



## Consultation Document on Listing Eligibility and Conservation Actions

### *Euastacus bindal* (a freshwater crayfish)

You are invited to provide your views and supporting reasons related to:

- 1) the eligibility of *Euastacus bindal* (a freshwater crayfish) for inclusion on the EPBC Act threatened species list in the Critically Endangered category; and
- 2) the necessary conservation actions for the above species.

Evidence provided by experts, stakeholders and the general public are welcome. Responses can be provided by any interested person.

Anyone may nominate a native species, ecological community or threatening process for listing under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) or for a transfer of an item already on the list to a new listing category. The Threatened Species Scientific Committee (the Committee) undertakes the assessment of species to determine eligibility for inclusion in the list of threatened species and provides its recommendation to the Australian Government Minister for the Environment.

Responses are to be provided in writing either by email to:  
[species.consultation@environment.gov.au](mailto:species.consultation@environment.gov.au)

or by mail to:

The Director  
Marine and Freshwater Species Conservation Section  
Wildlife, Heritage and Marine Division  
Department of the Environment  
PO Box 787  
Canberra ACT 2601

**Responses are required to be submitted by 2 August 2016.**

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## **General background information about listing threatened species**

The Australian Government helps protect species at risk of extinction by listing them as threatened under Part 13 of the EPBC Act. Once listed under the EPBC Act, the species becomes a Matter of National Environmental Significance (MNES) and must be protected from significant impacts through the assessment and approval provisions of the EPBC Act. More information about threatened species is available on the department's website at:

<http://www.environment.gov.au/biodiversity/threatened/index.html>.

Public nominations to list threatened species under the EPBC Act are received annually by the department. In order to determine if a species is eligible for listing as threatened under the EPBC Act, the Threatened Species Scientific Committee (the Committee) undertakes a rigorous scientific assessment of its status to determine if the species is eligible for listing against a set of criteria. These criteria are available on the Department's website at:

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

As part of the assessment process, the Committee consults with the public and stakeholders to obtain specific details about the species, as well as advice on what conservation actions might be appropriate. Information provided through the consultation process is considered by the Committee in its assessment. The Committee provides its advice on the assessment (together with comments received) to the Minister regarding the eligibility of the species for listing under a particular category and what conservation actions might be appropriate. The Minister decides to add, or not to add, the species to the list of threatened species under the EPBC Act. More detailed information about the listing process is at:

<http://www.environment.gov.au/biodiversity/threatened/nominations.html>.

To promote the recovery of listed threatened species and ecological communities, conservation advices and where required, recovery plans are made or adopted in accordance with Part 13 of the EPBC Act. Conservation advices provide guidance at the time of listing on known threats and priority recovery actions that can be undertaken at a local and regional level. Recovery plans describe key threats and identify specific recovery actions that can be undertaken to enable recovery activities to occur within a planned and logical national framework. Information about recovery plans is available on the department's website at:

<http://www.environment.gov.au/biodiversity/threatened/recovery.html>.

## **Information about this consultation process**

Responses to this consultation can be provided electronically or in hard copy to the contact addresses provided on Page 1. All responses received will be provided in full to the Committee and then to the Australian Government Minister for the Environment.

In providing comments, please provide references to published data where possible. Should the Committee use the information you provide in formulating its advice, the information will be attributed to you and referenced as a 'personal communication' unless you provide references or otherwise attribute this information (please specify if your organisation requires that this information is attributed to your organisation instead of yourself). The final advice by the Committee will be published on the department's website following the listing decision by the Minister.

Information provided through consultation may be subject to freedom of information legislation and court processes. It is also important to note that under the EPBC Act, the deliberations and recommendations of the Committee are confidential until the Minister has made a final decision on the nomination, unless otherwise determined by the Minister.

# *Euastacus bindal*

(a freshwater crayfish)

## Taxonomy

Conventionally accepted as *Euastacus bindal* (Morgan 1989).

## Species Information

### Description

*Euastacus bindal* is a species of small freshwater crayfish of the genus *Euastacus*. This species is less spiny than other members of the genus (Coughran 2008), with minimal spination on the abdomen and thorax in particular. However, the species does have two distinctive rows of spines along the fixed 'finger' of the claw (propodus) (Furse et al., 2012a). The species has a maximum size of approximately 37 mm in length from the eye region to the end of the main body segment (occipital carapace length (OCL)) and a maximum weight of approximately 34 g (McCormack 2012).

