

A New Species of the Freshwater Crayfish Genus *Euastacus* (Decapoda: Parastacidae) from Northeastern New South Wales, Australia

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ABSTRACT. A new species of the freshwater crayfish genus *Euastacus*, *E. mirangudjin*, is described from northeastern New South Wales. The species most closely resembles *E. reductus* Riek 1969, differing in spination of the chelae and in colouration. The species is recorded only from the type locality, in Toonumbar National Park, where it inhabits the rocky edges of Iron Pot Creek.

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The genus *Euastacus* was erected by Clark (1936), separating the spiny crayfishes of the Australian mainland from those of the Tasmanian genus *Astacopsis*. Species of *Euastacus* have been described by a number of authors, the main taxonomic works having been undertaken by Clark (1936, 1941), Riek (1951, 1956, 1969) and Morgan (1986, 1988, 1997). The genus *Euastacoides* Riek was synonymised with *Euastacus* by Morgan (1988).

Five specimens of *Euastacus mirangudjin* n.sp. were caught on 6 September 2000 during a research project on *Euastacus gumar* Morgan 1997, on the eastern side of the Richmond Range in northeastern New South Wales (Fig. 1). The new species was not found at 27 other locations sampled (all within ≈ 50 km of the type locality), although the majority of these were on the western side of the Richmond Range. The specimens were caught in an area within the known distribution of two other species of *Euastacus*, *E. sulcatus* Riek 1951 and *E. valentulus* Riek 1951. However, no other species of crayfish was captured at the site where the new species was found. The specimens of this new species were immediately recognisable as being different from the above species in both morphology and

colouration. Two specimens were retained and preserved, and the other three released alive at the site of capture. Morphological details were recorded for the two specimens preserved and two of the three specimens released. The third specimen released was much smaller than the others (< 15 mm occipital carapace length [OCL]) and was not subjected to the same detailed examination. The four specimens examined in detail were between 26 mm and 37 mm OCL. The largest specimen collected (37 mm OCL), a berried female, was released.

The specimens collected could not be identified with the most recent key to the genus (Morgan, 1997), either collectively or individually. The large number of distinguishing features, including several features integral to the identification of species in the genus *Euastacus*, warrant the recognition of the specimens as a new species of this genus. This species most closely resembles *E. reductus* (from central eastern New South Wales). The species is easily distinguished from other species of *Euastacus* from northeastern New South Wales, which are generally larger and/or spinier. Character states and ratios are as used by Morgan (1986, 1997).

Euastacus mirangudjin n.sp.

Fig. 2–4

Type material. HOLOTYPE: female (30 mm OCL); Iron Pot Creek, Toonumbar National Park, rainforest; 28°28'30"S 152°45'E; elevation 560 m; 6 September 2000; collected by Jason Coughran and Benjamin Black, lodged with the Australian Museum (AM P61072). PARATYPE: male (34.5 mm OCL), lodged with the Australian Museum (AM P61073).

Type locality. The type locality is in Iron Pot Creek, an upper tributary of the Richmond River, approximately 30 km NW of Kyogle (28°28'30"S 152°45'E). The site is approximately 500m upstream of the junction of Murray Scrub Management Trail and Iron Pot Creek. The site is in the rainforest of Toonumbar National Park, at an elevation of 560m. The stream where the specimens were collected was up to 10 metres in width and 1 metre in depth. Water temperature was 9°C and pH 6.65 (recorded at 3:00 PM on 6 September 2000).

Other specimens examined. Two other specimens (26 mm OCL ♀; 37 mm OCL ♀) caught at the type locality were also examined before being released. Ratios used in the description are based on the retained specimens only.

Diagnosis. Male cuticle partition present. Rostrum short, just reaching base of third antennal segment. 3 rostral spines per side, extending beyond midlength of rostrum. Antennal squame without marginal spines. Suborbital spine small to

