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A NEW SPECIES OF THE FRESHWATER CRAYFISH GENUS *ENGAEUS* ERICHSON (DECAPODA: PARASTACIDAE) FROM NORTH-WESTERN TASMANIA

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Abstract

Horwitz, P. 1994. A new species of the freshwater crayfish genus *Engaeus* Erichson (Decapoda: Parastacidae) from north-western Tasmania. *Memoirs of the Museum of Victoria* 54 (2): 439–445.

A new species of freshwater crayfish, *Engaeus yabbimunna*, is described from Burnie in north-western Tasmania. The species can be readily distinguished by using characters established in the most recent revision of the genus *Engaeus*, notably the nature of the chelae, form of rostrum and the antennal flagella. It is proposed that the new species has a restricted geographical range (not unusual for species in this genus), and that it is found in and around the city of Burnie. Its absence from previous extensive collections, its absence from parts of Burnie, and the restricted nature of the distribution, together highlight the need for adequate protection of the species.

Introduction

The genus *Engaeus* contains 34 species, 12 endemic to Tasmania (Horwitz, 1990). This paper reports on another endemic species from the Burnie region in north-western Tasmania. The following description follows the format and uses the same abbreviations of Horwitz (1990).

Engaeus yabbimunna

Figure 1

Material examined. Holotype. Burnie Park, from burrow in seepage area in gully of Shorewell Creek below Oldacre Falls (GR 8015 068 551), P. Horwitz, 9 Dec 1992, Museum of Victoria NMV J34474 (male, OCL 25.7 mm.)

Allotype. Type locality, NMV J34475, berried female, OCL 24.0 mm.

Paratypes. Type locality, Queen Victoria Museum QVM:10:11235, berried female, OCL 23.2 mm; burrow in ferny gully in Reserve Park on Romaine Creek, Burnie (GR 8015 080 513), Tasmanian Museum and Art Gallery G3529, P. Horwitz, 10 Dec 1992, male, OCL 25.0 mm.

Other specimens. Type locality, 1 male, 1 female and 2 juveniles; type locality, Bill Walker, Feb 1992, 1 female, one juvenile; Cooee Creek in Burnie (GR 8015: 056520), from burrow in bank, 10 Dec 1992, P. Horwitz, 1 male; Romaine Creek (as for paratype), 1 male, 1 female.

Description. Rostrum length variable but usually extending to junction of penultimate and distal segments of antennular peduncle, broad, anteriorly upturned to produce a bold spine. Rostral carinae conspicuous, tuberculate along length (but occasionally inconspicuously so), otherwise smooth, long, fading out well beyond posterior of rostrum, widely separated and ending abruptly almost at anterior of rostrum, not fusing with rostral rim; intracarinate region depressed and U-shaped (in transverse), deep and asetose (except for small single setae in row along the inner margin of each carina). Suborbital angle variable; postorbital ridges low and blunt. Eyes relatively small but pigmented area not reduced on orbital peduncle; antennal flagella short, not extending beyond posterior edge of carapace; antennal scale moderately long and usually extending to distal segment of antennal peduncle, 0.3 as wide as long and with long tapering sharp conical terminal spine and carinate lateral edge. Antennules biflagellate with inner flagellum 0.5–0.6 as long as outer. Interantennal scale generally triangular but variable on that theme, with median longitudinal ridge or swelling. 3rd maxilliped with raised (tuberculate or spined) mesioventral corner of coxopodite; ischium with broad, largely asetose ventrolateral surface, with carinate lateral edge and laterodistal corner produced to short spine; exopodite either absent or shaft-like and less than 0.2 as long as ischium.

Carapace vaulted; areola 0.3–0.4 as wide as long. Carapace granulate on branchiostegal, mandibular, antennal and orbital regions. Cervical groove deepest at meson, V-shaped.

