

THREATENED SPECIES SCIENTIFIC COMMITTEE

Established under the *Environment Protection and Biodiversity Conservation Act 1999*

The Minister's delegate approved this Conservation Advice on 16/12/2016.

Conservation Advice

Engaeus martigener

Furneaux burrowing crayfish

Conservation Status

Engaeus martigener (Furneaux burrowing crayfish) is listed as Endangered under the *Environment Protection and Biodiversity Conservation Act 1999* (Cwlth) (EPBC Act) effective from the 7 December 2005.

This species is also listed as Vulnerable under the Tasmanian *Threatened Species Conservation Act 1995*.

The main factors that are the cause of the species being eligible for listing in the Endangered category are that its extent of occurrence and area of occupancy are restricted, it is known from only five sites and potential declines in the area, extent and/or quality of habitat can be inferred from the threat of severe wildfire.

Description

Species of *Engaeus* are small freshwater crayfish, with a general body length of under ten centimetres (Doran 2000). Colouration among *Engaeus* species can vary from orange to reddish brown, to grey-blue or purple (Doran 2000), with the Furneaux burrowing crayfish predominantly displaying purplish hues (TSS 2016). The Furneaux burrowing crayfish is of medium size among the burrowing crayfish group, reaching a carapace length of approximately 25 mm (TSS 2016). Horwitz (1990) recorded the largest male surveyed as 25.1 mm carapace length and mature females ranging from 18.8 to 25.3 mm carapace length.

Distribution

The Furneaux burrowing crayfish is only found on Flinders Island and Cape Barren Island in the Bass Strait (TSS 2016). This species is known only from isolated locations in fern-rich gullies on Mount Strzelecki and the Darling Ranges on Flinders Island, and from Mount Munro on Cape Barren Island (Horwitz 1990; Richardson et al., 2006). Based on the known distribution of the species, a significant proportion of the area of occupancy of the Furneaux burrowing crayfish is protected within the Strzelecki National Park, however its range may be wider than currently documented.

Relevant Biology/Ecology

The Furneaux burrowing crayfish inhabits boggy areas and small clear water creeks in high altitude wet ferny gullies (Horwitz 1990, Doran & Richards 1996). These areas appear to be the stronghold of the species, although occasional surveys also locate populations at lower altitudes, and in poorly drained mossy tea-tree bog and small grassy springs/soaks in open dry eucalypt forest (Doran, unpublished data, cited in Doran 2000). Characteristic vegetation within the species habitat includes *Dicksonia antarctica* (soft tree fern), *Cyathea australis* (rough tree fern), *Todia* species and other ferns, and is general found on sandy granitic soils (TSS 2016). *Engaeus* species are believed to eat rotting wood, detritus, root material and occasionally animal material (Doran 2000).

Most species of *Engaeus* are characterised by their ability to burrow, often to considerable depths, and specimens are only rarely seen above ground or in standing water (Horwitz 1990). Burrows often have chimneys of pelleted soil where they meet the surface, and in sheltered

areas these may be quite high (up to 40 cm). Burrows can be simple and shallow or complex, deep and extensive, and each species constructs a slightly different burrow type (Doran 2000). The Furneaux burrowing crayfish often connects its burrow to the water table rather than directly to a stream or lake (Doran 2000), and burrows tend to have more than one opening and frequently consist of multiple branches extending beneath rotting logs or the root matting of tree ferns (TSS 2016). Burrow systems are often the product of several generations of crayfish activity (Doran 2000).

Relatively little is known about the life history of species within the *Engaeus* genus in general (Doran 2000). Based on the life history of *E. spinicaudatus*, the Furneaux burrowing crayfish may be found with varying size classes of young within their burrows, and individuals may show some degree of variation in morphological features and sexual characteristics between and within sites (Horwitz 1990, Doran & Richards 1996, Doran 1998). Reproductively active, and egg or juvenile-bearing, females have been found in November and December, and very small juveniles have been found individually within larger burrow systems in November (Horwitz 1990). During the breeding season, females carry large orange eggs and recently hatched young under their tail (Doran 2000).

Threats

All listed species within the *Engaeus* genus are of conservation concern due to their acutely restricted ranges and areas of occupancy, and the presence of actively threatening processes within these areas (Horwitz 1990b, 1991 & 1994, Gaffney & Horwitz 1992, Doran & Richards 1996, Doran 1998). Threatening processes particularly include those that affect water quality/quantity, and soil and food (wood/plant) availability (Doran 2000).

Although a considerable proportion of the Furneaux burrowing crayfish’s distribution is protected within a National Park, the species is at significant risk from wildfire which has the potential to destroy large swathes of habitat (TSS 2016). Extended periods of drought also pose a threat to the species, particularly due to the increased fire risks which may follow (TSS 2016).

Table 1 – Threats impacting the Furneaux burrowing crayfish in approximate order of severity of risk, based on available evidence.