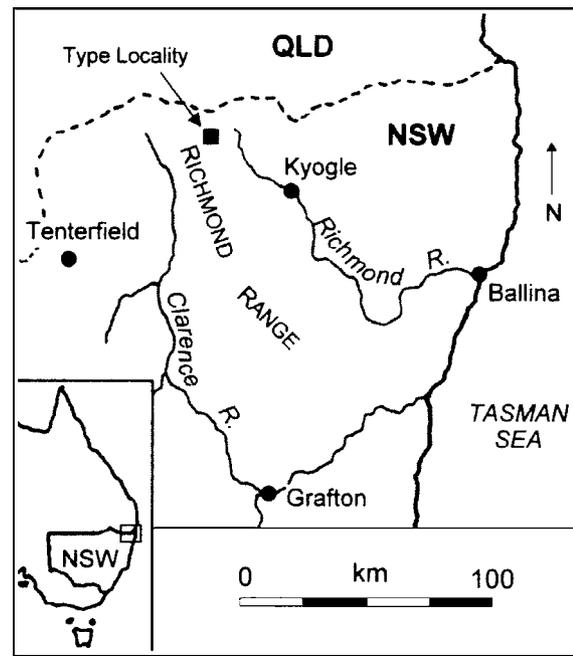


Figure 1. Collection locality of *Euastacus mirangudjin* n.sp.

medium. Dorsal thoracic spines absent/barely discernible. Cervical spines barely discernible or small. 1–5 small and sharp Li spines on somite 2, 1 barely discernible or absent on other somites. D spines and abdominal boss absent. Telsonic and uropodal marginal spines absent. 4–7 spines above the propodal cutting edges extending to base of chela gape, and 3–4 spines above the dactylar cutting edges. 3–4 dorsal apical propodal spines. 1 apical mesial dactylar spine. Dactylar basal spines absent. Ventrolateral propodal spine row either absent or poorly developed into a single, blunt spine at midlength. Usually 3 mesial carpal spines. 1 poorly developed lateral carpal spine at distal edge of carpus (rarely two spines). Ventral carpal spine large. One ventromesial carpal spine.

Description. Maximum OCL 37 mm. *Rostrum*—short, just reaching base of third antennal segment, with a distinct and deep longitudinal groove; rostral margins parallel at sides and divergent at base; rostral carinae short; 3 marginal rostral spines per side, extending beyond midlength of rostrum (paratype with 2 spines on one side); acumen spine similar in size to marginal spines; OCL/carapace length = 0.88; rostral width/OCL = 0.14–0.17. *Cephalon*—weakly spinose; antennal squame marginal spines absent; 1st postorbital ridge spine small to medium, 2nd postorbital ridge spine barely discernible (ridge reduced to a subtle bump on carapace); numerous small to medium, blunt cephalic spines ventral to postorbital ridges; suborbital spine small to medium in size; interantennal scale of medium width and scalloped; basipodite spine absent or small; coxopodite spine small to medium and occasionally bifid; interantennal scale length/OCL = 0.09–0.1. *Thorax*—1–5 cervical spines per side, barely discernible or very small; thoracic spines absent or barely discernible; general tubercles dense and small; areola length/OCL = 0.35; areola width/OCL = 0.13–0.14; carapace width/OCL = 0.53–0.55; carapace depth/OCL = 0.47–0.54. *Abdomen*—1–5 Li spines on somite 2, 1 barely discernible or absent on other somites;



Figure 2. *Euastacus mirangudjin* n.sp. Dorsal view, holotype. Photograph by Max Egan.



Figure 3. *Euastacus mirangudjin* n.sp. Dorsal view of chela (paratype) showing 4 mesial carpal spines. All other specimens examined bore 3 mesial carpal spines. Photograph by Max Egan.

2 Lii spines on somite 2 of large female specimen (released) (OCL 37 mm); D-L spines absent on most specimens, although present and minute on large female; D spines and abdominal boss absent; abdomen width/OCL = 0.5–0.52; OCL/total length = 0.42. *Tailfan*—telsonic and uropodal marginal spines absent; telson length/OCL = 0.33. *Chelae*—elongate. *Dactylus*—dactylar basal spines absent; 1 apical mesial dactylar spine; 3–4 medium to large and blunt spines above dactylar cutting edge, extending to midlength of chela gape (apical on paratype); dactylar