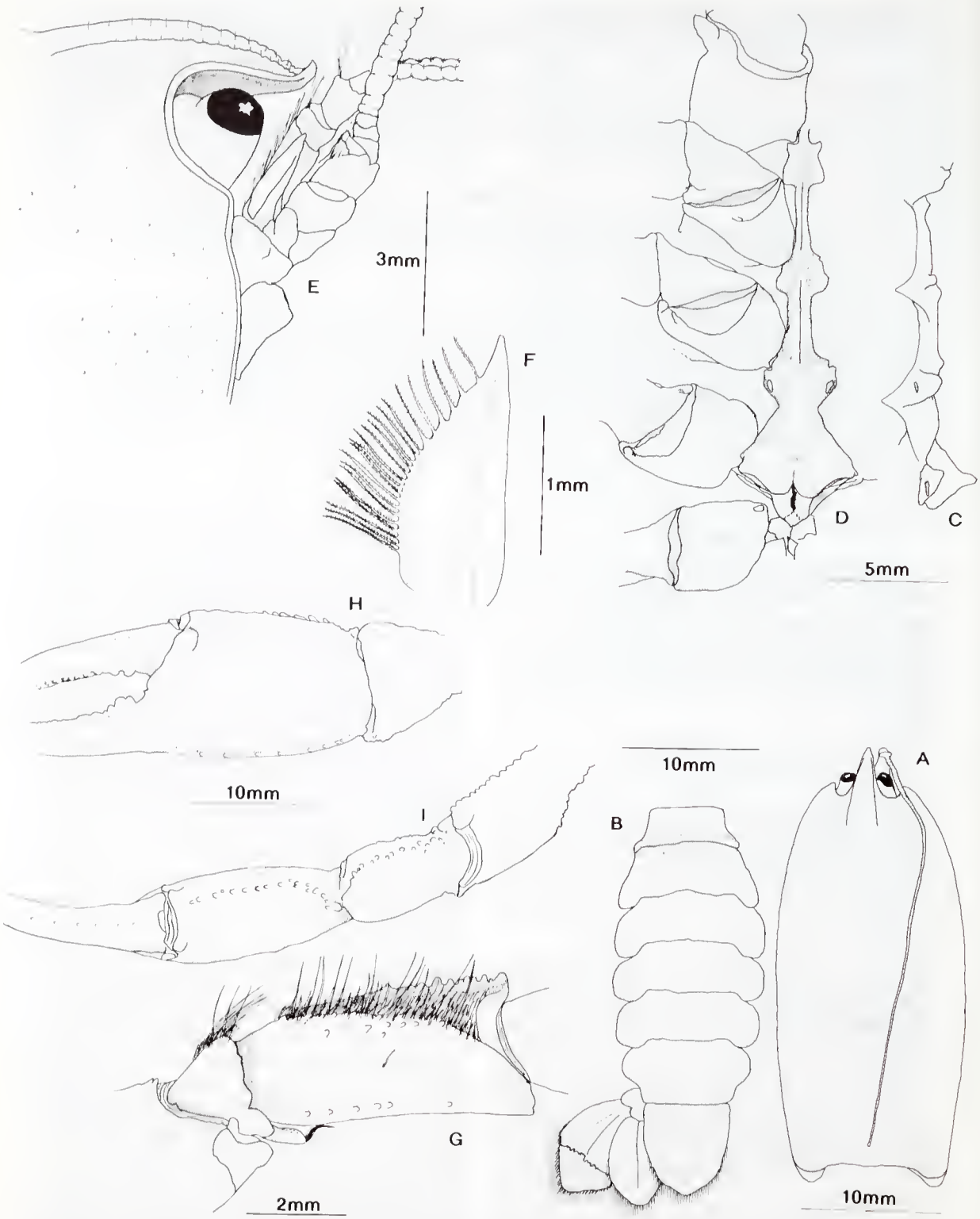

Figure 1. All diagrams are of the holotype. A, dorsal view of carapace; B, dorsal view of abdominal somites and elements of the tail fan (telson and the inner and outer ramus of one uropod); C, lateral profile of sternum (from right side of specimen); D, ventral view of sternum; E, lateral view of anterior cephalon; F, dorsal view of right antennal scale; G, ventral view of third maxilliped (from left side of specimen) showing coxopodite, basipodite, ischium and exopodite; H, lateral view of carpus, propodus and dactyl of left chela; I, dorsal view of carpus, propodus and dactyl of left chela.

