Action statement No.264

Flora and Fauna Guarantee Act 1988

Dandenong Burrowing Crayfish *Engaeus urostrictus*

VICTORIA State Government | Environment, Land, Water and Planning

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Dandenong Burrowing Crayfish *Engaeus urostrictus*

Description

The Dandenong Burrowing Crayfish (*Engaeus urostrictus* Riek 1969) is a small terrestrial burrowing crayfish belonging to the southern hemisphere crayfish family Parastacidae. The species has a laterally flattened body and a small, bristly abdomen (Horwitz 1990). This contrasts with the better known Freshwater Yabby (*Cherax destructor*) which has a dorsoventrally flattened body and a larger, non-bristly abdomen (Horwitz 1990, Horwitz 1995). The Dandenong Burrowing Crayfish has a maximum recorded carapace length* of approximately 20 mm, a short broad rostrum and an almost spineless triangular tail fan (Horwitz 1990). The Tubercle Burrowing Crayfish (*Engaeus tuberculatus*), co-occurs with the Dandenong Burrowing Crayfish but is distinguished by a longer carapace length (approximately 33 mm), a long, thin rostrum and tufts of long bristles on the ends of the tail fan (Horwitz 1990). The morphology and detailed descriptions of all known *Engaeus* species is provided in Horwitz (1990, 1994).

*carapace length, also known as the Occipital Carapace Length (OCL), is measured from the rear of eye socket to the central posterior edge of the carapace

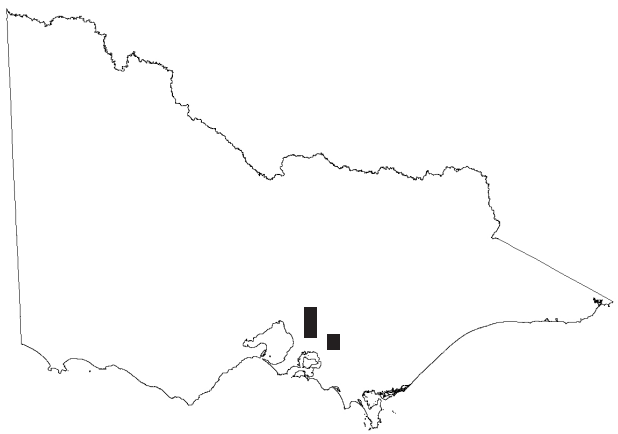
Distribution

The 35 known species of the genus *Engaeus* are endemic to south-east Australia, with most occurring in Victoria and Tasmania (Horwitz 1994). The majority of *Engaeus* species have small natural distributions, also known as short-range endemics (Horwitz 1994, Harvey 2002) and include the Dandenong Burrowing Crayfish which is restricted to the Dandenong Ranges east of Melbourne. This species has only been recorded from a few small sub-catchments around Mount Dandenong, Sherbrooke, Sassafras and Kallista areas. All known locations of the species are near the headwaters of small streams that flow through predominantly forest in the Dandenong Ranges National Park and the Sassafras Creek Nature Conservation Reserve (Lumsden *et al.* 2011, DSE 2013a). A historical outlying record at Mount Donna Buang in the Yarra Ranges to the east of the Dandenong Ranges is unusual and requires clarification (Horwitz 1990). A further historical record from Bunyip township (DEPI 2013b) is suspected to be erroneous. The species is not likely to be found west of Mount Dandenong (Horwitz 1990). The related Tubercle Burrowing Crayfish is sympatric with the Dandenong Burrowing Crayfish in the Dandenong Ranges but occupies a different habitat (Horwitz *et al.* 1985).

Habitat

The Dandenong Burrowing Crayfish occurs in riparian zones characterised by sandy soil flats adjacent to small, slow flowing headwater streams with high organic content. The organic content in the stream and adjacent flats originates from leaf and bark fall (Horwitz *et al.* 1985). These streams are predominantly located within the Wet Forest Ecological Vegetation Class (EVC) which occurs on well-drained loamy soils in protected gullies and on southern aspects of hills and mountains in high rainfall areas (DSE 2004a). In the Dandenong Ranges, the Wet Forest EVC is comprised of tree ferns (*Dicksonia antarctica*) and Sassafras (*Atherosperma moschatum*) with a tall forest of Mountain Ash (*Eucalyptus regnans*) dominating

Sassafras Creek (Kaylene Morris)



Distribution in Victoria (DELWP, 2015)

nearby slopes and a moist, shaded, fern-rich ground layer (Horwitz *et al.* 1985, DSE 2004a). There is one historic record from the foothills of Mount Dandenong (DEPI 2013a) in the Grassy Dry Forest EVC (DSE 2004b) which is an exception to the species occurrence in the Wet Forest EVC. The species is known from altitudes of approximately 250 - 440 m (Horwitz 1990, DEPI 2013b).

