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A new record of *Dardanus australis* Forest & Morgan, 1991 (Crustacea: Anomura: Diogenidae) from off northern New South Wales, eastern Australia

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ABSTRACT

Dardanus australis Forest & Morgan, 1991, is reported from off Nambucca Heads, New South Wales, markedly increasing its known distribution in Australian waters. It was captured in a deep water lobster trap at 137 m. It is diagnosed and refigured, and notes on variation in colour and morphology are given. It is characterised by its pattern of spination, subequal chelipeds, proportions of the ocular peduncles, colour pattern, and its large size (to at least 36.5 mm shield length). □ *Decapoda, Diogenidae, Dardanus, New South Wales, Australia, deep water, new record.*

In Australia, particularly New South Wales (NSW), the majority of by-catch recorded by eastern rock lobster (*Jasus verreauxi*) fishermen is taken from deep water traps greater than 50 m. A large component of this by-catch is predominantly hermit crab species, particularly *Strigopagurus strigimanus* (White 1847) and *Dardanus arrosor* (Herbst 1796). The implementation of the NSW Department of Primary Industries Eastern Rock Lobster Fishery Management Strategy (FMS) in 2007 recognised the need to identify by-catch species associated with lobster catches and to assess the impacts of rock lobster fishing activities on hermit crab populations. During 2008 and 2009, as part of an observer based research program with the eastern rock lobster fishery, collections of hermit crabs were taken from numerous deep water lobster traps at depths ranging from 50–220 m along the entire NSW coast.

Daniel Stewart, a commercial fishermen from Coffs Harbour, on the board the vessel *Flo Baby*, set deep water lobster traps off Nambucca Heads (30°38' S) on 20 April 2009 in 137 m, on the edge

of a patchy coralline reef, running down a gentle slope to 146 m to a muddy/gravel sea bed. Traditional traps (rectangular hard wood frame of 1.8×1.4×0.8 m, with three 25 cm nozzles) were baited with a combination of fish wastes and salted shark/cow hide, and set for a period of approximately six weeks. With the retrieval of the traps on 1 June, all hermit crabs captured were removed from the traps, packed into foam boxes with ice, labeled and sent to the NSW Industry and Investment Cronulla Fisheries Research Centre for processing in the laboratory. All hermit crabs and shells were identified to species, crabs were removed from their shells, sexed, measured and weighed. The present specimen could not be initially recognised, and so was set aside for further examination. After processing it was frozen before being placed into 95% ethanol and forwarded to the Queensland Museum where it was formally identified as *Dardanus australis* Forest & Morgan, 1991, after comparison with specimens from Western Australia, from where it was originally described.

Dardanus currently contains 43 species (see McLaughlin *et al.* 2010), of which 30 are Indo-West Pacific in distribution. The most recent additions to the genus have been four new species described by Asakura & Hirayama (2002) and Asakura (2006).

Abbreviations. All measurements were taken using dial calipers, and are in millimeters (mm). Measurements are of cephalothoracic shield length (SL); cephalothoracic shield width (SW), claw length (CL), chela length, including fixed finger (CHL), chela width (CHW), and total weight (g). Specimens examined are deposited in the Queensland Museum, Brisbane (QM); Western Australian Museum, Perth (WAM); Museum of Victoria, Melbourne (MOV).

SYSTEMATICS

Dardanus australis Forest & Morgan, 1991 (Figs 1–3)

Dardanus australis Forest & Morgan, 1991: 204–208, fig. 1; Poupin, 1996a: 17, 76, 96; 1996b: 16, pl. 7h. *Dardanus* sp. — Poore, McCallum & Taylor, 2008: 25, un-numbered colour fig.

Material examined. QM-W29182, male (SL 29.0 mm, SW 24.2 mm, CL 95.8 mm, CHL 59.6 mm, CHW 25.9 mm, fresh weight 155.02 g), off Nambucca Heads, northern NSW, 137 m depth, D. Stewart, 1.06.2009. WAM-C20215, paratype male (SL 34.3 mm, SW 28.7 mm), off Hamelin Bay, Augusta, Western Australia, 34°12'S, 115°01'E, coll. Mrs Wynne, Dec 1964. MOV-J54960, ovig. female, SL 12.2 mm, SW 10.6 mm, off Zuytdorp, Western Australia (27°03'07"S–27°02'53"S, 113°04'52"E–113°04'48"E), 106 m, beam trawl, *Southern Surveyor*, stn SS10-2005-110, G.C.B. Poore *et al.*, 6.12.2005. MOV-J54961, female (SL 3.4 mm, SW 3.0 mm), female (SL 5.0 mm, SW 4.4 mm), off Mentelle, Western Australia (33°58'48"S–33°59'01"S, 114°44'02"E–114°44'06"E), 96–123 m, *Southern Surveyor*, stn SS10-2005-15, coll. G.C.B. Poore *et al.*