TAL 1.08–1.17 × OCL. AP1 reduced in width and with narrow pleura not overlapped by forward extension of pleura of AP2.

Telson broad and well rounded caudally; each caudolateral corner with either a conspicuous spine, a small spine or a notch only; outer ramus of uropod with prominent longitudinal median carina, terminating in median spine on suture; suture straight, with 1–4 extra dorsomesial spines and with 0–4 extra (usually smaller) dorsolateral spines; caudolateral corner with 0, 1 or 2 spines on edge. Inner ramus with or without 1 spine at caudolateral corner, with longitudinal median carina which fades out premarginally.

Chelae isomorphic, largely non-granulate and asetose. Propodal palm with single row of rounded tubercles along dorsal edge, non-granulate and asetose laterally and mesially, and with tuberculate carina along ventral edge. Dactyl dorsally granulate or non-granulate. Carpus smooth dorsally and laterally, without centrodorsal depression and with row or band of small tubercles along dorsomesial edge. Merus with row or band of small tubercles along dorsal edge.

Sternal keel commencing between LP 1st P rising to low peak and then continuing as low but thin ridge, fading at articulations of 2nd P before rising to low ridge, continuing to slight saddle and rising again to fade out at 3rd P articulation level, then recommencing as broad, low ridge and terminating at articulation level of 4th P. LP 1st and 2nd P without pores, otherwise conspicuously raised; LP 3rd P each with pore opening posterolaterally, peaked at articulations and much higher than keel summit; LP 4th P with long slit like pores (beneath posterior rim, opening posterolaterally) and separated by deep Y-shaped valley. Bullar lobes with processes sloping anteromesially, separated by deep, sharp groove and bluntly pointed posteriorly.

Individuals either with male or female gonopores only (no intersexed specimens found). Gill formula usually 21 + ep (posterior pleurobranch reduced to a short fleshy stump).

Holotype Male

Cephalon. Rostrum moderately long and broad, extending to middle of distal segment of antennular peduncle, 0.11 × OCL, spineless, with straight lateral edges converging to upturned, bluntly pointed tip, whole rostrum curved downwards in lateral profile, bordered entirely by thin rim and dorsolaterally extremely steep and concave between rim and carinae. Rostral carinae conspicuous, straight, converging anteriorly to end very abruptly but neither fusing with themselves nor with the rostral rim, widely separated, tuberculate over at least anterior half, and long (approximately 1.5 × as long as rostral length) fading out posteriorly beyond level of posterior edge of orbit; intracarinate region broadly U-shaped (in transverse), becoming slightly deeper and minutely setose along inner margin of carinae. Suborbital angle obtuse, approximately 110°; postorbital region moderately deeply depressed dorsoposteriorly; postorbital ridges short, bluntly raised; notch in orbital rim absent. Eyes small but pigmented area not reduced on orbital peduncle; eyes extending halfway along rostrum. Antennal flagellum short, extending to posterior edge of carapace, 1.08 × OCL; antennal scale moderately short, extending to just beyond junction of penultimate and distal segments of antennal peduncle, 0.08 × OCL, 0.30 × as wide as long and widest at proximal two-fifths with conical, terminal spine occupying one-fifth of scale length, with distinctly carinate and straight ventrolateral edge to spine, and long plumose setae along mesial edge. Antennules biflagellate with inner flagellum 0.53 × as long as outer and outer 0.28 × OCL. Interantennal scale broad with diverging lateral edges to rounded lateral corners before converging to rounded tip; centroventrally inflated. 3rd maxilliped with mesioventral corner of coxopodite raised and ridge-like, with one large and one smaller apical tubercles; ischium with long bristle setae and short plumose setae along ventromesial surface (becoming sparse mesially and distally), with punctate, granulate and very sparsely setose, broad ventrolateral surface with carinate lateral edge (carinae with minute tubercles along length) and spiniform laterodistal corner; exopodite reduced to a short stump (0.07 × as long as ischium).

