

An annotated check-list of British Pleistocene, Holocene and modern freshwater ostracods

H. I. GRIFFITHS¹ & J. G. EVANS²

¹Department of Genetics, School of Biological Sciences, University of Leeds, Woodhouse Road, Leeds LS2 9JT, UK.

²School of History & Archaeology, University of Wales College of Cardiff, PO Box 909, Cardiff CF1 3XU, UK.

ABSTRACT - A revised check-list of British Pleistocene, Holocene and Recent freshwater ostracods is given, and notes provided on the taxonomy and occurrence of some rare and newly-reported species. *Stenocyprina fischeri* (Lilljeborg, 1883) and the hypogean species *Pseudocandona* cf. *eremita* (Vedjvosky, 1882) and *Pseudocandona breuili* (Paris, 1920) are reported from Britain for the first time. *J. Micropalaeontol.* 14(1): 59–65, April 1995.

INTRODUCTION

Over recent years there has been renewed interest in freshwater ostracods, particularly because of their potential in palaeolimnological and palaeohydrological studies (see reviews by Delorme, 1989; De Deckker & Forester, 1988; Carbonel *et al.* 1988; Holmes, in press). This increase in ecological interest has been accompanied by a spate of taxonomic and systematic research that has done much to increase our understanding of evolutionary patterns and processes in freshwater Ostracoda. Some freshwater ostracod lineages are evolutionarily dynamic, and divergence within the Holocene has been demonstrated for at least one cluster of lake-specific taxa (Martens, 1990). It is possible that the examination of ostracod valves in extended lake cores (which often cover periods of several thousands of years) may prove to be a powerful tool to the evolutionary biologist (Evans & Griffiths, 1993). However, advances in ostracod palaeobiology do require continuity in systematic nomenclature.

A BRIEF HISTORY OF BRITISH OSTRACOD STUDIES

Some of the key works in ostracod taxonomy were based on studies of the British and Irish faunas during the last century, notably through the work of G. S. Brady and colleagues (e.g. Brady & Robertson, 1869; Brady & Norman, 1889; Brady, 1910). As a result, comparatively comprehensive check-lists of the faunas of both Britain (Scourfield, 1904) and Ireland (Norman, 1905) were available within the first years of this century. Subsequently, interest in native ostracod faunas waned, and scientific attention was turned to the description of species from overseas. Some workers continued to study British freshwater species, notably P. F. Holmes, A. G. Lowndes, G. Fryer and H. M. Fox, however most had a broad interest in freshwater Crustacea, rather than a specific interest in ostracods. Hence, prior to the 1980s, there were remarkably few published contributions, and no substantial body of

work accrued. Despite this, J. E. Robinson's Pleistocene and Holocene studies continued to document ostracod faunas, as occasionally have archaeological (e.g. Griffiths & Mount, 1993) and modern synecological works (e.g. Ham, 1982).

An updated check-list of freshwater Ostracoda was made as part of the Institute of Terrestrial Ecology's attempt to compile a complete listing of British freshwater animals (Maitland, 1977). This was not based upon the work of a single individual, but gleaned from a variety of sources, largely without reappraisal. More recently, a new faunal work on modern British freshwater ostracods has been published as part of the Linnean Society's 'Synopsis of the British Fauna' series (Henderson, 1990). Unfortunately, this important benchmark was delayed in press for almost five years (Henderson, pers. comm.) and, as a result, over 30% of the specific and generic nomenclature used by Henderson had been superseded by the time of publication. The undesirable result is a loss of continuity with current European taxonomic usage (e.g. Wouters, 1989; Meisch *et al.* 1990). With the increasing interest in the group by both palaeoecologists and freshwater biologists, it seems timely to provide a check-list of the British species that includes not only recent revisions, but also records of Recent species omitted by Henderson (1990), plus a small number of species that are thus far known only from Pleistocene and Holocene contexts.

NOTES ON SOME OF THE SPECIES

Changes of generic assignment and specific nomenclature have come about as the result of formal revisions, the details of which are beyond the scope of this account. Key works include those of Broodbakker (1983), Carbonnel (1965), Colin & Danielopol (1980), Danielopol (1978), Danielopol & McKenzie (1977), Danielopol *et al.* (1989), Marmonier *et al.* (1989), Martens (1989, 1992) and Meisch (1984, 1985, 1991). Some species do require additional comment, however.

Cypridopsis bamberi was originally described from a spring in Cornwall by Henderson (1986). Professor T. K. Petkovski (pers. comm.) initially suggested the possible

synonymy of *C. bamberi* with *C. brincki* Petkovski, 1963, described from wells in the Azores and also known from Germany, Portugal and Macedonia (Petkovski, 1963). We examined type material of *C. bamberi* lodged in the collections of the Natural History Museum in London (BMNH) and reached a similar conclusion. More recently, Petkovski *et al.* (1993) have shown *C. brincki* to be a junior synonym of *C. lusatica* Schäffer, 1943, and the synonymy of *C. bamberi* has been confirmed by Dr. C. Meisch of the Natural History Museum of Luxemburg (Meisch, pers. comm.).

Eucypris anglica was posthumously described as a British endemic by Fox (1967) from sites in Buckinghamshire and Hertfordshire, but has since only been reported as a single specimen from Hampshire (Ham, 1982). Syntypes are maintained in the BM(NH)'s Fox Collection (accession nos 1967.4.3.1,2,3,4), the material consisting of four sealed microscope slides bearing valves, two intact individuals, and intact specimens decalcified in potassium hydroxide. All are mounted in glycerine jelly or euparal. These specimens compare well with illustrated descriptions of *E. crassa* in Klie (1938) and Sywula (1974), although are a little larger than usually cited (i.e. 2.2 mm). At our request, Professor T. K. Petkovski has re-examined material of *E. anglica* originally sent to him by Fox, and concluded that the species is indeed distinct. We therefore maintain *E. anglica* on the British list, although reinvestigation of new material of this species would be welcome.

