J.micropalaeontol., **4** (2): 153-158, August 1985

G. S. Brady's Pleistocene ostracods from the Brickearth of the Nar Valley, Norfolk, U.K.

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ABSTRACT – The identity of four ostracod species described by G. S. Brady (1865) from the Pleistocene Brickearth of the Nar Valley, Norfolk, E. England, is established. This has been accomplished by comparing rediscovered type material and Brady's illustrations and descriptions with Recent specimens.

INTRODUCTION

The recent re-curation of the G. S. Brady Collection at the Hancock Museum, Newcastle-upon-Tyne (see Davis & Horne, 1985), has brought to light a large number of type specimens of Ostracoda which were hitherto thought to have been lost. Of particular note among these are the types of three of the four species which Brady (1865) described from the Brickearth of the Nar Valley, Norfolk. The aim of this paper is to present a reappraisal of the taxonomic status and potential palaeoenvironmental significance of these species.

DISCUSSION

In 1865, G. S. Brady described four new ostracod species from samples of the Brickearth of the River Nar Valley in Norfolk. He reported that this material was given to him by T. R. Jones; however, its exact provenance is unknown since neither Brady nor Jones (1865), who also described fossils from this deposit, made any reference to a particular locality. At about the same time, Rose (1836, 1865) reported several exposures of 'Brickearth' in the Nar Valley and it is possible that Brady's material came from one or more of these localities. The deposit is generally accepted as being Pleistocene, probably Hoxnian (antepenultimate interglacial), in age (Stevens, 1960).

Despite the fact that Brady's original descriptions and illustrations are fairly informative, there has not been a consensus in the literature regarding the generic and specific identity of three of these taxa. This is a situation we are now able to rectify following the rediscovery of type material. Curiously, the specific identity of the fourth species, *Cytheridea punctillata*, for which there is no surviving type material, has never been questioned.

All four species have living representatives in N.W. European waters today; their original and revised generic and specific names are as follows:

Brady, 1865		Herein
Cytheridea punctillata sp. nov.	=	*Sarsicytheridea punctillata* (Brady)
Cythere carinata sp. nov.	=	*Loxoconcha rhomboidea* (Fischer, 1855)
Cythere arborescens sp. nov.	=	*Aurila arborescens* (Brady)
Cythere aspera sp. nov.	=	*Carinocythereis whitei* (Baird, 1850)

Brady's original plate (Pl. 9) is reproduced herein as our Pl. 1 for comparison with our illustrations of syntypic, topotypic and Recent specimens (Pl. 2). All the specimens illustrated in Pl. 2 are housed either in the Hancock Museum, Newcastle-upon-Tyne, or in the British Museum (Natural History), London, as indicated in the text. As well as a brief synonymy and taxonomic comments, we have offered some notes on the present-day ecology of each species which may help in future studies.

The establishment of the fact that all four taxa have living representatives whose ecology and distribution are known, is an important step towards the interpretation of the depositional environment of the Nar Brickearth. In view of the detailed study of the Nar Valley ostracod fauna presently being undertaken by other authors (Drs. A. R. Lord & E. Robinson, pers. comm.) it would be inappropriate for us to enter into any discussion of the environmental significance or age of the fauna as a whole. Preliminary findings indicate that the environmental history of the deposit may be complex (Lord & Robinson, 1978), and it remains to be seen whether or not Brady's four species are of major importance.

ACKNOWLEDGEMENTS

We are grateful to Mr. A. Tynan, Curator of the Hancock Museum, for allowing us access to Brady's type

specimens, and for permission to photograph them. We wish to thank Drs. A. R. Lord and E. Robinson of University College, London, for providing us with some comparative material and for discussing the broader aspects of the Nar Valley Brickearth ostracod fauna. Dr. R. C. Whatley, (University College of Wales, Aberystwyth) commented helpfully on the text.

