Threatened Species Assessment

Euastacus bispinosus
Glenelg Spiny Crayfish

Taxonomy

Euastacus bispinosus Clark, 1941

Current conservation status

Listed as Endangered under the *Environment Protection and Biodiversity Conservation Act 1999*.

Listed as threatened under the *Flora and Fauna Guarantee Act 1988* (SAC 2001).

Categorised as Endangered in the 2009 Advisory list of threatened invertebrate fauna in Victoria (DSE 2009).

Proposed conservation status

Endangered in Victoria

Criteria A2bce+4ce; B1ab(i,ii,iii,v)c(iv)+2ab(i,ii,iii,v)c(iv)

Species Information

Description and Life History

The Glenelg Spiny Crayfish is a large, long-lived freshwater crayfish. Like other *Euastacus* spp., the crays are robust and their claws and carapace (main body) are covered in spines and bumps. Glenelg Spiny Crayfish are commonly olive green in colour, sometimes brown, with splashes of red colouration on the joints of their claws and legs. Their undersides are a pale creamy-beige colour. Individuals are large and grow to at least 130 mm OCL (occipital carapace length: length between eyes and end of main body segment) and 1.1 kg in weight.

This is a slow-growing taxon taking up to 12 years to reach sexual maturity (Van Praagh 2003). It reproduces annually, has a low dispersal rate, and is typically found at low densities (Honan and Mitchell 1995). Glenelg spiny freshwater crayfish are both detritivores and predators. They forage on the stream bed and feed on a wide variety of organic matter including general organic detritus, decomposing terrestrial vegetation, aquatic macrophytes, algae and decomposing animal material (Honan, 2004). They will also strike at and eat living organisms including fish and other invertebrates. In smaller streams the taxon is the apex predator. Adult Glenelg spiny freshwater crayfish are large and strong and can move significant amounts of river bed substrate in their feeding. This movement of the stream bed plays an important role in nutrient recycling and stream bed structure in the streams crayfish inhabit.

Generation Length

The generation length of the Glenelg Spiny Crayfish is inferred to be 14 years. Several reproductive studies show *Euastacus* spp. mature late, with females only becoming reproductive at >5-8 years in most species (Honan and Mitchell 1995, Turvey and Merrick 1997, Furse and Wild 2004). Studies on large species of *Euastacus* show ages of up to 30 years and above (e.g. Turvey and Merrick 1997). Furse and Coughran (2010) determined the generation length for the taxon to be 14 years.

Distribution

The Glenelg Spiny Freshwater Crayfish is endemic to Australia, occurring across the Glenelg River Basin and associated tributaries and several spring-fed coastal streams in south-east South Australia (Morgan 1986). The natural distribution of the Glenelg Spiny Freshwater Crayfish is restricted to the Glenelg River system in south-

western Victoria and five spring-fed coastal streams in south-eastern South Australia including the Ewens Ponds system. The taxon has occasionally been recorded from several nearby river and creek systems, but these are likely the result of translocation by anglers in the past (TSSC 2011).

Habitat

The taxon is usually found in small permanent or temporary streams, and along the margins of swampy areas, in forested catchments, though it can persist in cleared areas if a border of vegetation is left along the creeks (Morgan 1986). The vegetation at lower altitude sites includes *Eucalyptus* and *Leptospermum* species, bracken, with wet sclerophyll forest and pine plantations in areas (Morgan 1986). This species prefers streams with shaded, well vegetated banks, and an abundance of woody debris. Within the Glenelg River system, the taxon uses undercut banks, woody debris, rock boulders and cobbled river beds as refuges when not feeding, resting or moulting. Crayfish also create burrows in which they retreat when inactive for longer periods. Springs discharging freshwater are a feature of the Glenelg River system, and deeper pools with spring-water inflows are important refuges for crayfish in summer when water temperatures are high and flows are low (Honan, 2004).

