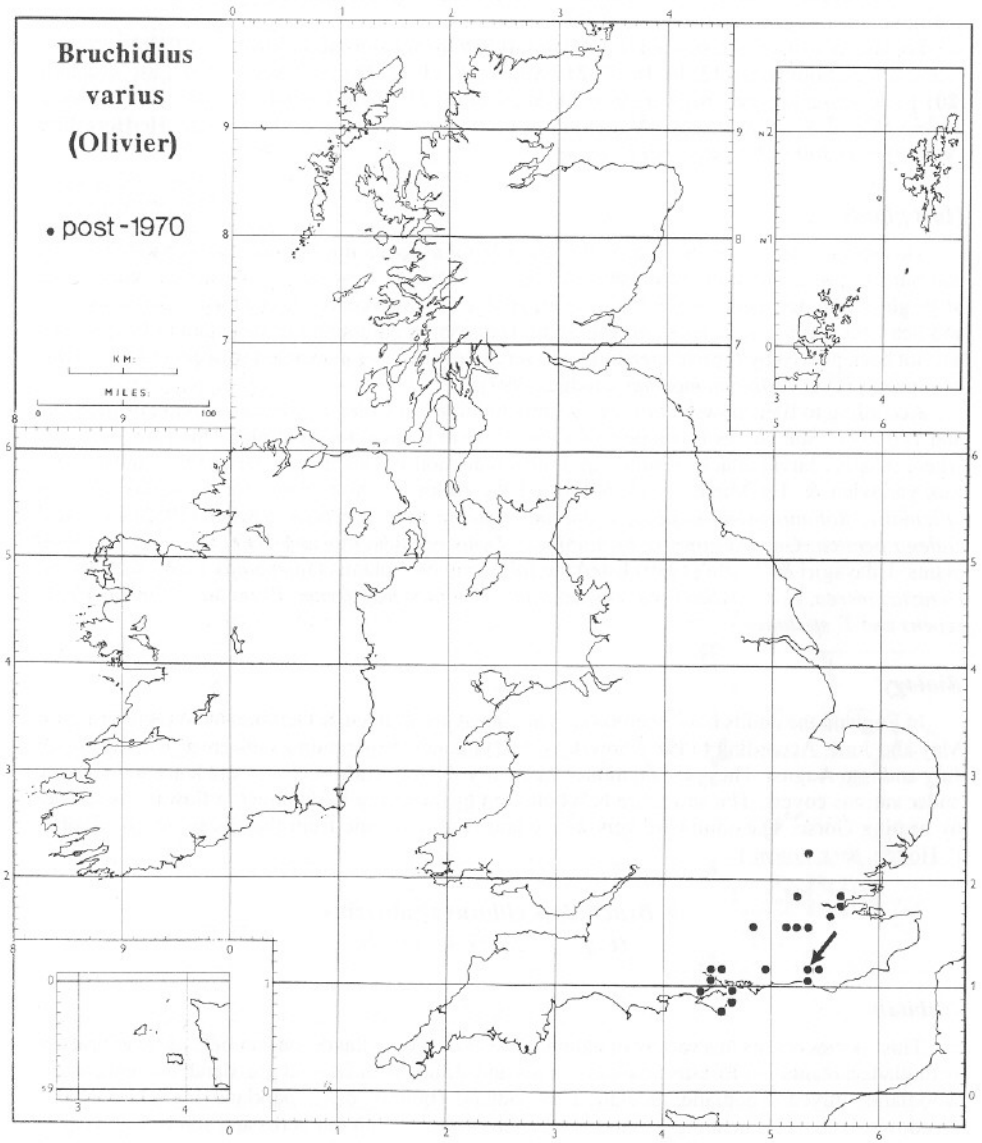
(Figs. 25,26,73)

Habitats

This species occurs locally on mixed herbage in grasslands, roadside verges, marshland; woodland; meadowland; chalk downland; coastal cliffs. It occurred for the first time in Essex, in Grays Chalk Pit in ix.1999 (*pers. obs.*).

Status

B. varius was added to the British fauna by Hodge (1997).



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Distribution (Fig. 73)

This species was first taken in the British Isles near the summit of Ditchling Beacon, East Sussex, 9.x.1994 (Hodge, 1997); in Fig. 73 an arrow shows this first record in TQ 31. Hodge (1998) gave additional locality records for this species.

To date, *B. varius* is restricted to England. It is known from the following NCC Regions and vice counties: South East (**13, 14, 16, 17, 21**); South (**10, 11, 12, 22**); East Anglia (**18**); East Midlands (**20**). First vice-county records were from Middlesex (VC 21) in viii.1999 (D. Hackett, *pers. comm.*), in Grays Chalk Pit, South Essex (VC 18) in ix.1999 (*pers. obs.*) and at Bennington, Hertfordshire (VC 20) in vi.2000 (P. Hodge, *pers. comm.*).

Host plants

This species was recorded from Red Clover *Trifolium pratense* in East Sussex (Hodge, 1997) and Surrey, North and South Hampshire (Hodge, 1998); also West Sussex, West Kent and the Isle of Wight (P. Hodge, *pers. comm.*). However, Hodge (1998) recorded it on Gorse *Ulex europaeus* and Sea Club-rush *Scirpus maritimus* in South Hampshire. Although the host plant in East Sussex has not been proved by captive breeding, it is very likely that it is associated with either Red Clover or Zigzag Clover *Trifolium medium* (Hodge, 1997).

According to Balachowsky (1962), this bruchid lives on *Galega officinalis*, *Lotus corniculatus* and *Trifolium*. Sometimes it is a pest of *T. pratense* in France, for example in the Low Pyrenees where massive larval attacks resulted in a 60% reduction in clover seed harvest in August 1950. Luk'yanovich & Ter-Minasyan (1957) listed the following host plants for *B. varius*: *Galega officinalis*; *Robinia pseudoacacia*; *Trifolium pratense* and *T. repens*. Zacher (1952) indicated *Galega persica*; *Genista cinerea*, *G. liniifolia*; *Lotus corniculatus* and *Trifolium repens* as food plants. Udayagiri & Wadhi (1989) listed the following host plants: *Galega officinalis*, *G. persica*; *Genista cinerea*, *G. liniifolia*; *Lotus corniculatus*; *Trifolium fragiferum*, *T. liniifolia*, *T. pratense*, *T. repens* and *T. stellatum*.

