

Description of *Durckheimia lochi* n. sp., with an annotated checklist of Australian Pinnotheridae (Crustacea: Decapoda: Brachyura)

SHANE T. AHYONG¹ & DIANE E. BROWN

Australian Museum, 6 College Street, Sydney, NSW 2010, Australia. ¹Corresponding author; shanea@austmus.gov.au.

Abstract

A new species of pinnotherid crab, *Durckheimia lochi*, is described from the Great Barrier Reef, representing the first Australian record of the genus. The new species differs from its congeners chiefly by the combination of a transverse anterior carapace margin, a deep, slit-like, median frontal carapace notch, a cristate, but interrupted longitudinal median carina on the carapace, and in features of the third maxilliped. *Pinnotheropsis yokotai* Kubo, 1939, is removed from the synonymy of *D. caeca* Bürger, 1895, and the generic position of *D. besutensis* Serène, 1967, is discussed. A key to the species of *Durckheimia* and an annotated checklist of the known Australian Pinnotheridae are provided. Previous records of *Pinnotheres novaezelandiae* Filhol, 1885, *P. obesus* Dana, 1852, and *Pinnixia faba* (Dana, 1851) from Australia are corrected.

Key words: Crustacea, Decapoda, Brachyura, Pinnotheridae, *Durckheimia lochi*, taxonomy, Indo-West Pacific

Introduction

The genus *Durckheimia* de Man, 1889, was erected for a new species, *D. carinipes* from the Red Sea, and was characterised chiefly by the presence of a longitudinal median carina on the carapace and strongly produced, upturned frontal, lateral and posterior margins that obscure the eyes in dorsal view. The most recent summary of the Pinnotheridae (Schmitt et al. 1973) recognised three species of *Durckheimia*, all from the Indo-West Pacific: *D. carinipes* de Man, 1889, *D. caeca* Bürger, 1895, and *D. besutensis* Serène, 1967. In the present study, we describe a new species of *Durckheimia* from Australia, and evaluate the status of *Pinnotheropsis yokotai* Kubo, 1939, regarded as a synonym of *D. caeca* by Sakai (1955, 1976). We also evaluate the generic position of *D. besutensis* Serène, 1967, whose

status was questioned by Manning (1993b) and Campos (1996), provide a key to the species of *Durckheimia*, and append an annotated checklist of the known Australian Pinnotheridae.

Abbreviations used: Australian Museum (AM), carapace length (cl), carapace width (cw), millimeters (mm). Australian states are abbreviated as follows: Queensland (QLD), New South Wales (NSW), Victoria (VIC), Tasmania (TAS), South Australia (SA), Western Australia (WA), Northern Territory (NT).

SYSTEMATIC ACCOUNT

PINNOTHERIDAE De Haan, 1833

Durckheimia De Man, 1889

Durckheimia de Man, 1889: 422 [Type species: *D. carinipes* de Man, 1889, by monotypy and original designation. Gender: feminine].

Pinnotheropsis Kubo, 1939: 57 [Type species: *P. yokotai* Kubo, 1939, by monotypy and original designation. Gender: feminine].

Dürckheimia. — Tesch, 1918: 245, 246, 287. — Balss, 1922: 140 [misspelling].

Duerckheimia. — Guinot, 1967: 279 [misspelling].

Diagnosis of females (males unknown). Carapace subtrapezoid to subcircular, well calcified; regions undefined; dorsum with or without longitudinal median carina; front strongly produced, completely obscuring eyes in dorsal view, with distinct median notch. Third maxilliped endopod with ischium and merus indistinguishably fused; palp 2- or 3-segmented; propodus longer than carpus; dactylus (when present) digitiform, inserted near midlength of ventral margin of propodus. Chelae symmetrical. Walking legs similar and symmetrical from left to right; dactyli falcate with spiniform apex.

Included species. Third maxilliped with 3-segmented palp: *D. caeca* Bürger, 1895 from Palau (host: *Lima squamosa* Lamarck, Limidae); *D. carinipes* de Man, 1889 from the Red Sea (host unknown); *D. lochi* n.sp. from Australia (hosts: *Ctenoides ales* (Finlay), *Lima lima vulgaris* (Link), Limidae); and *D. yokotai* (Kubo, 1939) n.comb. from Japan (hosts: *Lima sowerbyi* Deshayes (Limidae), *Chama reflexa* Reeve (Chamidae). Third maxilliped with 2-segmented palp: *D. besutensis* Serène, 1967, from Peninsular Malaysia (host: *Lithophaga* sp., Mytilidae).

Remarks. Kubo (1939), apparently unaware of de Man's (1889), Bürger's (1895) and Balss' (1922) papers dealing with *Durckheimia*, described a new genus and species from Japan, *Pinnotheropsis yokotai*. Like *Durckheimia*, *Pinnotheropsis* was characterised by a carapace with a longitudinal median carina and strongly produced, upturned margins. Sakai (1955) synonymised *P. yokotai* with *D. caeca* and therefore *Pinnotheropsis* with *Durckheimia*. Although we concur with the synonymy of *Pinnotheropsis* with *Durckheimia*, we believe Sakai (1955) was incorrect to synonymise *P. yokotai* with *D. caeca*. Based on comparison of the account and figures of *D. caeca* by Bürger (1895) with that of

P. yokotai by Kubo (1939) and Sakai (1976, as *D. caeca*), Kubo's species is clearly distinct, and is herein removed from synonymy. *Durckheimia yokotai* n. comb. differs from *D. caeca* in the following features: 1) the median carina of the carapace is interrupted by a distinct notch instead of being entire; 2) the anterolateral margins of the carapace are more strongly rounded; 3) the median frontal notch of the carapace is relatively broad and U-shaped instead of narrow and slit-like; and 4) the dactylus of the third maxilliped palp distinctly overreaches instead of just reaching the apex of the propodus. Balss's (1922) record of *D. caeca* from Japan requires verification; it is probably based on *D. yokotai*.

Recent revisionary studies on the Pinnotheridae (e.g. Manning 1993a, b, c, Campos 1989, 1990, 1996, 2002), following Bürger (1895), have increasingly focussed on limb segment proportions, segmentation and morphology of the third maxilliped, and features of the carapace. Principally on the basis of segmentation of the third maxilliped, several recent studies have suggested heterogeneity within *Durckheimia* (see Manning 1993b, Campos 1996) to the effect that *D. besutensis* should be excluded from the genus.

Serène (1967) acknowledged the atypical characters of his species, but in determining its generic placement, focussed on the subtrapezoid carapace shape and distinctive frontal carapace margin that united *D. besutensis* with other species of *Durckheimia*. As in other species of the genus, the frontal carapace margin of *D. besutensis* bears a distinct median notch and is strongly produced, completely obscuring the eyes in dorsal view. Serène (1967) and Campos (1996) together indicated that *Durckheimia besutensis* differs from congeners in having the exopod of the third maxilliped with concave instead of convex margins and a 1- instead of 2-segmented flagellum, the presence of a knob or ridge and strong concavities ('fausse orbite') dorsolateral to the orbits, distinctly pitted or eroded instead of generally smooth carapace surfaces, subcylindrical meri of the walking legs, and most importantly the 2- instead of 3-segmented third maxilliped palp, the absence of a median carina on the carapace, and the absence of upturned lateral and posterior carapace margins.

The median carina of the carapace is broad and blunt in *D. carinipes*, uninterrupted and cristate in *D. caeca*, and cristate but interrupted in *D. yokotai* and *D. lochi* n.sp. *Durckheimia carinipes*, *D. caeca*, *D. lochi*, and *D. yokotai* all share a 3-segmented third maxilliped palp (probably plesiomorphic) and uniquely share the median carina and strongly produced carapace margins that wrap around the front, sides and rear. Therefore, these four species appear to be more closely related to each other than either is to *D. besutensis*. The present recognition of *D. lochi* and *D. yokotai* reinforces the contention that *D. besutensis* is either outside of the main group of *Durckheimia* or erroneously assigned.