length/propodal length = 0.55. *Propodus*—5 mesial propodal spines; ventrolateral propodal spines absent or poorly developed into a single blunt spine at midlength of propodus; dorsolateral propodal spines reaching apex but not base of propodus; 3–4 apical propodal spines; 4–7 small to large and blunt spines above propodal cutting edge, extending to base of chela gape; few to numerous protuberances lateral to dactylar base dorsally, two specimens also with 1 or 2 spines (on one chela only); usually 1 (rarely 2) spines lateral to dactylar base ventrally; 2 spines ventral to propodal cutting edge proximal to midlength; spines posterior to dactylar articulation absent; 2 spines at dactylar articulation both dorsally and ventrally; propodal length/OCL = 1.0–1.03; propodal width/propodal length = 0.42; propodal depth/propodal length = 0.27–0.28. *Carpus*—dorsal groove deep; lateral carpal spination poorly developed into a single blunt spine at distal edge of carpus (one specimen with two discernible spines on one chela); usually 3 mesial carpal spines, paratype with 4 large and distinct spines on one chela and 2 large and 2 small (but distinct) spines on other chela (Fig. 3); dorsal carpal spines absent; ventral carpal spine large; ventromesial carpal spine as large as, or larger than, ventral spine on specimens >30 mm OCL, smaller than ventral spine on specimens 30 mm OCL and smaller; dorsal carpal groove present. *Merus*—7–8 small to large dorsal spines. *Keel*—*Pr.1*, close and parallel; *Pr.2*, apart and parallel to slightly closed; *Pr.3*, apart and of narrow to moderate breadth, scoops absent; *Pr.4*, apart and very broad, anterior margin rounded, posterior margin convex. *Setation*—moderate. *Punctuation*—moderate on cephalon, denser on thorax.

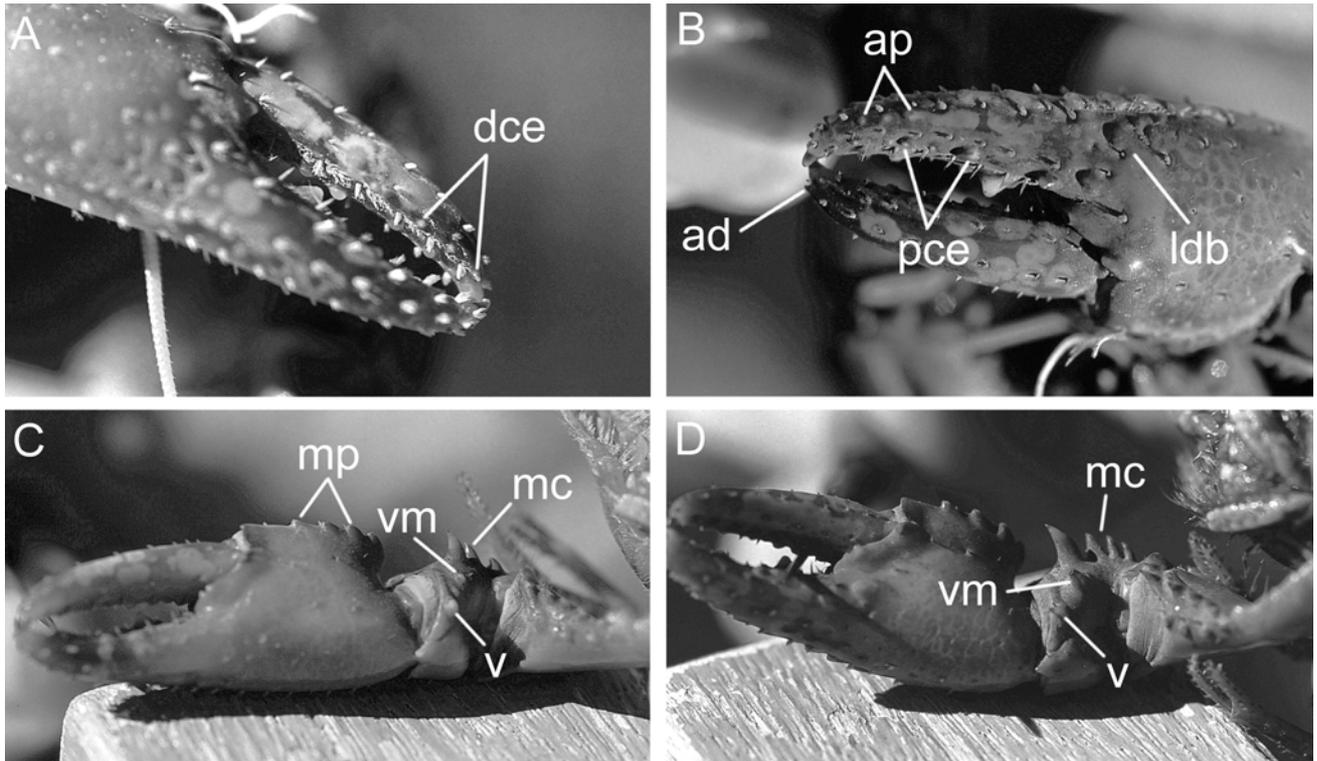


Figure 4. Distinguishing features of the chela of *Euastacus mirangudjin* n.sp. Dorsal view (A, B) and ventral view (C, D) of chela of holotype (A, C) and paratype (B, D). ad, apical mesial dactylar spine (1 spine); ap, dorsal apical propodal spine row (3–4 spines); dce, spine row above dactylar cutting edge (3–4 spines); ldb, bumps and protuberances lateral to dactylar base; mc, mesial carpal spines (usually 3, paratype with 4); mp, mesial propodal spines (5); pce, spine row above propodal cutting edge (4–7 spines, extending to base of chela gape); v, ventral carpal spine (large); vm, ventromesial carpal spine (1 spine, smaller than or as large as ventral carpal spine). Photographs by Max Egan.