Ilyocypris biplicata is well-known in Quaternary palaeontology, and has been recorded in the modern faunas of Canada (Delorme, 1970) and France (Meisch *et al.*, 1990). The status of the species has long been the source of debate; Scourfield (1904) stated that *I. biplicata* was common in Britain, although it seems possible that he may have been confused between *I. biplicata* and *I. gibba*. Sywula (1974) lists *I. biplicata* as a subspecies of *I. gibba*. Palaeontologists have long accepted *I. biplicata* (*sensu* Diebel & Pietrzeniuk, 1969: pl 7, figs 1–3), and Van Harten (1979) provides a valve-based diagnosis of the species. *Ilyocypris biplicata* is a bland ilyocypridid, in which surface ornamentation is reduced. The carapace is sub-rectangular, posteriorly and anteriorly rounded, and with ventral and posterior margins running almost parallel. In Britain the species has often been recorded at Pleistocene sites, and we have material from Holocene deposits at West Overton in Wiltshire (Griffiths & Mount, 1993). As soft-part diagnosis remains elusive (Meisch, 1988), it would seem that *I. gibba* and *I. biplicata* would benefit from examination by either molecular or genitalia-based taxonomic techniques (cf. Martens, 1991). Until such a time as they can either be synonymized or verified, it seems prudent to maintain *I. biplicata* as a valid species.

Western European species of *Potamocypris* have been extensively revised by Meisch (1984, 1985) and the nomenclature used here differs somewhat from that of Henderson (1990). *Potamocypris arcuata* was first recorded in the modern British fauna by Griffiths & Evans (1992) from a temporary, groundwater-fed pool in Hampshire. Since that time we have also found the species amongst

air-dried material from Regent's Park Lake, London (*leg.* J. E. Robinson). The species is also known from British late Devensian and Holocene deposits as *P. maculata* Alm, 1914 (see list of synonyms in Meisch, 1985).

***Eucypris elliptica*.** This is one of Britain's less well-known species; Henderson (1990) knew of no definite locations for *E. elliptica* in the UK. In December 1990, we collected two females from the shallows of Llangorse Lake in the Brecon Beacons National Park, Wales, and Professor D. D. Williams has recently provided further specimens collected from the Island of Bardsey off the North Wales coast.

***Eucypris lilljeborgi*.** Again, Henderson (1990) knew of no definite records for this 'exceedingly rare' species, although *E. cf. lilljeborgi* had been reported from Holocene tufas (Preece & Robinson, 1984; Willing, 1985). We have since found *E. lilljeborgi* living in great numbers in a run-off and rain-fed, grassy, seasonally-inundated meadow adjacent to a *Phragmites*-rich pond at Thornhill in Cardiff. *Eucypris lilljeborgi* first appears when the habitat is inundated in October or November, and then seems to breed continuously until the site dries out in early summer. The species rarely occurs in the reed beds which border the inundated grasses, and males are absent. Carapace length is more variable than usually believed; we have collected gravid females ranging from 1.42–1.88 mm long, although clearly identifiable as *E. lilljeborgi* on the basis of soft-part anatomy.

***Trajancypris serrata*.** There has been considerable confusion over the taxonomic status of denticulate eucypridines. Some are assignable to *Prionocypris serrata* (Norman, 1861) of which we have modern and Holocene material from the Test Valley, Hampshire. Martens (1989) erected genus *Trajancypris* to accommodate subclavate eucypridines with pronounced lists and selvages on the anterior inner margins, including *Eucypris serrata* G. W. Müller, 1900 and *E. clavata*, the latter having often been recorded from the Pleistocene as *Sclerocypris? clavata prisca* Diebel & Pietrzeniuk, 1969. Because of the confusion over nomenclature, it now seems almost impossible to say with confidence which denticulate eucypridine was actually meant by many earlier authors. Hence, we provisionally maintain *T. serrata* in the British check-list, despite having seen neither subfossil or modern material.

***Paralimnocythere* spp.** There has been some confusion over the correct specific assignment of non-Balkan species of *Paralimnocythere*, now resolved by Martens (1992). Subfossil British material has usually been referred to *P. compressa* or *P. cf. diebeli*. *Paralimnocythere compressa* is known from Mid Pleistocene, late Devensian and Holocene deposits in Britain, although it has not been collected alive for over a century (Martens, 1992). *Paralimnocythere diebeli* was originally described from Macedonia (Petkovski, 1969) and a variant, *Paralimnocythere cf. diebeli*, was described from the German Mid Pleistocene (Diebel & Pietrzeniuk, 1978: fig.2, pl. 52, figs 8–11). *Paralimnocythere cf. diebeli* has been reported from late Devensian deposits at Kildale, Yorkshire (Keen *et al.*, 1984). *Paralimnocythere relicta* is only known from the

modern fauna, having been reported from Hampshire by Henderson (1990).

Fabaeformiscandona siliquosa. This is an unusual species which appears to be a British endemic. Some authors have doubted this; Nüchterlein (1969: 246) believed *F. siliquosa* to be synonymous with *F. caudata*. Henderson (1990) maintains *F. siliquosa* as a valid species, listing several sites in the New Forest of Hampshire. We have also collected *F. siliquosa* from permanent ponds in the New Forest and compared it with specimens of *F. caudata* from France (*leg.* P. Marmonier). The two species appear very different, and we have retained them both as distinct species.

Candona lactea was reviewed by Brady (1910) and retained as a valid species by Henderson (1990). Although we have not examined type material of this taxon, we have collected material that appears similar to *C. lactea*, but have never encountered mature individuals. We therefore maintain *C. lactea* in the British list until formal revision is made, but believe that it may be a synonym mistakenly erected upon juvenile material of another species. Further investigation is required to validate or deny this suggestion.