If the condition of the carapace front is convergent, then *D. besutensis* is unrelated to *Durckheimia* sensu stricto rendering the frontal similarities superficial. If, however, the strongly produced front and medially notched frontal margin of the carapace in *D. besutensis* is homologous with that of its congeners, then Serène's species would be the sister to the remaining species of *Durckheimia*. *Durckheimia carinipes* would thus repre-

sent an intermediate between *D. besutensis* and the remaining species of the genus. Either way, the absence of the median carina of the carapace in *D. besutensis* is plesiomorphic as no other pinnotherids bear such a structure. Clearly, *D. besutensis* warrants further study. Irrespective, however, of whether *D. besutensis* is sister to the remaining congeners or only distantly related, it can be excluded from the genus without threatening the monophyly of *Durckheimia* sensu stricto. Removal of *D. besutensis* will enable a more uniform diagnosis of *Durckheimia*.

Previous workers (de Man 1889, Serène 1967) have recognised the similarity between the type species of *Xanthasia*, *X. murigera* White, 1846 (having a 2-segmented third maxilliped palp) and species of *Durckheimia* (those with a 3-segmented third maxilliped palp) in the upturned lateral and posterior carapace margins. *Xanthasia murigera* and the 3-segmented third maxilliped species of *Durckheimia* also share a similar third maxilliped exopod in which the margins are convex and the flagellum is 2-segmented. They differ obviously in dorsal carapace ornamentation, the subcylindrical versus dorsally cristate meri of walking legs and segmentation of the third maxilliped palp. Based on Serène (1967), *D. besutensis* resembles *X. murigera* in the following ways: 1) the shape of the segments of the third maxilliped palp — the propodus is spatulate and longer than the carpus, tapering to a blunt apex, and the ischiomerus has a concave outer margin and relatively straight inner margin; 2) the meri of the walking legs are subcylindrical; 3) the carapace is dorsally and ventrally irregularly pitted, but much less so in *X. murigera*; and 4) a ventral knob or ridge is present lateral to the orbits. *Durckheimia besutensis* differs from *X. murigera* in having concave margins and a 1-segmented flagellum on the third maxilliped exopod, a strongly pitted and eroded carapace, and most significantly in carapace ornamentation. In *D. besutensis* the lateral and posterior carapace margins are not upturned, the median dorsal tubercle and carinae are absent, and the eyes and outline of the orbits are not visible dorsally. Aside from carapace characters, *D. besutensis* and *X. murigera* bear a strong phenetic resemblance and might ultimately prove closely related. *Xanthasia* itself, however, requires further attention because of the presence of *X. whitei*, de Man, 1887, which has a 3- instead of 2-segmented third maxilliped palp. In any case, Serène's species cannot be placed in *Xanthasia*, for *X. murigera* and *D. besutensis* share no unique characters.

Durckheimia besutensis cannot be accommodated in any existing genus without significant generic modification. The strongly produced frontal carapace margin that completely obscures the eyes from dorsal view, the distinct median frontal notch, and deep excavations dorsolateral to the orbits exclude *D. besutensis* from all other genera. *Durckheimia besutensis* should eventually be removed to a new monotypic genus. Such an action would be premature, however, in lieu of specimens of *D. besutensis*, and that we have neither examined type nor other specimens of the poorly known *D. carinipes* (the type of the genus). In the absence of further comparative material and phylogenetic data, and in view of the strong similarities in frontal form between *D. besutensis* and other spe-

cies of *Durckheimia*, we provisionally recognise the unity of the genus. Presently, *Durckheimia* can be distinguished from other pinnotherid genera, by the strongly produced frontal and anterolateral margins of the carapace that completely obscure the eyes in dorsal view, and the presence of a distinct median frontal notch in the carapace. Males are presently unknown for any species of *Durckheimia*.

***Durckheimia lochi* n.sp.**

Figs. 1–2

Type material. HOLOTYPE: AM P24478, ovigerous female (cw 9.8, cl 7.7 mm), Moore Reef near Cairns, Queensland, 16°54'S, 146°12'E, 9.1 m, host *Ctenoides ales* (Finlay, 1927) (AM C103731), in crevice on bommie, I. Loch, 18 Jan 1976. PARATYPE: AM P24101, 1 ovigerous female, (cw 7.1 mm, cl 6.1 mm), Broadhurst Reef, near Townsville, Queensland, 18°58'S, 147°42'E, 11 m, host *Lima lima vulgaris* (Link, 1807) (AM C102954), under coral on bommie, I. Loch, 14 Sep 1975.

Diagnosis of female (males unknown). Carapace subtrapezoid, broader than long, all margins, upturned; anterior margin transverse, strongly produced, with deep, narrow, slit-like median notch. Dorsal surface with prominent, cristate longitudinal median carina, interrupted at midlength by deep notch. Third maxilliped with ischiomerus about 2/3 as wide as long, proximal 3/4 of inner margin straight; palp 3-segmented; tip of dactylus slightly falling short of propodal apex; exopod with 2-segmented flagellum.

Description of female (males unknown). *Carapace*: subtrapezoid, broader than long, with thin, continuous, upturned rim around all margins; anterior margin strongly produced and upturned, transverse with deep, narrow, slit-like median notch. Dorsal, lateral and frontal surfaces non-setose, glabrous except for several shallow, irregular depressions or pits on dorsum; with prominent, cristate longitudinal median carina extending from base of frontal median notch posteriorly to the up-turned, thickened posterior edge of carapace; median carina interrupted at midlength by deep notch; regions undefined. Anterior surface of carapace above and lateral to orbits glabrous and relatively uniform, without deep excavation.

Antennules and antennae: Antennular sinus larger than orbit; antennules folded obliquely. Antennae of 5 segments, basal 2-segments fused to epistome.

Eyes: small, pigmented, filling orbit, not visible in dorsal view.

Third maxilliped: Ischium and merus indistinguishably fused. Ischiomerus about 2/3 as wide as long; proximal 3/4 of inner margin straight; outer margin strongly convex. Palp 3-segmented, inserted subdistally on outer margin of ischiomerus. Carpus shorter than propodus. Propodus spatulate, longer than wide tapering to blunt apex; margin setose. Dactylus digitiform, distally setose, inserted slightly proximal to propodal midlength, apex slightly falling short of propodal apex; exopod with 2-segmented flagellum, distal segment setose.

