

**Advice to the Minister for Sustainability, Environment, Water, Population and Communities
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. Name

Euastacus bispinosus

This species is commonly known as Glenelg spiny freshwater crayfish. It is also known regionally as 'pricklyback'. It is in the Family Parastacidae.

2. Reason for Conservation Assessment by the Committee

This advice follows assessment of information provided by a public nomination to list the Glenelg spiny freshwater crayfish. The nominator suggested listing in the endangered category of the list.

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 1 to make it **eligible** for listing as **vulnerable**.

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

The Committee judges that the species has been demonstrated to have met sufficient elements of Criterion 3 to make it **eligible** for listing as **vulnerable**.

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

4. Taxonomy

The species is conventionally accepted as *Euastacus bispinosus* Clark, 1936 (Glenelg spiny freshwater crayfish).

5. Description

The Glenelg spiny freshwater crayfish is a large, long-lived freshwater crayfish of the *Euastacus* genus. The *Euastacus* crayfish, also commonly known as spiny crayfish, are one of two groups of fully aquatic freshwater crayfish in Australia, the other being the smooth-shelled *Cherax* crayfish, commonly known as yabbies. Like other *Euastacus* crayfish, Glenelg spiny freshwater crayfish are robust and their claws and carapace (main body) are covered in spines and bumps. Glenelg spiny freshwater 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.

6. National Context

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 Ewen Ponds system. The species has occasionally been recorded from several nearby river and creek systems, but these are likely the result of translocation by anglers in the past (Honan, pers. comm., 2009). There is no connecting habitat between the Victorian and South Australian crayfish, therefore they are effectively separate populations (Hammer and Roberts, 2008).

The Glenelg spiny freshwater crayfish's distribution overlies the Glenelg-Hopkins and South-East South Australia Natural Resource Management (NRM) regions and the Victorian Midlands (VM), Victorian Volcanic Plain (VVP) and Naracoorte Coastal Plains (NCP) bioregions in the Interim Biogeographic Regionalisation for Australia (IBRA) Version 6.1.

The Glenelg spiny freshwater crayfish is listed as threatened under the Victorian *Flora and Fauna Guarantee Act 1988* and is subject to fishing restrictions under the Victorian *Fisheries Act 1995*. It is also listed as a protected species under the South Australian *Fisheries Management Act 2007*.

7. Relevant Biology/Ecology

Euastacus crayfish are found only in south-eastern Australia, and are a characteristic and important part of the region's aquatic fauna. At least 41 *Euastacus* species occur in Australia, and many are endemic to single river systems (Morgan, 1997). In contrast to *Cherax* yabby species, *Euastacus* crayfish breed and are mostly active in winter and have low tolerances to salinity, high water temperatures, drought and habitat degradation, and cannot survive prolonged drying out of their habitats. Therefore *Euastacus* crayfish generally inhabit upland (higher-altitude) rivers and streams that are permanently flowing, cool and well-oxygenated (Riek, 1972; Morgan, 1997; Crandall, 1999; Martin et al., 2008).

Within the Glenelg River system in Victoria, the Glenelg spiny freshwater crayfish is found in cool, shaded, flowing habitats with high water quality and intact riparian vegetation. In these habitats, Glenelg spiny freshwater crayfish use 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).

In South Australia, the Glenelg spiny freshwater crayfish is found in five spring-fed streams including the Ewen Ponds system in the south-eastern corner of the state. These South Australian habitats represent the remnants of a very large peat swamp system present at the time of European settlement plus the artificial channels and channelised streams used to drain it. Despite their proximity to the coastline, these streams are similar to upland streams in that they have strong flows and their water is cool, clear and low in salinity. However, crayfish numbers appear to be limited by habitat in these streams. Rocks and woody debris are rare, and emergent aquatic vegetation such as *Triglochin* spp. (water ribbon) and *Typha* spp. (bullrush) and submergent aquatic vegetation such as *Potamogeton* spp. (pond weed) and *Myriophyllum* spp. (water milfoil) provide the main structure for crayfish (Hammer and Roberts, 2008).

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 species 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.