Pseudocandona elongata was initially described from Lakes Windermere and Ohrid (Holmes, 1937) although no type material was nominated, and none has been located (Henderson, pers. comm.). Petkovski (pers. comm.) has failed to record the species despite many years collecting at Lake Ohrid. Within recent years *P. elongata* has been reported from Lake Windermere by Horne *et al.* (1990), but subsequent collections have failed to provide further specimens (Horne, pers. comm.). This species also requires further investigation before it can be validated.

PLEISTOCENE AND HOLOCENE SPECIES

In addition to a diverse modern British fauna, a small number of species are known exclusively from Pleistocene and Holocene deposits, although some exist only as single records. These include *Leucocythere baltica* (as *Limnocythere baltica*), *Limnocythere falcata*, *Limnocythere stationis*, *Limnocythere* cf. *usenensis*, *Ilyocypris quinculminata*, *I. papillata*, *I. schwarzbachii*, *Candona levanderi*, *Candona lozeki*, *Candona triticatrica*, *Fabaeformiscandona fabella* (as *Candona fabella*), *Fabaeformiscandona balatonica* (as *Candona balatonica*), *Pseudocandona breuili*, *Pseudocandona* cf. *eremita*, *Nannocandona faba*, *Scottia browniana*, *S. tumida*, *Eucypris dulcifrons*, *E. heinrichi*, *Herpetocypris ehringsdorfensis* and *Stenocypris fischeri*. In addition, the Tertiary species *Eucypris* cf. *gemella* has been reported from Pleistocene deposits at Holderness (Catt & Penny, 1962) and a few taxa, e.g. *Candona brevicornis* Klie, 1925 have been reported from the Irish Republic (Preece *et al.*, 1986). Some taxa are believed to have stratigraphic value (Robinson, 1978), notably: *Candona triticatrica*, *C. lozeki*, *Limnocythere falcata*, *Leucocythere baltica*, *Ilyocypris quinculminata*, *I. schwarzbachii*, and possibly *I. papillata* (see Robinson, 1990). The biostratigraphic importance of *Scottia* spp. has been discussed in detail by Kempf (1971).

Candona lozeki has been reported from the British Holocene (Willing, 1985; Mount, 1991) and from the Mid Devensian (Gibbard *et al.*, 1981), whilst locations for *C. triticatrica* are all Mid Pleistocene. Fuhrmann (1991) has suggested that *C. lozeki*/*C. triticatrica* are synonymous. If this is the case, this would remove the stratigraphic value of both taxa.

Pseudocandona breuili was first described from a cave in Spain (Paris, 1920) and, as *Candona breuili*, is known from the German Quaternary (Diebel & Pietrzeniuk, 1984) and the Belgian Holocene (Van Frausum & Wouters, 1990). Definitive determination of this species is difficult without soft-parts, although we have collected it in considerable numbers from Holocene deposits at West Overton, Wiltshire and from the Test Valley, Hampshire. It appears that the species lived interstitially, and Danielopol (1978) lists *P. breuili* as a hypogean species. In some cases at least, it seems that *P. breuili* has been erroneously identified as the juvenile moult stages of *Psychrodromus olivaceus*.

Pseudocandona eremita is one of a cluster of hypogean ostracods that display a high degree of local endemism, and represent a distinct lineage within *Pseudocandona* (Danielopol, 1982). These are difficult to identify with precision without soft parts, hence we have cited our taxon as *P.* cf. *eremita*. The species occurs in Holocene sediments from West Overton, Wiltshire and Bossington, Hampshire, where it seems to have existed interstitially. *Pseudocandona eremita* has a distinctive triangulate carapace, quite unlike any other British candonid.

Stenocypris fischeri is only known in Britain from Holocene material from West Overton, Wiltshire (Griffiths & Mount, 1993). *Stenocypris fischeri* is illustrated in several European faunal works (e.g. Klie, 1938: 124, figs 416–418; Sywula, 1974: 211, fig. 105, pls 17 g–h).

Nannocandona faba. The absence of this species from the fauna of Modern mainland Britain is rather puzzling; the species is quite widespread in Pleistocene and Holocene deposits, furthermore *Nannocandona* sp. has been reported from Modern Ireland (Douglas & Healey, 1991). As *Nannocandona faba* often occurs in interstitial contexts, especially in rivers (Marmonier & Danielopol, 1988), it is possible that it may yet be found in modern Britain, where interstitial habitats remain largely unexplored.

SYSTEMATIC CHECK-LIST

In the following species list, higher-level systematic nomenclature follows Bowman & Abele (1982), and familial nomenclature largely conforms to Hartmann & Puri (1974). The nomenclature of rankings below the familial level conforms to current European usage (Meisch *et al.*, 1990). Taxonomic authorities are drawn from Kempf's index (1980a, b). Species are broadly provenanced by the following superscripts: P = Pleistocene, H = Holocene, R = Recent. Those taxa which have been recorded in the British fauna, but whose status is here considered questionable, are prefixed by a question mark. *Cyprideis torosa* is included, although more typically a species of brackish waters.