Carapace. Vaulted, 0.85 × as wide as deep; areola narrow, 0.35 × as wide as long (grooves faint). Branchiostegites (particularly anteroventrally), mandibular, antennal and orbital regions of carapace granulate; areola and dorsal cephalon sparsely, minutely punctate; dorsolateral cephalon glabrous. Cervical groove deep at meson and broadly V-shaped.

Abdomen. TAL 1.09 × OCL. AP1 reduced in width, 0.51 × CTW and with unilobed pleura (lobe small and swollen), not distinctly overlapped by forward extension of pleura of AP2. Terga and pleura of AP2–6 minutely punctate and largely asetose.

Tail Fan. Telson with tapering lateral sides to caudolateral corners (each produced to small spine) and rounded caudal tip; dorsal surface minutely punctate and setose, with shallow depressions laterally and with longitudinal, central groove caudally; caudal edge with long plumose and short bristle setae. Outer ramus of uropod with short, fine bristle setae along lateral edge, with low, longitudinal median carina terminating on transverse suture in median spine; suture with 3 or 4 extra spines dorsomesially and 4 extra smaller spines dorsolaterally; suture itself moderately straight and deeply impressed along length; caudolateral corner with 2 widely separated spines on one ramus and none on the other; caudal section of ramus with central longitudinal groove fading out before caudal tip, otherwise with indistinct, minute carinae radiating from suture caudally, with short bristle setae and

longer plumose setae, along caudal edge; outer ramus constricted at caudolateral and caudomesial corners. Inner ramus of uropod minutely granulate and setose on dorsolateral half, with prominent median carina extending almost entire length of ramus terminating without spine; ramus dorsocaudally minutely striate; caudolateral corner without spine at edge; caudal edge with long plumose and short bristle setae; ramus somewhat leaf-shaped in outline. Inner ramus of uropod extending to beyond telson caudally, outer ramus marginally beyond that. Uropodal peduncle with both lobes rounded and asetose.

Chelae. Isomorphic, elongate and largely asetose and non-granulate: DACL/PROPL, 0.59; PROPW/PROPL, 0.43; PROPD/PROPL, 0.25; PROPL/OCL, 0.99. Left chela: propodal palm with only very sparse punctations laterally and mesially; dorsal edge with 15 tubercles in row along entire edge; perpendicular groove indistinct; ventral surface carinate (with row of tubercles along carina proximally). Propodal finger with row of punctations laterally defining the continuation of the carina (from ventral surface of propodal palm), otherwise smooth; cutting edge with 1 large compound tooth in proximal corner followed by 8 small teeth along edge to tip. Dactyl smooth but with 3 longitudinal rows of punctations (dorsal, dorsomesial and dorsolateral) and with one row of sparsely separated small tubercles dorsomesially; cutting edge with 13 teeth decreasing in size over proximal two-thirds of edge, followed by scale setae to tip. Carpus with very shallow centrodorsal groove, with tuberculate ventral projection and sparsely punctate laterally and dorsally, with row of tubercles along lateral edge, row of tubercles along dorsomesial edge (clustered proximally) and extra, small tubercles along ventral area of mesial triangle; otherwise smooth. Merus with glabrous mesial surface; with glabrous lateral surface sparsely granulate dorsally; dorsal surface with prominent dorsal spine amongst a double row of spiniform tubercles along edge; ventral surface granulate centrally, and with tubercles continuous along mesial and lateral rows.

Right chela slightly smaller than left; as for left chela except: 16 tubercles in row along dorsal edge of propodus, 1 small tooth followed by 1 compound tooth and 8 small teeth along cutting edge of propodal finger, and dactyl with 12 teeth along cutting edge.

