

A new species of glypheid lobster, *Glyphea christeyi* (Decapoda: Palinura), from the Eocene (Bortonian) Waihao Greensand, South Canterbury, New Zealand

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Abstract The presence of *Glyphea christeyi* n. sp. in the Waihao Greensand, exposed along the Opihi River, South Canterbury, marks the geologically youngest occurrence of the genus in New Zealand and, perhaps, in the world. The only other Eocene report of *Glyphea* von Meyer is from Antarctica, also a high latitude occurrence. This discovery reinforces our contention that the sole extant member of the family, *Neoglyphea inopinata* Forest & de Saint Laurent, 1975, was derived from a species of *Glyphea* in the South Pacific region.

Keywords Crustacea; Decapoda; Palinura; Glypheidae; Eocene; new species; New Zealand

INTRODUCTION

The record of fossil decapod crustaceans in New Zealand is fairly substantial. Feldmann & Keyes (1992) compiled records of species-level taxa collected from more than 230 localities in Cenozoic and Mesozoic rocks. Subsequent to that compilation, several other studies have increased the number of species to at least 89. As a result of this work, decapods have become useful in New Zealand biostratigraphic and paleoecological studies. These efforts also have yielded important data regarding the geological history of decapod crustaceans in the Southern Hemisphere (Feldmann & McLay 1993).

The present work recognises a new species of glypheid lobster that represents the youngest known occurrence of *Glyphea*, whose major development occurred in the Mesozoic. Furthermore, the expanded range of the genus strengthens the possibility that it was the progenitor of *Neoglyphea* Forest & de Saint Laurent, the sole living representative of the Glypheidae.

SYSTEMATIC PALEONTOLOGY

Order DECAPODA Latreille, 1803
Infraorder PALINURA Latreille, 1803

REMARKS: Although the family Glypheidae is herein referred to the Palinura—its traditional systematic position—it is appropriate to note that Forest & de Saint Laurent (1989) have suggested that the Palinura may be an artificial grouping and that the Glypheidae may be more closely related to the Astacidea. We tend to agree with this view. However, because Forest & St Laurent did not formalise this placement, and because a discussion of the systematic position of the family is beyond the scope of this work, the customary classification will be followed.

Superfamily GLYPHEOIDEA Winckler, 1883
Family GLYPHEIDAE Winckler, 1883
Genus *Glyphea* von Meyer, 1835

Glyphea christeyi n. sp.

Fig. 1, 2, 3

DIAGNOSIS: Glypheid with flat-topped dorsal ridge on cephalic region; strong, spinose antennal ridge; coarsely pustulose hepatic region; and distinct reticulate sculpture on anteroventral portion of branchiostegite becoming obsolete dorsally and posteriorly.

DESCRIPTION: Cephalothorax of moderate size for genus, carapace length of holotype >37.5 mm, height c. 41% length excluding rostrum. Rostrum not preserved. Dorsal margin straight; posterior margin straight dorsally and strongly convex ventrally; posteroventral margin smoothly convex, greatest height of carapace at c. 60% total length measured from front and excluding rostrum; anteroventral margin straight, sloping posteroventrally, strongly downturned at base of cervical groove.

Cervical groove gently sinuous, intercepts dorsum at 64° angle at distance of c. 45% total length of cephalothorax, measured back from front, curving anteriorly and then dorsally near base to join antennal groove. Branchiocardiac groove narrow, deeply incised, steeply oblique, approaching dorsum at 23° angle, curving abruptly to cross dorsum at 64° angle. Postcervical groove nearly as strong as branchiocardiac, approaching dorsum at 11° angle, converging toward branchiocardiac posteriorly to meet above inflection in branchiocardiac groove. Inferior groove concave anteriorly, distinct. Antennar groove parallels ventral margin.

Cephalic region with 3 longitudinal ridges, dorsal ridge, and row of spines ventral to antennal ridge. Antennal ridge strongest and spinose; other ridges appear smooth. Dorsal ridge flat-topped, widening posteriorly, cleft by axial suture.

