On Arcacythere Hornibrook, 1952 (Cytheracea, Ostracoda, Crustacea), a senior synonym of Rockallia Whatley, Frame & Whittaker, 1978

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ABSTRACT — The type specimens of Arcacythere chapmani Hornibrook, 1952 (the type species of Arcacythere Hornibrook, 1953; Tertiary, New Zealand) have been re-examined and are shown to have internal carapace features identical to those of Rockallia Whatley, Frame & Whittaker, 1978. Rockallia is known from Cenozoic deep-sea sediments worldwide and from the Oligocene and Miocene of northwestern Europe. The external carapace morphologies of Arcacythere and Rockallia show only minor distribution of the fossae. Rockallia is, therefore, shown to be a subjective junior synonym of Arcacythere. An emended diagnosis of A. chapmani is given.

INTRODUCTION

The genus Arcacythere was erected by Hornibrook (1952) to accommodate the single cytheracean species A. chapmani Hornibrook, 1952, which he recorded from the late Cretaceous (Piripauan Stage) to the Middle Miocene (Waiauan Stage) of New Zealand. Whatley et al. (1982) noted the similarity of Arcacythere to Rockallia Whatley et al., 1978, a genus originally described from Holocene and Recent sediments of the Rockall Trough, North Atlantic, but were unable to synonymise them based on the original description and illustrations of Hornibrook. Specimens of Rockallia were later found throughout the Southwest Pacific in Cenozoic D.S.D.P. core material and in Oligocene and Miocene of northwestern Europe. Whatley et al. (1982) considered that Arcacythere belonged to the Pectocytheridae, based on its original description and illustration, and erected a new family, Rockalliidae, to accommodate both Rockallia and an undescribed Tertiary genus from Argentinian Patagonia.

I have recently recovered from New Zealand Tertiary shelf sediments specimens similar to Rockallia. This has prompted a re-examination of the type material of Arcacythere and a reassessment of its affinities with Rockallia.

MATERIAL

Material examined includes type specimens of Arcacythere chapmani housed at the New Zealand Geological Survey, Lower Hutt. The original sample from which these specimens were picked was collected by J.S. Marwick, from the Third Bay, Sandstone Member, Nga Pari Formation (Lillburnian Stage, Middle Miocene) of the Waiau River bank section at Clifden, Southland (New Zealand Fossil Record File Number D45/f8458, grid reference D45/004513, New Zealand map sheet overprint series, 1975). Four specimens from the type locality (two specimens from sample D45/f8466, Upper Shellbeds Member, Park Bluff Sandstone Formation, Waiauan Stage; and one specimen from samples D45/f8475, Lill Sand Member, Park Bluff Sandstone Formation, Lillburnian Stage, and D45/f8476, Third Bay Sandstone Member, Nga Pari Formation, Lillburnian Stage) were made available to me for study and are illustrated in Pl. 1, Fig. 1. Other Tertiary material or Arcacythere housed at the New Zealand Geological Survey, has also been examined and specimens of late Eocene age (Runagan Stage, from the Kaiata Mudstone, Cape Foulwind, southwestern Nelson, sample K29/f6504) are illustrated here. Figured specimens have been registered at the New Zealand Geological Survey and are catalogued with numbers prefixed OP.

In addition I have recovered specimens of Arcacythere from the late Eocene Kaiaitan and Runagan Stages (Ashley Mudstone Formation of a Waiau River bank outcrop, South Canterbury, sample J40/f90, and Totora Limestone of Taylors Quarry, North Otago, sample J41/f8244A, respectively) and from the early Miocene Otaian and Altonian Stages (of the coastal outcrop of All Day Bay, North Otago; Gee Greensand Formation, sample J42/f6544 and Rifle Butts Formation, sample J42/f169 respectively). Some specimens from these localities are also illustrated here. Figured specimens have been deposited in the museum collections of the Department of Geology, University of Otago, Dunedin, New Zealand, and are catalogued with numbers prefixed OU.

OBSERVATIONS

Topotypes of A. chapmani were examined using the scanning electron microscope (see Plate 1) and transmitted light (see Fig. 1). These techniques allow illustration of important carapace features in greater detail and accuracy than Hornibrook was able to achieve in his drawings of Arcacythere in 1952. Internal carapace features are shown in Pl. 1, Figs 3, 4, 8-11, and Fig. 1, and are consistent with those of Rockallia (see Whatley et al. 1978 and Whatley et al. 1982). The most significant features in common include: (1) a median hinge element which lacks crenulation, (2) interdigitating adductor muscle scars, (3) a large and subreniform frontal scar, and (4) a large triangular fulcral point which is almost dorsal to the adductor scars. Other internal features such as the normal and radial pore canal number and distribution are also consistent with the generic diagnosis given by Whatley et al. (1982) for Rockallia.

The overall external morphology, inflation and lateral outline of A. chapmani is also similar to that of Rockallia. The nature of the reticulate ornament is comparable to Rockallia and in some specimens bears weak papillate ridges as it does in some specimens of Rockallia. The two large normal pore conuli near the anterior and posterior margins reported in species of Rockallia are also present in A. chapmani.

The features listed above clearly indicate that Arcacythere and Rockallia show only minor distribution of the fossae. Rockallia is, therefore, shown to be a subjective junior synonym of Arcacythere. An emended diagnosis of A. chapmani is given.
Rockallia are congeneric. Differences between A. chapmani and species assigned to Rockallia can be seen in details of the external carapace morphology and lateral outline (see emended diagnosis of A. chapmani below). These features identify the former as a distinct species but are insufficient to merit a generic distinction. The above observations indicate that Arcacythere is a senior subjective synonym of Rockallia.

