

THREATENED SPECIES SCIENTIFIC COMMITTEE

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

The Minister's delegate approved this conservation advice on 10/03/2016

Conservation Advice

Euastacus bispinosus

Glenelg Spiny Freshwater Crayfish

Taxonomy

Conventionally accepted as *Euastacus bispinosus* (Clark 1936)

Summary of previous assessment (TSSC 2011)

Conservation status

Endangered: Criterion 2 B2, (b)

Euastacus bispinosus was found to be eligible for listing under the following listing categories:

Criterion 1: A2 (a), (c): Vulnerable
Criterion 2: B2 (a), (b) (i, v): Endangered
Criterion 3: B (a) (b) (v): Vulnerable

The highest category for which *Euastacus bispinosus* is eligible to be listed is Endangered. The species was listed as Endangered in February 2011 as a result of the species having a restricted geographic distribution of less than 500 km² (or total area of occupancy of less than 22 km² (Honan 2004; Hammer & Roberts 2008)) that was also precarious for its survival. The species has undergone a decline in area of occupancy of approximately 50% in three generations. It is considered that this decline in area of occupancy is also likely to represent a significant decline in population numbers. The total number of mature *Euastacus bispinosus* is limited and considered very likely to continue to decline (TSSC 2011).

Main factors causing this eligibility (Honan 2004; TSSC 2011; Whiterod et al. 2013):

- Restricted geographic distribution as a result of poor water quality (including salinity), clearing of riparian vegetation and declining flows and drying of habitats because of extensive eucalyptus plantations, groundwater extraction for irrigation, dams, drought and climate change.
- Population decline / habitat loss because of declined or ceased discharge of spring water or introduced fish or channel modification.
- Being subject to, overfishing (this species is sensitive to even low level removal), compounded by the species' life history characteristics (low fecundity, long time to sexual maturity and limited recolonisation/dispersal ability).

Additional threats are (Honan 2004; TSSC 2011; Whiterod et al. 2013): genetic deterioration (inbreeding depression), introduction of disease, the risk of bushfire negatively affecting aquatic habitats via sedimentation and increased predation.

For more information on this listing and the species threats, see

<http://www.environment.gov.au/biodiversity/threatened/species/pubs/81552-listing-advice.pdf>

Species can be listed as threatened under state and territory legislation. For information on the listing status of this species under relevant state or territory legislation, see

<http://www.environment.gov.au/cgi-bin/sprat/public/sprat.pl>

Euastacus bispinosus (Glenelg Spiny Freshwater Crayfish) conservation advice

Reason for Conservation Advice revision

1. New information came to hand as a result of a workshop on the species hosted by Nature Glenelg Trust in Mt Gambier, June 2013, and
2. The species recovery is considered dependant on development control and additional information relevant to this was necessary in the Conservation Advice.

Background

The Glenelg spiny freshwater crayfish (*Euastacus bispinosus*) is a large, long-lived freshwater crayfish restricted to the Glenelg river system (and associated tributaries) in south-western Victoria and several spring-fed coastal streams (termed karst rising springs, KRS) and sinkholes in south-eastern South Australia (Morgan 1986; Hammer & Roberts 2008). These two main populations are distinct and separate populations, which consist of subpopulations that are highly fragmented (Whiterod & Hammer 2012; Miller et al. 2014). South Australia (SA) subpopulations are of significant conservation importance because they occupy habitat that is ecologically unique across the species range and are considered important fringe populations (Miller et al. 2014). There are recent records from the headwaters of the Wimmera River in the Grampians, the Darlots Creek-Fitzroy River and the Merri River in South West Victoria, but it is not clear if these are natural populations, or the result of introductions.

Conservation Actions

National conservation objectives

- Maintain and improve habitat attributes for all subpopulations of the two main Glenelg spiny freshwater crayfish populations.
- Increase genetic diversity and population density of Glenelg spiny freshwater crayfish within its current and former area of occupancy.
- Conserve and enhance known populations of the species and look for new populations.
- Ensure activities within the range of the Glenelg spiny freshwater crayfish do not have a significant impact under the EPBC Act (guidance on what is likely to have a significant impact and therefore avoiding a significant impact on this species is provided in Appendix A).