Diagnosis. Shield (Fig. 1C, D) 1.13–1.33 times longer than broad, proportionately longer with increasing size. Rostrum broadly triangular, blunt or rounded distally; not projecting as far as lateral projections; lateral projections strongly projecting, apex blunt or rounded. Shield unarmed except for small spines and tubercles anterolaterally. Ocular peduncles (Fig. 1C), moderately stout; shorter than front of shield, and less than half length; peduncles weakly inflated distally and proximally; corneal length about 0.25 total length of peduncle. Ocular

acicles with 3–6 distal spinules; acicles about 1/3 length of ocular peduncles, as broad as long. Antennular peduncles long, over-reaching ocular peduncles by 1/2 to 2/3 length of ultimate segment; unarmed except for 6–10 spinules on distolateral margin of proximal segment. Antennal peduncles as long as or slightly longer than ocular peduncles. Antennal acicles reaching at most 1/3 length of ultimate peduncular segment; acicles with 2 distal spines, 1 dorsal spine posterior to these, 3–4 mesial spines. Antennal flagella as long as or slightly longer than carapace. Third maxilliped merus with 1 distodorsal and 3–5 ventral spines; ischium with strong crista dentata, 1–3 ventral spines; basis with about 12 distoventral spines. Chelipeds (Fig. 1A, B) subequal; dactyl about 0.5 times length of propodus, covered with strong corneous-tipped spines on dorsal and lateral faces; mesial face with some spines dorsally. Propodus twice as long (or slightly less) maximum width (excluding spines); fixed finger deflexed ventrally; finger and palm covered on lateral, dorsal and ventral faces with strong mostly corneous-tipped spines (on large specimens spines tend to lose corneous tips and become distally blunted); propodus less spinose mesially, with more scattered and usually blunter spines. Carpus slightly broader than long; numerous corneous-tipped spines on lateral and dorsal faces; spines largest dorsally; mesial face almost smooth. Merus dorsal edge with several large spines distally and on distolateral edge; spines and tubercles along ventrolateral and ventromesial edges, especially large proximally on ventromesial edge. Second pereopods (Fig. 1E) longer than chelipeds; dactyl long and recurved ventrally, bearing numerous corneous-tipped spines dorsally and laterally in irregular rows; mesial and ventral surfaces with few scattered spines; lateral longitudinal sulcus along most of length. Propodus shorter, stouter than dactyl, with numerous corneous-tipped spines, largest and most numerous dorsally; mesial face with few spines dorsally. Carpus with large spines dorsally; some smaller more scattered spines laterally; 1–2 ventral spines; mesial surface almost smooth. Merus with non-corneous spines only along ventral margin. Third pereopods (Fig. 1F) similar to second. Dactyl longer than