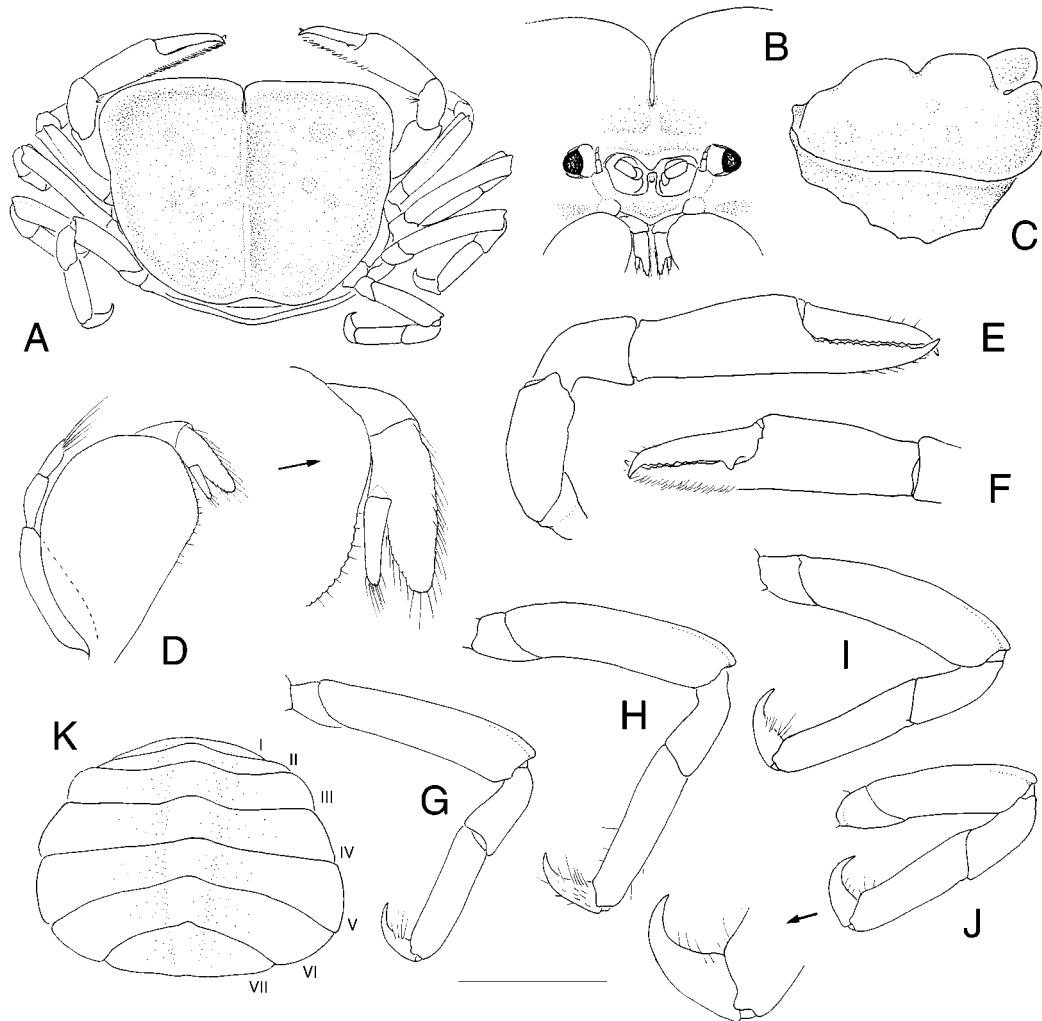


FIGURE 1. *Durckheimia lochi* n.sp., female holotype, AM P24478. A, dorsal view; B, anterior region; C, carapace, right oblique lateral; D, third maxilliped, right; E, chela, right outer; F, chela, right inner; G–J, pereopods 2–5, right; K, abdomen. Scale A, C, K = 5 mm. B, D–J = 2.5 mm.

Pereopod 1 (cheliped): Chelipeds symmetrical. Dactylus and pollex relatively straight, crossing distally, slightly shorter than propodal palm; occlusal margins crenulate, dactylus with blunt proximal projection; pollex with fringe of short setae on inner ventral margin.

Pereopods 2–5 (walking legs): Pereopods 2–5 similar and symmetrical from left to right; relative lengths in decreasing order $3 > 4 > 2 > 5$. Dactyli falcate, laterally compressed, sparsely setose (densest on pereopod 2), apices spiniform; about half length of propodus. Propodus and carpus unarmed, glabrous, former about 1.5 times length of latter. Merus longer and deeper than other segments, with cristate dorsal margin, glabrous.

Abdomen: broader than long, covering thorax, reaching base of third maxilliped; comprising 7 free segments (including telson), widest at segment 5.

Hosts. Both specimens were collected from the mantle cavities of species of the bivalve mollusc family Limidae. The holotype was found inside *Ctenoides ales* (Finlay, 1927) (Fig. 2) and the paratype from *Lima lima vulgaris* (Link, 1807).

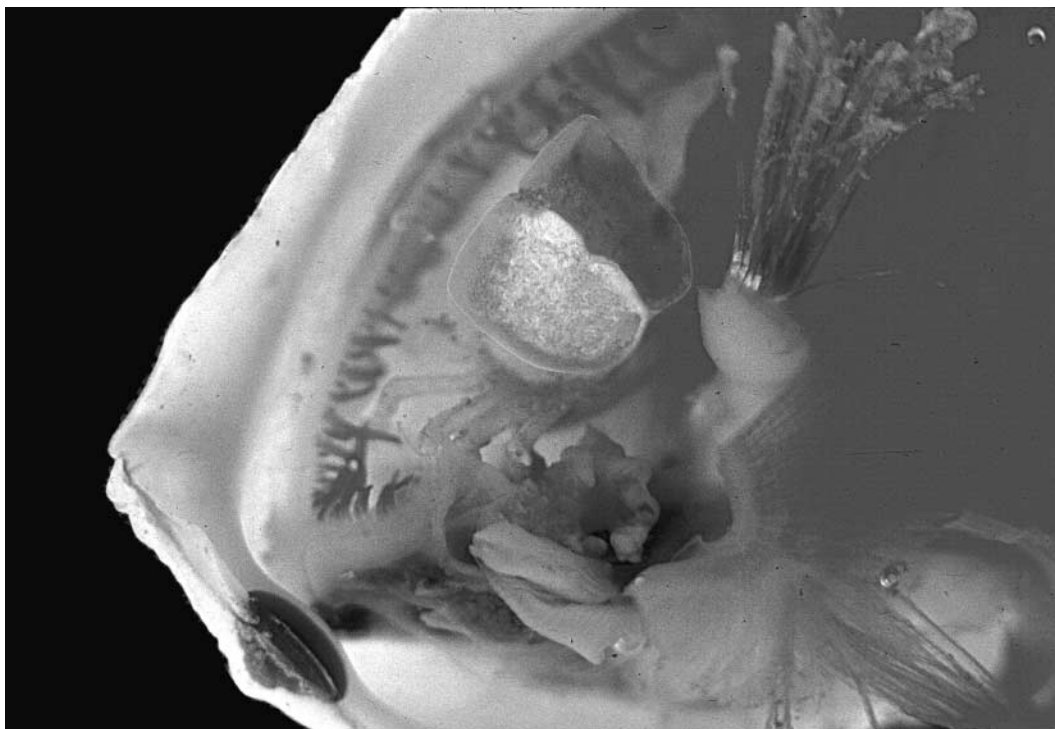


FIGURE 2. *Durckheimia lochi* n.sp., female holotype, AM P24478, in bivalve mollusc host, *Ctenoides ales* (Finlay, 1927) (AM C103731). Photo: I. Loch.

Colour in life. Uniform tan-orange. Eggs bright red-orange.

Etymology. Named in honour of Ian Loch, Australian Museum, who collected and photographed the type material, and has contributed much to the invertebrate collections of the Australian Museum.

Remarks. *Durckheimia lochi*, new species, resembles *D. yokotai* and *D. caeca* in having a cristate median carina on the carapace that extends from the base of the frontal notch, to the posterior margin of the carapace. The long, cristate median carina in the aforementioned species contrasts with that of *D. carinipes* which has a broad, blunt median carina that is distinct only on the posterior two-thirds of the carapace, and *D. besutensis* which lacks the median carina altogether. *Durckheimia lochi* resembles *D. caeca* in having a subtrapezoid carapace but differs most significantly in having an interrupted instead of entire median carina on the carapace. *Durckheimia lochi* resembles *D. yokotai* in having an interrupted median carina on the carapace but differs in having a transverse instead of rounded frontal carapace margin, and a narrow instead of broad, U-shaped median frontal notch.

Durckheimia lochi differs from congeners in characters of the third maxilliped: 1) the ischiomerus is comparatively broader, with a width of about 2/3 the length instead of about half the length; 2) the inner margin of the ischiomerus is straight instead of concave (as in *D. caeca* and *D. yokotai*) or convex (as in *D. carinipes* and *D. besutensis*); 3) the apex of the dactylus falls slightly short of the apex of the propodus whereas in other species, the apex of the dactylus reaches or slightly exceeds the apex of the propodus (except in *D. besutensis* which lacks a dactylus). All species of *Durckheimia* are presently known from very few specimens.

To date, *D. besutensis*, *D. caeca*, and *D. carinipes* are known with certainty only from their respective type localities, namely Peninsular Malaysia, Palau, and the Red Sea. It should be noted that listings of *D. caeca* from the Philippines are based on an error by Tesch (1918) that was perpetuated by subsequent authors (e.g. Balss 1922, Sakai 1955, 1976, Schmitt et al. 1973). Balss' (1922) record of *D. caeca* from Japan is probably based on *D. yokotai*. *Durckheimia yokotai* is presently known from three Japanese localities (coast of Miyazaki, Kii Peninsula, Amami Group) and *D. lochi* is known from two localities on the Great Barrier Reef, Australia (Moore Reef, Broadhurst Reef).

Distribution. Known only from the Great Barrier Reef, northern Queensland, at depths of 9.1–11 m from limid molluscs.