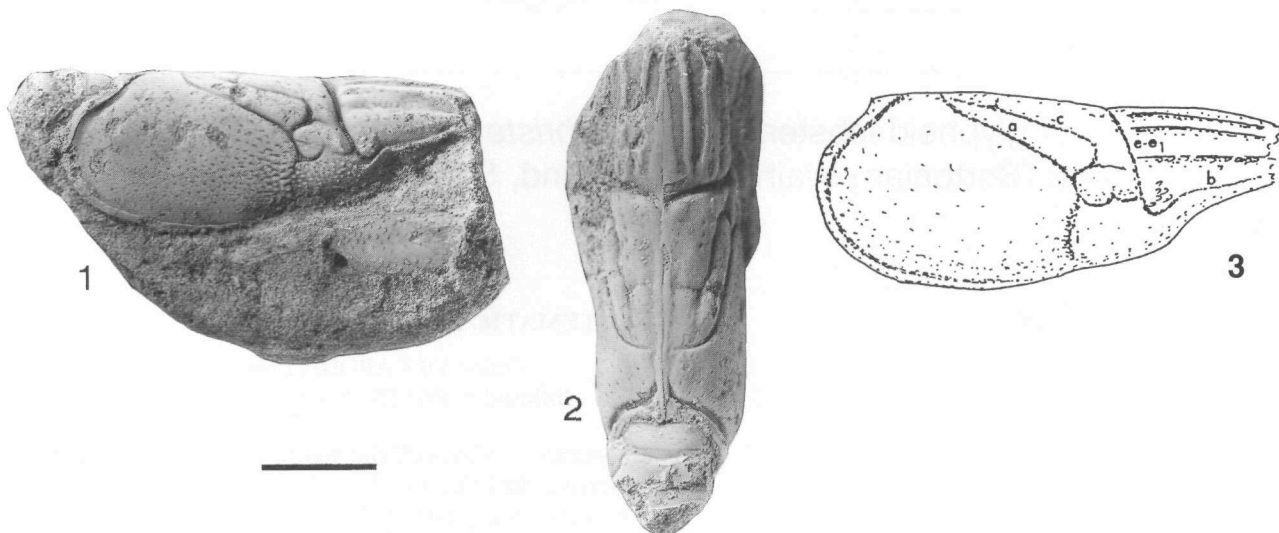


Fig. 1-3 *Glyphea christeyi* n. sp. 1, Right lateral view of the holotype, deposited in the Canterbury Museum. 2, Dorsal view of the same specimen. 3, Line drawing of the carapace showing the position of carapace grooves: a = branchiocardiac groove; b = antennal groove; c = postcervical groove; e-e₁ = cervical groove; i = inferior groove. Scale bar equals 1 cm.

Hepatic region coarsely pustulose. Region of external mandibular articulation well defined, surface with ridge extending anteroventrally. Row of coarse setal pits situated dorsal to postcervical groove. Branchiostegite with coarse reticulate sculpture anteroventrally becoming smooth posteriorly. Marginal rim broad, smooth, distinct posteriorly, becoming narrower but remaining distinct ventrally.

Dorsal surface of abdominal somites 1 and 2 preserved, smooth, with transverse row of setal pits at midlength of somite 1 and near anterior border of somite 2.

Remainder of abdomen, telson and uropods not preserved.

Appendages represented only by portion of merus of pereopod 1. Merus broad, apparently flattened, with fine scabrous ornamentation on outer surface, particularly near upper and lower margins.

MEASUREMENTS: All measurements are taken on the holotype. Length of carapace, >37.5 mm; length of cephalic region measured along dorsum, >13 mm; height of carapace, 15.2 mm, measured at about midlength of branchiostegite.

ETYMOLOGY: The trivial name recognises Mr Gavin Christey, Rockwood, New Zealand, who collected the specimens and generously made them available to us for study.

TYPES: The holotype and paratype are deposited in the Canterbury Museum, Christchurch, New Zealand.