Sternum. 1st P: keel present as low rounded ridge at posterior of LP, rising immediately to small peak then as ridge continuing to 2nd P; LP posteroventrally setose, conspicuously raised but without pores, separated by narrow, moderately deep channel (becoming broader and fading out at posterior level of processes). 2nd P: keel fading out between articulations, then rising to thin crest between LP and beyond, slightly lower than LP at articulations, before decreasing in height to saddle between 2nd and 3rd P; LP posteroventrally setose, distinctly raised, without pores, and separated from keel on either side by narrow, shallow channel. 3rd P: keel rising to low peak before fading out completely at articulation level, then rising to low broad ridge before dropping steeply at articulation level of 4th P; LP 3rd P very high (higher than keel summit) distinctly peaked at articulations, each with pore opening posterolaterally, separated from keel on either side by narrow channel. 4th P: keel as described above; LP peaked at articulations, ridged caudally, with large slit-like pore beneath posterior rim of each process opening posterolaterally, and sloping inward towards sharp Y-shaped valley. Bullar lobes: large, calcified and almost as long as broad, sloping anteromesially to sharp, longitudinal groove in anterior half; pointed posteriorly.

Sex. Without female gonopores; penes calcified around perimeter.

Allotype Female

Specimen exhibiting secondary sexual characteristics of reproductively active female (see Horwitz 1988), and with 28 orange eggs, 2.0 × 1.5 mm in diameter). As for Holotype Male except:

Cephalon. Rostrum 0.11 × OCL, extending to junction of distal and penultimate segments of antennal peduncle. Antennal flagellum 1.00 × OCL; antennal scale 0.09 × OCL, 0.34 × as wide as long, occupying approximately one-sixth of scale length. Inner antennular flagellum 0.58 × as long as outer with outer 0.32 × OCL. 3rd maxilliped with raised mesioventral corner of coxopodite (with 2 apical tubercles); ischium with carina but not granulate along length; exopodite 0.12 × as long as ischium.

Carapace. 0.85 × as wide as deep; areola 0.36 × as wide as long.

Abdomen. TAL 1.16 × OCL.

Tail Fan. Telson with lateral edges straight and parallel to caudolateral corner; one caudolateral corner produced to a small spine, the other spineless. Outer ramus with 3 or 4 extra dorsomesial spines along suture and 2 or 3 extra spines dorsolaterally; outer ramus with only one spine on caudolateral corner (of both rami). Inner ramus ovoid, with spine at caudolateral corner; uropodal peduncle with a tuft of small setae.

Chelae. Left chela small, elongate and presumed regenerating. Right chela elongate and largely asetose; DACL/PROPL, 0.54; PROPW/PROPL, 0.45; PROPD/PROPL, 0.27; PROPL/OCL, 0.93; as for isomorph of Holotype Male except: 13 tubercles along dorsal edge of the propodus; cutting edge of propodal finger with 4 teeth in proximal third followed by small scale setae along edge to tip; cutting edge of dactyl with 2 teeth proximally followed by small scale setae to tip. Propodal finger with tufts of small setae arising from punctations (which are arranged in rows).

Sex. Without male gonopores but with huge, open female gonopores (ovoid, 1.3 × 0.7 mm diameter).

Morphological variation. The species displays some considerable morphological variation and some may be attributable to geographical location. The mesioventral corner of the coxopodite is tuberculate on individuals from Burnie Park, Shorewell Creek, but at both Romaine and Cooee creeks it is bluntly spined. The interan-

tennal spine from Romaine and Cooee creeks is clearly triangular and pointed, but at Shorewell Creek it is bluntly rounded with either convex or concave lateral edges. The exopodite of the third maxilliped is absent on individuals from Romaine Creek and extremely short on those from Cooee Creek; Shorewell Creek individuals generally have a short shaft-like stump up to 0.2 times as long as the isehium.

The suborbital angle ranges from about 80° to about 130°; the ventrolateral surface of the isehium can be tuberculate or lumpy not smooth (see Holotype). The individual from Cooee Creek had a spined rostrum which was not upturned.

Relationship to other species. When applied to the key to species in the genus *Engaeus* given in Horwitz (1990), *E. yabbimunna* terminates at couplet 28 with *E. tayatea* Horwitz. It ean be distinguished from this species by the nature of the ehela; whilst those of *E. tayatea* have tuberculate propodal palms with tufts of bristle setae, *E. yabbimunna* has a smooth and asetose propodal palm. It is readily distinguished from *E. fossor* (Erichson) by the presence of only one row of tubereles on the dorsal surface of the propodus (instead of two rows as in *E. fossor*), by the form of the rostrum and rostral earina, and by the shorter antennal flagella. Its phylogenetie affinities are unclear in spite of sharing several morphological similarities with the four speeies in couplets 27 and 28 (*E. fossor*, *E. strictifrons* (Clark), *E. tayatea* and *E. fultoni* Smith & Sehuster; three of these occur in the western Bassian region with *E. yabbimunna*).