Key to species of *Durckheimia* De Man

- 1 Carapace without longitudinal median carina. Third maxilliped with 2-segmented palp *D. besutensis*
- Carapace with longitudinal median carina. Third maxilliped with 3-segmented palp.. 2
- 2 Median carina of carapace blunt, broad, indistinct on anterior third of carapace *D. carinipes*
- Median carina of carapace thin, cristate, distinct for almost full length of carapace, commencing anteriorly from base of median frontal notch 3
- 3 Median carina of carapace entire, uninterrupted *D. caeca*
- Median carina of carapace interrupted by dorsal notch 4
- 4 Frontal margin of carapace rounded; with broad, U-shaped median notch. Third maxilliped dactylus exceeding apex of propodus; proximal ¾ of inner margin of ischiomerus concave *D. yokotai*
- Frontal margin of carapace transverse; with narrow median notch. Third maxilliped dactylus not exceeding apex of propodus; proximal ¾ of inner margin of ischiomerus straight *D. lochi*

Annotated checklist of Australian Pinnotheridae

The thirteen pinnotherid species known from Australia are listed below. Synonymies include the original citation and references applicable to the Australian fauna. In some cases, additional specimens are listed to document range extensions and/or to clarify the status of published records. The most recent list of the Australian Pinnotheridae (Davie 2002) placed the following species in *Pinnotheres*: *P. similis* Bürger, 1895, *P. spinidactylus* Gordon, 1936, *P. holothuriensis* Baker, 1907, and *P. subglobosus* Baker, 1907. In the present study, however, we follow Campos (2001) in placing *P. similis* and *P. spinidactylus* in *Arcotheres* Bürger, 1895, and follow Pregonzer (1988) in referring *P. holothuriensis* and *P. subglobosus* to *Ostracotheres* Milne Edwards, 1853. Davie (2002) noted that records of *P. novaezealandiae* and *Pinnixia faba* from Australia require verification – the status of these records is clarified below under the accounts of *Pinnotheres hickmani* (Guiler, 1950), and *Orthotheres haliotidis* Geiger & Martin, 1999. Similarly, the single Australian record of *Pinnotheres obesus* Dana, 1852, is addressed under the account of *O. holothuriensis* (Baker, 1907).

In a brief discussion about pinnotherid occupants of pearl oysters in Australia, Woodward (1886) made reference to several British Museum specimens referred to *Pinnotheres orientalis* infecting *Pinna* sp., *Donax* sp. and *Glycymeris* sp. (as *Pectunculus*). Unfortunately, *Pinnotheres orientalis* is a nomen nudum. Woodward's (1886) pinnotherid record, however, is significant as possibly the oldest published reference to pinnotherids infecting the bivalve molluscs *Glycymeris* sp. (Glycymerididae) and *Donax* sp. (Donacidae) in Australia.

PINNOTHERIDAE de Haan, 1833

Pinnotherinae de Haan, 1833

Arcotheres similis (Bürger, 1895)

Pinnotheres similis Bürger, 1895: 373, pl. 9: fig. 14 [type locality: Ubay, Philippines]. — Rathbun, 1924: 15. — Davie, 2002: 434.

Pinnotheres sp. — Ward 1967: 62.

Arcotheres similis. — Campos & Manning, 2001: 168. — Campos, 2001: 494.

Material. QLD: AM P7067, 4 males (cw 4.0–6.8 mm, cl 3.4–6.8 mm), 5 females (cw 8.9–11.7 mm, cl 7.0–9.0 mm), Fields Reef, Port Denison, 20°01'S, 148°15'E, from young *Pinna* sp. in shallow water, E. Rainford, 1923; AM P12173, 1 female (cw 8.9 mm, cl 7.1 mm), Michelmas Cay, 16°35'S, 146°02'E, from *Pinna* sp. on coral reef, Whitley & Iredale, Jun 1926; AM P64685, 1 female (cw 12.2 mm, cl 9.0 mm), Lindeman Id., dredged, M. Ward, Dec 1928. **NT:** AM P20161, 1 female (cw 11.5 mm, cl 9.2 mm), East Arm, Darwin Harbour, in mytilid *Stavilla* (sic) *horrida* (= *Staveila subdistorta*), O. Cameron, 19 Dec 1971.

Australian hosts. Bivalve molluscs. *Crassostrea* or *Saccostrea* sp. (Ostreidae) (Rathbun 1924, as *Ostrea* sp.). *Staveila subdistorta* Recluz, 1852 (Mytilidae), *Pinna* sp. (Pinnidae) (this study).

Remarks. Ward (1967) noted the presence of a species of *Pinnotheres* living in *Pinna* in shallow waters off the beach at Lindeman island, Queensland. Unfortunately, Ward's account is a generalised narrative of species observed on the sandy beaches and associated shallow waters at Lindeman Island. We tentatively assign *Pinnotheres* sp. of Ward (1967) to *A. similis*. The specimen data for the Lindeman Island specimen are not sufficiently detailed to reasonably confirm that it represents the species seen by Ward, but the specimen was collected by him and the species is known to infect *Pinna* spp.

Distribution. Philippines, Singapore, Malaysia, Australia (Schmitt et al. 1973). In Australia, the species is known from northwestern Australia and now from the Northern Territory and Queensland.

Arcotheres spinidactylus (Gordon, 1936)

Pinnotheres spinidactylus Gordon, 1936: 164, 167–172, figs. 1 a, b, e, figs. 2 a, b, c [type locality: Siglap, Singapore]. — Griffin & Campbell, 1969: 156–162, figs. 7–8. — Stephenson et al., 1970: 492. — Jones, 1990: 202. — Davie, 2002: 434.

Arcotheres spinidactylus. — Campos 2001: 494.

Australian host. Bivalve molluscs, Mytilidae. *Modiolus* sp. (Griffin & Campbell 1969).

Distribution. Singapore, Philippines, China and Australia (Schmitt et al. 1973, Davie, 2002). The Australian range includes Moreton Bay, Queensland, and Shark Bay, Western Australia (Jones 1990).

Durckheimia lochi n.sp.

Australian hosts. Bivalve molluscs, Limidae. *Ctenoides ales* (Finlay, 1927), *Lima lima vulgaris* (Link, 1807) (this study).

Distribution. Great Barrier Reef, Queensland, Australia.

Orthotheres haliotidis Geiger & Martin, 1999

Orthotheres haliotidis Geiger & Martin, 1999: 273–278, figs. 1–7 [type locality: between Lizard Head and Coconut Beach, Lizard Island, Queensland, Australia].

Pinnixa faba. — Haswell, 1882: 113. — Grant & McCulloch, 1906: 6, 23. — Schmitt et al., 1973: 108–109 [northern Australian references only]. — Geiger & Martin, 1999: 269, 270. — Davie, 2002: 431. [Not *Pinnixa faba* (Dana, 1851)].

Material. QLD: AM G5919, 2 males (cw 6.7–7.0 mm, cl 6.2–6.4 mm), 1 female (cw 9.8 mm, cl 7.2 mm), Masthead Id., 23°32'S, 151°44'E, from *Haliotis asinina*, F. E. Grant; AM P14875 (identified by Haswell as *Pinnixia faba*), 1 female (cw 12.7 mm, cl 9.0 mm), Holbourne Id., Port Denison, found in *Haliotis coccoradiata*; AM P3155, 2 females (cw 12.3–12.7 mm, cl 7.9–8.8 mm), Masthead Id., 23°32'S, 151°44'E, from *Haliotis asinina*, A. McCulloch & E. Troughton, Aug 1912.

Australian hosts. Gastropod molluscs, Haliotidae. *Haliotis asinina* Linnaeus, 1758 (Grant & McCulloch, 1906; Geiger & Martin, 1999), *H. coccoradiata* Reeve, 1846 (Haswell, 1882); *H. squamata* Reeve, 1846 (Geiger & Martin, 1999).

Remarks. Rathbun (1918) was the first to suggest that Haswell's (1882) record of *Pinnixia faba* from Australia was probably incorrect. Geiger & Martin (1999) further suggested that most previous records of *Pinnixia faba* from Australia could have been based on *Orthotheses haliotidis*. Thomson's (1893) report of *Pinnixia faba* from Tasmania, perpetuated by Guiler (1952) is almost certainly based on *Pinnotheres hickmani*, the common Tasmanian species. Other primary records of *P. faba* from Australia are based on specimens in the collections of the Australian Museum; all were re-examined and are referable to *O. haliotidis*. The specimen from Holbourne Island, Port Denison (AM P14875), is the basis of Haswell's (1882) record and those from Masthead Island (G5919) are the basis of Grant & McCulloch's (1906) record. Subsequent reports of *Pinnixia faba* from Australia (i.e. Schmitt et al. 1973, Davie 2002) are based on the original records of Haswell (1882) and Grant & McCulloch (1906).