Order Podocopida Muller, 1894
Superfamily Cytheracea Baird, 1850
Family Rockalliidae Whatley, Uffenorde, Harlow, Downing & Kesler, 1982

Genus Arcacythere Hornibrook, 1952

**Included species:**

| Species | Reference |
|---------|-----------|
| Arcacythere chapmani Hornibrook, 1952 | |
| Rockallia enigrnutica Whatley, Frame & Whittaker, 1978 | |
| Rockallia eocenica Whatley, Uffenorde, Harlow, Downing & Kesler, 1982 | |
| Rockallia inceptiocelata Whatley, Uffenorde, Harlow, Downing & Kesler, 1982 | |
| Rockallia woutersi Whatley, Uffenorde, Harlow, Downing & Kesler, 1982 | |
| Rockallia sp. Whatley, Uffenorde, Harlow, Downing & Kesler, 1982 | |
| Arcacythere sp. McKenzie, 1974 | |
| Arcacythere cf. eocenica Whatley et al. 1982, this paper (see Pl.1, Figs 14-15) | |

**Emended diagnosis.** A species of Arcacythere subrectangular in lateral view often with a distinct postero-ventral angle and almost straight ventral margin. Two ridges, sometimes broad, occur parallel and close to the anterior and postero-dorsal margins; the latter extends anteriorly to mid-length. Reticulation robust with vertical components tending to dominate and, in anterior half of carapace, radiate from mid dorsal region.

**Remarks:** This species is similar to A. eocenica (Whatley et al.) from the Eocene of D.S.D.P. Site 207 in the Tasman Sea, but differs in its robust reticulation and ridges. A. woutersi (Whatley et al.) from the Oligo-Miocene of northwestern Europe differs in lacking the strong anterior and postero-dorsal ridges present in A. chapmani, but is similar in its robust reticulation, a feature presumably reflecting similar relatively shallow water depths at which these two species occurred.

**Stratigraphical range.** Hornibrook (1952) states that Arcacythere chapmani ranges from the Piripauan Stage (Late Cretaceous) to the Waiauan Stage (Middle Miocene). New Zealand records older than Oligocene probably involve different species since they lack an anterior extension of the postero-dorsal ridge, have a more convex posterior outline, and a less robust reticulation (see Pl. 1, Figs 14-17).

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**Explanation of Plate 1**

All dimensions are given as length x height in mm. All scale bars = 50μm.

**Figs.1-11, 18 & 19**

Arcacythere chapmani Hornibrook, all figured specimens are from the type locality, Waiau River bank section, Clifden, Southland, lat. 46° 02.0’S, long. 167° 41.7’E; Fig. 1, male RV, OP1147, ext. lat., 0.41 x 0.20, (D45/f8466) Upper Shellbeds Member, Park Bluff Sandstone Formation, Waiauan Stage, middle Miocene; Fig. 2, male RV, OP1144, ext. lat., 0.50 x 0.21, (D45/f8467) Third Bay Sandstone Member, Nga Pari Formation, Lillburnian Stage, middle Miocene; Fig. 3, same specimen, int. lat.; Fig. 4, same specimen, detail of hinge, adductors, frontal scar and fulcral point; Fig. 5, same specimen, postero-lat. oblique; Fig. 6, female carapace, OP1145, ext. lat. LV, 0.44 x 0.21, (D45/f8475) Lill Sand Member, Park Bluff Sandstone Formation, Lillburnian Stage, middle Miocene; Fig. 7, female LV, OP1146, ext. lat., 0.46 x 0.21, (D45/f8466) Upper Shellbeds Member, Park Bluff Sandstone Formation, Waiauan Stage, middle Miocene; Fig. 8, same specimen, int. lat.; Fig. 9, same specimen, detail of posterior part of hinge; Fig. 10, same specimen, detail of anterior part of hinge; Fig. 11, same specimen, detail of central muscle scars and fulcral point; Fig. 12, same specimen, OP1145, dors, 0.44 x 0.21, (D45/f8475) Lill Sand Member, Park Bluff Sandstone Formation, Lillburnian Stage, middle Miocene; Fig. 13, female RV, OP1146, ext. lat., 0.48 x 0.22, (J42/f6544) Gee Greensand Formation, Otaian Stage, early Miocene, N. Otago, lat. 40° 10.8’S, long. 170° 53.7’E; Fig. 14, female RV, OU39798, ext. lat., 0.42 x 0.21, (J42/f169) Rifle Butts Formation, Altonian Stage, early Miocene, N. Otago, lat. 45° 12.0’S, long. 170° 53.0’E.

**Figs.12-13**

Arcacythere aff. chapmani Hornibrook: Fig. 12, female RV, OU39799, ext. lat., 0.48 x 0.22, (J42/f6544) Gee Greensand Formation, Otaian Stage, early Miocene, N. Otago, lat. 40° 10.8’S, long. 170° 53.7’E; Fig. 13, female RV, OU39798, ext. lat., 0.42 x 0.21, (J42/f169) Rifle Butts Formation, Altonian Stage, early Miocene, N. Otago, lat. 45° 12.0’S, long. 170° 53.0’E.

**Figs.14-15**

Arcacythere cf. eocenica Whatley et al., both figured specimens are from (K29/f6504) Kataiata Mudstone Formation, Runagan Stage, late Eocene, Cape Foulwind, S.W. Nelson, lat. 41° 44.7’S, long. 171° 29.0’E; Fig. 14, female LV, PO1148, ext. lat., 0.40 x 0.21; Fig. 15, female RV, OP1149, ext. lat., 0.40 x 0.20.

**Figs.16-17**

Arcacythere aff. chapmani Hornibrook:** Fig. 16, female LV, OU39800, ext. lat., 0.42 x 0.22; Fig. 17, female RV, OU39801, ext. lat., 0.43 x 0.22.
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