

**PREVIOUSLY UNDESCRIBED HABITAT OF THE SCOTTSDALE
BURROWING CRAYFISH *ENGAEUS SPINICAUDATUS* (DECAPODA:
PARASTACIDAE)**

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ABSTRACT

This paper reports on records of the Scottsdale burrowing crayfish *Engaeus spinicaudatus* from Ruby, China and Donnolly Creeks, minor tributaries of the Great Forester River, near Scottsdale, in northeastern Tasmania. These records expand the previously described habitat (buttongrass sedge land) of this species to include scrub/forest along streams within dry sclerophyll forest. This riparian habitat is described in detail for several known localities of *E. spinicaudatus* along Ruby Creek.

INTRODUCTION

The Scottsdale burrowing crayfish *Engaeus spinicaudatus* (Decapoda: Parastacidae) is one of five burrowing crayfish listed on both the *Tasmanian Threatened Species Protection Act 1995* and the *Commonwealth Environment Protection and Biodiversity Conservation Act 1999*. The species is listed as endangered under both Acts due to its restricted distribution and habitat disturbance (Doran, 2000).

Engaeus spinicaudatus is found near Scottsdale (Figure 1), northeast Tasmania, within an area of approximately 23 km² (Horwitz 1991; Gaffney and Horwitz 1992; Richards, 1997). Horwitz (1991) explored the extent of its distribution and it is unlikely that the species extends beyond this current known range (Doran, 2000). The range of *E. spinicaudatus* is closely bound by the distribution of other *Engaeus* species: *E. mairener*, *E. tayatea*, *E. leptorynchus* and *E. orramakunna* (Doran and Richards, 1996). *Engaeus spinicaudatus* is distinctive and can be distinguished from its neighbours by the presence of a terminal spine on the outer ramus of the uropod (Horwitz, 1990a), and it is unlikely that the species has been or will be confused with other species of *Engaeus* (Figure 2).

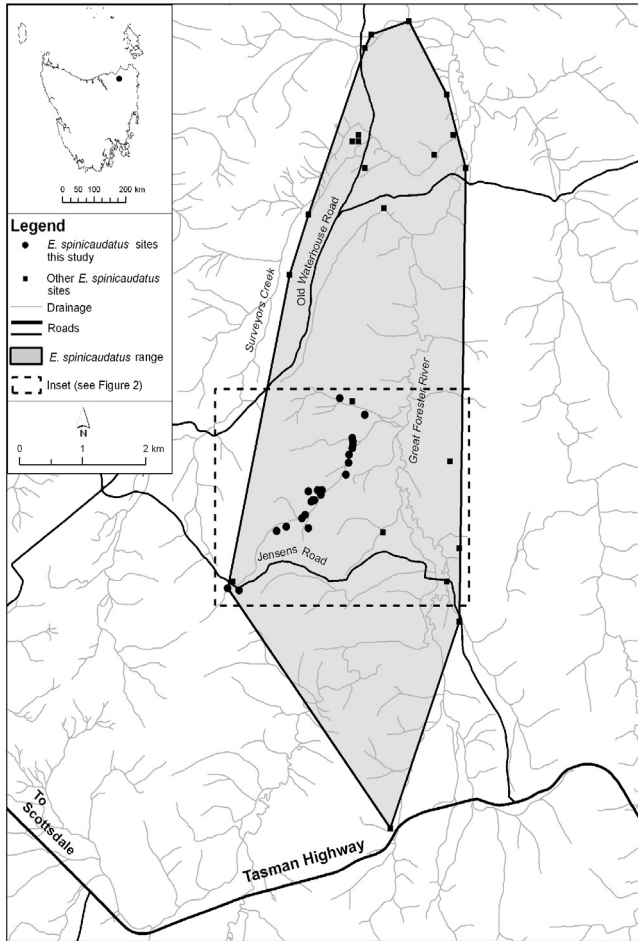


Figure 1. Distribution of *Engaeus spinicaudatus* near Scottsdale, northeast Tasmania.