The species colouration ranges from dull green to green-brown above and from dull orange to brownish-purple below (Furse et al., 2012a; McCormack 2012). The top sides of the pincers are teal-blue to green in colour with a distinctive light-brown mottled pattern, while the undersides transition from a mottled light blue or blue-green colour near the tips to a mottled reddish or orange-brown colour near the base, and the spines are tinted yellow, reddish or orange-brown at the tips (Furse et al., 2012a; McCormack 2012).

*Euastacus bindal* is not likely to be misidentified, as it is readily distinguished from the only other species of freshwater crayfish occurring on Mt. Elliot (*Cherax cairnsensis*).

### Distribution

Many species in the genus *Euastacus* are endemic to single mountain-tops, with each species restricted to the cool summit regions of its mountain and isolated from other members of the genus by the intervening warmer lowlands (Ponniah & Hughes 2004). *Euastacus bindal* is endemic to Mount Elliot, in central Queensland. Mount Elliot is wholly within Bowling Green Bay National Park, which is approximately 30 km south-west of Townsville (McCormack 2012). Mount Elliot is a remote and isolated peak and *Euastacus bindal* has a very restricted distribution within this high-altitude region (McCormack 2012). Suitable rainforest stream habitat is extremely limited in extent on Mount Elliot, and this habitat type is restricted to very small areas of gully near to the mountain's peak (Furse et al., 2012a). The nearest comparable high altitude habitat is approximately 250 km to the north near Cairns, Queensland (Coughran & Furse 2010). The sole population of *Euastacus bindal* is protected as it is contained within the Bowling Green Bay National Park boundary, but the conservation of this species is not actively managed.

The distribution of *Euastacus bindal* has been well surveyed by Furse et al. (2012a), with the species extent of occurrence estimated to be 1.06 km<sup>2</sup>. While small additional areas of habitat harbouring crayfish might exist on Mount Elliot, due to the very small size of these potential patches of suitable habitat, the distribution of the species is unlikely to be considerably larger than estimated by Furse et al. (2012a). An earlier IUCN Red List of Threatened Species assessment found that the extent of occurrence and area of occupancy of *Euastacus bindal* were both less than 10 km<sup>2</sup> (Furse & Coughran 2010).

### Cultural Significance

The species is not known to have any cultural significance, but in the original taxonomic description (Morgan 1989) the species was named after the Bindal language of the local Indigenous group (Furse et al., 2012a).

## Relevant Biology/Ecology

*Euastacus bindal* inhabits the small well-shaded headwater streams in rainforest habitats at altitudes above approximately 830 m on Mount Elliot (Furse et al., 2012a). During a survey expedition in 2011 the species was collected at altitudes between approximately 830 m and 1100 m, which is near to the highest point of the mountain at 1221 m (Furse et al., 2012a).

With the exception of *E. armatus*, the other 51 species of *Euastacus* are typically associated with specific vegetation types (Coughran & Furse 2010, Furse & Coughran 2011a). The high-altitude streams and damp-soaks inhabited by *Euastacus bindal* are closely-associated with subtropical rainforest vegetation featuring rainforest spinach (*Elatostema reticulatum*) (Furse et al., 2012a), a plant that appears to be a reliable indicator for the presence of a number of other *Euastacus* species in eastern Australia (Coughran 2011a).

*Euastacus bindal* appears to rely on subsurface moisture during the dry season when typical 'flowing' habitat is not available, at which time it engages in burrow-dwelling behaviour (Furse et al., 2012a). The species does not appear to construct extensive burrow networks, however individuals utilise small excavated refuges around rocks in the streambed (Furse et al., 2012a).

The biology and ecology of *Euastacus bindal* is not well understood with only a single preliminary study (i.e. Furse et al., 2012a) completed to date. It is likely the biology of this species is broadly similar to the other small, less-spiny species of *Euastacus* that are endemic to the eastern extent of the Queensland-New South Wales border (e.g. *E. mirangudjin* and *E. gumar*) (Furse et al., 2012a). These species are slow growing and late maturing (only becoming reproductive at 5-8 years), reproductive capacity of females is typically very low (approximately 20-80 eggs per female) compared to other members of the genus and females may only breed biennially (as is common for some *Euastacus*) (Coughran 2011a, b). Based on growth studies of other species within the genus, it is possible *Euastacus bindal* could be very long-lived (i.e. >30 years) (Furse & Wild 2004, Coughran 2013).