Biology

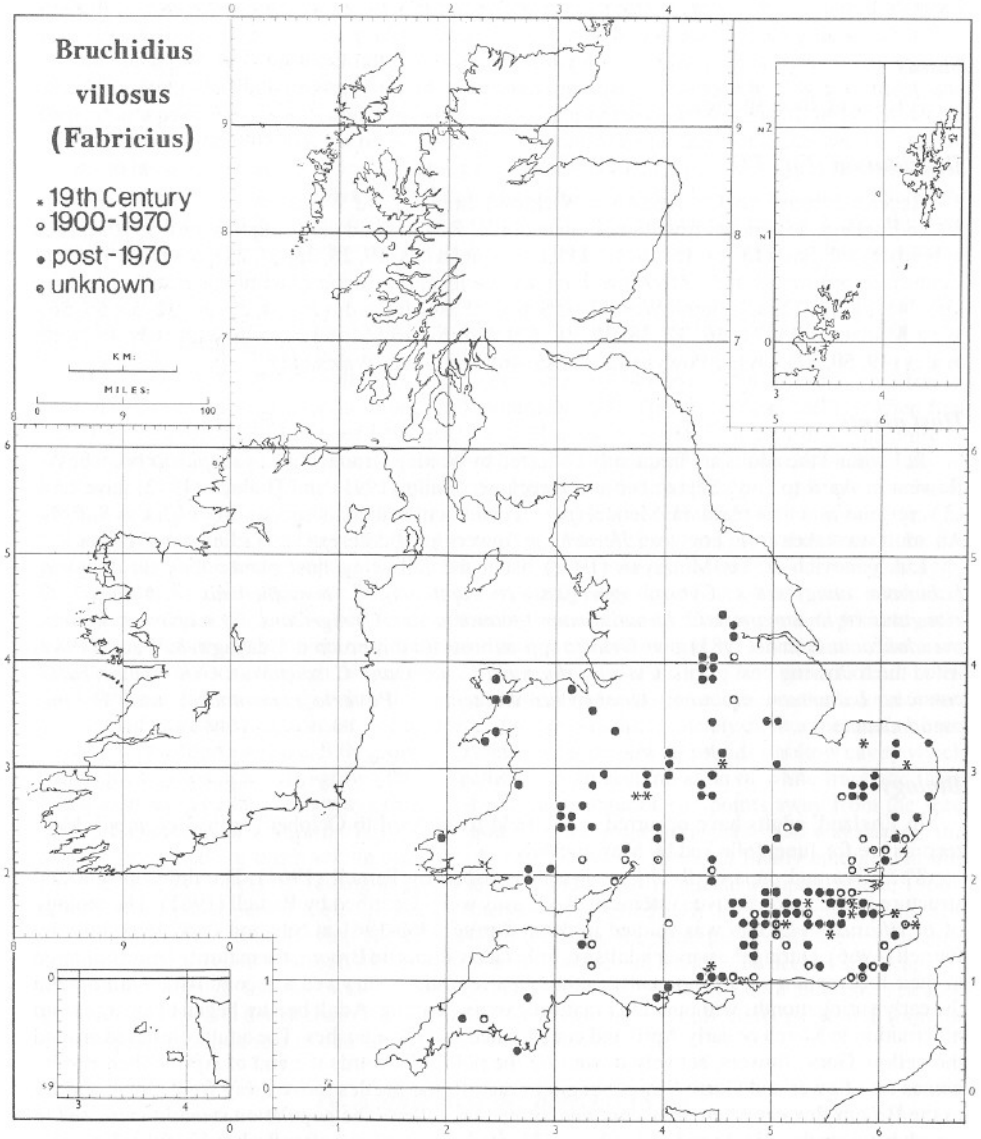
In England the adults have been taken from late April until early October. Most records are for May and June. According to Balachowsky (1962) the new generation adults emerge at the end of July and into August. They remain hidden in the dry flower heads of clover and leave to hibernate under various covers. The adults are best collected by sweeping Red Clover in flower, sometimes by beating Gorse. The adults are very active and readily escape from the sweep net (*pers. obs.*; P. Hodge, *pers. comm.*).

9. *Bruchidius villosus* (Fabricius)

(Figs. 21,24,27,32,35,74)

Habitats

This species occurs in a variety of habitats as follows. Woodlands: oak woodlands over bracken with glades; plantation forestry; parkland trees and shrubs with flushed grassland; ancient pasture woodland; mixed woodland; deciduous woodland (mainly oak); parkland including woody meadows. Grassland: acidic grassland; wet heath and mire with tall herbs and scrub; wet pasture, carr; old pasture planted with trees and shrubs; commons; roadside verges; commons; downland. Heathland: derelict heathland; heathland (heather and grassland) with scattered hawthorn and birch scrub; sandy heathland; heathland with gorse and birch; broom scrub. Moorland: heather moorland deeply dissected by a series of stream valleys with grassland, trees and shrubs. Wetlands: broads;



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raised shingle bed with willow and ruderals; valley fen (mire) and wet heath surrounded by woodland and scrub; pond and riverside vegetation; grazing marsh; creeks; wet heath. Coastal: coastal cliffs; dunes; Disused/restored: restored, undisturbed, sand quarry; disused railways; quarries.

Status

A resident, local species.

Distribution (Fig. 74)

Recorded from Eire (Co. Kerry and Wicklow), England and Wales.

In England, it is known from the following NCC Regions and vice-counties (post 1970 records in bold): South East (**13**, **14**, **15**, **16**, **17**, **21**); East Anglia (**18**, **19**, **25**, **26**, **27**, **28**); South (**8**, 10 [19th Century record from Fowler (1890) with no precise locality and therefore not on distribution map Fig. 74], **11**, **12**, **22**, **23**); South West (**2**, **3**, **5**, **6**, **9**); East Midlands (**20**, **24**, 29, **30**, **32**, **53**, **55**, **56**); West Midlands (**33**, **34**, **36**, **37**, **38**, **39**, **40**, **57**); North East (**61**, **64**); North West (**63**). In North Wales (**49**, **50**, **52**); Dyfed-Powys (42, **43**, **45**, **46**); and South Wales (**41**).

Host plants

In England the adults are frequently collected by beating Broom *Cytisus scoparius* branches or flowers in April to July, September and December. Philp (1991) and Bullock (1992) gave only *C. scoparius* as a host plant. H. Mendel (*pers. comm.*) collected this species from *Ulex* in Suffolk. An adult was taken from hogweed *Heracleum* flowers in Middlesex (D. Hackett, *pers. comm.*).

Luk'yanovich & Ter-Minasyan (1957) listed the following host plants: *Genista tinctoria*; *Laburnum anagyroides*; *Cytisus aggregatus* (= *capitatus*), *C. borysthenicus* (= *biflorus*), *C. elongatus* (= *lindemanni*), *C. hirsutissimum* (= *austriacus*), *C. nigricans*, *C. scoparius*; *Robinia pseudoacacia*. Brandl (1981) gave *Genista* spp. as hosts for this bruchid. Udayagiri & Wadhi (1989) listed the following host plants: *Cytisus laburnum*, *C. nigricans*, *C. scoparius*; *Genista cinerea*, *G. corsica*; *Laburnum alpinum*; *Onobrychis viciaefolia*; *Petteria ramentacea*; and *Robinia pseudoacacia*.

Biology

In England, adults have occurred in the field from April to October and in December. Most records are for June, followed by May and July.