- Phylum or sub-phylum **Crustacea** Pennant, 1777
 Class **Ostracoda** Latreille, 1806
 Sub-class **Podocopa** G. W. Müller, 1894
 Order **Podocopida** Sars, 1866
 Sub-order **Podocopina**, Sars 1866
- Superfamily **Darwinuloidea** Brady & Norman, 1889
 Family **Darwinulidae** Brady & Norman, 1889
 Genus *Darwinula* Brady & Robertson, 1885
Darwinula stevensoni (Brady & Norman, 1870)^{PHR}
- Superfamily **Cytheroidea** Baird, 1850
 Family **Limnocytheridae** Klie, 1938
 Sub-family **Limnocytherinae** Klie, 1938
 Genus *Leucocythere* Kaufmann, 1900
Leucocythere baltica (Diebel, 1965)^P
 Genus *Limnocythere* Brady, 1867
Limnocythere falcata Diebel, 1968^P
Limnocythere inopinata (Baird, 1843)^{PHR}
Limnocythere sanctipatricii (Brady & Robertson, 1869)^{PHR}
Limnocythere stationis Vavra, 1891^P
Limnocythere cf. *usenensis* Karmischina, 1970^P
 Genus *Paralimnocythere* Carbonnel, 1965.
Paralimnocythere compressa (Brady & Norman, 1889)^{PHR}
Paralimnocythere cf. *diebeli* (Petkovski, 1969) Diebel & Pietrzeniuk, 1978^P
Paralimnocythere relicta (Lilljeborg, 1863)^R
 Sub-family **Timiriaseviinae** Mandelstam, 1960
 Genus *Metacypris* Brady & Robertson, 1870
Metacypris cordata Brady & Robertson, 1870^{PHR}
- Family **Cytherideidae** Sars, 1925
 Sub-family **Cytherideinae** Sars, 1925
 Genus *Cytherissa* (Sars, 1863)
Cytherissa lacustris (Sars, 1863)^{PHR}
 Genus *Cyprideis* (Jones, 1850)
Cyprideis torosa (Jones, 1850)^{PHR}
- Superfamily **Cypridoidea** Baird, 1845
 Family **Candonidae** Kaufmann, 1900
 Sub-family **Candoninae** Kaufmann, 1900
 Genus *Candona* s.s. Baird, 1845
Candona angulata G. W. Müller, 1900^{PR}
Candona brevicornis Klie, 1925^H
Candona candida (O. F. Müller, 1776)^{PHR}
 ? *Candona lactea* Baird, 1850^R
Candona levanderi Hirschmann, 1912^P
 ? *Candona lozeki* Absolon, 1973^{PH}
Candona neglecta Sars, 1887^{PHR}
Candona tricatricosa Diebel & Pietrzeniuk, 1969^P
 Genus *Cryptocandona* Kaufmann, 1900
Cryptocandona reducta (Alm, 1913)^R
Cryptocandona vavrai Kaufmann, 1900^{HR}
 Genus *Fabaeformiscandona* Krstic, 1972
Fabaeformiscandona acuminata (Fischer, 1854)^R
Fabaeformiscandona balatonica (Daday, 1894)^{PH}
Fabaeformiscandona caudata (Kaufmann, 1900)^{HR}
Fabaeformiscandona fabella (Nüchterlein, 1969)^H
Fabaeformiscandona fabaeformis (Fischer, 1851)^{PHR}
Fabaeformiscandona fragilis (Hartwig, 1898)^R
Fabaeformiscandona hyalina (Brady & Robertson, 1870)^R
Fabaeformiscandona protzi (Hartwig, 1898)^{PR}
Fabaeformiscandona siliquosa (Brady, 1910)^R
 Genus *Pseudocandona* Kaufmann, 1900
Pseudocandona albicans (Brady, 1864)^{PHR}
Pseudocandona breuili (Paris, 1920)^H
- Pseudocandona compressa* (Koch, 1838)^{PHR}
Pseudocandona cf. *eremita* (Vejdovsky, 1882)^H
Pseudocandona insculpta (G. W. Müller, 1900)^R
Pseudocandona lobipes (Hartwig, 1900)^{HR}
Pseudocandona marchica (Hartwig, 1899)^{PH}
Pseudocandona pratensis (Hartwig, 1901)^{PHR}
Pseudocandona rostrata (Brady & Norman, 1889)^H
Pseudocandona sarsi (Hartwig, 1899)^R
Pseudocandona stagnalis (Sars, 1890)^R
 Genus *Candonopsis* Vávra, 1891
Candonopsis kingsleii (Brady & Robertson, 1870)^{PHR}
Candonopsis scourfieldi Brady, 1910^R
 Genus *Nannocandona* Ekman, 1914
Nannocandona faba Ekman, 1914^{PH}
 Genus *Paracandona* Hartwig, 1899
Paracandona euplectella (Robertson, 1889)^{HR}
 Sub-family **Cyclocypridinae** Kaufmann, 1900
 Genus *Cyclocypris* Brady & Norman, 1889
Cyclocypris globosa (Sars, 1863)^R
Cyclocypris laevis (O. F. Müller, 1776)^{PHR}
Cyclocypris ovum (Jurine, 1820)^{PHR}
Cyclocypris serena (Koch, 1838)^{PHR}
 Genus *Cypria* (Zenker, 1854)
Cypria exsculpta Fischer, 1855^R
Cypria ophthalmica (Jurine, 1820)^{PHR}
- Family **Ilyocyprididae** Kaufmann, 1900
 Genus *Ilyocypris* Brady & Norman, 1889
Ilyocypris biplicata Koch, 1838^{PH}
Ilyocypris bradyi Sars, 1890^{PHR}
Ilyocypris decipiens Masi, 1905^R
Ilyocypris getica Masi, 1906^R
Ilyocypris gibba (Ramdohr, 1808)^{PHR}
Ilyocypris inermis Kaufmann, 1900^{PHR}
Ilyocypris lacustris Kaufmann, 1900^P
Ilyocypris monstifrica (Norman, 1862)^{PR}
Ilyocypris papillata Robinson, 1990^P
Ilyocypris quinculminata Sylvester-Bradley, 1973^P
Ilyocypris schwarzbachi Kempf, 1967^P
- Family **Notodromatidae** Kaufmann, 1900
 Sub-family **Notodromatinae** Kaufmann, 1900
 Genus *Notodromas* Lilljeborg, 1853
Notodromas monacha (O. F. Müller, 1776)^R
 Sub-family **Cyproidinae** Hartmann, 1963
 Genus *Cyprois* Zenker, 1854
Cyprois marginata (Straus, 1821)^{PHR}
- Family **Cyprididae** Baird, 1845
 Sub-family **Cypricerinae** McKenzie, 1971
 Genus *Bradleystrandesia* Broodbakker, 1983
Bradleystrandesia fuscata (Jurine, 1820)^{HR}
Bradleystrandesia reticulata (Zaddach, 1844)^{HR}
 Genus *Strandesia* Stuhlmann, 1888
Strandesia obliqua (Brady, 1868)^{HR}
 Sub-family **Cypridinae** Baird, 1845
 Genus *Cypris* O. F. Müller, 1776
Cypris bispinosa Lucas, 1849^R
Cypris pubera O. F. Müller, 1776^{PHR}
 Sub-family **Dolerocypridinae** Triebel, 1961
 Genus *Dolerocypris* Kaufmann, 1900
Dolerocypris fasciata (O. F. Müller, 1776)^R
 Sub-family **Eucypridinae** Bronshtein, 1947
 Genus *Eucypris* (Vávra, 1891)
Eucypris anglica Fox, 1967^R
Eucypris crassa (O. F. Müller, 1785)^R
Eucypris dulcifrons Diebel & Pietrzeniuk, 1969^P
Eucypris elliptica (Baird, 1846)^R

