Ground-beetle identification and ecology

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Part 1: Background

1 INTRODUCTION

These notes formed the basis of a 10 week series of evening classes first run in Spring 2001, and since repeated 6 times. In 2008, it was condensed into a weekend course, run in May and September. Now, it's back to the 10 session format. The first series was run jointly with Mark Telfer, the organiser of the national Ground Beetle Recording Scheme, who provided the checklist and some of the introductory notes. This introduction tries to explain why anyone might want to study ground-beetles (Coleoptera: Carabidae, often called 'carabids'), and what this course aims to achieve. It also provides some facts and figures about ground-beetles, and some snippets of general ecology and conservation biology, which may make the task of "learning your carabids" less daunting and more purposeful.

The introductory chapters of Forsythe's *Naturalist's Handbook* on common ground-beetles will fill in many more of the background details. The publishers, Richmond Publishing, have kindly given the Wildlife Trusts a supply of the first (1986) edition, so copies are available during the course. The second edition (2000) has more detailed keys, and is larger (96 pp. rather than 75 pp). The illustrations are often referred to in these notes, and the keys provide an alternative way of reaching a species identification - one of the Appendices to these notes tabulates the page(s) at which to start with either volume of Forsythe if you know the genus of a carabid. The main difficulty with Forsythe for beginners is a result of the keys trying to make allowances for mistakes - many species key out in several places, and the keys loop back on themselves frequently: as a result, it is almost impossible to re-trace your steps if you make a mistake. For that reason, and so that all participants have a set of keys at the end of the course, I have produced my own keys, in plainer English than most published sets. Most recently, a new handbook has been published, with improved illustrations and keys (Luff, 2007), which will be the standard work for serious carabid enthusiasts for many years; it is more technical than Forsythe or the keys presented here, but is probably the work to move onto after this workshop.

1.1 Why a course on carabids?

The Wildlife Trust, and many field centres, run general natural history and ecology courses. These give participants a reason to identify species, without the skills to do so. The Wildlife Trust has also run lots of one-day workshops on invertebrate identification. In one day, you can learn to identify a fair proportion of dragonflies, grasshoppers or ants to species level, because these are species-poor groups in Britain. But thyat species-poorness is a limitation. This course aims to give participants the beginnings of real species-level field skills, in a group which is diverse enough to be useful in site evaluation in most habitats. (The underlying motivation, apart from a belief that invertebrates are fascinating in their own right, is to help you apply a knowledge of invertebrates to nature conservation problems.)

The ground-beetles are an ideal group for the conservationist, ecologist, student or amateur naturalist to study, for several reasons:

- around 360 species (about as diverse as birds in Britain);
- numerous characteristic species, including good 'habitat indicators' in almost all habitats;
- a modern national distribution atlas, and well-defined conservation status and rarity categories;
- a rich ecological and behavioural literature;
- readily sampled, both by pitfall trapping and by direct searching;
- almost all species can ultimately be identified alive, in the field, with no more than a hand lens (manycan be recognised with the naked eye)
- fascinating behaviour, and an amazing range of colours, shapes and textures
- an ideal place to begin studying entomology, which goes beyond the 'compare-with-pictures' approach of most guides to butterflies, moths and dragonflies.

1.2 Objectives and opportunities: what can you get out of it?

This course aims to provide participants with the following information:

- a guide to basic entomological skills, in collecting, studying and identifying ground-beetles
- new keys to name the majority of British carabid species accurately using a microscope
- pointers to identifying species in the field with a hand lens
- summary information on the distribution, habitats and ecology of species enabling you to interpret the results of surveys, and assess the conservation value of sites, on the basis of their carabid fauna

Most of the keys were written specially for previous courses, where they were tested. No doubt this course will help correct some of the remaining problems with the keys or the identification features.

Although ground-beetles have long been popular with collectors, and the published literature is written with dead, pinned or carded specimens in mind, almost all British species can be identified accurately in the field with a hand lens, given sufficient experience. So, whenever using a key with a binocular microscope, it's a good idea also to try seeing the key features with a x10 hand lens. You may be pleasantly surprised - very often, quality of lighting is more important than magnification in seeing a feature, and a hand-held specimen in sunshine may be easier to identify than a dead specimen under a microscope.

Toward the end of the first part of the course, I will also provide some ideas for interpreting ground-beetle records for nature conservation, and an appendix provides draft information in the habitat use and indictor status of ground-beetles, which should allow you to interpret any species lists which you come across, in a more objective way.

2 IDENTIFYING GROUND-BEETLES: KEYS AND KEYING

CLASSIFICATION AND THE PARETO PRINCIPLE

2.1 Invertebrates, Arthropods, Insects, Beetles, Carabidae

Invertebrates are animals without backbones; there are about 30,000 species on land and in freshwater in Britain. ***Arthropods*** are the Phylum of jointed-limbed invertebrates with a hard outer casing or exoskeleton; among others, these include crustaceans, arachnids, centipedes etc., and maybe 25,000 British non-marine species. ***Insects*** are the Class of 6-legged arthropods, usually with 2 pairs of wings, and a 3-part body: head (usually with a pair of antennae, and 2 pairs of palps), thorax (where the legs and wings join the body) and abdomen. There are about 23,000 known species of insect in Britain.

Beetles (Coleoptera) are the Order of insects with the fore-wings modified into hard protective cases, called elytra. They have jaws for chewing (not sucking mouth-parts like bugs and flies), and they have a 4-stage lifecycle: egg, larva, pupa, adult beetle. The pupa has the appendages (legs, wings, mouthparts) visible from the outside (unlike, say, a butterfly's chrysalis or a fly's puparium). There are about 4000 species of beetle in Britain, divided between about 88 families (depending on whose classification you follow). Lest this seem too daunting, it's helpful to note that the largest four families account for over half the species:

Staphylinidae (rove-beetles)	994 species
Curculionidae (weevils)	416 species
Carabidae (ground-beetles)	364 species
Chrysomelidae (leaf-beetles)	256 species

At the other extreme, 41 of the 86 families have 10 or fewer species each. A key to the most important families of beetles, and lists of all families with the numbers of species they contain, is provided in the Appendices.

Ground-beetles, family Carabidae, are thus one of the 'big four' beetle families in Britain, with about 360 species. They are also the most species-rich beetle family in the world, with over 40,000 known species.

So, to review progress so far: if you can recognise that something is a ground-beetle, you've narrowed it down from 30,000 invertebrates, to 23,000 insects, to 4,000 beetles, to 360 ground-beetle species. You might have named its genus (a group of related species) or you could know even what species it is.

2.2 The Pareto Principle

The fact that a few families of beetles account for most of the species is oddly reminiscent of an ecological principle which makes learning natural history less daunting, and less of a memory test, than it might seem.

The Pareto Principle, also known as the 90:10 or 80:20 Rule (depending on where you learn it) comes from the world of business. It states, for instance, that, for any company, 10% of customers will be responsible for 90% of sales. And a different 10% will make 90% of complaints.

The same rule seems to apply to much of the living world, in a variety of ways and with varying precision. The most diverse 10% of beetle families make up about 63% of the species. Looking at the British carabids, there are about 70 genera (a lot to remember?), but the biggest 7 of these (10%) account for 197 of the 364 species (54%). If those classificatory points don't fit the 10:90 rule very closely, the abundance of species in nature can be much more exact: the following results come from a sample of 40 pitfall traps run for 2 weeks at a site in Suffolk in autumn 1993.

Species	**Specimens**	**Traps**
Calathus ambiguus	445	28
Amara bifrons	276	26
Calathus cinctus	232	33
Harpalus smaragdinus	22	12
Amara consularis	19	10
Calathus fuscipes	19	9
Laemostenus terricola	19	9
Amara fulva	16	7
Harpalus froelichii	5	2
Nebria salina	3	3
Amara eurynota	2	2
Amara equestris	2	2
Amara ovata	2	2
Dromius linearis	2	2
Harpalus affinis	2	2
Harpalus anxius	2	2
Notiophilus germinyi	2	2
Agonum dorsale	1	1
Amara aenea	1	1
Amara aulica	1	1
Calathus melanocephalus	1	1
Harpalus rufipalpis (=rufitarsis)	1	1
Leistus ferrugineus	1	1
Syntomus foveatus	1	1
Trechus quadristriatus	1	1
Notiophilus biguttatus	1	1
Total	**1078 specimens of 26 species**	

A few striking features: the top 3 out of 26 species (11.5%) account for 953 of 1078 individual beetles caught (88.4%). So, if you could recognise those 3 species, you could name nearly 90% of the catch. At the other extreme, about a third of the species (9 out of 26) were represented by single specimens. The underlying principle, which is less contradictory than it seems, is that being rare is commonplace in nature: few species in any group are very abundant, and many seem to occur at very small population sizes. And almost all species are patchily distributed (only 5 of 26 species fell into as many as 10 (25%) of the traps).

Eventually, when you know your carabids quite well, you may find this frustrating, or at least challenging (a similar simple ratio of species abundances has inspired the 'twitching' movement among bird-watchers). But in the early stages, it means that the same few species in any habitat will turn up again and again. Learn the handful of widespread and abundant species first, and you can name most of the carabids you see.

With some interesting exceptions, there is a tendency for species frequency to correlate across many spatial scales. In other words, a species which is very abundant in one place will tend to be abundant in many others. It will also occur in a large number of sites, it will tend to have a large geographic range in Britain, and to be widespread in Europe and elsewhere. This interesting fact may be explained by the ecology of species: such abundant, widespread species tend to be ecologically wide-ranging, and to occur in many different habitats. Conversely, rare species tend to be narrowly specialised.

Ironically, the species list above seems to contradict this: the top species, *Calathus ambiguus*, is Nationally Scarce in Britain (occurs in fewer than 100 of the 2860 10-km squares of the Ordnance Survey grid) - looking in the draft checklist, it has been found in only 71 squares. So, why is a scarce species so abundant? Because this was a very peculiar site: it was a very dry, sandy disturbed road verge in the Suffolk Breckland. As you get to know your carabids better, you can look back at the species list and be surprised by the absences: the site is so extreme that not a single specimen of the (usually) very common genus *Pterostichus* was found, and just one specimen in 1078 of the equally common genus *Agonum.* Strange places support strange species.

2.3.1 The predictive power of natural classifications

The most useful key in this course is probably that to the genera of British carabids (thanks to the Pareto principle, although it includes only 50 of the 65 or so British genera, it covers about 350 of the 365 British species). Later in this course are keys to species of most genera - see the index. In Appendix 4, there is also a 2-side table showing where each genus starts in the keys in Forsythe (both editions). The approach of keying to *genus*, then trying to get closer to *species* using later keys or using Forsythe provides a clearer framework to aid the memory than a large key heading straight to species. Conversely, I think it is less confusing to use just 2 keys - genus and species - than to proceed via separate keys to subfamily, tribe, genus, subgenus and species (as Luff's new handbook does). The keys in this course often cross-refer to the illustrations in Forsythe, so it's useful to have both beside you as you work.

Most naturalists use terms like 'genus' and 'species' regularly without being as impressed as they should be by the strength of generalisations which such a classification permits. There are lots of different levels at which we might divide organisms into groups, some of them 'natural' (reflecting the course of evolution as we currently understand it), others entirely artificial. In one beginners' key. I 'classified' carabids into those above and below 13mm in length: entirely artificial, but helpful in writing a key that excludes over 80% of the British species.

An annotated hierarchy placing carabids in the context of life on earth might be useful:

Kingdom ANIMALIA	(carabids are not plants, fungi or micro-organisms)
Phylum Arthropoda	(carabids have jointed limbs, and a tough exoskeleton)
Class INSECTA	(like other insects, carabids have 3 pairs of legs and 2 pairs of wings)

Order Coleoptera	(carabids and most other beetles have the forewings modified into elytra)
Suborder Adephaga	(carabids, in common with about 6 families of diving beetles, and two small groups of non-British dead-wood beetles, share particular features of the underside of the thorax and the attachment of the hind legs. These derive from a time in the evolutionary history of the group when the thorax of insects still showed clear segmentation, in the way the abdomen still does. Unfortunately, the vestiges of this period, fine grooves on the underside of the thorax of modern beetles, are hard to see, hard to illustrate and even harder to describe - an example of where taxonomy and identification part company)
Family Carabidae	All the ground-beetles share many features, some of which were outlined earlier.

The Family Carabidae is divided into about 6 **Subfamilies**, four of which occur in Britain. These are the tiger-beetles (Cicindelinae, 5 species), the bombardier-beetles (Brachininae, 1 or 2 species), the peculiar, rounded species *Omophron limbatum* (Omophroninae), and the other 360 or so species in the Carabinae. Names of subfamilies always end in –inae.

The major subfamily, Carabinae, is divided into between 15 and 25 **Tribes** (names ending in –ini), depending on whose classification you follow. In a later section, I shall discuss the tribes, how they relate to each other, and how genera are grouped within Tribes. At this stage, it's maybe helpful to look at the broader issues of classification, in a way that conservationists and field naturalists seldom do. Why should you bother remembering any of this arcane stuff?

2.3.2 The purposes and value of classification

One reason for ignoring classification is that the main features which taxonomists use to identify species or to establish evolutionary relationships (which are likely to be very different), are structural, anatomical or developmental. These are not the attributes which concern conservationists, who are interested in habitat needs, response to management, and maybe population dynamics or ecological function in the landscape. So, conservationists tend to pay little attention to systematics, and to regard classification and taxonomy as 'service industries'. But the framework of sound taxonomy is more than a tool for naming.

Properly constructed, and reflecting genuine relationships between species, genera, families and higher taxa, the framework has immense *predictive power*, providing reliable generalisations. For example, imagine a new species of diving duck, *Aythya cantabrigensis* (Class Aves, Family Anatidae). Being described as a bird (Class Aves) gives us a clear and reliable mental image of its appearance, structure and behaviour. It will possess feathers, two legs, two wings, a beak (mandibles with horny sheaths), a light-weight skeleton with air-spaces in the bones, a sternum with a deep keel for muscle attachment, it will reproduce by laying eggs with calcareous shells...etc. If we are told that it is a duck (Family Anatidae), we can expect it to have a flattened bill, webbed feet...etc. If it is a diving duck of the genus *Aythya* (allied to tufted ducks, scaup and pochards), we will picture it as a rather short-bodied dumpy duck, which dives and swims below the surface of the water, rather than up-ending. It will probably feed on a mixture of aquatic vegetation and invertebrates, the male will be more brightly coloured than the female. It may also be possible to predict aspects of courtship behaviour, whether both sexes build the nest, how many and perhaps what colour eggs it lays, which parent(s) care for the young, at what age the chicks will fledge, etc., all because the species is placed in the genus *Aythya*. Of course, like most generalisations, there will be exceptions: individual species may to some extent be aberrant. But the power of a sound systematic framework is that many characteristics of closely related species will be shared. This should always be borne in mind when looking for, or attempting to conserve, a species whose individual ecology is poorly known. And this will very often be the case when dealing with invertebrates, especially the rarer and more obscure species.

So, back to carabids and genera. A classification of any kind is useful in helping to remember the diversity of the British fauna. If we classified carabids into 'large', 'medium' and 'small', then into 'black' and 'not black',

you'd be able to place any ground-beetle you saw (though many might be 'rather blackish' and be difficult to be certain about). The 365 species would be divided into more manageable chunks: 60 species bigger than 13mm, of which maybe 40 were 'black' and 20 'not black'.

Unfortunately, the 'large not-black' grouping is a hotchpotch. It includes tiger-beetles (fast-running, agile predators, with amazing tunnel-dwelling larvae), tree-climbers who each caterpillars (the brightly metallic *Calosoma*), some of the more metallic *Carabus* (long-lived, slow-moving, flightless generalist predators), the flattish sea-shore-living scavenger *Eurynebria*, some of the seed-eating *Harpalus* species (with an annual life cycle, and including some very good fliers), and maybe the blue-black rabbit-burrow scavenger *Laemostenus*. So, having defined a carabid as 'large, non-black' we can't say much more about it.

On the other hand, if we divide species according to their evolutionary relations, they will have lots of things in common, just as we saw with the bird-duck-*Aythya* example. All tiger-beetles are large-eyed, sun-loving and fleet of foot. *Harpalus* are seed-eaters (hence, rather slow, short-legged, chunky oval beetles). *Dromius* and its relatives are climbers who often hide (in leaf-sheaths or in grass-roots) during the day and wander around after dark… and so it goes on. Because of this marvellous predictive power inherent in the modern classification of ground-beetles, it's been possible to structure the keys both taxonomically, and by habitat. So, if you can remember the names of the commoner and more species-rich genera, you'll have pegs on which to hang the growing body of information about ground-beetles which the course will put before you.

2.4.1 How keys are written

The first major key in part 2 of this course, the Key to Genera, is likely to be useful throughout the learning process in getting to know your carabids. It should enable you to place almost every British ground-beetle you are likely to encounter in the correct genus, and in doing so, you will explore almost all the parts of beetle anatomy which help in that decision-making process. It cross-refers frequently to Forsythe's handbook, and in doing so, will highlight some of the differences in the ways that different people write keys:

> Forsythe's keys are complex in structure (five keys, numbered by Roman numerals, cross-linked between them, sometimes looping back on themselves and re-starting at several places), but well illustrated. This key to genera is simple (start at couplet 1 and continue to couplet 46) but unillustrated.
>
> Running a specimen through Forsythe, you will often leap several pages forward, then loop back on yourself later. By doing this, Forsythe is sometimes attempting to predict the mistakes you will make, and allowing for them; but it's almost impossible to retrace your steps in Forsythe. With my hand-outs, you will usually progress simply and steadily forward. My keys are less 'forgiving', but make it easy to work backwards and find for yourself where you made a mistake.
>
> Forsythe almost always uses just a single feature at each couplet, which keeps them short and quick to read. I use several features, so that some couplets turn into short essays. If you can't see one of Forsythe's features, you're stumped; if you can't see one of mine, you will probably have several others to choose between.
>
> Forsythe's features are (or at least, read as though they should be) absolute. Mine use relative features (e.g. 'head narrow' versus 'head less narrow') which are difficult in isolation, but can be the best features to distinguish species when you have examples of both options (or good illustrations) to hand.
>
> Because he uses single features at each couplet, Forsythe has to pick features that apply to every species in the group he's keying towards. By using a combination of features, the keys presented here can allow for the variation in a group.

None of the above are 'right' or 'wrong' approaches. Each has its benefits and its drawbacks. Having access to keys which take different routes gives you as near as you can get to a second opinion on each identification

2.4.2 How keys might be read

The last point picks up again on the discussion of classification and identification. Take the following excerpts from the last couplet of the Key to Genera, separating *Agonum* from *Pogonus*. I've highlighted some of the more important words, in case you skip over them. Let's explore its structure and content, and see if it gives us some short cuts in using a key.

46 **Either** the pronotum is simply rounded at sides, without protruding hind angles **or**, **if** sides of pronotum are sinuate with pointed hind angles, **then** antennae are hairy from 4th segment onwards (with large numbers of hairs, which are short, usually curved or lying flat against surface) , contrasting with hairless segments 1 to 3 (which bear a small number of longer bristles). Elytra **usually** broadened toward rear, so whole beetle is pear-shaped. 4.5-12.3mm. *Agonum* (25 spp.)

46a Pronotum with sinuate sides and pointed hind-angles. Antennae hairy from halfway along 3rd segment. Elytra almost parallel-sided, pronotum equilateral or wider than long, about same width as elytra at shoulders. 5.5-8.5mm. Saltmarshes only. *Pogonus* (3 spp.)

It's worth reading the whole before starting to look at your beast. There are 25 species of *Agonum* (in the broad sense) in Britain and only 3 of *Pogonus*. In fact, *Agonum* is a diverse, widespread and important genus in many habitats, from arable fields to lake shores and woodlands. *Pogonus* is a group of three very similar species, all of which are strictly confined to salt marshes. (So, if you get to couplet 46 and your beast isn't from a saltmarsh, it's probably an *Agonum*). Of course, nature being fickle, one day, someone will find a flying *Pogonus* windblown inland on a freak storm and come through their kitchen window in Cambridge… though it's not happened yet.

Some of the information is useful only some of the time. Size: all *Pogonus* are between 5.5 and 8.5mm long. If your beast is 10mm long, it's not a *Pogonus*. If your beast is 7mm long, size is not helpful in identifying it.

The first word, 'Either…' warns you that the features which follow need to be qualified. As it turns out, there are two sorts of pronotum shape in *Agonum*. Some are sinuate at the sides (the edges follow an S-shaped curve, with the hind corners jutting out), and others are smoothly rounded with blunt hind angles. All *Pogonus* have sinuate sides to their pronotum. So, if your beast had a rounded pronotum, look no further: it's an *Agonum*. Sadly, if your beast's pronotum is sinuate at the sides, it could be either. That's where the bit about hairy antennal segments comes in: the *Agonum* species with sinuate pronotum happen to have the third segment smooth and hairless, and so differ from *Pogonus*. A clear distinction, then.

The bit in brackets explains just what is meant by 'hairy' in this context: an important distinction between short fur covering a segment, and a few long bristles sticking up form them. In some keys, notes like this are hidden in an introductory chapter, or in a glossary,

The cautionary 'if' should serve as a warning: read it as "Not all *Agonum* species are like this but…". If you look at enough *Agonum* species, you'll find that many have hairy 3rd segments to their antennae. But those are the ones with the rounded pronotum, so the key still works.

The 'usually' in the *Agonum* couplet is another warning: you can occasionally find an *Agonum* that isn't like this. Such exceptions can be of two types. Some features are variable within species, and the odd individual won't fit the description. And in keys to genera (or other higher taxa), one or two species in a group may differ from the rest. In this case, a single species, *Agonum livens*, is more parallel-sided and less pear-shaped than the others. This gives the key-writer a dilemma: many users dislike 'usually', 'sometimes' and other such qualifiers in keys, as it's not absolutely reliable. But it's helpful to know that most *Agonum* will look pear-shaped. If I tell you that starlings are usually black, it's helpful; if one day you see a pink one, you'll be surprised, but the discovery does not lessen the benefit of knowing that black is the common condition of starlings. Likewise *Agonum*: very few of the *Agonum* you will see in Britain will be *A. livens*, so 'pearshapedness' is a useful attribute to remember.

The above might read more like textual analysis than an aid to identifying beetles. Be patient, and maybe come back to it later. Using keys quickly and reliably is a skill, not unlike solving cryptic crossword clues (some keys are much more cryptic than others, of course). Once you understand the way the key-setter's mind works, and the conventions he follows, you can use his key much more easily. The quirks discussed above apply to many keys, to many groups of organisms. The 'if' clause is a symptom of trying to separate groups of taxa which are quite variable, but whose variation is 'clumped' (so, a particular shape of pronotum always goes with a particular distribution of antenna hair).

An alternative approach, which later hand-outs will illustrate, is to allow two or more genera to key out together, then prepare a key that takes them all to species. This is particularly useful when the main distinguishing features between genera are difficult to see (e.g. mentum teeth and crossed epipleures), but the species are actually well defined. Life is often like this: it's easier to describe the difference between a Corgi and a Dalmatian than it is to tell a person how to distinguish a dog and a cat.

2.5.1 Higher classification: framework for storing knowledge

This first section explains my choice of classification, and something of the alternatives which are in use elsewhere. It probably won't contribute much to your understanding of British ground-beetles, but may maike continental or US literature a little less unintelligible.

As noted earlier, ground-beetles are a single family in the hierarchy which starts at the Kingdom Animalia, Phylum Arthropoda, Class Insecta, Order Coleoptera (beetles), Suborder Adephaga. The Family Carabidae is divided into about 6 Subfamilies, four of which occur in Britain:

Cicindelinae (Tiger-beetles, 5 species),
Brachininae (Bombardier-beetles, 1 or 2 species),
Omophroninae (the peculiar, rounded species *Omophron limbatum*),
Carabinae (the rest)

This is based on one of the more modern classifications of the beetles of the world, following, among others, Moore *et al.* (1987) and Kryzhanovsky (1976), which is also followed by Lindroth (1974), the latest British checklist (Kloet & Hincks, 1976), and is used, for example, in North America, Australasia and most of Europe. It's also the system used in the draft Checklist of species which I gave you at the start of the course.

Previous British workers, from Fowler (1887) through Joy (1932) to Kloet & Hincks (1945) differed in a few respects. The most obvious was that what I treat as a single huge subfamily, the Carabinae, was divided into two, referred to as Carabinae *s.s.* (*sensu stricto* = in the strict sense) and *Harpalinae s.l.* (*sensu lato* = in the broad sense). These divisions have been abandoned mainly because, in other parts of the world, there are ground-beetles which show combinations of features which are mutually exclusive as far as a Eurocentric carabidologist is concerned. So, the groups cannot be regarded as major natural (i.e. evolutionary) divisions. But they may be useful in helping you to impose some logic on the diversity of Carabidae, or in constructing pigeonholes for your new-found knowledge.

The major subfamily, Carabinae, is divided into between 15 and 25 Tribes (tribe names ending in –ini), depending on whose classification you follow. These are included in the Outline Key which accompanies these notes. The key also shows, roughly, how the tribes relate to each other.

Why classify? Why 'naturally'? Why now?

In an earlier section, I discussed the benefits of a 'natural classification' which reflected evolutionary relationships. This was much more likely to be predictive, and to allow one to generalise between the few species which have been studied in detail, and the many about which, say, conservationists, would like to know more.

A natural classification is also likely to be the most useful in helping to remember the diversity of the British fauna., both in terms of general appearance and identification features (I hope that most of the couplets in the key to Tribes will be strangely familiar to most of you), and in terms of behaviour, biology and habitats: all tiger-beetles are large-eyed, sun-loving and fleet of foot; *Harpalus* are seed-eaters (hence, rather slow, short-legged, chunky oval beetles) likely to be found in dry, early-successional habitats; *Bembidion* species are small, of characteristic shape, and most are found in wetlands. It is largely because of the predictive power of the modern classification of ground-beetles that it's been possible to structure the course both taxonomically, and by habitat: several of the keys are essentially a series of ecological and behavioural generalisations.

Sadly, evolution is not always convenient. Some Tribes are most reliably characterised by the configuration of small plates on the underside of the thorax, and how these relate to the articulation of the legs. Hard to describe, and not easy to see (even on a specimen which has not been glued to a piece of card), these are not the ideal stuff of identification keys. So, more visible but less evolutionarily rigorous features must be sought. But the process known as convergent evolution means that a similar feature can evolve twice, so that a structure which is functionally analogous may have evolved in two groups separately. So, possession of p[ale spots on the elytra crops up in most of the major divisions of the carabids. A more subtle example, which rather messes up the construction of 'natural' keys, may be the mechanism used to clean the antennae in carabids: in some, there is a notch about half-way along the front tibia, and the opening of the notch is closed by a long, rigid, flexuous-curved bristle: the gap between the inside of the notch and the bristle is used to scrape dirt off the antennae, hence the name antenna-cleaner. In other groups, the cluster of straight spurs at the apex of the front tibia serves the same function. In a few genera which we might not expect to have an antenna-cleaner, there is a groove which looks remarkably like one: in *Blethisa*, for instance. But in these cases, the groove opens toward the apex of the tibia, and is not so clearly transverse, across the width of the tibia, and it is covered by a comb of small bristles, rather than a single, long, flexuous one. So, maybe this is not a 'real' antenna-cleaner.

Why introduce the higher levels of the classification now? It might have been more logical to introduce the subfamilies and tribes earlier, then let you see some genera, and only introduce species identifications later. As it is, you should by now be familiar with quite a few genera, by name and possibly by 'jizz', especially if you came on the field trip to Kennett. I'd guess many of you have a mental picture of *Cicindela, Carabus, Notiophilus, Bembidion, Harpalus, Amara, Pterostichus* and *Agonum.* All of these either contain lots of species, or have some very common and widespread ones in them. If you've keyed one out, or looked at specimens, I hope that some of the most distinctive small genera will also have made an impression: *Omophron, Cychrus, Elaphrus, Loricera, Abax…*

So, you have quite a wide knowledge of British ground-beetles, and thanks to the Pareto Principle, this gives you an understanding of the majority of ground-beetles you are likely to encounter in most habitats. So now, rather than pile more small facts on the heap you have already built up, I present the outline structure of the natural classification, into which you can place your knowledge.

Have a look at the Outline Key to Tribes etc. It's full of long, strange confusing Latin- and Greek-derived names which meant nothing at all to most of you at the start of this course. It could be really off-putting. Except that now, with luck, much of it sounds very familiar - because each Tribe is named after one if its most important genera, and there's a good chance that you've already identified one or more species in that genus. It won't surprise you to discover that Tribe Notiophilini contains the genus *Notiophilus*, or that Amarini consists of the genus *Amara.* I'll leave you to guess what is included in Bembidiini and Loricerini.

2.5.2 Grouping the tribes of the ground-beetles

For those interested in the higher classification of ground-beetles (family Carabidae - like all animal families ending in –idea), this draft 'key' outlines the main divisions of the largest subfamily of the British ground-beetles, the Carabinae. It is intended to show how the Tribes group together, but is not ideal for identification purposes. Please continue to use the Key to Genera for routine identifications.

Rather than keying all Tribes out individually (which would mirror the Key to Genera, as quite a few contain just one genus), I have used some more or less natural groupings of related or similar Tribes, such as "dromioid tribes" (= all those carabids with truncate elytra).

This key should work for all British species, and most of the characters should be visible with a x15 hand lens in good light. Tribes which are particularly similar to each other, and form recognisable groups, are listed on the same line, linked with a '+', which may help in finding one's way around the family.

In most cases, to save space, the genera included in a Tribe are not listed here - to find out, look again at the checklist provided earlier. But when a Tribe keys out in two places, because it contains genera which are different in respect of a key character, I have listed the genera that key out each way. In most cases, these are separated by quite superficial characters which are fairly easy to see and are useful in identification, but are not of deep evolutionary significance. Two of the three smaller subfamilies of the Carabidae are omitted. This is because, in Britain, each includes a single Tribe and a single distinctive genus:

Cicindelinae (Tiger-beetles, 5 species in Tribe Cicindelini, genus *Cicindela*)

Omophroninae (the peculiar, rounded species *Omophron limbatum* in Tribe Omophronini)

The easiest way to identify these subfamilies, Tribes and genera is to look at specimens or pictures.

The subfamily Brachininae (Bombardier-beetles, 1 or 2 species, in Tribe Brachinini, genus *Brachinus*) is included, and is grouped, artificially (not closely related, but rather similar in appearance) to the other Tribes with truncate elytra.

1 Fore tibiae fairly straight-sided, without antennal cleaner (a notch on inner edge), though some species have a concavity at apex of tibia. Usually a single pit with a long bristle above each eye (bristles often break off, but the small pits from which they arise are usually visible in good light).

CYCHRINI + CARABINI
NEBRIINI
NOTIOPHILINI
ELAPHRINI (*Elaphrus*)

1a Fore tibia with a notch and spur on inner or lower side, the antennal cleaner (best seen from above in front, and to one side, looking across the beetle), usually between halfway alone and a third the way from apex. (Forsythe, p.26, fig. I.6, or inside front cover).Fore tibia with antennal cleaner. Often with two pits, each bearing a single long bristle, above each eye. **2**

2 Last segment of maxillary palps (the longer, outer pair of palps) very small and slender, much smaller than penultimate segment (p.34, fig. III.10). Beetle 2.5-7mm long.

BEMBIDIINI

2a Last segment of maxillary palp normal, about as large as penultimate. **3**

3 Elytral apex truncate (as though snipped off), so last 2 or more abdominal segments jut out. 2.5-12mm long. "**Dromioid tribes"**

DROMIINI, COLLIURINI, MASOREINI , LEBIINI
CYMINDIINI + ZUPHIINI, DRYPTINI, BRACHININAE
LICININI (*Licinus*)

3a Elytral apex rounded, pointed or elongate, covering all of abdomen, or with only a part of last segment showing (but beware gravid females and specimens from pitfalls, which may have swollen abdomens) **4**

4 Species obviously adapted for tunnelling underground. Pronotum and elytra joined by narrow cylindrical waist; pronotum almost spherical, without hind-angles jutting out at side (may have a ridge on the 'waist'). Scutellum (small triangle on midline at base of elytra) situated on the 'waist' and not between elytra bases. Front tibiae modified for digging: flattened and/or with large spurs and bristles. Short-legged, walk slowly when on surface. e.g. pl. 1 fig 3.

SCARITINI + BROSCINI

4a Species not adapted for tunnelling. Less obviously 'waisted'. Often but not always fast-running. Body forms various but usually more flattened or relatively broader and more oval. Scutellum forms a triangle which separates the two elytra at the base. Front tibiae more slender and

less spiny. Many spp. able to run quickly. Pronotum often with hind angles, which may be sharp or rounded. **5**

5 A single pit with a long bristle above each eye (bristles often break off, but the small pits from which they arise are usually visible in good light). **HARPALINI *s.l.***
= **HARPALINI + ANISODACTYLINI + ZABRINI**
STENOLOPHINI + PERIGONINI, OODINI

5a Two bristle-bearing pits above each eye. **6**

6 A pair of fine but often deep furrows run between the eyes, then diverge in a smooth semicircle around the back of each eye, running down the side of the neck. Legs always pale. Whole body brown or yellowish in most species. Mostly smaller than 4mm (range 2.2-6.5mm). **TRECHINI**

6a Lacking the fine semicircular furrows on head. Most species have dark or black legs and few have brown or yellowish bodies (at least when fully hardened and mature). Size range 3.9mm to over 20mm. **7**

7 Antennae with very long, thick bristles (2-2.5 times the segment length) on segments 2-6. Dense, long bristles on underside of head. Or elytra each with about 8 longitudinal grooves, which are interrupted by deep, irregular pits, giving a bumpy appearance and head with a figure-of-eight shaped groove above each eye. **LORICERINI, ELAPHRINI** *(Blethisa)*

7a No such bristles. Elytra not so bumpy and head never with figure-of-eight grooves. **8**

8 No bristle-bearing pits on elytral intervals 1-7, **OR** entire upper surface punctate and sometimes hairy. **9**

8a 1-7 (?) bristle-bearing pits on 3rd interval, often adjoining 3rd or 2nd stria. Sometimes also on other intervals. Can be small, shallow and inconspicuous, and may be quite close to apex of elytra (but not along elytral margin): appear as depressions when seen from above, and visible as upstanding hairs in side view. Intervals never with more than 7 punctures in total, and never hairy on dorsal surface.
PTEROSTICHINI (*Pterostichus, Calathus*) **+PATROBINI**
AGONINI, POGONINI, LICINIIINI (*Badister*)

9 All elytral intervals and pronotum punctate, sometimes clothed with dense golden hairs and/or long black bristles. **LICINIIINI** (*Licinus*), **PANAGAEINI, CHLAENIINI**

9a Pronotum and elytral intervals smooth, neither pitted nor hairy. **10**

10 Mandibles short and blunt, protruding beyond the labrum by less than the length of the labrum, even when wide open. **AMARINI**

10a Mandibles long to very long, protruding by more than the length of the labrum, whether they are wide open or closed together. **PTEROSTICHINI**
(*Stomis, Abax, Sphodrus, Laemostenus*)

The above key is presented in tabular form, below.

Fore tibiae fairly straight-sided, without antennal cleaner *	Fore tibia with a notch and spur on inner or lower side, the antennal cleaner	
CYCHRINI + CARABINI, NEBRIINI, NOTIOPHILINI ELAPHRINI (*Elaphrus*)	Last segment of maxillary palps much smaller than penultimate segment	Last segment of maxillary palp about as large as penultimate.
	BEMBIDIINI	
Elytral apex truncate so last 2 or more abdominal segments exposed	Elytral apex rounded, pointed or elongate, covering all of abdomen	
DROMIINI, COLLIURINI, MASOREINI , LEBIINI, CYMINDIINI + ZUPHIINI, DRYPTINI, BRACHININAE LICININI (*Licinus*)		
	Species adapted for tunnelling.	Species not adapted for tunnelling.
	SCARITINI + BROSCINI	
A single pit with a long bristle above each eye	Two bristle-bearing pits above each eye.	
HARPALINI *s.l.*		
	A pair of fine, deep semicircular furrows between the eyes	Lacking the fine semicircular furrows on head.
	TRECHINI	
Antennae with very long, thick bristles (2-2.5 times the segment length) on segments 2-6. Dense, long bristles on underside of head.	Elytra with deep, irregular pits, bumpy, with figure-of-eight shaped groove above each eye.	No such bristles. Elytra not so bumpy and head never with figure-of-eight grooves
LORICERINI *	**ELAPHRINI** *(Blethisa)**	
No bristle-bearing pits on elytral intervals 1-7, **OR** entire upper surface punctate and sometimes hairy.	1-7 (?) bristle-bearing pits on 3rd interval, often adjoining 3rd or 2nd stria.	
	PTEROSTICHINI (*Pterostichus, Calathus*) **+PATROBINI, AGONINI, POGONINI, LICINIINI** (*Badister*)	
All elytral intervals and pronotum pitted and sometimes densely hairy.	Pronotum and elytral intervals smooth, neither pitted nor hairy.	
LICINIINI (*Licinus*), **PANAGAEINI, CHLAENIINI**		
Seed-eaters: mandibles short, blunt.	Omnivores or carnivores, mandibles long to very long,	
AMARINI	**PTEROSTICHINI** (*Stomis, Abax, Sphodrus, Laemostenus*)	

2.5.3 Name changes in the British ground-beetles

The rules of nomenclature (naming) of animals are complex and detailed, and are policed by an International Commission. In practice, two principles are responsible for most of the confusion, annoyance and irritation which nomenclature - especially, changes in the currently-valid name of organisms - can cause for naturalists, conservationists and ecologists:

- **The first properly-plublished name for a species is the correct one** - it is said to have priority. So, if an earlier name is discovered, by a historian of natural history, or by re-examining the original specimen (the type) of a species, that name should replace any later name.

- Whereas the species is a biological entity with (at least in theory) a behavioural and genetic basis for its denifition (species breed within themselves, but in nature will rarely if ever breed with other species and produce viable, fertile offspring, **there is no fixed and final defininition of genus**, tribe, subfamily, family and higher units of classification.

So, each author is at liberty to use whatever genus name he chooses, and to 'split' or 'lump' as he prefers. Thus, in recent British and European handbooks, some carabid genera are subdivided into many separate units. Unfortunately, these units are rarely named in ways which makes their origins clear. While you might guess that *Eurynebria* is a relative of *Nebria*, but you've no way of linking *Batenus*, *Oxypsephalus*, *Paranchus*, *Anchomenus, Platynus* and *Sericoda* to the genus *Agonum*, from which they are all recently split.

A leading freshwater ecologist, T.T. Macan, once proposed that all changes of genus should be held in limbo for 50 years, from being proposed by a taxonomist, to being accepted by the world of ecologists. Given the rate of change, some form of probation is certainly appealing.

So, in the keys which follow, I've almost always taken an old-fashioned and conservative view, and have ignored most recent divisions of genera. The advantage is that you have fewer names to remember, and lots of very similar species are kept together. I prefer one genus *Agonum* with 22 species, to 7 separate genera (of which 6 contain just one species each, and 16 remain in *Agonum).* In the individual keys, I indicate where other modern authors may do things differently**.**

The exceptions are where a subdivision groups together obviously similar species, which are instantly recognisable - so, *Ophonus* is a useful new genus, as it takes the 'hairy *Harpalus*' and separates them from the smooth and shiny ones. You can see the difference in the field, even before you pick up a specimen. But the subdivisions of *Amara* are not easy to see, even under a microscope.

In naming species, I have tried to update the keys and notes to follow Luff (2007) but have repeated the older name which will be found in Forsythe and in many other books and papers. Apologies if some old species-names slip through, in writing or speaking.

I have listed most of the changes which have taken place in the last 30 years in Appendix 3.

2.6.1 Identification

Although the keys to adult carabids, by Luff (2007) or by Lindroth (1974, 1985, 1986) are good, there are many species which are hard to identify without access to a reliable reference collection. Forsythe (1987) is initially simpler to use than Luff or Lindroth, although its structure may be rather confusing. It includes almost all species (despite its title), but does not enable all of them to be distinguished reliably: it makes regular cross-reference to the works of Lindroth. Wheater & Read (1996) have a much wider remit, covering most soil and litter invertebrates. They devote 6 pages of keys to carabids, including many of the larger and commoner species. Joy (9132) was the standard work on British beetles for forty years, and although there have been a few name changes, the keys are quite user-friendly and still worth consulting. Since Joy also includes all the other beetle families, it is a good place to start if you are uncertain whether your animal is a ground-beetle.

The following supplementary reference list highlights a few recent additions to the British list, or problems with the keys.

Basic identification works

Luff, M.L. 2007. The Carabidae (ground-beetles) of Britain and Ireland. (*Handbooks for the Identification of British Insects,* **4**(2), 1-247. 2nd edition.)
[The standard guide, with good well-illustrated keys, and 17 pages of colour photographs. Rather technical language, and keying to subfamily, tribe, genus, subgenus and species. Some of the keys are still difficult to use, but there are useful short descriptions of each species, with a little more emphasis on identifying in the field than in previous keys. Essential for a serious study of ground-beetles.]

Lindroth, C.H. 1974. Coleoptera: Carabidae. *Handbooks for the Identification of British Insects,* **4**(2), 1-148.
[Reprinted 1996; with 2 pages of corrections and amendments, which mention some, but not all, the errors and difficulties in the keys. Available from Royal Entomological Society, 41 Queen's Gate, London SW7 5HR, price £15 + postage.]

Lindroth, C.H. 1985-1986. *The Carabidae (Coleoptera) of Fennoscandia and Denmark*, parts 1 & 2. Fauna Entomologica Scandinavica, **15**. Leiden: Brill. [In English; keys omit a few British species, and are otherwise almost identical to Lindroth (1974) but with short descriptions of each species. Obtainable from entomological booksellers, about £70 for the two volumes.]

Forsythe, T.G. 1987, 2000. *Common ground beetles*. (Naturalists' Handbook **8**). Richmond Publishing Co. [A fairly simple starting point; includes most species.]

Wheater, C.P. & Read, H.J. 1996. *Animals under logs and stones.* (Naturalists' Handbook **22**). Richmond Publishing Co. [Most soil fauna included; a short key to the commoner carabids.]

Joy, J.H. 1932. (reprinted 1973, 1997) *A practical handbook to British Beetles.* Classey.
[An introduction to all the British beetles. Includes keys to almost all carabid species. Relies too heavily on 'relative' features which are hard to see without a reference collection.]

Luff, M.L. 1993. *The Carabidae (Coleoptera) larvae of Fennoscandia and Denmark*. Fauna Entomologica Scandinavica, **27**. Leiden: Brill. [In English: good as far as it goes; difficult to use.]

Trautner, J. & Geigenmuller, K. 1989?. *Tiger beetles, ground beetles. Illustrated keys to the Cicindelidae and Carabidae of Europe.* Aichtal, W Germany: Josef Margraf. [Bilinguial German/English. Good brief introduction, with superb photos of live beetles. Useful key to tribes and genera (different structure from Lindroth). Some genera keyed to species, but many only to subgenus, and some not at all. Covers the fauna of different geographic areas for different genera; most British species are in, together with a large number of German, Scandinavian and sometimes southern European species. Keys rather brief, with some errors in the English; no descriptions. About £30 in softback.]

Hurka, K. 1996. *Carabidae of the Czech and Slovak Republics.* Zlín: Kabourek. [Bilingual Czech and English, keys to almost all British species, and many others. Provides some new characters for certain species, and reasonable colour paintings. About £55 in hardback.]

Wachmann, E., Platen, R. and Barndt, D. 1995. *Laufkafer: Beobachtung, Lebensweise.* Augsburg: Naturbuch Verlag (Weltbild Verlag). ISBN 3 89440 125 7. [In German: text descriptive, and of limited use in identification, but clear colour photographs of about 220 species would help in the absence of a reference collection. About £16 in hardback in Germany; not sure about availability in Britain.]

2.6.2 New species added since Lindroth (1974)

The following gives an indication of the rate at which species are still being discovered in Britain. Although carabids are among the best-known British beetles, there is still scope to find new things. A fuller explanation of the reasons for addition is given in Appendix 3.

Anderson, R. 1985. *Agonum lugens* (Duftschmid) new to the British Isles (Col., Carabidae). *Entomologist's Monthly Magazine*, **121**, 133-135.
Anderson, R. & Luff, M.L. 1994. *Calathus cinctus* Motschulsky, a species of the *Calathus melanocephalus/mollis* complex (Col., Carabidae) in the British Isles. *Entomologist's Monthly Magazine*, **130,** 131-135
Aukema, B. 1990. Taxonomy, life history and distribution of three closely related species of the genus *Calathus* (Coleoptera: Carabidae). *Tijdschrift voor Entomologie*, **133**, 121-141. [Detailed description of *C. melanocephalus*, *C. mollis*, and *C. cinctus*].
Crossley, R. & Norris, A. 1975. *Bembidion humerale* Sturm (Col., Carabidae) new to Britain. *Entomologist's Monthly Magazine*, **111**, 59-60.
Eversham, B.C. & Collier, M. 1997. *Microlestes minutulus* (Goeze) (Carabidae) new to Britain. *Coleopterist*, **5**, 93-94.
Hammond, P.M. 1982. *Cymindis macularis* (Fischer v. Waldheim) (Col., Carabidae) - apparently a British species. *Entomologist's Monthly Magazine*, **118**, 37-38.
Lindroth, C.H. 1972. Taxonomic notes on certain British ground-beetles (Col., Carabidae). *Entomologist's Monthly Magazine*, **107**, 209-223 [Includes information on likely additions to the British fauna].
Luff, M.L. 1990. *Pterostichus rhaeticus* Heer (Col., Carabidae), a British species previously confused with *P. nigrita* (Paykull). *Entomologist's Monthly Magazine*, **126**, 245-249.
Speight, M.C.D., Martinez, M. & Luff, M.L. 1986. The *Asaphidion* (Col.: Carabidae) species occurring in Great Britain and Ireland. *Proceedings and Transactions of the British Entomological and Natural History Society*, **19**, 17-21. [Separates *A. flavipes* as in Lindroth into three species - *A. flavipes* s.s., *A. curtum* and *A. stierlini*. *A. pallipes* is adequately defined in Lindroth].

2.6.3 Identification notes on other species which may cause problems

Allen, A.A. 1950b. Two species of Carabidae (Col.) new to Britain. *Entomologist's Monthly Magazine*, **86**, 89-92.
Allen, A.A. 1956. *Amara cursitans* Zimm. (Col., Carabidae) new to Britain. *Entomologist's Monthly magazine*, **92**, 215-216.
Allen, A.A. 1965. *Harpalus honestus* Duft. (Col., Carabidae) confirmed as British. *Entomologist's Monthly Magazine*, **100**, 155-157.
Allen, A.A. 1991. On the separation of *Patrobus atrorufus* Ström and *P. assimilis* Chaud. (Col., Carabidae). *Entomologist's Record*, **103**, 71-72.
Boer, P.J. den 1965. External characters of sibling species *Trechus obtusus* Er. and *T. quadristriatus* Schrk. (Coleoptera). *Tijdschrift voor Entomologie*, **108**, 219-239.
Houston, W.W.K. & Luff, M.L. 1983. The identification and distribution of the three species of *Patrobus* (Coleoptera: Carabidae) found in Britain. *Entomologist's Gazette*, **34**, 283-288.
Jones, R.A. 1992. *Bembidion octomaculatum* (Goeze)(Carabidae) rediscovered in Britain. *Coleopterist*, **1**, 2-4.
Key, R. 1993. *Dyschirius angustatus* (Ahrens)(Carabidae) and other Coleoptera from the Wampool Estuary, Kirkbride, Cumbria. *Coleopterist*, **2**, 29-30.
Luff, M.L. 1981a. Notes on the identification of some Carabidae - 1. *Coleopterists' Newsletter*, **4**, 5-6.
Luff, M.L. 1981b. Notes on the identification of some Carabidae - 2. *Coleopterists' Newsletter*, **6**, 2-3.
Plant, C.W. & Drane, A.B. 1988. A review of the records of *Acupalpus elegans* Dejean (Coleoptera: Carabidae) in Britain, with a note on its separation from *Acupalpus dorsalis* (F.). *Entomologist's Gazette*, **39**, 227-232.
Reid, C. 1981. Macropterous *Agonum fuliginosum* (Panz.) in Britain. *Entomologist's Monthly Magazine*, **116**, 92.
Sciaky, R. 1987. Revisione delle specie paleartiche occidentali del genre *Ophonus* Dejean, 1821. *Memorie della Societa entomologica Italiana*, **65** (1986), 29-120. [A very detailed and well illustrated account of subgenus *Ophonus* of *Harpalus*; in Italian, but with the keys also in English.]
Shephard, G. 1970. *Dyschirius obscurus* Gyll. (Col., Carabidae) in Sussex, and a key to the British species of the genus. *Entomologist's Monthly Magazine*, **106**, 91-94.
Welch, R.C. 1981. *Nebria nivalis* (Payk.)(Col., Carabidae) from Mull, Skye and the Cairngorms, with a new character for its separation from *N. gyllenhali* (Schoen.). *Entomologist's Monthly Magazine*, **116**, 166.

3 TECHNIQUES FOR CARABIDOLOGISTS: INDOORS

3.1.1 Building a collection

Sooner or later, every student of British carabids (and most other invertebrate groups) will need to consider the issues surrounding ‘collecting’. ‘Collecting’ in the sense used by entomologists is almost a euphemism for ‘killing’, as few specimens are found dead.

This course may help us find out whether it is possible for a beginner to make serious progress in the study of carabids without collecting; the previous literature assumes beginners will collect, though some do attempt to learn their carabids without it. Those who do choose to collect specimens will doubtless wish to limit the number they take and to minimise any negative impacts they may have on populations.

Good reasons for 'collecting' carabids

- To generate reliably-identified records - these can be fed into the national Ground Beetle Recording Scheme, or to Local Records Centres and used to the benefit of conservation. Records based on specimens can also be re-identified in future if additional species are recognised as British.
- To develop your own reference collection - this can then be used to develop your identification skills to the point where you can identify more carabids in the field.
- To promote the study of carabids to others, who may never have seen a carabid in the field for themselves.
- To study them under a microscope, or to make a dissection.

Bad reasons for collecting carabids

- To fill a collection the way a stamp collector fills a stamp album.

4.1.2 Collecting as a threat to species

The collection of specimens is a necessary requirement of many studies on carabids. Whilst the removal of adult specimens from a population is theoretically damaging, its impact is generally likely to be trivial for the species Almost all species occur at moderate to high densities within their preferred habitats, and most techniques for finding or trapping carabids are very inefficient. In a few cases, detailed below, collecting can be an immediate and significant threat. It is certain that habitat loss and habitat degradation are ultimately very much more serious threats to carabid conservation. And ignorance of the species, their distribution and their habitat requirements is a serious obstacle to their conservation.

Under special circumstances, collecting can be a significant threat: when a species is easily found, occurs in small populations of long-lived adults, has low reproductive rate, occurs in easily damaged habitat, is targeted by beetle 'twitchers', or is targeted by greedy or commercial collectors.

4.1.3 The future of collecting

It is interesting to speculate whether the study of carabids will evolve in the way that bird-watching and butterfly-watching have evolved. The collecting of specimens has become increasingly outdated and unnecessary as field guides, field identification skills and optical equipment have all improved. This has also opened the way for a much greater number of people to get into those groups - could the lowly carabid go the same way? Previous keys and field guides have certainly not facilitated recording without collecting.

4.1.4 How to kill a specimen

1. The best method: ethyl acetate.
Place your specimen in a glass tube, with a tight-fitting lid. Put one or two drops of ethyl acetate (modern name: ethyl ethanoate) onto a piece of tissue paper, put that into the tube with the beetle and seal the lid. The beetle will die fairly quickly. Although there may be a period of rigor mortis, this will last no more than 24 hours, after which the specimen will be relaxed, allowing 'carding' (setting in position and gluing to a piece of card). Note that the tube must be glass - ethyl acetate dissolves many plastics! Appropriate care needs to be taken in handling this chemical: ethyl acetate liquid and vapour is highly inflammable, and should not be inhaled.
Specimens in tubes with a bit of ethyl acetate will be preserved in a suitably relaxed state for several days, possibly weeks, depending on how good a seal the tube has. They will keep longer in a fridge or freezer.

2. Alternative method: alcohol.

Submerge in 70% ethanol (alcohol). Beetles killed in this way are quite stiff and very difficult to card. They will however remain preserved almost indefinitely as long as the alcohol does not dry out. 70% alcohol is flammable, so care needs to be taken.

3. Alternative method: the freezer.
As with alcohol, this doubles as a killing method, and a method for long-term preservation. Specimens killed in this way tend to be quite stiff.

4. Apparently the best method of all: the laurel bottle.
Young laurel leaves, collected at around Whitsun and mashed into the bottom of a big jar provide a cyanide killing bottle to last a whole year, apparently. Old leaves, and leaves which are not chopped finely enough, are much less effective.