The larva and pupa of *B. villosus* were described by Parnell (1964). The development and structure of the reproductive systems of *B. villosus* were described by Parnell (1965). The biology of *B. villosus* on Broom was studied in detail during 1960-1961 at Silwood Park, Berkshire, by Parnell (1966). During the winter adults are only rarely found on Broom, the majority being scattered in their hibernation sites. Apparently, although a few adults survived a second winter, all died in the early spring months without either maturing or ovipositing. Adult beetles began to emerge from hibernation in March or early April and congregated on Gorse bushes. The adults clustered around the yellow Gorse flowers, actively devouring the pollen. Towards the end of April, when Broom comes into flower and Gorse flowers begin to die off, the beetles move away from Gorse and fly to the Broom flowers where they continue to feed on pollen. The population steadily increased to a peak between the middle and end of May. This peak occurred just after the height of the flowering period when the majority of new pods were beginning to form. Males fed vigorously and attained maturity towards the middle of May. Copulation commenced at this time and the males remained mature until mid-June. Many males died during the next two months and only two were found on 16th August. Females were all mature and fertilized by the end of May when the population was at

its peak. These females remained mature and oviposited throughout the latter part of May and well into June. The females also occurred on Yarrow *Achillea millefolium* throughout the latter part of June and into July. Throughout August, the new generation began to emerge from dehiscing Broom pods, thus causing an increase in the adult population on Broom. Females oviposited only on the outsides of young green Broom pods, especially during May and June. Having taken up a firm position on a pod the female extrudes the ovipositor and moves it over the surface of the pod in a circular motion. A small droplet of liquid is smeared onto the pod surface by this movement, and then, after a pause of a few seconds, an egg is deposited into the central region of the liquid, which quickly dries, cementing the egg to the surface of the pod. The female then either walks away or begins to lay a second egg beside the first. Eggs are normally laid around the edges of pods where females can get a firm grip before ovipositing. The eggs are laid randomly without any relation to the position of the seeds within the pod. The majority of females were not fertilized until the third week of May. In mid-June numerous adults feed on the pollen of Yorkshire Fog *Holcus lanatus* flowers growing beneath Broom bushes. Towards the end of June, when the *Holcus* finished flowering, the beetles moved to flowers of Yarrow. Throughout July and August these adults could be collected from Yarrow, whereas the new generation emerging from Broom pods could be collected only on the Broom bushes.

The egg is oval, with a length of 0.48-0.57 mm (mean 0.54 mm), width 0.26-0.30 mm (mean 0.28 mm) (n=10). The chorion is smooth and extremely rigid. The egg is straw yellow when first laid. The incubation period varied between 17 and 21 days (mean 18.5) at a mean temperature of 18°C in shaded outdoor conditions. In the laboratory, at a constant 30°C and relative humidity of 67.5%, this was reduced to 5-6 days (mean 5.5) (Parnell, 1966). When it emerges, the first instar larva chews its way through the underside of the egg where it is cemented to the pod surface. The larva then bores straight through the soft green tissues into the pod cavity. As the larva enters the pod it blocks up the tunnel behind it with residues from the excavation. Once inside the pod cavity the larva attacks a soft green seed. It does not necessarily bore directly into the nearest seed, as in several instances a single larva was found inhabiting a seed up to 4 cm away from its point of entry into the pod cavity, passing up to three unoccupied seeds before making an entrance. The larva usually enters the seed through the micropore. It bores into the seed and commences to feed on the part of the cotyledons directly below the entrance hole. The larva soon ecdyses to the second instar. The second, third and fourth instars are the feeding stages which completely devour the seed embryo by the time the fourth instar is fully grown. Thus the seed testa now surrounds a hollow cavity which is occupied by a single fully-grown larva together with an accumulation of white frass and three larval exuviae. The larva is always orientated so that its anterior end points away from the seed caruncle and diagonally towards the tip of the pod. The last instar larva gnaws half way through the testa before pupation, this marking out the hole through which the adult finally emerges. In this position the larva enters the resting or prepupal stage and finally moults to a pupa (Parnell, 1966). After a short pupal period the adult beetle emerges and immediately begins to gnaw a circular incision in the seed coat. Having chewed through the testa, the adult pushes off the disk-shaped trap-door and pulls itself through the hole in the seed into the pod cavity. The beetles are incapable of gnawing through the pod wall, remaining instead within the cavity until they are released automatically by pod dehiscence (Parnell, 1966). Each Broom seed only contains enough food for the complete development of one larva.

10. *Acanthoscelides obtectus* (Say)

(Fig. 38)

Antennae dark grey, segments 1-5 and 11 reddish. Elytral pubescence forming numerous indistinct spots. Pygidium, majority of abdomen, and apices of elytra yellowish red, legs yellowish red, except ventral half of meso- and metafemora black. Body length 2.5-3.0 mm.

This New World species has spread to Africa, southern Europe and the Middle East. It usually infests beans, but may also occur in chick peas etc.

British locality and host records are as follows: among beans in warehouse, London docks, iv.1920 (F.T. Vallins); ex old-fashioned yellow eye 'Minnesota', Wisley RHS Gardens, Surrey, i.1923 (G. Fox Wilson); Wisley, Surrey, iii.1924 (G. Fox Wilson); breeding in dried beans *Phaseolus vulgaris*, white seeded var., Cambridge, 1934; near Burgess Hill, Sussex, v.1938 (C.E. Tottenham); on dried figs, Gloucester, no date; London WC1, x.1991, adults and larvae in beans, refectory kitchen (specimens in NHM); in butter beans, Southlands Hospital, Shoreham by Sea, vi.1986 (M. Colvin; P.J. Hodge, *pers. comm.*); packed mixed pulses, Ipswich, Suffolk, x.1990 (H. Mendel); one swept in rank vegetation, Guinness Park Royal, Ealing, Middlesex, ix.1998 (P. Hodge). Dobie *et al.* (1984) described its biology.

11. *Callosobruchus analis* (Fabricius)

(Figs. 53-55,65)

This bruchid is indigenous to the Oriental region, but it is now more widespread and also occurs in North Africa and rarely in East and Southern Africa. It usually attacks seeds of pigeon peas, lubia, lentils, cowpeas and greengram.

12. *Callosobruchus chinenis* (Linnaeus)

(Figs. 39-41,44,47,50,57,59-62)

C. chinenis, the Adzuki Beanseed Beetle, originated in Asia, but is now cosmopolitan in the tropics and subtropics. Seeds of pigeon pea, chick peas, lentils and cowpeas may be attacked by this bruchid.

British locality and host records are as follows: ex *Heracleum sphondylium*, Penge Wood, 19th Century (det. Stephens); Scarborough, 19th Century (Lawson & Wilkinson); Salford, 19th Century (Chappell); Manchester, 19th Century (Chappell); in house, West Malvern, post 1900 (Tomlin, 1910); Killamarsh, Derbyshire, 1911 (Pillar); fresh specimen in New Forest, vi.1912 (Sharp, 1913); Liverpool, xii.1946; in Adzuki Beans *Vigna angularis*, Canterbury, x.1980; Soho, London, ii.1981, ex red Adzuki Beans from Chinese supermarket (specimens in NHM). Dobie *et al.* (1984) described its biology.

13. *Callosobruchus maculatus* (Fabricius)

(Figs. 43,46,49,52,56,64)

C. maculatus, the Cowpea Weevil or Cowpea Seed Beetle, originated in Africa, where it is the dominant member of the genus, but it now occurs throughout the tropics and subtropics. It most often infests seeds of cowpeas, lubia or dolichos beans and *Phaseolus* spp. U.K. localities and hosts are as follows: Liverpool Docks, v.1925 (A.M. Massee coll.); ex dried chick peas *Cicer arietinum*, Cirencester, Gloucestershire, xii.1981 (K. Alexander); ex chick peas, Ipswich, Suffolk, vii.1990 (H. Mendel). The biology of *C. maculatus* was dealt with by Dobie *et al.* (1984).