Etymology. The speeifie epithet was recommended by members of the Northwest Coast Aboriginal Language Programme in Burnie and means "little elaw".

Life history notes. LM, 25.7 mm OCL; LRF, 26.0 mm OCL; SRF, 23.2 mm OCL; LNRF, 15.6 mm OCL. Berried females were eollected in early December 1992; no females carrying larvae were found, suggesting that eggs had just been extruded and/or were in the early phases of developing. In fact a predominance of berried females was found at sites then (of eight adults found at the type locality, six were berried females). Most berried females were returned to their burrows to avoid depleting the population.

Ecology. The speeies has been found sympatrieally with *E. fossor* (at the type loeality) and is likely to oecur in the same ereek systems as another parastacid, *Astacopsis gouldi* Clark. No mierohabitat separation has been discerned between the *Engaeus* species.

E. yabbimunna oecupies burrows in the flood beds of creeks dominated by tree ferns, in burrows next to creeks, in seepages dominated by tea tree and with a ground cover of ferns, and well above crecks in burrows on the ereek bank or slopes of the gully. Soils in these habitats ranged from brown to orange-red elay loams, or eontained a high level of organic matter. Vegetation was typieal of wet gullies, with *Acacia melanoxylon* dominant in the over-story. Burrow structure depended on the type of habitat and depth to water table and seemed typieal of other members of this genus.

So far the species has not been found from habitats where native vegetation no longer exists (see below).

Distribution and conservation. Previous searehes for burrowing freshwater erayfish in Tasmania have been extensive and detailed (see Horwitz, 1990; Richardson, unpublished data), and have revealed for northern Tasmania some well defined distributions. *E. fossor* for instanee has a broad range aeross northern and western Tasmania, as do *E. cisternarius* and *E. lengana* (Horwitz, 1990). The faet that *E. yabbimunna* has until now eseaped detection is evidenee that some speeies are found loeally and not over a broad area.

Collation of all data on the distribution of burrowing freshwater erayfish within about 10 km of Burnie has produced a distribution map (Fig. 2). Within the Burnie area itself eight sites were investigated. Many burrows of *E. yabbimunna* were found at the Shorewell Creek and Romaine Creek sites where flood bed and seepage areas were relatively undisturbed. Only one burrow was found at the Cooee Creek site where the ereek was receiving sediment from its western side (industrial activity) and used by eattle on its eastern side. Further down Cooee Creek the original vegetation has been replaeed by willows and no burrows were found. Other parts of Shorewell Creek were searehed to no avail, including an area downstream of the old dump, and in the upper reaches adjaeent to a sports oval; at both loealities riparian vegetation had been completely removed. Parts of Shorewell Creek and Romaine Creek which have been landscaped (where vegetation has been removed and the ereek ehannelized, for instanee) were similarly devoid of burrows. These data suggest that:

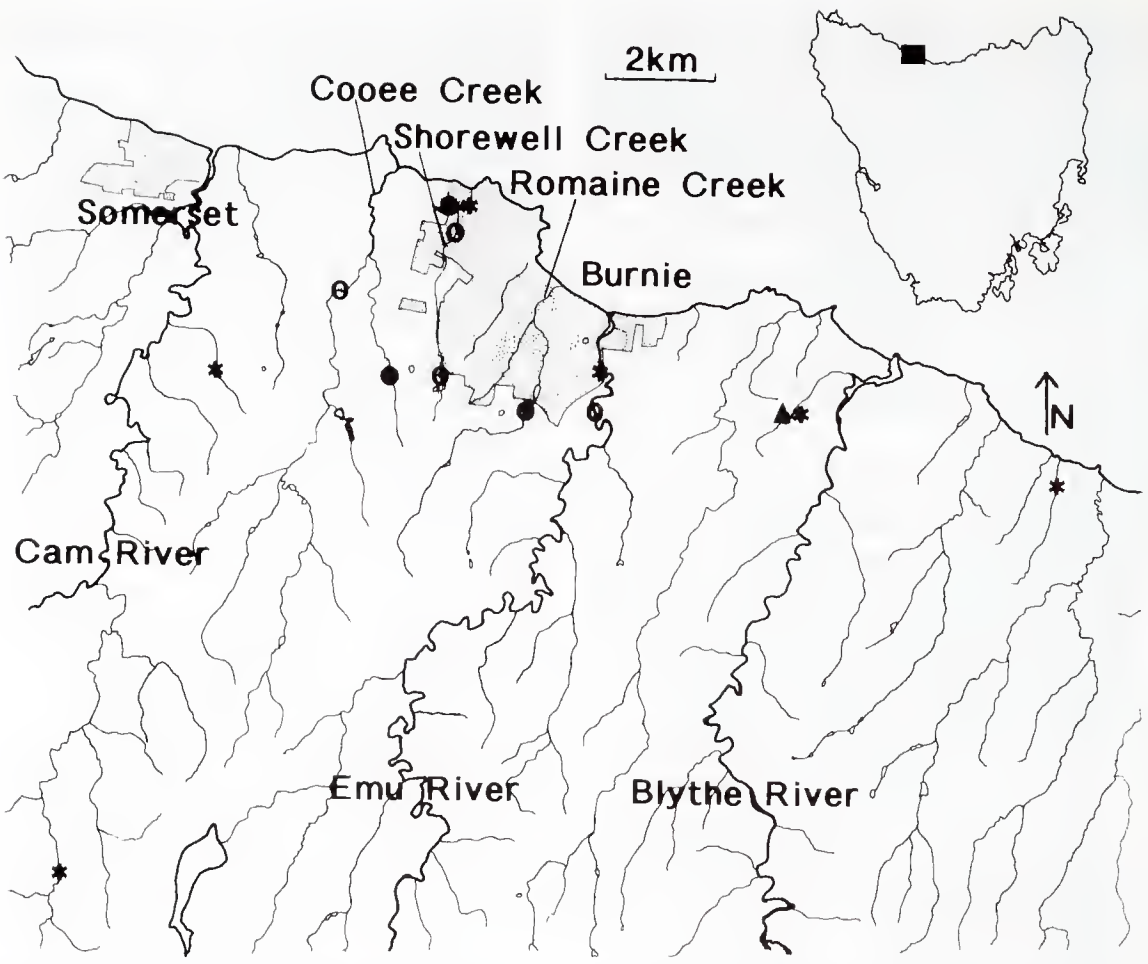

Figure 2. Distribution of *Engaeus yabbimunna* (closed circles) around Burnie (with urban area stippled) in northern Tasmania, showing the main water courses in the region, known localities of other species (*E. fossor* asterisk, *E. disjunctícus* closed triangle), and locations where searching revealed no burrows of freshwater crayfish (open circles).

i) *E. yabbimunna* may have a restricted distribution in the Burnie area and may be confined to the three creek systems from which it has been found; and

ii) populations of *E. yabbimunna* may have been eliminated by human activities in parts of the Burnie area.

The restricted distribution hypothesis is supported by the presence of only *E. fossor* at localities surrounding the three creeks, and the failure to find *E. yabbimunna* elsewhere during extensive surveys for *Engaeus* (see above). Alternatively, there is always the (albeit remote) chance that the species will occur elsewhere in northern Tasmania. For instance, the enigmatic *E. disjunctícus*, so named in Horwitz (1990) because of its disjunct populations over one hundred kilometres apart, has recently been found in the Burnie area (Richardson, pers. comm.; Fig. 2).

Even given this possibility, *E. yabbimunna* should be regarded as neither widespread nor common. Accordingly, and given that threatening processes can be identified, the species should be considered threatened and steps should be taken to consolidate knowledge on its ecology and manage its known populations appropriately.

Acknowledgements

Bill Walker (Burnie City Council) found the species and referred specimens to Alastair Richardson (Zoology Department, University

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