Horwitz (1991) described the habitat of the species within its known range, and estimated that there was only about 3.9 km² of suitable habitat. During his study he found that *E. spinicaudatus* occurred predominantly in wet buttongrass (Figure 3) and heathy plains (particularly with peaty and saturated soils), the flood plains of creeks (often with scrubby or taller tea-tree vegetation), and wet areas converted to pasture from any of the preceding habitat types. These habitats have been well described, as has the life history of the species (Horwitz, 1990b).



Figure 2. *Engaeus spinicaudatus*. Inset shows terminal spine on the outer ramus of the uropod. Photo: Niall Doran.



Figure 3. More typical buttongrass moorland habitat of *E. spinicaudatus*. Photo: Niall Doran.

This paper documents the results of a survey for *E. spinicaudatus* in dry eucalypt forest within the known range of the species. The survey was required as part of the threatened fauna management procedures under the forest practices system (Forest Practices Board, 2000; Munks and Taylor, 2000). The habitat of *E. spinicaudatus* within dry eucalypt forest is described.

METHODS

Study area

Survey work was conducted along Ruby Creek and China Creek and associated tributaries (Scottsdale Tasmap 5444 549900mE 5446500mN). This paper is primarily concerned with the results from Ruby Creek, which is a north flowing tributary of the Great Forester River (Figure 1). Information on the habitat of the species along China Creek is not further reported because in that creek system the species occupies the more usual buttongrass vegetation. Ruby Creek originates at approximately 300 m a.s.l. within the Mt Stronach Forest Reserve to the south of Jensens Road and flows through State forest before joining China Creek to flow into the Great Forester River at approximately 50 m a.s.l. The geology of the area is Upper Devonian to Lower Carboniferous granite (Scottsdale Batholith). Current land use within the catchment is varied and includes some formal reserves, agricultural and private land, forestry activities and recreational use such as four wheel driving and horse riding. Historical use of the area included forestry and alluvial tin mining.

Animal survey

A survey of the occurrence of *E. spinicaudatus* within the study area was conducted during 1997. Excavations of crayfish burrows were made approximately every 150 m along Ruby Creek and associated tributaries, depending on burrow numbers and locations (25 sites). All tributaries, including minor seepages, were investigated for the presence of crayfish burrows. Burrows were visually inspected to determine the probability of occupation (e.g. evidence of fresh diggings) and those considered likely to be inhabited were excavated using spade, trowel and hand until either the crayfish was captured or the burrow deemed vacant (Figure 4). A burrow was defined as empty when the end of the tunnel system was reached without any crayfish detected. Specimens were identified on site and released at the excavated burrow site.

Additional surveys have been conducted by the authors as part of the establishment of long-term monitoring sites (to be reported elsewhere). Furthermore, a survey was conducted for the species in another tributary of the Great Forester

River (Donnolly Creek) in May 2005, located about 800 m east of Ruby Creek as part of the fauna management procedures under the forest practices system.



Figure 4. Typical burrows of *E. spinicaudatus* along Ruby Creek. Note the freshly dug soil around the burrow entrance. Photo: Niall Doran.

RESULTS

Distribution of burrowing crayfish in the study area

The distribution of *Engaeus spinicaudatus* along Ruby Creek and other streams in its vicinity is illustrated in Figure 5. *Engaeus mairener* was also found along China Creek, the upper tributaries of Surveyors Creek and Ruby Creek. *Engaeus leptorynchus* was found along a minor tributary of Ruby Creek and *E. tayatea* was found along an upper tributary of Surveyors Creek. Over the length of Ruby Creek where *E. spinicaudatus* was found, the majority of the forest can be broadly classified as dry sclerophyll forest - more specifically as heathy coastal *Eucalyptus amygdalina* forest and shrubby siliceous *E. obliqua* forest (Duncan and Brown, 1985). On slopes adjacent to creeks, the vegetation is dominated by *E. amygdalina* with a sparse heathy/bracken understorey. Riparian areas are dominated by *E. obliqua* and locally by *E. ovata* with *Melaleuca squarrosa* forming locally dense stands with an understorey of ferns and graminoids. Frequent fires have modified the vegetation structure with many areas dominated by bracken or regenerating shrub species. Typical forested riparian habitat is shown in Figure 6.