Table 1. Morphological traits distinguishing *Euastacus mirangudjin* n.sp. from *E. reductus*, *E. setosus*, *E. urospinosus*, *E. maida* and *E. jagara*. (Character traits for *E. reductus* taken from Morgan (1997). Character traits for *E. setosus*, *E. urospinosus*, *E. maida* and *E. jagara* taken from Morgan [1988])

| feature | <i>E. mirangudjin</i> | <i>E. reductus</i> | <i>E. setosus</i> | <i>E. maida</i> | <i>E. jagara</i> | <i>E. urospinosus</i> |
|------------------------------------|---|---|--|---|---|---|
| suborbital spine | small to medium | usually small or very small, medium on some specimens | large or very large | small | very small or small | small to medium |
| thoracic spines | absent | absent | absent | absent | absent | 1–3, small, blunt or moderately sharp |
| Li spines on 2nd somite | 1–5 spines, moderately sharp | 1–8 (usually 2–5), sharp or moderately pointed | 2–3 spines, blunt or very blunt | 4–6 spines, moderately pointed to blunt | 2–3 very blunt spines on holotype, (largest specimen) absent on others | 2–3 spines, moderately pointed to blunt, absent on animals <20 mm OCL |
| dorsal apical propodal spines | 3–4 spines | usually absent, some specimens with 1 or 2 spines | usually absent (rarely 1) | 1–2 spines | absent | absent |
| spines above propodal cutting edge | 4–7 spines | usually 1–3 spines, 4 on some regenerate chela | usually 1 apical spine | absent | absent | absent |
| mesal propodal spines | 5 spines | 4–7 (usually 5 or 6) | usually 4 spines, sometimes 3 or 5 (esp. on regenerate chelae) | 3–4 spines | 6–7 spines, 4–5 on animals <20 mm OCL | usually 5 (rarely 6) |
| apical dactylar spines | 1 (mesal) spine | usually 1, sometimes 2 spines | 2 (mesal) spines | 1–2 (mesal) spines | 1 (mesal) spine | usually 1 (mesal) spine |
| spines above dactylar cutting edge | 3–4 spines | usually 1–3 spines | usually 1 apical spine | 1 spine | 1 apical spine on largest specimen, absent on animals <30 mm OCL | 1 apical spine, absent on animals <20 mm OCL |
| mesal carpal spines | usually 3 spines, one specimen with 4 large | 4 spines (3 on some regenerate chela) | usually 4–5 spines | 4 spines | 3–6 spines | 4 spines |
| ventral spine size | 4 large | small or medium | small or medium | very small or tiny | small to medium | medium/large to small |
| ventromesial spines | one spine | 3–4 spines | 3–7 spines | 2–4 spines | “largest” and “other ventromesial spines” mentioned (more than one spine) | usually 3–4 spines |
| dorsal carpal spines | absent | absent | usually present | absent | absent (low bumps on largest specimen) | 1–2, small |

Colouration—body dorsally red-brown to green-brown; ventrally orange, with orange colouration extending up onto lateral branchiostegites on larger animals; abdominal pleura blue, brown on one specimen; abdominal spines yellow; cervical and cephalic spines yellow, orange, or orange with yellow tips; carpus dark brown dorsally, ventrally orange tinged mesially with blue-brown; dorsal surface of propodus mottled green-brown; propodus ventrally orange, mesially brown. Mesial propodal spines blue; lateral propodal spine ridge blue to green-brown, with yellow or light brown spines; fingers dark brown with paler or yellow tips. **Sexes**—males possess a cuticle partition; a berried female was caught with an OCL of 37 mm; the eggs carried were bright red in colour; the holotype, a 30 mm OCL female, has proportionally similar abdomen width (relative to OCL) to the slightly larger male paratype, suggesting an immature sexual state (see Honan & Mitchell, 1995). Further biological research is required to better ascertain size at onset of sexual maturity. The species would appear to have a winter/spring breeding season, which has also been recorded for other *Euastacus* species (Clark, 1937; Turvey & Merrick, 1997; Borsboom, 1998; Honan, 1998).