LOCALITY AND STRATIGRAPHIC POSITION: The specimens were collected from the banks and bed of the Opihi River in a section extending c. 100 m downstream from Rockwood Bridge, South Canterbury (NZMS 260 metric grid reference J38/457691; New Zealand Fossil Record File no. J38/f80) (Fig. 4). The decapods occur in locally strongly bioturbated glauconitic sands with scattered concretions and local, more persistent cemented units. The rock unit is tentatively

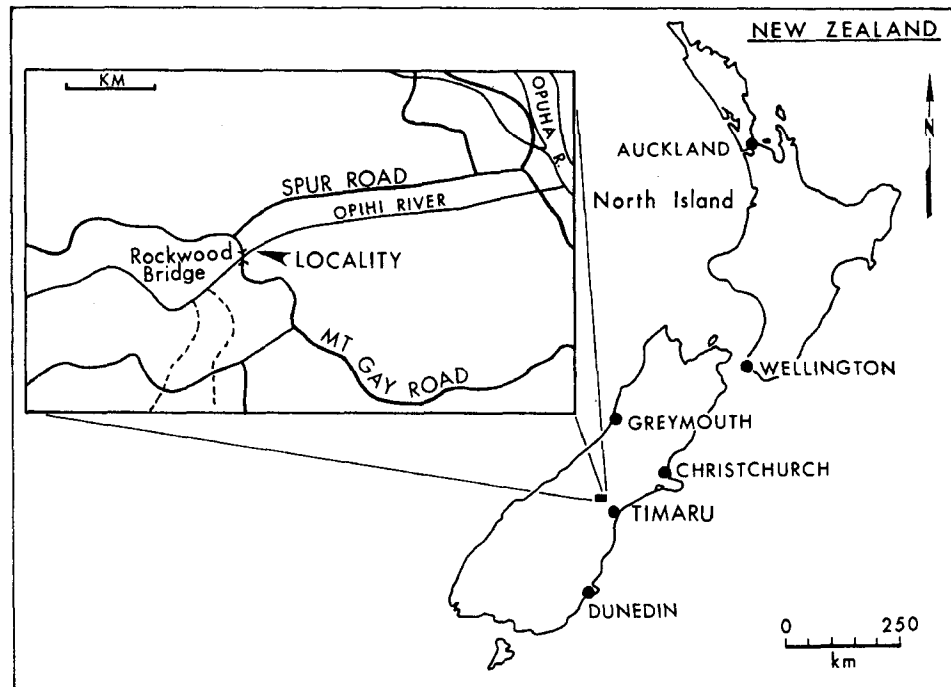
assigned to the Waihao Greensand. Based upon the enclosed mollusc, *Duplipecten parki* (Marwick, 1942), as well as the known age of the Waihao Greensand elsewhere, a Bortonian (late-middle Eocene) age is assigned. *Duplipecten parki* forms a thin shellbed within the unit but also occurs scattered throughout the sands. The glauconitic sands are underlain by a cemented shellbed with poorly preserved molluscs, which seem to mark the top of a fairly thick sequence of sands with little or no glauconite but at least one persistent cemented bed with *Callianassa* s.l. This sequence, in turn, overlies prominent cemented shellbeds at or near the base of the Tertiary sequence.

REMARKS: The holotype upon which this new species is based is a nearly complete carapace and the associated dorsal surfaces of the pleura of the first two abdominal somites. The paratype is a fragmentary carapace exposing the dorsal and left lateral portion of the mid carapace. The specimens exhibit all the features necessary to place the material in the genus *Glyphea* with confidence. The only genera that might be confused with *Glyphea* are *Trachysoma* Bell, 1858 and *Litogaster* von Meyer, 1847. Convergence of the postcervical groove is diagnostic of *Glyphea*. In both *Trachysoma* and *Litogaster* the postcervical and branchiocardiac grooves are parallel.

A combination of characters exhibited by this species, and noted in the diagnosis, serve to distinguish it from all others. *Glyphea reticulata* Feldmann & Gaździcki (1997) from the Eocene La Meseta Formation of Seymour Island, Antarctica, which is the only other Eocene representative of the genus, exhibits a row of fine spines posterior to the cervical groove, and uniformly fine reticulate ornamentation over the posterior portion of the carapace.