3.2 Carding, Pinning and Labelling

Carding is the act of gluing a beetle to a small piece of card. Ideally, the beetle should be in a fairly natural pose, the right way up, and with all 6 legs and both antennae spread out. Carding can be extremely difficult and time-consuming, and it probably only becomes a simple, rapid task after lots of practice. However, there are a few tips that can save you a lot of headaches.

First, always try to start with fresh, relaxed specimens. Ideally, specimens should be killed with ethyl ethanoate and kept cool in an airtight tube for 6 hours or more after death. It is always best to identify a specimen before carding it, so that underside characters, or characters such as crossed elytral epipleura and antennal cleaners, can be seen more easily. However, once out of the tube, specimens will dry out quickly, especially if they are being identified under the hot light of a tungsten-filament light source.

Equipment you will need:
- tissue paper
- 2 very small paint-brushes
- forceps (storksbill and watch-makers' forceps ideally)
- stiff but thin, white card (you can purchase suitable card cut to standard sizes or cut your own)
- water-soluble glue - Gloy is fine, watered down a bit; wallpaper paste is even better
- scissors
- pins
- a cork block or similar for pinning
- card for labels
- a staging block may be used to get all labels at the same height on the pins - not essential kit!
- a very fine-nibbed pen with indelible ink

Working on a sheet of tissue paper, lay the beetle on its back. Hold it down with one finger and using a dry brush, brush out the legs and antennae. Try to brush out both hind-legs first. Once they are brushed out, they can be held down while the remaining appendages are teased out. Any stubborn appendages can be held gently with forceps and tugged out into position (this requires very delicate handling, and the appendages often get snapped off – if so, simply glue them alongside the beetle when the rest is in position). Once this is done, the beetle is ready to card.

Using the other brush, paint a thin film of glue onto a suitable area of card, and then turn the beetle over and place it onto the glue. Using the forceps again, arrange the legs and antennae, and the palps if you want to be a real perfectionist (if you identify before carding, you will know whether the palps have any diagnostic features), making sure all appendages are stuck down. Try to minimise the amount of glue you get on the upper surface of the beetle. The glue will dry out pretty quickly - the thicker you paint it on, the more time you have to arrange appendages, but the more likelihood you will get glue all over the specimen! In case of disaster, remember that you can always wash your beetle in water, pat it dry with tissue, and start again.

Once glued down, trim the card to size, if necessary, and pin through the base of the card. A thimble will be necessary for driving pins through thick card, or if using the less sharp makes of pin. Use a cork block underneath.

A staging block is useful for getting card and labels onto the pin at standard height, but is not essential kit by any means.

Labels should be added to the pin immediately, including at least the essential information, e.g.

Amara
aenea
det. MGT, vi.2000

Holkham Gap
TF88-45-
3.vi.2000
coll. MG Telfer

'det.' means 'determined by'. For some reason, entomologists always speak of determinations rather than identifications. It is good practice to record the date of the identification, as our understanding of limits of a species changes through time.
'coll.' means 'collected by' on my labels, but other entomologists often use 'coll.' to mean 'in the collection of'.

Additional labels
If a specimen is redentified at a later date, it is good practise to add another 'det.' label, rather than replace the original one. This is not to embarrass the original identifier, but to track changes in opinions, to emphasise where mistakes can be made, and in the case of specimens which are in support of reports or published records, allowing subsequent users of the collection to link specimen to record.

It is worth noting that most coleopterists have some specimens which frequently 'change their identity'. There are a few tricky species-pairs among the carabids which are identified differently depending on which set of features you place your trust in: in a future session, Brian and I may disagree over specimens of *Amara ov*ata and *similata*, or *Amara communis* and *convexior*. Hence the value of recording who identified the specimen, and when.

If you know a lot more about the origin of your specimen - the habitat or microsite, what it was feeding on etc., it is very useful to add this information on a separate label.

Re-carding
Only a perfectionist will want to re-card all his specimens onto clean, standard cards once they have dried. However, it is very quick and easy, and should encourage you to look at underside features when needed. Because wallpaper paste and gloy are water-based, if you wet the surface of the card with a paintbrush, the adhesive softens in 30 seconds, and the beetle can be gently lifted off with forceps. Because it is fully dried out after a week or so, it retains its position - flat and legs spread - so can be dropped neatly onto a freshly-pasted piece of card after its underside has been examined. Unless it is soaked for a long time, the legs and antennae will not need arranging again.

4 FIELDWORK: SAMPLING, IDENTIFYING AND INTERPRETING CARABID ASSEMBLAGES

4.1 Sampling

4.1.1 Direct searching

Several species of carabids or ground-beetles (Coleoptera: Carabidae) can be seen running over bare ground in full sunshine. Many others are active on the soil surface at night, and can be found by torchlight. Many species of carabid climb vegetation, to visit flowers or to collect seeds, and some are addicted to it; these can be searched for. Some climb trees and may be found directly, especially at night. Direct searching methods have the advantage of seeing exactly where the species was living, and often, what it was doing there; but such methods are difficult to replicate: each recorder has his/her biases, and efficiency probably changes with time of day, weather, and the mood of the observer.

4.1.2 Beating, sweeping and trapping

Most chemical, mechanical extraction and trapping techniques used for invertebrates are not particularly good for carabids. Water traps and flight-interception traps catch huge numbers of flies, bees, wasps etc, and only a few beetles. Sweep-netting (from low vegetation) and beating (from trees and bushes) is good for phytophagous beetles (weevils, chrysomelids etc.), but is very weather-dependent (sunshine, temperature and wind speed probably all have a marked effect), so it is hard to replicate between sites (although comparisons along a transect at one site at one time might work). If you want to standardise sweeping, then choose a set of specific weather conditions and times (those specified for butterfly monitoring might be o.k.). Night-sweeping can produce many more carabids than daytime. Direct searching, either by turning over logs and stones, or by sifting leaf-litter, are rather subjective (after a long, hard day, your effectiveness is likely to decline!). Sifting a standard volume or area of litter back at home is better, but will probably produce more staphylinids, cryptophagids and other 'difficult' groups than carabids. If people-pressure on your recording sites isn't too much, you could try placing standard logs, boards or tiles, and pooting up any beetles after a week or two.

4.1.3 Pros and cons of pitfall traps

Overall, most entomologists and ecologists settle for pitfall trapping for ground-beetles. Using plastic cups as pitfalls is quick, easy and cheap. If they are run for more than a few days, a preservative, such as ethylene glycol (antifreeze), diluted 1 part to 5 parts of water, with a few drops of detergent, is o.k., but the catch should be transferred to 70% alcohol as soon as it is brought home (at least every 2 weeks). Glass pitfalls are more effective than plastic, but are too heavy and breakable to be practicable for most uses.

However, there are problems with pitfalls, which should be borne in mind. Traps are strongly biased toward large, heavy, clumsy beetles that run around a lot. Many species avoid traps. Even readily trappable large, active species like *Pterostichus madidus* do not always fall in; studies with video cameras suggest that only about 4% of encounters between a *Pterostichus* and a pitfall result in capture. Traps in dense vegetation are proportionately less effective than those in bare ground. And there are some systematic biases in catch. The genus *Harpalus* (common in dry situations) is particularly adept at pulling itself up by a hind leg having almost fallen into a trap. The small wet-ground species of *Bembidion* also avoid traps particularly well. Few studies have compared pitfalls and thorough, regularly repeated direct searching. One which did (Eversham & Telfer 1994) found only 35 of the 62 species in the first year fell into traps; and a further 20 or so species have since been found at the site by direct searching, and none in the pitfalls.

5 SITE EVALUATION FOR NATURE CONSERVATION

5.1 CARABIDS IN ECOLOGICAL STUDIES AND CONSERVATION EVALUATION

Carabids are particularly useful for ecological and conservation studies, because they are diverse enough to give fine discrimination between good, mediocre and poor sites, and are found in almost all habitats. Yet there are not too many species: 365 or so in Britain, which is the same order as bird species. The identification of most species is rather less difficult than many beetle families, and there's a rich literature to consult when writing up any study. Even larvae can often now be identified (Luff, 1993), although not all species have been described yet. A *Provisional Atlas* of carabids (Luff, 1998) gives accurate and fairly comprehensive distribution maps for almost all species: although you will often find species in 'new' 10km squares, you will rarely find a species far from its recorded range, and you will see at a glance which species are common and which are rare. The *Atlas* also gives good summaries of species habitats and seasonality (as does Luff's new keys (2007).).

Section 6 provides an example fom Suffolk Breckland of how a carabid assemblage can be evaluated and interpreted.

Simple principle: rare species are conservation priorities in their own right, and because rare species tend to be specialised, they also indicate particular ecological conditions more effectively than the diversity of common species can do.

Practical example: in the following discussion, a real-life example from the Breckland district of Suffolk is given, based on the first year's recording at the site.

5.2 Definitions of species status categories

Species status is indicated throughout this discussion by the following codes:

RDB1 = Red Data Book category 1, nationally endangered
RDB2 = Red Data Book category 2, nationally vulnerable
RDB3 = Red Data Book category 3, nationally rare
Na = Nationally scarce category A (recorded, or expected to occur in, fewer than 30 10km squares in Britain)
Nb = Nationally scarce species, category B (recorded, or expected to occur in, 31-100 10km squares in Britain)
Nr = Regionally notable **L** = Local
C = Common

Detailed criteria for the RDB categories are provided in the Red Data Books (Shirt, 1987; Bratton, 1991). They are intended to reflect *threat* rather than mere *rarity*, though the two often correlate, and a rough-and-ready threshold of occurrence 15 or fewer 10km squares has often been used as a basis.

The Nationally Notable categories are defined in terms of the number of 10km squares from which a species has been recorded recently (usually, post-1970): there are *c.* 2860 10km squares in Britain. Where comprehensive data are available (e.g. butterflies, dragonflies, Orthoptera), the square counts are used strictly. For less well-known groups, the same thresholds are used, but with an allowance for the likely results of future recording. Thus, many species of carabid beetle are currently known from far fewer than 100 10km squares (see Table 6) but are not classed as Nationally Notable.

'Regionally Notable' is used here to include species meeting one of two criteria. The English Nature definition is 'found in five or fewer sites in the region' (Eversham, 1983): in the example which follows, the region is taken as East Anglia. However, because an important part of the biogeographic significance of Breckland lies in the inland occurrence of species which are otherwise almost exclusively coastal, the category Nr is also used here for species which occur at very few inland sites in Britain. This is in keeping with the philosophy of English Nature's *Natural Areas.*

'Common' and 'local' are more subjectively separated, depending on whether a species has been found at the majority of sites I have surveyed in East Anglia and the Midlands in recent years. Where possible, the division follows English Nature usage (Foster, 1987a, 1987b, 1987c; Key et al., 1993).

6.3 Rarity Scores

The presence of rare species is a common criterion used in conservation evaluation (Margules & Usher, 1981). For invertebrates, two scoring systems have commonly been used in Britain. Both rely on giving points to species according to their status: the more rare or threatened a species, the more points it scores. The first system was proposed by Ball (1986) and has been used in JNCC's Invertebrate Site Register. The second was used first for water beetles (G N Foster 1987) and has since been extended to other groups. The status categories recognised by the two are similar, but the point scores differ: Ball (1986) is intended to evaluate sites entirely on the less common species; Foster (1987) is also influenced by the number of common species recorded (Table 1).

Status	***Ball (1986)***	***Foster (1987)***
Red Data Book (RDB)	100	32
Notable A (Na)	50	16
Notable B (Nb)	40	8
Regionally Notable (Nr)	20	4
Local (L)	0	2
Common (C)	0	1

Table 1: Point scores for species status-categories used by Ball (1986) and G.N. Foster (1987)

By summing the scores for each species, a site score is derived. Rather confusingly, in Ball's method this is referred to as the Invertebrate Index, whereas Foster's, relying somewhat less on rare species, is called the Rarity Score. The calculations for a Breck roadside are given in Table 2, according to the two systems.

Category	***No. of spp.***	***Sum (Ball)***	***Sum (Foster)***
RDB	4	400	128
Na	5	250	80
Nb	30	1200	240
Nr	22	440	88
L	58	0	116
C	173	0	173
Total	**252**	**2290**	**825**

Table 2: Number of species in status categories, Invertebrate Index, and Rarity Scores, for the roadside

It is hard to interpret an Invertebrate Index of 2290 points, or a Rarity Score of 825, as both measures are largely dependent on recorder effort, and they also vary from region to region.

For comparison, the Invertebrate Indices of sites in three adjacent Invertebrate Site Registers have been collated in Table 3. Grade A sites are considered to be of national importance for their invertebrates, equivalent to Nature Conservation Review sites (Ratcliffe, 1977). Grade B sites are of regional importance, and would merit SSSI status for their invertebrates.

Source	***Area***	***A,B,no.***	***Max***	***Min***	***Mean***	***S.D.***
Foster (1987a)	Norfolk Breck	A,5	8120	1660	5068	2821
		B,5	1420	620	1028	265
Foster (1987b)	Suffolk	A,4	5470	820	2478	1823
		B,9	3900	200	1408	1165
Foster (1987c)	Norfolk Broads	A,4	7460	1760	4700	2043
		B,11	4050	340	1111	1019

A,B, No. = grade of site (A or B), and the number of such sites in area
Max, Min = highest, lowest Invertebrate Indices for that grade and area
Mean, S.D. = mean Invertebrate Index and standard deviation of the mean

Table 3 Comparison of Invertebrate Indices for important conservation sites in East Anglia (from Invertebrate Site Register reports)

There is a wide variation in the Invertebrate Indices of grade A and B sites, due to the range of recording effort, so it is inadvisable to use the Index to rank sites. The highest scoring sites in the region are mostly large and diverse sites which have been well-worked by a wide range of entomologists over many years, such as Thompson Common (8120), Stanford Training Area (7680), Foulden Common (6120), Walberswick (5470) and Surlingham & Wheatfen (4050).

The roadside survey is the work of only two entomologists, with rather narrow interests, examining a very small site for seven months; not an exceptionally high intensity of survey effort. The score of 2270 is higher than several famous and highly-regarded sites, including Weeting Heath (1760), East Wretham Heath (1660), East Harling Common (1140) and Upton Broad (1760).

No equivalent context is available for Rarity Scores for terrestrial habitats, as there are very few published lists for East Anglian sites which are scrupulous in including all the common species as well as the rarities.

5.4 Species Quality Indices

Any cumulative species score will increase as the number of species identified from a site grows. A partial solution to this problem is the Species Quality Index (G.N. Foster, 1987; Ball, 1992), which is the average species status for a site:

SQI = Rarity Score / Number of species

In theory, the SQI is independent of recorder effort, although the inclusion of different taxonomic groups and different sampling methods seem to alter the SQI. A more robust estimate of site quality could be based on a single taxonomic group, or a standardised sampling method; carabid beetles and pitfall trapping is a likely choice for such studies. However, the results from the roadside are mixed. The SQI from the full species list for the roadside is:

RS / No. of species = 825/292 = **2.83**

This may be compared with the data for the Carabidae, and with the subset of carabids captured in one month's pitfall trapping (Table 4).

	No. of species		**Score (Foster)**	
Status	***Pitfall***	***All Carabids***	***Pitfall***	***All carabids***
RDB	1	2	32	64
Na	0	3	0	48
Nb	5	9	40	72
Nr	1	8	4	32
L	3	11	6	22
C	16	36	16	36
Total	**26 spp.**	**69 spp.**	**98 pts**	**274 pts**

SQI (pitfall) = 98/26 = **3.08** SQI (all carabids) = 274/69 = **3.97**

Table 4 Calculation of Species Quality Index for the Carabidae at the roadside, and for the subset of Carabidae from the roadside pitfall traps (data from table in section 2.2)

The SQI for the pitfall trapping is thus close to that from all recording to date, but the carabids as a whole score much higher than the rest of the fauna.

5.5 Example: Habitat requirements of a Breck roadside fauna

The majority of the fauna at the roadside are species typical of dry grassland, bare ground (early successional habitats) and heathland. This is not surprising: it would apply to most road verges on sandy soil. What is most remarkable about the roadside is the abundance of the most stenotopic species of early succession, and the complete absence of many very common eurytopic species which are usually considered ubiquitous.

For instance, the two commonest carabid species in Britain are probably *Pterostichus madidus* and *Nebria brevicollis*: neither has yet been recorded at the roadside. They are both large and very mobile, so dispersal should not be a problem. Two of the largest carabid genera, *Pterostichus* (23 species, of which 10 are very common in East Anglia) and *Agonum* 24 species, 7 common), are virtually absent (a single specimen of the common arable-field species *Agonum dorsale* was found). The largest carabid genus, *Bembidion* (57 species in Britain, of which 9 are almost ubiquitous), is represented by only two species, neither of which is abundant - none was caught in the pitfall traps.

The absentees probably provide the key to understanding the fauna which is present at the roadside. It seems likely that conditions are too harsh (hot and dry in summer; cold, dry and probably unstable in winter) for eurytopes to survive. Four overlapping natural habitat-elements may be distinguished, which are each adapted to such dry, sandy harsh conditions: heathland, coastal-dune, and sandy-grassland faunas, which occur wherever there is mobile sand or dry heathy vegetation with bare ground; and a specifically Breckland fauna, which requires a similar structure of habitat but which is further restricted by requiring a semi-continental climate. A few of the species also find suitable conditions in ploughed fields and gardens. Although the divisions are artificial, and there is a continuum between heathland, grass-heath and sandy grassland, most of the scarcer species may be placed in one or two of these categories; a few occupy can occasionally be found in all of them. To summarise the habitat requirements of the scarcer species:

Habitat	***RDB***	***Na***	***Nb***	***Nr***	***L***	***Total scarce***
Breck specialists	4	2	1	0	0	7
Dry heath	1	1	9	2	4	17
Coastal dune	0	3	9	8	8	28
Sandy grassland	2	4	10	9	9	34
Ploughed fields	0	0	6	1	0	7

This illustrates a simple principle: rare species tend to occupy rare habitats. The four Red Data Book species at the roadside are all Breck specialists. This is a consequence of their requirements being doubly-restricted: a special habitat in a small climatic region.

5.6 Breckland affinities of British Carabidae

Using data from the *Atlas of British Ground-beetles* (Luff, 1998), it is possible to assess the status of each species, most simply as a count of 10km squares. Because the historical record of carabids is patchy, and tends to over-estimate the frequency of the rarer species, I have concentrated on post-1970 records in this analysis. A comparison of total and post-1970 records provides an index of the national decline of the species. Counts of squares in both categories are given in Table 6. (A broadly similar pattern of decline has been reported from the Netherlands (Turin & Den Boer, 1988).

'Breckland' may be defined as a group of twelve 10km squares: TL76, TL77, TL78, TL79, TL87, TL88, TL89, TL97, TL98, TL99, TF70 and TF80 (Corbett, 1973). Species may be ranked according to the proportion of their British range (in terms of recorded 10km squares) which lies within Breckland.

The Breck carabid fauna comprises two very distinct groups: dry heathland species and wetland species characteristic of Breck meres and pingo pools. This analysis looks only at the dry species: the roadside

supports only the dry-heath element. The species are ranked by their Breck affinity, in Table 5. Although the small sample size for the rarer species may exaggerate their affinity, in most cases it parallels their habitat choice in Europe (Lindroth, 1985, 1986).

Table 5 British Carabidae ranked by their Breckland affinity, with a summary of their current and historical national distributions

Total = no. of 10km squares species is recorded from in Britain (max = 1212)
P70 = no. of 10km squares species is recorded from since 1970 (max = 1076)
Breck = no. of 10km squares in Breck since 1970 (max = 12)
% Breck = % of total post-1970 squares for a species which are in Breck

The average % Breck for all carabid species in Britain is 1.1%; Table 6 includes all species with % Breck greater than 4

Species	Total	P70	Breck	% Breck
Amara fusca	3	1	1	100
Cymindis macularis	2	1	1	100
Harpalus froelichii	10	2	2	100
Harpalus pumilus (=vernalis)	13	10	6	60
Bradycellus csikii	4	4	2	50
Cymindis axillaris	22	9	4	44
Amara infima	9	6	2	33.3
Harpalus servus	21	9	3	33.3
Harpalus smaragdinus	24	9	3	33.3
Amara consularis	71	25	6	24
Masoreus wetterhalli	16	9	2	22.2
Licinus depressus	60	34	6	17.7
Amara equestris	38	18	3	16.7
Harpalus attenuatus	63	38	5	13.2
Amara lucida	79	39	5	12.8
Syntomus truncatellus	80	50	6	12
Harpalus schaubergerianus	42	18	2	11.1
Demetrias monostigma	48	30	3	10
Panagaeus bipustulatus	84	50	5	10
Harpalus rufipalpis (=rufitarsis)	103	77	6	7.8
Calathus ambiguus	64	31	2	6.5
Laemostenus terricola	166	80	5	6.3
Amara fulva	95	49	3	6.1
Tachys bistriatus	35	17	1	5.9
Harpalus tardus	183	120	7	5.8
Harpalus anxius	87	57	3	5.3
Amara convexior	109	77	4	5.2
Dromius angustus	49	39	2	5.1
Platyderus depressus	115	81	4	4.9
Amara eurynota	118	67	3	4.5
Calathus erratus	204	136	6	4.4
Syntomus foveatus	290	216	9	4.2
Amara anthobia	29	24	1	4.2
Amara praetermissa	41	25	1	4.0

5.7 Literature on Ecology and Conservation

Thiele (1977), a book of about 200 pages, is a thorough review of the ecophysiology of carabids, particularly in relation to the mechanisms of habitat selection. A habitat classification of ground-beetles is available from the Netherlands; there are a few differences from species' behaviour in Britain, but it is generally quite informative; it is also quantified, as far as pitfall data can be:

> **Turin, H., Alders, K., Den Boer, P.J., Essen, S., Heijerman, T., Laane, W., and Penterman, E.** 1991. Ecological characterization of carabid species (Coleoptera: Carabidae) in The Netherlands from thirty years of pitfall sampling. *Tijdschrift voor Entomol.*, **134**, 279-304.

The proceedings of international conferences provide summaries of current research into ground-beetles. The most useful recent volumes are probably:

> *Ground beetles as a key group for biodiversity conservation studies in Europe.*
> 2005. XII European Carabidologists' Meeting proceedings, Nausicaa Edicion Electronica, Murcia, Spain.
>
> **Niemela, J.** (editor) Population biology and conservation of carabid beetles. *Annales Zoologici Fennici* volume **33**, June 1996
>
> **Desender, K., Dufrêne, M., Loreau, M., Luff, M.L. and Maelfait, J-P.** 1994. *Carabid beetles: ecology and evolution.* Dordrecht: Kluwer Academic Publishers. (*Series Entomologica* **51**).

Each has contains a large number of useful papers the two most recent are reasonably priced (£20-30), but the 1994 volume is expensive (about £175), and hard to obtain.

A more specialised but more balanced review of a small group of carabids worldwide:
Pearson, D.L. & Vogler, A.P. 2001. *Tiger Beetles: the evolution, ecology and diversity of the cicindelids.* Ithaca & London: Cornell University Press.

Eyre and Luff's classification of grassland carabid communities shows what can be done with multivariate statistics, combined with a sound subjective understanding of the factors governing species distributions.
Luff, M.L. Eyre, M.D. & Rushton, S.P. (1989. Classification and ordination of habitats of ground beetles (Coleoptera, Carabidae) in north-east England. *Journal of Biogeography*, **16**, 121-130) provides a wider-ranging analysis.

A further paper,

> **Terrell-Nield, C.** 1990. Is it possible to age woodlands on the basis of their carabid beetle diversity? *Entomologist*, **109**, 136-145.

might be of interest. Its conclusions are rather negative, but are worth reading.

Conservation

The most up-to-date assessment of the conservation status of beetles, and on the habitats of the scarcer ones, is Hyman (revised Parsons) (1992) , listed in the Breck paper; the Red Data Book (Shirt 1987) provides a little more detail on the very rare species. A review of the status of species in adjacent parts of Europe is given by:

> **Turin, H. and den Boer, P.J.** 1988. Changes in the distribution of Carabid beetles in the Netherlands since 1880. II. Isolation of habitats and long-term time trends in the occurrence of Carabid species with different powers of dispersal (Coleoptera, Carabidae). *Biological Conservation*, **44**, 179-200.

Part 2: Identification

KEY TO GENERA OF BRITISH GROUND-BEETLES

v. 1.6 May 2008

This key to about 50 of the 65 or so British genera includes the larger ones, and those with common or conspicuous species, so should cover about 340 of the 360 British species; the omissions are all scarce or rare species, and are listed at the end. Almost all the characters should be visible with a x10 hand lens in good light. Within a few of the included genera, a handful of very rare or extinct species may fail to key out. Where several genera key out together, these are closely related, and will later be keyed to species in a single key.

1 Antennae attached between clypeus and frons, on upper surface of head above base of mandibles. Eyes huge. Clypeus broader than distance between bases of antennae. Mandibles marked with yellow or white. Elytra smooth and flat,without grooves, bright green or brown-black, with opaque creamy spots or blotches. 8-19mm. Tiger-beetles *Cicindela* (4 species) and *Cylindera* (1 species)

1a Antennae attached behind base of mandibles, below level of frons and clypeus; clypeus much narrower than distance between antennae bases. Eyes various. Mandibles usually dark. Elytra often with grooves or rows of pits, seldom with opaque creamy spots or blotches. **2**

2 Fore tibiae with fairly straight sides, gradually widening from base toward apex, without an antenna cleaner (a notch on inner edge). Some species have a notch at or near the apex of tibia, often surrounded by a comb of bristles, used for cleaning antennae. In these cases, the tibia below the notch is narrower than the widest part, which is above the notch. Elytra never truncate (see couplet 14). **3**

2a Fore tibia with a notch on inner or lower side, the antenna cleaner, usually with a long, thick, curved bristle spanning the opening. The notch is best seen from above in front, and to one side, looking across the beetle, and is usually between halfway along and a third the way from apex. (Forsythe, p.26, fig. I.6, or inside front cover). The tibia almost always gets wider below the antenna cleaner, so the widest part of the tibia is below it. Elytra may be truncate. **11**

3 Usually 4-14mm long (max = 24mm). Last segment of palps almost as slender as other segments, usually cylindrical, not widened at apex. If longer than 13mm, then elytra are smooth and rather flat, and each has 7-9 regular grooves (striae). If 14-24mm long, then whole animal is yellow with black markings on elytra. Legs, black, brown, yellow or metallic. **4**

3a 14-30mm long. Last segment of both pairs of palps widened toward tip, more or less broadly triangular. Often with rather convex elytra, with various sculpturing, but never smooth and never with 7-9 flat intervals between 7-9 regular impressed grooves (if grooves are present, there are 11-15 of them on each elytron). Whole animal is black, sometimes with strong metallic sheens. Legs usually black, usually glossy, seldom metallic. **9**

4 4-7mm long. Rather parallel-sided: head, pronotum and elytra about equally wide, pronotum ± equilateral. Elytra shiny, brassy or black, and with 8 regular longitudinal grooves. Second interval (gap between grooves) on each elytron (counting from midline of body) much wider than the others. Eyes huge, and forehead with 5-8 deep longitudinal grooves. In most habitats. Forsythe pl.1 fig. 2 *Notiophilus* (8 spp.)

4a 6.5-24mm long. More pear-shaped: rear of pronotum often narrower than front of elytra. Elytra various: deeply pitted or bumpy, or, if rather flat and smooth, each elytron with 8-11 evenly-spaced grooves. **5**

5 Antennae with very long, thick bristles (2-2.5 times the segment length) on segments 2-6. Dense, long bristles on underside of head. Brassy metallic, elytra each with 3 very deep pits on 4th interval, and 11 full-length striae in total (but no short scutellar stria). 6-8.5mm. Common in many habitats, especially wetlands. *Loricera pilicornis*

5a Bristles on antennae much shorter, and no such cage of bristles underneath head. Seldom with 3 deep pits on interval 4, and if so, with other pits or adornments; never more than 9 striae, though often with a short scutellar stria too. **6**

6 6.5-13mm long. More pear-shaped: rear of pronotum much narrower than front of elytra, pronotum ± equilateral. Elytra convex, with deep wide, frosted pits, or appearing very uneven and bumpy, eyes large. Legs black or metallic, often with strong blue or green sheen. In wetlands. e.g. Forsythe pl. 3, fig. 1. **7**

6a 6.5-24mm long. Pronotum 'heart-shaped', wider than long, at widest part about equal to base of elytra, but narrowed at base. Elytra rather flat and smooth, each with 8 evenly-spaced grooves. Eyes normal (not large and bulging). Legs red-brown, blackish or yellowish. **8**

7 Elytra appearing frosted-metallic, without well-defined grooves, but with several large, flat oval or circular pits with a green or purple metallic sheen. Hind margin of pronotum turned down all along its edge. Head pitted but without conspicuous grooves. Legs and tarsi with blue or green metallic sheen. 6.5-10mm. *Elaphrus* (4 spp)

7a Elytra glossy, each with about 8 longitudinal grooves, which are interrupted by deep, irregular pits, giving a bumpy appearance. Pronotum with hind edge raised in middle, and at sides, so hind corners stick up and are right-angled. Head with a conspicuous figure-of-8 groove on each side, inside the eyes. Legs and tarsi unmetallic brown-black. 10-13.5mm. *Blethisa multipunctata*

8 **[3 choices]**

8a 6.5-10.5mm long. Mandibles with wide flange on outside (p.28, fig I.21); palps very long and slender. Upper surface brown (often reddish and translucent) or blackish with bluish metallic sheen. *Leistus* (6 spp.)

8b 9-16mm long. Mandibles without flange (p. 28, fig. I.22), palps not especially elongate or slender. Upper surface black or dark brown, sometimes with a yellow margin. *Nebria* (5 spp.)

8c 17-24mm long. Mandibles without flange, palps not especially elongate or slender. Whole beetle, inc. legs, yellow or yellow-brown, with black zigzag marks on elytra. *Eurynebria (Nebria) complanata*

9 Head and pronotum narrow, jaws very elongate: head (from pronotum to tip of jaws) about twice as long as wide. Elytra with roughening but no grooves or other longitudinal pattern. Pronotum longer than wide, completely rounded at hind angles. Elytra broad and very convex; whole beetle pear-shaped, unmetallic black. 14-19mm. *Cychrus caraboides*

9a Head, pronotum and jaws not elongate. Elytra often with linear sculpting: grooves, rows of pits, or raised bumps (sometimes like strings of sausages). Pronotum usually with backward-pointing hind angles; if not, then broader than wide. Elytra flat or moderately convex, whole beetle more parallel-sided. 13-38mm. **10**

10 Pronotum with rounded base. 2nd antennal segment almost equilateral, and no more than 0.33x the length of 3rd segment. Elytra broad, each with 11-15 regular, punctate striae with smooth, flat or convex intervals in between. 16-30mm long. *Calosoma* (2 spp.)

10a Hind-angles of pronotum protruding as backward-directed points. 2nd antennal segment elongate, at least 0.5-0.7x length of 3rd segment. Elytra more elongate, with various sculpting, but not with 11-15 regular, punctate striae with smooth intervals between. 13-38mm long. *Carabus* (9 spp.)

11 Last segment of maxillary palps (the longer, outer pair of palps) very small and

slender, much smaller than penultimate segment, like a finger protruding from a mitten (p.34, fig. III.10). Beetle 2.5-7mm long **12**

11a Last segment of maxillary palps about as large as penultimate segment. Beetle often larger. **14**

12 Elytra hairy; no clearly-defined grooves. Head broad, with very large eyes. Upper surface brassy or coppery metallic, with a frosted appearance; no pale or translucent spots. 3.9-6mm. *Asaphidion* (4 spp.)

12a Elytra not hairy, but each with 6-8 grooves or rows of neatly-alligned pits, well-marked at least at base of elytra. Colour very varied, but seldom frosted copper/brassy, and often with pale or translucent spots on elytra. 1.5-7mm. **13**

13 1.5-2.7mm. Short scutellar stria of elytra absent. Sutural stria runs to apex, then curves back toward middle of elytra. Plain black or brown, sometimes with diffuse paler spots; not brightly metallic. *Tachys* (4 spp.), *Elaphropus* (3 spp.), *Porotachys* (1 sp.)

13a 2.5-7mm. Short scutellar stria present (p.42, fig. IV.2). Sutural stria curves back only in 2 species, which are 3.5-6mm long. Often well-marked with pale spots or metallic coloration. *Bembidion* (*c.* 60 spp., inc *Ocys, Cillenus, Bracteon etc.)*

14 Elytral apex truncate (as though snipped off), so last 2 or more abdominal segments jut out. 2.5- 12mm long. **15**

14a Elytral apex rounded, pointed or elongate, covering all of abdomen, or with only a part of last segment showing (but beware gravid females and specimens from pitfalls, which may have swollen abdomens) **22**

15 Beetle entirely black or dark brown, sometimes with a metallic sheen. At most a faint translucent spot on each elytron near shoulder. Legs dark brown or black. 2.5-4mm. **16**

15a Variously coloured (often pale, yellow, brown or orange in part), seldom all dark; often with head dark and elytra patterned pale and dark. If entirely dark, usually longer than 4mm. **17**

16 Elytra end straight across. Apex of elytra thin and flimsy, ridge or groove along margin weak or absent. 2-3.5mm *Microlestes* (2 spp.)

16a Elytra end rather obliquely, the apical margin sloping forward at the sides. Apex more rigid and 'better finished', with a strong marginal ridge outside a groove along the epipleure. 2.6-3.8mm *Syntomus* (*c.* 4 spp.)

17 Fourth tarsal segment composed of two enlarged lobes, much wider than segments 1-3. Head black, pronotum and elytra straw-coloured, often with a blackish mark along suture. 4.2-5.6mm *Demetrias* (3 spp.)

17a Fourth tarsal segment similar to segments 1-3 but slightly smaller. If tarsus 4 is somewhat bilobed, then elytra are black with a metallic sheen, or with 4 conspicuous pale spots. 2.5-12mm. Colours variable; if head black and rest of beetle straw-coloured, then only 2.5-3.4mm long. **18**

18 Elytra dark, black or metallic green or blue, usually uniform, in one rare species with 4 large orange spots. 4-9.8mm **19**

18a Elytra brown or yellowish, never blue, green or black, often with pale spots or stripes. 2.5-12mm **20**

19 Head blue-black, pronotum reddish, elytra bright metallic green or blue. 4-8.1mm *Lebia* (*c.* 5 spp.)

19a Head and pronotum red-brown, elytra black or metallic blue-black. Emits a puff of acrid steam from tip of abdomen when irritated: 'Bombardier beetle'. 6.1-9.8mm *Brachinus crepitans*

19b Whole beetle black. Elytra heavily pitted between striae. 9.5-18mm. *Licinus* (2 spp.)

20 Head and elytral *intervals* strongly and densely pitted (lots of pits, mostly as about 2 rows along each interval), in most species hairy. Elytra usually dark brown with a cream-coloured elongate streak on each shoulder. 8-12mm *Cymindis* (3 spp.)

20a Head and elytral *intervals* not pitted (elytral striae may be rows of small pits, sometimes widely spaced). Not hairy. Often differently patterned. 2.5-12mm. **21**

21 Head and pronotum bright metallic blue-green. Pronotum with scattered deep pits, and shaped like a narrow barrel, about twice as long as wide and much narrower than head. Elytra orange-brown with black or blue-metallic apical spot. Wet places, esp. reedbeds. 6.6-7.8mm *Odacantha melanura*

21a Pronotum about equilateral, as wide as head or wider, with a smooth, flat dorsal surface. Variously patterned in yellows, browns and black, but never metallic blue-green in any part. 2.5-7mm. *Dromius* (12 spp., inc. *Paradromius* (2 spp.), *Calodromius* (1 sp)., *Philorhizus* (5 spp.))

22 Species obviously adapted for tunnelling underground. Pronotum and elytra joined by narrow cylindrical waist; pronotum without hind-angles jutting out at side (may have a ridge on the 'waist'). Front tibiae usually modified for digging: flattened and/or with large spurs and bristles. Short-legged, walk slowly when on surface. e.g. pl. 1 fig 3. **23**

22a Species not adapted for tunnelling. Less obviously 'waisted'. Often but not always fast-running. Body forms various but usually more flattened or relatively broader and more oval. Front tibiae more slender and less spiny. Many spp. able to run quickly. Pronotum often with hind angles, which may be sharp or rounded. **24**

23 [4 choices, distinguishable on length and colour]

23a 17-22mm, all black, sometimes shiny but never metallic. Elytra rather dull back, with striae very faint. Coastal sand dunes, occasionally gravel pits inland. *Broscus cephalotes*

23b 6.5-8mm long, very glossy brown-black. Elytra very convex. Upland and northern. *Miscodera arctica*

23c 5-6.5mm long, some shade of brown or orange, never metallic or strongly shiny. Elytra parallel-sided and with rather square shoulders. *Clivina* (2 spp.)

23d 2.2-4.1mm (coastal spp. up to 5.5mm), black with strong brassy gloss. Elytra parallel-sided but shoulders rather rounded in outline. *Dyschirius* (11 spp.)

24 Antennae with very long, thick bristles (2-2.5 times the segment length) on segments 2-6. Dense, long bristles on underside of head. Brassy metallic, elytra each with 3 very deep pits on 4th interval, and 11 full-length striae in total (but no short scutellar stria). 6-8.5mm. *Loricera pilicornis*

24a Bristles on antennae much shorter, and no such cage of bristles underneath head. Seldom with 3 deep pits on interval 4, and if so, with other pits or adornments; never more than 9 striae, though often with a short scutellar stria too. **25**

25 A single pit (a small round depression, sometimes with a small raised bump in the middle of it) with a long bristle above each eye (bristles often break off, but the small pits from which they arise are usually visible in good light) (If the head is covered with short hairs, the bristle referred to here projects beyond the other hairs, which are usually much finer). **26**

25a Two pits, each bearing a single long bristle, above each eye. **34**

26 Pronotum, sometimes head, and always all elytral intervals hairy (with hairs short, usually curved or lying flat against the surface). **27**

26a Upper surface not generally hairy, apart from a small number of long, erect bristles on elytra margin, above eyes, and on margin of pronotum. Sometimes hairy on outer 2-3 intervals, and along apex of inner intervals. **29**

27 Upper surface of tarsi without hairs. Antennal segments hairy (with large numbers of hairs, which are short, usually curved or lying flat against surface) from no. 4 onwards, contrasting with hairless segments 1 to 3 (which bear a small number of longer bristles). Head, pronotum and elytra usually metallic green, sometimes with yellow apex or margin to elytra. 8.5-13mm. *Chlaenius* (4 spp.)

27a Tarsi hairy. Antennal segments hairy from no. 2 or no. 3 onwards. Upper surface seldom metallic green, and never with a contrasting pale margin. **28**

28 Lacking a short scutellar stria. Eyes hairy (short pale bristles arising between the facets of the eyes). Only in saltmarshes. 5.2-8mm. *Dicheirotrichus* (2 spp.)

28a Short scutellar stria present. Eyes not hairy. 5.5-17mm
Ophonus (*c.* 14 spp.) and *Harpalus* subgenus *Pseudophonus* (2 spp.)
See key to *Harpalus* and related genera.

29 Pronotum with a well-marked rounded or flattened ridge across the base. Mostly broad, thickset species with pronotum about as wide as elytra. Usually blackish, often with a metallic sheen. 5 - 17mm. **30**

29a Pronotum without a distinct basal ridge, except sometimes at sides. Unmetallic brown, often reddish or pale. Pronotum narrower than elytra, and beetle more elongate. 2.2-6.5mm **32**

30 First segment of hind tarsi about equal to, or shorter than, apical spur of tibia. Males with both front and middle tarsi with expanded segments. No translucent spots between eyes. Hind angles of pronotum blunt or sharp, but rarely protruding sideways 5.3-14mm. *Harpalus s.s.* (*c.* 20 spp.)

30a First segment of hind tarsi much longer than apical spur of tibia. Males with only front tarsi expanded. 8-16mm. Head usually with one oval spot or a pair of small circular spots, faintly-translucent reddish, on upper surface between eyes, and hind angle of pronotum with a small tooth sticking out sideways. If no spots on head, and hind angle not protruding, then a heavily-built, very convex, plain black species, 14-16mm. **31**

31 Surface of pronotum heavily marked at base with large, coarse pits, and often with shallow zigzag grooves across middle. Hind angles of pronotum blunt. Head without a pair of small reddish spots. Antennae uniformly dark red. No bristle-bearing pit at base of scutellar stria. Epipleures (flange at edge of elytra) crossed near apex of elytra (view from behind, slightly to one side, and slightly from below). Heavily-built, very convex, plain black species, 14-16mm. Arable land, especially on chalk, rare. *Zabrus tenebroides*

31a Surface of pronotum with many fine pits at base, and a scatter of pits at front, but smooth in middle. Hind angles of pronotum often with a small tooth sticking out sideways (if not, upper surface is metallic, usually greenish). A small bristle-bearing pit at base of scutellar stria (as in p.49, fig. V.12). Head usually with one oval spot or a pair of small circular spots, faintly-translucent reddish, on upper surface between eyes. Antennae dark brown with 1-2 basal segments contrasting pale reddish. Epipleures not crossed. Rather flat species, 8-13.5mm. *Anisodactylus* (3 spp.)
(see key to *Harpalus* and related genera)

32 **[Three options]**

32a Antennae entirely pale. Mentum (underneath mouthparts) with a small central tooth between the two larger side teeth. Body convex, often uniformly pale reddish brown. 3-5.2mm. Often in dry places. *Bradycellus* (7 spp.)

32b Antennae dark with 1 or 2 basal segments pale. Mentum without a central tooth. Body rather flat. Usually mid or dark brown, often with pronotum paler. 2.2-4mm (rarely 4.5mm). In wet places. *Acupalpus* (9 spp.)

32c Antennae dark with 1 or 2 basal segments pale. Mentum without tooth. Body rather flat. Mid or dark brown, sometimes with paler markings on elytra. 5-6.2mm. In wet places. **33**

33 Outer 2-3 elytral intervals hairy, and inner intervals often hairy toward apex. Upper surface not iridescent. Sides of head and pronotum hairy. Eyes with short hairs between facets. 3.5-5.5mm.
Trichocellus (2 spp.)

33a All intervals hairless, apart from a few long bristles. Elytra iridescent (with multicoloured coloured rainbow reflection like oil-film). Head, eyes and pronotum hairless. 5-6.2mm.
Stenolophus (3 spp.)

34 A pair of fine but often deep furrows run between the eyes, then diverge in a smooth semicircle around the back of each eye, and run down the side of the neck. Legs always pale. Whole body brown or yellowish in most species. Tips of palps finely pointed. Mostly smaller than 4mm (range 3.5-6.5mm). *Trechus* (7 spp.), *Trechoblemus* (1 sp.), *Blemus* (1 sp).

34a Lacking the fine semicircular furrows on head. Most species have dark or black legs and few have brown or yellowish bodies (at least when fully hardened and mature). Tips of palps usually blunt. Size range 3.9mm to over 20mm. **35**

35 No bristle-bearing dorsal pits on flat surfaces of elytral intervals 1-7. Intervals never covered with short hairs and never heavily pitted. **36**

35a At least 1, and sometimes up to 7, bristle-bearing pits on or adjoining 3rd interval, often next to 3rd or 2nd stria (marginal and apical bristles not counted). Sometimes pits also present on flat part of other intervals. Pits can be small, inconspicuous, or close to apex of elytra (but not along elytral margin): they appear as depressions from above, and as upstanding hairs in side view. They tend to be in similar positions on the two elytra. (Intervals never have more than 7 bristle-bearing pits total, but may be covered with short hairs.) **39**

36 Rounded or parallel-sided oval species. Pronotum usually broadest near rear, and hind edge of pronotum about as wide as width of elytra at shoulders **37**

36a Slender species. Pronotum much narrower than base of elytra, and strongly sinuate (S-shaped curve, bulging out, then going in at sides, then out again toward hind-angle) at sides; much narrower at base than at widest part. **38**

[3 choices]

37a Up to 15mm long. Usually dark brown or blackish with a metallic sheen. Mandibles short and blunt, protruding beyond the labrum by less than the length of the labrum, even when wide open. 8th elytral interval no more ridged or keeled than 7th and 9th. Mostly rounded oval beetles.
Amara (27 spp.), *Curtonotus* (3 spp.)

37b 18-22mm long, glossy black without a metallic sheen. Mandibles longer, protruding by more than the length of the labrum. 8th elytral interval ridged, to the outer edge of the elytra is turned down almost vertically. Parallel-sided, broadly oval, flattened. *Abax parallelepipedus*

37c Not fitting either of the above descriptions **39**

[3 choices]

38a 6.8-8.3mm. Reddish brown, rather narrow and parallel-sided. Mandibles extremely long and forward-pointing (p. 48, fig. V.2), first antennal segment elongate (longer than 2nd and 3rd together). Tarsi not hairy on upper surface, tarsal claws smooth. *Stomis pumicatus*

38b 13-17.5mm. Black, usually with a bluish metallic sheen, narrow head and thorax, elytra widening toward rear. Mandibles sharply pointed but not so long nor protruding. Tarsi hairy on upper surface, tarsal claws with small teeth at their base. *Laemostenus* (2 spp.).

38c Not fitting either of the above descriptions **39**

39 Tarsal claws serrated on the inside, with 3-6 comb-like teeth at least toward the base of each claw (sometimes worn, so may need x20 magnification). Pronotum with sides straight or simply rounded, never sinuate. Mostly elongate-oval beetles with a smoothly convex outline (1 sp. with narrower pronotum). 6-15mm. Mostly rather dull brown-black, or red-brown with black pronotum. **40**

39a Claws smooth. Pronotum various, often sinuate at sides (S-shaped curve, going in at sides, then out again toward hind angles). Pronotum often narrower than elytra at shoulders. Upper surface more convex than lower. 5-21mm. **41**

40 Last segment of labial (inner) palps swollen and pear-shaped. Pronotum rounded, and much narrower than elytra. 6-8.5mm. *Synuchus vivalis*

40a Last segment of labial palps not swollen, almost cylindrical. Rather convex beneath and flat on the back. Hind legs long: fast-running spp. Mostly elongate-oval beetles with a smoothly convex outline (1 sp. with narrower pronotum). 6-15mm. Either rather dull brown-black, or red-brown with black pronotum. *Calathus* (8 spp.)

41 Mandibles very blunt and asymmetrical (a large lump on upper surface of one mandible). Labrum with deep V-shaped incision p.48, figs V.1a, V.1b). Only 2 bristle-bearing dorsal pits on elytra. The only common sp. has black head, orange pronotum, and elytra orange with black marking. If large (9.5-18mm), all black and with numerous pits on each elytral interval. 4-18mm **42**

41a Mandibles more pointed, and without a lump on upper surface of one. Labrum straight or with shallow concave front margin. Most species uniformly black, occasionally brown, sometimes with metallic sheen. Elytral intervals never heavily pitted. 4.5-20mm **43**

42 Elytra shiny, intervals smooth and hairless, usually shiny. Common species has black head, orange pronotum, and elytra orange with black marking. Others are all-black. Black-and-orange species 4.5-9.1mm, all-black species 4.5-6mm *Badister* (7 spp.)

42a Elytra dull, intervals densely pitted but not conspicuously hairy. Whole beetle black. 9.5-18mm *Licinus* (2 spp.)

43 Pronotum and elytra covered in thick, long golden hairs. Head rectangular, parallel-sided, with small eyes protruding hemispherically a each side. Black, with two large and clearly defined red spots on each elytron. 6.5-9mm *Panagaeus* (2 spp.)

43a Pronotum and elytra never with more than a few hairs. Head less parallel-sided and eyes less protruding. Elytra either uniformly coloured, or dark along midline and narrowly or broadly pale at margins. 4.5-20.5mm. **44**

NB. Alternative: go to Key 2 on page 110 (see footnote)

44* Epipleures (flange at edge of elytra) 'crossed' near apex of elytra (view from behind, slightly to one side, and slightly from below), as if one flange narrows and disappears, and a second flange appears from behind it. Legs dark red or black, rather stout; front tibiae often much broader at apex than at base. Mostly rather stout and parallel-sided beetles with thick tibiae. 5-20mm **45**

44a* Epipleures not crossed, the flange usually narrows gradually toward apex of elytra.. Mentum with a central tooth or pair of small teeth. Legs black or pale or reddish, slender; fore tibiae not much thicker at apex than at base. Mostly rather 'pear-shaped' beetles, with slender head and fore-body, and often with elytra broadest in hind half, legs usually rather long and slender. 5-13mm. **47**

45 Head with a deep transverse groove across the neck, giving impression of a rounded collar. 6.8-10mm. Dark red-brown, never metallic. *Patrobus* (3 spp.)

45a Head without deep groove. Most species glossy black, some metallic. **46**

46 Tarsi hairy on upper surface. Tarsal claws with (often very shallow and obscure) small teeth. Eyes rather small and flat, their outline coinciding with the sides of the head. Rather pear-shaped (elytra wider toward rear), black, often with a bluish sheen. 13-17.5mm. *Laemostenus* (2 spp.)

46a Tarsi not hairy above. Claws smooth, not toothed. Eyes larger, slightly protruding at sides of head. Usually rather parallel-sided, glossy black, without a bluish sheen (a few species are strongly brassy, coppery or green metallic). 5.3-20.5mm. *Pterostichus* (21 spp.), *Poecilus* (4 spp.)

47 Front edge of pronotum with a slight forward curve or bump near middle. This rubs on a rough, finely-ridged or granular patch at the back of the head. Pale reddish brown, very fast. 5.5-8mm *Platyderus depressus*

47a Front of pronotum straight or gently curved. Back of head without granular patch. **48**

48 Mentum (on underside of head between the bases of jaws, see fig. G2 inside front cover of Forsythe) with 2 large teeth and a gap or bay between them (p.48, fig. V.6). Pronotum rounded, almost circular and as wide as elytra over shoulders. Dark metallic olive-brown with pale, often whitish legs. 6.4-7.8mm. Dry places. *Olisthopus rotundatus*

48a Mentum with a shorter tooth in the middle between the pair of large teeth (p.48, V.8 and V.9). Pronotum usually narrower and less rounded. Legs dark in many species. 4.5-12.3mm **49**

49 Either the pronotum is simply rounded at sides, without protruding hind angles, or, if sides of pronotum are sinuate with pointed hind angles, then antennae are hairy from 4th segment onwards (with large numbers of hairs, which are short, usually curved or lying flat against surface) , contrasting with hairless segments 1 to 3 (which bear a small number of longer bristles). Mentum with 3 teeth, a large pair and a smaller one in middle (p.48, V.8). Pronotum often longer than wide, narrower than elytra at shoulders. Elytra usually broadened toward rear, so whole beetle is pear-shaped. 4.5-12.3mm. *Agonum* and related genera (25 spp.)

49a Pronotum with sinuate sides and pointed hind-angles. Antennae hairy from halfway along 3rd segment. Mentum with 4 teeth: two large ones at sides, and a central tooth which is divided into two smaller teeth at its tip (p.48, V.9). Elytra almost parallel-sided, pronotum equilateral or wider than long, about same width as elytra at shoulders. Dark with strong metallic brassy sheen (contrasting pale elytra in one species). 5.5-8.5mm. Saltmarshes only. *Pogonus* (3 spp.)

- **Note*: Pterostichus* and *Agonum*, separating at couplet 44, are important genera, with about 25 species each, including many common species. They are reliably distinguished using rather difficult characters (epipleures), but have a distinctive 'jizz' due to body shape, and leg length/ thickness. The small genera keying here resemble *Pterostichus* and *Agonum* respectively. Key 2 starting on page 110 includes all the species which key out at/after couplet 44, and it avoids this feature, and avoids the mentum (underside of head) feature.**

The following species are not included in the key; all are scarce, rare or believed extinct in Britain. Most are described in the alphabetical section of the guide, and many are included in keys to related and similar species.

Omophron limbatum
Pelophila borealis
Perileptus areolatus
Aepus robinii
Aepus marinus
Thalassophilus longicornis
Sphodrus leucophthalmus
Perigona nigriceps
Scybalicus oblongiusculus
Diachromus germanus
Callistus lunatus
Oodes helopioides
Masoreus wetterhallii
Lionychus quadrillum
Polistichus connexus
Drypta dentata

KEYS TO SPECIES, ARRANGED ALPHABETICALLY BY GENUS

ABAX

The two species may be separated as follows. Note that *A. parallelepipedus* is common and widespread, and *A. parallelus* has been recorded once or twice as an introduction.