The Dandenong Burrowing Crayfish builds extensive burrow systems with many lateral branches amongst buried, rotting plants and roots of ferns, shrubs and trees (Horwitz *et al.* 1985). The riparian burrow systems of the species have tunnels which descend to the water table, allowing the crayfish to follow the rise and fall of the water table (Horwitz *et al.* 1985). The species can form chimneys of excavated soil pellets up to 13 cm high. This contrasts with the habitat of the Tubercle Burrowing Crayfish which occupies banks and hill slopes and has burrows independent of the water table being wholly reliant on surface water runoff (Horwitz *et al.* 1985).

Life History and Ecology

Burrowing crayfish spend most of their time underground and freshly excavated soil at burrow entrances is the most obvious sign of their presence. Surface activity is suspected to be nocturnal (Richardson and Swain 1980) and is linked to dispersal and foraging (Shaw 1996) and breeding (Van Praagh and Hinkley 1999). Activity is commonly related to seasonal rainfall (Morey and Hollis 1997, Van Praagh and Hinkley 1999). The cryptic behaviour of burrowing crayfish means little is known about their life history and ecology, including the Dandenong Burrowing Crayfish. Poor dispersal, slow maturation and confinement to discontinuous habitats are common to short-range endemics (Harvey 2002) such as the Dandenong Burrowing Crayfish.

The diet of burrowing crayfish is predominantly plant-based and consists of roots, decomposing leaves and occasionally, small invertebrates (Lake and Newcombe 1975, Suter and Richardson 1977, Growns and Richardson 1988). The diet of the Dandenong Burrowing Crayfish is not specifically known.

Breeding in most burrowing crayfish is likely to occur over spring and summer. Males surface during late spring and early summer to search for mates and then enter the burrows of females (Van Praagh and Hinkley 1999). Females incubate egg clusters under the abdomen and the juveniles hatch in late summer (Van Praagh and Hinkley 1999). Berried (gravid) females of the Dandenong Burrowing Crayfish have been found in late November and early December with small, ovoid and undeveloped eggs (Horwitz *et al.* 1985, Horwitz 1990) and juveniles have been found in chambers of burrow systems in June and September (Horwitz *et al.* 1985). Males and females of the species have been found in approximately equal ratios with intersexed specimens occasionally found (Horwitz 1990).

The life span of the Dandenong Burrowing Crayfish and many other burrowing crayfish species is not known.

Conservation status

Victorian conservation status

Dandenong Burrowing Crayfish (Engaeus urostrictus) has been listed as threatened under the Victorian *Flora and Fauna Guarantee Act 1988*.

Dandenong Burrowing Crayfish (Engaeus urostrictus) has been listed as critically endangered in Victoria according to the Department of Environment, Land, Water and Planning (DELWP)'s *Advisory List of Threatened Invertebrate Fauna in Victoria – 2009 (DSE 2009).*

Threats

The highly restricted distribution of the Dandenong Burrowing Crayfish, poor dispersal and confinement to discontinuous habitats increase the risk of losses from stochastic or anthropogenic events. Should extinction of a population occur, chances of re-colonisation from other populations are presumed to be low and genetic decline may be an issue. As the biology and ecology of the species is poorly understood further investigation into aspects of breeding and dispersal are required to understand the range of threats to the species.

Fire has the greatest capacity to impact the species by damaging or destroying habitat. The crayfish occupies Wet Forest EVC, which is not targeted for planned burning. Bushfire could have a significant impact as this forest type requires long-term recovery from fire. Planned burning in drier EVCs can however reduce the risk of fires entering and impacting on Wet Forest and crayfish habitat.

Climate change has the potential to impact water quality and quantity via reduced rainfall. Changes to hydrological regimes are one of the most serious impacts of climate change on freshwater systems (e.g. Aldous *et al.* 2011, Kingsford 2011). This poses a serious threat as the species occupies riparian habitat.

Water quality impacts from pollutant runoff (roads, storm-water and septic tanks) have been identified as serious long-term issues within the Dandenong Ranges National Park (Parks Victoria 2006). Pollutant impacts on the species require further investigation. Habitat and soil disturbance due to fire or weed control are also considered potential threats.

Surface and ground water reductions arising from drought and water extractions/diversions may limit habitable area for the species.

The species is only known from national park, however if found outside of protected areas, the species may be subject to threats arising from forestry, agriculture and urban development activities.