## Threats

The most significant potential threat to *Euastacus bindal* is climate change. The species already occupies the highest available habitat on Mount Elliot, and the closest suitable habitat is separated by 250 km of intervening lowlands that form barriers to dispersal. Therefore, the species would be unable to retreat to an alternative location if its current habitat were compromised, or to move to higher ground in response to potential future climate change (Furse et al., 2012a). Given its highly restricted range, *Euastacus bindal* is also extremely susceptible to stochastic events, such as localised impacts arising from natural disasters, severe weather events and bushfires (Furse et al., 2012a). Weed incursion, collection, invasive species and disease/pathogen exposure may also impact *Euastacus bindal* (Furse et al., 2012a).

Table 1 – Threats impacting the *Euastacus bindal* in approximate order of severity of risk, based on available evidence

Threat factor	Threat type	Threat status	Evidence base
Climate change			
Climate change	likely	current and future	<p>The increased temperatures, decreased rainfall and increased frequency of severe weather events that occur as a result of climate change pose a serious threat to this species.</p> <p>Studies of thermal tolerance limits indicate that other species in the <i>Euastacus</i> genus display signs of physiological stress at approximately 23 degrees Celsius and become incapacitated at approximately 27 degrees (Bone et al., 2014). <i>Euastacus bindal</i> already occupies the upper altitudinal reaches of its range and the next closest suitable habitat is approximately 250 km distance and separated by uninhabitable lowlands. Therefore, the species is unable to move into cooler environments in response to increasing temperatures (Furse 2010, 2014),</p> <p>Furthermore, the species has been shown to be at risk from natural disasters, including droughts, cyclones and other severe weather events (Furse et al., 2012b), all of which are predicted to be exacerbated under future climate change scenarios.</p> <p>Climatic modelling of the Townsville region predicts increased temperatures, decreased rainfall and increased frequency of severe weather events under future climate change scenarios (Hennessy 2006; IPCC 2007; Furse et al., 2012a). Therefore, <i>Euastacus bindal</i> is likely to be particularly susceptible to climate change, which may lead to significant reductions in the area of occupancy and number of mature individuals for the species.</p>
Habitat loss and disturbance			
Natural Disasters	known and potential	current and future	<p>Given its restricted range, <i>Euastacus bindal</i> is highly susceptible to natural disasters such as extended heatwaves, droughts and tropical cyclones, any of which could conceivably extirpate the species (Furse et al., 2012b).</p> <p>Surveys conducted in 2011 noted that vegetation on Mount Elliot (including vegetation at the summit) had been substantially damaged by Tropical Cyclone Yasi (Furse et al, 2012a). Any reduction in the quality or availability of habitat within the range of <i>Euastacus bindal</i> is likely to directly affect the species.</p>

			<p>Surveys also noted that while rainfall in North Queensland had been relatively high in 2011, by September headwater streams on Mount Elliot had ceased flowing and only a few small isolated pools and damp soaks were evident (Furse et al., 2012a). It is conceivable that a lack of rainfall could lead to a reduction in the already limited habitat available for the species.</p> <p>Wide-scale severe weather events that have the capacity to reduce the extent and quality of habitat available to the species, such as those listed above, may also lead to reductions in the population size of <i>Euastacus bindal</i> (Furse et al., 2012b).</p> <p>Similarly, species with such highly restricted extents of occurrence are extremely susceptible to the effects of small-scale natural disasters, such as highly localised high-intensity rainfalls, flash-flood events and landslides, and any subsequent siltation events (Furse &amp; Coughran 2011b; Furse et al., 2012b). For example, in another <i>Euastacus</i> species, the strong crayfish (<i>E. valentulus</i>), a mass mortality was recorded following a single, high intensity rainfall event that led to a flash flood in the Numinbah Valley in southeast Queensland in 2008 (Furse et al., 2012b).</p>
Weed incursion	known	current and future	<p>A number of highly invasive, non-native vegetation species are known on Mount Elliot, including Lantana (<i>Lantana camara</i>) and Siam Weed (<i>Chromolaena odorata</i>) and these have considerable potential to negatively impact the single population of this species (Anonymous, nomination., 2015). Weed incursion has been identified as a potential threat to other <i>Euastacus</i> species due to the potential for riparian and aquatic weeds to degrade habitat (TSSC 2016) and smother water-bodies.</p>
Illegal collection			
Illegal collection	known	current and future	<p>Illegal collection of <i>Euastacus</i> species for personal collections and the aquarium trade has been well documented (Coughran 2007, Coughran &amp; Furse 2012). These illegal collectors are known to target rare and critically endangered species, including species whose distribution lies within National Parks boundaries (Coughran &amp; Furse 2012). There is anecdotal evidence to suggest that collectors have attempted (unsuccessfully) to poach <i>Euastacus bindal</i> on Mount Elliot within the last five years, while recent photographic evidence indicates reproductive sized female and male specimens have been successfully collected and illegally</p>