1 7th elytral interval strongly keeled. Underside of last (claw-bearing) tarsal segments with 2 or more pairs of pale brown bristles. 18-22mm. Common, mainly woodlands. *Abax parallelepipedus*

1a 7th interval convex but not strongly keeled. Underside of last tarsal segment without bristles. 14-18mm. Rare introduction. *Abax parallelus*

ACUPALPUS

1 Pronotum sides sinuate: convex at front, becoming concave toward rear, with hind angle jutting out. Antennae long and slender, whole beetle rather long and parallel-sided. Abdomen with many long hairs on underside. Usually dark brown, blackish on head, with elytra red-brown with a long blackish spot along the middle of each. 3.8-5mm. Rather scarce, usually in fens and rich waterside vegetation. *Anthracus (=Acupalpus) consputus*

1a Pronotum rounded to hind angles, which are completely rounded. Abdomen with only a few short hairs underneath. Usually smaller (2.2-4.5mm). *Acupalpus* **2**

2 Base of pronotum strongly pitted. Head and middle part of pronotum smooth and very glossy, looking as if polished. 3-4.3mm. *Acupalpus meridianus*

2a Base of pronotum without strong deep pits. Head and pronotum with transverse fine microsculpture, so more silky, less glossy. **3**

3 3rd interval of elytra with a bristle-bearing pit, usually behind middle and next to 2nd stria. If the bristle is missing (as it often is), look for the pits, one on each elyron in roughly the same place. **4**

3a No bristle-bearing pit on 3rd interval. **8**

4 Smaller, 2.5-2.8mm.. Head, including eyes, almost as wide as than pronotum. **5**

4a Larger, 3-4.5mm. Head, including eyes, clearly narrower than pronotum. **6**

5 Pronotum larger, slightly longer than head (measured from front of pronotum to tip of jaws). Whole beetle is shades of brown, with pale legs, sometimes darkened at tips of tibiae. 2.5-2.7mm. Common. *Acupalpus dubius*

5a Pronotum smaller, about same length as head. Whole beetle blackish, with tibiae also mainly dark. 2.2-2.8mm. Scarce. *Acupalpus exiguus*

6 Pronotum convex and evenly rounded. First 2 antennal segments pale. Pronotum always bright re- or orange-brown. Front tibiae stout, the male with 4th tarsal segment deeply 2-lobed. Extremely rare, south-eastern. *Acupalpus elegans*

6a Pronotum flatter, with sides straighter in rear half. Second antennal segment darker than first. Pronotum often darker in middle. Front tibiae slenderer, male 4th tarsal segment only slightly concave at apex. Very variable in colour, but often mid brown with pale base to elytra. 3-4mm. Common. *Acupalpus parvulus (=dorsalis)/maculatus* **7**

7 Pronotum clearly wider than long, rather flat. Pronotum widest in front third, widest point almost coinciding with the long bristle on either side of pronotum. 3-4mm. Common.
Acupalpus parvulus (=dorsalis)

7a Pronotum almost square, rather convex and domed in middle. Pronotum widest just in front of middle, some distance behind the pair of long bristles. Recently added to British list, so status unclear. *Acupalpus maculatus*

8 Uniform dark brown or blackish, with suture paler. Only 1st antennal segment pale. 3-3.5mm. Rare.
Acupalpus brunnipes

8a Blackish, with contrasting bright orange pronotum. Basal 2 antennal segments pale. 2.6-3.5mm. Scarce. *Acupalpus flavicollis*

AEPUS

Two small species, found uncommonly among intertidal rocks around the coast. See *Trechus* key for details.

AGONUM

Agonum is regarded as 'difficult' by most coleopterists. Some species are separated by subtle, relative characters, or are rather poorly defined and understood in Britain (so, published guides differ in what features they regard as reliable in distinguishing them). Despite this, most can be named reliably in the field using a hand lens, with a little practice. The status of one species, known in previous keys as *Agonum moestum* is unclear; work on the continent has shown this to be a complex of several similar species, and it is uncertain which, and how many, are present in Britain. Another species, *A. scitulum*, has often been mis-identified in Britain, and the literature in Britain and Europe is inconsistent in defining it. These parts of this key must be regarded as provisional.

The genus is divided into several subgenera, mostly with just one or two British species, and only two, *Agonum s.s.* and *Europhilus*, grouping several very similar ones together. They are listed below, partly because in other guides, including Luff (2007) some or all will be treated as genera.

Subgenus	***Species***	***Size range (mm)***
Anchomenus	*dorsale*	*5.6-7.7*
Sericoda	*quadripunctatum*	*4.7-6*
Paranchus	*albipes*	*6.1-8.8*
Oxypselaphus (=Anchus)	*obscurum*	*4.5-6.6*
Batenus	*livens*	*7.5-11*
Platynus	*assimile*	*8.8-12.1*
Agonum s.s.	*ericeti, gracilipes, lugens, marginatum, moestum, muelleri, nigrum, sahlbergi*[1]*, sexpunctatum,versutum, viduum*	*6.8-10.2*
Europhilus	*fuliginosum, gracile, micans, piceum, scitulum, thoreyi*	*5.5-8*

As a memory aid, subgenus *Agonum s.s.* can be divided into the strongly metallic and colourful (*ericeti, sexpunctatum, muelleri, marginatum, gracilipes*) and the mainly-black species (*moestum, versutum, viduum, nigrum, lugens*).

[1] Extinct; formerly on River Clyde in Scotland

1 Pronotum with more or less sinuate sides (curving out from front to middle, in again in rear half, then out again toward rear edge). Hind angles either pointed and protruding, or sharply right-angled. **2**

1a Pronotum simply rounded and convex at sides, not straight in hind third. Hind angles smoothly rounded and often barely discernible. **5**

2 Head and pronotum metallic green, elytra orange-brown with an oval green spot in apical half, centred on midline. Antennae hairy from halfway along 3rd segment onwards (with large numbers of hairs, which are short, usually curved or lying flat against surface) , contrasting with hairless segments 1, 2 and basal part of 3 (which bear a small number of longer bristles). 6-8.2mm Common in many habitats, including farmland. *Agonum (=Anchomenus) dorsale*

2a Differently coloured (often uniform brown or black, sometimes metallic), only parts which may be orange or yellow are the margins of the elytra). Antennae hairy from 4th segment, whole of segments 1-3 contrastingly smooth. **3**

3 Large and black with blackish legs. Pronotum with a wide concave groove around the sides, as wide as the front tibiae. Apex of elytra strongly sinuate. 8.7-12.3mm. Common, mainly woodlands. *Agonum (=Platynus) assimile*

3a Smaller, brownish. Legs red-brown or pale. Pronotum with a much narrower groove along sides. Apex of elytra not strongly sinuate. 5-9mm. **4**

4 Smaller. Pronotum narrow and elongate, much longer than wide, and with sides concave or straight in hind third. Elytral striae strongly pitted. Legs red-brown. 5-6.6mm. Common, many habitats. *Agonum (=Oxypselaphus) obscurum*

4a Larger. Pronotum equilateral or slightly wider than long, sides convex almost to hind angles. Elytral striae smooth, not pitted. Legs whitish or pale brown. Tarsi with a groove along the middle of each segment on upper side. 6.8-9mm. Common, wetlands. *Agonum (*=Paranchus) *albipes (=ruficorne)*

5 Antennae hairy from 4th segment (with large numbers of hairs, which are short, usually curved or lying flat against surface, so segments look matt finish at low magnification), whole of segments 1-3 contrastingly smooth and shiny, apart from a few longer, thicker bristles. **6**

5a Antennae hairy from halfway along 3rd segment onwards, contrasting with hairless segments 1, 2 and basal part of 3 (which bear a small number of longer, thicker bristles). **19**

6 Sides of elytra, outer 1-2 intervals, translucent yellow, contrasting with bright metallic green or bronze of rest of elytra, pronotum and head (in old specimens, or alcohol material, thethe sides may be dull borwn, but still contrasting with the metallic green) 8.8-10.4mm. Common, wetlands. *Agonum marginatum*

6a Elytra uniformly black or metallic, without yellow margins, if faintly paler brown on edges, then beetle is not metallic green or coppery on other parts of the body. **7**

7 Colour of head, pronotum and elytra strongly metallic green, coppery, brass or bluish. **8**

7a Colour unmetallic blackish, sometimes with a faint brassy or greenish sheen on elytra. **13**

8 Tibiae and at least first antennal segment reddish-brown, somewhat translucent. **9**

8a Tibiae and antennae entirely black, not translucent. **10**

9 Usually vivid metallic green on head and pronotum, with brassy or coppery elytra. 3 fine pits on third elytral interval. First antennal segment reddish, tibiae and base of femora yellow-brown. 7.2-9.5mm. *Agonum muelleri*

9a Upper surface often uniformly metallic. Third elytral interval *either* with 3-5 deep pits, the depressions wider than the third intervals, or with 4-6 fine pits. **10**

10 Base of pronotum coarsely and densely pitted, especially in the broad depression at sides. Sometimes, pits merge together to appear like coarse wrinkles. **11**

10a Base of pronotum not pitted, either smooth or shallowly and faintly wrinkled. **12**

11 Upper surface usually uniformly coppery-red metallic, sometimes uniformly green- or gold-metallic, or occasionally blackish and unmetallic. Pronotum more strongly narrowed in the basal half than at front, and widest part in front of the midpoint. Hind-wings short. Elytral striae strongly pitted. 6.5-8mm. Scarce, northern and western, bogs and wet moorland. *Agonum ericeti*

11a Upper surface usually 2-tone, head and pronotum blue-green and elytra coppery red with green margins, rarely all blackish. Pronotum widest in middle, and narrowed to the same extent front and rear. Hind-wings usually full length (life or part elytra to see). Elytral striae finely punctate. Rare, southern England, on wet heaths. 7.6-10mm. *Agonum sexpunctatum*

12 Small, 4.5-5.8mm. Elytra with 3-5 deep, wide pits in 3rd interval. Dull black with a bronze sheen. Legs and antennae not especially slender. Pronotum much wider than long, with hind angles obtuse but clearly visible. Rare, usually on burnt heathland. *Agonum (=Sericoda) quadripunctatum*

12a Larger, 7-8.5mm. Elytra with 4-6 fine pits on 3rd interval. Upper surface strongly bronze or brassy. Legs and antennae very slender. Rare migrant. *Agonum gracilipes*

13 Base of pronotum coarsely and densely pitted, especially in the broad depression at sides. **11**

13a Base of pronotum not pitted, either smooth or wrinkled. **14**

14 Head with a deep groove behind eyes and down sides, giving a well-defined 'neck'. Head with a pair of translucent red or orange spots between eyes. A long, slender, rather flat and parallel-sided, brown species, with reddish brown legs. Scarce, in wet woodland. 7.8-10.5mm. *Agonum (=Batenus) livens*

14a Head without groove across neck, and no red spots on forehead. Shorter and more 'thickset'. **15**

15 First antennal segment reddish brown, as seen from above. Edge of elytra (especially when seen from side or below) paler, brownish and slightly translucent. Tibiae brownish. Striae less deep, so intervals appear completely flat in the basal half, though often becoming slightly convex toward apex. **16**

15a First antennal segment black when seen from above (sometimes paler on underside). Tibiae and whole of elytra black. Elytral striae fairly deep at base, so the intervals are slightly convex for the full length of the elytra (though usually getting deeper toward apex). **17**

16 Raised rim of pronotum very narrow, hardly visible at front. Pronotum widest in front of middle. 7-9mm. Scarce, wetlands. *Agonum nigrum*

16a Raised rim of pronotum wider. Pronotum widest in middle, or just behind middle. Upper surface slightly bronzed. 7-8.6mm. Scarce, wetlands. *Agonom versutum*

17 Upper surface slightly metallic, so with a brassy or greenish tinge, especially the front half of elytra (best seen with naked eye in bright light). Pronotum very glossy in middle, and widest in front of middle. Depressions at base of pronotum deeper, elytral striae somewhat deeper and elytral intervals more convex. 7.7-9.6mm. Uncommon but widespread, wetlands. *Agonum viduum*

17a Upper surface completely unmetallic black, though often glossy (best seen with naked eye, in bright light). Pronotum rather strongly microsculptured, so silky or matt finish. Pronotum widest in middle. Depressions at base of pronotum shallower, elytral striae somewhat shallower and elytral intervals slightly flatter. **18**

18 Elytra fairly glossy, pronotum not entirely dull. Hind angles of pronotum completely rounded. Tarsal segment 1-3 with a ridge on the midline (formed by a shallow groove along each side of the midline), 4th segment with a weak ridge, 5th segment smoothly rounded, with neither ridge nor with side-grooves. 7-9.5mm. Common in wetlands. *Agonum emarginatum (= moestum = afrum)*

18a Pronotum and elytra dull black. Hind angles of pronotum visible as small protruding teeth. Ridge strong on tarsal segments 1-5, and faint on segment 5 which is not smoothly rounded. Large, 8.1-10mm. Not yet recorded from Britain; present in fens in western Ireland. *Agonum lugens*

19 Pronotum longer than broad; side margin narrow, usually pale, and not much raised above surface of pronotum; surface of pronotum convex right to margins, no flattened or concave areas at sides toward base. Upper surface of tarsi with a narrow channel or groove along the midline of each

segment. Legs and at least 1st antennal segment pale. Two colour forms: one with head, pronotum and elytra all dark brown, the other with elytra pale brown, especially at bases, sometimes with pale shoulders conspicuous. 6-8mm. Common in wetlands. *Agonum (Europhilus) thoreyi*

19a Pronotum roughly as long as wide, or broader; side margins wider and more raised, usually dark; pronotum rather flattened at sides toward base. Tarsi without groove on midline of each segment. Legs dark brown or black. **20**

20 Almost always with short hind-wings (press gently with finger-nail on middle of elytra on live specimens - abdomen shows dark, with small, narrow, withered-looking wings at base). Pronotum very broad, much wider than one elytron at its widest, smoothly rounded from sides to base with only the slightest hint of a hind angle. Bristle near hind angle situated a little way in from edge. 5.5-7.8mm. *Agonum (Europhilus) fuliginosum*

20a Long-winged: if elytra are parted, hind wings show white. Pronotum narrower, and with hind angles more clearly visible as a small bump or tooth or angle, from which the bristle arises. **21**

21* Base of pronotum with a broad depression on each side, much wider than the groove along the sides in front of the depression. Hind angle of pronotum well marked. Upper surface, especially pronotum, with greenish, brassy or bluish metallic sheen. Elytra shorter, and more convex at sides. **22**

21a* Base of pronotum with a shallower, narrower depression at each side, often not much wider than groove along the sides. Hind angles rounded, only faintly visible. Upper surface unmetallic glossy black. Elytra relatively longer and more parallel-sided. **23**

22 Upper surface, especially elytra, with a silky green- or brassy-metallic sheen. Pronotum widest near middle, symmetrical front: back, sides straighter. First antennal segment pale brown, palps and legs dark red-brown with paler tibiae. Eyes larger, temples only a third the length of the eyes. Elytra moderately long and convex (the two elytra together about 1.5 times as long as wide), widest behind middle. 6.2-7.4mm. Widespread and fairly frequent in wetlands, especially under willows. *Agonum (Europhilus) micans*

22a Elytra more glossy, blue-metallic. Pronotum widest in front of middle, narrower at base than front, broader than long, sides more rounded. First antennal segment hardly paler than rest of antennae, legs dark red-brown with blackish femora. Eyes smaller, temples at least half as long as eyes. Elytra rather shorter and flatter, less than 1.5 times as long as wide. 5.5-7mm. Apparently very rare, mainly Thames valley. *Agonum (Europhilus) scitulum*

23 Whole beetle, including legs and antennae, black. Elytra as dark as abdomen and pronotum. 6-7.3mm. Bogs and fens, usually on peat, locally abundant in its habitat. *Agonum (Europhilus)gracile*

23a Elytra pale brown, often with a khaki sheen, contrasting with pronotum and abdomen: in side view or from below, edge of elytra is much paler than abdomen. Legs pale translucent brown. 5.5-7.3mm. Riverside marshes and clayish wetlands, scarce. *Agonum (Europhilus) piceum*

* The 4 species in couplets 22 and 23 are separated on rather vague and relative characters. However, *A. scitulum* is extremely rare or extinct in Britain; the other three can be separated on leg colour: black in *gracile*, dark broan in *micans* and pale brown and obviously translucent in *piceum.*

AMARA

The two large genera in the group, *Amara* and *Harpalus* (plus *Ophonus* and *Pseudophonus*), might seem superficially similar at first. Both share the distinctive features of rather short, stout legs, and a rounded, rather blunt body form. The two genera can be distinguised in several ways. Most *Harpalus* species are relatively narrower and more parallel-sided than similarly-sized *Amara* species, and *Harpalus* tend to have more bristly legs. More precisely, the two genera differ in numerous characteristics, which also serve as a 'refresher' for most students' favorite diagnostic features:

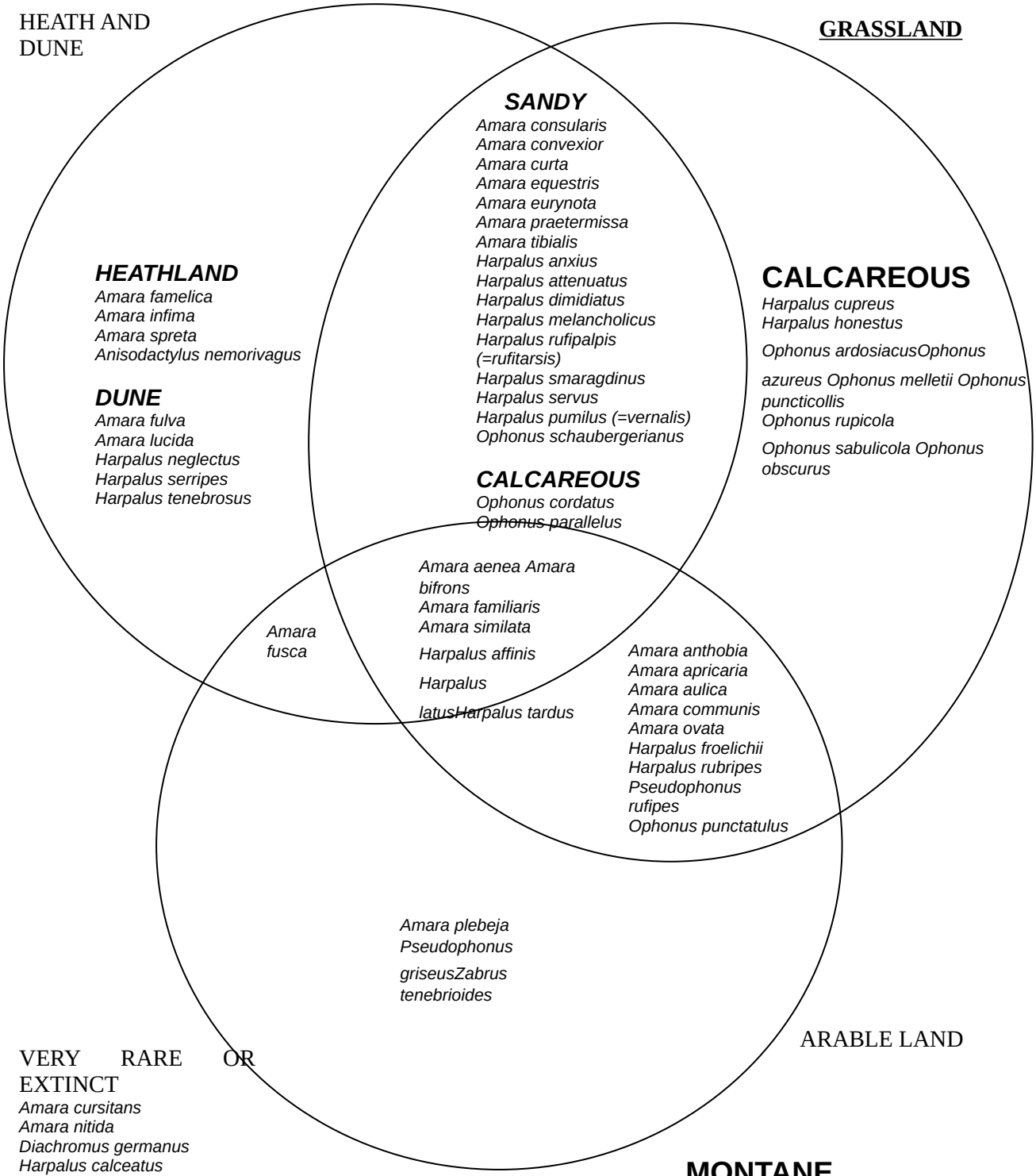
AMARA	***HARPALUS***
Two bristle-bearing pits	One bristle-bearing pit above each eye
Elytra with no bristle-bearing pits on 3rd interval, so upper surface is smooth and glossy	Elytra with one or more pits on 3rd interval (except in one dull brown species only 5.3-6.3mm long), or whole elytra covered in short hairs
Epipleures crossed	Epipleures not crossed
Basal 3 antennal segments smooth apart from a few long bristles; fourth segment contrastingly hairy	Antennae covered with short, dense hairs from halfway along 3rd segment
Male with front feet with enlarged segments, middle feet normal	Male with both front and middle feet enlarged
Pronotum with a long bristle at or close to each hind corner	Pronotum without bristles at hind corners, but often with a few long bristles along sides

In the following checklist, species which are common in Beds, Cambs or Northants are marked with **, only 13 of the 66 species; and those which have been recorded at some time in the three counties marked *, a further 26 or so species.

	Common?	**Size (min, max) in mm**		**Notes on subgenera**
AMARA				
Subgenus *Amara*				Smoothly oval, pronotum rounded into elytra, usually brassy, antennae mostly dark brown with pale bases
aenea	**	*6.2*	*8.8*	
anthobia	*	*5*	*6.8*	
communis	*	*6*	*8*	
convexior	*	*7*	*8.2*	
curta	*	*5.8*	*7.4*	
eurynota	*	*9.5*	*12.6*	
famelica		*6.6*	*9*	
familiaris	**	*5.6*	*7.2*	
lucida	*	*4.6*	*6.4*	
lunicollis	*	*7.3*	*9*	
montivaga	*	*7.8*	*9.2*	
nitida		*7.2*	*8.5*	
ovata	**	*8*	*9.5*	
similata	**	*7.8*	*10*	
spreta		*7.8*	*9.5*	
tibialis	*	*4.6*	*5.7*	
Subgenus *Bradytus*				Longer, more parallel, pronotum slightly sinuate and/or constricted at base; antennae uniformly brown
apricaria	**	*6.5*	*9*	
consularis	*	*8*	*9.4*	
fulva	*	*8*	*10.4*	
Subgebus *Celia*				Smoothly oval, pronotum rounded into elytra, usually unmetallic brown; antennae uniformly pale-mid brown
bifrons	*	*5.3*	*7.4*	
cursitans		*7*	*8.8*	
fusca		*8*	*8.8*	

infima		*4.9*	*5.7*	
praetermissa		*6.2*	*8.2*	
quenseli		*6.4*	*8.8*	
Subgenus *Curtonotus*				Large, long-oval, parallel-sided; pronotum strongly sinuate; antennae uniform brown
alpina		*8*	*11*	
aulica	**	*11*	*14.3*	
convexiuscula	*	*10.8*	*12.2*	
Subgenus *Percosia*				Convex, oval with thick edge to pronotum, and extra bristles on underside; unmetallic blackish; antennae pale red-brown
equestris		*8.2*	*10.5*	
Subgenus *Zezea*				Front tibia with a thick, 3-pronged spur; body smoothly oval, pronotum rounded into elytra; usually brassy, antennae dark brown with pale bases
plebeja	**	*6.3*	*7.8*	
strenua		*8*	*9.5*	

The ecology of *Amara* and *Harpalus* species is summarised in the following diagram.



1 A small but deep, circular pit, usually in the form of a ring-like depression with a raised area in middle, at the base of scutellar stria (as in p.49, fig. V.12). The pit sometimes bears a fine bristle, but as these often break off, it is safer to look for the pit itself. Note: this feature is also present in most species of *Harpalus* and *Anisodactylus.* **2**

1a No pit at base of scutellar stria. **12**

2 Small (less than 7.5mm): doubtful species key both ways. **3**

2a Large (over 7.5mm). **5**

3 Front tibia with a stout 3-pronged spur at apex (note: this is a single flattened spine with three prongs, not a group of 3 or more separate thick bristles, which all species have; and often only 2 of the 3 spurs are visible from one angle). Legs usually with dark femora and contrasting pale tibiae. 6.3-7.8mm. Common in many habitats. *Amara plebeja*

3a Front tibia with a simple 1-pronged spur. Legs entirely pale. **4**

4 Antennae entirely pale, the basal segments the same colour as the rest. Base of pronotum coarsely pitted, and with the two depressions at each side usually well marked. Front angles of pronotum moderately protruding. Upper surface usually unmetallic mid brown. 6.2-8.2mm. Scarce, often on chalk, limestone or gravel. *Amara praetermissa*

4a Antennae with the 3 or 4 basal segments pale, contrasting with the dark outer segments. Front edge of pronotum almost straight. Upper surface dark brown, usually with a metallic, brassy sheen. 5-6.8mm. Fairly scarce, usually on sandy or chalky arable land. *Amara anthobia*

5 Front tibia with a 3-pronged spur at apex (note: this is a single flattened spine with three prongs, not a group of 3 or more separate thick bristles, which all species have; and often only 2 spurs visible from one angle). 6.3-9.5mm. **6**

5a Front tibia with a simple 1-pronged spur. 6.2-12.6mm. **7**

6 Small (6.2-8mm). Base of pronotum pitted, with a wavy hind margin, which is quite concave in outer quarter, so hind angle protrudes and is acute. Striae almost smooth throughout. Surface of pronotum inside hind corners evenly curved from middle. Whole of underside of abdomen unpitted, though sometimes wrinkled. Front angles of pronotum strongly protruding. Common in a wide range of habitats. *Amara plebeja*

6a Large (8-9.5mm). Base of pronotum smooth, with a straighter hind margin, so hind angle protrudes less and is more rounded. Striae evidently pitted in basal half. Pronotum lower inside hind corners than in middle, as if pushed down. Underside of abdomen usually pitted, at least at sides of basal 2 segments. Front angles of pronotum only weakly protruding. Very rare, confined to saltmarshes and brackish grassland in south-east England. *Amara strenua*

7 Small (6.2-8.2mm). Legs and antennae entirely pale. Whole beetle unmetallic mid brown. Scarce, often on chalk, limestone or gravel. *Amara praetermissa*

7a Larger (7.2-12.6mm). At least femora, and often whole legs, dark. Antennae with 3-4 contrasting pale segments at base, the remainder dark. **8**

8 Smaller (7.2-10mm). Striae often fine in basal half, but becoming deeper and wider apically, so the intervals of elytra become conspicuously convex in apical third. All intervals equally convex, no different between odd and even. Elytra curving down strongly apically. **9**

8a Larger (9.5-12.6mm). Striae equally fine throughout, so intervals are no more convex in apical third than at base of elytra. Even-numbered intervals tending to be flatter than odd-numbered. Elytra rather flat, and curving down less toward apex, so apex sticks out backwards. Brassy metallic, usually with a distinctive rainbow-iridescent sheen. Rather scarce, on dry, well-drained arable land, especially on sand. *Amara eurynota*

9 Bristle-bearing pit at hind corner of pronotum close to hind corner: no more than about 1.5 times as far from side as from basal margin, about twice the width of the pit from the side margin, or 2-3 times the width of the ridge along the side of the pronotum. **10**

9a Bristle-bearing pit further from hind corner: about 3 times as far from side as from base, about 3-4 pit-widths or 4-5 times the width of the side-margin from the side. **11**

10 Pronotum and elytra usually broader, pronotum continuously widened to base, where it is *c.* 4mm wide. Base of pronotum usually unpitted and with only faint depressions. Elytral striae deep at apex. tibiae mostly entirely dark brown or blackish, not contrasting with femora. Upper surface mostly black or with a bluish sheen. 7.5-10mm. Common in many habitats. *Amara ovata*

10a Pronotum and elytra usually narrower; pronotum sides almost straight and parallel-sided in rear half, and about 3.5mm wide at base. Base of pronotum usually pitted and with a pair of depressions at each side. Elytral striae rather weaker at apex. Greater part of tibiae usually pale brown, usually paler than femora. Upper side mostly with a greenish metallic sheen, sometimes rather dull. 7.5-10mm. Common in many habitats. *Amara similata*

11 Tibiae blackish. Pronotum extremely broad and short, widest at base, with a strongly concave hind edge. Pronotum as wide as elytra at base, and usually forming a smooth curved outline with them. Front angles of pronotum clearly visible, whole surface usually completely smooth, with n pits or depressions apart from the usual groove along the midline. Black, with a strong usually greenish metallic gleam. 7.8-9.2mm. Dry habitats, especially gravel pits and sandy fields. Uncommon, but apparently expanding. *Amara montivaga*

11a Tibiae pale, reddish. Pronotum less broad, widest about a third the way in front of the base, with hind margin almost straight. Pronotum rather narrower than elytra, and sides converging a little at base, so outline shows a distinct step or indentation. Front of pronotum almost straight, and base usually well pitted and with 2 depressions either side. Black, usually with a brassy sheen. 7.2-8.5mm. Extremely rare, but widely scattered. *Amara nitida*

12 Antennae entirely pale, yellow, red, or brownish. Basal segments not contrasting with the rest.. **13**

12a 1-4 basal antennal segments contrasting pale compared with the rest. **26**

13 Outer depression at each side of pronotum either completely absent or not marked off from the side margin by a keel. Pronotum sides smoothly and convex-rounded to hind angles, not at all sinuate (not concave in basal fifth), and widest at or near base, giving the beetle an uninterrupted oval outline. Hind angles never protruding sideways. **14**

13a Base of pronotum with 2 depressions, the outer close to the side margin but clearly separated from it by a longitudinal or oblique ridge or keel (examine obliquely from behind). Pronotum with sides often slightly sinuate, straight or concave in basal fifth, so base is somewhat narrower than maximum width. Hind angles sometimes protruding sideways. **19**

14 Legs pale, whitish or yellowish. Pronotum pitted all the way across the base. Side margin of pronotum with a tiny nick just in front of hind angles. Whole beetle rather pale brown, but with a brassy sheen on elytra. 5.3-7.4mm. Common and widespread on sandy and other well-drained soils. *Amara bifrons*

14a Legs red-brown. Pronotum either smooth, or pitted at sides only (or at least, pits much less dense near middle). Pronotum rarely with a tiny nick in side margin near hind corner. Usually larger and darker. **15**

15 Very small, 4.9-5.7mm. Front of pronotum almost straight. Scutellar stria absent or broken in o a few short separate grooves. Under heather on lowland heaths, rare. *Amara infima*

15a Larger (6.4-8.8mm). Front angles protruding a little. Scutellar stria well formed, about as deep and pitted as the other striae. **16**

16 Base and sides of pronotum broadly flattened inside hind corners and along rear. Elytral striae very fine and smooth. Eyes almost flat, their diameter along head about 5 times their height (bulge). Front angles of pronotum protruding strongly. Side margin of pronotum with a tiny nick just in front of hind angles. 6.4-8.8mm. Broad, flat, found only in Scottish Highlands. *Amara quenseli*

16a Base and sides of pronotum not pressed down. Elytral striae deeper and evidently pitted. Eyes strongly convex, almost hemispherical, about 1.5-3 times as long as high. Front angles of pronotum more rounded. Side margin without nick. Whole beetle more convex. **17**

17 Side margin of pronotum strongly ridged at outer edge, with groove widening forward from hind corner, and with some scattered pits in the groove. Hind corners of pronotum bluntly rounded. Striae deepened toward apex of elytra. Femora of middle legs with 4 long backward-pointing bristles on underside near hind edge. Prosternal process (***underneath*** thorax: backward-pointing blunt, flat plate on midline between bases of mid legs) has 6 or so short, thick bristles around its edge. A robust, convex red-black beetle. Uncommon but widespread, on dry sides, especially on manmade substrates. *Amara equestris*

17a Side margin with weaker ridge, narrow and not widening, without scattered pits. Hind corners of pronotum angled, often jutting out sideways slightly. Striae of elytra no deeper at apex than base. Mid femora with 2 long bristles on hind edge. Prosternal process without bristles. Flatter species. **18**

18 Palps and antennae entirely pale. Hind angles of pronotum almost right-angled, not protruding. Whole beetle rather narrower and more convex. Usually larger. 8-8.8mm. Dark unmetallic brown, with rather translucent red-brown elytra. Very rare, on dry sand, apparently confined to Breckland. *Amara fusca*

18a Palps dark, at least toward tip of each segment. Antennal segments becoming gradually darker toward apex. Hind angle of pronotum protruding slightly. Whole beetle rather broader and flatter. Usually smaller, 7-8.8mm. Dark brown with faint brassy sheen. No modern records, possibly a temporary introduction. *Amara cursitans*

19 At least 11mm long. Groove along side of pronotum wide and smooth. Hind corners often protruding sideways. Pronotum with sides strongly sinuate, concave in basal fifth, so base is somewhat narrower than maximum width. Hind angles sometimes protruding sideways. **20**

19a At most 10.5mm. If groove on sides of pronotum is wide, then also with scattered pits. Sides of pronotum only slightly sinuate. **22**

20 Hind angle of pronotum jutting out strongly, and obscuring the ridge along side margin, which disappears before hind corner. 11-14.3mm. A large, stout species, common in grasslands, rough ground etc. *Amara aulica*

20a Hind angle not jutting out, roughly right-angled. Ridge on side margin reaching hind corner of pronotum. **21**

21 Larger (10.8-12.2mm). Palps and antennae entirely pale, and first segment more than twice as long as it is wide. Common on coast, fairly frequent in lowlands inland. *Amara convexiuscula*

21a Smaller (8-11mm). Palps dark, and antennae darker from 3rd segment, and with 1st segment no more than twice as long as wide. Rare, in high mountains. *Amara alpina*

22 Pronotum with sides and rear broadly flattened, so middle rises dome-like from the flat and pitted area. No clearly marked keel on outer edge of outer basal depression of pronotum. Side margin of pronotum with a tiny nick just in front of hind angles. Elytral striae very fine and smooth. Eyes almost flat, their diameter along head about 5 times their height (bulge). 6.4-8.8mm. Broad, flat, found only in Scottish Highlands. *Amara quenseli*

22a Pronotum with sides not flattened. A strong longitudinal or diagonal ridge or keel running forward from hind corner marks off the outer edge of the outer depression at pronotum base. Front angles of pronotum rounded. Side margin without nick. More convex. Elytral striae with definite pits, at least in basal half. Eyes more convex, about 1.5-3 times as long as high. **23**

23 Side margin of pronotum strongly ridged at outer edge, with groove widening forward from hind corner, and with some scattered pits in the groove. Hind corners of pronotum bluntly rounded. Striae deepened toward apex of elytra. Femora of middle legs with 4 long backward-pointing bristles on underside near hind edge. Prosternal process (***underneath*** thorax: backward-pointing blunt, flat plate on midline between bases of mid legs) has 6 or so short, thick bristles around its edge. A robust, convex red-black beetle. Uncommon but widespread, on dry sides, especially on manmade substrates. *Amara equestris*

23a Side margin with weaker ridge, narrow and not widening, without scattered pits along side. Hind corners of pronotum angled, often jutting out sideways slightly. Striae of elytra no deeper at apex than base. Mid femora with 2 long bristles on hind edge. Prosternal process without bristles. Flatter species. **24**

24 Keel separating outer depression on pronotum base from side margin is almost longitudinal (examine obliquely from behind) and runs to the basal margin inside the bristle at the hind corner. Pronotum narrower, about 1.5x as wide as it is long. 6.5-9mm. A rather cylindrical species, common on cultivated or disturbed ground of all sorts. *Amara apricaria*

24a Keel outside basal depression runs obliquely toward bristle at hind corner, and is prevented from reaching hind margin by the bristle. Pronotum broader, 1.7-2 x as wide as long 8-10.4mm. **25**

25 Upper surface yellow or pale brwn, with s faint greenish sheen on elytra. Pronotum sides clearly sinuate, concave in hind quarter. Eyes rather flat. 8-10.4mm. Usually on bare or sparsely vegetation sand or shingle. *Amara fulva*

25a Dark brown all over, with no metallic sheen. Pronotum sides convex almost to hind corner, where the hind angle juts out as a small tooth. Eyes semicircular. 8-9.4mm. Uncommon, on sand, gravel and other disturbed soils. *Amara consularis*

26 Legs entirely pale. **27**

26a At least femora dark brown or blackish. **28**

27 Front angles of pronotum protruding. Scutellar stria well developed, as strong as striae 1 and 2. Larger, 5.6-7.2mm. Very common in most habitats. *Amara familiaris*

27a Front of pronotum almost flat. Scutellar stria usually weak or absent. Smaller, 4.6-6.4mm. Scarce, on dry, disturbed sand. *Amara lucida*

28 Antennae with 3 or 4 basal segments contrasting pale, the remainder dark. **29**

28a Antennae with only 1-2 basal segments pale, third segment as dark as segments 4-11. **34**

29 Elytral striae very fine and shallow throughout, so intervals are completely flat right to apex of elytra. Elytra not becoming more convex at apex, but remaining flat. Inner of the 2 depressions on each side of pronotum base is in form of a short, sharp groove some distance from base (p.51, fig. V21). Usually brassy metallic, but occasionally blue, green or matt black. 6.2-8.8mm. Extremely common in all habitats. *Amara aenea*

29a Striae deeper toward apex, so intervals become more convex there than in basal half of elytra. Inner depression on pronotum base not a short, deep groove. **30**

30 Very small, 4.6-5.7mm. Front of pronotum almost straight. Scutellar stria absent or broken into a few short separate grooves or pits. Outer depression on pronotum base is small, but very deep. Inner one is present but less well defined. Fairly common in dry places. *Amara tibialis*

30a Larger (6-82mm). Front angles protruding a little. Scutellar stria well formed, about as deep and pitted as the other striae. Outer depression of pronotum much less deep. **31**

31 Antennae fairly long, if bent back, extending beyond base of pronotum, segments 6-10 more than twice as long as thick. Bristle-bearing pit at hind corner of pronotum clearly further from side than from base. **32**

31a Antennae very short, not reaching base of pronotum if bent back, segments 6-10 less than twice as long as thick. Bristle-bearing pit at hind corner of pronotum close to hind corner, equidistant from side and base. 5.8-7.4mm. Scarce species found mainly on limestone, sometimes also on gravel. *Amara curta*

32 Large, 8-11mm. Pronotum with well marked depressions at base, the outer with a fairly strong ridge on its outside separating it from side margin. Hind corner of pronotum protruding as a small tooth. Head narrower. Confined to Scottish mountains. *Amara alpina*

32a Smaller, 6-8.2mm. Pronotum smooth or with faint triangular depressions, without a ridge on outer edge. Hind corners of pronotum not protruding. Head very broad, at least two-thirds the width of pronotum. **33**

33 Row of conspicuous pits down the edge of the elytra continuous from base to apex, a little more widely spaced in middle but not with a definite gap. Base of pronotum usually densely and deeply pitted. A larger, broader species, with convex elytra. 7-8.2mm. Frequent in a range of habitats, including gravel pits and other open habitats. *Amara convexior*

33a Row of pits down edge of elytra quite dense at base and toward apex, but with a gap in the middle. Base of pronotum with a thin scatter of pits, or almost smooth. A rather small and narrow species with elytra rather parallel-sided. 6-8mm. Frequent in many habitats, including sparse woodland and scrub, gardens and grasslands. *Amara communis*

34 Striae deeper toward apex, so intervals become more convex there than in basal half of elytra. Elytra more convex at apex, curving down steeply so apex does not stick out backwards. **35**

34a Elytral striae very fine and shallow throughout, so intervals are completely flat right to apex of elytra. Elytra not becoming more convex at apex, but remaining flat. **36**

35 Usually larger, 7.3-9mm. Antennae fairly long, if bent back, extending beyond base of pronotum, segments 6-10 more than twice as long as thick. Bristle-bearing pit at hind corner of pronotum clearly further from side than from base. Tibiae usually as dark as femora. Spur on front tibia stout and dark. Common species in many habitats, including damp grasslands and wetlands. *Amara lunicollis*

35a Smaller, 5.8-7.4mm. Antennae very short, not reaching base of pronotum if bent back, segments 6-10 less than twice as long as thick. Bristle-bearing pit at hind corner of pronotum close to hind corner, about equidistant from side and base. Tibiae usually paler brown than femora. Front tibial spurs usually translucent and slender. Scarce species found mainly on limestone, sometimes also on gravel. *Amara curta*

36 2 basal antennal segments bright red. Base of pronotum with pits, especially around inner depression. Basal margin of pronotum sinuate, so hind angles appear sharper. 7.8-9.5mm. A broad, flat species, especially on pronotum. Rare, mainly on coastal sand dunes. *Amara spreta*

36a Second segment darker brown than first. Base of pronotum almost completely unpitted. Basal margin less sinuate, so hind angles appear less sharp. 6.6-9mm. Rather narrower and more convex, especially on pronotum. Extremely rare, on lowland heaths. *Amara famelica*

ANISODACTYLUS

1 Front tibia with a 3-pronged spur at apex (like *Amara plebeja).* Upper surface of head, pronotum and elytra metallic green. Clypeus (between base of jaws – see fig. inside front cover of Forsythe) with 2-4 bristles at either side on its front edge. Hind angles of pronotum completely rounded. 10-13.5mm. Looks very like *Harpalus aeneus.* Very rare species confined to salt-marshes. *Anisodactylus poeciloides*

1a Spur on front tibia not 3-pronged, though rather flatter and more angled at sides than in *Harpalus*. Upper surface matt black. Clypeus with only one bristle at each side. Hind angles of pronotum sharp, slightly protruding. **2**

2 Larger (10-12.8mm). Legs usually black. Outer 2-3 elytral intervals, and apical fifth of all intervals, pitted and covered with fine, short hairs. Basal groove curving backwards as it approaches shoulder, so running smoothly into side groove (like p.51, fig. V.24). Fairly frequent in many habitats, including clay grasslands, arable land and moorland. *Anisodactylus binotatus*

2a Smaller (8-10mm). Legs reddish. Inner intervals not pitted and hairy at apex, and outer intervals often also lacking hairs throughout. Basal groove of elytra running forward as it meets side groove at shoulder, so forming an angle (as in p.48 fig. V.4). Extremely rare, confined to dry sandy heathland. *Anisodactylus nemorivagus*

ASAPHIDION

1 Smaller (3.9-4.7mm), eyes so large that head is wider than pronotum. A short, fine diagonal ridge running in from each hind angle of pronotum. Elytra with patterns of large and small pits, the larger ones on the darker, smoother areas, and the smaller ones in the paler, hairy patches. Pronotum with coarse pits, head with coarse pits and grooves and wrinkles. Common. **2**

1a Large (5-6mm), head not wider than pronotum. No short keel at base of pronotum just inside hind angles. Elytra with small-medium pits, fairly uniformly scattered across whole of elytra. Pronotum rather smooth, with only fine pits, head with fine pits and few or no grooves and wrinkles. Scarce, by streams or on coastal cliff seepages. *Asaphidion pallipes*

2 Antennae entirely pale, or gradually getting darker from about 5th segment toward apex. At least segments 1-4 are completely pale. Sides of pronotum rather strongly angled at the point where the marginal bristle arises. Elytra rather short and broad, densely pitted and usually with strong longitudinal wrinkles or undulations (not microsculpture). Upper surface usually with a red coppery sheen. *Asaphidion curtum*

2a Antennae suddenly darker brown from segment 5 onward, so apical part of antennae contrast with basal. Segments 1-4 either all yellowish, or each segment slightly darkened at its apex. Legs darkened, at least where femur joins tibia. Pronotum sides more smoothly rounded. Elytra usually less densely pitted, and without or with only weak, longitudinal wrinkles. **3**

3 Penultimate (largest) segment of maxillary (larger, outer) palps dark brown or black on upper surface. Legs strongly darkened where femur and tibia join, and all tarsal segments darkened, usually blackish and faintly metallic. Elytra rather long and parallel-sided. *Asaphidion stierlini*

3a Penultimate segment of palps entirely pale yellowish, or faintly browner on upper surface. At least the front legs, and often all legs, uniformly brownish yellow, not darkened and metallic. Elytra usually shorter and more rounded, less parallel-sided. Whole upper surface usually with a bronze sheen. *Asaphidion flavipes s.s.*

BADISTER **(7 species)**

Smaller and much shinier than *Licinus*, and not pitted on the upper surface, but sharing the peculiar blunt jaws with a knob on one or other. Some species, including the common *B. bullatus (=bipustulatus)*, are red with a black head and a black pattern on the elytra. Others as small and all-black, resembling some species of *Agonum*, but with much broader heads. The latter are very difficult to identify; see keys in Forsythe (1998) and Lindroth (1974) work fairly well. The following quick key includes the species so far recorded in central England.

1 Head black, pronotum bright orange or red, elytra black with orange markings. **2**

1a Head and pronotum both brown or black, elytra dark or with a pale shoulder spot. **3**

[3 choices]

2a Large, 7-9.1mm. Scutellum (small triangle between bases of elytra) reddish. Head unusually large, almost as large as pronotum. First antenna segment sometimes all red, sometimes red at base and darkened at apex. Rather scarce, in fens and lush wetlands. *Badister unipustulatus*

2b Smaller, 4.8-6.5mm. Scutellum darker than adjacent red parts of elytra. Head much smaller than pronotum. First antenna segment entirely red. Common in a wide range of habitats, dry and wet. *Badister bullatus (=bipustulatus)*

2c Medium, 6.2-7.2mm. Scutellum darker than adjacent red parts of elytra. Head much smaller than pronotum. First antenna segment red at base, but darkened at apex. Extremely rare, usually near water. Retain specimen for confirmation. *Badister meridionalis*

3 Small, 3.9-4.8mm. Eltyra with pale circular spot at each shoulder. Legs pale. Uncommon, usually in wetlands with few or no other species. *Badister sodalis*

3a Larger, 5-5.9mm. Elytra uniformly black or dark brown. Legs dark. Uncommon, in marshes and fens. *Badister dilatatus*

[Two extremely rare species, *B. peltatus* and *B. collaris (=anomalus)*, would key out with *B. dilatatus*. They are found in wetlands in the south-east of England, mainly coastal, and are usually smaller, 4-5.4mm, and have distinctive male genitalia.]

BEMBIDION AND OTHER WETLAND GENERA

These keys to about 70 species include the recently-recorded species in the following genera: a handful of species which are believed extinct, or which were recorded once only in the nineteenth century, have been omitted from this version of the key

Bembidion (56 species) 2.5-7.5mm
Asaphidion (4 species) 3.9-6mm
Tachys (6 species) 1.5-2.8mm

Most of these beetles are found mainly in wetlands. Their occurrence in different types of wetland is summarised in the diagram at the end of the keys. The other important wetland species are in genera which are covered previously: *Agonum* (23 species, medium sized), *Pterostichus* (in a previous key), and several distinctive genera with few species, such as *Blethisa*, *Elaphrus*, and *Badister*.

This session's 3 genera all share the distinctive feature of having the last segment of the maxillary palps (the larger outer pair of palps) much shorter and thinner than the penultimate segment, hence the English name Pin-palps. The two species-poor genera, *Asaphidion* and *Tachys*, are fairly distinct, and are keyed out at the beginning.

Bembidion, with 60 species, about a sixth the British carabid fauna, and no species longer than 7.5mm, might seem more daunting. However, as with *Agonum*, it can be divided into several subgenera which are fairly easy to recognise: some are distinctive enough that some continental authors raise them to genus level. The following synopsis may help in remembering the *Bembidion* species, by breaking them down into smaller chunks. Subgenera which are similar to each other in important characters are grouped together here, and the size range of the species in each subgenus is shown. The notes beside each grouping will mean little at this stage, but are 'sort-hand' for some of the distinguishing features which appear in the key which follows.

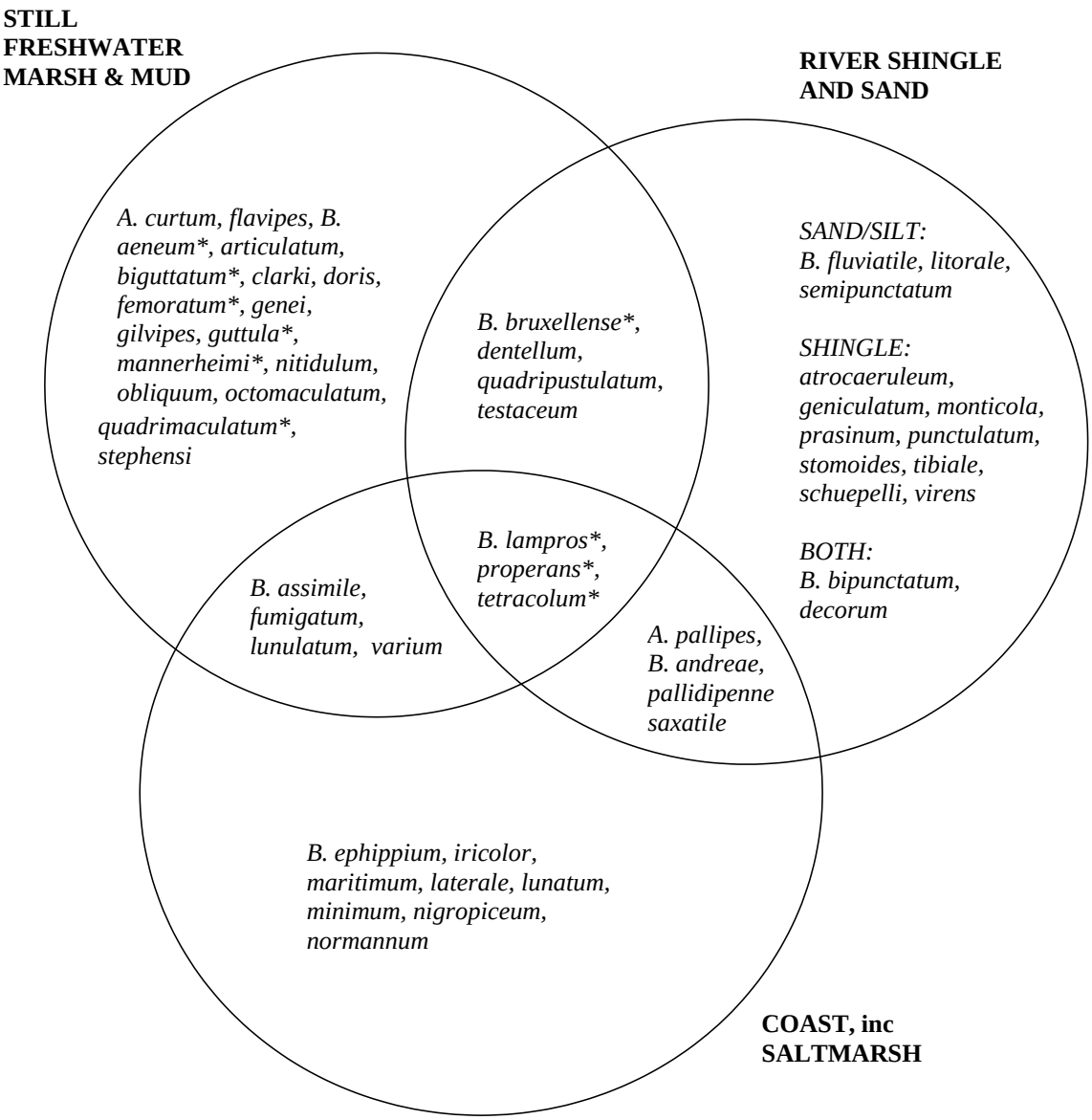
Species which are common in Beds, Cambs or Northants are marked with * in the main key, and account for about 17 of the 60 species. If you exclude species confined to fast-flowing upland streams, and species living only in salt-marshes, there are only about 32 species of *Bembidion* and *Asaphidion* which occur inland in the lowlands.
These are covered by a shorter, simpler key in Appendix 2 at the end of these notes.

Subgenus	**Species,**	**Size, notes**	
Chrysobracteon	*litorale*	5.6	
	argenteolum	5.9-7.5mm.	Scarce or rare. Large, broad, frosted elytra with mirrors.
Neja	*nigricorne*	3.4-3.8mm	Upland moors only. Very similar to *Metallina* species
Metallina	*lampros* *		
	properans *	3-4.4mm	Very common. Metallic, angular shoulders.
Cillenus	*laterale*	3-4mm	Salt-marshes. Thick neck, narrow, straight-sided, frosted.
Lyimnaeum	*nigropiceum*	3.5-4mm	Coastal, scarce. Tiny eyes, thick neck, dull brown.
Ocys	*harpaloides* *		
	quinquestriatum	3.5-6mm	1 common, 1 rather scarce. Looped 1st stria. Brown.
Princidium	*punctulatum*	4.5-5.6mm	Mostly upland. Brassy, pitted head and prontum..