- Eucypris* cf. *gemella* Bodina, 1961^P
Eucypris heinrichi Diebel & Pietrzeniuk, 1978^{PHI}
Eucypris lilljeborgi (G. W. Müller, 1900)^{HR}
Eucypris ornata (O. F. Müller, 1776)^R
Eucypris pigra (Fischer, 1851)^{PHR}
Eucypris virens (Jurine, 1820)^{PHR}
 Genus *Prionocypris* Brady & Norman, 1896
Prionocypris serrata (Norman, 1861)^{PHR}
 Genus *Tonnacypris* Diebel & Pietrzeniuk, 1975
Tonnacypris lutaria (Koch, 1838)^{HR}
 Genus *Trajancypris* Martens, 1989
Trajancypris clavata (Baird, 1838)^{PHR}
 ? *Trajancypris serrata* (G. W. Müller, 1900)^R
 Sub-family **Herpetocypridinae** Kaufmann, 1900
 Genus *Herpetocypris* Brady & Norman, 1889
Herpetocypris brevicaudata Brady & Norman, 1889^{PHR}
Herpetocypris chevreuxi Sars, 1896^{PHR}
 ? *Herpetocypris ehringsdorfensis* Diebel & Wolfschläger, 1975^P
Herpetocypris reptans (Baird, 1835)^{PHR}
 Genus *Psychrodromus* Danielopol & McKenzie, 1977
Psychrodromus olivaceus (Brady & Norman, 1889)^{PHR}
Psychrodromus robertsoni (Brady & Robertson, 1889)^R
 Genus *Stenocypria* G. W. Müller, 1901
Stenocypria fischeri (Lilljeborg, 1883)^{H1}
 Sub-family **Scottinae** Bronshtein, 1947
 Genus *Scottia* Brady & Norman, 1889
Scottia browniana (Jones, 1850)^P
Scottia pseudobrowniana Kempf, 1971^{PHR}
Scottia tumida Kempf, 1971^P
 Sub-family **Cyprinotinae** Bronshtein, 1947
 Genus *Heterocypris* Claus, 1892
Heterocypris incongruens (Ramdohr, 1808)^{HR}
Heterocypris salina (Brady, 1868)^{PHR}
 Sub-family **Isocypridinae** Rome, 1965
 Genus *Isocypris* G. W. Müller, 1908
Isocypris beauchampi (Paris, 1920)^R
 Sub-family **Cypridopsinae** Kaufmann, 1900
 Genus *Cypridopsis* Brady, 1867
Cypridopsis hartwigi G. W. Müller, 1900^{PHR}
Cypridopsis lusatica Schäffer, 1943^R
Cypridopsis obesa Brady & Robertson, 1869^R
Cypridopsis vidua (O. F. Müller, 1776)^{PHR}
 Genus *Plesiocypridopsis* (Rome, 1965)
Plesiocypridopsis newtoni (Brady & Robertson, 1870)^{HR}
 Genus *Sarscypridopsis* McKenzie, 1977
Sarscypridopsis aculeata (Costa, 1847)^{HR}
 Genus *Cavernocypris* Hartmann, 1964
Cavernocypris subterranea (Wolf, 1920)^{HR}
 Genus *Potamocypris* Brady, 1870
Potamocypris arcuata (Sars, 1903)^{PHR}
Potamocypris fallax Fox, 1967^{HR}
Potamocypris fulva (Brady, 1868)^{PHR}
Potamocypris pallida Alm, 1914^R
Potamocypris similis G. W. Müller, 1912^{HR}
Potamocypris smaragdina (Vávra, 1891)^{HR}
Potamocypris variegata (Brady & Norman, 1889)^{HR}
Potamocypris villosa (Jurine, 1820)^{PHR}
Potamocypris zschokkei (Kaufmann, 1900)^{PHR}

ACKNOWLEDGEMENTS

Our thanks to Dr S. Halsey (Crustacea Section, BMNH) for allowing our examination of type material from the Museum's collections. Professor T. K. Petkovski (Macedo-

nian Museum of Natural History, Skopje), Dr D. J. Horne (University of Greenwich, London), Dr P. A. Henderson (National Power Marine Biology Labs, Fawley) and Dr C. Meisch (National Museum of Natural History, Luxembourg) provided valuable discussions and advice. Dr P. Marmonier (University of Savoy) and Dr J. E. Robinson (University College, London) are thanked for comparative material. Special thanks to Dr K. Martens (KBIN, Brussels) who kindly read through an earlier version of this manuscript, made many useful comments and criticisms, and also provided a preprint of his study of *Paralimnocythere*. Thanks also to our many colleagues for their ready help, advice, and assistance.