14. *Callosobruchus rhodesianus* (Pic)

(Figs. 42,45,48,51,58,63)

This species occurs in East and Southern Africa, and sporadically in West Africa. It usually infests cowpeas and blackgram.

Subfamily Amblycerinae

15. *Zabrotes subfasciatus* (Boheman)

(Figs. 1-4)

Strongly sexually dimorphic as regards colour/patterning; females with pronotum and elytra strongly marked with white pubescent patterning on dark, almost black cuticle; males bearing uniformly pale brown pubescence over a dark cuticle. Elytra subquadrate, tenth stria about half elytral length (Fig. 4). Pygidium broader than long, with two black spots. Metafemora with longitudinal, ventral groove, bounded by two sharp carina, without teeth. Body length 1.8-2.5 mm. This bruchid originated in the New World, but now occurs widely throughout tropical and subtropical regions. It infests especially *Phaseolus vulgaris* and *P. lunatus*. Dobie *et al.* (1984) described the biology.

Acknowledgements

I wish to thank all those recorders to the National Recording Scheme for the seed and leaf beetles (too many to mention here) for ecological data and locality records used in the preparation of the distribution maps (Figs. 66-74), and especially those mentioned in the text. Moreover, grateful thanks go to Mr R.I. Vane-Wright, Keeper of Entomology, the Natural History Museum (NHM), for allowing the use of facilities in the Department of Entomology.

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Choragus sheppardi Kirby (Anthribidae) in West Cumbria

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On 7th July 2000 I discovered one specimen of this minute anthribid near Nethertown, West Cumbria. The beetle was swept from long grass along a very overgrown cart track near Lop Bank (NX 9907). While in the sweep net the beetle was quite active and was observed to hop several times before being tubed.

C. sheppardi is graded Notable A by Hyman (1992) and has been recorded from a large number of counties in England. It has alo been recorded from Wales, Scotland and Ireland. According to Morris (1990), *C. sheppardi* is associated with old dead Ivy *Hedera helix* and the larvae develop in the fungus-infected wood. It is possible that my specimen may have come fom a large patch of old Ivy which was growing on the trunk of an old hawthorn *Crataegus* tree in the immediate area by the cart track. *C. sheppardi* is also an Ancient Woodland Indicator species (Harding & Rose, 1986).

As fas as I am aware this is the first record of *C. sheppardi* from vice-county 70 (Cumberland) as it is not listed by Day (1923) and there are no local specimens in the Coleoptera collections of F.H. Day, James Murray and G.B. Routledge in the Tullie House Museum at Carlisle.

Acknowledgement

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

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Notes on the natural history, distribution and identification of seed beetles (Bruchidae) of Britain and Ireland
By M. L. Cox
We expect that many coleopterists will wish to make extensive use of Dr Cox's new key to the Bruchidae, 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.**

Are Glow-worms *Lampyris noctiluca* (Linnaeus) (Lampyridae) distasteful?

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Some North American lampyrid species have been found to contain toxins, known as lucibufagins, in sufficient quantities to kill a medium-sized lizard if swallowed (Eisner *et al.*, 1978, Knight *et al.*, 1999, Meinwald *et al.*, 1979). However no comparable study seems to have been carried out on the European Glow-worm *Lampyris noctiluca*.

With this in mind I decided to see whether Robins *Erithacus rubecula* could be persuaded to tackle Glow-worm larvae, and if so what the outcome would be. Between 1996 and 2000 I offered semi-tame Robins a choice between a Glow-worm larva and a Mealworm larva (*Tenebrio molitor* Linnaeus) of about the same size. On each of the 92 occasions without exception, the Robin took the Mealworm but rejected the Glow-worm. The Robins were not marked and so could not be recognised individually, but there were at least three of them.

This result in itself is not totally conclusive as some of the Robins had originally been tamed using Mealworms, and so may simply have been choosing the food with which they were most familiar. However, whenever the Robin took a Mealworm I waited to see whether it would then eat the Glow-worm, in effect giving it the choice between that or nothing. On each occasion it chose nothing, flying off empty-beaked until another Mealworm became available.

To see whether the Robins were recognising the Glow-worms by their colour, rather than for example their shape, I also made up some simple 'artificial larvae' from pieces of rolled uncooked pastry dough, some of which I stained black with food dye to resemble Glow-worm larvae, whilst others I left pastry-coloured. Again the results were clear-cut: in each of the 27 tests the Robin went straight for the plain 'larva'. On just three occasions did it then come back to take the black one, preferring instead to wait until I had restocked with another plain one.

It appears therefore that at least one predator regards Glow-worm larvae as unpalatable. This may account for the fact that prior to pupation large, conspicuous larvae can often be seen wandering about on open ground in broad daylight, apparently untroubled by predators. Furthermore, at least in the case of Robins, it may be the larva's black coloration that gives the warning signal (the pulses of light emitted by larvae at night may serve a similar function for nocturnal predators). Of course it is quite possible that the larvae are not harmful at all and are simply mimicking a species that is. Here the final word goes to Martin Newcombe (*pers. comm.*) who may well have the distinction of being the only person known to have tasted a Glow-worm, in this case a dead male. He describes the taste as bitter, with a rather sharp or hot element and a distinct but indescribable aftertaste. All in all not a pleasant experience.

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New and noteworthy Coleoptera from Wales

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The following list of records is mainly the result of recent collecting in Wales. A few records arise from reidentification of old material in the collection of the National Museum of Wales, Cardiff (NMGW). The number of new records for Glamorgan, probably the best collected area of Wales, is indicative of the relatively small amount of collecting that has been carried out in Wales in comparison to England. No doubt many more interesting records will be forthcoming when other areas and habitats are investigated.

Other recent records of interesting finds in Wales by the authors are listed in Levey (1998) and Levey & Pavett (1998 & 1999), and are not repeated here.

CARABIDAE

Notiophilius quadripunctatus Dejean **Nb**

A single specimen was taken under driftwood on Whitford Burrows (SS 436942), Glamorgan on 7.iii.1998. Another specimen was taken among river debris collected at Aberdulais Basin (SS 784995), Glamorgan, on 23.x.1998. It is believed that these are the only records for Wales.

Thalassophilus longicornis (Sturm) **Na**

A very scarce species which is difficult to find, due to its elusive ways. A number of these beetles were found by digging in the shingle close to the water's edge, on a shingle bank on the R. Towy near Llandeilo (SN 603221), Carmarthenshire, on 3.vi.1997.

Asaphidion sterlini Heyden

A single specimen was recorded on the dunes at Nicholaston (SS 516879), Glamorgan, on 16.iv.1987. We believe this to be the first record of the species in Wales.

Bembidion geniculatum Heer

There are two specimens in the NMGW collection bearing the data 'R. Dee, N. Wales, 290-11.96'. These specimens are from the J.R.le B. Tomlin Collection and came to him via W. Chaney. The information in the Chaney notebooks indicates they originally came from W.E. Sharp of Ledsham, Cheshire and were originally identified as *B. atrocoeruleum*. There are very few Welsh records of this species.

