

**Advice to the Minister for the Environment, Heritage and the Arts
from the Threatened Species Scientific Committee (the Committee)
on Amendment to the list of Threatened Species under the
*Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act)***

1. Scientific name (common name)

Engaewa reducta (Dunsborough Burrowing Crayfish)

2. Reason for Conservation Assessment by the Committee

This advice follows assessment of information provided by a public nomination to list the Dunsborough Burrowing Crayfish. The nominator suggested listing the species in the endangered category. The Committee provides the following assessment of the species' eligibility for inclusion in the EPBC Act list of threatened species.

This is the Committee's first consideration of the species under the EPBC Act.

3. Summary of Conclusion

The Committee judges that the species has been demonstrated to have met sufficient elements of Criterion 2 to make it eligible for listing as **critically endangered**.

The highest category for which the species is eligible to be listed is **critically endangered**.

4. Taxonomy

The species is conventionally accepted as *Engaewa reducta* (Dunsborough Burrowing Crayfish) (Riek, 1967).

5. Description

The Dunsborough Burrowing Crayfish is a small burrowing crayfish up to 50 mm in length. It is generally a pale to mid-brown colour with purplish-blue claws. Distinctive characteristics of burrowing crayfish include a narrow abdomen which may be shorter than the head and thorax, reduced eye size and large claws adapted to digging, with the fingers of the claws moving in a vertical plane.

The Dunsborough Burrowing Crayfish is almost identical in appearance to closely related species such as *E. pseudoreducta* (Margaret River Burrowing Crayfish) and *E. walpolea* (Walpole Burrowing Crayfish). Identification of the individual species can be determined by examining anatomical features using a microscope. Dunsborough Burrowing Crayfish can be distinguished by the presence of low, short rostral carinae (raised ridges on the pointed rostrum at the front of the head), which are absent in other *Engaewa* species, and the presence of pits or pores on the lateral processes (side projections) of the 3rd and 4th pereopods (walking legs). In the field, these species are more easily distinguished from each other by the river system in which they are found, as they have extremely limited capacity for dispersal and are geographically isolated (Horwitz and Adams, 2000).

6. National Context

The Dunsborough Burrowing Crayfish is endemic to south-western Western Australia and is known from an area between Dunsborough and the Margaret River, approximately 250 km south of Perth. Past surveys within the known range of the Dunsborough Burrowing Crayfish have collected the species at 13 different locations. The species is now considered extinct at one location, and a further three locations have not been resurveyed since 1995. The remaining nine locations were resurveyed in 2007 and contain extant populations. The majority of these nine locations are on private property, with three locations receiving limited protection in reserves, however the perpetuity of these reserves is not assured.

The Dunsborough Burrowing Crayfish is listed under the Western Australian *Wildlife Conservation Act 1950* as Schedule 1 Fauna (fauna that is rare or likely to become extinct) and ranked as endangered for management purposes.

7. Relevant Biology/Ecology

The Dunsborough Burrowing Crayfish uses a variety of habitats that provide moist sandy/loamy soils and an accessible watertable. These include vegetated seepages, swamp plains and swampy headwaters of streams. The Dunsborough Burrowing Crayfish constructs a complex burrow system that can be several metres deep, extending down to the freshwater watertable in drier months. At wetter times of the year burrows are marked by conspicuous chimneys of soil pellets. Vegetation associated with these habitats is native heaths dominated by myrtaceous shrubs (e.g. callistemons, melaleucas) (Burnham et al., 2007).

It is likely that the Dunsborough Burrowing Crayfish is a social species as multiple specimens have been collected from single burrows. This is consistent with the *Engaewa* spp. burrowing crayfish of eastern Australia, where adults and juveniles are known sometimes to occupy the same burrow (Burnham, 2005; Burnham et al., 2007).

The animals are difficult to study in the wild and details of diet and reproduction are not known. Other burrowing freshwater crayfish are believed to eat rotting wood, detritus, root material and occasionally animal material (Suter and Richardson, 1977; Growns and Richardson, 1988; Bryant and Jackson, 1999). No egg-carrying specimens of the Dunsborough Burrowing Crayfish have been collected, however, the maximum recorded egg-count for the closely related *Engaewa similis* is 25 (Horwitz and Adams, 2000). *Engaewa* spp. burrowing crayfish may surface in extremely wet conditions, when watertables are rising and shallow surface water is present. This phenomenon is rare, and may be related to mate-searching and reproduction or avoidance of high groundwater levels and floodwaters.

The lifespan and age at sexual maturity for Western Australian burrowing crayfish species are unknown. The only published information that may be relevant is provided by Hamr and Richardson's study of the south-western Tasmanian burrowing crayfish species *Parastacoides tasmanicus tasmanicus*. This species attains sexual maturity at 3–5 years and has a life span of up to 10 years, providing a minimum generation length of six years (Hamr and Richardson, 1994). However, this slow growth rate and longevity is considered due to the coldness of the groundwater in south-western Tasmania (Hamr and Richardson, 1994); the generation length of Western Australian burrowing crayfish may be shorter given that the groundwater is likely to be warmer.