Standard threat	Source of threat	Explanation
Habitat damage or loss	Fire - wildfire	The species occupies Wet Forest EVC dominated by Mountain Ash. Bushfire damage or destruction to this forest type will require long-term recovery and therefore has the potential to impact the species. Bushfire has the potential to impact soil properties, a key habitat for the species.
	Water - nutrients and chemicals	Effluent overflow and discharge of grey water into stormwater from septic systems are known to cause dieback of Mountain Ash due to waterlogging and increased nutrient levels (Parks Victoria 2006). Road, urban and agricultural runoff can also directly transmit excess nutrients and chemicals to the waterways via stormwater. Any damage to the Wet Forest EVC dominated by Mountain Ash has the potential to impact all populations occupying this vegetation type.
Surface water - quality	Water - nutrients and chemicals	Effluent overflow and discharge of grey water into stormwater pipes from septic systems are known to cause nutrient enrichment. Runoff from roads, urban and agricultural areas can deliver excess nutrients and chemicals to the waterways via stormwater. These have been identified as a serious long-term issue within the Dandenong Ranges National Park (Parks Victoria 2006). Application of herbicides as part of weed control programs can also present risks of chemical inputs to waterways. The Dandenong Burrowing Crayfish burrows link to the waterways so any nutrient enrichment or chemical pollution could impact all populations.
Genetic decline	Genetic decline - other	There are only four known populations of the species so the loss of any population is potentially significant in terms of the loss of genetic diversity.

Important locations

Catchment	Location name	Land manager	Bioregion
PORT PHILLIP AND WESTERNPORT	Dandenong Ranges National Park	Parks Victoria	Highlands - Southern Fall
	Sassafras Creek Nature Reserve	Parks Victoria	Highlands - Southern Fall

Past management actions

Improved road drainage, connection to reticulated sewerage systems and instalment of modern septic systems has previously been undertaken in some parts of the Dandenong Ranges (Parks Victoria 2006) but not specifically in areas where the crayfish is known to occur.

Action	Result explanation
Conduct survey	As part of the Victorian Bushfire Royal Commission project, a range of biodiversity surveys were undertaken to inform planning decisions based around bushfire risk mitigation measures and environmental impacts. Surveys for the Dandenong Burrowing Crayfish were undertaken in 2011 around the Dandenong Ranges (Lumsden *et al.* 2011). Surveys were limited to thirteen sites within the Dandenong Ranges taking in historic sites for the species.

Conservation objectives

Long term objective

To ensure that the Dandenong Burrowing Crayfish can survive, flourish and retain its potential for evolutionary development in the wild.

Objectives of this Action Statement

- To increase knowledge of biology, ecology or management requirements
- To secure populations or habitat from potentially incompatible land use or catastrophic loss
- To increase community awareness and support

Intended management actions

The actions in this action statement have been developed taking into consideration relevant social and economic matters, as required under the FFG Act.

These actions are designed to support the conservation, management or control of flora and fauna and the management of potentially threatening processes, which will assist in mitigating any impact of climate change on the Dandenong Burrowing Crayfish, and will have no impact on greenhouse gas emissions.

The intended management actions listed below are further elaborated in DELWP's Actions for Biodiversity Conservation (ABC) system. Detailed information about the actions and locations, including priorities, is held in this system and will be updated annually for land managers and other authorities.

Standard objective	Objective explanation	
To increase knowledge of biology, ecology or management requirements.	Demonstrable improvement in knowledge of the distribution, habitat requirements, threats and population size and dynamics of the Dandenong Burrowing Crayfish.	
Standard action	**Details**	**Responsible agents**
Conduct survey to confirm existing records	Confirm the presence of the Dandenong Burrowing Crayfish at known locations using a standardised monitoring protocol. The monitoring protocol can involve using modified burrowing crayfish traps (see Bryant *et al.*2012) and habitat assessment sheets developed for various surveys (Crowther 2013).	DELWP, Parks Victoria

Conduct survey to locate additional populations	Survey all creek headwaters draining off the Dandenong Ranges and other areas identified as containing suitable habitat for the species to locate additional populations. Report all new records to the Victorian Biodiversity Atlas.	DELWP, Parks Victoria
Undertake detailed population monitoring and collect demographic information	Establish a monitoring program to survey key sites for the species to estimate abundance, determine breeding success, identify seasonal trends in populations and observe any responses to disturbance. Outcomes will address key knowledge gaps in the biology of the species and further direct management requirements for protection of the species.	DELWP, Parks Victoria
Undertake genetic research	Determine the genetic diversity within and between populations which will determine diversity and connectivity within and between populations. This will also inform management in the event a species translocation program is required.	DELWP
Assess threats	Monitor water quality periodically at key sites by using standard, cost-effective methods (e.g. automated loggers). This can be undertaken by engaging community or volunteer environmental groups. This action will identify if there are water quality issues such as high levels of nutrients and/or toxicants) that may impact populations of the species. Inform relevant agencies of any findings from water quality monitoring. Actions to identify and manage any water quality issues will have beneficial effects on maintaining and enhancing the species habitat. If waterlogging, nutrient enrichment and chemical pollution in waterways and surrounding catchment areas is limited this has potential to prevent dieback in Mountain Ash, enhance native vegetation growth and conserve riparian soils.	DELWP, Parks Victoria, Melbourne Water, Yarra Ranges Council