Testedium	*bipunctatum*	3.6-4.7mm	Scarce. Brassy/green, pitted head and pronotum.
Actedium	*pallidipenne*	4.1-4.7mm	Scarce, on sand. Metallic pitted head and pronotum, yellow elytra.
Eupetedromus	*dentellum* *	5.1-6mm	Common. Large, mottled elytra. 'Mirror' round bristle near eye.
Notaphus	*varium* *		
	semipunctatum		
	obliquum	3-5.1mm	1 common species. Mottled elytra.
Nothaphemphanes	*ephippium*	2.5-3mm	Scarce, salt-marshes. Small, very smooth.
Emphanes	*minimum*		
	normannum	2.3-3.2mm	Common, salt-marshes Small, black, smooth and rather featureless.
Trepanes	*articulatum* *		
	octomaculatum	2.5-3.9mm	1 common species. V-shaped frontal furrows on head.
Semicampa	*schuppelii*		
	gilvipes	2.5-3.2mm	Scarce. Furrows on head doubled at front.
Diplocampa	*fumigatum*		
	assimile *		
	clarki *	2.8-4mm	2 common species. Furrows on head double throughout.
Nepha	*illigeri (=genei)*	3.5-4.9mm	Extremely glossy, narrow thorax, 4 opaque cream spots.
Bembidion s.s.	*humerale*		
	quadrimaculatum *		
	quadripustulatum	2.5-4mm	1 common species. Small, glossy, creamy spotted. Pronotum hind angle separate from base.
Phyla	*obtusum* *	2.8-3.5	Common. Black. Rounded pronotum, straight base.
Philochthus	*aeneum* *		
	biguttatum *		
	guttula *		
	iricolor		
	lunulatum *		
	mannerheimii		
	*(=unicolor)**	2.8-5.5mm	Mostly common. Rounded pronotum, sinuate base.
Synechostictus	*stomoides*	5-5.6mm	Scarce, upland. Narrow, convex, 8th stria at apex.
Plataphus	*prasinum*		
	virens	4.2-5.5	1 common, upland. Flat, all-dark, 7 strong striae.
Bembidionetolitzkya	*atrocaeruleum*		
	geniculatum		
	tibiale	4.5-6.5mm	Common, upland. Large, all-dark, 6 strong striae.
Peryphus	*bualei (=andreae)*		

bruxellense		
decorum		
femoratum *		
fluviatile		
lunatum		
maritimum		
monticola		
deletum (=nitidulum)		
saxatile		
stephensii		
testaceum		
tetracolum *	4-6.5mm	Several common species. Medium, often 4-spotted. Striae vanish near apex.

The following diagram summarises *Bembidion* habitats.



PEAT: *B. bruxellense, humerale, B. nigricorne, obliquum*

HEATHLAND: *B. nigricorne*

NON-WETLANDS (GENERAL): *A. stierlini, B. aeneum, biguttatum, femoratum, guttula, lampros, mannerheimi, obtusum, properans, quadrimaculatum, tetracolum*

WOODLANDS: *B. harpaloides* WALLS: *B. quinquestriatum*

Features used in identifying *Bembidion* species

Some features used in separating *Bembidion* species have not been used in previous genera, or are used here with a particular meaning. The following notes may usefully be read before embarking on the key. The references to figures in Forsythe (ed. 1) are not repeated in the key .

Metallic: shiny and with a coloured sheen (usually green, blue or brassy) like metallic paint; this is different from iridescent (which produces rainbow colours, like an oil-film, from certain angles). The metallic sheen is often stronger on head and pronotum than on elytra, whereas iridescence is often seen on elytra only.

Glossy: here used to mean full-gloss, as opposed to half-gloss *(silky)* or dull *(*either *matt*, if merely unreflective, or *frosted* if densely microsculpted, as seen previously in *Elaphrus riparius*)

Spotted: elytra with pale spots. There are usually 2 pairs, one at the shoulder and one near the apex (as in Forsythe p. 39, fig. III.36); a few species have just the apical ones, rarely just the basal. In a few species the spots join up down the side of the elytron. In many species, the spots are translucent, orange or pale brown, contrasting with black or metallic elytra; in a few, they have opaque creamy or yellow or white pigment. One group of species have more a complex mosaic pattern of spots or blotches. A few species have spots in parts, and general paleness elsewhere on the elytra.

Pronotum shape: this is generally either sinuate (S-shaped curve, bulging out, then going in at sides, then out again toward hind-angles, which protrude, as in p.37, fig. III.28) or rounded (a single convex curve, leading to rather blunt, unprotruding hind angles, as in p.37, fig. III.26 and III.27) at the sides.

The base of the pronotum may be straight (p.37, fig. III.26), or angled forward toward the sides, or sinuate (with a forward step at each side, as in fig. III.29 and III.30). In a few species, the base is almost straight, but the hind angles are set slightly forward, with a small incision behind them.

'Shoulders': these are either angular or rounded. This does *not* refer to the outline of the shape of the elytra, but refers to the shape of the groove and ridge at the edge of the elytra. In *rounded shoulders* the groove down the side of the elytron curves round the shoulder and fades gradually along the base of the elytra (p. 40, fig. III.40). In *angular shoulders*, the straight or arched basal groove and ridge (which run along the base, in some species effectively joining up the elytral striae) cuts across to meet the side groove, forming a definite angle pointing forward into the shoulder (p. 40, fig. III.41)

Head pitted: either with deep pits generally scattered over whole upper surface (often likewise on pronotum), or with a sharply defined cluster of little pits above and slightly behind each eye, as in p.40, fig. III.39.

Frontal furrows: these are the pair of grooves which run from the base of the jaws, up the head and between the eyes, usually one at each side. The grooves are sometimes shallow and vague, in other species they are bordered by strong ridges. In most cases, they are almost parallel with the midline of the head, or they may be curved or slightly wiggly. In a few species, the grooves strongly converge toward the front of the head, so form a V (as in p.38, fig. III.32). In a few species there are 2 grooves at either side, either for their full length (p.38, fig. III.31) or just at the front, or just between the eyes. These species with doubled grooves tend to have them accompanied by the strongest ridges.

Bristle-bearing pits on elytra: this feature should be familiar from other groups of carabids. In *Bembidion*, it is useful to note if the pits are in the middle of the third interval, or at one side, touching the 2nd or 3rd stria.

Microsculpture: a very fine pattern of raised lines or granules on the surface, visible only at high magnification (say, x40 upwards), but having an effect ont the appearance at lower powers. If in the form of dense, fine, parallel lines, it creates an iridescence, showing rainbow colours like oil-film More often in *Bembidion*, it is in the form of meshes, which may be isodiametric (same size longitudinally and transversely), transverse or longitudinal. Strong microsculputure makes the surface appear dull or matt or frosted. Absence leaves the surface looking glossy. Microsculpture is often not the same on the elytra and pronotum, and may be present round the edges of the pronotum but absent in he middle.

KEY TO *BEMBIDION, ASAPHIDION* and *TACHYS*

1 Elytra covered in short curved hairs, which are dense in parts, sparse in others, so creating a pattern on the frosted, brassy background. Eyes very large. Legs pale, creamy or whitish with darker joints or tibiae, and at least 4 basal antennal segments pale in part. 3.4-6mm. *Asaphidion* **2**

1a Elytra not hairy, and seldom frosted. Eyes often smaller. Legs and antennae often dark. **5**

2 Smaller (3.9-4.7mm), eyes so large that head is wider than pronotum. A short, fine diagonal ridge running in from each hind angle of pronotum. Elytra with patterns of large and small pits, the larger ones on the darker, smoother areas, and the smaller ones in the paler, hairy patches. Pronotum with coarse pits, head with coarse pits and grooves and wrinkles. Common. **3**

2a Large (5-6mm), head not wider than pronotum. No short keel at base of pronotum just inside hind angles. Elytra with small-medium pits, fairly uniformly scattered across whole of elytra. Pronotum rather smooth, with only fine pits, head with fine pits and few or no grooves and wrinkles. Scarce, by streams or on coastal cliff seepages. *Asaphidion pallipes*

3 Antennae entirely pale, or gradually getting darker from about 5th segment toward apex. At least segments 1-4 are completely pale. Sides of pronotum rather strongly angled at the point where the marginal bristle arises. Elytra rather short and broad, densely pitted and usually with strong longitudinal wrinkles or undulations (not microsculpture). Upper surface usually with a red coppery sheen. *Asaphidion curtum*

3a Antennae suddenly darker brown from segment 5 onward, so apical part of antennae contrast with basal. Segments 1-4 either all yellowish, or each segment slightly darkened at its apex. Legs darkened, at least where femur joins tibia. Pronotum sides more smoothly rounded. Elytra usually less densely pitted, and without or with only weak, longitudinal wrinkles. **4**

4 Penultimate (largest) segment of maxillary (larger, outer) palps dark brown or black on upper surface. Legs strongly darkened where femur and tibia join, and all tarsal segments darkened, usually blackish and faintly metallic. Elytra rather long and parallel-sided. *Asaphidion stierlini*

4a Penultimate segment of palps entirely pale yellowish, or faintly browner on upper surface. At least the front legs, and often all legs, uniformly brownish yellow, not darkened and metallic. Elytra usually shorter and more rounded, less parallel-sided. Whole upper surface usually with a bronze sheen. *Asaphidion flavipes s.s.*

5 Very small (1.5-2.8mm). Dark brown or black, without paler spots. Outer edge of tibiae cut off obliquely at apex. 1st elytral stria runs to tip of elytra then loops back on itself around the apex. *Tachys* **6**

5a Usually larger (2.5-6.5mm). Often with pale spots on elytra. Tibiae square-ended. 1st stria loops back only in 2 species, which are 3.5-6mm long. *Bembidion* **11**

6 Base of pronotum angled forwards toward hind angles. Body flat, elytra dull. **7**

6a Base of pronotum almost straight. Body more convex, elytra glossy. **10**

7 Loop at apex of 1st stria straighter, extending back toward elytra base much further than the more forward of the two apical bristle-bearing pits in the apical third of elytra. Head and pronotum blackish, legs and elytra pale yellowish. 2-2.7mm. Salt-marshes. *Tachys scutellaris*

7a Loop of 1st stria more rounded and shorter, extending back just far enough to encompass the more forward of the two bristle-bearing pits. **8**

8 Pronotum sides sinuate - clearly concave in basal third. Reddish brown with dark head. Antennae short, segments each 1.2-1.7 times as long as broad. 2-2.4mm. *Tachys micros*

8a Pronotum sides almost straight in basal third. Whole animal blackish brown, head only slightly darker than rest. Antennae usually longer and slenderer, each segment 1.5-1.7 times as long as broad;

if short and with segments as in *micros*, then beetle only 1.5-2mm long. **9**

9 Antennae longer, each segment 1.5-1.7 times as long as broad. First segment of hind tarsi much longer than 2nd plus 3rd together. 1.8-2.3mm On damp sand or clay, scarce but widespread. *Tachys bistriatus*

9a Antennae short, segments each 1.2-1.7 times as long as broad. First segment of hind tarsi only slightly longer than 2nd plus 3rd together. 1.5-2mm. *Sphagnum* hummocks in New Forest. *Tachys obtusiusculus (=edmondsi)*

10 Antennae darkened from 3rd or 4th segment. Legs usually yellow-brown. Pronotum less than 1.4 times as wide as long, elytra narrower and more slender. Upper surface dark brown or blackish, often with elytra slightly paler. 1.8-2.2mm. On sand and gravel, often near the sea. *Elaphropus* (=*Tachys) parvulus*

10a Antennae darkened from 2nd segment. Legs usually dark brown. Pronotum more than 1.4 times as wide as long, elytra broader and more rounded. Upper surface of beetle uniformly dark brown or blackish. 1.8-2.1mm. In *Sphagnum* moss on lowland heaths. *Elaphropus* (=*Tachys) walkerianus*

11 Shoulders angulate, basal groove and ridge (which run along the base, effectively joining up the elytral striae) present in outer part of elytral base, and cuts across to meet the side groove, forming a definite angle pointing forward into the shoulder (p. 40, fig. III.41). 2.8-4.4mm. **12**

11a Shoulders rounded, groove and ridge down the side of the elytron curves round the shoulder and fades gradually along the base of the elytra (p. 40, fig. III.40); no distinct basal groove present. **17**

12 Pronotum completely rounded at sides, not sinuate and without protruding hind angles. Base straight. Upper surface black, uunmetallic, often rather dull. 2.8-3.5mm. Very common, including farmland on clay soils. *B. obtusum*

12a Sides of pronotum sinuate, hind angles sharply protruding. Upper surface usually strongly metallic, brassy or bluish. 3.2-7.5mm. **13**

13 Larger (5.6-7.5mm). Upper surface frosted brassy, not uniformly glossy metallic. 3rd interval of elytra about twice as wide as 4th interval in middle, with alternating frosted and mirrored rectangular spots. **14**

13a Smaller (3.0-4.4mm). Uniformly brassy metallic on upper surface. 3rd interval only as wide as 4th, and without frosting or sculpting. **15**

14 First antennal segment and tibiae pale. Outer intervals of elytra uniformly frosted. 4th stria straight. 5.9-7.5mm. Extremely rare, N Ireland and Dungeness, Kent. *B. argenteolum*

14a Only underside of first antennal segment slightly pale. Outer intervals of elytra chequered with strongly-frosted and more glossy rectangles. 4th stria with a bend in basal half, next to the frosted rectangle. 5.6-6.2mm. Widely scattered on sand and shingle by flowing water. *B. litorale*

15 Pronotum sides sinuate only close to hind angles. Frontal furrows doubled in rear quarter, near eyes. Antennae all black, legs usually dark. 3.4-3.8mm. Under heather, mainly on upland moorland. *B. nigricorne*

15a Pronotum sides strongly sinuate in basal quarter. Frontal furrows not doubled at rear. Base of antennae and legs (at least tibiae) usually reddish. Often larger. Common in many habitats. **16**

16 Frontal furrows absolutely straight and parallel-sided in front of bristle-bearing pits. 7th elytral stria visible in basal half of elytra, almost as strong as 6th. Ridge down sides of pronotum broader. Common in many habitats. *B. properans*

16a Frontal furrows slightly sinuous, each with a slight outward bulge about halfway along, between bristle-bearing pits and base of clypeus. 7th stria usually (not always!) absent or much weaker than 6th, if present containing no more than 7 pits, which are finer than the first 7 in stria 6. Ridge down sides of pronotum narrower. 3.5-4.2mm. Very common in most habitats. *B. lampros*

17 Pronotum completely rounded *at sides*, completely convex to hind angles, not sinuate and without protruding hind angles. *Base* slightly or strongly sinuate. Elytra either all black or with a pale spot toward apex. **18**

17a *Sides* of pronotum sinuate, hind angles sharply protruding. Variously coloured, often with pale markings in basal half of elytra. **23**

18 Larger (3.4-5.5mm). Base of pronotum deeply sinuate at sides (with a deep forward step at each side, as in p. 37, fig. III.29). Upper surface often bluish, iridescent or brassy. **19**

18a Smaller (2.8-3.5mm). Base of pronotum only shallowly sinuate at sides, often appearing almost straight at a casual glance (p. 37, fig. III.30). Upper surface usually black or brown without a coloured sheen. **22**

19 7th elytral striae visible for most of length of elytra, and coarsely pitted in basal (front) half, almost as strong as 6th. Elytra usually blue-green metallic with an orange-yellow spot near apex. 1st antenna segment pale. 3.8-4.3mm. Very common, especially in nutrient-rich wetlands, cattle-ponds etc. *B. biguttatum*

19a 7th stria absent or consisting of a few very fine pits. 1st antenna segment usually as dark as rest of antenna. **20**

20 Head, pronotum and elytra dull or frosted-brassy black. Striae very finely pitted and intervals flat. 3.4-4.5mm. Common in muddy wetlands. *B. aeneum*

20a Upper surface glossy, black, blue-green or iridescent. Striae more coarsely pitted, and intervals convex. **21**

21 Larger (4.1-5.5mm). Antennae long and slender, segments 8-10 (not last segment, no. 11) each much more than twice as long as thick. Elytra glossy and strongly iridescent. Striae with rather fine pits. Confined to saltmarshes, where it is frequent. *B. iricolor*

21a Smaller (3.6-4.1mm). Antennae shorter and thicker, segments 8-10 each about twice as long as thick. Upper surface fairly glossy black with a faint bluish sheen. Striae with very coarse pits. Common beside fresh waters of all kinds. *B. lunulatum*

22 Legs and 1st antennal segment clear bright reddish. Hind-wings (under elytra) short. Elytra more convex, shorter and more rounded at sides. 2.8-3.4mm. Frequent in woodlands and fens. *B.mannerheimii (=unicolor)*

22a Legs and 1st antennal segment a dirty mid- or pale-brown. Hind wings short or full-length. Elytra longer, flatter and more parallel-sided. 2.8-3.5mm. Very common near fresh water or on clay or loamy farmland. *B. guttula*

23 With characteristic deep and conspicuous frontal furrows and ridges: ***either*** with each furrow very straight, deep and strongly converging toward front (V-shaped) and prolonged onto clypeus, ***or*** furrows doubled at each side at least at front of head. 2.5-4mm. **24**

23a Frontal furrows a single groove, sometimes with a ridge on the inner side, deep or fairly shallow, but more or less parallel, never strongly convergent, usually stopping at base of clypeus, and never doubled at any point. 2.3-6.5mm **31**

24 Frontal furrows a single groove at each side of head, converging, V-shaped (p.38, fig. III.32). **25**

24a Frontal furrows doubled, at least in front, but not strongly converging (p.38, fig. III.31). **27**

25 Elytra blackish, sometimes with a faint pale spot near apex but always dark in basal half. Pronotum with a single round pit at each side of midline groove (p.38, fig. III.33). At least 1st antennal segment reddish. 3.1-3.6mm. Rich fens and marshes. Uncommon. *B. doris*

25a Elytra with numerous small pale spots all over, or generally yellowish in basal half. Pronotum with an oval pit on midline and 2 smaller round pits on either side (fig. III.34). Usually with first 3 antennal segments pale; if only 1st segment pale, then beetle less than 2.8mm long. **26**

26 Larger (2.9-3.9mm). Pale brownish-yellow spots uniting in basal half of elytra, and usually a brighter yellow diagonal pale spot on outer side of elytra in apical third. 3 pale yellow-red antennal

segments. Pronotum slightly narrower than head. Common in wetlands of all kinds. *B. articulatum*

26a Smaller (2.5-2.8mm). Numerous small but well defined pale spots all over elytra. Only 1st antennal segment pale. Pronotum wider than head. Very rare, mainly a migrant. *B. octomaculatum*

27 Frontal furrows doubled throughout their length (as in fig. III.31). 2.8-4mm **28**

27a Frontal furrows doubled only in front third of their length. 2.5-3.2mm. **30**

[If elytra are black with 2 pale yellow spots on each, go to 41]

28 Larger (3.5-4mm). Elytra with yellow spots throughout, not dark in basal half. Rather scarce, in fens and other freshwater marshes. *B. fumigatum*

28a Smaller (2.8-3.7mm). Elytra all dark with a more or less distinct pale spot near apex. **29**

29 Antennae with 3-4 basal segments reddish, rest of antennae blackish. Pronotum strongly frosted with microsculpture, so appears much less glossy than elytra. Pronotum relatively narrower, elytra relatively longer. 2.8-3.5mm. Common beside fresh water. *B. assimile*

29a Only 1st antennal segment reddish. Pronotum with only faint microsculpture, so as glossy as elytra. Pronotum broader, less narrowed at base, elytra relatively shorter and more convex. 3.2-3.7mm. Beside fresh water, rather scarce. *B. clarki*

30 Legs entirely reddish-brown. Head and pronotum unmetallic black. Striae of elytra strongly pitted. Elytra glossy. 2.5-3mm. Fairly frequent in fens and marshes in lowlands. *B. gilvipes*

30a Legs red-brown with femora blackish. Head and pronotum metallic blue-green. Striae only weakly pitted. Elytra matt or frosted. 2.8-3.2mm. Uncommon, on river shingle in north-east England. *B. schuppelii*

31 1st elytral stria runs to tip of elytra then loops back on itself around the apex, the groove becoming deeper and wider in the loop. Only 1 or 2 bristle-bearing pits on 3rd elytral interval, and these all in apical half of elytra. Groove round sides of pronotum wide and deep. Whole beetle uniform red- or dark-brown. 3.5-6mm. **32**

31a 1st stria continues straight to apex or fades away, never looping back. At least one bristle-bearing pit on 3rd interval in basal half of elytra. Groove on sides of pronotum often narrow and/or shallow. Often with pale spots on elytra. **33**

32 Larger (4.3-6mm), red-brown, sometimes with elytra darker than head and pronotum, upper surface entirely unmetallic. Side margin of pronotum wide, base of pronotum straight. A single bristle-bearing pit on 3rd interval of elytra in apical half. Very common in many habitats including woodlands and wetlands. Active in summer. Often climbs trees. *B. harpaloides*

32a Smaller (3.5-4.3mm). Dark brown, often with a bluish metallic sheen. Side margin of pronotum narrow, base angled forwards toward sides. 2 bristle-bearing pits on 3rd interval in apical half. Rather scarce, often under ivy on stone walls and in quarries. Mainly Winter active. *B. quinquestriatum*

33 Head either heavily pitted all over upper surface, or with a distinct cluster of pits behind and above each eye, around the rear end of the frontal furrows, the pits similar to those in the elytral striae. **34**

33a Head smooth, not pitted, though maybe frosted with microsculpture. **38**

34 Head pitted all over upper surface; pronotum pitted along sides and front, if not all over. **35**

34a Head with a small cluster of sharp, fine pits above and behind each eye (p.40, fig. III.39). Prontum smooth and unpitted, except sometimes at base. Elytra very flat and parallel-sided. **37**

35 Elytra mainly yellow, marked with dark brown zigzags or spots. Head and pronotum metallic green or brassy. Legs and antennae pale. 4.1-4.7mm. Uncommon, on damp sand. *B. pallidipenne*

35a Elytra dark, black or metallic. **36**

36 Pronotum pitted all over, in same way as head. Elytra with striae continuing to apex. At least tibiae and 1st antennal segment paler. Upper surface usually brassy or bronzed metallic. 4.5-5.6mm. Common on sand and gravel by running water. *B. punctulatum*

36a Pronotum not pitted in middle, though often with a scatter of pits around the edges. Elytral striae disappearing in apical half. Legs and antennae black. Upper surface usually brassy or greenish metallic. 3.6-4.7mm. Mainly upland streams and lakes, also sea shore. Rare. *B. bipunctatum*

37 Smaller (4.2-5.1mm). Each elytron with 2 pale spots, a large one near the base and a smaller, neatly rounded one near the apex. Legs pale, sometimes femora darkened. Head and pronotum metallic green, elytra unmetallic dark brown or with a bluish sheen. On gravel, sand or clay, by flowing water or on the coast. Scarce. *B. saxatile*

37a Larger (5.2-6mm). Elytra all dark, usually metallic blue or green. Legs reddish. On gravelly river and stream sides. Common in the north. *B. decorum*

38 In saltmarshes, usually between the tide lines. Whole beetle parallel-sided, pronotum almost as wide as elytra, and head parallel (not narrowed into a neck) behind eyes. 3-4mm. **39**

38a Seldom in salt-marshes, if so beetle usually less than 3mm long. Pronotum much narrower than elytra at their widest, and head narrowed into a neck behind the eyes. **40**

30 Head and pronotum metallic green. 4 bristle-bearing pits on 3rd elytral interval. Eyes larger and more convex. 3-4mm. On intertidal mud, under algae. All round Britain but local. *B. laterale*

39a Whole upper surface reddish brown and unmetallic. Only 2 bristle-bearing pits on 3rd interval. Eyes very small and flat. 3.5-4mm. Sandy or stony sites on the south coast. *B. nigropiceum*

40 Hind angles of pronotum very sharp, set slightly forward from base, with a small incision behind them. Elytra usually with 2 pale, opaque creamy or yellow spots, occasionally with just one. 2.5-4mm. **41**

40a Hind angles not set forward of the base. Elytra with various patterns. **43**

41 First 4 antennal segments and whole of legs pale, at most femora slightly brownish. 2.8-3.5mm. Very common in many habitats. *B. quadrimaculatum*

41a Antennae and legs entirely black or dark brown with black femora. **42**

42 Smaller (2.5-3mm). Elytra with pale spot at shoulder, but apex entirely dark. Very rare, on acid peatlands in lowland Yorkshire. *B. humerale*

42a Larger (3.5-4mm). Elytra each with 2 pale spots. Uncommon, usually on damp clay or chalk soils. *B. quadripustulatum*

43 Bristle-bearing pits on 3rd elytral interval are in middle of the interval, not touching 2nd or 3rd stria. **44**

43a Bristle-bearing pits are touching or situated within the 2nd or 3rd stria. **50**

44 2.3-3.2mm. Uniformly dark, or elytra pale with a vague dark band across middle. Confined to salt-marshes. **45**

44a 3-6mm. Elytra with sharply defined fawn or cream marbling, each pale patch being angular or straight-sided. Beside fresh- or brackish water. **47**

45 Head, pronotum and elytra uniformly dark, usually blackish with a metallic sheen. Striae on elytra disappearing in apical half. Legs dark or with tibiae paler. **46**

45a Head and pronotum black with a metallic sheen, elytra pale brown with a dark transverse band in hind half. Legs entirely pale. 2.5-3mm. Upper edges of saltmarshes, rare. *B. ephippium*

46 Larger, usually larger than 3mm (2.5-3.4mm). More convex. Pronotum longer and narrower, about equilateral, less contracted at front and back, only weakly sinuate at sides. Hind angles of pronotum obtuse. Basal margin of pronotum curved backwards in middle. Basal depressions (at either side) deep and curved, following the curved line of the edge of the pronotum. Legs and first antennal segment pale brown. Elytral striae more strongly punctate. Elytra paler, brownish, toward apex, only weakly metallic. 2.5-3.2mm. Fairly frequent in salt-marshes. *B. normannum*

46a Smaller, usually less than 3mm (2.3-3.2mm). Somewhat flatter. Pronotum shorter and broader, wider than long, strongly contracted at front and back, more strongly sinuate at sides. Hind angles of

pronotum right and prominent. Basal margin of pronotum almost straight. Basal depressions deep, with a straight keel on outside. Elytral striae with moderately strong pits. Antennae and legs entirely dark, or tibiae somewhat paler. Uniformly dark, whole animal usually black with a bluish sheen. 2.3-3.2mm. Common in saltmarshes. *B. minimum*

47 Larger (5.1-6mm), with a shiny raised area around the bristle-bearing pit next to the eye (p.39, fig. III.35). Frontal furrows prolonged almost to level with hind edge of eye. Tip of last abdominal segment yellowish, easiest to see from below. Common in many kinds of wetlands. *B. dentellum*

47a Smaller (3-5.1mm), without shiny raised area around bristle-bearing pit above each eye. Frontal furrows shallower, fading away about level with the midpoint of the eye. Tip of abdomen, above and below, same colour as rest of abdomen. **48**

48 First 3-4 antennal segments pale, though sometimes darker or metallic on upper surface. Legs pale reddish-yellow. Elytra with a large pale spot on the shoulders. 3.2-4mm. Rare, though widely scattered. *B. semipunctatum*

48a Only 1st antennal segment pale. ***If*** less than 4mm long, then legs are black or very dark brown and bases of elytra are blackish. **49**

49 Larger (4.1-5.1mm). Legs pale. First antennal segment, and undersides of segments 2-4, red-brown. Pale markings on elytra usually more extensive. Outline of elytra bases rather square. Common in many wetland types including saltmarshes and river and lake shores. *B. varium*

49a Smaller (3-4.4mm). Legs black or very dark brown. First antennal segment, slightly paler than rest, which are black. Elytra blackish with 2 narrow, broken diagonal cream or brown bands. Outline of elytra bases rounded. Widespread but uncommon, especially on peaty soils. *B. obliquum*

50 Elytra each with 1 or 2 well-marked pale spots or (saltmarshes only) yellow around sides and apex, dark in middle. **51**

50a Elytra uniformly coloured, dark, usually black with a blue or green metallic sheen. **59**

51 Elytral striae rather faint, only 1st stria reaching beyond halfway down elytra. Upper surface extremely smooth and glossy. Pale spots are opaque pale yellow. Pronotum equilateral or slightly longer than wide, strongly constricted at base (base is about 60% maximum width of pronotum). 4-4.9mm. Common on bare ground beside fresh water, a rapid colonist of new ponds. *B. illigeri (=genei)*

51a Striae deeper, surface with some hint of microsculpture so not as glossy. Pale spots often orange or brownish, often translucent rather than pale-pigmented. Pronotum clearly broader than long, and less constricted at base. **52**

52 Each elytron with a single pale spot, either half-moon shaped at the apex of each, or a basal and apical spot linked by a pale margin. **53**

52a The two spots on each elytron which are separated by a dark transverse band across the middle of the elytra. **54**

[3 choices]

53a A large, curved reddish-brown spot at the apex of each elytron, the base entirely dark. 5.5-6.2mm. River banks, uncommon. *B. lunatum*

53b Pale patches at base and apex of elytra joined by a broad pale strip along the outside of each. Pale spots usually whitish or creamy, translucent but with some whitish pigment. 5-5.5mm. Saltmarsh and tidal estuaries, uncommon, but often abundant where it occurs. *B. maritimum*

53c Elytra diffusely pale at base and apex, with a vague darker band across middle separating the two ill-defined 'pale spots'. Pronotum with ridge along side margin extremely thin, so that it disappears in the front third of the pronotum when viewed from above. 4.5-5.5mm. Beside running water, scarce. *B. testaceum*

54 7th elytral striae visible for most of length of elytra, and made up of coarse pits in basal (front) half, almost as strong as 6th. Base (rear) of pronotum with many coarse pits, especially in the depression at either side. Hind wings usually short (lift elytra, or look through translucent spots under strong

light. A stout species with broad pronotum and oval elytra. Legs and antennae pale, reddish. 4.9-6.1mm. Very common in most habitats, wet and dry. *B. tetracolum*

54a 7th stria absent or consisting of a few very fine pits. Pronotum smooth, or with a scatter of fine pits, or with a few coarse pits in the depressions. Hind wings always full-length. **55**

55 Pronotum narrow, with ridge along side margin extremely thin, so that it disappears in the front third of the pronotum when viewed from above. **56**

55a Pronotum broader, with raised ridge along side margin clearly visible up to front angles. **57**

56 Frontal furrows slightly curved, each bulging outwards slightly, and concave on the inner side. Pronotum glossy, with a short diagonal ridge running in from hind angles. Transverse dark band sharply defined and blackish. 5.5-6.5mm. On bare gravel by running water, uncommon. *B. fluviatile*

56a Frontal furrows completely straight. Pronotum dull, without a short diagonal ridge running in from hind angles. Transverse dark band ill-defined. 4.5-5.5mm. Beside running water, scarce. *B. testaceum*

57 2nd antennal segment dark, at least at apex. Legs with at least femora darkened. Pronotum dull with dense microsculpture. Pale spots on elytra often brownish and hard to see. 4-5.2mm. Fairly common in a range of wetlands. *B. bruxellense*

57a 2nd (and often also 3rd) antennal segment pale. Pronotum glossy. Pale spots on elytra whitish or creamy translucent. **58**

58 First three antennal segments and all legs entirely pale, creamy or whitish. 4.5-5.5mm. On gravel or sand beside running water or at the coast. *B. bualei (=andreae)*

58a 3rd antennal segment and at least femora brownish. 4.2-5.2mm. Common on bare sand or clay, not always beside water. *B. femoratum*

59 All elytral striae continue to apex of elytra. 7th stria as strong and deep as 6th. **60**

59a Striae become shallow and faint at apex. 7th stria faint or absent. **61**

60 Legs with reddish bases to femora, and first antennal segment reddish underneath. Striae almost smooth, barely pitted. On underside, each abdominal segment with 2 long bristles only. 4.2-5.5mm. Common on river shingle in northern England and Scotland. *B. prasinum*

60a Legs and antennae entirely black. Striae strongly pitted in basal half. On underside, abdominal segments fringed with short bristles along hind margin of each segment, as well as the usual 2 long bristles on each segment. 4.5-5.4mm. Rare, mainly on lake shores in north-west Scotland. *B. virens*

61 Elytral striae only slightly shallower at apex, their position visible to apex, and 2nd as strong as 1st. Legs blackish, sometimes red-brown on tibiae or at base of femora. **62**

61a Striae disappearing in apical third, 2nd shallower and disappearing before 1st. Legs red or red-brown, sometimes with darker femora. **64**

62 Frontal furrows shallow, and not extending backwards beyond midpoint of eyes. Base of pronotum angled forwards at sides, base hardly wider than width across eyes. Front angles of pronotum scarely protruding. Elytra often rather brownish and slightly translucent, upper surface otherwise with a strong metallic sheen, usually blue, sometimes brassy. 4.5-5.5mm. Frequent on river shingle. *B. atrocoeruleum*

62a Frontal furrows deeper, and extending backwards almost to hind margin of eyes. Base of pronotum almost straight, considerably wider than width across eyes. Front angles of pronotum jutting forward. Elytra uniformly blue- or brassy-metallic. **63**

63 Smaller, 4.5-5.5mm. Elytra pointed, sides tapering toward apex. Elytra rather short and rounded at sides. On river shingle, rather scarce. *B. geniculatum*

63a Larger, 5.5-6.5mm. Elytra more rounded and blunt-ended. Elytra long and parallel-sided. On river shingle, common in northern England, Scotland and Wales. *B. tibiale*

63 8th elytral stria deeply and smoothly engraved in apical third of elytra, then disappearing or continuing as a row of fine pits, at about the midpoint. Body very convex, pronotum narrow and with strongly sinuate sides. Black with a faint reddish or violet tinge, especially on elytra. 5.5-6mm. Northern river shingle, scarce. *B. stomoides*

63a 8th stria clearly visible at apex, then running into side margin in the basal half. Usually strongly blue-metallic on upper surface. **64**

64 Pronotum dull, with very strong microsculpture. **65**

64a Pronotum shiny, at least in middle, where there is no microsculpture. **66**

65 Pronotum extremely narrow, only slightly wider than head. Whole upper surface bright metallic blue-green. Legs red. 4.5-5mm. Scarce, on northern shingle. *B. monticola*

65a Pronotum much wider than head. Upper surface brown or black with a faint brassy sheen. Femora black or dark red-brown. Elytra usually with 2 pale spots, but these are often brownish and may be overlooked. 4-5.2mm. Fairly common in a range of wetlands, in lowlands as well as uplands. *B. bruxellense*

66 Smaller, 4.5-5.3mm. Penultimate (largest) segment of maxillary palps, and femora, dark brown or blackish, contrasting with rest of palps and tibiae. Elytra rather narrow and parallel-sided. Common in a range of habitats, usually damp. *B. deletum (=nitidulum)*

66a Larger, 5.2-6.1mm. Whole of palps and legs red, not darkened. Elytra rather broader and more rounded at side, slightly wider toward read. Scarce, usually on damp clay under scrub or in woodland. *B. stephensii*

BLETHISA

There are three related genera of wetland beetles, with strongly bumpy or pitted elytra. In the four *Elaphrus* (see separate key), the pits are oval to circular, flat-bottomed, and with strong contrasting colour sheens. *Elaphrus* are smaller, 6.5-10mm, whereas *Blethisa multipunctata* and *Pelophila borealis* are larger (10-13.5mm and 9-12.5mm respectively) and superficially similar to each other - glossy dark brown with deep dimples scattered across the elytra. *Blethisa* is unique in the figure-of-8 shaped groove above each eye. Whereas *Pelophila* has a single bristle-bearing pit above each eye, *Blethisa* has 2. *Blethisa* is uncommon but widespread in rich fen and marsh vegetation; *Pelophila* is currently known only from northern Ireland.

BRACHINUS **(1-3 species)**

The bombardier-beetles: deter potential predators by spraying boiling water and steam from a sac at the tip of the abdomen (sounding like a faint sneeze). Quite distinctive, with the head and narrow thorax reddish, and broad truncate elytra black or blue-metallic. Currently one species, *B. crepitans*, is recognised as British, and is widespread in dry coastal grassland, and found on a few inland sites on limestone. There are rumours that the inland form may be a different species. Recently, a distinctive second species, *B. sclopeta*, has been rediscovered near the Thames estuary, after an absence of records for 80 years. It is easily recognised by the broad red-orange stripe along the suture of the elytra in the basal half.

BRADYCELLUS

This key is also presented in Appendix 2, in a key to small brown harpalines - if you are not sure if your specimen is *Bradycellus* or one of its relatives, try there instead.

1 Large, 3.8-5.2mm (doubtful cases key both ways) **2**

1a Small, 2.5-3.5mm **6**

2 Hind angles of pronotum completely rounded, and sides straight or convex to hind angle. **3**

2a Hind angles of pronotum visible, sides of pronotum slightly sinuate in rear half, becoming very slightly concave just in front of hind angles. **4**

3 Scutellar stria present, and usually well marked. Groove round the sides of pronotum continues along base to the midpoint of the deep depression in the base of the pronotum. Usually large (3.8-5mm) and pale or red-brown. Eyes slightly more convex. Best to confirm identification with male genitalia: penis in dorsal view pointed. Very common everywhere. *Bradycellus harpalinus*

3a Scutellar stria absent or very faint. Groove round the sides of pronotum continues along base only about a quarter the way across the deep depression in the base of the pronotum. Smaller (3.5-4.3mm) and darker brown. Eyes slightly flatter. Best to confirm identification with male genitalia: penis in dorsal view blunt. Apparently rare. *Bradycellus csikii*

4 Pronotum finely pitted at front edge. No dorsal bristle-bearing pit on 3rd elytral interval . 4-4.5mm. Scarce and mainly coastal. *Bradycellus distinctus*

4a No fine pits near front edge of pronotum. Interval 3 with a bristle-bearing pit near 2nd stria just behind middle of elytra. **5**

5 Large (4.5-5.2mm) and pale or red-brown. Hind-wings full-length, often visible through the translucent elytra, otherwise lift elytra of fresh specimens: flies readily, often comes to light. Common everywhere, especially in dry habitats. *Bradycellus verbasci*

5a Small (3.9-4.5mm) and dark brown. Hind-wings short (lift elytra of fresh specimens). Usually in damp grassland or woodlands. Scarce. *Bradycellus sharpi*

6 Very small, 2.5-3.4mm. Dark brown or almost black, with a pale, orange line along the suture of the elytra. Pronotum pitted and covered in short, fine hairs at the rear and in middle. Under heather on heaths and moors, common in that habitat. *Bradycellus ruficollis*

6a Larger (3-5mm), if dark then not with conspicuous orange line down suture. Pronotum less pitted and without short hairs. **7**

7 Pronotum dark, with margins contrasting pale. 3.5-5mm. **8**

7a Pronotum pale brown, sometimes with a faint darker patch in middle, but margins not contrasting. 3-5mm. **9**

8 Scutellar stria present, and usually well marked. Groove round the sides of pronotum continues along base to the midpoint of the deep depression in the base of the pronotum. Usually large (3.8-5mm) and pale or red-brown. Eyes slightly more convex. Best to confirm identification with male genitalia: penis in dorsal view pointed. Very common everywhere. *Bradycellus harpalinus*

8a Scutellar stria absent or very faint. Groove round the sides of pronotum continues along base only about a quarter the way across the deep depression in the base of the pronotum. Smaller (3.5-4.3mm) and darker brown. Eyes slightly flatter. Best to confirm identification with male genitalia: penis in dorsal view blunt. Apparently rare. *Bradycellus csikii*

9 Larger (3.8-5mm). Head and pronotum rather small and narrow, elytra longer and broader, so beetle looks pear-shaped. Striae not pitted. Base and front of pronotum about equally wide. Eyes very convex and bulging. Common in most habitats. *Bradycellus harpalinus*

9a Smaller (3-3.5mm). Head and pronotum relatively rather larger, and elytra more parallel-sided, so whole beetle looks cylindrical. Striae finely pitted. Base of pronotum narrower than front edge. Eyes rather flattened. Under heather, mainly on upland moorland, rarely on lowland heaths. *Bradycellus caucasicus (=collaris)*

BROSCUS

The largest of the specially-adapted burrowing carabids in Britain species, *B. cephalotes* is very distinctive, large and silky black. The only species which it might conceivably be confused with are much smaller, and differ in other ways: *Clivina* are dark brown (*fossor*) or two-tone, dark at the front and orange on the elytra (*collaris*) - see key, below ; *Miscodera* is medium-sized and glossy brown.

CALATHUS

1 Pronotum continuously rounded and convex at sides, not straight in hind third. Hind angles smoothly rounded. **2**

1a Pronotum either with sinuate sides (curving out from front to middle, in again in rear half, then out again toward rear edge), or with sides almost straight in the hind third. Hind angles either pointed and protruding, or approximately right-angled, rounded only at extreme tip. **7**

2 Pronotum hind-angles broadly rounded, so it is hard to define where the hind corner is. Hind edge of pronotum narrower than front edge of elytra. **3**

2a Pronotum hind-angles rounded at extreme tip, but clearly angular. Hind edge of elytra almost as wide as base of elytra. **4**

3 Labial (inner) pair of palps with last segment broadly pear-shaped, at least twice as wide as penultimate segment. Pronotum wider than long. 6-8.5mm *Synuchus vivalis*

3a Labial (inner) palps with last segment no wider than penultimate. Pronotum as long as it is broad. 8.5-10mm. *Calathus rotundicollis (=piceus)*

4 Head black, pronotum orange-red, elytra dark. **5**

4a Head, pronotum and elytra all of the same colour. **6**

5 Flat surfaces of elytra black, contrasting with the translucent brown or orange of the outer edge (epipleures) and the base (in front of the basal groove). Elytra rather parallel-sided. 6.5-8.8mm *Calathus melanocephalus*

5a Flat surface of elytra dark brown, the same colour as the epipleures and the bases. Elytra rather convex oval in outline. 6.5-8.8mm *Calathus cinctus*

6 Whole beetle blackish, with only the extreme edge of the pronotum paler. Pronotum narrower at base than in middle. 6.5-8.8mm *Calathus micropterus*

6a Whole beetle brown or reddish, with broader pale edges to pronotum and elytra. Pronotum sides parallel in rear half. 6.6-9.2mm *Calathus mollis*

7 Third and fifth elytral striae with a row of deep pits, clearly visible at 8x. Rear of pronotum with numerous small pits. 10-14.4mm. Very common. *Calathus fuscipes*

7a Only third interval with rather shallow pits. Rear of pronotum smooth. **8**

8 **[3 choices]**

8a Pronotum broadest at or near base. Hind angles of pronotum translucent. First segment of hind tarsi with a groove on inner side. Dull red-brown to dark brown. 8.4-11.6mm. Local, usually in dry, sandy habitats. *Calathus ambiguus*

8b Pronotum widest in front half, and clearly narrowed toward base. Hind angles of pronotum not or only very slightly translucent. First segment of hind tarsi without a groove on the inner side, but with a ridge on the outer edge. Dark brown to black, sometimes faintly bronzed. 8.5-11.8mm. Frequent in dry habitats. *Calathus erratus*

8c If less than 9mm long, and hind angles of pronotum well rounded, also check **4**

CALLISTUS

One distinctive black and red species, *C. lunatus,* found in dry calcareous grasslands and possibly extinct in Britain. The black mark on the elytra is diagnostic, resembling the leathermark symbol. See illustrations in colour guides.

CALOSOMA

Large and distinctive species, the elytra and thorax broader than in *Carabus* species.

1 13-22mm long. Pronotum with a raised rounded ridge only in front two-thirds of sides. Upper surface uniformly shiny, usually with a bronze or greenish metallic sheen; no contrast between head and pronotum and elytra and fore-body. Uncommon, in oak woods, especially along Wesh-English border. *Calosoma inquisitor*

1a 17-35mm long. Pronotum with a raised rounded ridge running the full length of the sides. Head and pronotum black with a bluish sheen, elytra contrastingly bright green-gold metallic. Very rare migrant, with half a dozen records in south-east England (not all coastal). *Calosoma sycophanta*

CARABUS

These large, distinctive beetles are mostly easily recognised from photographs, reference collections or book illustrations. Unfortunately, the differences sound very subtle when written down.

1 **[3 choices]**

1a Elytra each with three smooth, prominent ridges, between which they are smooth or finely granular or wrinkled, or with circular golden dimples. No 'sausage-shaped' granules. Upper surface bright metallic green or gold, or dull brassy with bright gold dimples. **2**

1b Elytra each with three rows of elongate 'sausage-shaped' granules, between which are either a single smooth raised line, or a set of three close-set fine raised lines, or rows of smaller granules. **4**

1c Elytra rough, pitted or granular, but no neat sausage-shaped granules or smooth raised ridges. **7**

2 A row of deep, wide, bright gold-metallic dimples between the smooth, black raised ridges. Remainder of upper surface greenish-brassy but not brilliant. 22-28mm. Northern and western wetland species. *Carabus clatratus (=clathratus)*

2a No gold dimples between ridges: smooth, wrinkled or with low, smooth-surfaced granules. All or most of upper surface brilliantly green or gold. **3**

3 The three raised ridges on each elytron black. Background bright metallic green. Legs black. 13-18mm. Peat-bogs and wet heaths *Carabus nitens*

3a Raised ridges the same gold-metallic colour as the gaps between them. Legs red. 20-27mm. Lowland England, a recent introduction. *Carabus auratus*

4 **[3 choices]**

4a A single smooth raised line between the rows of sausage-shaped granules. Upper surface almost always brassy. **5**

4b Three smooth raised lines between the rows of sausage-shaped granules. Upper surface usually green-metallic or coppery. A slender, rather flat species. 22-26mm. Scarce but widespread in damp grasslands and other habitats. *Carabus monilis*

4c Surface rough or granular between sausage-shaped granules, but no well-marked longitudinal raised lines. **6**

5 Legs and antennae all black. 16-23mm. Common in wet woodland, fens etc. *Carabus granulatus*

5a First antennal segment red. Femora usually reddish. 20-27mm. Rare introduced species. *Carabus cancellatus*

6 18-30mm. Sculpting on elytra irregular, though sometimes with about three uneven rows of sausage-shaped granules. Pronotum broadest near front, and strongly narrowed toward rear; side margins strongly raised. Black, with a violet or bluish sheen, especially on pronotum and the edges of elytra. Frequent in many habitats. *Carabus problematicus*

6a 16-20mm. Three rows of 'sausages' on each elytron neat and regular. Pronotum broadest near middle, and only slightly narrowed to rear; side margins little raised. Colour variable: green, brassy, coppery, or violet on whole of upper surface. Heaths and moors, uncommon. *Carabus arvensis*

7 Head and thorax long and narrow: pronotum at least as long as wide, and distance between eyes equal to distance from middle of eyes to base of labrum. Elytra coarsely granular all over, with bright blue reflections especially in marginal groove. 25-38mm. Rare, in ancient woodland in south-west. *Carabus intricatus*

7a Head and thorax much less elongate: pronotum wider than long, and gap between eyes much wider than distance from mid-eye to base of labrum. **8**

8 Elytra each with three rows of small but well-marked metallic pits, and with granules or flat scaly sculpturing between these. Pronotum much wider than long. Coppery or green metallic sheen on pronotum and around edge of elytra. 20-26mm. Common throughout, especially in woodland. *Carabus nemoralis*

8a Elytra without well-marked pits. Granules variable, often longitudinal. Violet-metallic or plain black. **9**

9 Elytra smooth. Whole beetle plain black. 22-30mm. Northern and upland. *Carabus glabratus*

9a Elytra conspicuously granular. Edges of elytra and pronotum with violet or blue sheen. Common and widespread. **10**

10 Elytra with fine irregular granules, no hint of longitudinal sculpture. Elytra narrow and elongate, no more than 30% wider than pronotum. Pronotum equilateral, almost as wide at base as at widest point; front of pronotum almost straight. 20-30mm. Common and widespread in many habitats. *Carabus violaceus*

10a Elytra more strongly granular, some of granules joined up to form longitudinal granules or short ridges. Elytra wider, especially toward rear: at widest, at least 50% wider than pronotum. Pronotum widest in front half, and strongly narrowed toward rear; front of pronotum strongly concave. 18-30mm. Common and widespread in many habitats. *Carabus problematicus*

CHLAENIUS

1 Sides of elytra with narrow yellow stripe, and apex with a broader, jagged yellow band. Rest of upper surface usually metallic green. Sides of pronotum sinuate, and hind angles clearly protruding. 8.5-11mm. Local, in fens and rich waterside vegetation. *Chlaenius vestitus*

1a Sides of elytra same colour as rest. Upper surface usually metallic green on elytra but often metallic coppery on head and pronotum. Sides of elytra usually convex throughout, and hind angles rather blunt and not protruding. 10-13mm. **2**

2 Upper surface almost always strongly metallic. Antennae with at least the first segment reddish contrasting with the remaining segments which are black. Legs partly reddish or yellowish. **3**

2a Pronotum and elytra silky black, without or with a very faint metallic sheen; head sometimes with a coppery sheen. Antennae entirely dark, blackish; legs dark. 10.5-13mm. Extremely rare, in rich fens or bogs. *Chlaenius tristis*

3 Only 1st antennal segment yellow-brown . Palps dark, at least toward the apex of each segment, legs often black or red-brown. Sides of pronotum evenly convex. 10-12.5mm. Scarce, in rich fens and water-fringe vegetation. *Chlaenius nigricornis*

3a 2nd and usually 3rd antennal segment orange or red. Palps entirely pale, legs largely reddish or yellowish. Pronotum sides straight in hind third. 10-12mm. Extremely rare, on open sunny silt or clay ground near fresh water. *Chlaenius nitidulus (=holosericeus)*

CICINDELA (inc. CYLINDERA)

In life, the Tiger Beetles are usually immediately recognised by their large size (8-19mm), very large eyes and jaws, long legs, very rapid running, and the ability to leap into flight as they run. There are good illustrations of several species in most illustrated beetle guides. Novices often think they have found a tiger beetle when looking at *Elaphrus* species, but these have shiny elytra with numerous large, metallic dimples.

Technically, tiger beetles can be diagnosed by their antennae, which are attached between clypeus and frons, above the base of mandibles; or by the clypeus which is broader than the distance between the bases of the antennae; or by the mandibles, which are marked with yellow or white. The elytra are always without striae, and are bright green to brown-black, with opaque creamy spots or blotches. . The only species over most of Britain is *C. campestris*, the Green Tiger-beetle. It is the only species which is bright green, but the 'brown' species often appear rather greenish or faintly metallic under artificial light, and *C. germanica* is green-brown.

1 Ground colour green. A pattern of isolated round or oval creamy or white spots, sometimes joining up along the margin, but not extending as lines toward middle of elytra. **2**

1a Ground colour brown. A pattern of pale spots on the margin of the elytra which extend inward as three transverse yellow or white bands, the middle of which is the longest. **3**

2 Small (8-11mm), dull green-brown, with all pale spots around edges of elytra. Elytra with a scatter of deeper pits toward the base. 2 basal segments of labial palps pale. Underside of thorax smooth, not hairy. Rare: on wet soft-rock cliffs on the south coast. *Cylindera germanica*

2a Larger (12-16mm), usually bright green, with one of the 5 pale spots near middle of elytra. All pits on elytra uniformly fine and shallow. Palps entirely dark. Underside of thorax with while hairs. Widespread and fairly common. *Cicindela campestris*

3 Larger (15-19mm) and dark brown-black. Labrum blackish, with a raised ridge along the midline. Palps all dark. A scatter of deeper pits on elytra toward midline of body. Very rare, southern heaths. *Cicindela sylvatica*

3a Smaller (12-16mm), paler brown. Labrum white or yellowish, without a ridge. Labial palps with 2 pale basal segments. All pits on elytra fine and uniform. Sand dunes on the coast. **4**

4 Wavy middle line is bent backwards through nearly 90º. A group of several white bristles above and behind each eye. 12-15mm. Rare: scattered on coastal dunes, Wales, south-west, Dorset, Kent, Norfolk, Lincs. *Cicindela maritima*

4a Wavy white or cream line which extends from the middle of the three side spots is only slightly kinked. Only 1-3 white bristles above and behind each eye. 12-16mm. Dunes in north-west England, with old records in Wales, Cornwall and Norfolk. *Cicindela hybrida*

CLIVINA

Clivina (2 species), *Broscus* (1 species) and *Miscodera* (1 species) are the larger burrowing species. *Clivina* are dark brown (*fossor*) or two-tone, dark at the front and orange on the elytra (*collaris*) - see key, below *Broscus* is large and silky black. *Miscodera* is medium-sized and glossy brown.

1 Uniform black-brown. Elytra long but convex-sided. Underside of last abdominal segment with microsculpture in form of a mesh of raised lines (visible at x40). 5.5-6.5mm. Common in farmland, grassland, gardens, on many soils. *fossor*

1a Dark brown head and thorax, contrasting with reddish or orange-brown elytra. Elytra parallel-sided. Underside of last abdominal segment dull because of granular or wrinkled microsculpting. 5-5.5mm. Sandy or silty soils, usually near rivers. Scarce. *collaris*

CYCHRUS

C. caraboides is a large and unmistakeable black carabid, its head and thorax very strongly elongate (for eating snails), and its elytra convex, almost domed.