Threats

From Furse and Coghran (2010):
Climate change, particularly with regard to altered hydrological regimes and severe weather events (Westoby and Burgman 2006) is a potential threat to this taxon. Climate change modelling predicts that southeastern mainland Australia will experience a warmer and drier climate, leading to decreased run-off and soil moisture (Howden 2002). This alteration of hydrological regimes is likely to impact environmental flows, particularly in areas of increasing demand for agricultural water supplies (Hennessy 2006).

The Glenelg River catchment has been extensively cleared, and modified, and river regulation, de-snagging, channelization and increased sedimentation have impacted in-stream habitat (Van Praagh 2003). Construction of the Rocklands Reservoir is thought to have caused the local extinction of this taxon, which was recorded at the site prior to the dam's construction (Horwitz 1990).

The abundance of this taxon has been reduced through inappropriate levels of exploitation. Morgan (1983) observed evidence of heavy fishing activity in the Glenelg River system, and noted that populations of *Euastacus* could be heavily impacted in a single weekend of heavy fishing pressure.

Exotic fishes such as Brown Trout or Redfin Perch, which are prevalent throughout the region, potentially are large scale threats for this taxon (Horwitz 1990). Other exotic species (cats, foxes, goats) that have generally been found to impact on crayfish (e.g. Horwitz 1990, O'Brien 2007) also occur in this taxon’s range and could have localised impacts, leading to declines in distribution and/or local abundance.

IUCN Criteria

Criterion A. Population size reduction.
Population reduction (measured over the longer of 10 years or 3 generations) based on any of A1 to A4

	Critically Endangered	Endangered	Vulnerable
A1	≥ 90%	≥ 70%	≥ 50%
A2, A3, A4	≥ 80%	≥ 50%	≥ 30%

A1 Population reduction observed, estimated, inferred or suspected in the past and the causes of the reduction are clearly reversible AND understood AND ceased.

A2 Population reduction observed, estimated, inferred or suspected in the past where the causes of the reduction may not have ceased OR may not be understood OR may not be reversible.

A3 Population reduction, projected or suspected to be met in the future (up to a maximum of 100 years) [*(a) cannot be used for A3*]

A4 An observed, estimated, inferred, projected or suspected population reduction where the time period must include both the past and the future (up to a max. of 100 years in future), and where the causes of reduction may not have ceased OR may not be understood OR may not be reversible.

based on any of the following:

(a) direct observation [*except A3*]

(b) an index of abundance appropriate to the taxon

(c) a decline in area of occupancy, extent of occurrence and/or quality of habitat

(d) actual or potential levels of exploitation

(e) the effects of introduced taxa, hybridization, pathogens, pollutants, competitors or parasites

Evidence:

Eligible under Criterion A2 as Endangered

The population reduction over the past 42 years is inferred to be 40 to 50%, based on (b), (c) and (e) above.

Impairment and modification to instream and riparian habitat (e.g. removal of riparian vegetation for farming, plantation establishment, impairment to stream bank integrity, water extraction, and increasing sediment inputs) have been listed as threats to *Euastacus* spp. (Horwitz 1990, Morgan 1997). Extreme events such as fire, floods and droughts are shown to impact crayfish populations (Johnston et al 2014). Impairment and modification to instream and riparian habitat and extreme events have occurred within the known range of the species therefore past population trends are inferred as declining.

TSSC (2011) considered that the taxon had undergone a 50% decline in the last three generations, and noted that in the Glenelg system, the estimated area of occupied habitat and declined by nearly 50%. The TSSC considered that this equated to a similar decline in numbers.

The causes of the reduction may not have ceased, be understood or be reversible.

Eligible under Criterion A4 as Endangered

The population reduction over any 42 year period, including both past and future, is projected to be 40 to 50%, based on (c) and (e) above. The causes of reduction may not have ceased, be understood or be reversible.

Impairment and modification to instream and riparian habitat and extreme events continue to occur within the known range of the taxon, therefore present and future population trends are inferred as declining. Predation by introduced species such as trout (Furse and Coughran 2011) and the long term impacts of climate change are likely drivers of further decline (Furse and Coughran 2011, Johnston et al 2014).