Like all crustaceans, individuals continue to grow over their entire lifespan. The largest recorded individual was 130 mm OCL and 1.1 kg in weight and was estimated to be 26 years of age. Historic

anecdotal accounts suggest some individuals reached greater sizes and ages of up to 50 years. Female crayfish from most parts of the Glenelg River system reach sexual maturity at around 85–86 mm OCL or 8–11 years of age. Generation length is currently estimated to be 13–16 years (Honan, 2004; Honan and Mitchell, 1995c).

Glenelg spiny freshwater crayfish reproduce annually from May–June. Recorded egg counts range from 63 eggs on a 62 mm OCL female from South Australia to 812 eggs on a 115 mm OCL female from Victoria. Females carry fertilised eggs under their abdomens for 6–7 months, and the hatched larvae for a further month before releasing the juveniles in November–December. Released juvenile crayfish are approximately 5–6 mm OCL, have exhausted their yolk sacs, and commence feeding on a diet of zooplankton and organic detritus (Honan, 1998; Honan and Mitchell, 1995a).

Based on studies on the closely related Murray River Crayfish (*Euastacus armatus*), Glenelg spiny freshwater crayfish are likely to have very limited dispersal and recolonisation abilities (Gilligan et al., 2007).

8. Description of Threats

Victorian populations

In the Glenelg River system, the main threats to the Glenelg spiny freshwater crayfish are fishing and low flows caused by eucalyptus plantations, river water and groundwater extraction for irrigation and river impoundment (Rocklands Dam). Collectively these are increasing the species' vulnerability to climate variation.

Fishing has been a major historic threat to the Glenelg spiny freshwater crayfish. Life history characteristics of the species, particularly slow growth and significant age before sexual maturity, make it difficult for the species to withstand even a low level of removal by fishermen (Hoey, 1990; Honan and Mitchell, 1995b). Anecdotal evidence suggests that severe overfishing of the species took place in the 1970s and 1980s before fishing regulations were introduced (Hoey, 1990). Ongoing illegal fishing is also a threat to the species.

Low flows threaten the species through increased water temperatures, poor water quality including raised salinity and low dissolved oxygen, and in extreme cases, actual drying of refuge pools. The species cannot survive drying out of its habitats. Eucalyptus plantations established in the catchment since 1990, totalling more than 18,000 hectares, are lowering water tables causing reduced flows and drying of springs (SKM, 2008). The management of eucalyptus plantations are also a potential threat to the species through pesticide and herbicide use. Drought has affected the catchment since the mid 1990s with increasingly severe effects.

Bushfires are an emerging threat to Glenelg spiny freshwater crayfish, and can cause severe degradation of stream habitats.

Habitat degradation by human activities in the catchment has been a major historical threat to the Glenelg spiny freshwater crayfish. Many parts of the Glenelg River system suffer from siltation due to historical land clearing and cattle-grazing leading to loss of habitat pools. Clearing of riparian vegetation and de-snagging of the system in the 1960s and 1970s has created bank and bed instability and further siltation. Continued cattle access to many waterways continues to degrade habitats.

Potential threats to the species are legal stockings of introduced trout into the system; illegal translocations of non-endemic native fish and crayfish into the system; and invading introduced fish species. Introduced Rainbow Trout (*Oncorhynchus mykiss*) and Brown Trout (*Salmo trutta*) have been stocked in the past, as have introduced Redfin (*Perca fluviatilis*). An illegal stocking of Australian Bass (*Macquaria novemaculeata*), a native species which is not endemic to the Glenelg River system, was discovered in 2001. Introduced Carp (*Cyprinus carpio*) were also discovered in 2001 and will likely invade the whole system in time (ASFB, 2001; Vic DPI, 2010). All of these introduced and non-endemic fish species pose a serious predation threat to juvenile crayfish.

South Australian population

Historically, the South Australian population of Glenelg spiny freshwater crayfish was severely impacted in the 1930s by the draining of the very large peat swamp system inhabited by the species. However it has persisted in some of the disconnected stream systems created by these drainage activities, which generally comprise of a spring discharge pond and the artificial channels or channelised streams draining them. The species is now found in five of these stream systems, however has been recently lost from at least one other stream system which has dried up (Hammer and Roberts, 2008).