CYMINDIS and POLYSTICHUS

Cymindis (3 species) and *Polistichus* (1 species) are medium-sized, predominantly dark brown beetles, with truncate elytra and elongate pale patches on the shoulders. In *Cyminidis* these are almost like epaulettes; in *Polistichus*, they extend as narrow rectangles along the elytra. All species are scarce or rare.

1 Elytra not hairy (though pitted on each interval), basal margin of elytra complete, male labial palp with ax-shaped last segment; head and elytra blackish, pronotum red. *Cymindis axillaris*

1a Elytra hairy on all intervals. **2**

2 Head constricted into a well-defined neck. Each elytron with a broad pale band running lengthwise for about 2/3 the length from base to apex, and each patch 5-6 intervals wide. *Polystichus connexus*

2a Neck not strongly constricted. Small pale patches on shoulders extending no more than 1/5 the way back, and for no more than 2-3 intervals' width. **3**

3 Elytra with basal margin complete; male palps not dilated; pronotum transverse; head and elytra dark brown or blackish, pronotum pale red-brown. Extremely rare, heather heath in Breckland. *Cymindis macularis*

3a Elytra with basal margin present at sides only; head, elytra and pronotum all one shade of mid-brown. Very local, on mossy ground on glacial moraine in northern Britain. *Cymindis vaporariorum*

[If hairy, without constricted neck, pronotum black, and the pale shoulder spots on elytra reach the side margins, *cf. Cymindis humeralis* (not yet on British list, but possible)]

DEMETRIAS (=RISOPHILUS)

Demetrias (3 species) and *Dromius* (12 species) are slender, flat, parallel-sided beetles, with strongly truncate elytra, which climb up plants (either grasses and herbs, orin a few cases, up trees). The three *Demetrias* are recognised by the fourth tarsal segments being widened into triangular flaps on eitehr side, and all three are straw-coloured with a black head and small dark marks on the elytra. Some *Dromius* species are similarly coloured, while others are entirely dark, or black with four pale spots. For that reason, *demetrias* are also included in the *Dromius* key, and if you have difficulties here, try that one.

1 Basal half of abdomen black (look at beetle from side or from underneath). Black marks on elytra in form of a long dark streak down joint between elytra. Head with long bristles behind eyes, across and down sides of neck. Each claw with 3 teeth on inner side. 4.5-5.6mm. Common in many habitats, including arable fields and nettle-beds. *Demetrias atricapillus*

1a Abdomen usually uniformly orange-yellow. Elytra either with a single circular spot on join, or with a dark longitudinal mark and a triangular spot on each side margin. Head not hairy. Claws with one small tooth or smooth. **2**

2 Hind wings short (usually visible through elytra in bright light). Claws with a single small tooth. Elytra usually pale with a round black spot on midline a little way from apex. 4.2-5.1mm. Uncommon, either in reedbeds in wetlands, or in marram-grass on sand dunes. *Demetrias monostigma*

2a Hindwings full-length and folded back at apex. Claws completely smooth. Elytra usually with a black stripe along suture, widening toward apex, and a black triangular spot on either outer edge a little way in front of apex. 4.9-5.6mm. Scarce, in reedbeds. *Demetrias imperialis*

DIACHROMUS

A single distinctive species, *D. germanicus.* Long thought extinct in Britain, but recently refound in Sussex. Included in the key to ruderal groups (*Harpalus, Amara* etc.).

DICHEIROTRICHUS

Two fairly distinctive saltmarsh species with hairy elytra and eyes. Also included in the key to small brown harpalines in Appendix 2.

1 Each elytral interval with 1-2 rows of deep pits, each pit bearing a fairly long hair. Males dark brown or blackish, females pale brown, both sexes with a darker longitudinal band down the middle of each elytron. 5-7.5mm (often smaller than next species). Common in saltmarshes.
Dicheirotrichus gustavi

1a Each elytral interval with about 3 rows of finer pits, each bearing a rather shorter hair. Both sexes pale brown with a dark band down the middle of each elytron. 5.5-7.8mm. Rather scarce, in salt-marshes. *Dicheirotrichus obsoletus*

DROMIUS

Dromius (12 species: now placed in four genera, *Dromius*, *Paradromius*, *Calodromius* and *Philorhizus*) and *Demetrias* (3 species) are slender, flat, parallel-sided beetles, with strongly truncate elytra, which climb up plants (either grasses and herbs, orin a few cases, up trees). The three *Demetrias* are recognised by the fourth tarsal segments being widened into triangular flaps on either side, and all three are straw-coloured with a black head and small dark marks on the elytra. Some *Dromius* species are similarly coloured, while others are entirely dark, or black with four pale spots.

1 All tarsi with segment 4 much wider than segments 1-3 and segment 5, with a triangular lobe at each side. Head black, pronotum orange-brown, elytra yellowish with black marks. 4.2-5.6mm.
Demetrias **2**

1a Tarsi with all segments of equal width. If coloured as above, then either less than 3.5mm, or more than 6mm long.
4
[If whole beetle is blackish and 2.5-3.9mm, see also *Syntomus* (=*Metabletus)* and *Microlestes*, below]

2 Basal half of abdomen black (look at beetle from side or from underneath). Black marks on elytra in form of a long dark streak down joint between elytra. Head with long bristles behind eyes, across and down sides of neck. Each claw with 3 teeth on inner side. 4.5-5.6mm. Common in many habitats, including arable fields and nettle-beds. *Demetrias atricapillus*

2a Abdomen usually uniformly orange-yellow. Elytra either with a single circular spot on join, or with a dark longitudinal mark and a triangular spot on each side margin. Head not hairy. Claws with one small tooth or smooth. **3**

3 Hind wings short (usually visible through elytra in bright light). Claws with a single small tooth. Elytra usually pale with a round black spot on midline a little way from apex. 4.2-5.1mm. Uncommon, either in reedbeds in wetlands, or in marram-grass on sand dunes.
Demetrias monostigma

3a Hindwings full-length and folded back at apex. Claws completely smooth. Elytra usually with a black stripe along suture, widening toward apex, and a black triangular spot on either outer edge a little way in front of apex. 4.9-5.6mm. Scarce, in reedbeds. *Demetrias imperialis*

4 Elytra at base about same width as widest part of pronotum, and with sloping shoulders. Striae clearly visible and pitted. Elongate, reddish brown or yellowish beetles without pale spots on elytra but often with a darker suture and apex. 4.4-6.5mm. **5**

4a Elytra wider than pronotum at base, and with rather square shoulders. Striae often faint or absent, even in basal quarter. Elytra relatively broader and shorter. Variously coloured, but often with 2 pale spots on each elytron. 2.5-6.8mm. **6**

5 Head, pronotum and elytra red-borwn, usually with elytra darker toward apex and along suture. Striae well marked, pitted. Head with deep longitudinal wrinkles between eyes. Head and pronotum less elongate, pronotum about equilateral. 4.4-6mm. Very common in grasslands, arable, and other habitats. *Dromius (=Paradromius) linearis*

5a Head dark brown, pronotum pale brown, elytra yellowish with a dark brown or black mark along midline. Striae faint and hardly pitted. Head without wrinkles. Head and pronotum more elongate, pronotum much longer than broad. 5.3-6.5mm. Scarce, in reedbeds and saltmarshes. *Dromius (=Paradromius) longiceps*

6 Elytra uniformly dark red-brown, or with faint, ill-defined paler spots. 6-7mm. **7**

6a Elytra in part pale yellowish, sometimes marked with black. 2.5-6.4mm. **9**

7 3rd elytral interval with 5 or more shallow bristle-bearing pits. 6-6.8mm. Frequent, climbs trees. *Dromius agilis*

7a 3rd interval with only a single pit and bristle, close to apex. 6-7mm **8**

8 Head with faint short wrinkles near each eye. The flattened margin of the pronotum slightly wider in basal half than in front, but no more than twice width in rear half as in front. 6-6.8mm Rare, living up trees. *Dromius angustus*

8a Head with wrinkles almost all the way across between the eyes. Flattened margins of pronotum much wider in rear half, 3-4 times the width (Beware: the flat margins are a structural feature, best seen with lighting from above, against a dark background; a wider strip round the edge of the pronotum is translucent). 6-7mm. Fairly common, living up trees. *Dromius meridionalis*

9 Each elytron blackish with 2 well defined pale spots. Outer edge of elytra blackish, so pale spots are separate from margins. **10**

9a Outer edge of elytra pale. Either with a dark cross on elytra and pale spots reaching margins, or elytra entirely pale. **11**

[If elytra are mainly mid-dark brown with only a faint pattern, try couplet 7]

10 Large: 5.2-6.4mm. Front of head covered with deep longitudinal wrinkles. Both pairs of spots large and rather square. Elytral striae well developed. No small pore at base of each elytron next to apex of scutellum. Common, climbing trees. *Dromius quadrimaculatus*

10a Smaller: 3.8-4.6mm. Front of head smooth. Front pale spots often much larger than rear spots. Elytra striae very faint and shallow. A small pore on each elytron, level with the apex of the scutellum. Common, climbing trees. *Dromius (=Calodromius) spilotus (=quadrinotatus)*

11 Basal half of elytra pale, or slightly darker along suture. Pronotum at least as long as broad. **12**

11a Whole basal half of elytra dark. Head strongly narrowed behind eyes, giving a narrow neck. Pronotum broader than long. 3.5-4mm. Very rare. *Dromius (=Philorhizus) quadrisignatus*

12 Elytra entirely pale, yellow or creamy, or slightly darker along suture. Head black, pronotum orange. 2.5-3.4mm. Very common, especially among the roots of grasses. *Dromius (=Philorhizus) melanocephalus*

12a Elytra with a dark transverse band across middle, and often also dark along suture. **13**

13 Underside of abdomen yellow to orange-red. Head black, pronotum pale orange. Elytra with well-defined dark brown or blackish marks along suture and across middle, and often widening along sides of elytra ('maltese cross' shape). 3.2-4mm. Rare, in fens and wet meadows. *Dromius (=Philorhizus) sigma.*

13a Abdomen brown to black. Pronotum often dark in middle. **14**

14 Abdomen brown. Ground colour clear orange-red, and elytral bands well defined. Transverse band on elytra narrowed toward sides. 3.4-3.8mm. Rare, on dry sand, shingle and heaths near south coast. *Dromius (=Philorhizus) vectensis*

14a Abdomen black. Overall, dirty yellowish. Darker elytral pattern ill-defined, but transverse band on elytra widening toward margins. 3.2-3.7mm. Uncommon, mainly coastal, on dunes and shingle. *Dromius (=Philorhizus) notatus*

DRYPTA

Not included in the keys, but unmistakeable: the single British species, *D. dentata,* is brilliant metallic blue-green over the whole upper surface, and has bright red legs. Its elytra are pitted and hairy, truncate, and its thorax is narrower than its head or elytra. 7-9mm. Extremely rare, found on seepages on coastal cliffs on the south coast.

DYSCHIRIUS **(11 species)**

A group of small to tiny cylindrical species, with a very strongly constricted waist, front legs for digging and mostly with a brassy or shiny-black surface to the body. 6 species are largely coastal. The following key to the commoner inland species should be used with caution. Other species are difficult to identify without good lighting and a high magnification. Use Lindroth rather than Forsythe if collecting on the coast.

1 Very small, 2.2-3mm. Groove on side of pronotum stopping about half-way along, not reaching the rear of the two bristles at the side of the pronotum. Frequent in a range of wetlands, especially on peaty soils. *Dyschirius globosus*

1a Larger, 3.1-4.9mm. Groove on side of pronotum reaching hind bristle. **2**

2 Larger, 4-4.9mm. Head with flat surface between eyes, from base of clypeus backwards. Rear margin of clypeus in form of a horizontal straight line. Scarce, in sandy habitats, often away from water. *Dyschirius politus*

2a Smaller, 3.1-4.1mm. Rear margin of clypeus pointing backwards, so that there is a raised triangle at front of head on upper surface. Confined to wetlands. **3**

3 Triangle at base of clypeus continues backwards as a ridge running between the eyes. 3.4-4.1mm. Common on bare mud in wetlands. *Dyschirius luedersi*

3a Triangle at base of clypeus ending in a right-angled point, with no ridge continuing backwards. 3.1-3.6mm. Fairly frequent on bare mud in wetlands. *Dyschirius aeneus*

ELAPHRUS

Elaphrus (4 species), *Pelophila* (1 species) and *Blethisa* (1 species) are three related genera of wetland beetles, with strongly bumpy or pitted elytra. In *Elaphrus,* the pits are oval to circular, flat-bottomed, and with strong contrasting colour sheens. *Blethisa* and *Pelophila* are superficially similar to each other - glossy dark brown with deep dimples scattered across the elytra. *Blethisa* is unique in the figure-of-8 shaped groove above each eye. Whereas *Pelophila* has a single bristle-bearing pit above each eye, *Blethisa* has 2. The two common *Elaphrus* are found running over bare mud or sand beside most kinds of fresh water, and are often found together.

1 Tibiae paler than the femora, brown or yellowish at least in middle, slightly translucent. 6.5-9.5mm. 2 common species. **2**

1a Tibiae as dark as femora, opaque black with a metallic sheen. 8.5-10mm. 2 rare species. **3**

2 Tarsi with blue metallic sheen. Elytra glossy brown all over, so the rectangular 'mirrors' near middle are hard to distinguish. Underside of thorax without hairs. 8-9.5mm *E. cupreus*

2a Tarsi with green metallic sheen. Elytra dull and frosted, each with a contrasting smooth and shiny rectangular 'mirror' about a third the way back from base of elytra, fairly near suture. Underside of thorax with thick white hears. 6.5-8mm. *E. riparius*

3 Elytra frosted, dull, with contrasting 'mirrors' (see 2). Underside of thorax with thick white hairs. Elytra rather flat and narrow. 8.5-10mm. Rare, northern, usually at high altitude. *E. lapponicus*

3a Elytra glossy, so 'mirrors' do not contrast strongly. Elytra broader, uneven, as each bristle-bearing pit is surrounded set in deep depression. Underside of thorax hairless. 8.5-10mm. Rare, fens and lake shores. Sometimes present in very small numbers among large populations of *riparius* and *cupreus.* *E. uliginosus*

EURYNEBRIA

Eurynebria complanata is highly distinctive: large (17-24mm), pale yellowish brown, with blackish zigzags across the elytra. It is also included in the key to *Nebria.*

HARPALUS (AND OTHER RUDERAL CARABIDS)

Note: *Harpalus* in the broadest sense is now generally treated as a group of three related genera: *Ophonus* (hairy all over upper surface), *Pseudophonus* (hairy on elytra and part of pronotum, smooth on head), and *Harpalus s.s* (not hairy on upper surface, except sometimes around the sides and apex of elytra).

For a diagram of habitat associations, see under AMARA

This key includes all the recorded species in the following genera:

Harpalus s.l. (36 species) 5.3-17mm
- *Harpalus s.*s. (20 species) 5.3-14mm
- *Ophonus* (14 species) 5.5-17mm
- *Pseudophonus* (2 species) 9-16.7mm

It also directs you to other genera which might be mistaken for *Harpalus:*
- *Anisodactylus* (3 species) 10-13.5mm
- *Scybalicus* (1 species) 11-13mm
- *Diachromus* (1 species) 7.5-10mm
- *Chlaenius* (4 species) 8.5-13mm
- *Oodes* (1 species) 7.5-10mm

The other genus with which *Harpalus* might be confused is *Amara*, but the distinctions are tabulated below.

Most of the species generally share an important behavioural feature: they are seed-eating, at least as adults and often as larvae too. Most are found mainly in dry, often early-successional habitats, though a few are more ecologically wide-ranging, and a few are confined to other specific habitats, e.g. fens, salt-marshes. See the diagram at end for a summary.

The species-poor genera are fairly distinct, and are keyed out in Appendix 2. Two, *Scybalicus oblongiusculus* and *Diachromus germanus*, are believed to be extinct in Britain. *Zabrus tenebrioides* is a distinctive, heavily-built black species found on chalky arable land. The four *Chlaenius* species are usually metallic green, hairy, and found in rich fens; two are extremely rare, and the other two uncommon. All these could conceivably be mistaken for *Harpalus* species. *Oodes* looks rather like a dull black wetland *Amara.*

As with other species-rich genera, a checklist of *Amara* and *Harpalus* is included, showing their sizes and their grouping into subgenera.

Almost all the species can be identified in the field with a hand-lens, given sufficient experience. The exception is a small group of *Ophonus* species (more 'small brown jobs'), which are best identified by examination of the male genitalia. Although many female *Ophonus* can be named reliably, a few remain difficult or impossible, because their overall body shape, details of pronotum shape, and density of their

furriness, are all too variable to provide reliable points of distinction. No other features have yet been devised, so these females may have to remain unidentified for the present.

The two large genera in the group, *Amara* and *Harpalus* (plus *Ophonus* and *Pseudophonus*), might seem superficially similar at first. Both share the distinctive features of rather short, stout legs, and a rounded, rather blunt body form. The two genera can be distinguised in several ways. Most *Harpalus* species are relatively narrower and more parallel-sided than similarly-sized *Amara* species, and *Harpalus* tend to have more bristly legs. More precisely, the two genera differ in numerous characteristics, which also serve as a 'refresher' for most students' favorite diagnostic features:

AMARA	***HARPALUS***
Two bristle-bearing pits	One bristle-bearing pit above each eye
Elytra with no bristle-bearing pits on 3rd interval, so upper surface is smooth and glossy	Elytra with one or more pits on 3rd interval (except in one dull brown species only 5.3-6.3mm long), or whole elytra covered in short hairs
Epipleures crossed	Epipleures not crossed
Basal 3 antennal segments smooth apart from a few long bristles; fourth segment contrastingly hairy	Antennae covered with short, dense hairs from halfway along 3rd segment
Male with front feet with enlarged segments, middle feet normal	Male with both front and middle feet enlarged
Pronotum with a long bristle at or close to each hind corner	Pronotum without bristles at hind corners, but often with a few long bristles along sides

In the following checklist, species which are common in Beds, Cambs or Northants are marked with **, only 13 of the 66 species; and those which have been recorded at some time in the three counties marked *, a further 26 or so species.

	Common?	**Size (min, max) in mm**	**Notes on subgenera**
HARPALUS			
Subgenus *Cryptophonus*			Medium-sized, blackish, defined on larval and adult characters
melancholicus		*10*	*11*
tenebrosus		*8*	*11*
Subgenus *Harpalus*			Variable, but often metallic, at least in males.
affinis	**	*8.5*	*12*
anxius	*	*6.6*	*8.2*
attenuatus	*	*7*	*9*
cupreus		*12*	*14*
dimidiatus		*12*	*14*
froelichii		*8.5*	*10.4*
honestus		*8*	*11*
latus	**	*8.2*	*11*
neglectus		*7*	*9*
laevipes (=quadripunctatus)		*9.5*	*12*
rubripes	**	*8.5*	*12.2*
rufipalpis (=rufitarsis)	*	*8*	*11*
serripes		*9.3*	*11.4*

servus		*7.5*	*8.5*
smaragdinus	*	*9*	*11.4*
tardus	**	*8.4*	*11*
pumilus (=vernalis)	*	*5.3*	*6.2*

Subgenus *Pardileus* Medium, blackish, hairy around elytra and on upper surface of tarsi

calceatus		*10.5*	*14*

OPHONUS

Subgenus *Metophonus* Mostly small-medium unmetallic brown species, hairy on upper side of head, pronotum and elytra; pronotum with sinuate sides and pointed hind angles

cordatus		*7.5*	*10*
melletii	*	*5.5*	*8.6*
parallelus		*5.7*	*7.3*
laticollis (=punctatulus =nitidulus)	*	*8.5*	*11*
puncticeps	*	*6.5*	*9*
puncticollis		*7*	*10*
rufibarbis	**	*6.2*	*9.5*
rupicola	*	*7*	*9*
schaubergerianus	*	*7.6*	*10*
subsinuatus		*6.2*	*8.2*

Subgenus *Ophonus* Small to large species, hairy on upper surfaces, and usually metallic at least in males; pronotum rounded at hind angles, and scarcely sinuate at sides

ardosiacus	*	*9.5*	*13*
azureus	*	*6.2*	*9.2*
obscurus	*	*13*	*17*
sabulicola		*12*	*17*

PSEUDOPHONUS Large species, hairy on elytra and rear half of pronotum, but not on head or in front half of pronotum; black, ginger fur, and pale reddish legs

griseus		*9*	*11*
rufipes	**	*10*	*16.7*

Features used in identifying *Amara, Harpalus* and related species

Some features used in separating species in these groups have not been used in previous genera, or are used here with a particular meaning. The following notes may usefully be read before embarking on the key. The references to figures in Forsythe (ed. 1) are not always repeated in the key .

Metallic: shiny and with a coloured sheen (usually green, blue or brassy) like metallic paint; this is different from iridescent (which produces rainbow colours, like an oil-film, from certain angles). The metallic sheen is usually stronger in males than females in *Harpalus.*

Pronotum shape: this is generally either sinuate (S-shaped curve, bulging out, then going in at sides, then out again toward hind-angles, which protrude, as in p.37, fig. III.28 and p.49 fig. V11) or rounded (a single convex curve, leading to rather blunt, unprotruding hind angles, as in p.49, fig. V.12 and III.27) at the sides. It may be broadest in the middle, or at the base.

The front edge of the pronotum usually juts out at the sides, in the form of a triangular projection at either side. If these are well marked, they tend to embrace the eyes; if less

prominent, they forrn a rounded bump on either side; in a few species, they protrude so little that the front edge is almost straight.

Pronotum surface: In many species of *Amara*, there are depressions at or near the base of the pronotum. Generally, there are 2 at each side, an outer one near the hind corner, and an inner one. These may be a triangular depression (like a sideways thumb-print) near the hind corner (like p.54, fig. V.42) and on either side of the midline, or a smaller or shallower or narrower depression some distance forward of the base, e.g. p.51 fig. V.21. The shape, size, depth and exact positioning of the depressions is very useful in separating species. Sometimes the 'thumb-print' type of triangular depression is defined on one or both sides by the present of a ridge of keel (p.49 fig.V.11).

In addition to these large depressions, the pronotum may be pitted or wrinkled. Sometimes the pits are fine, and are the points from which short hairs arise. In other species, they are coarser, deeper and wider pits. They are usually, but not always, concentrated along the base of the pronotum (p.44, fig.IV.13), and may be confined to, or more dense within, the depressions.

Shoulders: Here, the term refers to the outline of the front outer corners of the elytra, and is quite different from the use with *Bembidion.* In *Harpalus,* these are either protruding or rounded (p.51, fig.s V.22-24).

Head pitted: With deep pits, usually bearing small hairs, generally scattered over whole upper surface (often likewise on pronotum).

Bristle-bearing pits: this feature should be familiar from other groups of carabids. In addition to the one or two pairs of pits above the eyes, and the fine pits on the elytral intervals, there is often also a pit at the base of the scutellar stria (the short additional stria near the inner corner of the base of the pronotum), as in P.49, fig. V.12. In *Amara*, there is also a bristle-bearing pit at the hind corner of the pronotum (like p.42, fig. IV.1); the latter may be close to, or well removed from, the hind corner.

Harpalus and relatives

This key concludes the identification of the main seed-eating groups of British ground-beetles begun in the previous section. References to Key 1 and Key 2 refer to the previous keys to the other seed-eating groups such as *Anisodactylus* and *Amara.* If a specimen seems not to key out, it is probably worth re-visiting Key 1 to check that it really is a *Harpalus.* A few *Ophonus* species can currently be identified with certainty only by examination of the male genitalia. This is much less difficult than it might sound, and in some, the critical features can even be observed with a hand lens.

Difficulties in identification of *Harpalus* and *Ophonus* are caused by the lack of robust, absolute, diagnostic features: much of the identification is based on the relative shapes of the pronotum (which is quite variable within some species, which may thus need to key out in more than one place), and the density of the pitting and hairs on the elytra or the pronotum. If a reliable reference collection is available, these relative characters are satisfactory in most cases; in isolation, without comparison, they are difficult to interpret.

Features used in identifying *Harpalus* and related species

Most features used in separating species in these groups were reviewed earlier. A few additional ones are specific to *Harpalus* and *Ophonus.* The following notes may usefully be read before embarking on the key. The references to figures in Forsythe (ed. 1) are not always repeated in the key.

Metallic: shiny and with a coloured sheen like metallic paint; the metallic sheen is usually stronger in males than females in *Harpalus,* and females of some species are more silky or matt finish compared witht the males. There is often much variation within a species, various shades of green, blue and coppery may occur in one population of the more variable species such as *H. affinis.*

Pronotum shape: in species with sinuate sides (S-shaped curve, bulging out, then going in, then out again toward hind-angles, which protrude, as in p.37, fig. III.28 and p.49 fig. V11), the degree of sinuation, curving in deeply, being parallel-sided- or out-curving at the rear, with hind

corners jutting out more or less, care all useful in identification. In other species, the sides are straight in the rear half, or are continuously rounded (a single convex curve, leading to rather blunt, unprotruding hind angles, as in p.49, fig. V.12 and III.27) at the sides. The pronotum may be broadest in the middle, or at the base. The hind angels may be sharp, right-angled, rounded at the extreme tip, or broadly rounded.

Pronotum surface: In many species of *Harpalus*, there are depressions at or near the base of the pronotum. Generally, there is 1 at each side, about a third the way from hind-angle to midline. These may be a triangular depression (like a sideways thumb-print), or a smaller, shallower or narrower depression some distance forward of the base, e.g. p.51 fig. V.21. The shape, size, depth and exact positioning of the depressions is sometimes useful in separating species. In many species, the depression is only slight, and without well defined sides.

In addition to these large depressions, the pronotum may be pitted or wrinkled. The pits may be fine or course, and in *Ophonus* and *Pseudophonus* are the points from which short hairs arise. In other species, they are coarser, deeper and wider pits which do not give rise to hairs. They are usually concentrated along the base of the pronotum (p.44, fig.IV.13), and may be confined to, or more dense within, the depressions.

Across the base of the pronotum in most glossy *Harpalus* and in a few hairy species there is a low and often rather fine raised ridge. It is usually smaller than the ridge around the sides of the pronotum, and in some species is visible at the sides but vanishes in the middle of the base. In many works, this is referred to as a 'bead', in the sense of a ridge of wood (beading) on furniture.

Bristle-bearing pits: this feature should be familiar from other groups of carabids. In addition to the pits above the eyes, the pit at the base of the scutellar stria, and the scatter of fine pits with short hairs on the elytral intervals of *Ophonus*, there may be larger pits on particular elytral intervals. These are most usually in the 7th interval, near the apex, where the outer edge of the elytra curve round to form the apex.

Bristles on the abdomen: on the underside of the abdomen, all species have a pair of long sensory bristles, one each side of the mid line. In some species there are also fine hairs n the surface, and in a few, a scatter of longer bristles.

Spines on front tibia: All *Harpalus* are characterised by having large numbers of stout spines in several rows along each tibia. On the front tibia, there is usually a short row, of 3-6 spines near the apex on the outer side, which lie on a separate ridge, further forward from the longer row of maybe 6-10 spines on the underside of the leg (p.45, fig. IV.20). The number of spines can help identify species. In *H. froelichii*, these are a continuation of that longer row.

Key to species of *Harpalus, Ophonus* and *Pseudophonus*

Quick check: if you are not sure whether it's a *Harpalus* or an *Amara*, remember that *Harpalus* have a single pit with a long bristle above each eye (bristles often break off, but the small pits from which they arise are usually visible in good light), where all the British *Amara* have two. See table above for other distinctions between *Harpalus* and *Amara.* A couple of other genera which could be confused with *Harpalus* and its relatives are included here.

Several *Harpalus* species are very rare in Britain. Many other are scarce and very local. Note that some of these are confined mainly to Breckland, where they may be abundant at disturbed sites on sandy or chalky soils. Some of these might also turn up in gravel pits in Cambridgeshire. Many of the rare *Ophonus* occur on limestone, chalk or calcareous clay, to the Northants/Peterborough area is particularly promising.

1 Pronotum (at least in rear half), and all elytral intervals hairy (with hairs short, usually curved or lying flat against the surface), including the base of inner intervals. **2**

1a Upper surface not generally hairy, apart from a small number of long, erect bristles on elytra margin, above eyes, and on margin of pronotum. Sometimes hairy on outer 2-3 intervals, and along apex of inner intervals, but basal part of inner intervals smooth, usually glossy or metallic. **5**

2 Upper surface of tarsi without hairs. Antennae hairy (with large numbers of hairs, which are short, usually curved or lying flat against surface) from 4th segment onwards, contrasting with hairless segments 1 to 3 (which bear a small number of longer bristles near their apices). Head, pronotum and elytra usually metallic green, sometimes with yellow apex or margin to elytra. 8.5-13mm.
Chlaenius (4 spp.)

2a Tarsi hairy on upper surface. Antennae hairy from 2nd or 3rd segments onwards. Upper surface seldom metallic green, and never with a contrasting pale margin. **3**

3 Head and front half of pronotum smooth and glossy, contrasting with hind half of pronotum and all of elytra which are covered with dense, short, yellowish hairs. Pronotum densely pitted across base, but smooth and shiny in middle. Pronotum sides straight or slightly sinuate in hind half, and hind corners well-marked, usually sharp and just over a right-angle. Upper surface dull black, legs reddish or yellowish. 8-16mm. **4**

3a Head and pronotum pitted and hairy throughout. If sides of pronotum are sinuate and hind corners well defined, then beetle is less than 10mm long, or upper surface is metallic blue. Hairs on upper surface not usually conspicuously yellowish. Legs usually reddish or yellowish.
Ophonus (*c.* 14 spp.) **31**

4 Larger (10-16.7mm). Sides of pronotum slightly concave in hind fifth, so hind corners are quite sharp. Margins of pronotum dark red-brown, pronotum scarcely translucent. Legs usually reddish. Underside of last three abdominal segments finely pitted and covered with short hairs at sides but almost smooth in middle, or with a few scattered hairs near front and rear margins, but smooth and shiny in the middle of each segment. Very common in many habitats, including arable and gardens.
Pseudophonus rufipes

4a Smaller (8-12.1m). Sides of pronotum straight in hind fifth, and hind corners of pronotum rounded at tip, so whole beetle appears to have a more distinct waist. Margins of pronotum pale yellow-brown, hind corners of pronotum translucent (like *Calathus ambiguus*). Legs usually paler, whitish or yellowish, when alive (may darken after death). Underside of last three abdominal segments hairy in middle across full length of segment, but smooth and hairless at sides. Apparently a very rare migrant, not yet established in Britain. *Pseudophonus griseus*

5 First hind tarsal segment equal to, or shorter than, apical spur of tibia. *Harpalus s.s.* (*c.* 20 spp.) **6**

5a First segment of hind tarsi much longer than apical spur of tibia. *Anisodactylus* (3 spp.)

6 Outer 2-3 elytral intervals, and often apex of inner intervals, finely pitted and covered in fine, short, pale hairs. **7**

6a All intervals without pits and hairs apart from the usual row of larger pits and long bristles on extreme edge of elytra. **8**

7 Upper surface of tarsi not hairy, but with 3-4 pairs of fine long bristles. Elytra, pronotum and head usually metallic. Very variable, blue, green or coppery, full gloss in males, usually silky or dull in females. Border of pronotum translucent reddish. Apex of each elytron with a deep embayment in its edge near apex. Whole underside of abdomen covered with short, fine, dense yellowish hairs. 8.5-12mm. Extremely common in most fairly dry habitats. *Harpalus affinis (=aeneus)*

7a Upper surface of tarsi covered in short, fine hairs arising from small pits. Upper surface unmetallic black. 10.5-14mm. Extremely rare, probably migrant. *Harpalus calceatus*

8 Pronotum smooth and without pits, or with a few in the depression either side of the mid line, and a scatter just inside the hind angle. **9**

8a Base of pronotum densely pitted (p.44, fig. IV.13) **24**

9 Only a single fine hair arising from a pit almost too small to see, at apex of 7th stria. (view from the side and slightly behind, almost as if looking for crossed epipleures) **10**

9a Either 7th or 8th interval with a row of pits bearing short bristles near apex, sometimes extra pits near the apex of 5th interval also (p.44, fig. IV.16): note that there may be as few as 2 pits in this position, and it is often useful to check both elytra before concluding that the pits are absent. **20**

10 Abdomen with 2 long, fine hairs on each segment underneath. **11**
10a Abdomen with a scatter of shorter hairs on at least the last 2 segments, in addition to the pair of long bristles. **18**

11 Antennae entirely pale, usually reddish. **12**
11a Antennae darker, brown or blackish, toward apex **14**

12 5-6 stout spines in a separate row at apex of front tibia on outer edge (p. 45, fig. IV.20).. Base of pronotum straight. Sides of pronotum parallel in rear half, and hind angles broadly rounded at tip. 8.4-11mm. *Harpalus tardus*
12a 3-4 spines at apex of front tibia. Base of pronotum slightly concave. Sides of pronotum usually converging a little toward hind angles, which are sharper. 5.3-11.5mm. **13**

13 Very small, 5.3-6.2mm. No bristle-bearing pit at base of scutellar stria, nor on 3rd interval. Whole beetle dark brown to black, pronotum rounded at sides and hind angles. Very scarce, but abundant on sandy sites in Breckland. *Harpalus pumilus (=vernalis)*
13a Larger. A bristle-bearing pit at base of scutellar stria, and another, finer bristle-bearing pit on 3rd interval. **14**

14 Base of pronotum narrowed, sides usually slightly sinuate in front of hind angles, hind angles about right-angled and sharp. Depressions at base of pronotum well marked, deep, with a steep outer edge to each depression. Often with a scatter of fine pits in and around the depressions. 7-9mm. A narrow, glossy-black, parallel-sided species. Widespread but uncommon on sandy soils. *Harpalus attenuatus*
14a Pronotum almost parallel-sided in basal half. Sides straight or convex, not sinuate, hind angles rounded at extreme tip. Depressions in pronotum base shallow or absent, seldom heavily pitted. **15**

15 Antennae entirely pale, 2nd segment the same colour as the first. **16**
15a Antennae gradually darker toward tip, usually from 2nd segment, which is darker than 1st. **17**

16 Upper surface, especially elytra, mid-dark brown. Pronotum broad, sides diverging almost to base, which is as wide as shoulders of elytra. Base of pronotum strongly convex, with sharp, backwardly pointing hind angles. 7.5-8.5mm. A broad, rounded species similar in outline to an *Amara*. Scarce and usually rare, on sand dunes. *Harpalus servus*
16a Upper surface blackish when mature (paler when freshly emerged). Pronotum narrower, its base only slightly concave, and its hind angles less well-marked and rounded at tip. 6.6-8.2mm. A moderately elongate, parallel-sided species. Widespread and locally abundant in dry, sandy sites. *Harpalus anxius*
17 Large, broad, convex and bulky, 9.3-11.5mm. Base of pronotum straight, sides rounded to base. Front tibia with 4-6 spines in the separate row near apex on outer edge (p. 45, fig. IV.20). Scarce and coastal. *Harpalus serripes*
17a Smaller, narrower and flatter, 6.6-8.2mm. Base of pronotum distinctly concave, sides almost straight in basal half. Front tibia with 3 spines in the separate row near apex. Widespread and locally abundant in dry, sandy sites. *Harpalus anxius*

18 Antennae entirely pale, reddish. Hind femora with a dense, irregular row of 10-15 long bristles along underside and hind edge. Spines near apex of front tibia not in the separate row, merely a continuation of the row of spines down the underside of the tibia (p. 45, fig. IV.21). 8.5-10.4mm. A heavily-built, convex and rounded species. Very rare, almost confined to Breckland. *Harpalus froelichii*
18a Antennae dark, usually with first segment contrasting pale, the rest black-brown, at least on upper surface, sometimes with apical few segments pale with a dark stripe on upper surface. Fewer than

10 long bristles, usually only 3-5, on underside and hind edge of hind femora, usually evenly spaced in a straight line. Spines near apex of front tibia are in a separate row, on a separate ridge on the outer edge rather than the underside (p.45, fig. IV.20). **19**

19 A small, rather narrow species, 7-9mm. Pronotum with sides evenly rounded, widest at about middle and much narrower at base. Fine pits at base of pronotum continue along outer edge, as well as in the basal depression and at the hind corner. Fringe of fine pale hairs along hind edge of pronotum long, longer than width of the ridge along edge. Front tibia with 3 spines in the separate row near apex on outer edge (p. 45, fig. IV.20). Scarce, sand dunes on south and west coast. *Harpalus neglectus*

19a A large, convex, bulky species, 9.3-11.5mm. Sides of pronotum rounded to base, but little narrower at base than at widest. Fine pits at base of pronotum more or less confined to the depressions. Fringe of pale hairs on rear edge of pronotum short, not as long as the width of the ridge on rear edge. Front tibia with 4 spines in the separate row near apex on outer edge. Scarce and coastal. *Harpalus serripes*

20 Row of pits on 7th interval, and occasionally on 5th and 3rd also. **21**

20a Row of pits on 8th interval. Pronotum flattened toward hind angles. Antennae reddish, often darker on segments 2-5. Abdomen with several additional bristles on underside of last 2 segments, as well as the usual pair. 10-11mm. On sand dunes etc., mainly coastal and southern, extremely rare. *Harpalus melancholicus*

21 Antennae entirely pale. Legs entirely red, or with darkened femora. Whole base of pronotum finely pitted. 8.5-12.2mm. Colour extremely variable, metallic blue or green or dull black. Common, espeically on dry post-industrial land. *Harpalus rubripes*

21a Antennae darkened from about segment 2. Legs dark, with tarsi paler, sometimes tibiae also brownish. If whole baseof pronotum is densely pitted, beetle is more than 12mm long. **22**

22 Large, very broad and convex, 12-14mm. Whole base of pronotum finely pitted. Rows of bristle-bearing pits on both 7th and 5th intervals. Base of pronotum usually slightly concave, as a very shallow V. Hind margin of pronotum without a fringe of short, fine hairs. Glossy black, usually with a blue or purplish sheen on pronotum. Rare, south coast and inland calcareous grassland. *Harpalus dimidiatus*

22a Smaller, generally narrower. Pits on pronotum mainly confined to the depression either side of midline. Row of bristle-bearing pits only on 7th interval. Base of pronotum straight or slightly convex. Hind margin of pronotum fringed with short, fine, pale hairs, about as long as width of the ridge along hind margin. **23**

23 Black, with a faint blue sheen to male elytra. Pronotum less narrowed at base, and sides not or very faintly sinuate. Hind wings (under elytra) full length. 8-11mm. Frequent in dry sandy sites. *Harpalus rufipalpis (=rufitarsis)*

23a Strongly metallic green or blue, glossy in male, silky in female. Pronotum narrower at base and sinuate at sides. Hind wings (under elytra) very short. 8-11mm. Very rare, recent record only form Cumbrian coast. *Harpalus honestus*

24 **7**th elytral interval with a row of pits bearing short bristles near apex, sometimes extra pits near the apex of 5th interval also (p.44, fig. IV.16): note that there may be as few as 2 pits in this position, and it is often useful to check both elytra before concluding that the pits are absent. Note: this is easiest to see from behind and to one side. **25**

24a No row of pits on 7th or 5th interval, just a single bristle-bearing pit near apex of 7th stria. **26**

25 Smaller, 8.5-12.2mm. Antennae entirely pale. Legs entirely red, or with darkened femora. Hind margin of pronotum fringed with short, fine, pale hairs. Colour extremely variable, metallic blue or green or dull black. Common, especially on dry post-industrial land. *Harpalus rubripes*.

25a Larger, very broad and convex, 12-14mm. Antennae darkened from about segment 2. Legs dark, with tarsi paler, sometimes tibiae also brownish. Rows of bristle-bearing pits on both 7th and 5th intervals. Hind margin of pronotum without a fringe of short, fine hairs. Glossy black, usually with a

blue or purplish sheen on pronotum. Rare, south coast and inland calcareous grassland.
Harpalus dimidiatus

26 Last 2 abdominal segments with just 2 long bristles on underside, either side of midline. **27**

26a Last 2 abdominal segments with dense, short hairs over much of surface, in addition to the two long bristles (p.44, fig. IV.19). **29**

27 Antennae and legs entirely pale, reddish. **28**

27a At least femora blackish, and antennae often darkened from 2nd or 3rd segment. **30**

28 A single bristle-bearing pit on 3rd elytral interval. Sides of pronotum almost straight in rear half, and widest in front of middle. Margins of pronotum usually reddish and slightly translucent. Head unusually broad. Upper surface black without a metallic sheen. 8.2-11mm. Common throughout, not always in dry sites. *Harpalus latus*

28a 2 or 3 bristle-bearing pits on 3rd interval. Sides of pronotum evenly rounded and widest at about mid-point. Margins of pronotum black. Elytra sometimes with a bluish sheen in males. 9.5-12mm. Scarce, in Scotland and northern England, on gravel under scrub.
Harpalus laevipes (=quadripunctatus)

29 Elytra metallic green in male, unmetallic brown in female; head and pronotum unmetallic in both sexes. Antennae entirely pale, reddish. Hind angles of pronotum about right-angled and sharp. Fine hairs on underside of abdomen mainly in middle, thinner toward sides. Shoulder tooth of elytra strong and protruding (p.51, fig. V23). Scarce, but locally abundant in Breckland.
Harpalus smaragdinus

29a Whole upper surface strongly metallic in both sexes. Antennae darker brown from 2nd segment. Hind angles of pronotum rounded at tip. Fine hairs on underside of abdomen absent in middle, thicker toward sides. Extremely rare or extinct in Britain, formerly on Isle of Wight.
Harpalus cupreus

30 Smaller, 7-9mm. Tarsi completely hairless on upper sides. Sides of pronotum slightly sinuate, becoming straight or slightly concave in basal fifth. Hind angles pointed and protruding a little. Widespread but uncommon, in dry, sandy or gravelly places. *Harpalus attenuatus*

30a Larger, 8-11mm. Tarsi with a scatter of fine hairs on upper surface. Sides of pronotum smoothly rounded, convex throughout. Hind angles rounded at tip, not protruding at all. Scarce, mainly on south and west coasts. *Harpalus tenebrosus*

31 Pronotum rounded and convex at sides, at most straight in the basal half. Hind angles rounded, at least at tip. Upper surface almost always metallic blue or green, or dull black. Shoulder of elytra rounded, with no protruding tooth. **32**

31a Pronotum sinuate at sides, at least slightly concave in rear fifth. Hind-angles pointed or sharply right-angled. Upper surface rarely metallic; if elytra are metallic, then shoulder has a protruding tooth. **35**

32 Small, 6.2-9.2mm. Pronotum with a raised ridge along its hind edge, and with hind angles almost right-angled and clearly defined. Upper surface usually greenish, sometimes blue or violet metallic, occasionally dull black. Scarce, in southern half of England, usually on chalk, limestone or calcareous clay. *Ophonus azureus*

32a Larger, 9.5-17mm. Pronotum without a raised ridge along base, and with hind angles broadly rounded. **33**

33 Sides of pronotum rounded in front half, almost straight and converging in rear half. Hind angles rounded at tip but still clearly defined. 12-17mm. Elytra and sometimes head and pronotum with blue- or green-metallic sheen. Hairs on elytra brownish. Very scarce, south coast only.
Ophonus sabulicola

33a Sides of pronotum evenly rounded to the very blunt, ill-defined hind angles. 9.5-17mm. **34**

34 Smaller, 9.5-13mm. Elytra meeting on midline. Hairs on elytra brownish. Elytra metallic, usually blue, but head and pronotum often unmetallic. Widespread but uncommon in southern half of England. *Ophonus ardosiacus*

34a Larger, 13-17mm. Elytra not quite meeting on midline at apex, a gap remaining between them. Hairs on elytra blackish. Often with a strong bluish sheen on the head and pronotum as well as on elytra. Extremely rare, on chalk and in quarries on oolitic limestone (Northants, Rutland, Leics). *Ophonus obscurus*

35 Upper surface strongly metallic blue-green, at least on elytra. Elytra with a strong protruding tooth at shoulder. 8.5-11mm. Rare, on sand or calcareous clay, usually under scrub or hedges, central and south-east England (including Northants and Cambs). *Ophonus laticollis (=punctatulus =nitidulus)*

35a Whole beetle red-brown to blackish brown, without or with only a faint metallic sheen. Elytral shoulders completely rounded, or with a small, weakly protruding shoulder-tooth. 5.5-10mm. **36**

36 Base of pronotum without any raised line across base, even at sides (examine with light from behind beetle, and move light or tilt beetle). **37**

36a Base of pronotum with a rounded raised ridge along base, sometimes disappearing in middle. **41**

37 Pronotum with 2-4 long, delicate bristles along outer edge, in front half (beware: bristles can snap off; the small pit or bump from which it arises is usually still visible). Pronotum obviously wider than long. **38**

37a Pronotum with only 1 long bristle on outer edge in front half. Pronotum roughly equilateral. **40**

38 Shoulders angulate, protruding as a small tooth (p.51, fig.V23). Never metallic, and usually with visible microsculpture, so less glossy. Pronotum not very strongly narrowed, and usually more gradually so. No pimple on last abdominal segment of female underneath. **39**

38a Shoulder rounded, not or hardly protruding (p.51, fig. V.24). Elytra often with a faint bluish or greenish sheen. Upper surface glossy, as lacking in microsculpture. Pronotum quite strongly but abruptly narrowed at base. Female has a small raised pimple (longitudinal oval area, with roughened surface) near tip of the last abdominal segment underneath. 7-9mm. Scarce, usually on chalk or limestone or calcareous clays. *Ophonus rupicola*

39 Pits and hairs on elytal intervals rather sparse: 3rd and 4th intervals with 2-3 rows of hairs in basal third. Pronotum with pits in central area very sparse, much less dense than round edges. 6.2-9.5mm. Very common in many habitats, often in dense vegetation and damp or shaded places. *Ophonus rufibarbis*

39a Pits and hairs more dense, 3rd and 4th intervals mostly with 4 rows of hairs in basal half. Pronotum with pits almost as dense in middle as they are toward edges. Usually larger and more stoutly built. 7.6-10mm. Scarce, mainly on dry sandy or chalky soil, among short, sparse vegetation. *Ophonus schaubergerianus*

40 Pronotum flat inside hind corners, as if pressed down, the central area arching up away from it. Pronotum narrow, at its widest part narrower than width of elytra over shoulder. Larger, 6.5-8mm. Frequent on railway land, spoil heaps, urban waste ground etc. *Ophonus puncticeps*

40a Area in side hind angles of pronotum not flattened; surface of pronotum smoothly curving down from middle to hind corners. Pronotum wider, at its widest part the same width as the elytra shoulders. Smaller, 5.5-8.6mm. Scarce, usually on dry calcareous soil, limestone and chalk quarries etc. , also on calcareous clay in dry parts of brick-pits. *Ophonus melletii*

41 Area inside hind corners of pronotum flat as if pressed down, the central area arching up away from it. Pronotum narrow, at its widest part narrower than width of elytra over shoulder. 6.5-8mm. Frequent on railway land, spoil heaps, urban waste ground etc. *Ophonus puncticeps*

41a Area inside hind angles of pronotum not flattened; surface of pronotum smoothly curving down from middle to hind corners. Pronotum wider, at its widest part the same width as the elytra shoulders. 5.5-10mm. Scarce, usually on dry calcareous soil, limestone and chalk quarries etc. , also on calcareous clay in dry parts of brick-pits and coastal sand and gravel. **42**

42 Elytral striae distinctly pitted. Pronotum wide at front, then strongly rounded, and constricted at base, where sides are parallel for a short distance and form sharp right-angles at hind corners. Elytra shoulders rounded, without a protruding tooth. 7.5-10mm. Rare, on coastal dunes or calcareous grassland, south coast and Wiltshire. *Ophonus cordatus*

42a Elytral striae in the form of smooth grooves, not pitted. Shoulders angulate, protruding at sides. Pronotum less strongly constricted, but often narrowed for a greater proportion of its length. **43**

[Identification of the following should be confirmed by reference to male genitalia.]

43 Base of pronotum straight, basal ridge usually strong and conspicuous. Pronotum strikingly broad compared with elytra, strongly rounded at sides, the sinuation in basal fifth both long and deep. Pitting in middle of pronotum sparse, but individual pits rather large and deep. Upper surface almost pure black. Larger, 7-10mm. Apparently very rare, scattered in southern half of England, on chalk or gravel with sparse vegetation. *Ophonus puncticollis*

43a Base of pronotum angled forward slightly at sides, basal ridge often faint or interrupted in middle. Pronotum narrower, less strongly sinuate. Pitting in middle of pronotum denser. Upper surface usually some shade of brown. Usually smaller, 5.5-8.6mm **44**

44 Hind angles of pronotum abut right-angled, sharp. Basal ridge of pronotum weak, faint and often missing for much of middle. Sides of pronotum clearly sinuate, concave in basal fifth, and almost parallel where they approach hind angles. Pitting of elytra and pronotum usually sparser but deeper, with bigger pits. Usually larger, though ranges from 5.5-8.6mm. Uncommon, widely scattered in southern half of England on chalk, limestone and calcareous clays. *Ophonus melletii*

44a Hind angles obtuse, rounded at tip. Basal ridge better developed. Sides of pronotum hardly sinuate, almost straight in basal fifth, converging on hind angles. Pitting of pronotum and elytra usually denser but finer. Usually smaller, 5.7-7.3mm. Apparently very rare, usually on chalk soils. *Ophonus parallelus*

LAEMOSTENUS

Easily mistaken for *Pterostichus* species, though more elongate and long-legged (more *Agonum*-shaped, but much larger even than *A. assimile*). The bluish metallic sheen is a good field character, and the small teeth at the base of the tarsal claws are diagnostic, though difficult to see.

1 Hind tibiae with a patch of dense fur on the inner edge in the apical half. Pronotum much narrower at base than at front. Eyes very small and flat. 13-17.5mm. Local, usually on sandy soils and in rabbit or badger holes. *Laemostenus terricola*

1a Hind tibiae without patch of dense fur. Pronotum almost equilateral. Eyes larger. 13-16mm. Rare, usually associated with human habitation. *Laemostenus complanata*

LEBIA (5 species)

Uncommon or very rare species with truncate elytra which are very broad compared with the thorax, and often broader at the rear than the base. Head with a very constricted neck. Most British species have a metallic blue- or green-black head, with an orange pronotum and abdomen; the elytra are metallic blue-black or patterned with orange. Unusual in having larvae which are parasites on the outside of the larvae of chrysomelid beetles.

1 Elytra entirely blue-black metallic. **2**

1a Elytra blue-black but with pale orange or red markings. **3**

2 First two antenna segments pale orange or red. Legs entirely pale. Elytral intervals without bristles. 5.8-8.1mm. Uncommon but widespread. *Lebia chlorocephala*

2a Only the basal antenna segment pale. Legs with apex of each femur black. Tiny pits on elytra each with a small bristle. 5.7-7.8mm. Extremely rare. *Lebia cyanocephala*

3 **[3 choices]**

3a Head brownish. Elytra metallic blue-black except for a reddish band at the apex.4-4.5mm, apparently extinct in Britain. *Lebia marginata*

Head blue-black. Each elytron with a pale spot at the base (rarely also a small spot near apex). Antennae entirely pale. 4-5.5mm, apparently extinct in Britain. *Lebia scapularis*

Head blue-black. Each elytron with a large spot at the base, and a smaller one at the apex. Antennae dark brown or black from about 3rd segment to apex. is reddish. 6-7mm. Extremely rare. *Lebia crux-minor*

LEISTUS

The broad, strongly sinuate pronotum is distinctive. Distinguished from related genera, such as *Nebria,* by the wide flanges on the outer edges of the jaws, and by the long, thin palps (both pairs), which are used to make a cage which is lowered over the main prey, springtails, so that when the prey springs, it bounces into the jaws and is caught.

1 Upper surfaces metallic, blue or greenish, at least on the elytra. Margins of elytra as dark as the rest. **2**

1a Entirely unmetallic, yellow or red-brown, sometimes with paler margins. **4**

2 Pronotum hind-angles about right-angled, the rear sixth of pronotum roughly parallel-sided, then strongly curving outwards. Marginal ridge along sides of pronotum very narrow. Head and pronotum only faintly metallic, elytra dark brown with a blue sheen. 6.5-8mm. Very common. *Leistus fulvibarbis*

2a Pronotum hind angles obtuse, sides diverging almost from the angles. Elytra strongly metallic. A wider flattened margin along sides. **3**

3 Legs black or very dark red with reddish tarsi. Only a very narrow strip along the extreme edge of the pronotum sides is reddish. Head with fine wrinkles at the sides, between the eyes. 8-10.5mm. A broad, flat species. Very common in most habitats. *Leistus spinibarbis*

3a Legs red, slightly darker at the apex of the femora. Whole of the flattened pronotal margin is reddish. Head with many irregular pits at sides between eyes. A narrower and more elongate species. Rare, high mountains. *Leistus montanus*

4 Large (8-9.5mm). Whole beetle dark brown, with edges of pronotum and of elytra paler, translucent. A small tooth juts out at the shoulder of the elytra. Widespread but local, increasing. *Leistus rufomarginatus*

4a Smaller (6-8mm). Pronotum and elytra entirely yellowish or reddish-brown, sometimes with the apex of the elytra darker. **5**

5 Uniform yellowish or brown. Pronotum parallel-sided in read sixth, with roughly right-angled hind angles. 6.5-8mm. Common in most habitats. *Leistus ferrugineus*

5a Head and abdomen black, and tips of elytra darkened, contrasting with red-brown pronotum and elytra bases. Pronotum sides diverge immediately from the obtuse hind angles. *Leistus terminatus (=rufescens)*

LICINUS

Broad, flat, dull-black beetles characteristic of calcareous grasslands and feeding on snails. The combination of dull black coloration, densely pitted or even corrugated elytral intervals, and very blunt asymmetrical jaws is diagnostic.

