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. Steinoecypria fischeri (Lilljeborg, 1883) and the hypogean species Pseudocandonia cf. eremita (Vediyovsky, 1882) and Pseudocandonia brevii (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 Decker & 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, and 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 ‘Synopses 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
compare well with illustrated descriptions of mounted in glycerine jelly or euparal. These specimens (comm.).

The status of the species has long been the source of debate; 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 Shäffer, 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 1967.4.3.1-3.1, 3.14), 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 they 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 plausible 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 synonmys 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 liljeborgi. Again, Henderson (1990) knew of no definite records for this 'exceedingly rare' species, although E. cf. liljeborgi had been reported from Holocene tufas (Preece & Robinson, 1984; Willing, 1985). We have since found E. liljeborgi 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 liljeborgi 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. liljeborgi 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 that 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.

Paralimnocthyere spp. There has been some confusion over the correct specific assignment of non-Balkan species of Paralimnocthyere, now resolved by Martens (1992). Subfossil British material has usually been referred to P. compressa or P. cf. diebeli. Paralimnocthyere 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). Paralimnocthyere diebeli was originally described from Macedonia (Petkovski, 1969) and a variant, Paralimnocthyere cf. diebeli, was described from the German Mid Pleistocene (Diebel & Pietrzeniuk, 1978: fig. 2, pl. 52, figs 8–11). Paralimnocthyere cf. diebeli has been reported from late Devensian deposits at Kildale, Yorkshire (Keen et al., 1984). Paralimnocthyere 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. schwarzbachi*, *Candona levanderi*, *Candona lozeki*, *Candona tricicatricosa*, *Fabaeformiscandona fabella* (as *Candona fabella*), *Fabaeformiscandona balatonica* (as *Candona balatonica*), *Pseudocandona breuili*, *Pseudocandona cf. eremita*, *Nannocandona faba*, *Scotidia browniana*, *S. tumida*, *Eucypris dulcisfrons*, *E. heinrichi*, *Herpetocypris ehringsdorfensis* and *Stenocypris fischiere*. 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 tricicatricosa*, *C. lozeki*, *Limnocythere falcata*, *Leucocythere baltica*, *Ilyocypris quinculminata*, *I. schwarzbachi*, and possibly *I. papillata* (see Robinson, 1990). The biostatigraphic importance of *Scotidia* 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. tricicatricosa* are all Mid Pleistocene. Fuhrmann (1991) has suggested that *C. lozeki* is tricicatricosa 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 & Pietrzienuik, 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 triangular carapace, quite unlike any other British candonid.

**Stenocypris fischiere** is only known from Holocene material from West Overton, Wiltshire (Griffiths & Mount, 1993). *Stenocypris fischiere* is illustrated in several European faunal works (e.g. Klie, 1938: 124, figs 416–418; Szywula, 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, whose status is here considered questionable, are prefixed by a question mark. *Cyprideis torosa* is included, although more typically a species of brackish waters.
Superfamily **Darwinuloidae** Brady & Norman, 1889
Family **Darwinulidae** Brady & Norman, 1889
Genus *Darwinula* Brady & Robertson, 1885
*Darwinula stevensoni* (Brady & Norman, 1870)

Superfamily **Cytheroidea** Baird, 1850
Family **Limiocytheridae** Klie, 1938
Subfamily **Limiocytherinae** Klie, 1938
Genus *Limiocythere* Kauffmann, 1900
*Limiocythere baltica* (Diebel, 1965)
*Limiocythere falcula* Diebel, 1968
*Limiocythere inopinata* (Baird, 1843)
*Limiocythere sanctipatrici* (Baird & Robertson, 1869)

Subfamily **Limiocythere regista** (Lilljeborg, 1863)
Subfamily **Timiriasevinae** Mandelstam, 1960
Genus *Metacypris* Brady & Robertson, 1870
*M. cordata* Brady & Robertson, 1870

Family **Cytheridae** Sars, 1925
Subfamily **Cytherinae** Sars, 1925
Genus *Cytherissa* (Sars, 1863)
*Cytherissa lacustris* (Sars, 1863)
Genus *Cyprides* (Jones, 1850)
*C. torosa* (Jones, 1850)

Superfamily **Cypridoidea** Baird, 1845
Family **Candonidae** Kaufmann, 1900
Subfamily **Candoninae** Kaufmann, 1900
Genus *Candonina s.s.* Baird, 1845
*C. angulata* G. W. Müller, 1900
*C. brevicornis* Klie, 1925
*C. candida* (O. F. Müller, 1776)
*C. lacera* Baird, 1850
*C. levanderi* Hirschmann, 1912
*C. lozcki* Absolon, 1973
*C. neglecta* Sars, 1887
*C. tricaricatica* Diebel & Pietrieniuk, 1969
Genus *Cryptocandona* Kaufmann, 1900
*Cryptocandona redux* (Alm, 1913)
*Cryptocandona vavali* Kaufmann, 1900