SYSTEMATICS

Order Podocopida Müller, 1894

Sarsicytheridea punctillata (Brady, 1865)
(Pl. 1, figs. 9-11; Pl. 2, figs. 9, 10)

1865 *Cytheridea punctillata* sp. nov. Brady: 189, pl. 9, figs. 9-11 (= juvenile).
1866 *Cyprideis proxima* sp. nov. Sars: 54.
1961 *Eucytheridea punctillata* (Brady); van den Bold: 294, pl. 9, figs. 1-9, text-figs. 14-20.
1982 *Sarsicytheridea punctillata* (Brady); Athersuch: 241-242, pl. 6, figs. 7-11; pl. 7, figs. 1, 3, 5; Fig. 8f.

Type specimens. The type specimens of this species are lost. Athersuch (1982) showed that the type illustration of this species depicts a juvenile (probably an A-1 instar). We have illustrated a juvenile (A-1) (Pl. 2, fig. 9) and an adult female (Pl. 2, fig. 10), both from the Recent, for comparison with Brady's original figures (Pl. 1, figs. 9-11, herein).

Remarks. See Athersuch (1982) for diagnosis, illustrations and further remarks on this species. *S. punctillata* is a benthic marine species, apparently living on sand and silt substrates in shallow water, although it may be found at depths of up to 100 m.

Distribution. Recent: it has been recorded from N.E. British coastal waters, Scandinavia (including the Baltic), and as far north as Novaya Zemlya in the Arctic. Pleistocene: apart from British records it has also been found in late Pleistocene sediments in the St. Lawrence Lowlands (N.E. North America) by Cronin (1981).

Loxoconcha rhomboidea (Fischer, 1855)
(Pl. 1, figs. 1-4; Pl. 2, figs. 5, 6)

1855 *Cythere rhomboidea* sp. nov. Fischer: 656.
1865 *Cythere carinata* sp. nov. Brady: 189-190, pl. 9, figs. 1-4.
1868a *Loxoconcha impressa* (Baird); Brady: 433, pl. 25, figs. 35-40; pl. 40, fig. 4 (*non Cythere impressa* Baird, 1850).
1976 *Loxoconcha rhomboidea* (Fischer); Athersuch & Whittaker: 81-90.
1978 *Loxoconcha carinata* (Brady); Robinson: 462, Pl. 3, figs. 2a, b.

Type specimens. Slide no. 1.23.10 in the Brady Collection at the Hancock Museum contains two adult valves (1 ♀LV and 1 ♀RV), labelled '*Loxoconcha impressa*, Brickearth of the Nar'. We have no doubt that these are the specimens on which Brady based his description of *Cythere carinata* (later placed by him in synonymy with *Loxoconcha impressa*); unfortunately their extreme fragility precludes their removal from the slide for photography or re-drawing. Nevertheless, we are satisfied from our comparison of these specimens with Brady's original illustrations (Pl. 1, figs. 1-4, herein), a topotypic specimen (Pl. 2, fig. 5, herein) and with the neotype of *L. rhomboidea* (designated by Athersuch & Whittaker, 1976) that they are all indeed conspecific.

Remarks. Brady (1865) noted that this species had already been recorded by Jones (1865) under the name *Normania carinata* (the name with which Brady had supplied him) but that he now regarded his MS genus *Normania* as . . . "incapable of accurate definition or separation" and so described the species under the generic name *Cythere*. See Athersuch & Whittaker (1976) for a more detailed synonymy, description and ilustrations of *L. rhomboidea*. This species lives in marine littoral and shallow sublittoral waters on both phytal and non-phytal substrates; it is also found in slightly reduced salinities in estuaries and lagoons.

Distribution. Recent: Norway, British Isles and other

Explanation of Plate 1

A reproduction of Plate 9 of Brady (1865). The names used by Brady have been retained, but the explanations are our own.

Figs. 1-4. *Cythere carinata* Brady. ♀RV, lateral, dorsal, ventral and ?anterior views (× 60). Hancock Museum slide no. 1.23.10.