1 Larger, 13-18mm. Most elytral intervals with just one row of coarse pits. The odd-numbered intervals usually more convex than the even ones. Rare, on southern English chalk. *Licinus punctatulus*

1a Smaller, 9.5-11.8mm. Most intervals with 2 or more rows of fine pits. All intervals equally convex. Uncommon, on chalk or calcareous sands, as far north as Yorkshire. *Licinus depressus*

LIONYCHUS

One British species, *L. quadrillum* is a tiny (3-4mm) black carabid with truncate elytra, keyed out with *Syntomus* (below), but with a large creamy-white spot on each elytral shoulder, and usually a smaller round spot near each elytra apex. Rare, on fine wet sand by rivers or the sea.

LORICERA

L. pilicornis, the only British species, is unmistakeable, as described in the key to genera.

MASOREUS

The one British species, *M. wetterhallii*, is quite distinctive - 4.7-5.6mm, a thickset species with truncate elytra, a broad, rounded pronotum, broader than it is long and a characteristic red-brown colour, palest at the elytra bases. Rare, on light sandy soils such as Breckland.

METABLETUS see SYNTOMUS

MICROLESTES

Microlestes (2 species), *Syntomus (=Metabletus* (4 species)) and *Lionychus* (1 species) are all small, black beetles with short truncate elytra. The differences between the genera are subtle, and Lindroth and Forsythe are not entirely reliable. All are keyed together under *Syntomus* (above).

MISCODERA

Clivina (2 species), *Broscus* (1 species) and *Miscodera* (1 species) are the larger specialist burrowing species, and they should be well separated in the key to genera. *Clivina* are dark brown (*fossor*) or two-tone, dark at the front and orange on the elytra (*collaris*); *Broscus* is large and silky black; *Miscodera* is medium-sized and glossy brown, and confined to glacial moraine in northern Britain.

NEBRIA

The five *Nebria* species are dark brown, with a broad, sinuate (heart-shaped) pronotum. They are rather flattened, and have the hind legs rather elongate. *Eurynebria* is highly distinctive: large (17-24mm), pale yellowish, with blackish zigzags across the elytra.

1 Pronotum yellow or reddish. 12-24mm **2**
1a Pronotum dark brown or black, same colour as the rest of the upper surface. 10-14mm. **3**

2 Head black, pronotum yellow, elytra black-brown with yellow outer and apical edges. 12-16mm. rare. Soft-rock cliffs on east coast. *Nebria livida*
2a Whole upper surface pale, yellowish, except for black zigzag lines across elytra. 17-24mm. Rare, sandy coasts on either side of Bristol Channel . *Eurynebria complanata*

3 Antennae and palps pale, translucent reddish. Shoulder angle of elytra sharp. 10-14mm. **4**
3a Antennae and palps black or very dark. Shoulders rounded. 8.5-12mm. **5**

4 Hind tarsi with a few pairs of long, fine, pale bristles on the upper surface (usually pressed closely to the surface); they leave visible pits if they break off. Raised rim of pronotum thick, about as thick as the base of the last tarsal segments. All palp segments pale, reddish. Very common, especially in woods and gardens. *Nebria brevicollis*
4a Hind tarsi smooth and hairless on upper surface (but with the usual long upstanding bristles on the sides and underneath). Raised rim of pronotum narrower. Basal segments of maxillary palps usually darkened. Common, especially in dry, open habitats. *Nebria salina*

5 Antennal segment 2 without any forward pointing bristles on its inner edge. Tibiae brown or reddish. Only 3rd elytral interval with bristle-bearing pits. Common in woods and beside streams in northern England, Scotland and Wales. *Nebria rufescens (=gyllenhali)*

5a Antenna segment 2 with 2 (rarely only 1) forward-pointing bristles on the inner edge. Tibiae black or nearly black. Often with pits on 5th interval also. Rare, high mountains. *Nebria nivalis*

NOTIOPHILUS

Entirely unmistakeable, these parallel-sided beetles with blunt front and rear have 6-10 almost parallel grooves running up the face, their elytra have the second interval much wider than the rest. Their eyes are among the largest and most bulging of all. This gives them excellent binocular vision, needed for stalking their springtail prey.

1 Second elytral interval more than 3 times as wide as third interval in middle, and as wide as or wider than intervals 3, 4 and 5 together. Elytra often with a pale translucent patch near apex. Or if all dark, then legs bright reddish. **2**

1a Second interval about twice as wide as third, and narrower than 3-5 together. Apex of elytra always dark. **5**

2 Elytra uniformly dark at apex. Legs bright red, usually darker on femora and at the apex of each tarsal segment. 5.5-6.6mm. Fairly frequent, especially in dry woodland. *Notiophilus rufipes*

2a Elytra with a pale yellowish, translucent spot (lift elytra on fresh specimen if not apparent). Legs black, with paler, brownish or yellowish, tibiae. 4.5-5.5mm **3**

3 Outer intervals, from third outwards, frosted and dull (surface appears granular in good light or under high magnification). Striae very finely pitted, and quite shallow, so all intervals are flat. Head with 8-10 fine ridged down front. 4.5-5.5mm. Common, in dry, open habitats, especially on sand. *Notiophilus substriatus*

3a Outer intervals as shiny as the others. Striae coarsely pitted and deep, intervals convex. Head with 6-10 ridges. **4**

4 Head with 6 coarse ridged down front. Elytra typically each with one deeply-dimpled bristle-bearing pit (but sometimes with 2!) on 4th interval, which is not or only slightly broader than 5th. Pronotum sides concave in hind third. 5-6mm. Very common in all habitats. *Notiophilus biguttatus*

4a Head with 7-10 fine ridges. Elytra usually with 2 dimpled bristle-bearing pits on 4th interval, which is broader than intervals 3 and 5. Pronotum sides almost straight in hind third. 5-5.5mm. Scarce, but widely scattered. *Notiophilus quadripunctatus*

5 Legs entirely black. Tibiae no paler than femora, and not at all translucent. **6**

5a Tibiae at least slightly paler than femora, and slightly translucent, at least in middle. **7**

6 Elytra with one deep pit near apex (the posterior of the two shown in Forsythe, p.35, fig. III.13): but beware, all species have a row of bristle-bearing pits along the outer edge of the elytra, on interval 8 or thereabouts, not shown in figure). Outer intervals 3-7 smooth. Male with palps hardly widening toward tips. 4.8-6mm. Common, in many habitats. *Notiophilus aquaticus*

6a Elytra with 2 pits near apex. Intervals 3-7 each with an irregular row of tiny flat dimples. Male with last segment of labial palp broadened and axe-shaped. 4-5.5mm. Scarce, mainly northern and upland. *Notiophilus aesthuans*

7 Furrows on head long and parallel (silt specimen to look down along the furrows). Head the same width as pronotum at widest point. Sides of head and neck with fine pits confined to the vertical sides, not spreading far n upper surface. 4.5-5.5mm. Mainly heath, moors and acid grassland. *Notiophilus germinyi*

7a Furrows on head shorter and diverging forward. Head clearly wider than pronotum. Pits on neck spreading further onto upper surface. 5-6mm. Common in many habitats, not necessarily wet places. *Notiophilus palustris*

ODACANTHA

A single totally unmistakeable species, *O. melanura*, with a narrow, barrel-shaped metallic green pronotum, narrower than the metallic green head, and orange-brown elytra with a black tip. Uncommon but expanding, found in reedbeds in south-eastern England.

OLISTHOPUS

A distinctive single species, *O. rotundatus*, looks rather like a white-legged *Agonum*, with an almost-circular pronotum and the upper surface with a khaki-metallic sheen. Found in dry, usually sandy places, common.

OMOPHRON

The single species, *O. limbatum*, is almost circular, very convex (even more extreme than a ladybird), yellowish, which green metallic blotches; see illustrated guides or look at a specimen. Completely unmistakable, but may be passed over as a water-beetle rather than a carabid. It lives on bare sand at the edge of water, beside gravel pits in Kent, Sussex and, more recently, Suffolk. It may well expand its range in resonse to hot summers. By nature nocturnal, it can by 'flushed' by splashing its habitat with water, where it runs rapidly over the dampened sand.

OODES

Not included in the keys, a rare wetland species, often found foraging under water. Legs not modified for swimming, and all but the basal 3 antennal segments hairy (unlike water beetles and diving beetles). No bristles on the pronotum nor the labial (inner pair of) palps, unlike almost all other carabids. It looks rather like a flat, broad, dull-black *Amara* species. 7.5-9mm.

OPHONUS

See under *Harpalus*

PANAGAEUS **(2 species)**

Distinctive species, black and furry, with 2 orange spots on each elytron, and a round pronotum. Head rather square, with small but very protruding eyes. The long bristles above each eye are not easy to see among the short and medium-length hairs, but they are longer and somewhat thicker. Probably snail-eaters. One is scarce and found in dry calcareous or sandy grasslands; the other in rich fen vegetation and extremely rare.

1 Larger, 7.5-9mm. Pronotum distinctly broader than long. Hind orange-red spots usually reaching side margin of elytra. In fens and dune-slacks (re-found at Wicken in 2008). *Panagaeus crux-major*

1a Smaller, 6.5-7.5mm. Pronotum almost equilateral. Hind spots on elytra smaller and surrounded by black. In dry grasslands. *Panagaeus bipustulatus*

PATROBUS

1 Pronotum broader than long. Elytra about four times as long as pronotum. Hind wings full-length (need to lift elytra to see - difficult on dried specimens). 7.4-10mm. Northern and mainly in high mountains. *Patrobus septentrionis*

1a Pronotum about as broad as long. Elytra about three times as long as pronotum. Hind wings very short, less than half the length of elytra. **2**

2 Front of head smooth. Third interval of elytra about as wide as second. Third antennal segment longer than first. 7.4-10mm. Widespread and fairly common. *Patrobus atrorufus*

2a Front of head transversely wrinkled. Third interval broader than second. First and third antennal segments equal. 6.8-9mm. Mainly northern and upland. *Patrobus assimilis*

PELOPHILA
A rare species found on lake shores in northern Ireland, rather similar to *Blethisa* (see that genus for details).

PERIGONA
A tiny (2-2.5mm) yellow-brown and hairy species with a black head, the only British species *P. nicriceps* is recorded rarely, usually around compost heaps. Not included in the keys.

PERILEPTUS
See *Trechus*

PLATYDERUS
A single red-brown species, *P. depressus*, looking like a small *Pterostichus* or *Agonum*, with a small forward bulge on the middle of the front edge of its pronotum (which stridulates against the back of the head).

POGONUS
Salt-marsh specialists, looking like large *Bembidion* or brassy *Pterostichus.*

1 Elytra yellowish, unmetallic. Legs pale red-brown. Head and pronotum bright metallic green. 6-8.5mm. Rare, a few sites on east coast. *Pogonus luridipennis*

1a Whole upper surface uniform metallic, brassy. Legs darker. **2**

2 Larger, 7-8mm. Front of pronotum smooth, rear wrinkled. Elytral striae visible to apex. Rather local. *Pogonus littoralis*

2a Smaller, 5.5-6.6mm. Front of pronotum pitted, base smooth or pitted. Elytral striae disappearing at sides and apex. Common in most saltmarshes. *Pogonus chalceus*

POLISTICHUS
See *Cymindis*

PSEUDOPHONUS
See *Harpalus*

PTEROSTICHUS
See key in Appendix 2, which also includes related genera which might be confused.

SCYBALICUS
See key to *Harpalus* and other ruderal carabids; the one British species, *S. oblongiusculus*, is extremely rare or perhaps extinct, and looks like a large hairy harpaline like *Ophonus*.

SPHODRUS
A single large species, 20-26mm, *S. leucophthalmus* looks like a very large *Pterostichus.* Synanthropic, and extinct or nearly so.

STENOLOPHUS
This key is also presented in Appendix 2, in a key to small brown harpalines - if you are not sure if your specimen is *Stenolophus* or one of its relatives, try there instead.

1 Pronotum dark with a narrow pale margin, not strongly contrasting. Base of pronotum with many small pits. Only first antenna segment pale. 5.1-5.6mm. Common. *Stenolophus mixtus*

1a Pronotum bright orange or red-brown, contrasting with blackish head. Base of pronotum almost unpitted. Two basal segments of antennae pale. **2**

2 Ridge down side edges of pronotum continues round hind angle and along base. Elytra entirely pale, or vaguely darker toward tips. 5-6mm. Scarce, wetlands. *Stenolophus skrimshiranus*

2a Ridge down side edges of pronotum stops at hind angle. Elytra usually reddish or orange with a single large oval black spot in apical half, overlapping midline. 5.5-6.2mm. Scarce, wetlands. *Stenolophus teutonus*

STOMIS

One species, *S. pumicatus*¸ looking like a small red-brown *Pterostichus,* but with very elongate jaws and first antennal segment. Included in the *Pterostichus* key in Appendix 2.

SYNTOMUS (=METABLETUS)

Microlestes (2 species), *Syntomus* (=*Metabletus*, (4 species)) and *Lionychus* (1 species) are all small, black beetles with short truncate elytra. The differences between the genera are subtle, and Lindroth and Forsythe are not entirely reliable. The commonest species are the tiny, glossy-black *Microlestes maurus* and the larger, bronze-finished *Syntomus foveatus*. All the *Syntomus* and *Microlestes* species could be found locally, though none is very common. *Lionychus* is black with 4 small pale spots on the elytra. It is found on sand or shingle beside fast-flowing streams.

1 All black, or with a faint paler brown spot on each elytron near shoulder. Pronotum marginal ridge follows the wavy outer edge of hind angles. Claws faintly toothed. **2**

1a Black, but each elytron with a large circular opaque cream spot in front half, and usually with a smaller cream spot near apex. Pronotum with a raised ridge at margin which cuts across inside hind angles in a smooth curve. Claws smooth. 3-4mm. Scarce, on sand or shingle beside rivers or the sea shore. *Lionychus quadrillum*

2 Elytra end straight across. Apex of elytra thin and flimsy, ridge or groove along margin weak or absent. 2.5-3.7mm. *Microlestes* **3**

2a Elytra end rather obliquely, the apical margin sloping forward at the sides. Apex more rigid and 'better finished', with a strong marginal ridge outside a groove along the epipleure. 2.6-3.8mm *Synhtomus (=Metabletus).* **4**

3 Larger, 2.7-3.7mm. Hind angles of pronotum well marked, middle of hind margin of pronotum less protruding. Pronotum relatively broad, elytra slightly longer and more parallel-sided. Penis 2-3 times as long as wide, tapering to a simple pointed apex. Rather local, south-eastern, but spreading. *Microlestes minutulus*

3a Smaller, 2.5-2.8mm. Hind angles of pronotum rather less prominent, and middle of hind margin more protruding backwards. Head and pronotum relatively narrower, and elytra widening more toward rear. Penis short and broad (1.5 times as long as wide), with a blunt, slightly forked apex which has a backward-directed point underneath. Fairly common and widespread. *Microlestes maurus*

4 3rd elytral stria with 2 deep pits set in conspicuous dimples. Upper surface bronzed or brassy. Legs black or nearly so. 3.1-3.8mm. *Syntomus foveatus*

4a 3rd stria with tiny, inconspicuous pits. Unmetallic black or brown. Legs brown or black. **5**

5 Brown, each elytron with an ill-defined pale spot at the base, and often another, even more vague, spot near apex. Legs pale, yellow-brown with darker femora. Elytra almost parallel-sided. 3-3.5mm. Often on damp clay soils, on southern third of England. *Syntomus obscuroguttatus*

5a Black. Legs dark brown. Elytra usually widening toward rear. 2.6-3.2mm. Frequent, usually in fairly dry, sandy places. *Syntomus truncatellus*

SYNUCHUS

The single species, *S. vivalis (=nivalis)* looks like a medium brown *Calathus* or, superficially, like an *Agonum* but with serrated tarsal claws. Keys with *Calathus* in the key in Appendix 2.

TACHYS

See *Bembidion*

THALASSOPHILUS

See *Trechus*

TRECHUS

Perileptus (1 species), *Aepus* (2 species) *Thalassophilus* (1 species) and *Trechus* (9 species) form a group of rather similar small brownish carabids, diagnosed by the frontal furrows (grooves on the head which start near the base of the jaws and run between the eyes), which are deep and fine, and extend beyond the eyes are diverging semicircles what loop down onto the 'neck'. *Trechus* includes two almost ubiquitous species, *obtusus* and *quadristriatus*, which are abundant on farmland; these two are far more often found than any of the other species. Many species in the group are rather subterranean and have very small eyes: *micros* and *discus* live in small mammal runs and burrows, *Thalassophilus* lives deep in river shingle. The two *Aepus* species live in cracks in rocks on the sea-shore, and spend some of each day under water.

1 Elytra hairy, at least one row of fine short hairs on each interval. **2**
1a Elytra not covered in sort hairs, occasionally with a few long bristles. **4**

2 Less than 3mm. Last segment of maxillary palp slender (about 0.3-0.5 width of penultimate segment), parallel-sided and blunt. 4th segment of front tarsi with a long, sharp spine. 2.4-2.5mm. Rare, scattered records in north and west; lives within sand and shingle beside fast-flowing rivers. *Perileptus areolatus*
2a More than 4mm. Last segment of maxillary palp about as thick as penultimate segment at base, tapering to a sharp point. **3**

3 Pronotum covered with fine, flattened hairs. Eyes tiny, their diameter about equal to the distance from front of eye to base of antenna. Uniform pale brown, or with a vague elongate dark spot on each elytron. 4-4.5mm. *Trechoblemus (=Trechus) micros*
3a Pronotum without hairs on its surface. Eyes larger, their diameter about twice the distance from front of eye to antenna base. Red-brown, with a dark brown transverse band across elytra at middle. 4.4-5.5mm *Blemus (=Trechus) discus*

4 Living below high-tide mark on sea shore, living under boulders or in cracks in rocks. 2.2-2.5mm. Eyes tiny, about same diameter as first antennal segment. **5**
4a Rarely on sea shore. 3.5-6.5mm. Eyes larger, much wider than the thickness of the antennae. **6**

5 Elytra almost straight across at apex, not indented at suture. A scatter of long hairs on elytra. 2.2-2.4mm *Aepus marinus*
5a Elytra each tapering to a rounded tip, so they are separated by a V-shaped gap between them at the apex on the midline. Each elytron with two long bristles. 2.5mm. *Aepus robinii*

6 Elytra with basal groove continuing to scutellum. Antennae very long. Whole beetle flat and parallel-sided. 3.5-4mm. Scarce, living in river shingle. *Thalassophilus longicornis*
6a Elytra with basal groove at sides of base only, around shoulder but finishing well short of scutellum. **7**

7 Base of pronotum angled forwards at each side. Hind angles of pronotum hardly protrude from general forward curve. 3.5-4mm. Local. *Trechus secalis*
7a Base of pronotum straight or almost so. Hind angles well defined. **8**

8 3.5-4.8mm. Outer 3 striae on elytra very shallow and intermittent, or hardly visible. **9**

8a 4.5-6.5mm. At least 6 striae clearly visible on each elytron. **11**

9 4.4-4.8mm. Base of pronotum completely straight. Hind angles protrude sideways as a small, sharp tooth. Striae 1 and 2 remain parallel even toward apex of elytra. Rare, in bogs and fens. *Trechus rivularis*

9a 3.5-4.1mm. Base of pronotum slightly forward-angled at each side. Hind angles of pronotum blunt. Striae 1 and 2 get wider apart toward apex of elytra. Very common in many habitats, including farmland. **10**

10 With long hind-wings, which are folded back at their apex so as to fit beneath the elytra (wings usually visible through slightly-translucent elytra, at least under bright light).The front one of the pair of bristle-bearing pits above each eye is very close to the eye. 3.5-4mm. *Trechus quadristriatus*

10a Hind-wings short (if specimen is fresh, lift elytron to be sure). Front bristle-bearing pit above eye slightly further from edge of eye. 3.6-4.1mm. *Trechus obtusus*

11 Each elytron with a pale spot near apex. Pronotum narrowest at base, sides diverging forward of the hind angles, which are visible as a small tooth. 4.5-5mm. Rare. *Trechus subnotatus*

11a Elytra without pale spots. Pronotum sides sinuate, with right-angled basal angles and slightly concave in front of hind-angles. 4.8-6.5mm. **12**

12 Eyes small and flat, diameter no more than distance from front of eye to base of antenna. Whole beetle yellowish-brown. 4.8-5.7mm. Uncommon, living beside fresh water near the high water mark of sandy and rocky sea-shores. *Trechus fulvus*

12a Eyes larger and protruding, much wider than distance from eye to base of antenna. Usually reddish brown, with head darker and elytra paler. 5-6.5mm. Local, northern species usually living beside streams in coniferous woodlands. *Trechus rubens*

TRICHOCELLUS

Fairly small brown harpalines, like reduced copies of *Dicheirotrichus*, and with the same hairy eyes. This key is also presented in Appendix 2, in a key to small brown harpalines - if you are not sure if your specimen is *Trichocellus* or one of its relatives, try there instead. One species in fens and marshes, the others on upland heaths and moors.

1 Small, 3.5-4.2mm. Dark, only basal antennal segment pale, whole upper surface sometimes dark brown or blackish, or reddish on elytra. Moorlands and peat, northern and upland. *Trichocellus cognatus*

1a Larger, 4-5.5mm. Usually with 2-3 basal antennal segments pale, and upper surface pale to mid brown with a dark central spot across elytra. Fens and marshes, common. *Trichocellus placidus*

ZABRUS

The single species, *Z. tenebrioides*, is like a large, extremely stout and convex black *Harpalus.* See *Harpalus* and *Amara* key for distinctions.

Part 3: Appendices

APPENDIX 1:
English names for the ground-beetles (Coleoptera, Carabidae) of Britain and Ireland

Mark G Telfer

Many naturalists feel strongly about English names, so this article will start with an attempt to justify the introduction of English names for the carabid fauna of Britain and Ireland.

What use are English names?

English names can help beginners to get into a group. It is a widely held belief that no group can become truly popular without English names. I think it is important for all coleopterists to encourage a new generation to take up the study of beetles, and to use their knowledge to help conserve beetles and their habitats.

Species with English names command greater respect and interest from reserve managers, policy-makers, curious passers-by and the general public.

A good English name will be a useful additional name, even to an experienced coleopterist who is already familiar with the scientific name. For example, *Pterostichus nigrita* and *P. rhaeticus* are best distinguished by characters of the eighth abdominal sternites of females. Their proposed English names, 'Mitten Black-clock' and 'Pincer Black-clock' respectively, reflect the different shapes of the sternites in the two species.

What harm are English names?

Nobody should gain the impression that at present they can use English names for carabids without needing to use scientific names. This may be the case for birds and butterflies, dragonflies, flowers or crickets, but it would be foolish to attempt to usurp the international system of zoological nomenclature. The English names are an optional second name.

English names have been accused of being part of a general 'dumbing-down' in society. It is true that many latinised names are in widespread use, e.g. Chrysanthemum, Rhododendron, Narcissus, Hyacinth, Dahlia, Hippopotamus, Tyrannosaurus. It is equally true that many fields of work require people to learn new jargon. Be that as it may, there is a certain stigma attached to scientific names by many people: in Britain, few groups of organisms with as many as 360 species but no English names, have as many devotees as species. So, inventing English names is the only response.

Badly thought out English names can be unhelpful and misleading. As an example of this, the recently-proposed name for the members of the family Histeridae, 'carrion beetles', ignores the fact that histerids have a far greater ecological range than just carrion (occurring in ant-nests, wood, dung and bird and mammal nests). On the other hand, many of the scientific names are no less misleading: *Cicindela sylvatica* (sylvatica = of woods) does not occur in woodlands (at least not in Britain), but on heathlands.

What makes a good English name?

I have based these carabid names as far as possible on real vernacular usage, although this is very limited for carabids. The vernacular names that do exist have not been precisely applied, thus to many people 'Violet Ground-beetle' encompasses both *Carabus violaceus* and *C. problematicus*. The name 'blackclock' has been used both as a name for *Pterostichus melanarius*, for *P. madidus*, and for 'big, black carabids' generally (and in some districts, also for the cockroach *Blatta orientalis*). I have used it for part of the genus *Pterostichus* (all except the subgenus *Poecilus*, which I have called 'greenclocks'). 'Sunshiners' I have used for some *Amara*, though in its vernacular usage it is likely to have been applied to other shiny and metallic carabids which scuttle across paths in the sunshine (e.g., *Harpalus affinis*, *Pterostichus versicolor*). I have translated the German vernacular names from *Laufkäfer*, which helped to decide on English names for a few species.

These English names largely mirror the binomial system in being composed of a specific and a generic part. The 'generic' part has not been applied too rigidly, such that *Amara* is split into 3, whereas other similar genera may share the same English name.

Each name aims to capture something distinctive about the species and its morphology, colour, ecology, phenology, behaviour, biogeography, status or localities. Every species, even the most lowly, does have at least a few distinctive attributes which could be considered for a name. However, it has often proved difficult to express one or more of those attributes in a name which is still brief, elegant and memorable.

Stability of names

Although the scientific names of most carabids are now stable, there are still occasional changes that become necessary, and it is always a source of confusion. Whatever the changes of scientific nomenclature, the English names will remain the same (unless someone else invents some different ones!). See Appendix 3 for details of recent changes.

Acknowledgements

Numerous people have cast their eyes over the list and offered suggestions. I am particularly grateful to Brian Eversham for his contribution.

Mark Telfer, 26 April 2001

Notes on the Checklist

The following list species by genus and species. It also shows the total number of 10km squares from which each species is recorded in Britain (from a mazimum of 2860); the conservation status, and the minimum and maximum length of each species, as well as the proposed English name where one exists. The conservation status is coded as follows:

EXTINCT	=	Believed Extinct in Britain; generally, no records for 30 years or more
RDB1	=	Red Data Book category 1, nationally endangered
RDB2	=	Red Data Book category 2, nationally vulnerable
RDB3	=	Red Data Book category 3, nationally rare
RDB Indeterminate	=	In a RDB category, but not yet clear which one (mainly, recent additions to the British list)
Na	=	Nationally Scarce category A (recorded, or expected to occur in, fewer than 30 10km squares in Britain)

Nb	=	Nationally Scarce species, category B (recorded, or expected to occur in, 31-100 10km squares in Britain)
N	=	Nationally Scarce but not subdivided into A or B
List 1	=	Migrant or introduction, which is locally established in Britain
List 2	=	Migrant or introduction, which is not yet established in Britain
List 3	=	Entirely synanthropic species, possibly extinct
List 4	=	Present in Ireland but not yet recorded from Britain

Genus	*Species*	*TOTSQU*	*STATUS*	*MINL*	*MAXL*	*English name*
Abax	parallelepipedus	845		18	22	Common Shoulder-blade
Abax	parallelus		List 2	14	18	Scilly Shoulder-blade
Acupalpus	brunnipes	11	Na	3	3.5	
Acupalpus	consputus	97	Nb	3.8	5	
Acupalpus	dorsalis(parvulus)	95		3	4	
Acupalpus	dubius	259		2.5	2.7	
Acupalpus	elegans	6	EXTINCT	3.5	4.5	
Acupalpus	exiguous	67	Nb	2.2	2.8	
Acupalpus	flavicollis	28	Na	2.6	3.5	Yellow-necked
Acupalpus	meridianus	173		3.2	3.8	
Aepus	marinus	60	Nb	2.2	2.4	Truncate/Spring Lusitanian
Aepus	robinii	43	Nb	2.5	2.5	Lobate/Autumn Lusitanian
Agonoderus	comma		List 2			
Agonum	emarginatum (moestum)	327		7.9	9.4	
Agonum	albipes	1140		6.8	9	White-legged Marsh-beetle
Agonum	assimile	612		8.7	12.6	
Agonum	dorsale	720		6	8.2	
Agonum	ericeti	68	Nb	6.5	8	
Agonum	fuliginosum	778		5.5	7.8	
Agonum	gracile	358		6	7.3	
Agonum	gracilipes	7	Na	7	8.5	
Agonum	livens	44	Nb	7.8	10.5	
Agonum	lugens	3	List 4	7.5	10	mourning
Agonum	marginatum	471		8.8	10.4	Yellow-sided Agonum
Agonum	micans	131		6.2	7.4	Skittish
Agonum	muelleri	762		7.2	9.5	
Agonum	nigrum	62	Nb	7	9	negro-black
Agonum	obscurum	332		5	6.6	dark, dusky, shady, obscure
Agonum	piceum	155		5.5	7.3	pitchy
Agonum	quadripunctatum	11	RDB1	4.5	5.8	
Agonum	sahlbergi	0	EXTINCT	7.5	8.3	
Agonum	scitulum	27	Na	5.5	7	pretty, neat, trim, elegant
Agonum	sexpunctatum	32	Na	7.6	10	
Agonum	thoreyi	359		6	8	
Agonum	versutum	33	Nb	7	8.6	
Agonum	viduum	206		7.7	9.6	
Amara	aenea	736		6.2	8.8	Common Sunshiner
Amara	alpina	5	RDB3	8	11	Alpine Stem-climber
Amara	anthobia	56		5	6.8	Garden Sunshiner
Amara	apricaria	354		6.5	9	Lesser Brown Sunshiner
Amara	aulica	511		11	14.3	Common Stem-climber
Amara	bifrons	270		5.3	7.4	Pale Moonshiner
Amara	communis	343		6	8	Interrupted Sunshiner
Amara	consularis	74	Nb	8	9.4	Great Brown Sunshiner
Amara	convexior	120		7	8.2	Continuous Sunshiner
Amara	convexiuscula	160		10.8	12.2	Saltmarsh Stem-climber
Amara	cursitans	1		7	8.8	Allen's Moonshiner
Amara	curta	25	Nb	5.8	7.4	Limestone Sunshiner
Amara	equestris	44	Nb	8.2	10.5	Bristly-chested Sunshiner
Amara	eurynota	132		9.5	12.6	Rumple-backed Sunshiner
Amara	famelica	13	RDB3	6.6	9	Early Sunshiner
Amara	familiaris	692		5.6	7.2	Red-legged Sunshiner
Amara	fulva	116	Nb	8	10.4	Green-tinged Moonshiner
Amara	fusca	3	RDB1	8	8.8	Wormwood Moonshiner
Amara	infima	12	Na	4.9	5.7	Heather Moonshiner
Amara	lucida	88	Nb	4.6	6.4	Dune Sunshiner
Amara	lunicollis	356		7.3	9	Mesophile Sunshiner
Amara	montivaga	46		7.8	9.2	Invading Dimpled Sunshiner
Amara	nitida	19	Na	7.2	8.5	Confounding Dimpled Sunshiner
Amara	ovata	329		8	9.5	Broad Dimpled Sunshiner
Amara	plebeja	728		6.3	7.8	Lesser Trident-spurred Sunshiner
Amara	praetermissa	58	Nb	6.2	8.2	Brownfield Moonshiner
Amara	quenseli	8	Na	6.4	8.8	Boreal Moonshiner

Amara	similata	357		7.8	10	Narrow Dimpled Sunshiner
Amara	spreta	12	Nb	7.8	9.5	Kentish Sunshiner
Amara	strenua	10	RDB3	8	9.5	Great Trident-spurred Sunshiner
Amara	tibialis	261		4.6	5.7	Least Sunshiner
Anisodactylus	binotatus	143		10	12.8	Common Shortspur
Anisodactylus	nemorivagus	10	Na	8	10	Heath Shortspur
Anisodactylus	poeciloides	17	RDB3	10	13.5	Saltmarsh Shortspur
Asaphidion	curtum	71		3.9	4.7	Shorter Lesser Hairy Pin-palp
Asaphidion	flavipes	4		3.9	4.7	Yellow-legged Lesser Hairy Pin-palp
Asaphidion	pallipes	43	Nb	5	6	Great Hairy Pin-palp
Asaphidion	stierlini	26		3.9	4.7	? Lesser Hairy Pin-palp
Badister	bipustulatus	624		4.8	6.5	
Badister	collaris	9	RDB1	4	5	
Badister	dilatatus	49	Nb	5	5.9	
Badister	meridionalis	7	RDB Indeterminate		6.2	7.2
Badister	peltatus	19	Na	4.3	5.4	
Badister	sodalis	153		3.9	4.8	
Badister	unipustulatus	54	Nb	7	9.1	
Bembidion	aeneum	394		3.4	4.5	
Bembidion	bualei	101		4.5	5.5	Pale-legged Four-spotted Pin-palp
Bembidion	argenteolum	2	RDBK	5.9	7.5	Vagrant Mirror-backed/Silver-spotted Pin-palp
Bembidion	articulatum	223		2.9	3.9	
Bembidion	assimile	228		2.8	3.5	
Bembidion	atrocoeruleum	228		4.5	5.5	
Bembidion	biguttatum	438		3.8	4.3	
Bembidion	bipunctatum	108	Nb	3.6	4.7	
Bembidion	bruxellense	272		4	5.2	Reticulated Pin-palp
Bembidion	callosum		List 2	3.5	4	
Bembidion	clarki	111	Nb	3.2	3.7	
Bembidion	coeruleum					Dungeness Pin-palp
Bembidion	decorum	193		5.2	6	
Bembidion	dentellum	335		5.1	6	
Bembidion	doris	148		3.1	3.6	glowering?
Bembidion	ephippium	24	Na	2.5	3	
Bembidion	femoratum	242		4.2	5.2	Dark-legged Four-spotted Pin-palp
Bembidion	fluviatile	31	Nb	5.5	6.5	
Bembidion	fumigatum	77	Nb	3.5	4	Clouded Pin-palp
Bembidion	illigeri	297		4	4.9	
Bembidion	geniculatum	92		4.5	5.5	
Bembidion	gilvipes	146	Nb	2.5	3	
Bembidion	guttula	772		2.8	3.5	
Bembidion	harpaloides	535		4.2	6	Hook-backed Pin-palp
Bembidion	humerale	3	RDB1	2.5	3	Thorne Pin-palp
Bembidion	iricolor	90		4.1	5.5	
Bembidion	lampros	943		3	4.4	Commom Gleaming Pin-palp
Bembidion	laterale	101	Nb	3	4	
Bembidion	litorale	62	Nb	5.6	6.2	Mirror-backed/Silver-spotted Pin-palp
Bembidion	lunatum	66	Nb	5.5	6.2	
Bembidion	lunulatum	509		3.6	4.1	
Bembidion	maritimum	84		5	5.5	
Bembidion	minimum	158		2.3	3.2	
Bembidion	monticola	93	Nb	4.5	5	
Bembidion	nigricorne	56	Nb	3.4	3.8	Double-browed Gleaming Pin-palp
Bembidion	nigropiceum	23	Na	3.5	4	Blackish-pitchy
Bembidion	deletum	370		4.5	5.3	
Bembidion	normannum	90		2.5	3.2	
Bembidion	obliquum	62	Nb	3	4.4	
Bembidion	obtusum	393		2.8	3.5	
Bembidion	octomaculatum	4	EXTINCT	2.5	2.8	Powdermill Pin-palp
Bembidion	pallidipenne	90	Nb	4.1	4.7	
Bembidion	prasinum	97		4.2	5.5	
Bembidion	properans	269		3.5	4.2	Rarer Gleaming Pin-palp
Bembidion	punctulatum	160		4.5	5.6	
Bembidion	quadrimaculatum	500		2.8	3.5	Common Four-dotted Pin-palp
Bembidion	quadripustulatum	46	Nb	3.5	4	Rarer Four-dotted Pin-palp
Bembidion	quinquestriatum	82		3.5	4.3	Winter (Hook-backed) Pin-palp
Bembidion	saxatile	97	Nb	4.2	5.1	
Bembidion	schuppelii	25	Na	2.8	3.2	
Bembidion	semipunctatum	11	Na	3.2	4	
Bembidion	stephensii	97		5.2	6.1	
Bembidion	stomoides	52	Nb	5.5	6	
Bembidion	testaceum	10	Nb	4.5	5.5	
Bembidion	tetracolum	917		4.9	6.1	Common Four-spotted Pin-palp
Bembidion	tibiale	366		5.5	6.5	
Bembidion	unicolor	370		2.8	3.4	
Bembidion	varium	208		4.1	5.1	
Bembidion	virens	7	RDB3	4.5	5.4	Loch Maree Pin-palp
Blethisa	multipunctata	103	Nb	10	13.5	The Many-dimpled

Brachinus	crepitans	87	Nb	6.1	9.8	The Bombardier Beetle
Brachinus	sclopeta		RDB1	4.5	7.5	Striped Bombardier Beetle
Bradycellus	caucasicus (collaris)	103		3	3.9	Northern/Moorland Brownling
Bradycellus	csikii	2	RDB Indet	3.5	4.3	Steppe Brownling
Bradycellus	distinctus	21	Na	4	4.5	
Bradycellus	harpalinus	553		3.8	4.2	Common Brownling
Bradycellus	ruficollis	302		2.5	3.4	Heather Brownling
Bradycellus	sharpi	198		4	4.5	
Bradycellus	verbasci	403		4.5	5.2	Ruderal Brownling
Broscus	cephalotes	274		16	23	Strandline Burrower
Calathus	ambiguus	71	Nb	8.4	11.6	Rarer Heathland Raker
Calathus	cinctus	45		6	8.8	Rarer Bi-coloured Raker
Calathus	erratus	221		8.5	11.8	Commoner Heathland Raker
Calathus	fuscipes	815		10	14.4	Common Raker
Calathus	luctuosus - not British					
Calathus	melanocephalus	12		6	8.8	Common Bi-coloured Raker
Calathus	micropterus	175		6.5	8.8	Northern Raker
Calathus	mollis	258		6.6	9.2	Dune Raker
Calathus	rotundicollis	474		8.5	10.5	Round-angled/ Pitchy/Forest Raker
Callistus	lunatus	7	RDB1	6	7	The Leather-mark
Calosoma	inquisitor	69	Na	16	22	The Inquisitor
Calosoma	sycophanta		6	List 2	24	30 The Sycophant
Carabus	arvensis	196		16	20	Moorland Ground-beetle
Carabus	auratus		List 1	20	27	Golden Ground-beetle
Carabus	cancellatus		List 2	20	27	Immigrant Beaded Ground-beetle
Carabus	clatratus	80	Na	22	28	Golden-dimpled Ground-beetle
Carabus	convexus					Winstanley Ground-beetle
Carabus	glabratus	183		22	30	Smooth Ground-beetle
Carabus	granulatus	482		16	23	Sausage Ground-beetle
Carabus	intricatus	10	RDB1	25	38	Blue Ground-beetle
Carabus	monilis	194	Nb	22	26	Necklace Ground-beetle
Carabus	nemoralis	490		22	26	Green Ground-beetle
Carabus	nitens	114	Nb	13	18	Furrow-backed Ground-beetle
Carabus	problematicus	741		18	30	Grainy Violet Ground-beetle
Carabus	violaceus	720		20	30	Violet Ground-beetle
Chlaenius	nigricornis	158	Nb	10	12.5	Green Night-runner
Chlaenius	nitidulus	1	RDB1	10	12	Lost Night-runner
Chlaenius	tristis	2	RDB1	11	13	Black Night-runner
Chlaenius	vestitus	171		8.5	11	Yellow-bordered Night-runner
Cicindela	campestris	588		12	16	Green Tiger-beetle
Cylindera	germanica	14	RDB3	8	11	Cliff Tiger-beetle
Cicindela	hybrida	14	RDB2	12	16	Northern Dune Tiger-beetle
Cicindela	maritima	27	Nb	12	15	Dune Tiger-beetle
Cicindela	sylvatica	31	Na	15	19	Heath Tiger-beetle
Clivina	collaris	164		5	5.5	Two-tone Tunneller
Clivina	fossor	769		5.5	6.5	Common Tunneller
Cychrus	caraboides	720		14	19	Snail-hunter
Cymindis	axillaris	25	Na	8	11	Jack-of-the-Sands
Cymindis	macularis	2	RDB1	7.7	10.1	Jack-of-the-Brecks
Cymindis	vaporariorum	47	Nb	8	9.6	Jack-of-the-Mists
Demetrias	atricapillus	564		4.5	5.6	Hairy-templed
Demetrias	imperialis	76	Nb	4.9	5.6	Reed
Demetrias	monostigma	47	Nb	4.2	5.1	Marram
Diachromus	germanus	4	EXTINCT	7.5	10	Spectacular Seed-eater
Dicheirotrichus	gustavi	188		5.2	7.5	Lesser Saltling
Dicheirotrichus	obsoletus	62	Nb	5.5	9	Great Saltling
Dromius	agilis	174		6	6.8	Lively Stem-runner
Dromius	angustus	52		6	6.8	Stem-runner
Dromius	linearis	695		4.4	6	Common Stem-runner
Dromius	longiceps	18	Na	5.3	6.5	Stem-runner
Dromius	melanocephalus	501		2.5	3.4	Stem-runner
Dromius	meridionalis	240		6	7	Stem-runner
Dromius	notatus	149		3.2	3.7	Stem-runner
Dromius	quadrimaculatus	461		5.2	6.4	Four-mark Stem-runner
Dromius	quadrinotatus/ spilotus	350		3.8	4.6	Stem-runner
Dromius	quadrisignatus	13	RDB1	3.5	4	Stem-runner
Dromius	sigma	12	Na	3.2	4	Stem-runner
Dromius	vectensis	20	RDB3	3.4	3.8	Stem-runner
Drypta	dentata	5	RDB1	7	9	Chine-beetle
Dyschirius	aeneus	112		3.1	3.6	Bronze Mole-beetle
Dyschirius	angustatus	8	RDB3	3	3.4	Narrow Mole-beetle
Dyschirius	extensus	3	RDB1	4	5	Lost Mole-beetle
Dyschirius	globosus	369		2.2	3	Least Mole-beetle
Dyschirius	impunctipennis	41	Nb	4.5	5.2	Smooth-backed Mole-beetle
Dyschirius	luedersi	145		3.4	4.1	Marsh Mole-beetle
Dyschirius	nitidus	26	Na	4.5	5.5	Shiny Mole-beetle
Dyschirius	obscurus	11	RDB2	3.5	4.6	Frosted Mole-beetle
Dyschirius	politus	76		4	4.9	Polished Mole-beetle

Dyschirius salinus	84		3.6	4.5	Clay-coast Mole-beetle
Dyschirius thoracicus	61		3.5	4.7	Sandy-coast Mole-beetle
Elaphrus cupreus	631		8	9.5	Copper Dimple-back
Elaphrus lapponicus	15	Na	8.5	10	Northern Dimple-back
Elaphrus riparius	473		6.5	8	Green Dimple-back
Elaphrus uliginosus	63	Nb	8.5	10	Shiny Dimple-back
Harpalus affinis	650		8.5	12	Sunshining Seed-eater
Harpalus anxius	94		6.6	8.2	Heath Seed-eater
Harpalus ardosiacus	63	Nb	9.5	13	Hairy Seed-eater
Harpalus attenuatus	68		7	9	Solitary Seed-eater
Harpalus azureus	72	Nb	6.2	9.2	Hairy Seed-eater
Harpalus calceatus		List 2	10.5	14	Vagrant Seed-eater
Harpalus cordatus	12	RDB3	7.5	10	Heart-shield Hairy Seed-eater
Harpalus cupreus	1	RDB1	12	14	Copper?
Harpalus dimidiatus	25	Na	12	14	Great Blue Seed-eater?
Harpalus froelichi	10	RDB2	8.5	10.4	Breckland/ Brush-thighed Seed-eater
Harpalus griseus			9	11	Vagrant Golden-haired Seed-eater
Harpalus honestus	10	RDB1	8	11	
Harpalus latus	447		8.2	11	Wide-headed
Harpalus melancholicus	14	RDB1	10	11	
Harpalus melletii	24	Na	5.5	8.6	Mellet's Hairy Seed-eater
Harpalus neglectus	32		7	9	
Harpalus parallelus	12	RDB3	5.7	7.3	
Harpalus pumilus (vernalis)	10	Na	5.3	6.2	Spring/ Least Seed-eater
Harpalus laticollis	25	Na	8.5	11	Set-aside Hairy Seed-eater
Harpalus puncticeps	75		6.5	9	Spoil-heap Hairy Seed-eater
Harpalus puncticollis	28	RDB3	7	10	
Harpalus laevipes	21	Na	9.5	12	Northern Seed-eater
Harpalus rubripes	249		8.5	12.2	Blue
Harpalus rufibarbis	288		6.2	9.5	Common Hairy Seed-eater
Harpalus rufipes	701		10	16.7	Golden-haired Seed-eater
Harpalus rufipalpis	114		8	11	Steely Seed-eater
Harpalus rupicola	38	Nb	7	9	
Harpalus sabulicola	19	RDB3	12	17	?Great? Hairy Seed-eater
Harpalus schaubergerianus	46	Nb	7.6	10	Densely Hairy Seed-eater
Harpalus serripes	26	Nb	9.3	11.4	Chesil / Shingle
Harpalus servus	23	Nb	7.5	8.5	Dune Seed-eater
Harpalus smaragdinus	25	Nb	9	11.4	Emerald Seed-eater
Harpalus stictus (obscurus)	13	RDB1	13	17	Oolite Hairy Seed-eater
Harpalus subsinuatus				Portland Hairy Seed-eater	
Harpalus tardus	205		8.4	11	Common
Harpalus tenebrosus	19	Na	8	11	
Laemostenus complanatus	33	List 1	13	16	Straight-legged Burrow-dweller
Laemostenus terricola	180		13	17.5	Bandy-legged Burrow-dweller
Lebia chlorocephala	103	Nb	5.8	8.1	
Lebia cruxminor	11	RDB1	6	7	
Lebia cyanocephala	11	RDB1	5.7	7.8	
Lebia marginata		EXTINCT	4	4.5	
Lebia scapularis		EXTINCT	4	5.5	
Leistus ferrugineus	549		6.5	8	Rusty Flange-mouth
Leistus fulvibarbis	568		6.5	8	Bluish Flange-mouth
Leistus montanus	18	Na	7	9.5	Montane Flange-mouth
Leistus terminatus	642		6	8	Black-headed Flange-mouth
Leistus rufomarginatus	182		8	9.5	Colonising Flange-mouth
Leistus spinibarbis	346		8	10.5	Blue Flange-mouth
Licinus depressus	65	Nb	9.5	11.8	Stump-jaw - only applies to punctatulus???
Licinus punctatulus	38	Na	13	18	Stump-jaw
Lionychus quadrillum	18	RDB3	3	4	Spotted Confounder
Loricera pilicornis	1186		6	8.5	Beard-runner
Masoreus wetterhallii		19	Na	4.7	5.6 The Sentinel?
Syntomus foveatus	318		3.1	3.8	Bronze Flimsy
Syntomus obscuroguttatus	130		3	3.5	Spotted Flimsy
Syntomus truncatellus	85		2.6	3.2	Black Flimsy
Microlestes maurus	172		2.5	2.8	Least Flimsy
Microlestes minutulus	4		3	3.8	Overlooked Flimsy
Miscodera arctica	77	Nb	6.5	8	Moraine Tunneller
Nebria revicollis	1339		10	14	Common Nebria/ Heart-shield
Eurynebria complanata	30	Na	17	24	The Beachcomber
Nebria rufescens (gyllenhali)	405		9	12	Upland Nebria/ Heart-shield
Nebria livida	15	Na	12	16	Clay-cliff Nebria/ Heart-shield
Nebria nivalis	26	Na	8.5	11	Summit Nebria/ Heart-shield
Nebria salina	542		10	13.5	Bare-footed Nebria/ Heart-shield
Notiophilus aesthuans	41	Nb	4	5.5	Mountain Springtail-stalker
Notiophilus aquaticus	465		4.5	6	Black-legged Springtail-stalker
Notiophilus biguttatus	1229		5	6	Common Springtail-stalker
Notiophilus germinyi	305		4.5	5.5	Heath Springtail-stalker
Notiophilus palustris	419		5	6	Rough-necked Springtail-stalker
Notiophilus quadripunctatus	58	Nb	5	5.5	Four-dimpled Springtail-stalker

Notiophilus rufipes	172		5.5	6.6	Red-legged Springtail-stalker
Notiophilus substriatus	391		4.5	5.5	Frosted Springtail-stalker
Odacantha melanura	45	Nb	6.6	7.8	Corsetted Reed-climber
Olisthopus rotundatus	408		6.4	7.8	
Omophron limbatum	3	RDB1	5	6.5	The Omophron
Oodes helopioides	74	Nb	7.5	10	The Amphibious Ground-beetle
Panagaeus bipustulatus	94	Nb	6.5	7.5	Lesser Crucifix
Panagaeus cruxmajor	24	RDB1	7.5	9	Great Crucifix
Patrobus assimilis	229		6.8	9	Northern/Upland Pinch-neck
Patrobus atrorufus	405		7.4	10	Common Pinch-neck
Patrobus septentrionis	37	Nb	7.4	10	Winged/Volant Pinch-neck
Pelophila borealis	39	RDB3	9	12.5	Ten-lined Dimple-back
Perigona nigriceps	13	List 1	2	2.5	Compost Ground-beetle
Perileptus areolatus	21	Na	2.4	2.5	Spiny-footed Shingle-beetle OR Peg-palp
Platyderus depressus	126	Nb	5.5	8	
Pogonus chalceus	144		5.5	6.6	Punctate Driftliner
Pogonus littoralis	34	Nb	7	8	Wrinkled Driftliner
Pogonus luridipennis	16	RDB3	6	8.5	Yellow-back Driftliner
Polistichus connexus	20	RDB2	8	10	The Cockney
Pterostichus adstrictus	179		10.4	13	Confined, concise, parsimonious
Pterostichus aethiops	73	Nb	12	14	Black (as an Ethiopian)
Pterostichus quadrifoveolatus	68	Nb	9.5	11	Narrow, also critical, subtle, difficult
Pterostichus anthracinus	100	Nb	10.5	17.5	?coal?
Pterostichus aterrimus	8	RDB1	13	15	Black-fissured
Pterostichus cristatus	58	Nb	14	18	Crested
Pterostichus cupreus	384		11	13.4	Copper Green-clock
Pterostichus diligens	699		5.3	6.7	Smooth-chested Blackclock
Pterostichus gracilis	55	Nb	8.5	10	Thin, slender, meagre, lean
Pterostichus kugelanni	21	RDB1	12	14	New Forest Green-clock
Pterostichus lepidus	43	Nb	11	15	Heath Green-clock
Pterostichus longicollis	67	Nb	5	6	Long-necked
Pterostichus macer	138		11	15	Lean
Pterostichus madidus	1315		13	17	Common Black-clock
Pterostichus melanarius	931		12	18	Rain-beetle
Pterostichus minor	408		6.8	8.7	Lesser/ Small
Pterostichus niger	950		15	20.5	Black
Pterostichus nigrita	37		8.8	12.8	Mitten Black-clock
Pterostichus oblongopunctatus	159	Nb	9.5	12.6	
Pterostichus rhaeticus	65		8.8	12.8	Pincer Black-clock
Pterostichus strenuous	1093		6	7.2	Rough-chested Blackclock
Pterostichus vernalis	491		6	7.5	Spring(time)
Pterostichus versicolor	338		9	12.2	Vari-coloured Green-clock
Scybalicus oblongiusculus	5		11	13	Portland-beetle
Sphodrus leucophthalmus	17	List 3	20	26	Cellar-dweller
Stenolophus mixtus	243		5.1	5.6	
Stenolophus skrimshiranus	37	Na	5	6	
Stenolophus teutonus	33	Nb	5.5	6.2	
Stomis pumicatus	382		6.8	8.3	Long-jaw Beetle
Synuchus nivalis	256		6	8.5	Pear-palp Beetle
Tachys bistriatus	38	Nb	1.8	2.3	Common
Porotachys bisulcatus		List 2	2.8	3.2	Bold's
Tachys obtusiusculus	1	RDB1	1.5	2	Edmond's
Tachys micros	7	Na	2	2.4	Cliff
Elaphropus parvulus	19	Nb	1.8	2.2	Patio
Elaphropus quadrisignatus		List 2	2.5	2.8	South Shields
Tachys scutellaris	16	Na	2	2.7	Yellow-backed
Elaphropus walkerianus	4	RDB1	1.8	2.1	Sphagnum
Thalassophilus longicornis	13	Na	3.5	4	
Blemus discus	63	Nb	4.4	5.5	Autumn Spear-palp
Trechus fulvus	58	Nb	4.8	5.7	Seashore Spear-palp
Trechoblemus micros	129		4	4.5	Mole-run Spear-palp
Trechus obtusus	742		3.6	4.1	Short-winged Spear-palp
Trechus quadristriatus	703		3.5	4	Long-winged Spear-palp
Trechus rivularis	12	RDB3	4.4	4.8	Sphagnum Spear-palp
Trechus rubens	89	Nb	5	6.5	Greater Spear-palp
Trechus secalis	150		3.5	4	Inland Spear-palp
Trechus subnotatus	7	RDB1	4.5	5	Shaldon Spear-palp
Trichocellus cognatus	143		3.5	4.2	Northern Hairy-eye
Trichocellus placidus	295		4	5.5	Southern Hairy-eye
Zabrus tenebrioides	41	Na	14	16	European Corn-beetle

APPENDIX 2: OTHER KEYS

This section includes:

Quick key to a few very common carabids: the commonest 30 species

Key to genera of the larger carabids

Key to *Carabus, Pterostichus* and related genera

Key to ruderal genera and species (except *Amara* and *Harpalus*)

Key to inland lowland *Bembidion* and relatives

Key to small Harpaline genera: *Acupalpus, Bradycellus, Dicheirotrichus, Stenolophus, Trichocellus*

QUICK KEY TO A FEW VERY COMMON CARABIDS
The commonest 30 species

The simple key to the commonest 30 species of ground-beetle in Britain covers many which are likely to be found in gardens, and on clay or loamy farmland, and should provide a good introduction to species-level identification. It will also reinforce the use of key characters which appear in the main key to genera introduced last week.