Genus *Fabaformiscandona* Kristic, 1972
*F. acuminata* (Fischer, 1854)
*F. alata* (Daday, 1894)
*F. candida* (Kauffmann, 1900)
*F. fabelia* (Nüchterlein, 1969)
*F. fragilis* (Hartwig, 1898)
*F. hyalina* (Baird & Robertson, 1870)

Subfamily **Fabaformiscandona protei** (Hartwig, 1898)
*F. silvisquosa* (Baird, 1910)
Genus *Pseudocandona* Kaufmann, 1900
*P. albicans* (Baird, 1864)
*P. breuili* (Paris, 1920)

Genus *Pseudocandona compressa* (Koch, 1838)
*P. cf. eremita* (Vedovskoj, 1882)
*P. insculpta* (G. W. Müller, 1900)
*P. lobipes* (Hartwig, 1900)
*P. marchiora* (Hartwig, 1899)
*P. pratensis* (Hartwig, 1901)
*P. rostrata* (Baird & Norman, 1889)
*P. sarsi* (Hartwig, 1899)
*P. stagnalis* (Sars, 1890)

Genus *Candona* (Zenker, 1854)
*C. exculpia* Fischer, 1855
*C. ophtalmica* (Jurine, 1820)

Family **Ilyocypridae** Kaufmann, 1900
Genus *Ilyocypris* Brady & Norman, 1889
*I. bifida* Koch, 1838
*I. bradyi* Sars, 1890
*I. deliciosa* Masi, 1905
*I. depressa* Masi, 1906
*I. gibba* (Ramdorh, 1808)
*I. inermis* Kaufmann, 1900
*I. lacustris* Kaufmann, 1900
*I. monstrifica* (Norman, 1862)
*I. papillata* Robinson, 1900
*I. quinctluminata* Sylvester-Bradley, 1973
*I. schwarzachii* Kempf, 1967

Family **Notodromatidae** Kaufmann, 1900
Subfamily **Notodromatinae** Kaufmann, 1900
Genus *Notodroma* Lilljeborg, 1853
*Notodromus umbilicus* (O. F. Müller, 1776)

Subfamily **Cypridinae** Hartmann, 1963
Genus *Cypris* Zenker, 1854
*C. marginata* (Straus, 1821)

Family **Cyprididae** Baird, 1845
Subfamily **Cypricerinae** McKenzie, 1971
Genus *Bradleystrandesia* Broadbækker, 1983
*Bradleystrandesia fuscata* (Jurine, 1820)
*Bradleystrandesia reticulata* (Zaddach, 1884)
*Strandesia stuhlmanni* (Hartmann, 1888)
*Strandesia obliqua* (Baird, 1868)

Subfamily **Cypridae** Baird, 1845
Genus *Cypris* O. F. Müller, 1776
*Cypris bisubata* Lucas, 1849
*Cypris pubera* O. F. Müller, 1776

Subfamily **Dolerocypridinae** Triebel, 1961
Genus *Dolerocypris* Kaufmann, 1900
*D. fasciata* (O. F. Müller, 1776)

Subfamily **Eucypridinae** Bronstein, 1947
Genus *Eucypris* Vávra, 1891
*E. anglica* Fox, 1967
*E. cressa* (O. F. Müller, 1785)
*E. dulcisporum* Diebel & Pietrieniuk, 1969
*E. elliptica* (Baird, 1846)
British freshwater ostracods

Eucypris cf. gemella Bodina, 1961
Eucypris heinrichi Diebel & Pietrzeniuk, 1978
Eucypris illiljeborgi (G. W. Müller, 1900)
Eucypris ornata (O. F. Müller, 1776)
Eucypris pigra (Fischer, 1851)
Eucypris virens (Jurine, 1820)

Genus Piranocypris Brady & Norman, 1896
Piranocypris serrata (Norman, 1861)

Genus Tonncypris Diebel & Pietrzeniuk, 1975
Tonnacypris lutaria (Koch, 1838)

Genus Trajanocypris Martens, 1889
Trajanocypris clavata (Baird, 1833)

? Trajanocypris serrata (G. W. Müller, 1900)

Sub-family Herpetocypridinae Kaufmann, 1900
Genus Herpetocypris Brady & Norman, 1889
Herpetocypris brevicaudata Brady & Norman, 1889
Herpetocypris chevreuxi Sars, 1896