Priority Conservation Actions

The following actions are considered necessary to stop the decline of and, or support the recovery of the Glenelg spiny freshwater crayfish:

- Restore riparian vegetation and in-stream habitat quality in former areas of occupancy and ensure maintenance, and where appropriate restoration, of habitat quality in known areas of occupancy, taking into account habitat differences across the species range.
- Improve habitat connectivity between each fragmented subpopulation (and between SA and Victorian populations) and to former areas of occupancy to enhance dispersal opportunities and ability adapt to environmental change.
- Address reduced flow in Victorian populations due to water regulation, changes in land use (e.g. plantations or impoundment in Glenelg River) and climatic pressures.
- Address reduced flow due to declining spring discharge and related decline or loss in SA population through hydrological investigation and improved water allocation planning accounting for specific regional pressures.
- Control and manage access, agricultural practices and fish stocking on private land and other land tenure within the catchments of each population.
- Monitor known populations, assessing population structure and numbers of breeding adults.

- Continued protection of Glenelg spiny freshwater crayfish from fishing in SA.
- Continued moratorium on fishing for the Glenelg spiny freshwater crayfish in Victoria, working towards permanent removal of this species from the list of potentially fished species due to the unsuitability of fishing for species with these life history characteristics.

Site specific and regional conservation actions

The following additional actions support the national conservation objectives and guide priority conservation actions. They may be useful for those developing plans of management for or mitigating impacts on the Glenelg spiny freshwater crayfish:

- Ensure river management flow regimes meet requirements for the species and maintain high water quality in key habitats, especially in drought years to maintain connectivity between habitats and water quality including in the salt wedge sections of the Glenelg estuary. See Whiterod et al. 2014 for recommendations on flow requirements for this species.
- Ensure river and catchment use minimises impacts on water table levels, river flows and water quality and spring discharge.
- Ensure in-stream and catchment activities including structures (e.g. weirs, bridges), fuel reduction and fire response and change in land use (e.g. cropping, plantation timber) do not adversely affect water quality, quantity and seasonality.
- Ensure use of pesticides and herbicides on agricultural and plantation timber crops does not impact aquatic habitats and decrease water quality (e.g. prevent spraying near watercourses).
- Control access routes to suitably constrain public access to known sites on public land and where possible, areas of previously inaccessible private land (e.g.) through negotiation with plantation managers.
- Control and prevent further introductions of introduced fish in the species' habitat, including other crayfish species (i.e. *Cherax* spp. (marron and redclaw) and *Euastacus armatus* (Murray River crayfish)), *Cyprinus carpio* (European carp), *Perca fluviatilis* (redfin), *Salmo trutta* (Brown trout) and *Oncorhynchus mykiss* (Rainbow trout) where possible.
- Improve management practices for landholders that own land near or in the vicinity of populations through the development of plans of management that include the following objectives:
 - prevent stock trampling and degradation of aquatic habitats through fencing and provision of off-river watering sites and work with landholders to manage water extraction for stock and domestic use particularly during drought periods
 - engage with private landholders and land managers responsible for the land on which populations occur and adjacent lands, and
 - encourage key stakeholders to contribute to the implementation of conservation management actions.
- Collaborate with the Rural Fire Services and seek inclusion of mitigative measures in bush fire risk management plan(s), risk register and/or operation maps and provide them with maps of known occurrences for fire prevention activities, emergency response (including no-go-zones for pumping for regional bushfires) and post-fire remediation works around waterways and in the wider catchment. Develop and implement a suitable fire management strategy for Glenelg spiny freshwater crayfish habitat.
- Continue to raise awareness of the Glenelg spiny freshwater crayfish conservation in the local community, including recreational fishers and land owners.

Liaise with relevant Indigenous communities to improve knowledge of the cultural significance of Glenelg spiny freshwater crayfish and encourage its active management in Indigenous Protected Areas and co-managed areas.