Bembidion monticola Sturm **Nb**

A scarce species in South Wales, this being, we believe, the second and only recent record for Glamorgan. A single specimen was taken on a shingle bank at Aberdulais Basin (SS 788997) on 20.x.1987. Further specimens were taken from flood debris on 23.x.1998.

Bembidion quadripustulatum Serville **Nb**

One specimen was collected on the banks of the R. Towy near Llandeilo (SN 603221), Carmarthenshire, on 14.vi.1996, and three specimens were collected on damp mud at the edge of Llandegfedd Reservoir, Monmouthshire (SO 333006), on 9.vi.1997. There are no other Welsh records of this species.

Bembidion clarki Dawson **Nb**

A single specimen was collected from moss in a dune slack on Merthyr Mawr (SS 872770), Glamorgan, on 4.v.1992.

Bembidion quinquestriatum Gyllenhal

A single specimen was found under a large flowerpot standing on paving stones in a garden in Whitchurch, Cardiff, Glamorgan (ST 157797), on 13.iv.1998. This is the only recent record for Glamorgan.

Tachys parvulus (Dejean) **Nb**

Four specimens were collected on the shingle banks of the R. Towy near Llandeilo (SN 603221), Carmarthenshire, on 14.vi.1996. There appears to be only one or two previous records of this species from Wales.

HISTERIDAE

Plegaderus dissectus Erichson **Nb**

Six specimens were collected in a flight interception trap in secondary oak *Quercus* woodland adjacent to open areas containing some ancient oak trees, at St Fagans (ST 1177), Glamorgan, in the period 16-24.vi.1997. This is the first record for Glamorgan.

SCYDMAENIDAE

Euconnus duboisi Méquignon

Two specimens of this species, standing as *Scydmoraphes sparshalli* (Denny), were found in the NMGW collection. One specimen from Cwrt-yr-ala, Glamorgan, 2.xii.1916, H.M. Hallett, and one from Penarth, Glamorgan, ex J.R.le B. Tomlin coll. The former specimen is the earliest known record of this species from Britain and these are the first records for Wales.

STAPHYLINIDAE

Hadrognathus longipalpus (Mulsant & Rey)

This species appears to be widespread in S. Wales. The following records have not previously been published and are additional to those mentioned by Holmes *et al.* (1990). One specimen from moss growing on oak trees in damp woodland at Allt yr Rhiw (SS 9386), near Blackmill, Glamorgan, on 7.ii.1998. Found commonly on 14.x.1991 by sieving grass tussocks at Craig Y Llyn (SN 908029), Glamorgan. A single specimen was sieved from a wood ants' nest at Priory Meadows, Fairwood Common (SS 577937), Glamorgan, on 23.xi.1996.

Oxytelus migrator Fauvel

One specimen was sieved from a warm grass heap near the R. Usk (SO 1223), Breconshire, on 17.ix.1998. This is the first Welsh record for this recently established species.

Thinobius crinifer Smetana

Two teneral examples of this tiny staphylinid were collected from the roots of grass growing near the water's edge on a shingle bank on the R. Towy near Llandeilo (SN 603221), Carmarthenshire, on 15.vi.1998. This is believed to be the second Welsh record for this species.

Neobisnius procerulus (Gravenhorst) **RDBK**

A single specimen was collected from moss at Crymlyn Bog (SS 687943), Glamorgan, on 24.vi.1997. This appears to be the first record of this species for Wales.

Neobisnius prolixus (Erichson) **RDBK**

Two specimens were collected from shingle banks of the R. Towy near Llandeilo (SN 603221), Carmarthenshire, on 3.iv.1997. There are a few recent records of this species from Wales.

Neobisnius villosulus (Stephens)

One specimen was collected on the banks of the R. Towy near Llandeilo (SN 603221), Carmarthenshire, on 14.vi.1996. This appears to be the first record of this species from Wales.

Mycetoporus punctus (Gravenhorst) **Notable**

A single specimen was collected in a flight-interception trap in secondary oak woodland adjacent to open areas containing some ancient oak trees, at St Fagans (ST 1177), Glamorgan, in the period 16-24.vi.1997. This appears to be the first record from S.Wales.

Meotica anglica Benick **Nb**

A single specimen was collected from flood refuse on the banks of R. Taff at Llandaff (ST 148787), Cardiff, Glamorgan, on 24.x.1998. This appears to be the second record from S. Wales. Taken commonly on the R. Usk on 11.vi.1998 by A.P. Fowles (*pers. comm.*).

Oxypoda lurida Wollaston **Notable**

About ten specimens were collected running on bare sand at Merthyr Mawr Warren (SS 8676) on 28.iv.1999. This is the first record for Wales. This species has apparently only previously been recorded from southeast England.

PSELAPHIDAE

Euplectus bonvouloiri rosae Raffray **Nb**

A single specimen was collected in a combined interception trap placed in the lower branches of an ancient oak tree at St Fagans (ST 1177), Glamorgan, in the period 16-24.vii.1997. This appears to be the second record of this species from Wales and the first from Glamorgan.

Euplectus duponti Aubé **Notable**

A single specimen was collected from flood refuse on the banks of R. Taff at Llandaff (ST 148787), Cardiff, Glamorgan, on 24.x.1998. This is the first record of this species from Wales.

Euplectus kirbyi Denny **Notable**

A single specimen was collected in a flight interception trap in secondary oak woodland adjacent to open areas containing some ancient oak trees, at St Fagans (ST 1177), Glamorgan, in the period 16-24.vi.1997. This appears to be the second record of this species from Wales and the first from Glamorgan.

SCARABAEIDAE

Aegialia sabuleti (Panzer) **Nb**

During 1998 this species was collected from flood debris on two occasions in Glamorgan, once from the R. Cynon near Cwmbach (SO 025009) on 3.iii.1998, and once from the R. Neath at Aberdulais Basin (SS 784995) on 22.x.1998. On both occasions this species was not uncommon.

LIMNICHIDAE

Limnichus pygmaeus (Sturm) **Na**

A single specimen was collected by trampling vegetation along a ditch on Margam Moors (SS 785845), Glamorgan, on 7.v.1999. A scarce species with very few Welsh records.

BUPRESTIDAE

Agrilus angustulus (Illiger) **Nb**

A number of individuals were found on a stunted oak growing along a footpath in the conifer woodlands of Pembrey Forest (SN 397007), Carmarthenshire, on 31.v.1985. A single specimen was beaten from birch *Betula* at Rhosgoch Common (SO 1948), Radnorshire on 7.vii.1999, by Mike Wilson. There appear to be only three records of this species from Wales.

Aphanisticus pusillus (Olivier) **Nb**

A number of these beetles were found in a dune hollow on Kenfig Burrows (SS 769799), Glamorgan on 29.iii.1997. Two specimens were collected in a dune hollow on 28.iv.1999 at Merthyr Mawr Warren (SS 8676).

EUCNEMIDAE

Melasis buprestoides (Linnaeus) **Nb**

A single specimen was extracted from hard oak wood at Coed Gwaenydd Bach (SO 029008), Glamorgan on 14.viii.1991. This is a scarce species in Wales with only a few records.