? Herpetocypris ehringsdorfensis Diebel & Wolfschläger, 1975

Herpetocypris repans (Baird, 1835)
Genus Psychrodromus Danielopol & McKenzie, 1977
Psychrodromus olivaceus (Brady & Norman, 1889)
Psychrodromus robertsoni (Brady & Robertson, 1889)

Genus Stenocypris G. W. Müller, 1901
Stenocypris fischeri (Lilljeborg, 1883)

Sub-family Scutitiae Bronshtein, 1947
Genus Scutitia Brady & Norman, 1889
Scutitia browniana (Jones, 1850)
Scutitia pseudobrowniana Kempf, 1971
Scutitia tumida Kempf, 1971

Sub-family Cyprinotinae Bronshtein, 1947
Genus Heterocypris Claus, 1892
Heterocypris incongruus (Rambador, 1808)
Heterocypris salina (Brady, 1868)

Sub-family Isocycridinae Rome, 1965
Genus Isocypris G. W. Müller, 1908
Isocypris beauchampi (Paris, 1920)

Sub-family Cypridopsinae Kaufmann, 1900
Genus Cypridopsis Brady, 1867
Cypridopsis hartwigi G. W. Müller, 1900
Cypridopsis fusata Schäffer, 1943
Cypridopsis oesa Brady & Robertson, 1869
Cypridopsis vidua (O. F. Müller, 1776)

Genus Plesiochypris (Rome, 1965)
Plesiochypris newtoni (Brady & Robertson, 1870)

Genus Sarscypris McKenzie, 1977
Sarscypris acuteata (Costa, 1847)

Genus Cavernocypris Hartmann, 1964
Cavernocypris subterranea (Wolf, 1920)

Genus Potamocypris Brady, 1870
Potamocypris arcata (Sars, 1903)
Potamocypris fallax Fox, 1967
Potamocypris fulva (Brady, 1868)
Potamocypris pallida Alm, 1914
Potamocypris similis G. W. Müller, 1912
Potamocypris smaragdina (Vavra, 1891)
Potamocypris variegata (Brady & Norman, 1889)
Potamocypris villosa (Jurine, 1820)
Potamocypris zschokkei (Kaufmann, 1900)

ACKNOWLEDGEMENTS

Our thanks to Dr S. Halsey (Crustacea Section, BMNH) for allowing us to examine our examination of type material from the Museum’s collections. Professor T. K. Petkovski (Macedonian 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 I. 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. Lecbours, 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 Cypricerina (Crandacea, 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. & Neustreube, 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. boulegiensis) d’ostracodes du Tortonien. Archives de la Sciences, Genève, Geneva, 18: 146–150, pl s 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 Timiriaseveinae (Limnocytheridae). Paléobiologie continentale. Montpellier, 11: 1–51, pls 1–16.

Danielopol, D. L. 1978. Über Herkunft und Morphologie der Süßwasser-hypogäschen Candoninae (Crustacea, Ostracoda). Sitzungberichte der Österreichischen Akademie der Wissenschaften, Mathematisch-naturwissenschaftliche Klasse. Abteilung I, Vienna, 187: 1–162.

Danielopol, D. L. 1982. Nouvelles données sur les Candoninae (Ostracoda) hypogäis de Roumanie et Yougoslavie, Bulletin du Musuem national d’Histoire naturelle de Paris, (Sect. A)., Paris, 4: 369–396.

Danielopol, D. L. & McKenzie, K. G. 1977. Psychrodromus gen. n. (Crandacea, Ostracoda), with rescription of the cypacid genera Piranocypris and Illydromus. 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. & Forestier, R. M. 1988. The use of ostracods to reconstruct continental palaeoenvironmental records. In De Deckker, P., Colin, J. P. & Peyrouquet, 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 ostracods. Geoscience Canada, St. John’s, 16: 85–90.

Diebel, K. & Pietrzniuk, E. 1969. Ostracoden aus dem Mittelpleistozän von Süßemborn bei Weimar. Paläontologische Abhandlungen, Abteilung A, Paläozoologie, Berlin 3: 463–488, pls 7–10.

Diebel, K. & Pietrzniuk, E. 1978. Die Ostrakodenfauna aus den Jungpleistozänen (weichkalkzeitlichen) Deckenschichten von Burgtonna in Thüringen. Quartärpaläontologie, Berlin, 3: 207–221, pls 49–53.

Douglas, D. J. & Healy, B. 1991. The freshwater ostracodes of two泉mires 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: D. H. R., & Edwards, D. (Eds), Evolutionary Patterns and Processes, 125–137 Academic Press, London for Linnean Society.