The main threat to the South Australian population is drying of their spring-fed habitats due to groundwater extraction for irrigation. There has been a rapid increase in intense irrigation pumping of groundwater in the immediate vicinity of crayfish habitat since the 1990s with only a 10% allocation preserved for the environment. Flow has decreased at Eight Mile Creek by 20–30% since 1990 and local groundwater levels have declined substantially in the same period. These flow / groundwater declines are predicted to continue at the same rate for the next 10 years unless use of groundwater is reduced (Brown et al., 2006). These groundwater effects are exacerbated by declining rainfall; well below average rainfall was recorded in south-east South Australia from 2005–2008 (Hammer and Roberts, 2008; BOM, 2009).

As well as reducing or eliminating areas of habitat, reductions in flows are also a demographic threat as they appear to result in very poor recruitment of juvenile crayfish (Hammer and Roberts, 2008).

Other threats to the South Australian population are fishing pressure and creek dredging. Fishing has been implicated in the decline of crayfish in Ewen Ponds (Hammer and Roberts, 2008), however the species is now protected from fishing. Eight-Mile Creek is dredged regularly (Hammer et al., 2004), although the South-East Drainage Board advises that dredging processes have been modified to reduce environmental impacts to some degree (Talanskas, pers. comm., 2009).

The main potential threats to crayfish in South Australia are the accidental or deliberate spread of introduced fish in their habitats.

9. Public Consultation

The nomination used in this assessment was made available for public exhibition and comment for 30 business days over September–October 2009. 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 **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

There is evidence that the Glenelg spiny freshwater crayfish has experienced localised declines and extirpations across its range. Declining flows and actual drying of habitats because of extensive eucalyptus plantations, groundwater extraction for irrigation, dams and drought, as well as overfishing, are considered the main causes for these localised declines and extirpations.

In the Glenelg River system in Victoria, reports from anglers (Honan, 2004, unpubl. data) and survey data (Vic DPI, unpubl. data) indicate that the distribution of the Glenelg spiny freshwater crayfish has significantly reduced since the 1980s. Mapping of these reports and records using an interactive mapping system shows the species occurring in 36.6 km² of estimated river habitat (using linear stream length and average width data from Norris et al., 2001) within the Glenelg River system in the 1980s and earlier. Similar mapping using post-1990 reports and records show

the species occurring in only 19.7 km² of estimated river habitat. Bushfires in 2006 have caused further severe declines in population size at several locations in the Grampians National Park, Victoria (K. Johnston, pers. comm., 2009). In South Australia, in the last 10 years, populations of Glenelg spiny freshwater crayfish have been lost from Bones Pond/Hitchcock Drain and locations on Jerusalem Creek where discharge of spring water has declined or ceased.

This measured decline in range suggests the area of occupancy of the Glenelg spiny freshwater crayfish may have approximately halved in less than three generations of the species. The Committee considers that this decline in area of occupancy is also likely to represent a significant decline in crayfish numbers. The Committee therefore concludes that the species has undergone a decline of approximately 50% within the last three generations and is very likely to continue to decline. Considering the life history characteristics of the species (see Section 7), particularly its longevity, significant age before sexual maturity and very limited recolonisation ability (Gilligan et al., 2007), the Committee judges this reduction to be substantial. Therefore, the species has been demonstrated to have met the required elements of Criterion 1 to make it **eligible** for listing as **vulnerable**.

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

The distribution of the Glenelg spiny freshwater crayfish in both Victoria and South Australia is precarious due to declining flows and actual drying of habitats because of extensive eucalyptus plantations, groundwater extraction for irrigation, dams and drought. Overfishing has also been a severe threat to both populations, as life history characteristics makes the species highly sensitive to even a low level of removal by fishermen. Victorian populations are under the additional threats of habitat degradation and raised salinity levels, which is a problem in many parts of the Glenelg River catchment. This precarious distribution is compounded by the species' life history characteristics and very limited recolonisation ability (Gilligan et al., 2007).