This study was funded by a SERC research grant to J. G. Evans.

Manuscript received August 1992

Manuscript accepted May 1993

REFERENCES

- Bowman, T. E. & Abele, L. G. 1982. Classification of the Recent Crustacea. In Abele, L. G. (Ed.), *The biology of Crustacea, volume 1. Systematics, the fossil record and evolution*, 1–27, Academic Press, New York.
- Brady, G. S. 1910. A revision of the British species of ostracod Crustacea belonging to the subfamilies Candoninae and Herpetocypridinae. (with a note on a parasitic worm, by Miss M.V. Lebour, M.Sc.). *Proceedings of the Zoological Society of London*, London, **1910**: 194–220, pls 19–30.
- Brady, G. S. & Norman, A. M. 1889. A monograph of the marine and freshwater Ostracoda of the North Atlantic and of North-western Europe. Section I. Podocopa. *Scientific Transactions of the Royal Dublin Society*, Dublin, **4**: 63–270, pls 8–23.
- Brady, G. S. & Robertson, D. 1869. Notes on a week's dredging in the west of Ireland. *Annals and Magazine of Natural History London*, Ser. 4, **3**: 353–374, pls 18–22.
- Broodbakker, N. W. 1983. The genus *Strandesia* and other Cypricerini (Crustacea, Ostracoda) in the West Indies. Part 1. Taxonomy. *Bijdragen tot de Dierkunde*, Leiden, **53**: 327–368.
- Carbonel, P., Colin, J. P., Danielopol, D. L., Löffler, H. & Neustrueva, I. 1988. Palaeoecology of limnic ostracodes: a review of some major topics. *Palaeogeography, Palaeoclimatology, Palaeoecology*, Amsterdam, **62**: 413–461.
- Carbonnel, G. 1965. Sur un nouveau genre (*Paralimnocythere*) et une nouvelle espèce (*P. bouleigensis*) d'ostracodes du Tortonien. *Archives des Sciences, Genève*, Geneva, **18**: 146–150, pls 1–2.
- Catt, J. A. & Penny, L. F. 1962. The Pleistocene deposits of Holderness, East Yorkshire. *Proceedings of the Yorkshire Geological Society*, Leeds, **35**: 375–420.
- Colin, J. P. & Danielopol, D. L. 1980. Sur la morphologie, la systématique, la biogéographie et l'évolution des ostracodes Timiriaseviinae (Limnocytheridae). *Paléobiologie continentale*, Montpellier, **11**: 1–51, pls 1–16.
- Danielopol, D. L. 1978. Über Herkunft und Morphologie der Süßwasser-hypogäischen Candoninae (Crustacea, Ostracoda). *Sitzungsberichte der Österreichischen Akademie der Wissenschaften, Mathematisch-naturwissenschaftliche Klasse, Abteilung 1*, Vienna, **187**: 1–162.
- Danielopol, D. L. 1982. Nouvelles données sur les Candoninae (Ostracoda) hypogées de Roumanie et Yugoslavie. *Bulletin du Museum national d'Histoire naturelle de Paris. (Sect. A)*, Paris, **4**: 369–396.
- Danielopol, D. L. & McKenzie, K. G. 1977. *Psychrodromus* gen. n. (Crustacea, Ostracoda), with redescription of the cypridid genera *Prionocypris* and *Ilyodromus*. *Zoologica Scripta*, Stockholm, **6**: 301–322.
- Danielopol, D. L., Martens, K. & Casale, L. M. 1989. Revision of the genus *Leucocythere* Kaufmann, 1892 (Crustacea, Ostracoda, Limnocytheridae), with the description of a new species. *Bulletin*