Biology. The species is known only from one site, in Iron Pot Creek. The specimens were caught during the dry season (in September), which appears to coincide with the breeding season.

Etymology. From the Bundjalung Aboriginal language “miran”, meaning belly or chest (Holmer, 1971; Smythe, 1978) and *gudjhn* [*gudji:n*, *gudi:n*], meaning ochre, red or orange (Crowley, 1978; Smythe, 1978; Sharpe, 1985). The species could be colloquially referred to as the “ochre-bellied crayfish” or “orange-bellied crayfish”. The specific epithet is used as a noun in apposition. The species is bright orange ventrally like *E. gumar*, although the orange colouration is more striking, remaining vivid as it extends ventrally over the walking legs, and extending well up onto the lateral branchiostegites of the carapace on larger specimens. The larger specimens in particular appear to glow orange from underneath.

Remarks. *Euastacus mirangudjin* is morphologically similar to *E. reductus*, from further south in the Port Macquarie region, and the species forming the *setosus* complex in southeastern Queensland (*E. jagara* Morgan 1988, *E. madae* Riek 1956, *E. setosus* Riek 1956 and *E. urospinus* Riek 1956). Table 1 outlines morphological traits which can be used to distinguish *E. mirangudjin* from these species. The distinguishing spination of the chelae of *E. mirangudjin* is shown in Figure 4.

Discussion

The species described here increases the recognised number of species in the genus *Euastacus* to 43, and the number of *Euastacus* occurring in New South Wales to 25. The species is easily distinguished from other northeastern New South Wales species, which are generally larger and/or spinier. The species more closely resembles species forming the *setosus* complex in southeastern Queensland (*E. jagara*, *E. madae*, *E. setosus* and *E. urospinus*). The latter three of these species were designated as belonging to a separate genus, *Euastacoides*, by Riek (1956). Morgan (1988) synonymised *Euastacoides* with *Euastacus*, arguing that

some species of *Euastacus* display characters Riek had considered unique to *Euastacoides*. Two of these traits are also exhibited by the present species:

- The ventrolateral propodal spine row of the species is either absent or poorly developed into a single, blunt spine at the midlength of the propodus.
- The ventromesial carpal spine is as large as the ventral spine on some individuals. However, the ventromesial/ventral spine size relationship is variable, with the ventromesial spine being smaller than, as large as, or slightly larger than, the ventral spine. Unlike the species in the *setosus* complex, the ventral spine is large.

However, the species bears abdominal spines, and can thus be considered separate from the *setosus* complex. Instead, like *E. reductus* (see Morgan, 1988), the species represents an intermediate condition between the *setosus* complex and most species of *Euastacus*.

The type locality is a highland rainforest stream. The species was caught by actively sampling the rocky edges of the stream. This entailed turning over rocks and capturing the crayfish by hand. The crayfish were caught behind these rocks, above the stream water level. Numerous burrows were noted in the stream channel, though no crayfish could be enticed from these burrows with baits. These burrows may belong to the presently described species, although they could also be burrows of *Euastacus sulcatus* or *E. valentulus*, which both inhabit the area (Leckie, 1999). The broader distribution of *E. mirangudjin* is unknown, and this should be considered as a significant research gap. Other small species of *Euastacus* have been found to be restricted to highland areas (Morgan, 1997). For example, the present species was discovered while conducting research on *E. gumar*, which was found to be restricted to five isolated, highland populations, with a total estimated extent of occurrence of <30 km² (Coughran, 2000). These findings highlight the urgency of undertaking further research on poorly known species of *Euastacus*, such as the presently described species.

Only two specimens were retained from the type locality as museum voucher specimens. The other three specimens were released because it was apparent that this new species is potentially rare and most likely has a very restricted distribution. Although the present study, based on the western side of the Richmond Range, provides little scope for assessing the distribution of the species, it is significant that Leckie (1999) did not record the species at any of the three sites he sampled directly downstream of the type locality. Rather, Leckie (1999) recorded the relatively common and widespread species *E. valentulus* and *E. sulcatus* in his study. At this stage, this new species *E. mirangudjin* appears to satisfy two criteria for listing as an endangered species under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*. These criteria are:

- 1 Very restricted geographic distribution.
- 2 Extremely low estimated total number of mature individuals.

Further research is required to better determine the conservation status of this species.

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