Distribution. Australia, from Fremantle, Western Australia and Lizard Island, Masthead Island, Rat Island, and Port Denison, Queensland (Geiger & Martin 1999, this study).

Ostracotheres holothuriensis (Baker, 1907)

Pinnotheres holothuriensis Baker, 1907: 177, 178, pl. 23: fig 3 [type locality: St. Vincent's Gulf, South Australia].

Pinnotheres obesa. — Fulton & Grant, 1906: 18. [Not *P. obesa* Dana, 1852].

Pinnotheres obesus. — Schmitt et al., 1973: 60. — Davie, 2002: 433–434. [Not *P. obesa* Dana, 1852].

Ostracotheres (?) ('*Pinnotheres*') *holothuriensis*. — Tesch, 1918: 287.

Pinnotheres holothuriensis. — Hale, 1927b: 174, fig. 175. — Schmitt et al., 1973: 49–50. — Davie, 2002: 433.

Ostracotheres holothuriensis. — Pregonzer, 1988: 21–28, figs. 10–16, 12a, 17–19.

Material. VIC: AM G5724, 1 male (cw 5.2 mm, cl 5.5 mm), Shoreham, dredged, F. Grant, 1900. **TAS:** AM P2968, 1 male (cw 4.5 mm, cl 4.5 mm), Hobart, C. Harrison; AM P4047, 1 female (cw 12.6 mm, cl 13.6 mm), E of Schouten Id., 73–92 m, C. Harrison, 1910.

Australian hosts. Holothurians, ascidians (Baker 1907). Ascidian *Herdmania momus* (Savigny, 1816) (Pregonzer 1988).

Remarks. The single primary record of *Pinnotheres obesus* Dana, 1852 from Australia by Fulton & Grant (1906) from Shoreham, Victoria, is based on *Ostracotheres holothuriensis* (AM G5724). Subsequent published listings of *P. obesus* from Australia (i.e. Schmitt et al. 1973, Davie 2002) are based on Fulton & Grant (1906).

Distribution. South Australia and New South Wales (Pregenzer 1988); now from Victoria and Tasmania.

Ostracotheres subglobosus (Baker, 1907)

Pinnotheres subglobosa Baker, 1907: 179 [type locality: St. Vincent's Gulf, South Australia].

Ostracotheres (?) ('*Pinnotheres*') *subglobosus*. — Tesch, 1918: 287 (list).

Pinnotheres subglobosa. — Rathbun, 1923: 96–97, fig. 1, pl. 16, text fig 1. — Hale, 1927a: 312; 1927b: 173–174, fig. 174. — Sakai, 1939: 597.

Pinnotheres subglobosus. — Schmitt et al., 1973: 88. — Davie, 2002: 434.

Ostracotheres subglobosus. — Pregenzer, 1988: 17–21, figs. 1–9.

Ostracotheres subquadratus Sakai, 1939: 596–597, fig. 82 [type locality: Ise Bay, Japan].

Australian hosts. Bivalve molluscs. 'Pectens' (Baker 1907). *Spondylus tenellus* Reeve, 1856 (Spondylidae) *Equichlamys bifrons* (Lamarck, 1819) (as *Chlamys bifrons*) (Pectinidae), *Modiolus* sp. (as *Modiolaria australis*) (Mytilidae) (Hale 1927b). *Pecten fumatus* Reeve, 1852 (as *Notovola meridionalis* Tate) (Pectinidae) (Pregenzer, 1988).

Remarks. Pregenzer (1988) synonymised *O. subquadratus* from Japan with *O. subglobosus* from South Australia after comparing Japanese and South Australian material. The resulting disjunct distribution of *O. subglobosus* is suspect, particularly since no records exist of the species from intermediate localities. Whether the two nominal species are distinct, or whether the disjunct distribution is the result of human introduction to one or other region remains to be tested. In the absence of evidence to the contrary, *O. subquadratus* is retained in the synonymy of *O. subglobosus*.

Distribution. South Australia and Japan (Pregenzer 1988).

Pinnotheres cardii Bürger, 1895

Pinnotheres cardii Bürger, 1895: 367, pl. 9: figs. 4–5, pl. 10: fig 4 [type locality: Burias Philippines]. — Rathbun, 1924: 14, 15, pl. 1: fig. 9, figs. 5, 6. — Davie, 1998: 100; 2002: 432.

Australian hosts. Bivalve molluscs, Pinnidae. *Pinna bicolor* Gmelin, 1791 (Rathbun 1924).

Distribution. Gulf of Thailand, the Philippines, India, Australia. The Australian range includes Broome, Western Australia (Rathbun 1924) and central east Queensland (Davie 1998, 2002).

***Pinnotheres edwardsi* de Man, 1888**

Pinnotheres Edwardsi de Man, 1888: 103, pl. 6: figs. 6–9 [type locality: King Island Bay, Mergui Archipelago].

Pinnotheres edwardsi. — Montgomery, 1931: 406, 450–451. — Gordon, 1936: 166. — Jones, 1990: 202. — Davie, 2002: 432.

Material. QLD: AM P5203, 1 female (cw 6.9 mm, cl 6.0 mm), Palm Id., 18°40'S, 146°33'E, from cockle shell, E. Rainford.

Australian hosts. Bivalve molluscs. Pearl oysters (probably *Pinctada* sp., Pteriidae) (Montgomery 1931). Cockles (probably Cardiidae) (this study).

Distribution. Mergui Archipelago, Indonesia, Singapore, and Australia (Schmitt et al. 1973). The Australian range includes Shark Bay, Houtman Abrolhos Islands, Western Australia (Jones 1990), and now Palm Island, Queensland.

***Pinnotheres hickmani* (Guiler, 1950)**

Fabia hickmani Guiler, 1950: 67–72, figs. 1–4 [type locality: Derwent River, Tasmania]. — Guiler, 1952: 40. — Schmitt et al., 1973: 24.

Pinnixa faba. — Thomson, 1893: 49. — Guiler, 1952: 40. [Not *Pinnixa faba* (Dana, 1851)].

Pinnoteres pisum. — Fulton & Grant, 1906: 18. [Not *P. pisum* (Linnaeus, 1767)].

Pinnotheres pisum. — Wellington & Hiscock, 1969: 333. — Griffin & Yaldwyn, 1971: 57–58. [Not *P. pisum* (Linnaeus, 1767)].

Pinnotheres novaezealandiae. — Rathbun, 1923: 98. [Not *P. novaezealandiae* Filhol, 1885a].

Pinnotheres novae-zealandiae. — Guiler, 1952: 40; 1956: 7 [not *P. novaezealandiae* Filhol, 1885a].

Pinnotheres hickmani. — Pregonzer, 1978: 127–139; 1979a: 22–29, figs. 1, 2, 5–6, 8, 11, 13–16, 17, 19, 19A, 21–23, 29; 1979b: 547–550. — Page, 1983: 156. — Phillips et al., 1984: 116. — Jones, 1990: 202. — Davie, 2002: 433.