Figs. 5-8. *Cythere arborescens* Brady. ♀ carapace, right lateral, dorsal, ventral and ?anterior views (× 48). Hancock Museum slide no. 1.03.26.

Figs. 9-11. *Cytheridea punctillata* Brady. Juvenile LV, lateral, dorsal and ?anterior views (× 48). Specimen lost.

Figs. 12-19. *Cythere aspera* Brady. Figs. 12-15, juvenile RV, lateral, dorsal, ventral and ?anterior views (× 48); figs. 16-19, ♂RV, lateral, dorsal, ventral and anterior views (× 48). Hancock Museum slide no. 1.03.43.


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N.E. Atlantic coasts, and the western Mediterranean. Pleistocene: British Isles.

Aurila arborescens (Brady, 1865)
(Pl. 1, figs. 5-8; Pl. 2, figs. 1-4)

1865 *Cythere arborescens* sp. nov. Brady: 190, pl. 9, figs. 5-8.
1868b *Cythere Woodwardii* sp. nov. Brady: 93, pl. 10, figs. 19-21.
1963 *Aurila woodwardii* (Brady); McKenzie: 8, pl. 1, figs. 1-3.
1980 *Aurila woodwardii* (Brady); Athersuch: 45-52.
non 1972 *Aurila arborescens* (Brady); Uffenorde: 77, pl. 8, fig. 5.
non 1978 *Hemicythere arborescens* (Brady); Robinson: 462, pl. 3, figs. 3a, b.

Type specimens. Slide no. 1.03.26 in the Brady Collection, Hancock Museum, contains a single adult female carapace which must be considered as the holotype. It is undoubtedly the specimen figured by Brady (1865) (Pl. 1, figs. 5-8, herein), though it is now poorly preserved (Pl. 2, figs. 1, 3). No type specimens exist of *Cythere woodwardii* (see Athersuch, 1980, for further details).

Remarks. Athersuch & Whittaker (1981) showed that the specimens illustrated by Robinson (1978) as *Hemicythere arborescens* were conspecific with *Hemicythere villosa* (Sars), and considered *arborescens* to be a *nomen dubium* since the types were, at the time, presumed lost. The rediscovered type, though not well preserved, has enabled us to determine that *Cythere arborescens* is in fact a senior synonym of *Cythere woodwardii*, described by Brady himself only three years later from the Recent of the Mediterranean; two specimens of *Aurila woodwardii auct.*, from the Mediterranean, are figured here for comparative purposes (Pl. 2, figs. 2, 4). *A. arborescens sensu* Uffenorde (1972) should be referred to *A. hesperiae* Ruggieri (see Ruggieri, 1975 for further discussion). *A. arborescens* is a predominantly phytal marine littoral and shallow sublittoral species which has also been found in brackish lagoonal environments.

Distribution. *A. arborescens* is predominantly a Mediterranean species although it has been recorded alive in S.W. Wales and we have seen empty valves in Recent sediments from the Thames Estuary; we cannot trace any records between S. Britain and the Mediterranean. This curious and apparent disjunct distribution could be merely due to previous taxonomic confusion, but if ultimately proved would mirror the distribution of certain species of *Cytheropteron* which Whatley & Masson (1979) suggest is due to postglacial readjustment. Pleistocene: Brady's (1865) material appears to represent the only valid published fossil record of this species so far, although C. Maybury (University College of Wales, Aberystwyth) has shown us specimens from the late Pliocene of N.W. France and Cornwall.

Explanation of Plate 2
All figures are ×75.

Figs. 1, 3. *Aurila arborescens* (Brady). Holotype, ♀ carapace; 790 μm long. Right lateral and dorsal views. Hancock Museum slide no. 1.03.26, Nar Valley, Brady Collection, Pleistocene.