Dardanus australis from eastern Australia

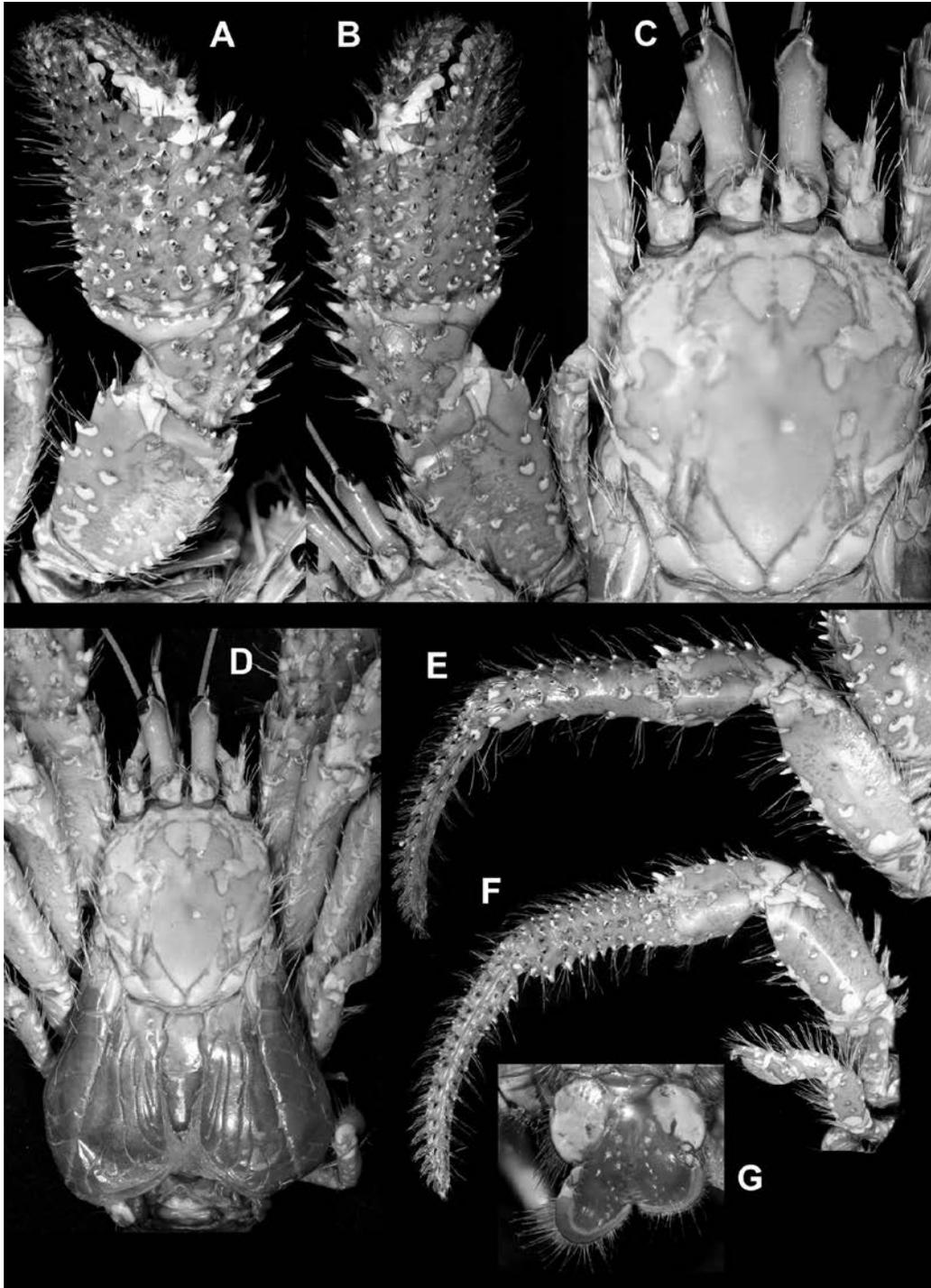


FIG. 1. *Dardanus australis* Forest & Morgan, 1991. QM-W29182, male (SL 29.3 mm), off Nambucca Heads, northern NSW. A, left cheliped; B, right cheliped; C, dorsal view of carapace shield and eyestalks; D, dorsal view of cephalothorax; E, second left pereiopod; F, third left pereiopod; G, telson.