The 30 species were chosen partly because they are the most often-recorded and geographically widespread species in the database of the national Ground-beetle Recording Scheme (the database summarised in the *Atlas of ground-beetles*). By way of background: there are abut 2860 10km squares of the Ordnance Survey national grid in Britain. The best-recorded ground-beetle, *Pterostichus madidus*, is recorded from 1339 squares. This compares rather poorly with, say, birds or flowering plants, where the commonest species are recorded from over 2800 squares.

If we take the 10km square-count for the commonest species as a marker of maximal recording effort to date, we can assess how many other species are common and widespread too. Surprisingly, only 28 of the 365 British species are recorded from half of the maximum number of squares.

Most of these 28 species were included in the top 30 species (those which are absent from large parts of Britain, e.g. the north or the south-west, and ubiquitously recorded from only a part of the country, were generally left out). A few extra species were added because they are almost ubiquitous on British farmland. Because geographically widespread species tend to be locally abundant and to be ecologically wide-ranging, these few species should also help familiarise you with the species which are most likely to be found in many other habitats, too.

The Pareto Principle comes into play here, too, as in previous sections. The national database for the *Atlas* contains 141,371 records (cf. the new butterfly atlas, covering fewer than 70 species, and comprising 1,548,935 records). So there is still a great deal of basic recording to do. The 30 commonest species, included in the key, provided 48,330 records, or 34% of the database.

It is interesting to extend the Pareto Principle to particular species-rich genera. The following table is based on the same national dataset, and compares the proportion of records which the commonest 10% and 25% of species in the genus contribute to the data.

Genus	**No. spp.**	**Total records**	**Commonest 10%**	**Commonest 25%**
Amara	30	10399	3spp. 4298 recs (41%)	8 spp. 7352 recs (70%)
Bembidion	60	21271	6 spp. 8234 recs (39%)	15 spp. 4064 recs (66%)
Pterostichus	23	7680	2 spp. 2408 recs (31%)	6 spp. 5429 recs (71%)

So, on average the commonest 10% of species in a genus make up 31-41% of all records, and the commonest 25% make up 66-71%.

These calculations are based on presence/absence recording in 10km squares, and take no account of population sizes or ecological range. Because widespread species tend to be locally-abundant and ecologically wide-ranging, the same 10% of species are likely to be even more often encountered than the figures suggest. So, learning to recognise the common 30 species may sort out half of all the ground-beetles which are found.

This key is kept simple, and colour characters are used in several places, because of all the omissions. Do not try it out on wetland species (where, for example, lots of extra *Bembidion* and *Agonum* species, for instance), nor on very dry, sandy soils (several more *Harpalus* and *Amara* species are likely to be found).

Because many species in most genera are omitted, supplementary features have often been added: if your specimen does not agree with these, it may well be a different species in the same genus. References to page numbers and figure numbers are from Forsythe (1987 edition).

1 Fore tibiae with fairly straight sides, gradually widening from base toward apex, without an antenna cleaner (a notch on inner edge). Some species have a notch at or near the apex of tibia, often surrounded by a comb of bristles, used for cleaning antennae. In these cases, the tibia below the notch is narrower than the widest part, which is above the notch. Elytra never truncate (see couplet 10). **2**

1a Fore tibia with a notch on inner or lower side, the antenna cleaner, usually with a long, thick, curved bristle spanning the opening. The notch is best seen from above in front, and to one side, looking across the beetle, and is usually between halfway along and a third the way from apex. (Forsythe, p.26, fig. I.6, or inside front cover). The tibia almost always gets wider below the antenna cleaner, so the widest part of the tibia is below it. Or, tibia modified for digging: flattened and/or with large spurs. Elytra may be truncate. **5**

2 4-7mm long. Rather parallel-sided: head, pronotum and elytra about equally wide, pronotum ± equilateral. Elytra shiny, brassy or black, and with 8 regular, strongly pitted longitudinal grooves. Tip of elytra pale-translucent. Second interval on each elytron (counting from midline of body) much wider than the others. Eyes huge, and forehead with 5-8 deep longitudinal grooves. In most habitats. Forsythe pl.1 fig. 2 ***Notiophilus biguttatus***

2a 6.5-24mm long. Pronotum wider than long, at widest part about equal to base of elytra, but narrowed at base. Elytra rather flat and smooth, each with 8 evenly-spaced grooves. Eyes normal (not large and bulging). **3**

3 6.5-10.5mm long. Mandibles with wide flange on outside (p.28, fig I.21); palps very long and slender. Upper surface brown (often reddish and translucent) or bluish metallic. ***Leistus*** (6 spp.) **4**

3a 9-16mm long. Mandibles without flange (p. 28, fig. I.22), palps not especially elongate or slender. Upper surface black or dark brown. ***Nebria brevicollis***

4 **[4 choices: for alternative key, start at Forsythe, 1987, p. 28, couplet 26]**
Whole animal red-brown. ***Leistus ferrugineus***
Head and abdomen black, rest of animal red-brown. ***Leistus terminatus***
Whole animal dark, elytra with a slight bluish metallic sheen. ***Leistus fulvibarbis***
Whole animal dark, with a very strong blue metallic sheen. ***Leistus spinibarbis***

5 Last segment of maxillary palps (the longer, outer pair of palps) very small and slender, much smaller than penultimate segment (p.34, fig. III.10). Beetle 2.5-7mm long ***Bembidion*** (c. 60 spp.) **6**

5a Last segment of maxillary palps about as large as penultimate segment. Beetle often larger. **10**

6 Elytra entirely dark, or faintly paler toward apex. 2.8-4.4mm **7**
Each elytron with 2 well-marked pale spots. 2.8-6.1mm **9**

7 Elytra strongly metallic-brassy. 3-4.4mm ***Bembidion lampros***
Dull or shiny black, not metallic . 2.8-3.5mm **8**

8 Pronotum base completely straight, and sides rounded to hind angles (p.37, fig III.26). ***Bembidion obtusum***
Pronotum base with hind angles in front of middle of base (p. 37, fig. III.27**)** ***Bembidion guttula***

9 4.9-6.1mm, pale spots rather orange and blurred. ***Bembidion tetracolum***
2.8-3.5mm, pale spots opaque creamy and well defined. Very glossy.
Bembidion quadrimaculatum

10 Elytral apex truncate (as though snipped off), so last 2 or more abdominal segments jut out. Rather long and narrow red-brown or yellow-brown beetles. 4.4-6.5mm. **11**

10a Elytral apex rounded, pointed or elongate, covering all of abdomen, or with only a part of last segment showing (but beware gravid females and specimens from pitfalls, which may have swollen abdomens) **12**

11 4th tarsal segment much larger than 3rd and 5th. Straw-coloured with black head. Long hairs on head behind eyes. 4.2-5.6mm ***Demetrias atricapillus***

11a 4th tarsal segment smaller than 3rd and 5th. Red-brown with head and tip of elytra a little darker. Head with deep wrinkled grooves between eyes. ***Dromius linearis***

12 Species obviously adapted for tunnelling underground. Pronotum and elytra joined by narrow cylindrical waist; pronotum almost spherical, without hind-angles jutting out at side (may have a ridge on the 'waist'). Front tibiae modified for digging: flattened and/or with large spurs and bristles. Short-legged, walk slowly when on surface. e.g. pl. 1 fig 3. 5-6.5mm long, some shade of brown or orange, never metallic or strongly shiny. Elytra parallel-sided. ***Clivina fossor***

12a Species not adapted for tunnelling. Less obviously 'waisted'. Often but not always fast-running. Body forms various but usually more flattened or relatively broader and more oval. Front tibiae more slender and less spiny. Many spp. able to run quickly. Pronotum often with hind angles, which may be sharp or rounded. **13**

13 A single pit with a long bristle above each eye (bristles often break off, but the small pits from which they arise are usually visible in good light). **14**

13a Two pits, each bearing a single long bristle, above each eye. **16**

14 Upper surface of head, pronotum and all elytral intervals hairy (with hairs short, usually curved or lying flat against the surface). Dark brown with blond or ginger hair and pale reddish legs. 10-16.7mm. ***Harpalus (Pseudophonus) rufipes***

14a Upper surface not generally hairy, apart from a small number of long, erect bristles on elytra margin, above eyes, and on margin of pronotum. Sometimes hairy on outer 2-3 intervals, and along apex of inner intervals. **15**

15 Pronotum with a well-marked raised rounded ridge across the base. A broad, thickset species with pronotum about as wide as elytra. Usually blackish, often with a metallic (usually green or blue) sheen. 8.5-12mm. ***Harpalus affinis***

15a Pronotum without a distinct basal rounded ridge, except sometimes at sides. Unmetallic brown, often reddish or pale. Pronotum narrower than elytra, and beetle more elongate, rather convex. 3.8-4.2mm. ***Bradycellus harpalinus***

16 A pair of fine but often deep furrows run between the eyes, then diverge in a smooth semicircle around the back of each eye, and run down the side of the neck. Legs always pale. Whole body brown or yellowish in most species. Mostly smaller than 4mm (range 3.5-6.5mm).
Trechus (9 species) **17**

16a No fine furrows between and behind eyes. Often larger and darker, with dark legs, and seldom entirely pale red-brown. **18**

17 Hind wings (tucked under elytra at rest) full-length, double-folded to fit in.
Trechus quadristriatus

17a Hind wings very short, narrow flaps of membrane. ***Trechus obtusus***

18 Antennae with very long, thick bristles (2-2.5 times the segment length) on segments 2-6. Dense, long bristles on underside of head. Brassy metallic, elytra each with 3 very deep pits. 6-8.5mm. ***Loricera pilicornis***

18a Bristles on antennae much shorter. Seldom with such deep pits in elytra. **19**

19 No bristle-bearing dorsal pits on flat surfaces of elytral intervals 1-7. Intervals never covered with short hairs and not heavily pitted. Up to 15mm long. Usually dark brown or blackish with a metallic sheen. Mandibles short and blunt, protruding beyond the labrum by less than the length of the labrum, even when wide open. 8th elytral interval no more ridged or keeled than 7th and 9th. Rounded oval beetles. ***Amara*** (27 spp.), ***Curtonotus*** (3 spp.) **20**

19a At least 1, and sometimes up to 7, bristle-bearing pits on or adjoining 3rd interval, often next to 3rd or 2nd stria (marginal and apical bristles not counted). Sometimes pits also on flat part of other intervals. Pits can be small, inconspicuous, or close to apex of elytra (but not along elytral margin): they appear as depressions from above, and as upstanding hairs in side view. They tend to be in similar positions on the two elytra. (Intervals never have more than 7 bristle-bearing pits total, but may be covered with short hairs.) **23**

20 5.6-8.8mm. Smoothly-rounded oval, with hind angles of pronotum fitting neatly at base of elytra. Metallic. **21**

20a 11-14.3mm. More elongate. Pronotum sinuate at sites, with sharply protruding hind angles. Unmetallic dark brown. ***Curtonotus aulicus***

21 Legs entirely pale, including femora. 5.6-7.2mm ***Amara familiaris***
Legs, at least femora, dark brown or blackish. **22**

22 Short stria at base of elytra, next to Scutellum, with a pit and a short bristle at its base (p.49, fig. V.12). Front legs with a 3-pronged spur on inner side at apex (often only 2 spurs visible from one angle). 6.2-7.8mm. ***Amara plebeja***

22a Short stria without a bristle-bearing pit. Spurs on front legs single. 6.2-8.8mm. ***Amara aenea***

23 Tarsal claws serrated on the inside, with 3-6 comb-like teeth at least toward the base of each claw (sometimes worn, so may need x20 magnification). Pronotum with sides straight or simply rounded, never sinuate. Elongate-oval beetles with a smoothly convex outline. Deep pits on both 3rd and 5th elytral striae. 10-14.4mm. Rather dull brown-black all over. ***Calathus fuscipes***

23a Claws smooth. Pronotum various, often sinuate at sides (S-shaped curve, going in at sides, then out again toward hind angles). Pronotum often narrower than elytra at shoulders. Upper surface more convex than lower. 5-21mm. **24**

24 Head black, pronotum orange, and elytra orange with black marking Mandibles very blunt and asymmetrical (a large lump on upper surface of one mandible). Labrum with deep V-shaped incision p.48, figs V.1a, V.1b). 4.8-6.5mm. ***Badister bullatus (=bipustulatus)***

24a Never black and red, usually shiny black or brown all over, sometimes with a metallic sheen. Often larger. Mandibles more pointed, and without a lump on upper surface of one. Labrum straight or with shallow concave front margin. Most species uniformly black, occasionally brown, sometimes with metallic sheen. 4.5-20mm **25**

25 At least 11mm long, stoutly built. Either glossy black all over, or, if metallic, then first 2 antennal segments orange, contrasting with the rest which are black.
Pterostichus and ***Poecilus*** (23 species) **26**

25a 6-9.5mm long, narrow at front, broader toward rear. All-metallic or metallic green and orange-brown. ***Agonum*** and allies (23 species) **29**

26 First 2 antennal segments orange. Whole upper surface metallic. 11-13.4mm. ***Pterostichus (=Poecilus) cupreus***

26a All antennae dark brown or black. Upper surface unmetallic black, often glossy. **27**

27 Hind angles of pronotum completely rounded, no protruding corners (p. 52, V.32). Whole upper surface glossy and convex. Legs either red or black. 13-17mm ***Pterostichus madidus***

27a Hind angles sharper (e.g. p. 53, V.27). Elytra often rather matt black. Legs always black. 12-20.5mm **28**

28 Last (claw-bearing_ segment of tarsi with a few short, stiff bristles underneath. Pronotum evenly rounded at sides, and widest at middle. 12-18mm. ***Pterostichus melanarius***

28a Last segment of tarsi smooth underneath. Pronotum almost straight in hind two-thirds, broadest in front half. 15-20.5mm ***Pterostichus niger***

29 Head, pronotum and an oval spot in middle of elytra metallic green. Rest of beetle orange-brown. Pronotum narrow, with sinuate sides and pointed hind angles. 6-8.2mm ***Anchomenus dorsalis***

29a Whole beetle metallic, usually with head and pronotum bright metallic green contrasting with coppery elytra. Pronotum almost as broad as elytra, and with rounded hind angles. 7.2-9.5mm. ***Agonum muelleri***

KEY TO GENERA OF THE LARGER CARABIDS

INTRODUCTION

This key is intended to introduce students to the use of identification keys, and to some of the range of body forms and structures within ground-beetles. Small species are not intrinsically more difficult to identify than large ones, but the features used (often the same as appear here) are more difficult to see. Larger beetles are also more robust, so there is less fear of damaging specimens while getting used to manipulating beetles under the microscope or hand lens. So, start large, then move on to smaller species later.

'Larger' is a vague term. This key covers all genera which include one or more species which can **reach or exceed 13mm in length**, on the grounds that

- novices generally regard 1cm beetles as small-medium, so the cut-off should be a little larger than that;
- 13mm encompasses about 60 species, so the key is not too long;
- it covers most of the major divisions within the carabids, so provides experience of most of the crucial identification features which will be important throughout the course.

This key includes about 17 of the 65 or so British genera. There are about 60 species of ground-beetle which reach 13mm, but the 17 genera in this key include about 150 of the 360 species (numbers of species mentioned in this key are the total number in the genus in Britain, not all of which are over 13mm long). Almost all the characters should be visible with a x10 hand lens in good light. Within a few of the included genera, a handful of very rare or extinct species have been omitted. may fail to key out. Two large species believed extinct in Britain, *Sphodrus leucophthalmus* (20-26mm) and *Scybalicus oblongiusculus* (11-13mm), are omitted.

Having identified the genus with this key, most beetles should key satisfactorily to species using Forsythe (1987 or 2000). The main exceptions are *Amara* and *Harpalus* for which new keys will be provided later. An alphabetical table at the end shows the page and couplet number in the two editions of Forsythe at which you should start. Even if there is only one species in the genus, it is often worth checking in Forsythe for an illustration of its key features.

KEY

1 Antennae attached between clypeus and frons, above base of mandibles. Eyes huge. Clypeus broader than distance between bases of antennae. Mandibles marked with yellow or white. Elytra without striae, bright green or brown-black, with opaque creamy spots or blotches.
Tiger-beetles *Cicindela* (5 species)

1a Antennae attached behind base of mandibles, below level of frons and clypeus; clypeus much narrower than distance between antennae bases. Eyes various. Mandibles usually dark. Elytra often with striae, seldom with opaque creamy spots or blotches. **2**

2 Fore tibiae fairly straight-sided, without antennal cleaner (a notch on inner edge), though some species have a concavity at apex of tibia. If more than 13.5mm long, has a single pit with a long bristle, above each eye (beware: bristles often break off). **3**

2a Fore tibia with a notch and spur on inner or lower side, the antennal cleaner (best seen from above in front, and to one side, looking across the beetle). Either one or two pits, each bearing a long bristle, above each eye. **7**

3 Up to 24mm long. Elytra smooth and rather glossy, with at least 7 regular grooves (striae) between which there are usually flat strips (intervals). If the flat strips are bumpy, there is a figure-of-8 pattern of deep grooves on either side of the head, next to the eyes. **4**

3a 14-30mm long. Often with rather convex elytra. Elytra with various sculpturing, but never with 9 well-marked grooves between which the intervals are smooth and flat. Head never with two figure-of-8 patterns of grooves. **5**

4 10-13.5 mm long. Elytra rather convex, glossy and with a brassy sheen, deeply pitted or bumpy, eyes large, and forehead with a raised figure-of-8 next to each eye. In wetlands.
Blethisa multipunctata

4a 9-24mm long. Elytra rather flat, simply with 9 regular grooves and with flat intervals in between. without deep pits and bumps. Not metallic, either blackish or yellow with black markings.
Nebria (4 spp.), *Eurynebria companata*

5 Head and thorax narrow, jaws very elongate: head (from pronotum to tip of jaws) about twice as long as wide. Elytra with roughening but no grooves or other longitudinal pattern. Elytra broad and very convex; whole beetle pear-shaped. 14-19mm. *Cychrus caraboides*

5a Head, thorax and jaws not elongate. Elytra often with grooves, rows of pits, or raised bumps (sometimes like strings of sausages). Abdomen flat or moderately convex, whole beetle more parallel-sided. 13-38mm. **6**

6 Pronotum with rounded base. 2nd antennal segment no more than 0.33x the length of 3rd segment. Elytra with 11-15 regular, punctate striae with smooth, flat or convex intervals in between.
Calosoma (2 spp.)

6a Hind-angles of pronotum protruding as backward-directed points. 2nd antennal segment 0.5-0.7x length of 3rd. Elytra with various sculpting, but not with 11-15 regular, punctate striae with smooth intervals between. *Carabus* (9 spp.)

7 Species adapted for tunnelling underground. Pronotum and elytra joined by cylindrical waist; thorax almost spherical, without hind-angles jutting out at side (may have a ridge on the 'waist'). Front tibiae modified for digging: flattened and/or with large spurs and bristles. 17-22mm, all black, sometimes shiny but never metallic. Elytra long and pointed at apex, rather dull black, with striae very faint. Coastal sand dunes, occasionally gravel pits inland. *Broscus cephalotes*

7a Species not adapted for tunnelling. Less obviously 'waisted'. Often but not always fast-running. Body forms various but usually more flattened or relatively broader and more oval, with rounded or blunt elytral apices. Front tibiae more slender and less spiny. Many spp. able to run quickly. Pronotum often with protruding hind angles, which may be sharp or rounded. **8**

8 A single pit with a long bristle above each eye (bristles often break off, but the small pits from which they arise are usually visible in good light). **9**

8a Two pits, each bearing a long bristle, above each eye. **13**

9 Upper surface of rear half of pronotum and all elytral intervals hairy (with large numbers of hairs, which are short, usually curved or lying flat against the surface). **10**

9a Upper surface not generally hairy, apart from a small number of long, erect bristles on elytra margin, above eyes, and on margin of pronotum. Sometimes hairy on outer 2-3 intervals, and along apex of inner intervals. **11**

10 Upper surface of tarsi without hairs. Antennal segments hairy (many short hairs as well as a few long bristles), from no. 4 onwards, contrasting with hairless segments 1 to 3. Head, pronotum and elytra usually metallic green, sometimes with yellow apex or margin to elytra. 8.5-13mm.
Chlaenius (4 spp.)

10a Upper surface of tarsi hairy. Antennal segments hairy from no. 3 onwards, contrasting with hairless segments 1 and 2. Upper surface seldom metallic green, and never with a contrasting pale margin. 5.5-17mm *Harpalus:* subgenera *Ophonus* (*c.* 14 spp.) and *Pseudophonus* (2 spp.)

11 First segment of hind tarsi equal to, or shorter than, apical spur of tibia.

Harpalus s.s. (*c.* 20 spp.)

11a First segment of hind tarsi much longer than apical spur of tibia **12**

12 Head without a pair of small reddish spots. Epipleures (flange at edge of elytra) crossed near apex of elytra (view from behind, slightly to one side, and slightly from below). Heavily-built, very convex, dull black species, 14-16mm. *Zabrus tenebroides*

12a Head with one oval, or a pair of small circular, reddish translucent spots on upper surface between eyes. Epipleures not crossed. Rather flat species, 8-13.5mm. *Anisodactylus* (3 spp.)

13 No bristle-bearing dorsal pits on flat surfaces of elytral intervals 1-7. Intervals never covered with short hairs and not heavily pitted. **14**

13a 1 - 7 bristle-bearing pits on or adjoining 3rd interval, often next to 3rd or 2nd stria (marginal and apical bristles not counted). Sometimes pits also on flat part of other intervals. Pits can be small, inconspicuous, or close to apex of elytra (but not along elytral margin): they appear as depressions from above, and as upstanding hairs in side view. (Intervals never have more than 7 bristle-bearing pits total, but may be covered with short hairs.) **16**

14 Pronotum much narrower than base of elytra, and strongly sinuate (S-shaped curve, bulging out, then going in at sides, then out again toward hind-angle) at sides. Tarsi hairy on upper surface; tarsal claws toothed, though often with only 2-3 very shallow and obscure teeth. Long-legged, rather slender, pear-shaped black beetles often with a faint blue-metallic gleam to the elytra. 13-17.5mm. *Laemostenus* (2 spp.)

14a Pronotum about as wide as base of elytra base, straight or smoothly convex-curved or slightly sinuate at sides. Tarsi not hairy above, claws not toothed. Broad, rather short-legged, round or oval beetles. 5-22mm. **15**

15 Up to 15mm long. Usually dark brown or blackish with a metallic sheen. Mandibles short and blunt, protruding beyond the labrum by less than the length of the labrum, even when wide open. 8th elytral interval no more ridged or keeled than 7th and 9th. Rounded oval beetles. *Amara* (c. 30 spp.)

15a 18-22mm long, glossy black without a metallic sheen. Mandibles longer, protruding by more than the length of the labrum. 8th elytral interval ridged, so the outer edge of the elytra is turned down almost vertically. Parallel-sided, broadly oval, flattened. *Abax parallelepipedus*

16 Tarsal claws serrated on the inside, with 3-6 comb-like teeth at least toward the base of each claw (sometimes worn, so may need x20 magnification). Pronotum with sides straight or simply rounded, never sinuate. Mostly elongate-oval beetles with a smoothly convex outline (1 sp. with narrower pronotum). 6-15mm. Mostly rather dull brown-black, or red-brown with black pronotum. *Calathus* (8 spp.)

16a Claws smooth, without teeth. Pronotum and colour variable. May be larger than 15mm. **17**

17 Elytra dull, intervals densely pitted between striae. Mandibles very blunt and asymmetrical (an oval lump on upper surface of one mandible, absent from other), with 2 blunt teeth at apex of each mandible. Labrum with deep V-shaped incision. Only 2 bristle-bearing dorsal pits on elytra. Whole beetle black. 9.5-18mm. *Licinus* (2 spp.)

17a Elytra intervals not densely pitted. Mandibles less blunt and without a lump on upper surface of one. Labrum straight or with shallow concave front margin. Usually with 3 or more bristle-bearing pits on each elytron. Most species uniformly black, occasionally brown, sometimes with metallic sheen. 4.5-20mm **18**

18 Epipleures (flange at edge of elytra) 'crossed' near apex of elytra (view from behind, slightly to one side, and slightly from below): as if one flange narrows and disappears, and a second flange appears from behind it. Legs rather stout, fore tibiae often much thicker at apex than at base. Mostly rather stout and parallel-sided beetles; glossy black, (a few species brassy, coppery or green metallic). 5.3-20.5mm. *Pterostichus* (25 spp.)

18a Epipleures not crossed, usually narrow gradually toward apex of elytra. Legs slender; fore tibiae not much thicker at apex than at base. Rather 'pear-shaped' beetles, with slender head and fore-body, and often with elytra broadest in hind half. 5-13mm. *Agonum* (25 spp.; only *A. assimile* is regularly above 10mm)*)*

KEY TO *CARABUS, PTEROSTICHUS* AND RELATED GENERA

Start at Key 1, and you will be referred to Key 2 where necessary. These keys to about 60 species include all resident species in the following genera, grouped as shown:

Key 1:
Calosoma (2 species)
Carabus (12 species)
Cychrus (1 species)

Key 2:
Abax (2 species)
Agonum (25 species, of which 3 are included here)
Calathus (8 species)
Laemostenus (2 species)
Olisthopus (1 species)
Patrobus (3 species)
Platyderus (1 species)
Pterostichus (25 species)
Synuchus (1 species)
Stomis (1 species)

These beetles are ecologically quite varied: the majority of woodland species are included here: but the two most species-rich genera, *Agonum* and *Pterostichus*, also include many wetland species, and a few in other habitats. 'Wetland *Agonum*' will be dealt with later, and this key refers you to them directly.

KEY 1

1 Fore tibiae fairly straight-sided, without antennal cleaner (a notch on inner edge), though some species have a concavity at apex of tibia. At least 13mm long. **2**

1a Fore tibia with a notch and spur on inner or lower side, the antennal cleaner (best seen from above in front, and to one side, looking across the beetle), usually between halfway alone and a third the way from apex. (Forsythe, p.26, fig. I.6, or inside front cover). Size range from 5-22mm. **KEY 2**

2 Head and thorax narrow, jaws very elongate: head (from pronotum to tip of jaws) about twice as long as wide. Elytra with roughening but no grooves or other longitudinal pattern. Pronotum longer than wide, completely rounded at hind angles. Underside of thorax blunt at rear, without a point to fit between bases of hind-legs. Elytra broad and very convex; whole beetle pear-shaped, unmetallic black. 14-19mm. Common in woodlands, hedgerows etc. *Cychrus caraboides*

2a Head, thorax and jaws not elongate. Elytra often with linear sculpting: grooves, rows of pits, or raised bumps (sometimes like strings of sausages). Pronotum usually with backward-pointing hind

angles; if not, then broader than wide. Underside of thorax with a backward-directed triangle, which is inserted between the bases of the mid legs. Elytra flat or moderately convex, whole beetle more parallel-sided. 13-38mm. **3**

3 Pronotum with rounded base. 2nd antennal segment almost equilateral, and no more than 0.33x the length of 3rd segment. Elytra with 11-15 regular, punctate striae with smooth, flat or convex intervals in between. 16-30mm long. *Calosoma* (2 spp.) **4**

3a Hind-angles of pronotum protruding as backward-directed points. 2nd antennal segment elongate, at least 0.5-0.7x length of 3rd segment. Elytra with various sculpting, but not with 11-15 regular, punctate striae with smooth intervals between. 13-38mm long. *Carabus* (12 spp.) **5**

4 13-22mm long. Pronotum with a raised rounded ridge only in front two-thirds of sides. Upper surface uniformly shiny, usually with a bronze or greenish metallic sheen; no contrast between head and pronotum and elytra and fore-body. *Calosoma inquisitor*

4a 17-35mm long. Pronotum with a raised rounded ridge running the full length of the sides. Head and pronotum black with a bluish sheen, elytra contrastingly bright green-gold metallic. *Calosoma sycophanta*

5 **[3 choices]**

5a Elytra each with three smooth, prominent ridges, between which they are smooth or finely granular or wrinkled, or with circular golden dimples. No 'sausage-shaped' granules. Upper surface bright metallic green or gold, or dull brassy with bright gold dimples. **6**

5b Elytra each with three rows of elongate 'sausage-shaped' granules, between which are either a single smooth raised line, or a set of three close-set fine raised lines, or rows of smaller granules. **8**

5c Elytra rough, pitted or granular, but no neat sausage-shaped granules or smooth raised ridges. **11**

6 A row of deep, wide, bright gold-metallic dimples between the smooth, black raised ridges. Remainder of upper surface greenish-brassy but not brilliant. 22-28mm. Northern and western wetland species. *Carabus clatratus (=clathratus)*

6a No gold dimples between ridges: smooth, wrinkled or with low, smooth-surfaced granules. All or most of upper surface brilliantly green or gold. **7**

7 The three raised ridges on each elytron black. Background bright metallic green. Legs black. 13-18mm. Peat-bogs and wet heaths *Carabus nitens*

7a Raised ridges the same gold-metallic colour as the gaps between them. Legs red. 20-27mm. Lowland England, a recent introduction. *Carabus auratus*

8 **[3 choices]**

8a A single smooth raised line between the rows of sausage-shaped granules. Upper surface almost always brassy. **9**

8b Three smooth raised lines between the rows of sausage-shaped granules. Upper surface usually green-metallic or coppery. A slender, rather flat species. 22-26mm. Scarce but widespread in damp grasslands and other habitats. *Carabus monilis*

8c Surface rough or granular between sausage-shaped granules, but no well-marked longitudinal raised lines. **10**

9 Legs and antennae all black. 16-23mm. Common in wet woodland, fens etc. *Carabus granulatus*

9a First antennal segment red. Femora usually reddish. 20-27mm. Rare introduced species. *Carabus cancellatus*

10 18-30mm. Sculpting on elytra irregular, though sometimes with about three uneven rows of sausage-shaped granules. Pronotum broadest near front, and strongly narrowed toward rear; side margins strongly raised. Black, with a violet or bluish sheen, especially on pronotum and the edges of elytra. Frequent in many habitats. *Carabus problematicus*

10a 16-20mm. Three rows of 'sausages' on each elytron neat and regular. Pronotum broadest near middle, and only slightly narrowed to rear; side margins little raised. Colour variable: green, brassy, coppery, or violet on whole of upper surface. Heaths and moors, uncommon.
Carabus arvensis

11 Head and thorax long and narrow: pronotum at least as long as wide, and distance between eyes equal to distance from middle of eyes to base of labrum. Elytra coarsely granular all over, with bright blue reflections especially in marginal groove. 25-38mm. Rare, in ancient woodland in south-west. *Carabus intricatus*

11a Head and thorax much less elongate: pronotum wider than long, and gap between eyes much wider than distance from mid-eye to base of labrum. **12**

12 Elytra each with three rows of small but well-marked metallic pits, and with granules or flat scaly sculpturing between these. Pronotum much wider than long. Coppery or green metallic sheen on pronotum and around edge of elytra. 20-26mm. Common throughout, especially in woodland.
Carabus nemoralis

12a Elytra without well-marked pits. Granules variable, often longitudinal. Violet-metallic or plain black. **13**

13 Elytra smooth. Whole beetle plain black. 22-30mm. Northern and upland. *Carabus glabratus*

13a Elytra conspicuously granular. Edges of elytra and pronotum with violet or blue sheen. Common and widespread. **14**

14 Elytra with fine irregular granules, no hint of longitudinal sculpture. Elytra narrow and elongate, no more than 30% wider than pronotum. Pronotum equilateral, almost as wide at base as at widest point; front of pronotum almost straight. 20-30mm. Common and widespread in many habitats.
Carabus violaceus

14a Elytra more strongly granular, some of granules joined up to form longitudinal granules or short ridges. Elytra wider, especially toward rear: at widest, at least 50% wider than pronotum. Pronotum widest in front half, and strongly narrowed toward rear; front of pronotum strongly concave. 18-30mm. Common and widespread in many habitats. *Carabus problematicus*

KEY 2

This Key includes all the British species in the following genera (except where otherwise stated):

Abax (2 species)
Agonum (25 species, of which 3 are included here)
Calathus (8 species)
Laemostenus (2 species)
Olisthopus (1 species)
Patrobus (3 species)
Platyderus (1 species)
Pterostichus (25 species)
Synuchus (1 species)
Stomis (1 species)

1 Antennae densely hairy from halfway along 3rd segment onwards (with large numbers of hairs, which are short, usually curved or lying flat against surface) , contrasting with hairless segments 1, 2 and basal part of 3 (which bear a small number of longer bristles). **2**

1a Antennae densely hairy from 4th segment, whole of segments 1-3 contrastingly smooth (but all with 1-4 long thin bristles near their apex). **6**

2 Pronotum simply rounded and convex at sides, not straight in hind third. Hind angles smoothly rounded and barely discernible. *Agonum* species living in wetlands (see later key).

2a Pronotum either with sinuate sides (curving out from front to middle, in again in rear half, then out again toward rear edge), or with sides almost straight in the hind third. Hind angles either pointed and protruding, or sharply right-angled. **3**

3 **[3 choices]**

3a Head and pronotum metallic green, elytra orange-brown with an oval green spot in middle. Head without a constricted 'collar'. 6-8.2mm Common in many habitats, including farmland. *Agonum (=Anchomenus) dorsale*

3b Uniformly glossy black. Broad oval, with pronotum exactly as wide as elytra over shoulders, and as wide as widest part of elytra. Base of pronotum concave, shallowly v-shaped. 7th elytral interval convex, so the outer edge of the elytra is turned down almost vertically. 14-18mm. Rare introduction. *Abax parallelus*

3c Uniformly coloured, red-brown or blackish. Head with a deep transverse groove across the neck, giving impression of a rounded collar. 6.8-10mm. *Patrobus* (3 spp.) **4**

4 Pronotum broader than long. Elytra about four times as long as pronotum. Hind wings full-length (need to lift elytra to see - difficult on dried specimens). 7.4-10mm. Northern and mainly in high mountains. *Patrobus septentrionis*

4a Pronotum about as broad as long. Elytra about three times as long as pronotum. Hind wings very short, less than half the length of elytra. **5**

5 Front of head smooth. Third interval of elytra about as wide as second. Third antennal segment longer than first. Widespread and fairly common. *Patrobus atrorufus*

5a Front of head transversely wrinkled. Third interval broader than second. First and third antennal segments equal. Mainly northern and upland. *Patrobus assimilis*

6 Pronotum continuously rounded and convex at sides, not straight in hind third. Hind angles smoothly rounded. **7**

6a Pronotum either with sinuate sides (curving out from front to middle, in again in rear half, then out again toward rear edge), or with sides almost straight in the hind third. Hind angles either pointed and protruding, or approximately right-angled, rounded only at extreme tip. **18**

7 Tarsal claws serrated on the inside, with 3-6 comb-like teeth at least toward the base of each claw (sometimes worn, so may need x20 magnification). **8**

7a Claws smooth. With no hint of teeth on inside. **13**

8 Pronotum hind-angles broadly rounded, so it is hard to define where the hind corner is. Hind edge of pronotum narrower than front edge of elytra. **9**

8a Pronotum hind-angles rounded at extreme tip, but clearly angular. Hind edge of elytra almost as wide as base of elytra. **10**

9 Labial (inner) pair of palps with last segment broadly pear-shaped, at least twice as wide as penultimate segment. Pronotum wider than long. 6-8.5mm *Synuchus vivalis*

9a Labial (inner) palps with last segment no wider than penultimate. Pronotum as long as it is broad. 8.5-10mm. *Calathus rotundicollis (=piceus)*

10 Head black, pronotum orange-red, elytra dark. **11**

10a Head, pronotum and elytra all of the same colour. **12**

11 Flat surfaces of elytra black, contrasting with the translucent brown or orange of the outer edge (epipleures) and the base (in front of the basal groove). Elytra rather parallel-sided. 6.5-8.8mm *Calathus melanocephalus*

11a Flat surface of elytra dark brown, the same colour as the epipleures and the bases. Elytra rather convex oval in outline. 6.5-8.8mm *Calathus cinctus*

12 Whole beetle blackish, with only the extreme edge of the pronotum paler. Pronotum narrower at base than in middle. 6.5-8.8mm *Calathus micropterus*

12a Whole beetle brown or reddish, with broader pale edges to pronotum and elytra. Pronotum sides parallel in rear half. 6.6-9.2mm *Calathus mollis*

13 At least 12mm long. Whole beetle glossy black. *Pterostichus* spp. **14**
13a Never more than 10.5mm long. Various colours. **16**

14 Third elytral interval with a single fine bristle-bearing pit. Base of pronotum with the depression at either side well defined, with a blunt keel on the outside, between the pit and the outer edge of the pronotum. First segment of hind tarsi with no groove on the outer edge. 13-17mm. Legs black or red. Extremely common everywhere. *Pterostichus madidus*
14a Third interval with 3 or 4 bristle-bearing pits. Legs always black. 13-15mm. **15**

15 Pits on elytra very deep. Outer grooves of elytra disappearing at shoulders. 13-15mm. Fens, believed extinct. *Pterostichus aterrimus*

15a Pits on elytra fine. Outer grooves of elytra well marked. 12-14mm. Northern and upland species. *Pterostichus aethiops*

16 Legs pale, whitish, yellowish or translucent reddish brown. **17**
16a Legs black or dark brown. *Agonum* species (see later key)

17 Front edge of pronotum with a slight forward curve or bump near middle. This rubs on a rough, granular patch at the back of the head. Pronotum rather square in outline, and hind margin concave. Grooves on elytra finely pitted. Upper surface of whole beetle pale reddish brown. 5.5-8mm *Platyderus depressus (=ruficollis)*

17a Front of pronotum straight or gently curved. Back of head without granular patch. Pronotum almost circular in outline, with hind margin convex and with pits around sides and base in rear half. Grooves on elytra fine and smooth, with only faint pitting. Dark metallic olive-brown. 6.4-7.8mm. *Olisthopus rotundatus*

18 Tarsal claws serrated on the inside, with 3-6 comb-like teeth, at least toward the base of each claw (sometimes worn, so may need x20 magnification). **19**
18a Claws smooth, with no hint of teeth. **23**

19 Pronotum as wide as elytra over shoulders. Legs and antennae brown or yellowish; if most of appendages are dark, at least first antennal segment is paler. Rather convex beneath and flat on the back. Elongate-oval beetles with a smoothly convex outline Rather dull brown-black. 8.4-14.4mm. *Calathus* spp. **20**
19a Pronotum much narrower than elytra over shoulders. Legs and antennae black. Pear-shaped beetles, with narrow head and pronotum, and elytra widening toward rear. Black, often with a bluish sheen. 13-17.5mm. *Laemosthenus* spp. **22**

20 Third and fifth elytral striae with a row of deep pits, clearly visible at 8x. Rear of pronotum with numerous small pits. 10-14.4mm. Very common. *Calathus fuscipes*
20a Only third interval with rather shallow pits. Rear of pronotum smooth. **21**

21 **[3 choices]**

21a Pronotum broadest at or near base. Hind angles of pronotum translucent. First segment of hind tarsi with a groove on inner side. Dull red-brown to dark brown. 8.4-11.6mm. Local, usually in dry, sandy habitats. *Calathus ambiguus*

21b Pronotum widest in front half, and clearly narrowed toward base. Hind angles of pronotum not or only very slightly translucent. First segment of hind tarsi without a groove on the inner side, but with a ridge on the outer edge. Dark brown to black, sometimes faintly bronzed. 8.5-11.8mm. Frequent in dry habitats. *Calathus erratus*

21c If less than 9mm long, and hind angles of pronotum well rounded, also check **10**

22 Hind tibiae with a patch of dense fur on the inner edge in the apical half. Pronotum much narrower at base than at front. Eyes very small and flat. 13-17.5mm. *Laemostenus terricola*

22a Hind tibiae without patch of dense fur. Pronotum almost equilateral. Eyes larger. 13-16mm. *Laemostenus complanata*

23 Legs entirely pale to red-brown (doubtful cases key both ways) **24**

23a At least femora black **32**

24 Whole beetle pale to dark brown. Legs white to reddish. 5-9mm **25**

24a Head, pronotum and elytra glossy black or metallic. Legs with reddish femora. 5.3-13.4mm **28**

25 Mandibles extremely long and forward-pointing (p. 48, fig. V.2). First antennal segment as long as segments 2 and 3 combined. Reddish brown, rather narrow and parallel-sided. 6.8-8.3mm. *Stomis pumicatus*

25a Mandibles shorter and less protruding. First antennal segment shorter than 2+3 combined. **26**

26 Pronotum much narrower than elytra: hind margin of pronotum narrower than elytra bases, so 'shoulders' jut out; and widest part of pronotum is much narrower than widest part of elytra. Elytra wider toward rear than at base. **27**

26a Pronotum about same width as elytra: hind edge of pronotum about same width as elytra bases, so whole beetle looks rather parallel-sided; and widest part of pronotum not much narrower than widest part of elytra. Elytra rather parallel-sided. **28**

27 6.8-9mm long. Elytral striae almost smooth. Tarsal segments all with a groove down the middle on their upper surface. Pronotum with hind angles turned outward as small points. Wetlands, very coommon. *Agonum (=Paranchus) albipes*

27a 5-6.6mm. Elytral striae strongly pitted. Tarsi without furrows. Pronotum with hind corners right-angled, not protruding, parallel-sided for hindmost fifth. Many habitats, very common. *Agonum(=Oxypselaphus) obscurum*

28 Base of pronotum with a single deep depression pit or groove at either side, usually about a quarter the way from side margin to midline of pronotum. (Best seen with a hand lens in diffuse light; less easy to see under microscope). **29**

28a Base of pronotum with two depressions at either side, the inner usually prolonged forward as a deep groove, the outer one usually shorter, shallower and more triangular than the inner (use hand lens). **31**

29 5.3-7.2mm. **30**

29a 11-15mm. Glossy black. Antennae uniformly dark. Pronotum much narrower at rear edge than front edge. Sides of pronotum clearly sinuate, concave for hindmost quarter. Elytra long and very flat and parallel-sided. 11-15mm. Local, usually on damp clay soils. *Pterostichus macer*

30 Underside of thorax strongly pitted, glossy between pits. Legs reddish brown. 6-7.2mm. Common. *Pterostichus strenuus*

30a Underside of thorax not pitted, but with a frosted or matt finish. At least femora dark brown. 5.3-6.7mm. Common. *Pterostichus diligens*

31 **[3 choices]**

31a 6.8-8.7mm. Dark brown or black. First antennal segment usually brownish, remainder black. Pronotum sides straight or slightly sinuate in front of hind angle (p.53 fig V.37). Legs pale to mid brown. Male with fine raised longitudinal line under last abdominal segment. Wetlands, local but often abundant. *Pterostichus minor*

31b 8.8-12.8mm. Glossy black. Antennae uniformly dark. Pronotum sides convex, rounded to hind corner, where a small tooth juts out (p.53, fig. V.36a). *Pterostichus nigrita var. rufifemorata*

31c 11-13.4mm. Brassy metallic on upper side of whole body. First 2 antennal segments orange or pale brown. Pronotum sides convex, rounded to hind corner, which does not have a jutting small tooth; edges with a broad border (p. 52, fig. V.30). *Pterostichus (=Poecilus) cupreus var. affinis*

32 Whole upper surface almost always strongly metallic, green, brassy, blue, violet or gold. No conspicuous deep pits in elytra. First three antennal segments with a sharp ridge on upper or outer side (p.52, fig. V.29). Very often with first 2 antennal segments bright orange. Never more than 15mm long. **33**

32a Upper surface glossy black, not strongly metallic. If faintly metallic, then with conspicuous deep pits along the elytra. Antennae without ridge, and entirely black. May be larger. **35**

33 **[3 choices]**

33a Antennae with 2 bright red or orange basal segments, contrasting strongly with the rest, which are black. Side margins of pronotum widen out toward rear of pronotum. Colour very variable. Common. **34**

33b Antennae with 2 basal segments usually dark brown, slightly paler than the rest of the antennae at least on underside. Side margin of pronotum narrow throughout. Pronotum coppery red, elytra green, full-gloss. 12-14mm. Very rare, southern heathlands. *Pterostichus (=Poecilus) kugelanni*

33c Antennae entirely black. Side margin of pronotum narrow throughout. Whole upper surface uniformly metallic, coppery or green, full gloss in male, dull in female. 11-15mm. Scarce but widespread. *Pterostichus (=Poecilus) lepidus*

34 Head finely pitted. Hind tibia with 10-14 long, very thin spines along its inner edge (beware: spines can break off). Pronotum not wider than elytra over shoulders. Whole upper surface usually with a rather dull or frosted metallic sheen. 11-13.4mm. *Pterostichus (=Poecilus) cupreus*

34a Head almost without pits. Hind tibia with 7-9 shorter, thicker spines along its inner edge. Pronotum slightly wider than elytra over shoulders. Upper surface more glossy metallic. 9-12.2mm. *Pterostichus (=Poecilus) versicolor*

35 Third interval of elytra with deep pits about as wide as the interval, visible to the naked eye as dimples. **36**

35a Pits on elytra, if present, very fine, less than half the width of the interval and hard to see with a x10 lens. **40**

36 Hind angles of pronotum completely rounded (see couplet 15) *Pterostichus aterrimus*

36a Sides of pronotum straight or sinuate before hind angles, which are right-angled or sharply pointed **37**

37 14-18mm. Elytra iridescent (oil-film colours under low-angle illumination). Bristle-bearing pits on elytra fairly wide (about half to 2/3 width of interval), but not set in a deep depression clearly visible to the naked eye. Woods in north-east England. *Pterostichus cristatus*

37a 9.5-12.6mm. Not iridescent, but sometimes bronzed. Pits set in depressions which are usually clearly visible to the naked eye. **38**

38 First antennal segment much shorter than third. Each elytron with 3 or 4 deep pits on third interval. No fine bristle-bearing pit at the apex of 1st stria. 9.5-11mm. Lowland heaths and moors. *Pterostichus quadrifoveolatus (=angustatus)*

38a First antennal segment about equal in length to third. Each elytron with 4 or 5 or more deep pits on 3rd interval. One or more fine bristle-bearing pits at the apex, at the end of 1st stria. **39**

39 Tibiae reddish brown, paler than femora. Pronotum sides clearly sinuate: convex in front ¾, then concave or almost parallel-sided in rear ¼. Underside of thorax with scattered pits. Upper surface usually slightly bronzed. 9.5-12.6mm. Woodland, especially birch. *Pterostichus oblongopunctatus*

39a Tibiae as black as femora. Pronotum sides convex for most of length, converging almost to hind corners. Underside of thorax without, or with very few, pits. Upper surface unmetallic glossy black. 10.4-12mm. Upland moorland. *Pterostichus adstrictus*

40 Base of pronotum with a single deep depression pit or groove at either side, usually about a quarter the way from side margin to midline of pronotum. **41**

40a Base of pronotum with two depressions at either side, the inner usually prolonged forward as a deep groove, the outer one usually shorter, shallower and more triangular than the inner. **45**

41 More than 13mm long **42**

41a Less than 13mm long. **43**

42 14-18mm. Parallel-sided. Elytra iridescent (oil-film colours when seen from a low angle), and with 3 or 4 bristle-bearing pits n 3rd interval. . Woods in north-east England. *Pterostichus cristatus*

42a 13-17.5mm. Pronotum narrow, elytra widening toward rear, so whole beetle 'pear-shaped'. No pits on 3rd interval. *Laemostenus* (2 species) **22**

43b 8.7-12.6mm. Elytra plain black**.** Antennae and legs all black. Pronotum about the width of one elytron, strongly narrowed at rear. Deep, wide groove along side margins of pronotum forming the deep, wide pits at the base of the pronotum. Elytra widening toward rear. Woodland, common. *Agonum (=Platynus) assimile*

43c 5.3-7.2mm. Elytra plain black. Antennae all black or paler at base, legs dark or light brown. Pronotum almost as wide as both elytra together, only slightly narrower at rear than front. Pit at base of pronotum is a separate deep groove, some distance in from side margins. Elytra almost parallel-sided. **44**

44 Underside of thorax strongly pitted, glossy between pits. Legs reddish brown. 6-7.2mm. *Pterostichus strenuus*

44a Underside of thorax not pitted, but with a frosted or matt finish. At least femora dark brown. 5.3-6.7mm. *Pterostichus diligens*

45 Beetle broad oval, with pronotum exactly as wide as elytra over shoulders, and as wide as widest part of elytra. Base of pronotum concave, shallowly v-shaped. 7th elytral interval ridged, to the outer edge of the elytra is turned down almost vertically. 14-22mm. *Abax* **46**

45a Less broadly oval. Pronotum narrower than shoulders, and clearly narrower than widest part of elytra. Base of pronotum almost straight. 7th interval not ridged. 5-20.5mm **47**

46 7th elytral interval strongly keeled. Underside of last (claw-bearing) tarsal segments with 2 or more pairs of pale brown bristles. 18-22mm. Common, mainly woodlands. *Abax parallelepipedus*

46a 7th interval convex but not strongly keeled. Underside of last tarsal segment without bristles. 14-18mm. Rare introduction. *Abax parallelus*

47 Scutellar stria (p.53, fig. V.35) absent. 5-7.5mm **48**

47a Scutellar stria present. 6.8-20.5mm **49**

48 Elytra with a single bristle-bearing pit, on interval 3 near tip of elytra. Abdominal segments 4-7 each with a transverse groove. Tarsal segments without a furrow on upper surface. 5-6mm. Rare *Pterostichus longicollis*

48a Elytra with at least 2 bristle-bearing pits on interval 3, at least one in the front half of elytra. Abdominal segments smooth. Each tarsal segment with a groove running along its upper surface. 6-7.5mm. Common. *Pterostichus vernalis*

49 **[3 choices]**

49a Underside of last (claw-bearing) tarsal segments with 2 or more pairs of brown bristles. Pronotum widest at middle. 12-18mm. Very common in many habitats. *Pterostichus melanarius*

49b Underside of last tarsal segment without bristles. Pronotum widest toward the front. 15-20.5mm. Very common in many habitats. *Pterostichus niger*

49c Underside of last tarsal segment without bristles. 6.8-12.8mm. Mainly wetlands. **50**

50 Underside of abdomen segments pitted, at least at the sides. 8.8-12.8mm **51**

50a Abdomen segments smooth all over. 6.8-10mm **52**

51 Pronotum simply rounded and convex at sides, but with a small protruding tooth at hind angles (p. 53, fig. V.36a). Common in many habitats. 8.8-12.8mm. 2 species separable only by examining genitalia *Pterostichus nigrita/rhaeticus*

51a Pronotum with slightly sinuate sides (curving out from front to middle, in again in rear half, then straight or curving out again toward rear edge), and with right-angled hind-angles, with no protruding tooth. 10.5-12.5mm (not 17.5mm as in Lindroth and Forsythe). Rather scarce, wetlands. *Pterostichus anthracinus*

52 Longer and broader. Elytra iridescent (oil-film colours with low-angle light). Eyes protruding. Femora blackish, tibiae and tarsi sometimes paler. Male without keel on last abdominal segment. 8.5-10mm. Fens and marshes, rather local. *Pterostichus gracilis*