Mapping using post-1990 reports and records show the species occurring in only 19.7 km² of estimated river habitat within the Glenelg River catchment in Victoria. Estimates of waterway habitat in South Australia is less than 2 km² (Hammer and Roberts, 2008). Therefore, the species' total area of occupancy is estimated at less than 22 km². The Committee considers this geographic distribution to be restricted and precarious for the survival of the species. Therefore, the species has been demonstrated to have met the required elements of Criterion 2 to make it **eligible** for listing as **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

No population estimates are available for Glenelg spiny freshwater crayfish within the Glenelg River system in Victoria. In the late 1980s, in one area of relatively undisturbed habitat within the Glenelg River system with no fishing pressure, crayfish densities were estimated at one mature crayfish (>85 mm OCL) per three metres of bank. This gave a population estimate of about 650 crayfish in a 1 km long pool (Hoey, 1990; Honan and Mitchell, 1995b). However, this was an exceptional habitat with no parallels anywhere else in the Glenelg River system. In other areas sampled the catches are too low to accurately estimate population size (Hoey, 1990; Honan, pers. comm., 2009), and there is evidence that the distribution of the Glenelg spiny freshwater crayfish has significantly reduced since the 1980s. In South Australia, the estimated total number of mature crayfish in 2008 was around 330 (Hammer and Roberts, 2008). Despite the lack of a population estimate within the Glenelg River system, the Committee is satisfied based on the available

evidence, including declines in area of occupancy, that the estimated total number of mature Glenelg spiny freshwater crayfish is considerably less than 10 000. This number is considered to be limited, and very likely to continue to decline, though there are insufficient data to demonstrate a particular rate of decline. The species' geographic distribution is also precarious for the survival of the species, as outlined in Criterion 2. Therefore, the species has been demonstrated to have met the required elements of Criterion 3 to make it **eligible** for listing as **vulnerable**.

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

In South Australia, the estimated total number of mature crayfish in 2008 was around 330 (Hammer and Roberts, 2008). No population estimates are available for the Glenelg spiny freshwater crayfish within the Glenelg River system in Victoria. However, based on the available evidence including current area of occupancy and population densities in the best known habitat, the Committee does not consider that the estimated total number of mature individuals of the species is extremely low, very low or low for the purpose of this criterion. Therefore, as the species has not been demonstrated to have met the required elements of Criterion 4, it is **not eligible** for listing in any category under this criterion.

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

- (a) 50% in the immediate future; or**
- (b) 20% in the near future; or**
- (c) 10% in the medium-term future**

There are no data available to estimate a probability of extinction of the species in the wild over a relevant timeframe. Therefore, as the species has not been demonstrated to have met the required elements of Criterion 5, it is **not eligible** for listing in any category under this criterion.

11. CONCLUSION

Conservation Status

Euastacus bispinosus (Glenelg spiny freshwater 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 the species has undergone a substantial decline within the last three generations and is very likely to continue to decline. Considering the life history of the species, particularly its longevity, significant age before sexual maturity and very limited recolonisation ability, the Committee judges this reduction to be substantial. Therefore, the species has been demonstrated to have met the required elements of Criterion 1 to make it **eligible** for listing as **vulnerable**.

The Committee accepts the species' distribution in both Victoria and South Australia is precarious for its survival due to declining flows and actual drying of habitats because of drought, dams, groundwater extraction for irrigation and extensive eucalyptus plantations, as well as historic overfishing, habitat degradation and raised salinity levels, and is compounded by the species' vulnerable life history characteristics and very limited recolonisation ability. The Committee accepts the species' geographic distribution is restricted. Therefore, the species has been demonstrated to have met the required elements of Criterion 2 to make it **eligible** for listing as **endangered**.

The Committee accepts, based on the available evidence, that the estimated total number of mature Glenelg spiny freshwater crayfish is limited and very likely to continue to decline. The Committee accepts the species' geographic distribution is precarious for its survival. Therefore, the species has been demonstrated to have met the required elements of Criterion 3 to make it **eligible** for listing as **vulnerable**.

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

Recovery Plan

There should not be a recovery plan for the Glenelg spiny freshwater crayfish as the approved conservation advice for the species provides sufficient direction to implement priority actions and mitigate against key threats.

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 **endangered** category:

Euastacus bispinosus

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

Associate Professor Robert J.S. Beeton AM FEIANZ

Chair

Threatened Species Scientific Committee

13. References

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