Material. TAS: AM E5676, 1 female (cw 8.5 mm, cl 8.4 mm), E coast of Flinders Id., Bass Strait, 40°01'S, 148°02'E, FIS *Endeavour*, 1909–1914. **VIC:** AM P15608, 5 females (cw 5.6–9.2 mm, cl 5.3–8.8 mm), Port Phillip, 37°58'S, 144°54'E, 12 m, from *Mytilus* sp., I. Hiscock, 1967. **NSW:** AM P10094, 1 female (cw 9.4 mm, cl 9.0 mm), Sow & Pigs Shoal, Port Jackson, 33°50.3'S, 151°16.2'E, from 'large black mussel', L. Comtesse, May 1930; AM P5500, 1 male (cw 6.2 mm, cl 6.2 mm), near Cape Hawke, 32°13'S, 152°34'E, from pippi, J. Kinghorn; AM P4870, 1 male (cw 2.7 mm, cl 2.6 mm), 4 females (cw 6.2–8.8 mm, cl 5.7–8.1 mm), Port Stephens, from *Donax* between mantle and gills, 152°06'E, E. Briggs, Sep 1919; AM P11481, 1 male (cw 4.7 mm, cl 4.4 mm), 6 females (cw 5.3–8.5 mm, cl 4.6–7.3 mm), Brunswick Heads, 28°32'S, 153°33'E, from pippi, C. Chadwick; AM P4003, 10 females (cw 8.3–10.0 mm, cl 7.7–8.4 mm), S of Tweed Heads, 28°10'S, 153°33'E, from *Donax deltoides* on sandy beach, J. Campbell. **QLD:** AM P2217, 2 females (cw 8.7–10.0 mm, cl 7.4–7.8 mm), Mud Id., Moreton Bay, 27°20'S, 153°15'E, A. McCulloch.

Australian localities. Moreton Bay, southern Queensland to Victoria, Tasmania, South Australia, to Shark Bay, Western Australia.

Australian hosts. Bivalve molluscs. *Mytilus* sp., *Eumarcia fumigata* (Sowerby, 1853), *Modiolus* sp. (all Mytilidae) (Griffin & Yaldwyn 1971, Pregonzer 1978). *Neotrigonia margaritacea* (Lamarck, 1804) (Trigoniidae) (Wellington & Hiscock 1969). *Donax deltoides* Lamarck, 1818 (Donacidae) (this study).

Remarks. Davie (2002) noted that Rathbun's (1923) record of *Pinnotheres novaezealandiae* (Filhol) from Bass Strait required verification. According to previous authors, Rathbun's (1923) specimen was neither referable to *P. novaezealandiae* (fide Scott 1961), nor *P. hickmani* (as *P. pisum*) (see Griffin & Yaldwyn 1971). According to Griffin & Yaldwyn (1971), Rathbun's (1923) specimen could not be identified with *P. hickmani* (as *P. pisum*) because of the presence of a lateral extension of the orbits as indicated by the shallow groove adjacent to the eyes, a feature absent from *P. hickmani*. Griffin & Yaldwyn (1971) also noted the presence of a fringe of dactylar setae on the ambulatory limbs in Rathbun's (1923) specimen but not *P. hickmani* (as *P. pisum*). Rathbun's (1923) specimen (AM E5676), some of Griffin & Yaldwyn's study material and other specimens in the Australian Museum were re-examined for this study. Rathbun's (1923) record of *P. novaezealandiae* is based on *P. hickmani*. The groove lateral to the eyes in Rathbun's (1923) specimen is an artefact of damage from overall dorsal compression to the specimen. The setation of the dactyli of the ambulatory limbs is similar in all specimens, but could appear absent if specimens were examined 'dry' instead of submerged in fluid. Therefore, we conclude that *Pinnotheres novaezealandiae* is currently not known from Australia.

As remarked under the account of *Orthotheses haliotidis*, Thomson's (1893) report of *Pininxia faba* from Tasmania, followed by Guiler (1952), is probably based on *Pinnotheres hickmani*, the common Tasmanian species.

Distribution. Shark Bay, Western Australia, Victoria, Tasmania (Jones 1990), and now from New South Wales and southern Queensland.

***Pinnotheres latipes* Hombron & Jacquinot, 1846**

Pinnotheres latipes Hombron & Jacquinot, 1846: pl. 5: figs. 16–20 [type locality: Raffles Bay, Northern Territory, Australia]. — Miers, 1876: 48–49. — Filhol, 1885a: 50; 1885b: 394, 395. — Scott, 1961: 303. — Schmitt et al., 1973: 51. — Davie, 2002: 433.
Pinnotheres laticeps. — Hutton, 1882: 264 [misspelling].

Australian hosts. Bivalve molluscs, Pinnidae. *Pinna* sp. (Hombron & Jacquinot 1846).

Remarks. Holthuis (2002) recently resolved confusion surrounding publication date and authorship of *P. latipes* and other species collected by the "Astrolabe" and "Zélée" between 1837 and 1840. As shown by Hutton (1882), Hombron & Jacquinot (1846) incorrectly placed the type locality, Raffles Bay, in New Zealand rather than the Northern Territory, Australia.

Distribution. Raffles Bay, Northern Territory, Australia (Hombron & Jacquinot 1846, Davie 2002).

***Pinnotheres villosulus* Guérin-Méneville, 1831**

Pinnotheres villosulus Guérin-Méneville, 1831: 7, pl. 4: fig. 6 [type locality: Timor, Indonesia]. — Miers, 1886: 277, pl. 22: fig. 2. — Tesch, 1918: 251, 252, 255, 256. — Rathbun, 1924: 13, 14, pl. 1: fig. 8, fig. 4. — Schmitt et al., 1973: 91. — Davie, 2001: 434.
Pinnotheres villosus. — Jones & Morgan, 2002: 202 (colour figure) (misspelling).

Material. QLD: AM P64671, 1 female (cw 11.6 mm, cl 10.9 mm), Lindeman Id., reef, Dec 1928, M. Ward; AM P45250, 1 female (cw 8.8 mm, cl 8.2 mm), Port Curtis and North West Island, 23°36'S, 151°33'E, M. Ward & W. Boardman, Jul 1929–Jan 1930; AM G4226, 11 females (cw 10.4–13.2 mm, cl 10.2–12.9 mm), Gulf of Carpentaria, C. Hedley. **WA:** AM P10228, 2 females (cw 11.5–12.8 mm, cl 10.7–12.4 mm), Broome, 17°58'S, 122°14'E, H. Clark, Jun 1932; AM P64554, 24 females (cw 10.0–15.4 mm, cl 10.2–15.1 mm), Roebuck Bay, Broome, 18°06'S, 122°20'E, 16.5 m, from pearl oysters, 15 Aug 1929.

Australian hosts. Bivalve molluscs. Pearl oysters (probably *Pinctada* sp., Pteriidae) (this study).

Remarks. The female from Lindeman Island is not referable to *Pinnotheres* sp. reported by Ward (1967). Ward's (1967) *Pinnotheres* sp. was from a *Pinna* sp. in shallow water off a beach, rather than reef as in the present Lindeman Island specimen. Another Lindeman Island specimen collected by Ward could be the basis of his 1967 report (see above account of *A. similis*).

Distribution. Philippines, Indonesia, New Guinea, Australia (Schmitt et al. 1973). The Australian range includes Torres Strait, Cape Jaubert, Western Australia, and now Broome, Western Australia, northeastern Queensland and the Gulf of Carpentaria.

***Xanthasia murigera* White, 1846**

Xanthasia murigera White, 1846: 177, pl. 2, fig. 3a. [type locality: Philippines]. — Haswell, 1882: 113. — Bürger, 1895: 386, pl. 10: fig. 31. — Grant & McCulloch, 1906: 6, 23. — Tesch, 1918: 246. — Schmitt et al., 1973: 97–98. — Davie, 2002: 434.
Xanthasia muriger. — Serène, 1967: 824.

Material. QLD: AM G5721, 1 male (cw 4.8 mm, cl 4.8 mm), 1 female (cw 10.0 mm, cl 8.3 mm), Hayman Island, 23°32'S, 151°44'E, F. Grant; AM P4100, 1 male (cw 9.8 mm, cl 8.3 mm), 1 female (cw 13.7 mm, cl 10.8 mm), Crescent Reef, 14°26'S, 145°05'E, from *Hippopus* sp., C. Hedley & A. Briggs, 29 Jul 1916; AM P10059, 1 male (cw 12.1 mm, cl

9.7 mm), 1 female (cw 18.3 mm, cl 13.3 mm), North West Islet, Capricorn Group, 23°30'S, 152°00'E, reef, from *Tridacna* sp., A. Livingstone & W. Boardman, Jan 1931; AM P10535, 1 female (cw 9.8 mm, cl 8.3 mm), Hayman Island, 20°03'S, 148°53'E, 9 m, from *Tridacna* sp., F. McNeill, Jan 1934; AM P10734, 1 male (cw 8.6 mm, cl 7.2 mm), 1 female (cw 13.2 mm, cl 11.4 mm), Hayman Island, 20°03'S, 148°53'E, 9 m, from *Tridacna* sp. H. Kroyer; AM P15977–15979, 3 males (cw 6.5–8.0 mm, cl 6.2–6.6 mm), 3 females (cw 8.6–13.6 mm, cl 7.7–11.4 mm), One Tree Island, 23°30'S, 152°05'E, lagoon, from *Tridacna maxima*, J. Yaldwyn, Nov–Dec 1966; AM P24819–24280, 4 males (6.9–10.3 mm, cl 5.6–7.5 mm), 4 females (cw 12.8–13.9 mm, cl 9.6–10.5 mm), Lizard Island, 14°40'S, 145°28'E, lagoon, inside *Tridacna crocea*, Ponder et al., Dec 1979.