- van het koninklijk Belgisch Instituut voor Natuurwetenschappen, *Biologie*, Brussels, **59**: 63–94.
- De Deckker, P. & Forester, R. M. 1988. The use of ostracods to reconstruct continental palaeoenvironmental records. In De Deckker, P., Colin, J. P. & Peypouquet, J. P. (Eds), *Ostracoda in the Earth Sciences*, 175–199 Elsevier Science Publishers, Amsterdam.
- Delorme, L. D. 1970. Freshwater ostracodes of Canada. Part 4. Families Ilyocyprididae, Notodromadidae, Darwinulidae, Cytherideidae and Entocytheridae. *Canadian Journal Zoology*, Ottawa, **48**: 1251–1259, pls 1–6.
- Delorme, L. D. 1989. Methods in Quaternary ecology No 7. Freshwater ostracodes. *Geoscience Canada*, St. John's, **16**: 85–90.
- Diebel, K. & Pietrzeniuk, E. 1969. Ostracoden aus dem Mittelpleistozän von Süssenborn bei Weimar. *Paläontologische Abhandlungen, Abteilung A, Paläozoologie*, Berlin **3**: 463–488, pls 7–10.
- Diebel, K. & Pietrzeniuk, E. 1978. Die Ostrakodenfauna aus den Jungpleistozänen (weichselkaltzeitlichen) Deckschichten von Burgtonna in Thüringen. *Quartärpaläontologie*, Berlin, **3**: 207–221, pls 49–53.
- Diebel, K. & Pietrzeniuk, E. 1984. Jungpleistozäne Ostrakoden aus Sedimenten der Parkholen von Weimar. *Quartärpaläontologie*, Berlin, **5**: 285–319, pls 1–10.
- Douglas, D. J. & Healy, B. 1991. The freshwater ostracods of two quagmires in Co. Louth, Ireland. Verh. Internat. *Verhandlungen der Internationalen Vereinigung für theoretische und angewandte Limnologie*, Stuttgart, **24**: 1522–1525.
- Evans, J. G. & Griffiths, H. I. 1993. Holocene mollusc and ostracod sequences; their potential for examining short-timescale evolution. In Lees, D. R. & Edwards, D. (Eds), *Evolutionary Patterns and Processes*, 125–137 Academic Press, London for Linnean Society of London.
- Fox, H. M. 1967. More new and interesting cyprids (Crustacea, Ostracoda) from Britain. *Journal of Natural History*, London, **4**: 549–559.
- Fuhrmann, R. (1991). Ostrakoden aus den Holstein-Interglazialbecken Wildschütz und Dahlen (Sachsen). *Zeitschrift für Geologische Wissenschaften*, Berlin, **19**: 269–288, pls 1–3.
- Gibbard, P. L., Coope, G. R., Hall, A. R., Preece, R. C. & Robinson, J. E. 1981. Middle Devensian deposits beneath the 'Upper Floodplain' terrace of the River Thames at Kempton Park, Sunbury, England. *Proceedings of the Geologists' Association*, London, **93**: 275–289.
- Griffiths, H. I. & Evans, J. G. 1992. *Potamocypris arcuata* (Sars, 1903) (Ostracoda) new to Britain. *Crustaceana*, Leiden, **62**: 110–112.
- Griffiths, H. I. & Mount, R. 1993. Ostracods. In Evans, J.G., Limbrey, S., Mount, R. & Máté, I., An environmental history of the Upper Kennet Valley, Wiltshire, for the last 10,000 years *Proceedings of the Prehistoric Society*, London, **59**: 139–195.
- Ham, S. F. 1982. The Crustacea of some chalk streams in southern England. *Hydrobiologia*, Dordrecht, **97**: 193–201.
- Hartmann, G & Puri, H. S. 1974. Summary of neontological and palaeontological classification of Ostracoda. *Mitteilungen aus dem Hamburgischen Zoologischen Museum und Institut*, Hamburg, **70**: 7–73.
- Henderson, P. A. 1986. *Cypridopsis bamberi* sp. nov., a new species of ostracod (Crustacea, Podocopida) from England. *Journal of Natural History*, London, **20**: 1–5.
- Henderson, P. A. 1990. *Freshwater Ostracods. Synopses of the British Fauna (New Series)*, **42**: Universal Book Services/Dr W. Backhuys, Oestgeest for Linnean Society of London and Estuarine and Coastal Sciences Association.
- Holmes, J. A. 1992. Non-marine ostracods as Quaternary palaeoenvironmental indicators. *Progress in Physical Geography*, Seven Oaks, **16**: 405–431.
- Holmes, P. F. 1937. *Pseudocandona elongata*, a new species of ostracod. *Annals and Magazine of Natural History*, (Ser. 10), London, **19**: 422–430.
- Horne, D. J., Horne, D. M. & Horne, J. E. M. 1990. New records of ostracods from the Lake District. *Transactions of the Natural History Society of Northumbria*, Newcastle-upon-Tyne, **55**: 147–148.
- Keen, D. H., Jones, R. L. & Robinson, J. E. 1984. A late Devensian and early Flandrian fauna and flora from Kildale, north-east Yorkshire. *Proceedings of the Yorkshire Geological Society*, Leeds, **44**: 385–397.
- Kempf, E. K. 1971. Ökologie, Taxonomie und Verbreitung der nichtmarinen Ostracoden-Gattung *Scottia* im Quartär von Europe. *Eiszeitalter und Gegenwart*, Öhringen, **22**: 43–63.
- Kempf, E. K. 1980a. Index and bibliography of nonmarine Ostracoda. 1. Index A. *Sonderveröffentlichungen der Geologischen Institut der Universität zu Köln*, Cologne, **35**: 1–188.
- Kempf, E. K. 1980b. Index and bibliography of nonmarine Ostracoda. 4. Bibliography A. *Sonderveröffentlichungen der Geologischen Institut der Universität zu Köln*, Cologne, **38**: 1–186.
- Klie, W. 1938. *Krebstiere oder Crustacea, III: Ostracoda, Muschelkrebsse. Die Tierwelt Deutschlands und der angrenzenden Meeressteile nach ihren Merkmalen und nach ihrer Lebensweise* **34**. Gustav Fischer Verlag, Jena.
- Maitland, P. S. 1977. *A coded check-list of animals occurring in fresh water in the British Isles*, Institute of Terrestrial Ecology, Edinburgh.
- Marmonier, P. & Danielopol, D. L. 1988. Découverte de *Nannocandona faba* Eckman (Ostracoda, Candonine) en basse Autriche. Son origine et son adaptation au milieu interstitiel. *Vie Milieu*, Paris, **38**: 35–38.
- Marmonier, P., Meisch, C. & Danielopol, D. L. 1989. A review of the genus *Cavemocypris* Hartmann (Ostracoda, Cypridopsinae): systematics, ecology and biogeography. *Bulletin de la Société des Naturalistes Luxembourgeois*, Luxembourg, **89**: 221–278.
- Martens, K. 1989. On the systematic position of the *Eucypris clavata*-group, with a description of *Trafancypris* gen. nov. (Crustacea, Ostracoda). *Archiv für Hydrobiologie*, Stuttgart, **83**(S): 227–251.
- Martens, K. 1990. Speciation and evolution in the genus *Limnocythere* Brady, 1867 *sensu stricto* (Crustacea, Ostracoda), in the east African Galla and Awassa Basins (Ethiopia). *Courier Forschungs-Institut Senckenberg*, Frankfurt, **123**: 87–95.
- Martens, K. 1991. On a small collection of non-marine ostracods from Mongolia, with the description of a new species. *Miscellanea zoologica Hungarica*, Bucharest, **6**: 53–60.
- Martens, K. 1992. A reassessment of *Paralimnocythere* Carbonnel, 1965 (Crustacea, Ostracoda, Limnocytherinae), with a description of a new genus and two new species. *Bulletin van het Koninklijk Belgisch Instituut voor Natuurwetenschappen, Biologie*, Brussels, **62**: 125–168.
- Meisch, C. 1984. Revision of the Recent western Europe species of genus *Potamocypris* (Crustacea, Ostracoda). Part 1. Species with short swimming setae on the second antennae. *Travaux Scientifique du Museum national d'Histoire naturelle de Luxembourg*, Luxembourg, **3**: 1–55.
- Meisch, C. 1985. Revision of the Recent West European species of the genus *Potamocypris* (Crustacea, Ostracoda), Part 2. Species with long swimming setae on the second antennae. *Travaux Scientifique du Museum national d'Histoire naturelle de Luxembourg*, Luxembourg, **6**: 1–96.
- Meisch, C. 1988. Ostracodes récoltés à Paris. Avec un clef pour la détermination des espèces européennes du genre *Ilyocypris* (Crustacea, Ostracoda). *Bulletin de la Société des Naturalistes Luxembourgeois*, Luxembourg, **88**: 145–163.
- Meisch, C. 1991. Revision of the freshwater ostracod species *Cypridopsis hartwigi* and *Cypridopsis elongata*. With a generic key to the European Cypridopsinae (Crustacea, Ostracoda). *Bulletin de la Société des Naturalistes Luxembourgeois*, Luxembourg, **92**: 159–178.
- Meisch, C., Wouters, K. & Martens, K. 1990. Liste annotée des ostracodes actuels non-marins trouvés en France. *Travaux Scientifique du Museum national d'Histoire naturelle de Luxembourg*, Luxembourg, **15**: 1–62.
- Mount, R. 1991. *An environmental history of the Upper Kennet River Valley and some implications for human communities*. Unpublished Ph.D. thesis, University of Wales.