Information and research priorities

The following information requirements inform the national conservation objectives and identification of priority conservation actions. They may be useful for directing research and other information providers when establishing research programs. Priority information requirements include:

- Broad scale surveys across the Victorian distribution to assess the status of populations (including genetic assessment) and development of a genetic management plan.
- Undertake further research into translocation (pending any supporting research outcomes consideration should be given to translocation as a priority conservation action).
- Identify locations for potential habitat restoration including sites not formally protected by conservation tenure or where vegetation has been removed.
- Continued monitoring of the status of known populations (by assessing population structure, number of breeding adults and level of juvenile recruitment).
- Genetic investigation of the populations in the Darlots Creek-Fitzroy system and Merri River to assess whether they are naturally occurring or the result of introductions.
- Understanding the potential impacts of pesticides on the Glenelg spiny freshwater crayfish
- Understand the impact of *Elodea canadensis* (pondweed) on the persistence of Glenelg spiny freshwater crayfish and investigate potential for decreasing dissolved oxygen levels.
- Explore the links between flows and the biology and ecology of the species.
- Understand the interactions of ground water and stream flows, and the effect land use and groundwater extraction on this process.

Other information requirements include:

- Investigate options for linking, enhancing or establishing additional populations using existing genetic dataset as framework, see Miller et al. 2014.
- Investigate consequences of high incidents of aberrant individuals (incapable of reproducing) on the long term viability of the South Australian population.
- Investigate formal conservation arrangements, management agreements and covenants on private land, and for Crown and private land investigate inclusion in reserve tenure.
- Assessment of the long-term viability of the SA population, with regard to projected climate, rainfall and sea level changes.

Appendix A

The [Significant Impact Guidelines 1.1: Matters of National Environmental Significance](#) is the Department's recommended guidelines for determining a significant impact on a Matter of National Environmental Significance. Given this species conservation is considered dependant on the control of land management activities, some further clarity on the criteria and definitions relevant for assessing a significant impact on this endangered species has been provided below. Making an allowance for this information will help proponents to avoid acting inconsistently with the conservation objectives for this species.

Populations and habitat critical to the survival

Populations

There are two populations of Glenelg spiny freshwater crayfish, one in south-western Victoria and the other in south-eastern SA. These two populations are distinct and separate populations. Within each population there are several fragmented subpopulations.

Habitat critical to the survival of the Glenelg spiny freshwater crayfish

Any habitat occupied by Glenelg spiny freshwater crayfish is habitat critical to the survival of the Glenelg spiny freshwater crayfish. Unoccupied or unsurveyed habitat in the accessible vicinity of known Glenelg spiny freshwater crayfish habitat which contains important habitat attributes such as snags, bank vegetation, undercut banks, cobblestones, rocks and good water quality is likely to be habitat critical to the survival of the species, particularly habitat with freshwater spring inflow as such habitat acts as a refuge during prolonged dry periods.

Actions likely to have a significant impact on the species

An action is **highly likely** to have a significant impact on Glenelg spiny freshwater crayfish if there is a real chance or possibility that it will:

Lead to a long-term decrease in the size of the South Australian population

The SA population is small and highly localised with more than 60% of individuals found at two locations (Eight Mile Creek and Deep Creek subpopulations) (Whiterod et al. 2014a). Any action that is likely to cause the mortality of a juvenile or adult Glenelg spiny freshwater crayfish in the core extent of occurrence (i.e. not including 'translocation sites') is highly likely to lead to a long-term decrease in the size of a population.

Reduce the area of occupancy of the Glenelg spiny freshwater crayfish

At the time of writing, the area of occupancy of the species is estimated to be less than 22 km². Actions which remove or reduce stream substrate and snags or substantially affect water quality (including the removal of riparian vegetation) are highly likely to reduce the area of occupancy of the species. These reductions in the area of occupancy may be permanent, particularly if there is no connective aquatic habitat, due to the species' limited ability to disperse and recolonise suitable habitats.

Adversely affect habitat critical to the survival of the Glenelg spiny freshwater crayfish

Adverse effects on habitat critical to the survival include removal, destruction, fragmentation and degradation. Adversely affecting habitat critical to the survival of the Glenelg spiny freshwater crayfish is highly likely to result from direct loss of habitat or altering water quality or volume. The very low genetic diversity of SA subpopulations (and lack of connectivity between them) makes these subpopulations extremely vulnerable to impacts from localised habitat change.