52a Smaller and narrower. Elytra not iridescent. Eyes rather flat. Legs pale to mid brown. Male with a fine raised longitudinal line along the last abdominal segment. 6.8-8.7mm. Wetlands, local but often abundant. *Pterostichus minor*

KEY TO RUDERAL GENERA AND SPECIES (and a few *Harpalus*-lookalikes, but omitting *Amara* and *Harpalus*)

1 A single pit with a long bristle above each eye (bristles often break off, but the small pits from which they arise are usually visible in good light). **2**

1a Two pits, each bearing a single long bristle, above each eye. **18**

2 Pronotum (at least in rear half), and all elytral intervals hairy (with hairs short, usually curved or lying flat against the surface), including the base of inner intervals. **3**

2a Upper surface not generally hairy, apart from a small number of long, erect bristles on elytra margin, above eyes, and on margin of pronotum. Sometimes hairy on outer 2-3 intervals, and along apex of inner intervals. **12**

3 Upper surface of tarsi without hairs. Antennae hairy (with large numbers of hairs, which are short, usually curved or lying flat against surface) from 4th segment onwards, contrasting with hairless segments 1 to 3 (which bear a small number of longer bristles near their apices). Head, pronotum and elytra usually metallic green, sometimes with yellow apex or margin to elytra. 8.5-13mm. *Chlaenius* (4 spp.) **4**

3a Tarsi hairy on upper surface. Antennae hairy from 2nd or 3rd segments onwards. Upper surface seldom metallic green, and never with a contrasting pale margin. **7**

4 Sides of elytra with narrow yellow stripe, and apex with a broader, jagged yellow band. Rest of upper surface usually metallic green. Sides of pronotum sinuate, and hind angles clearly protruding. 8.5-11mm. Local, in fens and rich waterside vegetation. *Chlaenius vestitus*

4a Sides of elytra same colour as rest. Upper surface usually metallic green on elytra but often metallic coppery on head and pronotum. Sides of elytra usually convex throughout, and hind angles rather blunt and not protruding. 10-13mm. **5**

5 Upper surface almost always strongly metallic. Antennae with at least the first segment reddish contrasting with the remaining segments which are black. Legs partly reddish or yellowish. **6**

5a Pronotum and elytra silky black, without or with a very faint metallic sheen; head sometimes with a coppery sheen. Antennae entirely dark, blackish; legs dark. 10.5-13mm. Extremely rare, in rich fens or bogs. *Chlaenius tristis*

6 Only 1st antennal segment yellow-brown . Palps dark, at least toward the apex of each segment, legs often black or red-brown. Sides of pronotum evenly convex. 10-12.5mm. Scarce, in rich fens and water-fringe vegetation. *Chlaenius nigricornis*

6a 2nd and usually 3rd antennal segment orange or red. Palps entirely pale, legs largely reddish or yellowish. Pronotum sides straight in hind third. 10-12mm. Extremely rare, on open sunny silt or clay ground near fresh water. *Chlaenius nitidulus*

7 Lacking a short scutellar stria (Forsythe p. 42, fig. IV.2). Uniformly dark brown. Only in saltmarshes. 5.2-8mm. *Dicheirotrichus* (2 spp.)

see Key small brown harpalines later in this Appendix

7a Short scutellar stria present. 5.5-17mm **8**

8 Upper surface of beetle uniform in colour, usually some shade of brown. **9**

8a Head and outer edges of elytra reddish, pronotum and an oval patch in midline, covering much of each elytron, black with a metallic blue-green sheen. 7.5-10mm. Extremely rare or extinct, in dry grassland. *Diachromus germanus*

9 Groove along base of elytra straight. Hairs on underside of thorax, if present, all pointing down toward ground, or standing up perpendicular to surface. Often smaller (5.5-17mm) **10**

9a Groove along base of elytra deeper and with a deep backward kink at level of 3rd stria. (Forsythe p.42, fig. IV.4). Side of thorax, beneath pronotum, with yellow hair with points forward toward the head. Pronotum much narrowed toward base, and with hind angles completely rounded. 11-13mm. Dark brown with red legs. Extremely rare or extinct, on dry, sandy soils. *Scybalicus oblongiusculus*

10 Head and front half of pronotum smooth and glossy, contrasting with hind half of pronotum and all of elytra which are covered with dense, short, yellowish hairs. Pronotum densely pitted across base, but smooth and shiny in middle. Pronotum sides straight or slightly sinuate in hind half, and hind corners well-marked, usually sharp and just over a right-angle. Upper surface dull black, legs reddish or yellowish. 8-16mm. **11**

10a Head and pronotum pitted and hairy throughout. If sides of pronotum are sinuate and hind corners well defined, then beetle is less than 10mm long, or upper surface is metallic blue. Hairs on upper surface not usually conspicuously yellowish. *Ophonus* (*c.* 14 spp.) **See *Harpalus***

11 Larger (10-16.7mm). Sides of pronotum slightly concave in hind fifth, so hind corners are quite sharp. Margins of pronotum dark red-brown, pronotum scarcely translucent. Legs usually reddish. Underside of last three abdominal segments finely pitted and covered with short hairs at sides but almost smooth in middle, or with a few scattered hairs near front and rear margins, but smooth and shiny in the middle of each segment. Very common in many habitats, including arable and gardens. *Pseudophonus rufipes*

11a Smaller (8-12.1m). Sides of pronotum straight in hind fifth, and hind corners of pronotum rounded at tip, so whole beetle appears to have a more distinct waist. Margins of pronotum pale yellow-brown, hind corners of pronotum translucent (like *Calathus ambiguus*). Legs usually paler, whitish or yellowish, when alive (may darken after death). Underside of last three abdominal segments hairy

in middle across full length of segment, but smooth and hairless at sides. Apparently a very rare migrant, not yet established in Britain. *Pseudophonus griseus*

12 Usually longer than 6.5mm, and usually stout, rounded beetles with pronotum about as wide as elytra, with thick, bristly legs. Pronotum almost always with a well-marked raised ridge across the base. Usually blackish, often with a metallic sheen. 5 -17mm. **13**

12a Never more than 6.5mm. Pronotum without a distinct basal ridge, except sometimes at sides. Unmetallic brown, often reddish or pale. Pronotum narrower than elytra, and beetle more elongate. 2.2-6.5mm **Small brown harpalines - see Key later in this Appendix**

13 First segment of hind tarsi equal to, or shorter than, apical spur of tibia. *Harpalus s.s.* (*c.* 20 spp.)

13a First segment of hind tarsi much longer than apical spur of tibia. **14**

14 Antennal segments hairy (with large numbers of hairs, which are short, usually curved or lying flat against surface) from segment 3 onwards, contrasting with hairless segments 1 to 3 (which bear a small number of longer bristles). Hind angles of pronotum blunt. Head without a pair of small reddish spots. 7.5-16mm. **15**

14a Antennal segments hairy from segment 2 onward. Hind angles of pronotum with a small tooth sticking out sideways. Head with a pair of small reddish spots, or a single oval spot, on upper surface behind eyes. Rather flat species, 8-13.5mm. Look very like *Harpalus* spp. *Anisodactylus* (3 spp.) **16**

15 7.5-10mm, flat, broadly-oval, found in fens and rich wetlands, often under water. Surface of pronotum flat and smooth, with dense microsculpting but no pits or zigzags. Spurs on all tibiae fine. Hind tarsi with first segment long and slender, at least twice as long as spur on tibia, and equal in length to 2nd and 3rd segments combined. A small bristle-bearing pit at base of scutellar stria (as in p.49, fig. V.12). Looks like a dull black *Amara.* *Oodes helopioides*

15a 14-16mm, long-oval, heavily-built, very convex, found in arable fields on dry soil. Surface of pronotum heavily pitted at base, and with shallow zigzag grooves across middle. Spurs on tibiae short and stout. Hind tarsi with 1st segment shorter and stouter, less than twice as long as tibial spurs, and shorter than 2nd and 3rd together. No bristle-bearing pit near scutellar stria. Looks like a very stout *Harpalus.* *Zabrus tenebroides*

16 Front tibia with a 3-pronged spur at apex (like *Amara plebeja).* Upper surface of head, pronotum and elytra metallic green. Clypeus (between base of jaws – see fig. inside front cover of Forsythe) with 2-4 bristles at either side on its front edge. Hind angles of pronotum completely rounded. 10-13.5mm. Looks very like *Harpalus aeneus.* Very rare species confined to salt-marshes. *Anisodactylus poeciloides*

16a Spur on front tibia not 3-pronged, though rather flatter and more angled at sides than in *Harpalus.* Upper surface matt black. Clypeus with only one bristle at each side. Hind angles of pronotum sharp, slightly protruding. **17**

17 Larger (10-12.8mm). Legs usually black. Outer 2-3 elytral intervals, and apical fifth of all intervals, pitted and covered with fine, short hairs. Basal groove curving backwards as it approaches shoulder, so running smoothly into side groove (like p.51, fig. V.24). Fairly frequent in many habitats, including clay grasslands, arable land and moorland. *Anisodactylus binotatus*

17a Smaller (8-10mm). Legs reddish. Inner intervals not pitted and hairy at apex, and outer intervals often also lacking hairs throughout. Basal groove of elytra running forward as it meets side groove at shoulder, so forming an angle (as in p.48 fig. V.4). Extremely rare, confined to dry sandy heathland. *Anisodactylus nemorivagus*

18 No bristle-bearing dorsal pits on flat surfaces of elytral intervals 1-7. Intervals never covered with short hairs and not heavily pitted. Rounded or parallel-sided oval species. Pronotum usually broadest near rear, and hind edge of pronotum about as wide as width of elytra at shoulders. **19**

18a At least 1, and sometimes up to 7, bristle-bearing pits on or adjoining 3rd interval, often next to 3rd or 2nd stria (marginal and apical bristles not counted). Sometimes pits also on flat part of other intervals. Pits can be small, inconspicuous, or close to apex of elytra (but not along elytral margin): they appear as depressions from above, and as upstanding hairs in side view. They tend to be in similar positions on the two elytra. (Intervals never have more than 7 bristle-bearing pits total, but may be covered with short hairs.) Often slender species, with pronotum much narrower than base of elytra, and strongly sinuate (S-shaped curve, bulging out, then going in at sides, then out again toward hind-angle) at sides; much narrower at base than at widest part. **Try Key to Genera**

19 Up to 15mm long. Usually dark brown or blackish with a metallic sheen. Mandibles short and blunt, protruding beyond the labrum by less than the length of the labrum, even when wide open. 8th elytral interval no more ridged or keeled than 7th and 9th. Rounded oval beetles. ***Amara*** (c. 30 spp.)

19a 18-22mm long, glossy black without a metallic sheen. Mandibles longer, protruding by more than the length of the labrum. 8th elytral interval ridged, to the outer edge of the elytra is turned down almost vertically. Parallel-sided, broadly oval, flattened. *Abax parallelepipedus*

SMALL BROWN HARPALINE GENERA

This key includes the following:

Dicheirotrichus (2 species)
Bradycellus (7 species)
Acupalpus (10 species)
Trichocellus (2 species)
Stenolophus (3 species)

Most of these beetles are found mainly in wetlands. The other important wetland species are in genera which are covered elsewhere: *Bembidion* (many species, all small (less than 7mm, and often much smaller; in a future key), *Pterostichus* (in a previous key), and several distinctive genera with few species, such as *Blethisa*, *Elaphrus*, and *Badister*. Although *Agonum* should be readily identified with the key to genera (where the lack of a crossed epipleure helps distinguish it from *Pterostichus*), it was also included in the *Pterostichus* key in Appendix 2, where a few species were taken to species, and the rest left as 'wetland *Agonum*'.

The species in these small brown harpaline genera are all fairly small (2.2-8mm) beetles, in various shades of brown. They all have a single bristle-bearing pit above each eye, and generally have faint furrows between the eyes (not the deep, fine lines, prolonged down the sides of the neck, as in *Trechus*), and the last palp segment is not much smaller than the previous one (as in *Bembidion*). Many of them live in wetlands, usually among dense vegetation. Because colour patterns are rather variable, some species key out more than once.

1 Upper surface smooth, elytra not hairy except for a small number of long marginal bristles. Head and pronotum not pitted and hairy, or only in rear half; no hairs on the eyes. A short scutellar stria usually present (Forsythe, p. 42, fig. IV.2) **2**

1a At least outer 2-3 intervals and apex of elytra covered in short, fine hairs, in addition to long marginal bristles. Upper surface of head and pronotum also pitted and hairy throughout; fine, short hairs also between the facets of the eyes. Short scutellar stria missing. **21**

2 Antennae dark with 1 or 2 basal segments pale. Mentum (underneath mouthparts, visible only if beetle is viewed from underneath) without a central tooth. Body rather flat. Usually mid or dark brown, often with pronotum paler. 2.2-6.2mm. In wet places. **3**

2a Antennae entirely pale. Mentum with a small central tooth between the two larger side teeth. Body convex, often uniformly pale reddish brown. 3-5.2mm. Often in dry places. *Bradycellus* (7 spp.) **4**

3 Small, 2.2-4mm, rarely 4.5mm. Tarsal segments of males not or only slightly concave. *Anthracus* (1 species) + *Acupalpus* (9 spp.) **13**

3a Larger, 5-6.2mm. 4th tarsal segment of male front and mid legs deeply concave or 2-lobed. *Stenolophus* (3 spp.) **24**

4 Large, 3.8-5.2mm (doubtful cases key both ways) **5**

4a Small, 2.5-3.5mm **9**

5 Hind angles of pronotum completely rounded, and sides straight or convex to hind angle. **6**

5a Hind angles of pronotum visible, sides of pronotum slightly sinuate in rear half, becoming very slightly concave just in front of hind angles. **7**

6 Scutellar stria present, and usually well marked. Groove round the sides of pronotum continues along base to the midpoint of the deep depression in the base of the pronotum. Usually large (3.8-5mm) and pale or red-brown. Eyes slightly more convex. Best to confirm identification with male genitalia: penis in dorsal view pointed. Very common everywhere. *Bradycellus harpalinus*

6a Scutellar stria absent or very faint. Groove round the sides of pronotum continues along base only about a quarter the way across the deep depression in the base of the pronotum. Smaller (3.5-4.3mm) and darker brown. Eyes slightly flatter. Best to confirm identification with male genitalia: penis in dorsal view blunt. Apparently rare. *Bradycellus csikii*

7 Pronotum finely pitted at front edge. No dorsal bristle-bearing pit on 3rd elytral interval . 4-4.5mm. Scarce and mainly coastal. *Bradycellus distinctus*

7a No fine pits near front edge of pronotum. Interval 3 with a bristle-bearing pit near 2nd stria just behind middle of elytra. **8**

8 Large (4.5-5.2mm) and pale or red-brown. Hind-wings full-length, often visible through the translucent elytra, otherwise lift elytra of fresh specimens: flies readily, often comes to light. Common everywhere, especially in dry habitats. *Bradycellus verbasci*

8a Small (3.9-4.5mm) and dark brown. Hind-wings short (lift elytra of fresh specimens). Usually in damp grassland or woodlands. Scarce. *Bradycellus sharpi*

9 Very small, 2.5-3.4mm. Dark brown or almost black, with a pale, orange line along the suture of the elytra. Pronotum pitted and covered in short, fine hairs at the rear and in middle. Under heather on heaths and moors, common in that habitat. *Bradycellus ruficollis*

9a Larger (3-5mm), if dark then not with conspicuous orange line down suture. Pronotum less pitted and without short hairs. **10**

10 Pronotum dark, with margins contrasting pale. 3.5-5mm. **11**

10a Pronotum pale brown, sometimes with a faint darker patch in middle, but margins not contrasting. 3-5mm. **12**

11 Scutellar stria present, and usually well marked. Groove round the sides of pronotum continues along base to the midpoint of the deep depression in the base of the pronotum. Usually large (3.8-5mm) and pale or red-brown. Eyes slightly more convex. Best to confirm identification with male genitalia: penis in dorsal view pointed. Very common everywhere. *Bradycellus harpalinus*

11a Scutellar stria absent or very faint. Groove round the sides of pronotum continues along base only about a quarter the way across the deep depression in the base of the pronotum. Smaller (3.5-4.3mm) and darker brown. Eyes slightly flatter. Best to confirm identification with male genitalia: penis in dorsal view blunt. Apparently rare. *Bradycellus csikii*

12 Larger (3.8-5mm). Head and pronotum rather small and narrow, elytra longer and broader, so beetle looks pear-shaped. Striae not pitted. Base and front of pronotum about equally wide. Eyes very convex and bulging. Common in most habitats. *Bradycellus harpalinus*

12a Smaller (3-3.5mm). Head and pronotum relatively rather larger, and elytra more parallel-sided, so whole beetle looks cylindrical. Striae finely pitted. Base of pronotum narrower than front edge. Eyes rather flattened. Under heather, mainly on upland moorland, rarely on lowland heaths.
Bradycellus caucasicus (=collaris)

13 Pronotum sides sinuate: convex at front, becoming concave toward rear, with hind angle jutting out. Antennae long and slender, whole beetle rather long and parallel-sided. Abdomen with many long hairs on underside. Usually dark brown, blackish on head, with elytra red-brown with a long blackish spot along the middle of each. 3.8-5mm. Rather scarce, usually in fens and rich waterside vegetation. *Anthracus (=Acupalpus) consputus*

13a Pronotum rounded to hind angles, which are completely rounded. Abdomen with only a few short hairs underneath. Usually smaller (2.2-4.5mm). *Acupalpus* **14**

14 Base of pronotum strongly pitted. Head and middle part of pronotum smooth and glossy. 3-4.3mm.
Acupalpus meridianus

14a Base of pronotum without strong deep pits. Head and pronotum with transverse fine microsculpture, so more silky, less glossy. **15**

15 3rd interval of elytra with a bristle-bearing pit, usually behind middle and next to 2nd stria. **16**

15a No bristle-bearing pit on 3rd interval. **20**

16 Smaller, 2.5-2.8mm.. Head, including eyes, almost as wide as than pronotum. **17**

16a Larger, 3-4.5mm. Head, including eyes, clearly narrower than pronotum. **18**

17 Pronotum larger, slightly longer than head (measured from front of pronotum to tip of jaws). Whole beetle is shades of brown, with pale legs, sometimes darkened at tips of tibiae. 2.5-2.7mm. Common. *Acupalpus dubius*

17a Pronotum smaller, about same length as head. Whole beetle blackish, with tibiae also mainly dark. 2.2-2.8mm. Scarce. *Acupalpus exiguus*

18 Pronotum convex and evenly rounded. First 2 antennal segments pale. Pronotum always bright re- or orange-brown. Front tibiae stout, the male with 4th tarsal segment deeply 2-lobed. Extremely rare, south-eastern. *Acupalpus elegans*

18a Pronotum flatter, with sides straighter in rear half. Second antennal segment darker than first. Pronotum often darker in middle. Front tibiae slenderer, male 4th tarsal segment only slightly concave at apex. Very variable in colour, but often mid brown with pale base to elytra. 3-4mm. Common. *Acupalpus parvulus (=dorsalis)/maculatus* **19**

19 Pronotum clearly wider than long, rather flat. Pronotum widest in front third, widest point almost coinciding with the long bristle on either side of pronotum. 3-4mm. Common.
Acupalpus parvulus (=dorsalis)

19a Pronotum almost square, rather convex and domed in middle. Pronotum widest just in front of middle, some distance behind the pair of long bristles. Recently added to British list, so status unclear, apparently rare and southern. *Acupalpus maculatus*

20 Uniform dark brown or blackish, with suture paler. Only 1st antennal segment pale. 3-3.5mm. Rare.
Acupalpus brunnipes

20a Blackish, with contrasting bright orange pronotum. Basal 2 antennal segments pale. 2.6-3.5mm. Scarce. *Acupalpus flavicollis*

21 Large, 5.2-8mm. Each elytral interval with a row of fine bristles along its full length. Hind angles of pronotum pointed or right-angled. Only in saltmarshes. *Dicheirotrichus* (2 spp.) **22**

21a Small, 3.5-5.5mm. Hairy only on the outer 3 intervals and the apical fifth of each inner interval. Hind angles of pronotum rounded. Often in freshwater marshes or on moorland.
Trichocellus (2 spp.) **23**

22 Each elytral interval with 1-2 rows of deep pits, each pit bearing a fairly long hair. Males dark brown or blackish, females pale brown, both sexes with a darker longitudinal band down the middle of each elytron. 5-7.5mm (often smaller than next species). Common in saltmarshes. *Dicheirotrichus gustavi*

22a Each elytral interval with about 3 rows of finer pits, each bearing a rather shorter hair. Both sexes pale brown with a dark band down the middle of each elytron. 5.5-7.8mm. Rather scarce, in salt-marshes. *Dicheirotrichus obsoletus*

23 Small, 3.5-4.2mm. Dark, only basal antennal segment pale, whole upper surface sometimes dark brown or blackish, or reddish on elytra. Moorlands and peat, northern and upland. *Trichocellus cognatus*

23a Larger, 4-5.5mm. Usually with 2-3 basal antennal segments pale, and upper surface pale to mid brown with a dark central spot across elytra. Fens and marshes, common. *Trichocellus placidus*

24 Pronotum dark with a narrow pale margin, not strongly contrasting. Base of pronotum with many small pits. Only first antenna segment pale. 5.1-5.6mm. Common. *Stenolophus mixtus*

24a Pronotum bright orange or red-brown, contrasting with blackish head. Base of pronotum almost unpitted. Two basal segments of antennae pale. **25**

25 Ridge down side edges of pronotum continues round hind angle and along base. Elytra entirely pale, or vaguely darker toward tips. 5-6mm. Scarce, wetlands. *Stenolophus skrimshiranus*

25a Ridge down side edges of pronotum stops at hind angle. Elytra usually reddish or orange with a single large oval black spot in apical half, overlapping midline. 5.5-6.2mm. Scarce, wetlands. *Stenolophus teutonus*

KEY TO INLAND LOWLAND *BEMBIDION* AND RELATIVES

Many of the 70 or so beetles in *Bembidion* and related genera are confined to upland streams with sand or shingle, and others are found only in saltmarsh, or are extremely rare, so need not confuse the beginner in the land-locked lowlands. These genera all share the distinctive feature of having the last segment of the maxillary palps (the larger outer pair of palps) much shorter and thinner than the penultimate segment, hence the English name Pin-palps. The two species-poor genera, *Asaphidion* and *Tachys*, are fairly distinct, and are keyed out at the beginning. *Bembidion*, with 60 species, about a sixth the British carabid fauna, and no species longer than 7.5mm, might seem more daunting. This key concentrates on the commonest species, and will probably include over 90% of the individuals found in Beds, Cambs and Northants.

KEY TO INLAND LOWLAND *BEMBIDION*, *ASAPHIDION* and *TACHYS*

1 Elytra covered in short curved hairs, which are dense in parts, sparse in others, so creating a pattern on the frosted, brassy background. Eyes very large. Legs pale, creamy or whitish with darker joints or tibiae, and at least 4 basal antennal segments pale in part. 3.4-6mm. *Asaphidion* **2**

1a Elytra not hairy, and seldom frosted. Eyes often smaller. Legs and antennae often dark. **5**

2 Smaller (3.9-4.7mm), eyes so large that head is wider than pronotum. A short, fine diagonal ridge running in from each hind angle of pronotum. Common. **3**

2a Large (5-6mm), head not wider than pronotum. No short keel at base of pronotum just inside hind angles. Scarce, streams or coastal cliffs. *Asaphidion pallipes*

3 Antennae entirely pale, or gradually getting darker from about 5th segment toward apex. At least segments 1-4 are completely pale. Sides of pronotum rather strongly angled at the point where the marginal bristle arises. Elytra rather short and broad, densely pitted and usually with strong longitudinal wrinkles or undulations (not microsculpture). Upper surface usually with a red coppery sheen. *Asaphidion curtum*

3a Antennae suddenly darker brown from segment 5 onward, so apical part of antennae contrast with basal. Segments 1-4 either all yellowish, or each segment slightly darkened at its apex. Legs darkened, at least where femur joins tibia. Pronotum sides more smoothly rounded. Elytra usually less densely pitted, and without or with only weak, longitudinal wrinkles. **4**

4 Penultimate (largest) segment of maxillary (larger, outer) palps dark brown or black on upper surface. Legs strongly darkened where femur and tibia join, and all tarsal segments darkened, usually blackish and faintly metallic. Elytra rather long and parallel-sided. *Asaphidion stierlini*

4a Penultimate segment of palps entirely pale yellowish, or faintly browner on upper surface. At least the front legs, and often all legs, uniformly brownish yellow, not darkened and metallic. Elytra usually shorter and more rounded, less parallel-sided. Whole upper surface usually with a bronze sheen. *Asaphidion flavipes s.s.*

5 Very small (1.5-2.8mm). Dark brown or black, without paler spots. Outer edge of tibiae cut off obliquely at apex. 1st elytral stria runs to tip of elytra then loops back on itself around the apex. *Tachys* **Rare, very small and difficult: not keyed here**

5a Usually larger (2.5-6.5mm). Often with pale spots on elytra. Tibiae square-ended. 1st stria loops back only in 2 species, which are 3.5-6mm long. *Bembidion* **6**

6 Shoulders angular, basal groove and ridge (which run along the base, effectively joining up the elytral striae) present in outer part of elytra, cutting across to meet the side groove, forming a definite angle pointing forward into the shoulder (p. 40, fig. III.41). 2.8-4.4mm. **7**

6a Shoulders rounded, groove and ridge down the side of the elytron curves round the shoulder and fades gradually along the base of the elytra (p. 40, fig. III.40); no distinct basal groove present. May be larger. **9**

7 Pronotum completely rounded at sides, not sinuate and without protruding hind angles. Base straight. Upper surface black, unmetallic, often rather dull. 2.8-3.5mm. Very common, including farmland on clay soils. *B. obtusum*

7a Sides of pronotum sinuate, hind angles sharply protruding. Upper surface usually strongly metallic, brassy or bluish. 3.2- 4.2mm. **8**

8 Frontal furrows absolutely straight and parallel-sided in front of bristle-bearing pits. 7th elytral stria visible in basal half of elytra, almost as strong as 6th. Ridge down sides of pronotum broader. Common in many habitats. *B. properans*

8a Frontal furrows slightly sinuous, each with a slight outward bulge about halfway along, between bristle-bearing pits and base of clypeus. 7th stria usually (not always!) absent or much weaker than 6th, if present containing no more than 7 pits, which are finer than the first 7 in stria 6. Ridge down sides of pronotum narrower. 3.5-4.2mm. Very common in most habitats. *B. lampros*

9 Pronotum completely rounded ***at sides***, completely convex to hind angles, not sinuate and without protruding hind angles. ***Base*** slightly or strongly sinuate. Elytra either all black or with a pale spot toward apex. **10**

9a ***Sides*** of pronotum sinuate, hind angles sharply protruding. Variously coloured, often with pale markings in basal half of elytra. **15**

10 Larger (3.4-5.5mm). Base of pronotum deeply sinuate at sides (with a deep forward step at each side, as in p. 37, fig. III.29). Upper surface often bluish, iridescent or brassy. **11**

10a Smaller (2.8-3.5mm). Base of pronotum only shallowly sinuate at sides, often appearing almost straight at a casual glance (p. 37, fig. III.30). Upper surface usually black or brown without a coloured sheen. **14**

11 7th elytral striae visible for most of length of elytra, and coarsely pitted in basal (front) half, almost as strong as 6th. Elytra usually blue-green metallic with an orange-yellow spot near apex. 1st antenna segment pale. 3.8-4.3mm. Very common, especially in nutrient-rich wetlands, cattle-ponds etc. *B. biguttatum*

11a 7th stria absent or consisting of a few very fine pits. 1st antenna segment usually as dark as rest. **12**

12 Head, pronotum and elytra dull or frosted-brassy black. Striae very finely pitted and intervals flat. 3.4-4.5mm. Common in muddy wetlands. *B. aeneum*

12a Upper surface glossy, black, blue-green or iridescent. Striae more coarsely pitted, and intervals convex. **13**

13 Larger (4.1-5.5mm). Antennae long and slender, segments 8-10 (not last one) clearly more than twice as long as thick. Elytra glossy and strongly iridescent. Striae with rather fine pits. Confined to saltmarshes and tidal rivers, where it is frequent. *B. iricolor*

13a Smaller (3.6-4.1mm). Antennae shorter and thicker, segments 8-10 each about twice as long as thick. Upper surface fairly glossy black with a faint bluish sheen. Striae with very coarse pits. Common by fresh waters of all kinds. *B. lunulatum*

14 Legs and 1st antennal segment clear bright reddish. Hind-wings (under elytra) short. Elytra more convex, shorter and more rounded at sides. 2.8-3.4mm. Frequent in woodlands and fens. *B. mannerheimii (=unicolor)*

14a Legs and 1st antennal segment a dirty mid- or pale-brown. Hind wings short or full-length. Elytra longer, flatter and more parallel-sided. 2.8-3.5mm. Very common near fresh water or on clay or loamy farmland. *B. guttula*

15 With characteristic deep and conspicuous frontal furrows and ridges: ***either*** straight, deep and strongly converging toward front (V-shaped) and prolonged on clypeus, ***or*** doubled at each side at least at front of head. 2.5-4mm. **16**

15a Frontal furrows a single groove, sometimes with a ridge along the inner side, deep or shallow, but more or less parallel, never strongly convergent, rarely prolonged onto clypeus, and never doubled at any point. 2.3-6.5mm **21**

16 Frontal furrows a single groove at each side of head, converging, V-shaped (p.38, fig. III.32). **17**

16a Frontal furrows doubled, at least in front, but not strongly converging (p.38, fig. III.31) **18**
[If elytra are black with 2 well defined pale yellow spots on each, go to 23]

17 Elytra blackish, sometimes with a faint pale spot near apex but always dark in basal half. Pronotum with a single round pit at each side of midline groove (p.38, fig. III.33). At least 1st antennal segment reddish. 3.1-3.6mm. Rich fens and marshes. Uncommon. *B. doris*

17a Elytra with numerous pale spots, pale brownish-yellow spots uniting in basal half of elytra, and usually a brighter yellow diagonal pale spot on outer side of elytra in apical third. Pronotum with an oval pit on midline and 2 smaller round pits on either side (fig. III.34). Usually with first 3 antennal segments pale. 2.9-3.9mm. Pronotum slightly narrower than head. Common in most wetlands. *B. articulatum*

18 Frontal furrows doubled throughout their length (as in fig. III.31). 2.8-4mm **19**

18a Frontal furrows doubled only in front third of their length. 2.5-3.2mm. Legs entirely reddish-brown. Head and pronotum unmetallic black. Striae of elytra strongly pitted. Elytra glossy. 2.5-3mm. Fairly frequent in fens and marshes. *B. gilvipes*

19 Larger (3.5-4mm). Elytra with yellow spots throughout, not dark in basal half. Rather scarce, in fens and other freshwater marshes. *B. fumigatum*

19a Smaller (2.8-3.7mm). Elytra all dark or with a pale spot near apex. **20**

20 Antennae with 3-4 basal segments reddish, rest of antennae blackish. Pronotum strongly frosted with microsculpture, so appears much less glossy than elytra. Pronotum relatively narrower, elytra relatively longer. 2.8-3.5mm. Common beside fresh water. *B. assimile*

20a Only 1st antennal segment reddish. Pronotum with only faint microsculpture, so as glossy as elytra. Pronotum broader, less narrowed at base, elytra relatively shorter and more convex. 3.2-3.7mm. Beside fresh water, rather scarce. *B. clarki*

21 1st elytral stria runs to tip of elytra then loops back on itself around the apex, the groove becoming deeper and wider in the loop. Whole beetle uniform red- or dark-brown. 4.3-6mm, red-brown, sometimes with elytra darker than head and pronotum, upper surface entirely unmetallic. Side margin of pronotum wide, base of pronotum straight. A single bristle-bearing pit on 3rd interval of elytra in apical half. Very common in many habitats including woodlands and wetlands. Often climbs trees. *B. (=Ocys) harpaloides*

21a 1st stria continues straight to apex or fades away, never looping back. Sie margin of probotum usually narrow and often shallower, base often angled forwards at sides. At least one bristle-bearing pit on 3rd interval in basal half of elytra. Often with pale spots on elytra. **22**

22 Hind angles of pronotum very sharp, set slightly forward from base, with a small incision behind them. Each elytron usually with 2 pale, opaque creamy or yellow spots, occasionally with just one. 2.5-4mm. Whole upper surface glossy. **23**

22a Hind angles in line with the base, not set forward. Elytra with various patterns and sometimes frosted or only half-gloss. **24**

23 First 4 antennal segments and whole of legs pale, at most femora slightly brownish. 2.8-3.5mm. Very common in many habitats. *B. quadrimaculatum*

23a Antennae and legs entirely black or dark brown with black femora. Larger (3.5-4mm). Elytra each with 2 pale spots. Uncommon, usually on damp clay or chalk soils. *B. quadripustulatum*

24 Bristle-bearing pits on 3rd elytral interval are in middle of the interval, not touching 2nd or 3rd stria. **25**

24a Bristle-bearing pits are touching or situated within the 2nd or 3rd stria. **27**

25 Larger (5.1-6mm), with a shiny raised area around the bristle-bearing pit next to the eye (p.39, fig. III.35). Frontal furrows prolonged almost to level with hind edge of eye. Tip of last abdominal segment yellowish, contrasting with black-brown of rest of abdomen, easiest to see from below. Common. *B. dentellum*

25a Smaller (3-5.1mm), without shiny raised area around bristle-bearing pit above each eye. Frontal furrows shallower, fading away about level with the midpoint of the eye. Tip of abdomen, above and below, same colour as rest of abdomen. **26**

26 Larger (4.1-5.1mm). Legs pale. First antennal segment, and undersides of segments 2-4, red-brown. Pale markings on elytra usually more extensive. Shoulders rather square. Common in many wetland types including saltmarshes and river and lake shores. *B. varium*

26a Smaller (3-4.4mm). Legs black or very dark brown. First antennal segment slightly paler than rest, which are black. Elytra blackish with 2 narrow, broken diagonal cream or brown bands. Shoulders rounded. Widespread but uncommon, especially on peaty soils. *B. obliquum*

27 Elytra each with 1 or 2 well-marked pale spots. **28**

27a Elytra uniformly coloured, dark, usually black with a blue or green metallic sheen. **32**

28 Elytral striae rather faint, only 1st stria reaching beyond halfway down elytra. Upper surface extremely smooth and glossy. Pale spots are opaque pale yellow. Pronotum equilateral or slightly longer than wide, strongly constricted at base (base is about 60% maximum width of pronotum). 4-4.9mm. Common on bare ground beside fresh water, an rapid colonist of new ponds. *B. illigeri (=genei)*

28a Striae deeper, surface with some hint of microsculpture so not as glossy. Pale spots often orange or brownish, often translucent rather than pale-pigmented. Ponotum clearly broader than long, and less constricted at base. **29**

29 **7**th elytral striae visible for most of length of elytra, and coarsely pitted in basal (front) half, almost as strong as 6th. Base (rear) of pronotum with many coarse pits, especially in the depression at either side. Hind wings usually short (lift elytra, or look through translucent spots under strong light. A stout species with broad pronotum and oval elytra. Legs and antennae pale, reddish. 4.9-6.1mm. Very common in most habitats, wet and dry. *B. tetracolum*

29a 7th stria absent or consisting of a few very fine pits. Pronotum smooth, or with a scatter of fine pits, or with a few coarse pits in the depressions at base. Hind wings always full-length. 4.2-5.5mm. **30**

30 2nd antennal segment dark, at least at apex. Legs with at least femora darkened. Pronotum dull with dense microsculpture. Pale spots on elytra often brownish and hard to see. 4-5.2mm. Fairly common in a range of wetlands. *B. bruxellense*

30a 2nd (and often also 3rd) antennal segment pale. Pronotum glossy. Pale spots on elytra whitish or creamy translucent. **31**

31 First three antennal segments and all legs entirely pale, creamy or whitish. 4.5-5.5mm. On gravel or sand beside running water or at the coast. *B. bualei (=andreae)*

31a 3rd antennal segment and at least femora brownish. 4.2-5.2mm. Common on bare sand or clay, not always beside water. *B. femoratum*

32 All elytral striae continue to apex of elytra. 7th stria as strong and deep as 6th. Upper surface entirely dark-metallic. OR head pitted or with a group of sharp pits behind each eye. OR legs entirely black.

Upland species associated with sand and shingle beside fast-flowing water

32a Striae become shallow and faint at apex. 7th stria faint or absent. Head not pitted all over, nor with a group of pits behind each eye. Legs pale, at least at base of femora or on tibiae. **33**

33a Pronotum dull, with very strong microsculpture. Upper surface brown or black with a faint brassy sheen. Femora black or dark red-brown. Elytra usually with 2 pale spots, but these are often brownish and may be overlooked, so elytra may appear all dark. 4-5.2mm. Fairly common in a range of wetlands. *B. bruxellense*

33a Pronotum shiny. Upper surface, especially of elytra, metallic blue or green. Legs usually clear red. **34**

34 Smaller, 4.5-5.3mm. Penultimate (largest) segment of maxillary palps, and femora, dark brown or blackish, contrasting with rest of palps and tibiae. Elytra rather narrow and parallel-sided. Common in a range of habitats, usually damp. *B. deletum (=nitidulum)*

34a Larger, 5.2-6.1mm. Whole of palps and legs red, not darkened. Elytra rather broader and more rounded at side, slightly wider toward read. Scarce, usually on damp clay under scrub or in woodland. *B. stephensii*

APPENDIX 3: RECENT ADDITIONAL SPECIES AND NAME CHANGES IN BRITISH GROUND-BEETLES

Introduction

The following lists show the additions and proposed name changes between Luff's (2007) standard key and its predecessor, Lindroth (1974). Most of the changes were introduced by the Palaearctic list edited by Lobl & Smetana (2003), with a few more recent amendments. Older names listed have been used in guides in English in the last 30 years or so; many more synonyms are present in the European literature, and in the more distant past.

Several of the most species-rich genera, such as *Carabus*, *Bembidion*, *Pterostichus*, *Amara*, *Harpalus* and *Agonum*, have been variously subdivided in European works in recent years. In this list, and in the accompanying keys, I have been quite conservative, retaining large genera wherever possible, and adopting only the most widely accepted subdivisions at genus level. Even in these cases, the 'new' genera are still keyed together, and may be easier to remember in the larger groupings.

Fuller lists of synonyms, and references for the additions and name changes are available on *The Coleopterist* website, ***http://www.coleopterist.org.uk***

Table 1: Recent additions and amendments

In this table, I have included species which have often been omitted from recent British lists and keys, even though there are historical records of their occurrence in Britain.

Species	**Reason for addition**
Brachinus sclopeta	Several old records, recently rediscovered
Carabus auratus	Recent introduction, now established
Carabus cancellatus	Occasional non-established introduction
Carabus convexus	19th century record ? formerly established
Asaphidion curtum	taxonomic split from *A. flavipes s.l.*
Asaphidion stierlini	taxonomic split from *A. flavipes s.l.*
Bembidion coeruleum	Addition ? recent colonist
Bembidion inustum	Addition, ? rare & overlooked
Pterostichus rhaeticus	Taxonomic split from *P. nigrita*
Harpalus griseus	Addition, probably non-established vagrant
Ophonus subsinuatus	Addition: overlooked museum specimens
Acupalpus maculatus	Taxonomic split from *A.dorsalis*
Calathus cinctus	Taxonomic split from *C. melanocephalus*
Agonum lugens	Addition, ? rare & overlooked
Microlestes minutulus	Addition, ? recent colonist
Cymindis macularis	Addition, probably rare and overlooked

Table 2: Recent name changes

In the following table, I have used CAPITALS for genera and italic lower case for species names which have changed. In some cases a species has been placed in more than one genus in recent years, and in a few cases, more than one previous species name has been applied. In a very few cases, both genus and species have changed. ***The first list is in taxonomic order, the second alphabetical.***

CYLINDERA *germanica*	was CICINDELA
LEISTUS *terminatus*	was *rufescens*
EURYNEBRIA *complanata*	*was* NEBRIA
NEBRIA *rufescens*	was *gyllenhali*
NOTIOPHILUS *aesthuans*	was *aestuans* (misspelling)
AEPUS *robinii*	was *robini* (misspelling)
BLEMUS *discus*	was LASIOTRECHUS and TRECHUS
TRECHOBLEMUS *micros*	was TRECHUS
TACHYS obtusiusculus	was *edmondsi*
ELAPHROPUS *parvulus*	was TACHYS
ELAPHROPUS *quadrisignatus*	was TACHYS
ELAPHROPUS *walkerianus*	was TACHYS
POROTACHYS *bisulcatus*	was TACHYS
OCYS *harpaloides*	was BEMBIDION
OCYS *quinquestriatus*	was BEMBIDION
CILLENUS *lateralis*	was BEMBIDION
BRACTEON *argenteolum*	was BEMBIDION and CHRYSOBRACTEON
BRACTEON *litorale*	was BEMBIDION and CHRYSOBRACTEON
BEMBIDION *bualei*	was *andreae* and *cruciatum* and *anglicanum*
BEMBIDION *deletum*	was *nitidulum*
BEMBIDION *stephensii*	was *stephensi* (misspelling)
BEMBIDION *illigeri*	was *genei*
BEMBIDION *schuppelii*	was *schuppeli* (misspelling)
BEMBIDION *mannerheimii*	was *mannerheimi* (misspelling) and *unicolor*
POECILUS *cupreus*	was PTEROSTICHUS
POECILUS *kugelanni*	was PTEROSTICHUS
POECILUS *lepidus*	was PTEROSTICHUS
POECILUS *versicolor*	was PTEROSTICHUS
PTEROSTICHUS *quadrifoveolatus*	was *angustatus*
PLATYDERUS *depressus*	was *ruficollis*
SYNUCHUS *vivalis*	was *nivalis*
CALATHUS *rotundicollis*	was *piceus*
LAEMOSTENUS	was LAEMOSTHENES and PRISTONYCHUS
OXYPSELAPHUS *obscurus*	was AGONUM
PARANCHUS *albipes*	was AGONUM and *ruficornis*
BATENUS *livens*	was AGONUM
PLATYNUS *assimilis*	was AGONUM
ANCHOMENUS *dorsalis*	was AGONUM
SERICODA *quadripunctata*	was AGONUM
AGONUM *chalconotum*	was *sahlbergii*
AGONUM *emarginatum*	was *afrum* and *moestum*
CURTONOTUS *alpinus*	was AMARA
CURTONOTUS *aulicus*	was AMARA
CURTONOTUS *convexiusculus*	was AMARA
HARPALUS *affinis*	was *aeneus*
HARPALUS *froelichii*	was *froelichi* (misspelling)
HARPALUS *laevipes*	was *quadripunctatus*
HARPALUS *pumilus*	was *vernalis*
HARPALUS *rufipalpis*	was *rufitarsis*
OPHONUS *ardosiacus*	was HARPALUS

OPHONUS *azureus*	was HARPALUS
OPHONUS *sabulicola*	was HARPALUS
OPHONUS *stictus*	was HARPALUS *obscurus* and *monticola*
OPHONUS *cordatus*	was HARPALUS
OPHONUS *laticollis*	was HARPALUS *punctatulus* and *nitidulus*
OPHONUS *melletii*	was HARPALUS *melleti* (misspelling)
OPHONUS *parallelus*	was HARPALUS
OPHONUS *puncticeps*	was HARPALUS
OPHONUS *puncticollis*	was HARPALUS
OPHONUS *rufibarbis*	was HARPALUS *brevicollis*
OPHONUS *rupicola*	was HARPALUS
BRADYCELLUS *caucasicus*	was *collaris*
ACUPALPUS *brunnipes*	was *brunneipes* (misspelling)
ACUPALPUS *parvulus*	was *dorsalis*
ANTHRACUS *consputus*	was ACUPALPUS
CHLAENIUS *nitidulus*	was *holosericeus*
LICINUS *punctatulus*	was *punctulatus*
BADISTER *bullatus*	was *bipustulatus*
BADISTER *collaris*	was *anomalus*
MASOREUS *wetterhallii*	was *wetterhali* (misspelling)
DEMETRIAS	was RISOPHILUS
PARADROMIUS *linearis*	was DROMIUS
PARADROMIUS *longiceps*	was DROMIUS
CALODROMIUS *spilotus*	was DROMIUS *quadrinotatus*
PHILORHIZUS *melanocephalus*	was DROMIUS
PHILORHIZUS *notatus*	was DROMIUS
PHILORHIZUS *quadrisignatus*	was DROMIUS
PHILORHIZUS *sigma*	was DROMIUS
PHILORHIZUS *vectensis*	was DROMIUS
SYNTOMUS *foveatus*	was METABLETUS
SYNTOMUS *obscuroguttatus*	was METABLETUS
SYNTOMUS *truncatellus*	was METABLETUS

Alphabetical list of new names

ACUPALPUS brunnipes	was brunneipes (misspelling)
ACUPALPUS parvulus	was dorsalis
AEPUS robinii	was robini (misspelling)
AGONUM chalconotum	was sahlbergii
AGONUM emarginatum	was afrum and moestum
ANCHOMENUS dorsalis	was AGONUM
ANTHRACUS consputus	was ACUPALPUS
BADISTER bullatus	was bipustulatus
BADISTER collaris	was anomalus
BATENUS livens	was AGONUM
BEMBIDION bualei	was andreae and cruciatum and anglicanum
BEMBIDION deletum	was nitidulum
BEMBIDION illigeri	was genei
BEMBIDION mannerheimii	was mannerheimi (misspelling) and unicolor
BEMBIDION schuppelii	was schueppeli (misspelling)
BEMBIDION stephensii	was stephensi (misspelling)
BLEMUS discus	was LASIOTRECHUS and TRECHUS
BRACTEON argenteolum	was BEMBIDION and CHRYSOBRACTEON
BRACTEON litorale	was BEMBIDION and CHRYSOBRACTEON
BRADYCELLUS caucasicus	was collaris
CALATHUS rotundicollis	was piceus
CALODROMIUS spilotus	was DROMIUS quadrinotatus
CHLAENIUS nitidulus	was holosericeus
CILLENUS lateralis	was BEMBIDION
CURTONOTUS alpinus	was AMARA
CURTONOTUS aulicus	was AMARA

CURTONOTUS convexiusculus	was AMARA
CYLINDERA germanica	was CICINDELA
DEMETRIAS	was RISOPHILUS
ELAPHROPUS parvulus	was TACHYS
ELAPHROPUS quadrisignatus	was TACHYS
ELAPHROPUS walkerianus	was TACHYS
EURYNEBRIA complanata	was NEBRIA
HARPALUS affinis	was aeneus
HARPALUS froelichii	was froelichi (misspelling)
HARPALUS laevipes	was quadripunctatus
HARPALUS pumilus	was vernalis
HARPALUS rufipalpis	was rufitarsis
LAEMOSTENUS	was LAEMOSTHENES and PRISTONYCHUS
LEISTUS terminatus	was rufescens
LICINUS punctatulus	was punctulatus
MASOREUS wetterhallii	was wetterhali (misspelling)
NEBRIA rufescens	was gyllenhali
NOTIOPHILUS aesthuans	was aestuans (misspelling)
OCYS harpaloides	was BEMBIDION
OCYS quinquestriatus	was BEMBIDION
OPHONUS ardosiacus	was HARPALUS
OPHONUS azureus	was HARPALUS
OPHONUS cordatus	was HARPALUS
OPHONUS laticollis	was HARPALUS punctatulus and nitidulus
OPHONUS melletii	was HARPALUS melleti (misspelling)
OPHONUS parallelus	was HARPALUS
OPHONUS puncticeps	was HARPALUS
OPHONUS puncticollis	was HARPALUS
OPHONUS rufibarbis	was HARPALUS brevicollis
OPHONUS rupicola	was HARPALUS
OPHONUS sabulicola	was HARPALUS
OPHONUS stictus	was HARPALUS obscurus and monticola
OXYPSELAPHUS obscurus	was AGONUM
PARADROMIUS linearis	was DROMIUS
PARADROMIUS longiceps	was DROMIUS
PARANCHUS albipes	was AGONUM and ruficornis
PHILORHIZUS melanocephalus	was DROMIUS
PHILORHIZUS notatus	was DROMIUS
PHILORHIZUS quadrisignatus	was DROMIUS
PHILORHIZUS sigma	was DROMIUS
PHILORHIZUS vectensis	was DROMIUS
PLATYDERUS depressus	was ruficollis
PLATYNUS assimilis	was AGONUM
POECILUS cupreus	was PTEROSTICHUS
POECILUS kugelanni	was PTEROSTICHUS
POECILUS lepidus	was PTEROSTICHUS
POECILUS versicolor	was PTEROSTICHUS
POROTACHYS bisulcatus	was TACHYS
PTEROSTICHUS quadrifoveolatus	was angustatus
SERICODA quadripunctata	was AGONUM
SYNTOMUS foveatus	was METABLETUS
SYNTOMUS obscuroguttatus	was METABLETUS
SYNTOMUS truncatellus	was METABLETUS
SYNUCHUS vivalis	was nivalis
TACHYS obtusiusculus	was edmondsi
TRECHOBLEMUS micros	was TRECHUS

APPENDIX 4: WHERE TO FIND GENERA IN FORSYTHE'S KEYS

The keys to genera, and some of the other keys, provided on this course, are probably quicker and easier to use, and is certainly much easier to work back through (in the rare event that you make a mistake) than Forsythe's keys. But, having reached a genus name, you may want to move across to Forsythe to attempt species identification. So, the following table lists all the genera, alphabetically, and gives page numbers and couplets in the keys, in the two editions of Forsythe's book.

Genus	No. of Spp.	Page, couplet Forsythe (1987)	Page, couplet Forsythe (2000)
Abax	2	48, 6	63, 18
Acupalpus	9	45, 32	60, 64
Aepus	2	33, 3	40, 22
Agonum	25	54, 79	71, 91
Amara	30	49, 14	64, 23
Anisodactylus	3	45, 30	56, 31
Asaphidion	4	34, 11	38, 3
Badister	7	56, 98	62, 9
Bembidion	60	36, 37	43, 53
Blethisa	1	29, 37	32, 36
Brachinus	2	33, 37	37, 45
Bradycellus	7	46, 42	53, 7
Broscus	1	35, 22	40, 27
Calathus	8	36, 29	42, 43
Callistus	1	47, 55	53, 8
Calosoma	2	26, 11	29, 11
Carabus	9	27, 14	29, 12
Chlaenius	4	47, 54	53, 3 or 61, 77
Cicindela	5	26, 6	28, 3
Clivina	2	35, 23	41, 28
Cychrus	1	26, 11	29, 10
Cymindis	3	32, 34	36, 38
Demetrias	3	31, 12	34, 13
Diachromus	1	omitted	54, 14
Dicheirotrichus	2	47, 56	53, 9
Dromius	12	31, 14	34, 16
Drypta	1	33, 38	37, 46
Dyschirius	11	35, 26	41, 28
Elaphrus	4	29, 34	31, 32
Eurynebria	1	29, 38	32, 37
Harpalus	20	44, 16	56, 30
Laemostenus	2	55, 96	63, 19
Lebia	5	30, 4	33, 4
Leistus	6	28, 25	30, 23

Genus	No. of Spp.	Page, couplet Forsythe (1987)	Page, couplet Forsythe (2000)
Licinus	2	55, 97	62, 7
Lionychus	1	30, 8	33, 8
Loricera	1	33, 4	40, 25
Masoreus	1	31, 17	34, 19
Metabletus	4	30, 8	33, 9
Microlestes	2	30, 8	37, 47
Miscodera	1	35, 23	41, 28
Nebria	4	29, 38	32, 37
Notiophilus	8	34, 14	38, 9
Odacantha	1	31, 21	35, 26
Olisthopus	1	48, 11	71, 91
Omophron	1	26, 1	28, 1
Oodes	1	43, 8	53, 1
Ophonus	14	43, 11	54, 15
Panagaeus	2	48, 3	62, 5
Patrobus	3	51, 46	68, 61
Pelophila	1	29, 37	32, 36
Perigona	1	48, 1	62, 1
Perileptus	1	33, 3 and 36, 37 and 48, 1	50, 123 and 62, 1
Platyderus	1	48, 11	71, 91
Pogonus	3	52, 51	71, 92
Polistichus	1	32, 34	36, 39
Pseudophonus	2	43, 11	61, 79
Pterostichus	25	52, 53	68, 60
Scybalicus	1	47, 54	54, 13
Sphodrus	1	48, 7	63, 21
Stenolophus	3	45, 34	60, 66
Stomis	1	48, 4	63, 16
Syntomus	4	30, 8	33, 9
Synuchus	1	36, 29	42, 43
Tachys	8	41, 94	50, 124
Thalassophilus	1	33, 3	40, 22
Trechus	9	41, 95	51, 132
Trichocellus	2	47, 52	53, 7
Zabrus	1	42, 7	53, 1