Fig. 2. *Aurila arborescens* (Brady). ♀ carapace; 745 μm long. Right lateral view, BMNH slide no. 1980.2. Cape Greco, Cyprus (34°56'N, 34°05'E), Recent.

Fig. 4. *Aurila arborescens* (Brady). ♀ carapace; 745 μm long. Dorsal view, BMNH slide no. 1980.4. Cape Greco, Cyprus, Recent.

Fig. 5. *Loxoconcha rhomboidea* (Fischer). Topotype of '*C. carinata* Brady', ♀RV; 640 μm long. Lateral view, BMNH slide no. OS 12311. Nar Valley Clay, East Winch (TF 7050 1645), authors' collection, Pleistocene.

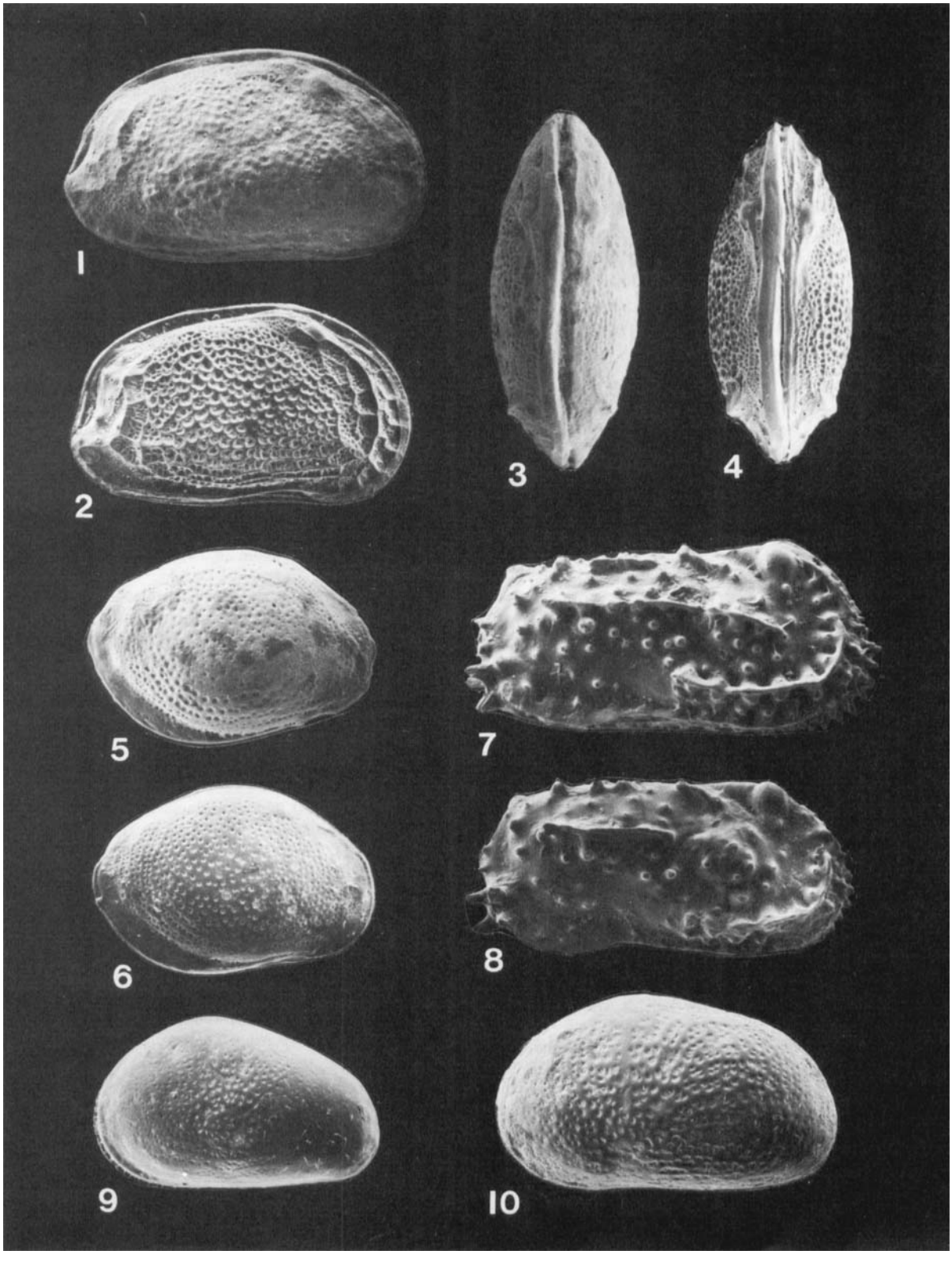
Fig. 6. *Loxoconcha rhomboidea* (Fischer). ♀ carapace; 615 μm long. Right lateral view, BMNH slide no. 1975.1242. Osmington Mills, Dorset (50°38'N, 02°23'W), Recent.