The burrowing crayfish species of Western Australia, including the Dunsborough Burrowing Crayfish, have been described as ecosystem engineers due to their burrowing habits, which enhance the flow of oxygen, water and nutrients through soil profiles, and create permanent habitats or seasonal refuges for other organisms in the form of their burrows (Horwitz and Rogan, 2003).

8. Description of Threats

The main threat to the Dunsborough Burrowing Crayfish is habitat loss caused by anthropogenic disturbance within the species' range. Land clearing for agriculture and forestry has removed habitat for the species and may have increased salinity in habitats utilised by the species. Farm dam construction has flooded suitable habitat and has altered surface water and groundwater flows. Cattle grazing has physically destroyed burrows through trampling and soil compaction, has created serious erosion and has impaired soil permeability and water holding capacity (Burnham, 2005; Burnham et al., 2007).

Potential threats to the Dunsborough Burrowing Crayfish include drainage for peat, sand mining or agriculture activities, which can desiccate the species' moisture-rich habitats, and water extraction from bores, which can lower watertables, desiccate moisture-rich habitats and potentially cause acidification and mobilisation of toxic metal ions in wetlands.

Feral pigs (*Sus scrofa*) are an additional potential threat, as feral pig numbers are increasing in south-western Western Australia due to illegal introductions by recreational pig hunters and subsequent reproductive success. Feral pigs may damage habitat through ground-rooting feeding behaviour and directly prey on crayfish during rare surfacing events (Spencer and Hampton, 2005).

Further threats that have not been quantified but may be detrimental to the Dunsborough Burrowing Crayfish include road and bridge construction, fire (both controlled and uncontrolled), disease from introduced crayfish species, exposure and subsequent hydration of acid sulphate soils, use of pesticides, fertilisers or herbicides that contaminate or reduce water quality, and climate change reducing rainfall and wetland habitats (Burnham, 2005; Burnham et al., 2007).

9. Public Consultation

The nomination used in this assessment was made available for public exhibition and comment for 30 business days. No comments were received.

10. How judged by the Committee in relation to the criteria of the EPBC Act and Regulations

The Committee judges that the species is **eligible** for listing as **critically endangered** under the EPBC Act. The assessment against the criteria is as follows:

Criterion 1: It has undergone, is suspected to have undergone or is likely to undergo in the immediate future a very severe, severe or substantial reduction in numbers.

The Dunsborough Burrowing Crayfish has been recorded from 13 sites within its known range. The species was extirpated from one of these sites following severe habitat degradation caused by the construction of a farm dam in 1960. Nine populations were confirmed extant in 2007. The confirmed localised extinction in 1960 may represent a decline in area of occupancy and numbers, although this decline has not been quantified. Much of the species' broader habitat has also been severely degraded over the last several decades, which is likely to have caused declines in area of occupancy and numbers, but these declines are also unquantified. Therefore, the

species has not been demonstrated to have met the required elements of Criterion 1, and is **not eligible** for listing in any category under this criterion.

Criterion 2: Its geographic distribution is precarious for the survival of the species and is very restricted, restricted or limited.

The area of occupancy of the Dunsborough Burrowing Crayfish has been estimated at approximately 6 km² and has been calculated by measuring the area of vegetated swamp/drainage system habitats where the species has been collected. Considering that there are only nine confirmed extant populations of Dunsborough Burrowing Crayfish, and that only three populations occur in semi-protected areas (council reserve, timber reserve and Class 'C' nature reserve) the Committee considers this geographic distribution to be very restricted. The nine extant populations of Dunsborough Burrowing Crayfish are isolated from each other, increasing the risk of localised extinctions, and they face a number of current threats (including land clearing for agriculture and forestry, farm dam construction and cattle grazing) and a number of potential threats (including drainage activities, feral pigs, groundwater extraction, road and bridge construction, fire and reduced rainfall from climate change) (Burnham, 2005; Burnham et al., 2007). These threats are likely to cause ongoing declines in numbers and area of occupancy. The Committee considers this geographic distribution to be precarious for the species' survival. Therefore, the species meets sufficient elements of Criterion 2 to make it eligible for listing as **critically endangered**.

Criterion 3: The estimated total number of mature individuals is limited to a particular degree; and either

- (a) **evidence suggests that the number will continue to decline at a particular rate; or**
- (b) **the number is likely to continue to decline and its geographic distribution is precarious for its survival.**

The Dunsborough Burrowing Crayfish has a very restricted geographic distribution, as its area of occupancy is less than 6 km² and it is found in nine isolated populations. The number of mature individuals has not been quantified, but is likely to be small given the very restricted geographic distribution. Further, one known population of Dunsborough Burrowing Crayfish has become extinct. The extant populations are subject to a number of current threats (including land clearing for agriculture and forestry, farm dam construction and cattle grazing) and a number of potential threats (including drainage activities, feral pigs, groundwater extraction, road and bridge construction, fire and reduced rainfall from climate change) (Burnham, 2005; Burnham et al., 2007). However, there are no actual estimates of numbers of mature individuals, and consequently, insufficient data are available to accurately quantify whether the number is limited to a particular degree. Therefore, the species has not been demonstrated to have met the required elements of Criterion 3, and is **not eligible** for listing in any category under this criterion.

