# AN *IN SITU* HERMIT CRAB FROM THE EARLY MIOCENE OF SOUTHERN NEW ZEALAND

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ABSTRACT. An Early Miocene (Burdigalian) hermit crab preserved within a struthiolariid gastropod shell is described. The specimen, here designated *Pagurus clifdenensis* sp. nov., has close affinities with the Recent species *P. spinulimanus* (Miers) which is common in New Zealand waters.

FOSSIL hermit crabs (pagurids) are rarely preserved *in situ* since they vacate their shelters (usually a gastropod shell) prior to death (Schäfer 1972, p. 131). Poor calcification and delicate skeletal structure of the cephalothorax renders them highly susceptible to taphonomic loss, and in almost all cases fossil specimens are represented only by the heavily calcified and robust chelipeds (Glaessner 1969). However, one *in situ* well-preserved pagurid has been found in a gastropod shell (*Struthiolaria subspinosa* Marwick, fig. 1), within a sequence of richly fossiliferous silty fine sandstones at Clifden, Southland, New Zealand. The rich associated molluscan fauna suggests a middle-inner neritic depositional environment.

## SYSTEMATIC PALAEONTOLOGY

Family PAGURIDAE Latreille, 1802
Subfamily PAGURINAE Latreille, 1802
Genus PAGURUS Fabricius, 1775
*Pagurus clifdenensis* sp. nov.

Text-fig. 1–3

*Holotype.* Specimen No. O.U. 11797 in the Department of Geology, University of Otago, New Zealand. Parts of left and right chelipeds and second and third periopods exposed *in situ* in gastropod (*S. subspinosa* Marwick).

*Stratigraphic Occurrence.* Calamity Point Sandstone, Nga Pari Formation, south bank of Waiau River, Clifden, New Zealand (Wood 1969); Altonian local stage (Early Miocene).

*Diagnosis.* Right cheliped larger than left; both covered with large, cone-shaped tubercles on dorsal surface; smaller and more numerous than in *P. spinulimanus*. Double row of molariform teeth on opposable faces of right chela; thoracic appendages covered with piliferous holes and striations. Manus of left cheliped longer than in *P. spinulimanus*.

*Description.* Right cheliped: Carpus has convex dorsal surface, bearing short, transverse, piliferous striae; row of large teeth on mesial border (text-fig. 2). Manus suboval, length 13·2 mm, width 7·7 mm, dorsal surface slightly convex. External and mesial margins of propodus lined with cone-shaped teeth, some of them broken; dorsal surface ornamented with numerous, evenly distributed, acute tubercles and innumerable minute perforations (5 $\mu$m and 12 $\mu$m in diameter). Double row of large, molariform teeth along opposable faces of fingers, bordered by a series of composite, indented perforations (text-figs. 1, 3*a*). Left cheliped (text-figs. 1, 3*a*): Propodus elongated, length 9·7 mm, width 3·6 mm; manus shorter than dactylus. Dorsal surface ornamented with cone-shaped tubercles and piliferous holes as in right cheliped; external margin also lined with broken cone-shaped teeth.