NITIDULIDAE

Epuraea angustula Sturm **Nb**

A single specimen was collected in a combined interception trap placed in the lower branches of an ancient oak tree at St Fagans (ST 1177), Glamorgan, in the period 9-16.vii.1997. This is the second Welsh record of this species.

SPHINDIDAE

Sphindus dubius (Gyllenhal) **Nb**

A single specimen was collected in a flight interception trap in secondary oak woodland adjacent to open areas containing some ancient oak trees, at St Fagans (ST 1177), Glamorgan, in the period 16-24.vi.1997. This is the first record of this species from Glamorgan.

CUCUJIDAE

Uleiota planata (Linnaeus) **Na**

Twelve of these beetles were found under bark of a fallen trunk at Techon Marsh (SN 544986), Carmarthenshire on 31.vii.1984. This is the only record of this beetle from Wales.

CRYPTOPHAGIDAE

Atomaria scutellaris Motschulsky **RDBK**

Found very commonly at the base of Sea Beet *Beta vulgaris* ssp. *maritima* at Pembrey Burrows (SN 3900), Carmarthenshire on 21.xi.1998 and as a singleton which was swept at Rhosilli Down (SS 417883), Glamorgan, on 3.v.1999. This is the first record of this species from Carmarthenshire. There is one previous record from Wales, from Glamorgan.

Cryptophagus intermedius Bruce **RDBK**

A single specimen was taken in a combined interception trap placed in the lower branches of an ancient oak tree at St Fagans (ST 1177), Glamorgan, in the period 19-25.viii.1997. This is the first Welsh record of this scarce species.

CERYLONIDAE

Annomatus duodecimstriatus (Müller) **Na**

A single specimen was collected from flood refuse on the banks of R. Taff at Llandaff (ST 148787), Cardiff, Glamorgan, on 24.x.1998. There are very few Welsh records of this species.

COCCINELLIDAE

Coccidula scutellata (Herbst)

A single specimen was recorded from Pant Y Sais Fen (SS 717941), Glamorgan on 23.v.1990. This is believed to be the first record for Glamorgan, although the species has been recorded from the Gwent Levels on several occasions.

COLYDIIDAE

Cicones variegatus (Hellwig) **Na**

A single specimen was collected from under the bark of a fallen beech at Allt Yr Esgair (SO 1223), Breconshire on 14.ix.1996. This is the first record for the species in Wales.

Colydium elongatum (Fabricius) **RDB3**

Two specimens of this rare beetle were recorded from the woodland of Coed Gwaenydd Bach (SO 029008), Glamorgan on 22.ii.1990. One specimen was taken from an old oak stump which was infested with the scolytid *Xyloterus signatus* (Fabricius) (Scolytidae) and another from a living oak in which *Melasis buprestoides* (Linnaeus) (Eucnemidae) had been burrowing. These are the only Welsh records for this species.

Pycnomerus fuliginosus Erichson

Found very commonly under oak bark at Clyne Country Park (SS 603925), Glamorgan on 25.i.1992 and in subsequent years since, but only in the winter months. This is the first record for the species in Wales.

MELANDRYIDAE

Conopalpus testaceus (Olivier) **Nb**

Two specimens were taken in a combined interception trap placed in the lower branches of an ancient oak tree at St Fagans (ST 1177), Glamorgan, in the period 16.vi.- 9.vii.1997. This is the first record of this species from Glamorgan.

Orchesia minor Walker **Nb**

A single specimen was collected in a Malaise trap in secondary oak woodland adjacent to open areas containing some ancient oak trees, at St Fagans (ST 1177), Glamorgan, in the period 25.viii-2.x.1997. This is believed to be the second record of this species from Glamorgan.

OEDEMERIDAE

Ischnomera sanguinicollis (Fabricius) **Nb**

First recorded on 20.vi.1987, and regularly since, at Nicholaston (SS 515880) but only in one small area. Frequently it is found on hogweed *Heracleum* flowers growing in a small fen area along the margins of the woodland at Nicholaston. This is believed to be a scarce species in Wales and is worthy of note being the first record for Glamorgan.

ADERIDAE

Aderus oculatus (Paykull) **Nb**

A single specimen was beaten from an ancient oak tree at Dinefwr Deer Park, Llandeilo, Carmarthenshire on 15.vi.1998. About 20 specimens were taken in a combined interception trap placed in the lower branches of an ancient oak tree at St Fagans (ST 1177), Glamorgan, from 9-24.vii.1997. There are very few Welsh records of this species.

CERAMBYCIDAE

Arhopalus rusticus (Linnaeus)

Recorded from under the bark of dead Corsican Pine *Pinus nigra* on Whitford Burrows (SS 437942), Glamorgan, on 16.viii.1991. It was further recorded, again under the bark of a dead Corsican Pine, in Pembrey Forest (SN 397007), Carmarthenshire, on 27.viii.1991. There are only a few other records of this species from Wales.

Leptura rubra Linnaeus

Previously confined to the Breckland areas of Suffolk and Norfolk this species appears to be spreading in the south of the country. On 11.viii.1998 it was recorded from two sites in Glamorgan, the first records for Wales. A single female was taken on a hogweed flower at Margam Moors (SS 7885) and a male was found crawling over a log on the dunes at Crymlyn Burrows (SS 718938).

Gracilia minuta (Fabricius) **RDB2**

A single specimen of this very rare longhorn was taken whilst sweeping at Magor Marsh (ST 4286), Gwent, on 20.vi.1997. Records for this species in Wales are very scarce.

CHRYSOMELIDAE

Chrysolina sanguinolenta (Linnaeus)

A single specimen was found on Common Toadflax *Linaria vulgaris* growing along the car park wall at Poppit Sands (SN 1548), Pembrokeshire, on 9.vii.1996. A very scarce species in Wales, this being the first record for many years.

ANTHRIBIDAE

Anthribus fasciatus Forster **Na**

A single specimen was taken in flight in a garden in Whitchurch, Cardiff, Glamorgan (ST 157797), on 12.v.1996. The only other Welsh records are from Llangollen and Swansea, the latter record attributable to L.W. Dillwyn prior to 1829, and Abergele, Denbighshire in 1945 (A.P. Fowles, *pers. comm.*).

APIONIDAE

Eutrichapion vorax (Herbst)

One specimen was beaten from herbage on the coastal cliffs at Rhoose Point (ST 070656), Glamorgan, on 20.vi.1996. This is believed to the first Welsh record. Morris (1990) records this species from Glamorgan, but this was subsequently found to be an error (A.P. Fowles, *pers. comm.*).

CURCULIONIDAE

Hypera ononidis Chevrolat **RDBK**

Specimens have been recorded in Glamorgan from Whitford Burrows (SS 436941) on 2.v.1994 and Kenfig Burrows (SS 802820) on 6.v.1995 and 29.iii.1997. There appear to be only two other records of this species from Wales.

Magdalis carbonaria (Linnaeus) **Nb**

A number of larvae and pupae were found in the bark of a birch which had been cut down along the borders of Llanllwch Bog (SN 3818), Carmarthenshire, on 7.v.1992. This is a scarce species in Wales with few other records.

Tapinotus sellatus (Fabricius) **Na**

On 29.v.1992 this species was found not uncommonly on Yellow Loosestrife *Lysimachia vulgaris* at Pant Y Sais (SS 7194), Glamorgan. This is believed to be the first Welsh record for this species.