Examination of other species of *Glyphea*, including those from Great Britain monographed by H. Woods (1925-31), Canada and the United States (Feldmann & McPherson 1980), and the Southern Hemisphere confirm that the single-most distinctive feature of *G. christeyi* is the presence of

Fig. 4 Locality in South Canterbury, New Zealand, from which *Glyphea christeyi* was collected.



the reticulate ornamentation on the anteroventral portion of the thoracic region of the carapace. Ornamentation in this region on other species tends to range from being nearly absent to being pustulose, or scabrous. Thus, there is little difficulty in distinguishing this new species from all others in the genus.

Glypheids are well represented in the Southern Hemisphere. *Glyphea stilwelli* Feldmann, 1993 was described recently from Paleocene rocks of New Zealand (Feldmann 1993), and *Glyphea arborinsularis* Etheridge Jr, 1917 and *G. oculata* J. T. Woods, 1957 were described from the Aptian and Albian, respectively, of Queensland, Australia (J. T. Woods 1957). Another, as yet undescribed species of *Glyphea* also has been collected from Australia. In Antarctica, *Glyphea alexandri* Taylor and *G. georgiensis* Taylor were described from Lower Cretaceous rocks of Alexander Island (Taylor 1979), in addition to *G. australensis* Feldmann et al., 1993 from the Campanian–Maastrichtian of James Ross and Vega Islands.

The specimens of *Glyphea christeyi*, although fragmentary, appear to represent corpses. The small portion of the abdomen that is preserved on the holotype is articulated with the carapace, and the carapace is fully inflated on both specimens. Unfortunately, the appendages are so poorly represented that it is difficult to comment further. Certainly, the quality of preservation is excellent, and there is no indication of abrasion or transport. Therefore, it is likely that the animals were buried rapidly within the area in which they had lived.

This new species occurs in association with other decapods, *Callianassa* s. l., and *Pororaria eocenica* Glaessner, 1980. The diagnostic characters necessary to provide a precise identification of the callianassid are to be found on the merus and carpus (Manning & Felder 1991). These elements apparently are not preserved and, therefore, generic placement must be considered to be in the general sense. Additional material will be necessary to refine the

identification. Most callianassids tend to occur in inner sublittoral or littoral habitats, which provides documentation for the bathymetric conditions at the depositional site of *G. christeyi*.

In addition to the decapods, the new species was also associated with the smooth pectinid bivalve, *Duplipecten parki* (Marwick), which helps to constrain the age of the material. *Duplipecten parki* is known from Bortonian and Kaiatan rocks (Beu & Maxwell 1990). Presuming that the inferred age of Bortonian is correct, the range of *Pororaria eocenica* would be extended into the Bortonian. Previously, it has only been reported from the Kaiatan–Runangan Island Sandstone of Westland (Feldmann & Maxwell 1990).

GLYPHEA AS PROGENITOR OF NEOGLYPHEA

The only living representative of the Glypheidae is *Neoglyphea inopinata* Forest & de Saint Laurent (1975), which is known only from depths of c. 200 m in the South China Sea (Forest et al. 1976). A few additional specimens collected subsequent to collection of the type specimen led to an emendation of the description of the species (Forest & de Saint Laurent 1989). The presence of a relatively weak postcervical groove that was convergent upon the branchiocardiac groove, overall similarities in proportion of carapace to that of *Glyphea* spp., and similar morphology of the abdomen and first pereopod all support our position that the extant form arose from an ancestor within *Glyphea*. As noted above, the only other genera within the Glypheidae consistently exhibit parallel postcervical and branchiocardiac grooves. Additionally, the general trend in expression of these grooves, and the adjacent regions, within *Glyphea* is toward reduction of complexity, loss of accessory grooves, and reduction of strength of the postcervical groove. Therefore, it seems reasonable to suggest derivation of the extant genus from a species of *Glyphea*. Discovery of Eocene representatives of *Glyphea* closes some of the gap in time

between disappearance of this genus, known only from the fossil record, and the living genus, *Neoglyphea*.

The Eocene representatives are also known from sites in high paleolatitudes, in both New Zealand and Antarctica. Extant *Neoglyphea* are known from a lower latitude, relatively deep water occurrence, a radiation pattern previously noted in the phylogenetic history of some other decapods (Zinsmeister & Feldmann 1984). It is possible that when additional sampling of deep-water sites is undertaken more glypheid taxa may be discovered.

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