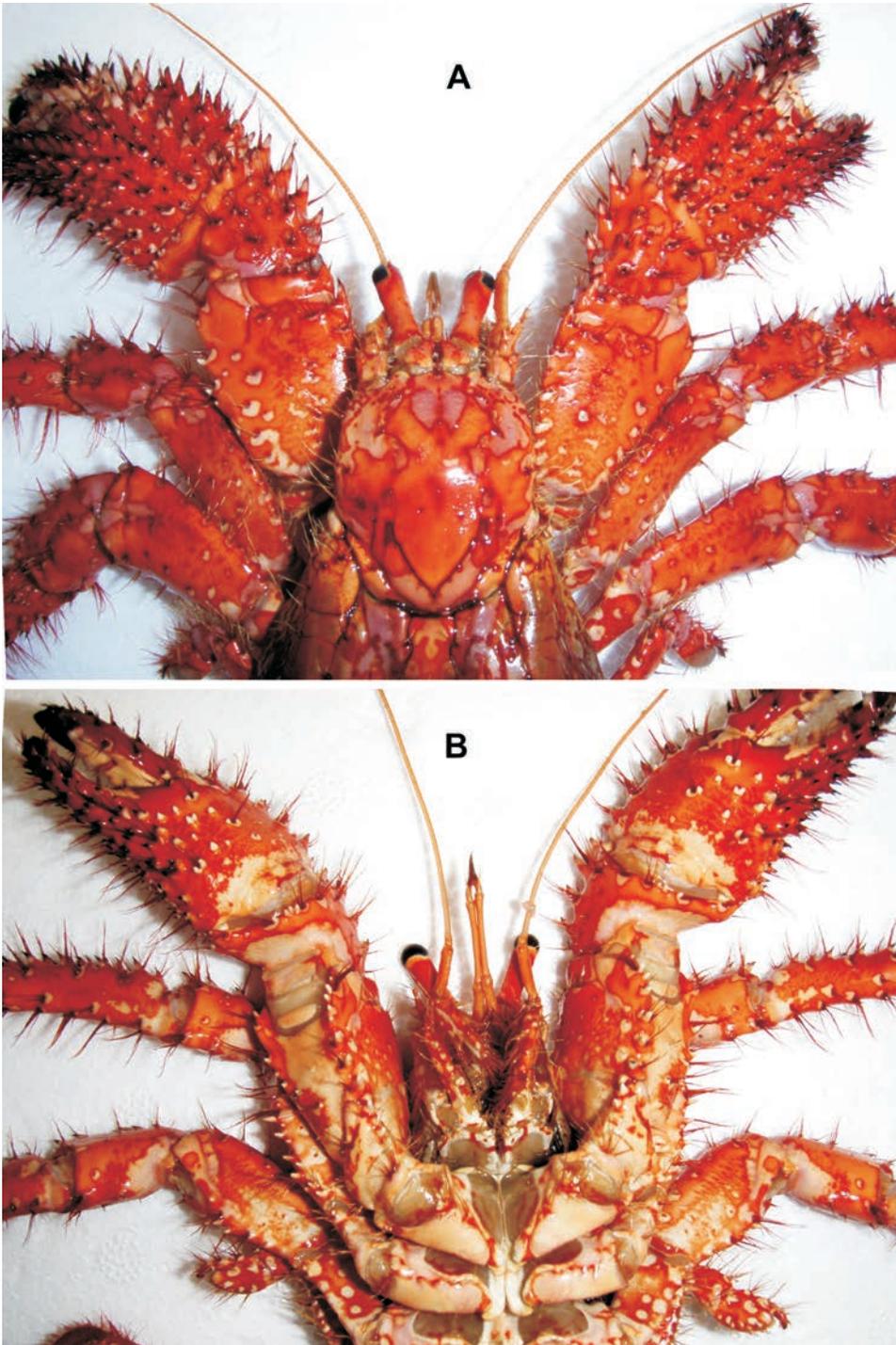


FIG. 2. *Dardanus australis* Forest & Morgan, 1991: QM-W29182, male (SL 29.3 mm), off Nambucca Heads, northern NSW. **A**, dorsal view of anterior carapace and claws; **B**, ventral view of same. Photographs by Marcus Miller.

Dardanus australis from eastern Australia



FIG. 3. *Dardanus australis* Forest & Morgan, 1991. **A**, off SW Western Australia, precise locality not recorded (photograph by Gary Morgan); **B**, off SW Western Australia, coll. *Southern Surveyor*, SS10-2005 (photograph by Karen Gowlett-Holmes); **C**, Rapa, Austral Islands, French Polynesia, BENTHAUS Exped., stn CP1906, trawl 110-127 m (photograph by Joseph Poupin); **D**, Marotiri, Austral Islands, French Polynesia, male SL 9.5 mm, in shell of *Malia* sp. (photograph by Joseph Poupin); **E**, off SW Western Australia, precise locality not recorded (photograph by Gary Morgan).

second; spines more numerous ventrolaterally. Propodus similar length to second, but broader and more spinose especially ventrolaterally. Tailfan markedly asymmetrical; left uropods much larger than right. Telson (Fig. 1G) length similar to width, or slightly longer; left posterior lobe slightly larger than right, each bearing 5–8 corneous spines along posterior margins (sometimes reduced).

Colouration. The original colour description is a little misleading as it fails to take into account some of the variation in colour and pattern shown by this species, particularly at different stages of maturity. Figure 3A is of a specimen from Western Australia photographed by Gary Morgan, and may have been that upon which he based his original colour description, as it matches almost exactly ... 'Shield predominantly red-brown with large semi-symmetrical patches of cream ... Ocular peduncles uniformly pale red-brown except for diffuse darker areas proximally and at base of corneas. Ocular acicles and antennal peduncles with patches of red-brown. Chelipeds and pereopods 2 and 3 with dactyl and propodus mostly deep red or red-brown, non-corneous spines tipped with cream or white; carpus and merus paler with darker red-brown band under corneous tips of most spines and areas of cream especially on tubercles and non-corneous spines; cream patches usually bordered by thin band of dark red-brown.' (Forest & Morgan 1991). However, large specimens are overall orange rather than red-brown (Figs 2, 3C, D), and the large semi-symmetrical patches are more typically pale mauve. Ocular peduncles are also not always uniformly pale red or orange, but can have even paler almost yellow tonings only, becoming darker distally (Fig. 3C).