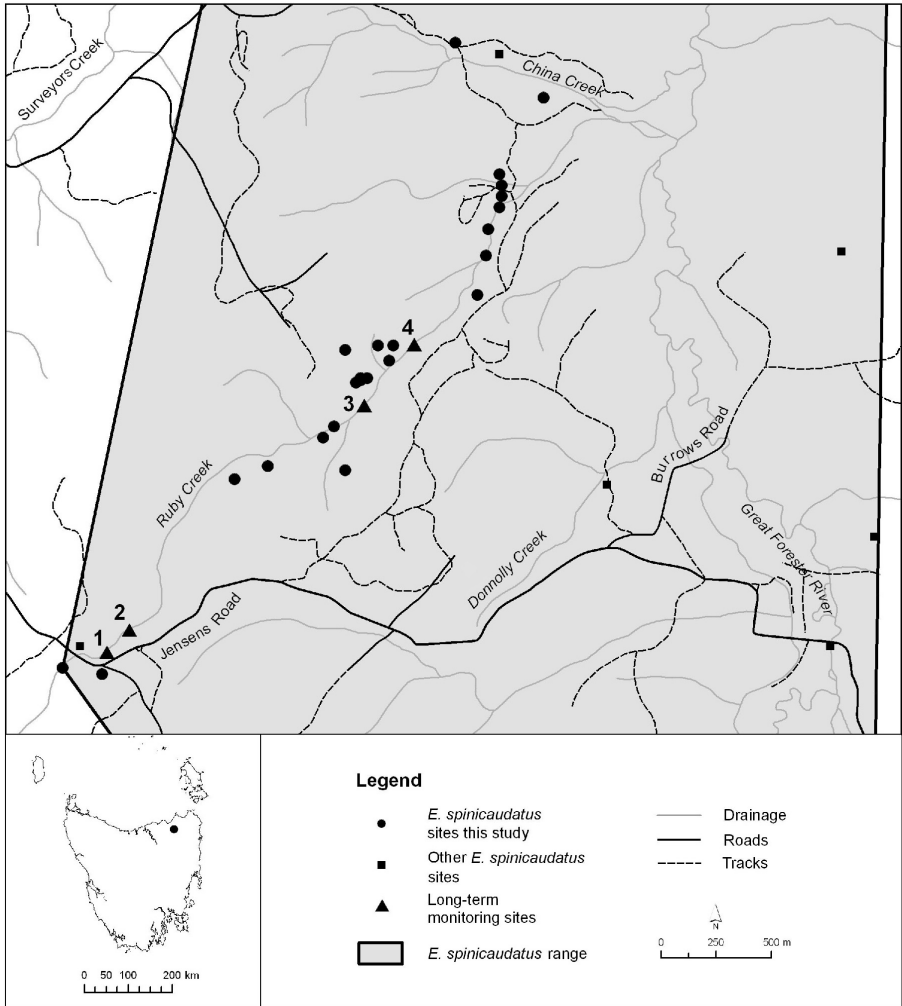


Figure 5. Location of Ruby Creek in northeast Tasmania, and the distribution of *Engaeus spinicaudatus* along Ruby Creek and surrounds. Location of long-term monitoring sites is shown (see Table 1 for site numbers).

Forest types and the occurrence of E. spinicaudatus

At a finer scale, the vegetation along Ruby Creek is variable. The four *E. spinicaudatus* sites that were later established as long-term monitoring sites (Figure 5) covered the variation in vegetation found along the length of the stream (Table 1), and were representative of sites for the species in China Creek and Donnelly Creek.



Figure 6. Forested riparian habitat of *E. spinicaudatus* along Ruby Creek. Note that this photo was taken about one month after the site had been heavily burnt, but the density and composition of the understorey and overstorey is still quite obvious.

Photo: Niall Doran.

Relationship between burrow densities and habitat characteristics

Burrow sites where *E. spinicaudatus* were found in the initial survey (Richards, 1997) were within a few metres of creek banks. However, data collected during the establishment of the long-term monitoring sites found that the occurrence of burrow entrances can extend to at least 10 metres from the creek bank, depending on local site and seasonal conditions.