Standard objective	**Objective explanation**	
To secure populations or habitat from potentially incompatible land use or catastrophic loss.	No loss of known Dandenong Burrowing Crayfish populations due to anthropogenic impacts.	
Standard action	**Details**	**Responsible agents**
Prevent habitat loss	Work collaboratively with the other responsible agents to support activities to protect and enhance native vegetation and conserve riparian soils.	Melbourne Water

Protect habitat from fire	Distribution and habitat preferences should be considered in all relevant planning for bushfire mitigation and planned burning by DELWP and Parks Victoria.	DELWP, Parks Victoria
Liaise with stakeholder groups	Liaise with stakeholder groups including Parks Victoria, Melbourne Water, Yarra Valley Water, Shire of Yarra Ranges, City of Knox, Shire of Cardinia and VicRoads, to raise awareness of the Dandenong Burrowing Crayfish through communication and knowledge transfer. Raising awareness of the species with stakeholder groups will assist in identification and mitigation of potential threats and allow additional required management actions for protection of the species and habitat to be implemented.	DELWP
Control/reduce human disturbance	Improvements to road drainage and septic systems to reduce inputs to waterways and ameliorate associated water quality issues should be undertaken. Long-term improvement in this area is considered essential (Parks Victoria 2006).	DELWP, Parks Victoria, Yarra Ranges Council, VicRoads
Manage the inappropriate use of pesticide/herbicides and non-target impacts	Prevent chemical contamination of water from herbicide applications under weed control activities. Avoid spraying of herbicides in known locations for the species and employ other weed control methods such as hand pulling. This action will require liaison with Melbourne Water and Parks Victoria to inform any works programs to be undertaken in the species habitat.	DELWP, Parks Victoria, Melbourne Water, Yarra Ranges Council
Develop, publish and distribute educational, technical or publicity material and/or displays.	Publish/make available material from the "Threatened Faunal Species Management Plan" (Egan & Hall 2014). The plan details a process for implementing control measures to avoid and/or minimise any impacts to these species as a result of the proposed works, including salvage and translocation measures with appropriate approvals under the *Fisheries Act 1995* as required.	DELWP, Yarra Ranges Council

Standard objective	**Objective explanation**	
To maintain or increase community awareness and support.	Increase community awareness of the Dandenong Burrowing Crayfish and freshwater ecology issues within the Dandenong Ranges community to aid in the protection of the species and the species habitat.	
Standard action	**Details**	**Responsible agents**
Develop, publish and distribute educational, technical or publicity material and/or displays.	Develop fact sheet for the species. This can be distributed to community groups and volunteers and relevant agencies to increase awareness and support for the species.	DELWP, Parks Victoria, Melbourne Water

Involve community groups and volunteers in recovery activities.	Support existing volunteer groups (e.g. Olinda Creek Landcare group, Friends of Sherbrooke Forest, Friends of Sassafras Creek and other relevant volunteer environmental groups) with on-ground works through government programs, grants and practical assistance to raise awareness of the Dandenong Burrowing Crayfish, highlight potential threats and assist in knowledge transfer and overall management of the species and its habitat. This can be achieved by linking to community awareness and involvement programs such as the Parks Victoria annual forum for volunteer groups and annual works programs (p. 43, Parks Victoria 2006) and the Community Macroinvertebrate Monitoring Program run by Melbourne Water. Community groups and volunteers could also undertake water quality monitoring at selected sites (see action 'manage water quality'). Raising awareness of the species will assist in outcomes to protect habitat, identify and mitigate potential threats and implement required management actions for the species. Collaboration between responsible agents will assist in achieving this action.	DELWP, Parks Victoria, Melbourne Water, Yarra Ranges Council
Promote awareness of item through communication with local community.	Raise awareness of the species among the Dandenong Ranges community through media coverage in local newspapers, presentations to community groups and articles in volunteer group newsletters and programs. Incorporate communication activities into current Parks Victoria programs such as the annual forum for volunteer groups and schools education programs (pp. 42-43 Parks Victoria 2006). Collaborate with Parks Victoria and Friends of Sassafras Creek to develop interpretative signage for Sassafras Creek Nature Conservation Reserve which is a highly used local reserve and prone to disturbance and habitat impairment from nearby roads/tracks, trampling and high foot traffic.	DELWP, Parks Victoria, Melbourne Water

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