Threat factor	Threat type and status	Evidence base
Wildfire		
Habitat loss and degradation	potential future	The most significant potential threat to the survival of the Furneaux burrowing crayfish is wildfire (TSS 2016). High levels of fuel have accumulated throughout Strzelecki National Park and accessibility for fire management activities in these areas is lacking (Doran 2000; TSS 2016). Therefore, high intensity burns may pose a significant threat to the species in the future (TSS 2016). In some instances crayfish are able to avoid the direct impacts of fire by retreating into deep burrows, however potential long-term impacts to habitat availability may still be catastrophic (Doran 2000). Consequences of intense or repeated burns may include the exposure and loss of erosion-prone granitic soils in the region, and the loss of water retention within the remaining soils of the gullies (Doran 2000). The flora in the upper reaches of Fotheringate Creek (the first described locality of the species and its associated vegetation, and an area containing exceptional habitat) has been identified as being particularly fire-sensitive (Walsh 1999; TSS 2016).

Drought		
Habitat loss and degradation	known current, potential future	Habitat loss may also result following prolonged dry periods, or as a result of climate change, due to the dying-off of the moisture-associated vegetation characteristic of the species' habitat. Droughts are also likely to exacerbate the risks of wildfire (Doran 2000; TSS 2016). Similar ferny wet gullies have been completely lost due to the combination of fire and drought on Deal Island (Doran, unpublished data, cited in Doran 2000), and these are unlikely to regenerate for centuries (Harris, pers comm., cited in Doran 2000). Some level of fern die-off has previously been observed under drought conditions on Flinders Island (TSS 2016).
Water quality and quantity		
Land-use activities	Potential future	Any activities that lead to changes in the water table, such as ground water extraction, may impact upon the species. For other <i>Engaeus</i> species, road work, drainage activities, forestry and agriculture are known to impact seepage, wetland and stream bank habitat quality, as are any associated activities that degrade river bank integrity and enhance erosion (Doran 2000). These activities can all lead to increased sediment loads and chemical pollutants, such as fertilisers, herbicides and pesticides, entering waterways (TSS 2016).
Invasive species		
Feral pigs	potential current and future	<p>Predation, habitat loss, competition and disease transmission by feral pigs (<i>Sus scrofa</i>) is recognised as a key threatening process under the EPBC Act (DotE 2013). Impacts to natural ecosystems that can result from the activities of feral pigs include destruction of plants, changes to floristic composition, reduced regeneration of plants, alteration of soil structure, increased invasion and spread of weeds, reduced quality and availability of water, and the creation of habitat suitable for disease vectors (DotE 2013).</p> <p>Feral pigs are known to occur in Strzelecki National Park and a management plan has been developed to control the impacts of feral pigs on Flinders Island (Copson 2002). Feral pigs have been identified as a potential risk to Furneaux burrowing crayfish on Flinders Island (Doran 2000). While burrow depth may protect crayfish from the direct impacts of feral pigs, the long-term impacts to habitat quality may still pose a threat to the species (Doran 2000).</p>

Climate change		
Habitat alteration	potential future	<p>Within Australia climate-mediated threats, including impacts on water temperature and availability, are putting the conservation status of two-thirds of all freshwater crayfish species at risk (Richman et al., 2015).</p> <p>Climate change may affect the Furneaux burrowing crayfish in the future if changes in weather, water and drainage patterns result in broad scale habitat changes (Doran, pers comm., cited in Doran and Horwitz 2010). However, the likely impacts to this species from climate change are not well understood as predictions suggest both more weather extremes and increased temperatures, but also increased rainfall.</p>
Forestry and agriculture		
Habitat alteration	potential future	<p>Forestry and agricultural issues are currently of little relevance to the Furneaux burrowing crayfish, although this may change depending upon future decisions regarding such activities on the islands, any future extensions to the known range of the species, and changes to the status of unallocated Crown land (Doran 2000).</p>

Conservation Actions

Conservation and Management priorities

Given the remote location of the Furneaux burrowing crayfish, and the nature of threats to the species, avoiding any further habitat loss wherever possible will be essential.

Habitat loss, disturbance and modifications

- Avoid all deliberate burning in areas of habitat for the Furneaux burrowing crayfish.
- Avoid activities which have an impact on water table levels in areas of burrowing crayfish habitat.
- Avoid activities which alter drainage patterns or water flow in and around habitat.
- Ensure that the species ecological requirements are considered in the development of water management plans.
- Avoid changes to the status of unallocated Crown land that may open habitat up to forestry or agricultural activities.

Invasive species

- Support the implementation of the 'Feral Pig Management Plan, Flinders Island, Tasmania'.
- If feral pigs are found to be impacting directly upon the Furneaux burrowing crayfish or its habitat, undertake a control program to eradicate feral pigs from Flinders Island, with a particular focus on known habitat on Mount Strzelecki and the Darling Ranges.

Survey and Monitoring priorities

- Assess the efficacy of current survey techniques and refine methodology if required.
- Design and implement an ongoing monitoring program for the Furneaux burrowing crayfish, including a minimum of five-yearly repeat surveys.
- Analyse survey data to identify any changes in the trajectory of the species.

Information and research priorities

- More precisely assess population size, distribution and ecological requirements of the Furneaux burrowing crayfish.
- Undertake predictive modelling to identify additional areas where the species may occur based upon known habitat requirements.
- Investigate the potential impacts of feral pigs on Furneaux burrowing crayfish.
- Investigate whether any additional, new or emerging threats may be impacting upon the Furneaux burrowing crayfish, including other introduced species, diseases or parasites.

References cited in the advice

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