Microplontus campestris (Gyllenhal) **Nb**

Recorded in Glamorgan from Ox-eye Daisy *Leucanthemum vulgare* on the limestone cliffs at Horton (SS 485855) on 14.v.1995 and Oxwich (SS 497853) on 14.iv.1994. This is a scarce species in Wales with few other records.

Ceutorhynchus rapae Gyllenhal **Nb**

A single specimen was swept from streamside vegetation at Pyle (SS 8283), Glamorgan, on 25.v.1987. There are only three known records of this species from Wales.

Anthonomus rufus Gyllenhal **pRDB3**

A single specimen was collected by beating dead branches of blackthorn *Prunus* at the Welsh Wildlife Centre, Pembrokeshire (SN 1845), on 6.vii.1996.

Furcipus rectirostris (Linnaeus) **Nb**

Recorded on 19.iii.1990 from Coed Gwaenydd Bach (SO 029008), Glamorgan. This constitutes the most southerly record in Wales for this species.

Acknowledgements

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Dromius vectensis Rye (Carabidae) rediscovered in Cornwall

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On 13th April 1995 at Tregardock, E. Cornwall (VC 2; SX 0484), during an entomological survey for the National Trust, AGD obtained a small *Dromius (Dromiolus)* species, thought at the time possibly to be *D. vectensis*, probably from cliff-top scree (unfortunately there is no record of the situation in which it was found). In August 1999 it was sent to Dr Martin Luff, who confirmed it as a definite *D. vectensis* on the basis of its diagnostic pale elytral bases and dark brown (rather than black) abdomen.

On 31st July 1998, at Trerathick Point, W. Cornwall (VC 1; SW 846686), while searching (unsuccessfully) for *Cathormiocerus* weevils by sieving soil/sand from the bases of plantains *Plantago*, RGB hand-collected a single male specimen of *D. vectensis* from the dry, poorly vegetated ground at the top of the cliff.

D. vectensis is given a status grading of RDB3 - Rare (Hyman, 1992) and since 1970 has been recorded only from Dorset, the Isle of Wight, E. Sussex and both W. & E. Kent (Luff, 1998). In Southwest England there are very few records, all pre-dating 1970: in South Devon (VC 3) it has been found near Seaton (SY 29) and from the Torcross-Beesands area (SX 84) (Keys, 1918), while Dr R.T. Bannister found it on a cliff at Lamorna, W. Cornwall (SW 42), in June 1924 (Bannister, 1968). The recent records are therefore probably the first since 1970 from the Southwest Peninsula and apparently the first from its north coast, while that for East Cornwall is apparently new for the vice-county.

It is of interest that both of the recent Cornish records have been from the tops of northwesterly-facing cliffs. Although cliff-tops would seem to be an unusual habitat for a species found among the shingle of Dungeness etc., the humidity levels in the two habitats are probably not too dissimilar. Certainly it may be presumed that *D. vectensis* occurs more widely along both the north and south coasts of Cornwall, and should be carefully looked for in such situations.

Acknowledgements

AGD would like to thank Simon Ford for arranging access to the Tregardock site, Martin Luff for identifying and commenting upon his specimen, and Andrew Foster for information on historic records from Cornwall and Devon.

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Wood-boring Coleoptera in driftwood

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In a survey on the distribution of *Pselactus spadix* (Herbst) in England and Wales (Oevering *et al.*, 2000), 43 samples of driftwood were collected from beaches and river mouths at 21 locations (methods described in Oevering *et al.*, 2000). Of these samples, two were not colonised by invertebrates, nine contained tunnels of unknown origin and five were previously infested by wood-boring crustacea *Limnoria* spp. Another five had been previously infested by cossonines (identified using gallery dimensions and frass morphology) and one was infested by Diplopoda. The 21 remaining samples were infested by five cossonines (Curculionidae): *P. spadix*, *Mesites tardii* (Linnaeus) singly, or together with *Caulotrupes aeneopiceus* (Boheman), *Euophryum confine* (Broun), *Pentarthrum huttoni* (Wollaston) and one anobiid: *Anobium punctatum* (Linnaeus). A living ambrosia larva was found in a *Castanea* sp. twig, but was not identified (Table 1).

Although for most insect species flight is the main mode of dispersal, intertidal species also disperse via driftwood (Cheng, 1976). Folwaczny (1983) suggested the flightless *P. spadix* dispersed in this way and the presence of *P. spadix* in 19% of the driftwood samples collected here supports this. Kuschel (1969) proposed that the terrestrial *P. huttoni* and *E. confine* may also disperse in this way. The occurrence of these species together with *M. tardii*, *C. aeneopiceus*, *A. punctatum* and an ambrosia beetle (Platypodidae) in driftwood suggests that wood-borers, even those capable of flight, may be partly distributed in driftwood. This may occur when adults or larvae infest wood in a habitat that allows transport by water.

Table 1: Coleoptera found colonising driftwood in England and Wales.

Coleoptera	Wood speciesa	Timber	Location	Grid ref.
Pselactus spadix	*Alnus* spp.	Twig	Felixstowe	TM 2830
	Fagus spp. (2x)	Log	St Anthony	SW 7725
	Pinus caribaea	Structural	Llanelli	SS 5098
	Pinus sylvestris	Structural	Great Yarmouth	TG 5303
	Softwood[b] (2x)	Branch	Helford	SW 7626
	Softwood[b]	Branch	Aberaeron	SN 4563
Mesites tardii	*Fagus* spp. (2x)	Branch	Dartmouth	SX 8851
	Fagus spp.[d]	Twig	Bodinnick	SX 1351
	Fagus spp.	Twig	Boverton	SS 9868
Pentarthrum huttoni	*Ocotea* spp. (4x)	Structural	Angle Harbour	SM 8602
Euophryum confine	Softwood[bd]	-[e]	Helford	SW 7626
	Ulmus spp.	Plank	Beaumaris	SH 6076
Caulotrupes aeneopiceus	*Fagus* spp.[c]	Twig	Bodinnick	SX 1351
Anobium punctatum	*Ocotea* spp.	Structural	Angle Harbour	SM 8602
	Fraxinus spp.	Structural	Beaumaris	SH 6076
Platypodidae sp.	*Castanea* spp.	Twig	Trelissick	SW 7626

[a] Numbers indicate different pieces from same location; [b] Microbial decay impeded identification; [c] Present in same twig; [d] Diplopoda present in same sample; [e] Unidentifiable.

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Bolitochara reyi Sharp (Staphylinidae) - not a British species

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The most recent full checklist of British beetles (Pope, 1977) lists six species of the genus *Bolitochara* as occurring in Britain. Five of these are distinctive and well-known, but one of them, *Bolitochara reyi* Sharp, has a place on the British List on the basis of just one published record—a single male captured in Windsor Forest by Horace Donisthorpe in September 1928 (Keys, 1931). Many years ago I examined this specimen, in the collections of The Natural History Museum, London (NHM), and was unable to satisfactorily distinguish it from British specimens of *Bolitochara lucida* (Gravenhorst), but left the matter there. However, recently I made a more thorough examination of the Donisthorpe specimen and studied available British and Continental European material of *B. lucida* and *B. reyi* with a view to establishing whether the latter species is, in fact, reliably recorded from Britain.