Disrupt the breeding cycle of a population of Glenelg spiny freshwater crayfish

The Glenelg spiny freshwater crayfish is a long-lived and slow growing species that can take up to 11 years to reach sexual maturity (Honan and Mitchell 1995c; Whiterod et al. 2014a). The number of eggs produced increases with increasing female size (Honan and Mitchell 1995c). Mating occurs annually over a relatively short period which varies across the species range. In Victoria females carry fertilized eggs (termed 'in berry') for a period of 6 - 7 months from May to October), attached Juveniles are then carried until November-December (total of 24-28 weeks)

(Honan and Mitchell 1995c; McCormack 2012). In SA, eggs or attached juveniles have been recorded in July and November. The factors regulating the reproductive cycle may include water temperature.

Any actions that lesson the ability of the species to reach sexual maturity or impact females 'in berry' are highly likely to negatively affect reproduction of the population. The dependent eggs, juveniles, newly released juveniles and moulting crayfish are particularly vulnerable to reduced water quality. Selective fishing of male crayfish has reduced the number and size of males relative to females, but it is not known how the population's size structure affects mating success. Very large females appear to alternate mating and moulting in successive years because of competing energetic demands.

Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the Glenelg spiny freshwater crayfish is likely to decline

As the area of occupancy of the Glenelg spiny freshwater crayfish is a total of approximately 22 km², the amount of suitable habitat for the species is considered to be an even smaller proportion of the extent of occurrence. Suitable habitat is therefore not extensive, and due to the small predicted total population sizes, loss of even small areas of habitat is highly likely to result in the decline of the Glenelg spiny freshwater crayfish.

The Glenelg spiny freshwater crayfish is most vulnerable during summer months, when there is less flow and pools are isolated, and during critical life stages such as hatching (November-December) and moulting (January- May).

Interfere with the recovery of the Glenelg spiny freshwater crayfish.

Acting contrary to the conservation actions outlined earlier in this advice is likely to interfere with the recovery of the Glenelg spiny freshwater crayfish. Interfering with the recovery of the Glenelg spiny freshwater crayfish is highly likely to result from the loss of Glenelg spiny freshwater crayfish habitat or reducing the quality or quantity of water or quality, quantity or extent of riparian vegetation in Glenelg spiny freshwater crayfish habitat. Actions which involve illegal fishing or harvesting of Glenelg spiny freshwater crayfish including changes in current protection arrangements are highly likely to interfere with the recovery of the species.

An action **may** or is **likely** to have a significant impact on Glenelg spiny freshwater crayfish if there is a real chance or possibility that it will:

Lead to a long-term decrease in the size of the Victorian population

Any action which is likely to result in multiple, ongoing mortalities of individuals in the Victorian population, particularly in strongholds or other water bodies with a relatively high abundance or density of species is likely to lead to a long-term decrease in the size of this population.

Fragment an existing important population of Glenelg spiny freshwater crayfish into two or more populations

Actions which create impassable in-stream barriers in areas of Glenelg spiny freshwater crayfish habitat (such as dams or weirs) may further fragment or isolate a population, depending on the size of the barrier. Fragmentation will also result from a lack of flow connectivity. The fragmentation of an existing important population into two or more populations is likely to occur if the barrier is likely to fragment a section of a water body where breeding is known to occur (i.e. juveniles or eggs have been detected). Continued fragmentation of Glenelg spiny freshwater crayfish habitat may further reduce the genetic status of subpopulations in the future.

Result in invasive species that are harmful to Glenelg spiny freshwater crayfish becoming established in Glenelg spiny freshwater crayfish habitat

The Rainbow trout, Brown trout, and the European carp are known to occupy Glenelg spiny freshwater crayfish habitat. The relevance of this criterion would only be likely if these introduced species were to be introduced into a system from which they were previously absent i.e. the SA population (TSSC 2011b). In some areas, introduced plants (weeds) are also an issue, with aquatic and riparian weeds both contributing to habitat degradation.

Introduce disease that may cause the Glenelg spiny freshwater crayfish to decline

It has been established that *Euastacus* species are vulnerable to European crayfish plague (caused by an infection with *Aphanomyces astaci*) (Unestam 1975), they may also be vulnerable to other infections carried by other crayfish species, which could come with introductions or aquaculture escapes e.g. *Thelohania*. There are some known issues with gonopore aberrations (atypical sexual openings), particularly in the SA population (Honan & Mitchell 1995b), that are thought to be due to inbreeding depression due to genetic isolation.

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