Evans, J. I. 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 Wildschutz 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. & Mátě, 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. Cypripodopsis bambergi sp. nov., a new species of ostracod (Crustacea, Podocopa) from England. Journal of Natural History, London, 20: 1–5.

Henderson, P. A. 1990. Freshwater Ostracods. Synopsis of the British Fauna (New Series), 42: Universal Book Services/Dr W. Backhuys, Oostwegel 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, J. 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.

Kemp, E. K. 1971. Ökologie, Taxonomie und Verbreitung der nichtmarinen Ostracoden-Gattung Scorta und ihrer Gattungsgenosse nachwurt, Öhringen, 22: 43–63.

Kemp, E. K. 1980a. Index and bibliography of nonmarine Ostracoda. 1. Index A. Sonderveröffentlichungen der Geologischen Institut der Universität zu Köln, Cologne, 35: 1–188.

Kemp, E. K. 1980b. Index and bibliography of nonmarine Ostracoda. 4. Bibliography A. Sonderveröffentlichungen der Geologischen Institut der Universität zu Köln, Cologne, 38: 1–186.

Kie, W. 1938. Krebsfische oder Crustacea, III: Ostracoda, Muschelkrebs. Die Tierwelt Deutschlands und der angrenzenden Meere, nach ihren Merkmalen und nach ihrer Lebensweise. 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. & Danielpol, D. L. 1988. Découverte de Nannocandona fabe Eckman (Ostracoda, Candonninae) en base Autrichie. Son origine et son adaptation au milieu intérieur. Vie Milieu, Paris, 35: 35–38.

Marmonier, P., Meisch, C. & Danielpol, D. L. 1989. A review of the genus Cavernocypria Hartmann (Ostracoda, Cypriodontinae): systematics, ecology and biogeography. Bulletin de la Société des Naturalistes Luxembourgeois, Luxembourg, 89: 221–278.

Martens, K. 1989. Speciation and evolution in the genus Cavernocypria Hartmann (Ostracoda, Cypriodontinae), with a description of a new genus and two new species. Miscellanea zoologica Hungarica, Bukarest, 6: 53–60.

Martens, K. 1991. A reassessment of Paralimnocythere Carbonnel, 1965 (Crustacea, Ostracoda, Limnothyrinae), with a description of a new genus and two new species. Bulletin van het Koninklijk Belgisch Instituut voor Natuurwetenschappen, Biologie, Brussels, 72: 125–168.

Meisch, C. 1984. Revision of the Recent western Europe species of 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 une clef pour la détermination des espèces européennes du genre Ilyocypris (Crustacea, Ostracoda). Bulletin de la Société des Naturalistes Luxembourg, Luxembourg, 53: 145–163.

Meisch, C. 1991. Revision of the freshwater ostracod species Cypripodopsis hartwigi and Cypripodopsis elongata. With a generic key to the European Cypripodolinae (Crustacea, Ostracoda). Bulletin de la Société des Naturalistes Luxembourg, 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, 5: 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.
British freshwater ostracods

Norman, A. M. 1905. Irish Crustacea Ostracoda. *Irish Naturalist*. Dublin, 16: 137–155.

Nüchterlein, H. 1969. Süßwasserostreodon 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 (premierre serie). *Archives de Zoologie experimentale et générale*. Paris, 58: 475–487, pls 18–21.

Petkovski, T. K. 1963. Über Süßwasser-ostracoden der Azoren. *Boletin do Museu Municipal do Funchal*. Funchal, 17: 49–65.

Petkovski, T. K. 1969. Limnocythere-Arten aus Macedonien (Crustacea, Ostracoda). *Acta Musei Macedonici Scientiarum*. Skopje, 12(1): 1–18, 1 pl.

Petkovski, T. K., Meisch, C. & Wouters, K. 1993. Taxonomic revision of the freshwater ostracod species Cypridopsis lusatica Schäffer, 1943 (Crustacea). *Travaux Scientifique du Museum national d’Histoire naturelle de Luxembourg*. Luxembourg, 19: 49–66.

Precece, 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.

Precece, 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, Scel 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. *Philosophical Transactions of the Royal Society of London*. Ser. B, London, 19: 29–44.

Szywula, T. 1974. Malzoraczki (Ostracoda). *Fauna Słodkowodna 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 Whatley, R. & Maybury, C. (Eds), *Ostracods and global events*. 505–511. Chapman & Hall, London.

Van Harten, D. 1979. Some new shell characters to diagnose the species of the Illocypris gibba-biplicata-bradyi group and their ecological significance. In Krsic, 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 Belgie’*. 153–158. Koninklijk Belgisch Instituut voor Natuurwetenschappen, Brussels.