Sharp's original description of *B. reyi* notes how similar it is to *B. lucida*, but that it differs from that species by having a broader form, longer antennae, with the distal antennomere 'distinctly longer', finer puncturation of the foreparts, and the elytral depressions characteristic of *B. lucida* poorly developed. Sharp described *B. reyi* on the basis of a single old specimen, reputed to be from Paris, France, from Castelnau's collection. However, in view of what is currently known of the European distribution of the species (see below), some doubt may be cast on the true provenance of the type. In Lohse's (1974) key to Central European species of *Bolitochara*, *B. reyi* comes out, as might be expected, closest to *B. lucida*, where it is distinguished by its larger and more robust build, finer puncturation of the foreparts, longer and more slender antennae, and generally darker colouration.

Horion (1967), in recording *B. reyi* from West, Central and Southern Europe, commented that its true distribution is not very clearly understood. He mentioned the single record for England, noted just one for France (Fontainebleau), and that the few previous records for (southern) Germany require confirmation. Records he regarded as reliable appear to be mostly for mountainous regions of south-central and southeastern Europe. Lucht's more recent (1987) catalogue of Central European Coleoptera, gives records for *B. reyi* from Austria and Czechoslovakia only, no records being given for Germany, Poland, northern Switzerland, eastern France, the Benelux countries, Denmark or southern Sweden.

In recording *B. reyi* from Britain, Keys (1931) stressed that the Windsor male specimen differs from *B. lucida* by its longer antennae and also 'appreciably' in the form of the male genitalia. In the review of British beetle species not mentioned in Joy's (1932) handbook, Hodge & Jones (1995: 47) note the characters originally listed by Sharp for the separation of *B. reyi* from *B. lucida*. Otherwise, the only recent mention of the species in the British literature is that of Hyman (1994) who include the species in his review of scarce and threatened British beetles. He allocates *B. reyi* Red Data Book Indeterminate (RDBI) status, and note an unconfirmed and unpublished record for Leicestershire in addition to the single record for Windsor. It seems likely that this Leicestershire record is based on two female specimens from Gopsall Park, collected on 22nd September 1941 by Horace Donisthorpe, and standing in his collection (in NHM), as *B. reyi*. Donisthorpe's collecting journal (in the NHM library), notes the capture of these two specimens with the note that they represent the second British record for the species.

Examination of the holotype female of *Bolitochara reyi* Sharp (in the collections of NHM) confirms that the species is distinct from, although rather similar to, *B. lucida* Gravenhorst. Some of the differences between the two species mentioned in the works referred to above, notably the length of the antennomeres, are difficult to appreciate. However, *B. reyi* does appear to differ consistently from *B. lucida* in its larger and broader head, with better developed temples, finer puncturation of head and pronotum, denser and more even abdominal puncturation, evident microsculpture on all abominal tergites, and virtual absence of a diagonal impression on the elytra. The colouration of *B. reyi* appears to be generally more uniform, with the upper surface generally dark brown and lacking the contrasting colouration that is generally a feature of the elytra and abdomen of *B. lucida*. The Windsor specimen identified as *B. reyi* by Keys (*loc. cit.*), on the other hand, is relatively large, but both it and the two females from Gopsall Park are typical examples of *B. lucida* in all respects including, in the case of the Windsor specimen, the form of the male genitalia.

Horace Donisthorpe is well known to have reported beetle species as additions to the British fauna on slender evidence, but the reason for Keys' decision to associate the Windsor specimen with *B. reyi* remain a mystery. On the basis of the available evidence *B. reyi* should not be regarded as a British species. Despite the (possibly false) listing of 'Paris' as its type locality, evidence for the presence of the species elsewhere in northern or western Europe seems slim.

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Review

The Ground Beetles of Northern Ireland (Coleoptera-Carabidae) by Roy Anderson, Damian McFerran & Alastair Cameron. Ulster Museum Publication No. 279, 2000. 246 pp., 64 col. pl., 6 figs., 166 maps. Hard cover 152 x 218 mm. Price £14.99.

This attractively produced book is the first of a series of publications from the Centre for Environmental Data and Recording (CEDaR), the Local Records Centre for Northern Ireland. The data used comprises relevant records from the I.T.E. Biological Records Centre at Monks Wood, supplemented by the results of dedicated pitfall surveys in Northern Ireland, such as the monitoring of Environmentally Sensitive Areas. These cover 21% of the land area, and have resulted in 36% of the total of 14,082 records from 1,052 sites. The (smoothed) species richness of individual 10-km grid squares ranges from 78 (one square) to a single species (seven squares), spread fairly evenly across the Province, save for generally fewer species recorded in the Co. Tyrone region.

The relatively small land area of Northern Ireland means that maps alone can give little idea of wider distribution patterns of carabids, nor of their habitat preferences. However the authors have compensated for this by including much more information than just distribution maps. The first chapter thus outlines the relationships between soil conditions and ground beetle community structure. After an overview of soils, and vegetation history in N. Ireland, there is a multivariate analysis, using TWINSPAN, of all 566 sites that contained at least seven recorded carabid species. This divides the ground beetles into 14 habitat groups, which the authors relate to such features as altitude, soil moisture and vegetation type.

The next chapter considers the biogeography of Irish carabids, using Biome Codes previously derived by Preston & Hill for vascular plants. Each species is assigned to a code based on any wider distributional information available, and nine faunal elements are recognised within the N. Irish fauna. These are then discussed in comparison with the British fauna. Following this, there is a section of excellent colour plates, two to a page, depicting 54 Irish ground beetles photographed in their habitats, and eight photographs of characteristic Irish habitat types.

Chapter 3 is the largest (101 pages) in the book. An updated check list of Irish Carabidae, is followed by 10-km square maps for each species, divided into the conventional pre- and post-1970 categories, together with brief notes on their N. Ireland and world distribution, and a summary of their ecology. It is good to see that notes on species that occur in the Republic, but not in N. Ireland, are also included.

Chapter 4 is a separate review paper by J.H. McAdam & W.I. Montgomery, on the impact of land use changes and management on ground beetle species assemblages. This is a comprehensive and useful review of a wide range of man's impacts on carabid habitats, and has relevance to a much wider area than just N. Ireland, from which the bulk of its references are derived. The book concludes with lists of references, and appendices which list both the Irish and British carabids according to their biome codes.

My only major criticism of this work is the rather arbitrary arrangement of the chapters, with the maps section being sandwiched between discussion and review papers by different authors. The book lacks an overall coherence, and is rather a compendium of separate items about the Irish carabids. The presence of two distinct appendices listing the biome codes of Irish and British carabids also seems unnecessary, as species occurring in both Britain and Ireland are duplicated in both lists. However the authors have updated and presented most available knowledge about the Carabidae of not only one province, but the whole of Ireland. There are few minor errors and the work is hard bound in a decorative cover depicting a close up of *Carabus nitens*. Overall this is a book to be welcomed both by those with an interest either in ground beetles, or in the previously sometimes neglected Irish insect fauna. It is worth its cover price for the colour photographs alone.

Martin Luff

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