Criterion B. Geographic range in the form of either B1 (extent of occurrence) and/or B2 (area of occupancy	Critically Endangered Very restricted	Endangered Restricted	Vulnerable Limited
B1. Extent of occurrence (EOO)	< 100 km²	< 5,000 km²	< 20,000 km²
B2. Area of occupancy (AOO)	< 10 km²	< 500 km²	< 2,000 km²
AND at least 2 of the following 3 conditions:			
(a) Severely fragmented OR Number of locations	= 1	≤ 5	≤ 10
(b) Continuing decline observed, estimated, inferred or projected in any of: (i) extent of occurrence; (ii) area of occupancy; (iii) area, extent and/or quality of habitat; (iv) number of locations or subpopulations; (v) number of mature individuals			
(c) Extreme fluctuations in any of: (i) extent of occurrence; (ii) area of occupancy; (iii) number of locations or subpopulations; (iv) number of mature individuals			

Evidence:

Eligible under Criterion B1 as Endangered

The Extent of Occurrence (EoO) across the taxon's range is estimated to be 922 km², based on accepted, post-1970 records from the Victorian Biodiversity Atlas (VBA) and on the available records from field work.

The taxon is considered to occur in one location as all key identified threats apply across its range and can rapidly affect all individuals of the taxon present.

It has a continuing decline in (i), (ii), (iii) and (v), and is inferred to have extreme fluctuations in (iv) above (J.M. Furse and J. Coughran pers. comm. 2009), cited in Furse & Coughran (2010)..

Eligible under Criterion B2 as Endangered

The Area of Occupancy (AoO) across the taxon's range is estimated to be 68 km², based on 2 x 2 km grids derived from accepted, post-1970 records in the VBA. As above, it is estimated to have 1 location, has a continuing decline in (i), (ii), (iii) and (v) and extreme fluctuations in (iv).

Criterion C. Small Population size and decline				
		Critically Endangered	Endangered	Vulnerable
Number of mature individuals		< 250	< 2,500	< 10,000
AND at least one of C1 or C2				
C1	An observed, estimated or projected continuing decline of at least (up to a max. of 100 years in future):	25% in 3 years or 1 generation (whichever is longer)	20% in 5 years or 2 generations (whichever is longer)	10% in 10 years or 3 generations (whichever is longer)
C2	An observed, estimated, projected or inferred continuing decline AND least 1 of the following 3 conditions:			
(a)	(i) Number of mature individuals in each subpopulation	≤ 50	≤ 250	≤ 1,000
	(ii) % of mature individuals in one subpopulation =	90 – 100%	95 – 100%	100%
(b) Extreme fluctuations in the number of mature individuals				

Evidence:

Ineligible under Criterion C

It is suspected that there are 5,000 to 8,000 mature individuals, but other thresholds under this criterion have not been met.

Criterion D. Very small or restricted population			
	Critically Endangered	Endangered	Vulnerable
Number of mature individuals (observed or estimated)	<·50	<·250	<·1,000
D2 Only applies to the VU category Restricted area of occupancy or number of locations with a plausible future threat that could drive the species to critically endangered or Extinct in a very short time.	-	-	D2. Typically: AoO <·20 km2 or number of locations ≤·5

Evidence:

Eligible under criterion D2 as Vulnerable

The taxon is estimated to be very restricted.

Criterion E (Quantitative Analysis) was not addressed as the taxon does not have a detailed Population Viability Analysis.

References

DSE (2009) *Advisory list of threatened invertebrate fauna in Victoria - 2009*. Department of Sustainability and Environment, Melbourne. Retrieved from: https://www.environment.vic.gov.au/__data/assets/pdf_file/0014/50450/Advisory-List-of-Threatened-Vertebrate-Fauna_FINAL-2013.pdf

Furse, J. and Coughran, J. (2010). *Euastacus bispinosus*. The IUCN Red List of Threatened Species 2010: e.T8138A12889919. http://dx.doi.org/10.2305/IUCN.UK.2010-3.RLTS.T8138A12889919.en. Downloaded on 11 September 2019.