Burrow densities were variable depending on local conditions. In well-shaded, fern-rich areas adjacent to the creek with saturated soils, burrow density was high but in areas of predominantly dry heathy forest, burrow density is considerably lower. Burrows appeared absent from very rocky areas of stream bank.

Table 1. Description of vegetation of known localities of *Engaeus spinicaudatus* along Ruby Creek (site numbers refer to those on Figure 5).

Site 1

A sparse canopy of *Eucalyptus obliqua* and *Eucalyptus amygdalina* present over a lower canopy layer of *Acacia melanoxylon*. A dense understorey of *Melaleuca squarrosa* present over a very dense stand of *Todea barbara* (stems to 1 m high and up to 60 cm diameter). Other species present at the site include *Tasmannia lanceolata*, *Acacia verticillata*, *Pittosporum bicolor*, *Blechnum watsii*, *Pteridium esculentum*, *Hypolepis rugosula*, *Gleichenia microphylla*, *Lepidosperma ensiforme*, *Gahnia* spp. and *Tmesipteris obliqua*. A power line easement is present to the immediate south of this site. This easement is periodically cleared of taller vegetation and was recently burnt (2001).

Site 2

A relatively dense canopy cover of *Eucalyptus obliqua* over *Acacia melanoxylon* present over a dense lower shrub layer comprising *Melaleuca squarrosa*, *Monotoca glauca*, *Acacia verticillata*, *Notelaea ligustrina*, *Pimelea drupacea*, *Leptospermum scoparium*, *Pultenaea juniperina*, *Coprosma quadrifida* and *Tasmannia lanceolata*. Ferns include *Pteridium esculentum*, *Blechnum nudum*, *Blechnum watsii*, *Calochlaena dubia* and *Todea barbara*. Graminoids include *Gahnia sieberiana* and *Lepidosperma elatius*. This site was burnt in October 1998.

Site 3

A relatively sparse canopy of *Eucalyptus obliqua* present over a slightly denser lower canopy of *Allocasuarina littoralis*. A lower shrub layer of *Melaleuca squarrosa*, *Olearia lirata*, *Lomatia tinctoria*, *Acacia verticillata*, *Daviesia latifolia* and *Epacris impressa* combined with graminoids (*Carex appressa*, *Gahnia sieberiana*, *Lepidosperma elatius*) and ground ferns (*Blechnum watsii*, *Blechnum nudum*, *Pteridium esculentum*, *Gleichenia microphylla* and *Todea barbara*) form a dense cover of vegetation. This site was burnt in October 1998 which reduced the canopy cover of shrub species markedly. The site is surrounded by heathy coastal *Eucalyptus amygdalina* forest with a mixed dominance of *Eucalyptus amygdalina* and *Eucalyptus obliqua* and a sparse heathy/bracken understorey.

Site 4

Eucalyptus obliqua and *Eucalyptus amygdalina* (with *Eucalyptus viminalis* and *Eucalyptus ovata*) form a sparse canopy over a dense lower shrub layer comprising *Melaleuca squarrosa*, *Lomatia tinctoria*, *Acacia verticillata* and *Olearia lirata*. A mixed fern/graminoid layer forms a dense cover of vegetation including *Blechnum watsii*, *Blechnum nudum*, *Pteridium esculentum*, *Gleichenia microphylla*, *Sticherus tenera*, *Todea barbara*, *Carex appressa*, *Gahnia sieberiana*, *Lepidosperma elatius* and *Lepidosperma filiforme*. The vegetation along Ruby Creek comprises relatively dry eucalypt forest with a riparian zone of dense low shrubs, ferns and graminoids. This site is immediately upstream of an old alluvial tin mining dam that results in the water flow being very slow to still for much of the year, and the surrounding soils are often saturated.

Burrow density was highest where soils are most suitable for burrow formation. This included previously disturbed areas. Several sites along Ruby Creek represent mini flood plains created by historical tin-mining activities along the creek. Small dams created as part of mining caused the backing-up of water and accumulation of finer sediments. These dams have since burst but the flatter seasonally inundated areas upstream of the dams still exist and burrows were abundant in these areas.