Australian hosts. Bivalve molluscs, Tridacnidae. *Hippopus* sp. (this study), *Tridacna crocea* Lamarck, 1819 (this study), *T. maxima* Röding, 1798 (this study, Grant & McCulloch 1906, as *T. elongata*).

Remarks. *Xanthasia murigera* is reported from *Hippopus* sp. for the first time.

Distribution. Western Indian Ocean to the central Pacific including the Great Barrier Reef, Queensland and northern Western Australia (Schmitt et al. 1973, Davie 2002, this study).

Xenophthalminae Alcock, 1900

Xenophthalmus pinnotheroides White, 1846

Xenophthalmus pinnotheroides White, 1846: 178, pl. 2: fig. 2 [type locality: Philippines]. — Griffin & Campbell, 1969: 153–156, figs. 5, 6E. — Schmitt et al., 1973: 99–100. — Davie, 2002: 435.

Australian hosts. Not commensal. Gritty sand–mud substrates (Griffin & Campbell 1969).

Distribution. India to Thailand, the Philippines, Hong Kong, Japan and eastern Australia. In Australia, the species is presently known only from Moreton Bay, Queensland (Griffin & Campbell 1969).

Acknowledgements

We thank Ian Loch (Australian Museum) for collecting and photographing the type material of *D. lochi* n.sp., and Darren Yeo (Raffles Museum of Biodiversity Research, National University of Singapore) for assisting with a copy of Kubo's (1939) paper. Oliver Coleman (Zoological Museum, Berlin) and G. Wahlrab (Gresford, New South Wales) kindly translated the accounts of *Durckheimia* species by Bürger (1895) and de Man (1889). Ian Loch, Holly Barlow and Alison Miller (all Australian Museum) are thanked for providing infor-

mation on current molluscan taxonomy. This study was supported by an Australian Post-doctoral Fellowship from the Australian Research Council granted to STA.

References

- Balss, H. (1922) Ostasiatische Decapoden. IV. *Die Brachyrhynchen (Cancriidea)*. *Archiv für Naturgeschichte*, 88A, 94–166.
- Baker, W.H. (1907) Notes on South Australian Decapoda Crustacea. Part V. *Transactions and Proceedings Reports of the Royal Society of South Australia*, 31, 173–191.
- Bürger, O. (1895) Ein Beitrag zur Kenntniss der Pinnotherinen. *Zoologische Jahrbücher, Abtheilung für Systematik, Geographie und Biologie der Thiere*, 8, 361–390.
- Campos, E. (1989) *Tumidotheres*, a new genus for *Pinnotheres margarita* Smith, 1869 and *Pinnotheres maculatus* Say, 1818 (Brachyura: Pinnotheridae). *Journal of Crustacean Biology*, 9, 672–679.
- Campos, E. (1990) *Calyptraeothers*, a new genus of Pinnotheridae for the limpet crab *Fabia granti* Glassell, 1933 (Crustacea, Brachyura). *Proceedings of the Biological Society of Washington*, 103, 364–371.
- Campos, E. (1996) Partial revision of pinnotherid crab genera with a two segmented palp on the third maxilliped (Decapoda: Brachyura). *Journal of Crustacean Biology*, 16, 556–563.
- Campos, E. (2001) A new crab species of the genus *Arcotheres* Manning, 1993, from Thailand (Crustacea, Brachyura, Pinnotheridae). *Zoosystema*, 23, 493–497.
- Campos, E. (2002) Two new genera of pinnotherid crabs from the tropical eastern Pacific (Decapoda: Brachyura: Pinnotheridae). *Proceedings of the Biological Society of Washington*, 111, 372–381.
- Campos, E. & Manning, R.B. (2001) Authorship and diagnosis of the genus *Arcotheres* Manning, 1993 (Crustacea: Brachyura: Pinnotheridae). *The Raffles Bulletin of Zoology*, 49, 167–170.
- Davie, P. (1998) *Wild Guide to Moreton Bay*. Queensland Museum, Brisbane. 408 pp.
- Davie, P.J.F. (2002) Crustacea: Malacostraca: Eucarida (Part 2). In: Wells, A. & Houston, W.W.K. (Eds.) *Zoological Catalogue of Australia*. Vol. 19.3B. CSIRO Publishing, Melbourne. 551 pp.
- Filhol, H. (1885a) Considérations relatives à la faune des Crustacés de la Nouvelle-Zélande. *Bibliothèque de l'École des Hautes Études, Section des Sciences Naturelles*, 30, 3–60.
- Filhol, H. (1885b) Crustacés. In: Recherches zoologiques, botaniques et géologiques faites à l'île Campbell et en Nouvelle-Zélande. *Recueil de Mémoires, Rapports et Documents relatifs à l'Observation du Passage de Vénus sur le Soleil du 9 Décembre 1874. Mission de Ile Campbell*. Institut de France, Académie des Sciences, Paris, Zoologie 3, 349–510.
- Fulton, S.W. & F.E. Grant, (1906) Census of the Victorian Decapod Crustacea. Part 1. (Brachyura). *Proceedings of the Royal Society of Victoria*, 19, 16–20.
- Geiger, D.L. & Martin, J.W. (1999) The pea crab *Orthotheres haliotidis* new species (Decapoda: Brachyura: Pinnotheridae) in the Australian abalone *Haliotis asinina* Linnaeus, 1758 and *Haliotis squamata* Reeve, 1846 (Gastropoda: Vetigastropoda: Haliotidae). *Bulletin of Marine Science*, 64, 269–280.
- Gordon, I. (1936) On a few Indo-Pacific species of *Pinnotheres*, with special reference to asymmetry of the walking legs. *Journal of the Linnean Society of London, Zoology*, 40, 163–180.
- Grant, F.E. & McCulloch, A.R. (1906) On a collection of Crustacea from the Port Curtis District, Queensland. *Proceedings of the Linnean Society of New South Wales*, 31, 1–53.
- Griffin, D.J.G. & Campbell, B.M. (1969) The sub-littoral Goneplacidae and Pinnotheridae (Crustacea: Brachyura) of Moreton Bay. *Memoirs of the Queensland Museum*, 15, 141–164.