Criterion 4: The estimated total number of mature individuals is extremely low, very low or low.

The number of mature individuals of the Dunsborough Burrowing Crayfish is likely to be small. However, there are no actual estimates of numbers of mature individuals, and consequently, insufficient data are available to accurately quantify whether they are extremely low, very low, low or not low. Therefore, the species has not been demonstrated to have met the required elements of Criterion 4, and is **not eligible** for listing in any category under this criterion.

Criterion 5: Probability of extinction in the wild that is at least:

50% in the immediate future; or

20% in the near future; or

10% in the medium-term future.

No quantitative (statistical) analyses have been done to estimate a probability of extinction of the Dunsborough Burrowing Crayfish in the wild over a relevant timeframe. Therefore, the species has not been demonstrated to have met the required elements of Criterion 5, and is **not eligible** for listing in any category under this criterion.

11. CONCLUSION

Conservation Status

Engaewa reducta (Dunsborough Burrowing Crayfish) was nominated for inclusion in the list of threatened species referred to in section 178 of the EPBC Act. The nominator suggested listing in the endangered category of the list.

The Committee accepts that the current area of occupancy for the nine known extant populations is less than 6 km², which the Committee judges to be a very restricted geographic distribution. The Committee also accepts that the nine extant populations are isolated from each other, increasing the species' risk of extinction, and are subject to a number of current and potential threats. The Committee judges the species' geographic distribution to be precarious for its survival. Therefore, the species meets sufficient elements of Criterion 2 to make it eligible for listing as **critically endangered**.

Recovery Plan

The approved conservation advice for the species provides sufficient direction to implement priority actions and mitigate against key threats. Further actions are being implemented as described in the Western Australian Department of Environment and Conservation's 'Dunsborough Burrowing Crayfish (*Engaewa reducta*), Margaret River Burrowing Crayfish (*Engaewa pseudoreducta*) and Walpole Burrowing Crayfish (*Engaewa walpolea*) Recovery Plan 2007–2016. Interim Recovery Plan No. 41'.

A nationally adopted recovery plan is not considered to be necessary at this time.

12. Recommendations

- (i) The Committee recommends that the list referred to in section 178 of the EPBC Act be amended by including in the list in the **critically endangered** category:

***Engaewa reducta* (Dunsborough Burrowing Crayfish)**

- (ii) The Committee recommends that there should not be a recovery plan for this species at this time.

Associate Professor Robert J.S. Beeton
Chair
Threatened Species Scientific Committee

13. References cited in the advice

- Bryant S and Jackson J (1999). Tasmania's Threatened Fauna Handbook Threatened Species Handbook. Parks and Wildlife Service Tasmania.
- Burnham QF (2005). The systematics of the *reducta* complex of the burrowing freshwater crayfish *Engaewa* Riek. Honours thesis, Edith Cowan University, Perth.
- Burnham QF, Koenders A and Horwitz P (2007). Field studies into the biology and conservation requirements of *Engaewa* species in the South-West and Warren DEC Regions. Final Report Prepared for DEC November 30, 2007.
- Growns IO and Richardson AMM (1988). The diet and burrowing habits of the freshwater crayfish *Parastacoides tasmanicus tasmanicus* Clark (Decapoda: Parastacidae). Australian Journal of Marine and Freshwater Research 39: 525–534.
- Hamr P and Richardson A (1994). Life History of *Parastacoides tasmanicus tasmanicus* Clark, a burrowing freshwater crayfish from south-western Tasmania. Australian Journal of Marine and Freshwater Research 45: 455–70.
- Horwitz P and Adams M (2000). The systematics, biogeography and conservation status of the species in the freshwater crayfish genus *Engaewa* Riek (Decapoda: Parastacidae) from south-western Australia. Invertebrate Taxonomy 14: 655–680.
- Horwitz P and Rogan R (2003). Aquatic macroinvertebrate and non-flowing wetland values of the Yarragadee (outcropping and subcropping) groundwater dependent systems of far south-western Australia. Final Report Stages 1 and 2. Centre for Ecosystem Management, Edith Cowan University.
- Riek EF (1967). The freshwater crayfish of Western Australia (Decapoda: Parastacidae). Australian Journal of Zoology 15: 103–21.
- Spencer PBS and Hampton JO (2005). Illegal translocation and genetic structure of feral pigs in Western Australia. Journal of Wildlife Management 69: 377–384.
- Suter PJ and Richardson AMM (1977). The biology of two species of *Engaewa* (Decapoda: Parastacidae) in Tasmania. III. Habitat, food, associated fauna and distribution. Australian Journal of Marine and Freshwater Research 28: 95–103.