DISCUSSION

The distribution of burrowing crayfish species in Tasmania has been relatively well studied (see Horwitz, 1991; Horwitz, 1990b; Doran and Richards, 1996) and the range of *Engaeus spinicaudatus* is well defined. However, within this defined range, it was previously thought that the species predominantly occupied habitats described by Horwitz (1991), namely, buttongrass and heathy plains.

In the present survey, *E. spinicaudatus* burrows were found in relatively dry forest within a riparian zone of dense low shrubs, ferns and sedges. This is substantially different from the vegetation in habitats previously reported for the species. However, site characteristics other than vegetation type alone may also indicate the presence of the species. Given the limited occurrence of *E. spinicaudatus* in this newly described riparian habitat, it is clear that the buttongrass habitat remains its stronghold. Several sections of Ruby Creek are flat and permanently saturated. Two of the long-term monitoring sites selected where burrow densities appear greatest were located immediately upstream of historical dam sites associated with alluvial tin mining. These areas have had an accumulation of silt over many years and are probably permanently saturated and hence are highly suitable for burrow formation. In areas of steeper gradient, Ruby Creek becomes more channelled, erosion is more prevalent, substrate alters and there are few, if any, flood plain areas. These areas of the creek appeared unfavourable to the species with few or no burrows observed. Where burrows were present in coarse gravel substrate, the burrow systems were shallow and took advantage of crevices and water flow between rocks.

The extension of *E. spinicaudatus* into the Ruby Creek catchment does not change the range of the species. However, it does expand the known area of occupancy within its known range. Richards (1997) estimated that the population of *E. spinicaudatus* along Ruby Creek might be in the vicinity of 1000 individuals. This was based on an estimate of 0.05 burrows per square metre (Horwitz, 1991) and a potential habitat area of 2 m either side of Ruby Creek available for occupancy (burrows may extend beyond 2 m but only in localised patches). Based on these estimates, the extension of the

species to Ruby Creek expands the total area of potential habitat available for the species by 0.022 km². Although this is a small area in broader terms, it is extremely important for a species believed to be restricted to less than 4.0 km² of available habitat. It is also significant if other areas of this new habitat type are identified within the known range of the species in future.

The habitat along Ruby Creek is potentially threatened from a number of sources. Recreational activity in the area is likely to maintain the relatively frequent fire frequency (P. Bird pers. comm.). Forestry activities, including conversion of native forest to plantation, are currently occurring in the catchment and further harvesting is planned. Such activities are subject to the provisions of the *Forest Practices Code* (Forest Practices Board, 2000) and the *Tasmanian Threatened Species Protection Act 1995*. Potential impacts from such operations include increased siltation from roading and timber harvesting, alteration to drainage patterns and flow rates which in turn can impact on moisture levels in riparian areas. Increase in sedimentation from roads in the area (e.g. Jensens Road) may impact on habitat locally. Part of the population of *E. spinicaudatus* within the Ruby Creek catchment is captured within the Mt Stronach Forest Reserve to the south of Jensens Road. Of the c. 18 ha of the upper catchment of Ruby Creek within the reserve, most is unsuitable habitat (of the c. 800 m of stream in the reserve, only about 400 m is suitably moist, and only the first 1-2 m from the stream bank is suitable, equating to less than 0.16 ha of potential habitat).

Doran (2000) lists inappropriate forestry and agricultural activities as the main threats to *E. spinicaudatus* with secondary threats including downstream impacts of road construction, quarrying and the impacts of inappropriate fire management. A long-term monitoring project has been established to primarily monitor the impacts of forestry activities within the catchment of Ruby Creek on populations of the species. However, the long-term monitoring project is also likely to yield results on the impacts of other disturbances and also on the natural trends in burrow densities. The forested area surrounding these creeks is subject to substantial recreational activity such as four-wheel driving and firewood collecting. Consequently, there are frequent accidental and deliberate (arson) fires (as evidenced by the open heathy understorey dominated by bracken). Additionally, two of the sites are immediately downstream of a gravelled public road adjacent to a transmission line easement. This easement is periodically cleared of taller vegetation and had recently been burnt. The monitoring will continue and will be reported on elsewhere as part of a larger monitoring programme of other species of burrowing crayfish.

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