- Griffin, D.J.G., & Yaldwyn, J.C. (1971) Port Phillip Bay Survey 2. Brachyura (Crustacea, Decapoda). *Memoirs of the National Museum of Victoria*, 32, 43–64.
- Guiler, E.R. (1950) A preliminary description of *Fabia hickmani*, sp. nov. (Pinnotheridae). *Papers and Proceedings of the Royal Society of Tasmania*, 1949, 67–72.
- Guiler, E.R. (1952) A list of the Crustacea of Tasmania. *Records of the Queen Victoria Museum, Tasmania*, 3, 15–44.
- Guiler, E.R. (1956) Supplement to a list of the Crustacea of Tasmania. *Records of the Queen Victoria Museum, Tasmania, new series*, 5, 1–8.
- Guinot, D. (1967) La faune carcinologique (Crustacea Brachyura) de l'Océan Indien occidental et de la Mer Rouge. Catalogue, remarques biogéographiques et bibliographie. In: *Réunion de Spécialistes C.S.A. sur les Crustacés, Zanzibar 1964. Mémoires de l'Institut Fondamental d'Afrique Noire*, (77) 1966(1967), 237–352.
- Hale, H.M. (1927a) The Crustacea. The fauna of Kangaroo Island, South Australia 1. *Transactions and Proceedings of the Royal Society of South Australia*, 51, 307–321.
- Hale, H.M. (1927b) *The Crustaceans of South Australia. Part 1*. Adelaide: Government Printer. 201 pp.
- Haswell, W.A. (1882) *Catalogue of the Australian Stalk- and Sessile-eyed Crustacea*. Australian Museum, Sydney. 326 pp.
- Holthuis, L.B. (2002) A few notes on the authors and dates of the names of Crustacea collected by the “Voyage au Pôle Sud et dans l'Océanie sur les corvettes L'Astrolabe et la Zélée”. *Crustaceana*, 75, 413–422.
- Hombron, J. B. & Jacquinot, H. (1842–1854) Crustacés. *Atlas d'Histoire Naturelle Zoologie. Voyage au Pôle Sud et dans l'Océanie sur les corvettes l'Astrolabe et la Zélée pendant les années 1837–1838–1839–1840*, Crustacés, pls. 1–9.
- Hutton, F.W. (1882) The stalk-eyed Crustacea of New Zealand. *New Zealand Journal of Science*, 1, 263–264.
- Jones, D. (1990) Annotated checklist of marine decapod Crustacea from Shark Bay, Western Australia. In: Berry, P.F, Bradshaw, S.D. & Wilson, B.R. (Eds.), *Research in Shark Bay*. Report of the France–Australie Bicentenary Expedition Committee. 325 pp.
- Kubo, I. (1939). One new Pinnotherid Crab found in Japan, *Pinnotheropsis yokotai*, gen. et sp. nov. *Bulletin of the Japanese Society of Scientific Fisheries*, 8, 57–59.
- Man, J.G. de. (1888) Report on the Podophthalmous Crustacea of the Mergui Archipelago collected by the trustees of the Indian Museum, Calcutta, by Dr. John Anderson, F.R.S., Superintendent of the Museum. *Journal of the Linnean Society, London (Zoology)*, 22, 1–312.
- Man, J.G. de. (1889) Über einige neue oder seltene indopacifische Brachyuren. *Zoologische Jahrbücher, Abtheilung für Systematik, Geographie und Biologie der Thiere*, 4, 409–452.
- Manning, R.B. (1993a) Three genera removed from the synonymy of *Pinnotheres* Bosc, 1802 (Brachyura: Pinnotheridae). *Proceedings of the Biological Society of Washington*, 106, 523–531.
- Manning, R.B. (1993b) *Epulotheres angelae*, new genus, new species, a pinnotherid crab from the Caribbean Sea (Decapoda: Pinnotheridae). *Journal of Crustacean Biology*, 13, 801–804.
- Manning, R.B. (1993c) West African pinnotherid crabs, subfamily Pinnotherinae (Crustacea, Decapoda, Brachyura). *Bulletin du Muséum National d'Histoire Naturelle, Paris*, series 4, 15, 125–177.
- Miers, E.J. (1876) *Catalogue of the stalk- and sessile-eyed Crustacea of New Zealand*. Colonial Museum and Geological Survey Department, London. 136 pp.
- Miers, E.J. (1884). Crustacea. *Report on the zoological collections made in the Indo-Pacific Ocean during the voyage of the H.M.S. “Alert” 1881–82: 178–322, 513–575*. British Museum, London.

- Miers, E.J. (1886) Report on the Brachyura collected by H.M.S. "Challenger" during the years 1873–76. *Report on the Scientific Results of the Voyage of the H.M.S. "Challenger"*, *Zoology*, 17, 1–362.
- Montgomery, S.K. (1931) Report on the Crustacea Brachyura of the Percy Sladen Trust Expedition to the Abrolhos Islands under the leadership of Professor W.J. Dakin, D.Sc., F.L.S. in 1913, along with other crabs from Western Australia. *Journal of the Linnean Society London, Zoology*, 37, 405–465.
- Phillips, D.A.E., Handreck, C.P., Bock, P.E., Burn, R., Smith, E.J. & Staples, D.A. (1984) *Coastal invertebrates of Victoria. An atlas of selected species*. Marine Research Group of Victoria and Museum of Victoria, Melbourne, Victoria. 168 pp.
- Pregenzer, C., Jr. (1978) *Pinnotheres hickmani* (Guiler) in wild and cultured *Mytilus edulis* in Port Phillip Bay, Victoria. *Australian Journal of Marine and Freshwater Research*, 29, 127–139.
- Pregenzer, C., Jr. (1979a) A redescription of *Pinnotheres hickmani* (Guiler) and comparison with *Pinnotheres novaezealandiae* Filhol and *Pinnotheres pisum* (L.) (Decapoda Brachyura). *Crustaceana Supplement*, 5, 22–30.
- Pregenzer, C., Jr. (1979b) Effect of *Pinnotheres hickmani* on neutral red clearance by *Mytilus edulis*. *Australian Journal of Marine and Freshwater Research*, 30, 547–550.
- Pregenzer, C., Jr. (1988) A redescription of *Pinnotheres holothuriensis* Baker, 1907 and *Pinnotheres subglobosus* Baker, 1907 with a reassignment to the genus *Ostracotheres* (Decapoda, Brachyura). *Crustaceana*, 55, 17–28.
- Page, R.D.M. (1983) Description of a new species of *Pinnotheres*, and redescription of *P. novaezealandiae* (Brachyura: Pinnotheridae). *New Zealand Journal of Zoology*, 10, 151–162.
- Rathbun, M.J. (1918) The grapsoid crabs of America. *United States National Museum Bulletin* 97, 1–461.
- Rathbun, M.J. (1923) Report on the crabs obtained by the F.I.S. "Endeavour" on the coasts of Queensland, New South Wales, Victoria, South Australia and Tasmania. *Biological results of the fishing experiments carried on by the F.I.S. "Endeavour" 1909–1914*, 5, 95–156.
- Rathbun, M.J. (1924) Results of Dr. E. Mjöberg's Swedish Scientific Expeditions to Australia 1910–1913. 37. Brachyura, Albuneidae and Porcellanidae, *Arkiv för Zoologi*, 16, 1–33.
- Sakai, T. (1939) Brachygnatha, Brachyrhyncha. *Studies on the Crabs of Japan*, 4, 365–741.
- Sakai, T. (1955) On some rare species of crabs from Japan. *Bulletin of Biogeographical Society of Japan*, 16–19, 106–113.
- Sakai, T. (1976) *Crabs of Japan and the Adjacent Seas*. Kodansha, Tokyo. 773 pp.
- Schmitt, W.L., McCain, J.C. & Davidson, E.S. (1973) Decapoda I, Brachyura I Fam. Pinnotheridae. In: Gruner, H.-E. & Holthuis, L.B. (Eds.), *Crustaceorum Catalogus* 3. W. Junk, Den Haag. 160 pp.
- Scott, M.S. (1961) A review of the New Zealand Pinnotheridae. *Transactions of the Royal Society of New Zealand, (Zoology)* 22, 303–309.
- Serène, R. (1967) Sur deux espèces nouvelles de brachyours (Crustacés Décapodes) et sur une troisième peu connue, récoltées dans la région Malaise. *Bulletin du Muséum National d'Histoire Naturelle, Paris*, 2nd series, 38, 817–827.
- Stephenson, W., Williams, W.T., & Lance, G.N. (1970) The macrobenthos of Moreton Bay. *Ecological Monographs*, 40: 459–494.
- Tesch, J.J. (1918) Goneplacidae and Pinnotheridae. The Decapoda Brachyura of the Siboga Expedition II. *Siboga-Expeditie*, 39c, 1–149.
- Thomson, G.M. (1893). Notes on Tasmanian Crustacea with descriptions of new species. *Papers and Proceedings of the Royal Society of Tasmania*, 1892, 45–49.
- Ward, M. (1967) Life on a sand beach. *Proceedings of the Royal Society of New South Wales*, 1967, 59–65.

- Wellington, A.M. & Hiscock, I.D. (1969) A pinnotherid crab in the bivalve mollusc, *Neotrigonia margaritacea*. *Australian Journal of Science*, 31, 333.
- White, A. (1846) Notes on four new genera of Crustacea. *Annals and Magazine of Natural History*, 18, 176–178.
- Woodward, H. (1886) Animals commensal or parasitic in *Meleagrina margaritifera* Lin. *Proceedings of the Zoological Society of London*, 1886, 176–177.