- Norman, A. M. 1905. Irish Crustacea Ostracoda. *Irish Naturalist*, Dublin, **16**: 137–155.
- Nüchterlein, H. 1969. Süßwasserostracoden aus Franken. Ein Beitrag zur Systematik und Ökologie der Ostracoden. *Internationale Revue der gesamten Hydrobiologie*, Berlin, **54**: 223–287.
- Paris, P. 1920. Biospeologica. XLI. Ostracodes (première série). *Archives de Zoologie expérimentale et générale*, Paris, **58**: 475–487, pls 18–21.
- Petkovski, T. K. 1963. Über Süßwasser-ostracoden der Azoren. *Boletim do Museu Municipal do Funchal*, Funchal, **17**: 49–65.
- Petkovski, T. K. 1969. *Limnocythere*-Arten aus Mazedonien (Crustacea, Ostracoda). *Acta Musei Macedonici Scientiarum Naturalium*, Skopje, **12**(1): 1–18, 1 pl.
- Petkovski, T. K., Meisch, C. & Wouters, K. 1993. Taxonomic revision of the freshwater ostracod species *Cypridopsis lusatica* Schäfer, 1943 (Crustacea). *Travaux Scientifique du Museum national d'Histoire naturelle de Luxembourg*, Luxembourg, **19**: 49–66.
- Preece, R.C. & Robinson, J. E. 1984. Late Devensian and Flandrian environmental history of the Ancholme Valley, Lincolnshire: molluscan and ostracod evidence. *Journal of Biogeography*, London, **11**: 319–352.
- Preece, R. C., Coxon, P. & Robinson, J. E. (1986). New biostratigraphic evidence of the Post-glacial colonization of Ireland and for Mesolithic forest disturbance. *Journal of Biogeography*, London, **13**: 487–509.
- Robinson, E. 1978. The Pleistocene. In Bate, R. H. & Robinson, E. (Eds), *A Stratigraphical Index of British Ostracoda*, 452–472. Seel House Press, Liverpool.
- Robinson, J. E. 1990. The ostracod fauna of the Middle Pleistocene interglacial deposits at Little Oakley, Essex. *Philosophical Transactions of the Royal Society of London*, Ser. B., London, **328**: 409–423.
- Scourfield, D. J. 1904. Synopsis of the known species of British freshwater Entomostraca. Part III Ostracoda, Phyllopora and Branchiura. *Journal of the Quickett Microscopical Club*, London, **9**: 29–44.
- Sywula, T. 1974. *Malzorzacki (Ostracoda)*. *Fauna Slodkowodna Polski* **24**: Polska Akademia Nauk, Warsaw.
- Van Frausum, A. & Wouters, K. 1990. Ostracoda from Holocene calcareous tufa deposits in southern Belgium: a palaeoenvironmental analysis. In Whately, R. & Maybury, C. (Eds), *Ostracoda and global events*, 505–511. Chapman & Hall, London.
- Van Harten, D. 1979. Some new shell characters to diagnose the species of the *Ilyocypris gibba-biplicata-bradyi* group and their ecological significance. In Krstic, N. (Ed.), *Taxonomy, Biostratigraphy & Distribution of Ostracodes*, 71–76, pls 1–2, Serbian Geological Society, Belgrade.
- Willing, M. J. 1985. *The biostratigraphy of Flandrian tufa deposits in the Cotswold and Mendip districts*. Unpublished Ph.D. thesis, University of Sussex.
- Wouters, K. 1989. Check-list of the recent non-marine Ostracoda (Crustacea) of Belgium. In Wouters, K. & Beart, L. (Eds), *Verhandlungen van het symposium 'Invertebraten van België'*, 153–158, Koninklijk Belgisch Instituut voor Natuurwetenschappen, Brussels.