There are also conspicuous mauve to cream patches baso-proximally on the carpi and meri of the chelipeds and pereopods 1 and 2, which can be particularly broad and prominent next to the mero-carpal joint (especially in juveniles); no such colouration is mentioned by Forest & Morgan (1991), but which are indeed also visible on the photographs of the Western Australian specimens (Fig. 3A, B). In small specimens (Fig. 3B) the chelae are less uniformly coloured, with red-brown colour mostly on

fingers, and extending a variable distance laterally onto palm.

Not previously mentioned is the marked mottling or spotting on the abdomen. Juveniles appear strongly mottled with white and reddish brown over the entire abdomen (Fig. 3B), but this gradually becomes white irregular blotching or spotting (Fig. 3A), gradually fading posteriorly until it almost disappears in large adult specimens (Fig. 3C).

Habitat. The present specimen was taken in a lobster pot at a depth of 137 m, on the edge of a patchy coralline reef, beside a gentle slope descending to a muddy/gravel bottom at 146 m. It occupied the shell of *Charonia lampas rubicunda* (total length, 185.1 mm; aperture width, 45.2 mm; weight 145.7 g). The shell had encrusting epibiotic and endolithic species, covering greater than 50% of the shell. Forest & Morgan (1991) recorded: '*Dardanus australis* has been dredged or caught in rock lobster pots at recorded depths of 10–188 m. The 10 m record might be regarded with suspicion as the next shallowest report is from 40 m, with most specimens taken at depths exceeding 50 m, most frequently between 130–150 m. Shells utilised by the species are large and voluminous and include *Angaria delphinus* (Linnaeus, 1758), *Monodonta labio* (Linnaeus, 1758) and *Turbo jourdani* Kiener, 1839.' A record from the Austral Is. in French Polynesia (see Legall & Poupin 2013) recorded it living in a shell of an unidentified *Malia* sp (Fig. 3D).

Distribution. *Dardanus australis* was originally described from southwestern Australia between about Dirk Hartog I., Shark Bay (25°31' S, 112°29' E) in the north, and Albany (35°02' S, 117° 53' E) in the south. A further specimen (a male SL 35.0 mm) in the Muséum national d'Histoire naturelle, Paris, that was trawled from 47 fathoms off Kingscliff, northern NSW, in June 1961, was considered to most probably have been an error as it was otherwise unknown from localities eastward across southern Australia. However, Poupin (1996a, b) recorded specimens from Rapa in the Austral Islands, French Polynesia, which were identified by Jacque Forest after comparison with paratypes in the MNHN, Paris. There have also now been further records from the Austral Is (Marotiri and Neilson Reef;

Legall & Poupin 2013). Thus the present record collected off Nambucca Heads, NSW, indicates that the unconfirmed record from off Kingscliff, is likely to have been accurate, and thus this species can be considered to extend up the eastern Australian coast to about 28°15' S.

Remarks. *Dardanus australis* Forest & Morgan, 1991 (maximum recorded shield length of 36.5 mm) is most closely related to *D. hessii* (Miers, 1884), and *D. brachyops* Forest, 1962. All are similarly spinose species, and all have subequal chelipeds which is rare for *Dardanus* species. *D. australis* can be immediately separated by 1) its longer ocular peduncles with feebly inflated corneas; 2) by the shape and spination of the chelae that have a much more enlarged palm, that bears slightly shorter, more numerous, and more closely set spines on the dorsal and lateral faces; and 3) more extensive spination on the lateral surfaces of the second and third pereopods.

Dardanus hessii, is known from the Red Sea to Vietnam, the Arafura Sea, and north-western Australian waters down to depths of 15–73 m (see Forest & Morgan, 1991). It also occurs across northern Australian waters and down the east coast to about Innisfail, north Queensland (Davie unpublished). However its range is more tropical and apparently does not overlap with that of *D. australis*. It also differs in colour in having dark lateral and mesial longitudinal bands on the ocular peduncles, and by having deep red coloration confined to the fingers of the chelae (Fize & Serène, 1955: fig. 34; Forest & Morgan, 1991). Adult *Dardanus hessii* are also much smaller, only reaching about 15.0 mm in shield length.

The only species comparable in size to *Dardanus australis* is *D. brachyops* Forest, 1962, known from Hawaii in the Pacific, and from Madagascar, the Marquesas and La Réunion in the Indian Ocean. Both are typically found at depths from 50–190 m. They are also similar in spination, however, in *D. brachyops* the right cheliped is obviously smaller than the left, and the ocular peduncles are much shorter and stouter, and bear three transverse dark red bands (Forest 1962: fig. 1; Forest & Morgan 1991).

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