Fig. 7. *Carinocythereis whitei* (Baird). ♂ carapace; 890 μm long. Right lateral view, BMNH slide no. 1984.173. Dartmouth, Devon (50°21'N, 03°35'W), Recent. Ex BMNH slide no. 1911.11.8.M3372, Norman Collection.

Fig. 8. *Carinocythereis whitei* (Baird). ♂RV; 850 μm long. Lateral view, Hancock Museum slide no. 1.03.43, figured by Brady (1865) as '*Cythere aspera*'. Nar Valley, Brady Collection, Pleistocene.

Fig. 9. *Sarsicytheridea punctillata* (Brady). Juvenile A-1 LV; 630 μm long. Lateral view, BMNH slide no. 1981.95. Drobak, Norway (59°40'N, 10°40'E), Recent.

Fig. 10. *Sarsicytheridea punctillata* (Brady). ♀LV; 750 μm long. Lateral view, BMNH slide no. 1981.94. Firth of Clyde, Scotland (55°20'N, 00°05'W), Recent.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Carinocythereis whitei (Baird, 1850)
(Pl. 1, figs. 12-19; Pl. 2, figs. 7, 8)

1850 *Cythereis Whitei* sp. nov. Baird: 175, pl. 20, fig. 3.

1865 *Cythere aspera* sp. nov. Brady: 190-191, pl. 9, figs. 12-19.

1969 *Carinocythereis bairdii* sp. nov. Uliczny: 75, pl. 5, figs. 1-4; Pl. 18, fig. 7.

1978 *Carinocythereis aspera* (Brady); Robinson: 462, pl. 3, figs. 4a, b.

Type specimens. Slide no. 1.03.43 in the Brady Collection, Hancock Museum, contains four valves (1 ♂LV, 1 ♀RV, 1 ♀LV and 1 juvenile RV) labelled *'Cythere aspera'*. These have been compared closely with the syntypes and other material of *Carinocythereis whitei* (Baird) in the British Museum (Natural History) and in our opinion they are conspecific. The ♂RV chosen from Brady's slide for illustration herein (Pl. 2, fig. 8) is believed to be the adult male specimen figured by Brady (1865); see our Pl. 1, figs. 16-19. It is compared with a Recent British specimen of *C. whitei* in Pl. 2, fig. 7. Other Nar Valley Pleistocene specimens are figured with specimens of *whitei* from both British and Mediterranean waters by Athersuch & Whittaker (in press).

Remarks. A lectotype chosen from the syntypes of *C. whitei* has been formally designated elsewhere together with a more detailed synonymy and comments on the affinity of this species with other members of the genus (see Athersuch & Whittaker, in press). *C. whitei* is a benthic marine species typically living on sand and silt substrates from 2-60m depth.

Distribution. Recent: Atlantic coasts from Britain in the north to N.W. Africa in the south; also widespread in the Mediterranean (as *C. bairdii auct.*). Pleistocene: British Isles. Pliocene: Greece. Other records now require careful re-evaluation.

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