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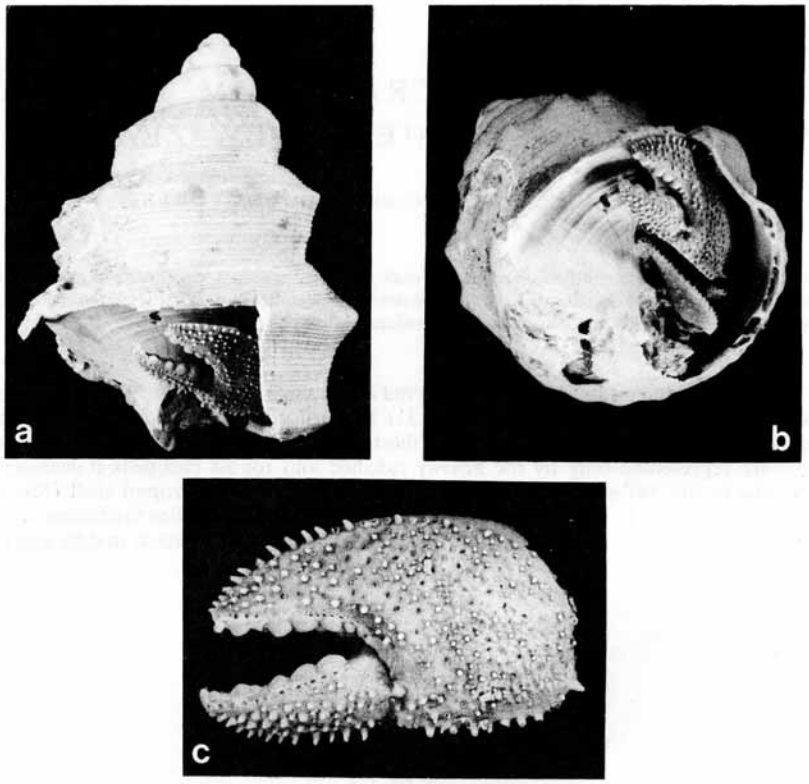
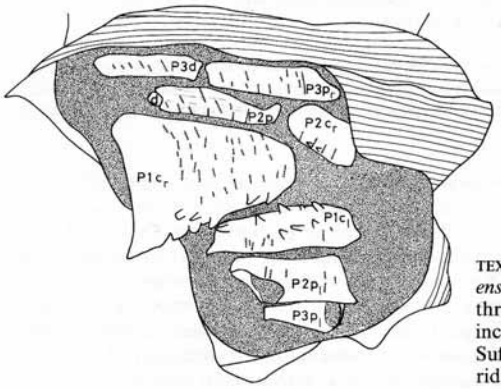
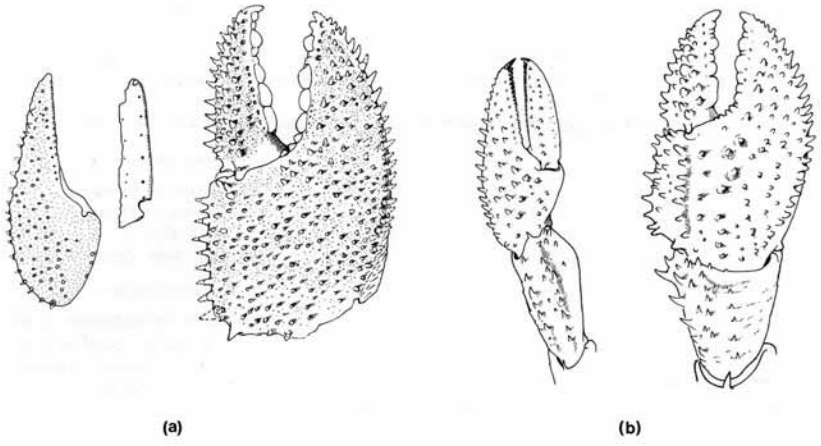



TEXT-FIG. 1. *Pagurus clifdenensis* sp. nov. within damaged gastropod shell (*Struthiolaria subspinosa* Marwick). (*a*) View of part of right cheliped; × 2. (*b*) Oblique view showing right and left cheliped in damaged aperture; × 2. (*c*) Propodus and dactylus of right cheliped; × 4·5.




TEXT-FIG. 2. Camera lucida drawing of *Pagurus clifdenensis* sp. nov. with part of gastropod shell removed. First three periopods (P1–P3) exposed in matrix (stippled), including carpus 'c', propodus 'p', and dactylus 'd'. Suffices refer to right 'r' and left 'l' periopods. Transverse ridges possess piliferous holes, × 4.




TEXT-FIG. 3. Camera lucida drawing of fossil and Recent pagurids: (*a*) Right and left chelipeds (propodus and dactylus) of *Pagurus clifdenensis* sp. nov. (Miocene), ×4. (*b*) Right and left chelipeds of Recent New Zealand species, *Pagurus spinulimanus* (Miers), ×2·5. All illustrations in dorsal view, except dactylus of left cheliped of *Pagurus clifdenensis*, in ventral aspect.

Small indentations along entire length of straight cutting edge of fixed finger; line of six piliferous alveoli, bordering opposable face of dactylus (text-fig. 3*a*). Second and third periopods lack teeth or spines but they possess several transverse piliferous striations (text-fig. 2); propodus rounded in cross-section.

*Discussion.* Though most of the significant taxonomic features cannot be observed in the fossil specimen, details of the thoracic appendages are very similar to those of the Recent pagurid, *P. spinulimanus* (Miers) (text-fig. 3*b*). *P. spinulimanus* has previously been described as *Eupagurus edwardsi* Filhol, *E. intermedius* Lenz (cf. Thompson 1930, p. 271) or *E. norae* Chilton. The Recent New Zealand pagurid fauna is currently being revised by J. Forest and M. de Saint Laurent, and both *P. clifdenensis* sp. nov. and *P. spinulimanus*, together with the larger, related Recent species *P. rubricatus* Henderson, will be moved to a new genus.

Size and distribution of perforations on the periopods of *P. clifdenensis* suggest that they were covered with very thick, rather short hairs, rather like *P. spinulimanus*, concealing the teguments except at the apex of tubercles and teeth. Holes and transverse striations on the fossil correspond to the much longer hairs observed in similar areas of *P. spinulimanus*. Moreover, a row of alveoli on the cutting edge of the dactylus (left cheliped) in *P. clifdenensis* most probably represent the insertion of small comb-like teeth which occur in *P. spinulimanus*.

*P. spinulimanus* is common in the New Zealand region, particularly around the Auckland Islands, to the north of the North Island, near the Chatham Islands, to the east of the South Island, and on the Otago shelf. It is most common on muddy sand substrates at depths of between 20 and 120 m.

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