Furse, J.M. and Coughran, J. (2011). An assessment of the distribution, biology, threatening processes and conservation status of the freshwater crayfish, genus *Euastacus* (Decapoda, Parastacidae), in continental Australia. II. Threats, conservation assessments and key findings. Akira Asakura et al. (eds) *New Frontiers in Crustacean Biology,* 253-263.

Furse, J.M. and Wild, C.H. (2004). Laboratory moult increment, frequency, and growth in *Euastacus sulcatus*, the Lamington Spiny Crayfish. *Freshwater Crayfish*, 14: 205-211.

Hennessy, K. (2006). *Climate change scenarios for initial assessment of risk in accordance with risk management guidance.* Commonwealth Scientific and Industrial Research Organization, Australia.

Honan, J. A. and Mitchell, B.D. (1995). Growth of the large freshwater crayfish *Euastacus bispinosus* Clark (Decapoda: Parastacidae). *Freshwater Crayfish*, 10: 118-131.

Honan, J.A. (2004). Habitats of Glenelg Spiny Crayfish (*Euastacus bispinosus)* in the Glenelg River drainage. Report to Glenelg-Hopkins Catchment Management Authority.

Horwitz, P. (1990) The conservation status of Australian freshwater crustacea. *Australian National Parks and Wildlife Service Report No* 14. ANP&WS, Canberra.

Howden, M. (2003). Climate trends and climate change scenarios. In: Howden, M., Hughes, L., Dunlop, M., Zethoven, I., Hilbert, D and Chilcott, C (eds), *Climate Change Impacts On Biodiversity In Australia*. Outcomes of a workshop sponsored by the Biological Diversity Advisory Committee, 1-2 October 2002, Canberra, Australia.

Johnston, K., Matthews, Ty G., Robson, B.J. and Chester, E.T. (2014). Impacts of extreme events on southeastern Australian freshwater crayfish. *Freshwater Crayfish* 20 (1): 61-71.

Morgan, G. J. (1986). Freshwater crayfish of the genus *Euastacus* Clark (Decapoda: Parastacidae) from Victoria. *Memoirs of the Museum of Victoria* 47 (1): 1-57.

Morgan, G.J. (1997). Freshwater crayfish of the genus *Euastacus* Clark (Decapoda: Parastacidae) from New South Wales, with a key to all species of the genus. *Rec. Aust. Mus.*, (Supplement) 23: 110.

O'Brien, M.B. 2007. Freshwater and terrestrial crayfish (Decapoda, Parastacidae) of Victoria, status, conservation, threatening processes and bibliography. *The Victorian Naturalist* 14(4): 210-229.

SAC (2001). Flora and Fauna Guarantee Scientific Advisory Committee: Final Recommendation on a Nomination for Listing. Nomination No. 519 *Euastacus bispinosus*

TSSC (2011). Commonwealth Listing Advice on *Euastacus bispinosus* (Glenelg Spiny Freshwater Crayfish). Threatened Species Scientific Committee, Department of Sustainability, Environment, Water, Population and Communities. Canberra, ACT Retrieved from: https://www.environment.gov.au/biodiversity/threatened/species/pubs/81552-listing-advice.pdf.

Turvey, P. and Merrick, J.R. (1997). Growth with age in the freshwater crayfish, *Euastacus spinifer* (Decapoda: Parastacidae), from the Sydney region, Australia. *Proc. Linn. Soc. N.S.W.*, 118: 205-215.

Van Praagh, B. (2003). Action Statement: Glenelg Spiny Crayfish *Euastacus bispinosus*, Murray Spiny Crayfish *Euastacus armatus*. Flora and Fauna Guarantee Act 1988 No. 184. Department of Sustainability and Environment, Victoria.

Westoby, M. and Burgman, M. (2006). Commentary. Climate change as a threatening process. Austral Ecology 31: 549-550.

Zeidler, W. (1982). South Australian freshwater crayfish. *South Australian Naturalist* 56 (3): 37-43.