			<p>removed from the mountain (Anonymous, nomination., 2015).</p> <p>Any collection of rare and relatively poorly understood species such as <i>Euastacus bindal</i> has the capacity to lead to serious negative consequences for the species. The removal of reproductive animals from the population, especially females that likely require more than five years to reach sexual maturity, could have very serious implications for the species' reproduction in general and particularly for the recruitment of juveniles to higher-age classes (Anonymous, nomination., 2015).</p> <p>However, the characteristics of species in the <i>Euastacus</i> genus generally indicates that they are difficult to keep in captivity, which may deter unauthorised collectors who intend to keep an illegal colony (Furse et al., 2016). Further, <i>Euastacus bindal</i> live in rugged, remote terrain which may also limit illegal collection.</p> <p>The threat posed by illegal collection is currently unknown.</p>
Diseases/pathogens			
Diseases pathogens	potential	current and future	<p>The unregulated activities of illegal collectors have the potential to provide a vector for the transmission of diseases and pathogens between waterways and isolated areas of habitat on Mount Elliot. Illegal collectors are not subject to any hygiene protocols that are typically specified within the conditions associated with Scientific Collection permits (e.g. Coughran &amp; Furse 2012). Given its highly restricted distribution, <i>Euastacus bindal</i> is extremely susceptible to the accidental introduction of a disease or pathogen, by any means (Furse et al., 2012a).</p>
Fire			
Bushfire	potential	current and future	<p>During the dry season and periods of drought, the dry eucalypt and wet sclerophyll forests at mid-altitudes on Mount Elliot are susceptible to occasional wildfires. In 2011 wildfires were observed in the vicinity of surveys for <i>Euastacus bindal</i> at altitudes of at least 550 m (Furse et al., 2012a). It is conceivable that in sufficiently dry conditions wildfires could penetrate upslope into the vegetation surrounding the peak of Mount Elliot and impact directly or indirectly on the <i>E. bindal</i> population.</p>

Invasive species			
Predation by feral cats and foxes	potential	future	Other potential threats to <i>Euastacus bindal</i> are predation and habitat disturbance by exotic terrestrial species that have been found to generally impact on freshwater spiny crayfish, such as foxes ( <i>Vulpes vulpes</i> ) (Green & Osborne 1981; Carey et al., 2003) and feral cats ( <i>Felis catus</i> ). Feral cats and foxes are known to occur within the Mount Elliot region and National Parks in the area (Furse et al., 2012a).
Habitat disturbance by feral pigs	potential	current and future	Feral pigs ( <i>Sus scrofa</i> ) are also known to occur in the region and have the potential to seriously impact the <i>Euastacus bindal</i> population by contributing to a reduction in the extent or quality of habitat available to the species (Furse et al., 2012a).

### **Assessment of available information in relation to the EPBC Act Criteria and Regulations**

Criterion 1. Population size reduction (reduction in total numbers)			
Population reduction (measured over the longer of 10 years or 3 generations) based on any of A1 to A4			
	Critically Endangered Very severe reduction	Endangered Severe reduction	Vulnerable Substantial reduction
A1	≥ 90%	≥ 70%	≥ 50%
A2, A3, A4	≥ 80%	≥ 50%	≥ 30%
<p>A1 Population reduction observed, estimated, inferred or suspected in the past and the causes of the reduction are clearly reversible AND understood AND ceased.</p> <p>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.</p> <p>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]</p> <p>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.</p> <p style="text-align: center;">based on any of the following</p> <p>(a) direct observation [except A3]</p> <p>(b) an index of abundance appropriate to the taxon</p> <p>(c) a decline in area of occupancy, extent of occurrence and/or quality of habitat</p> <p>(d) actual or potential levels of exploitation</p> <p>(e) the effects of introduced taxa, hybridization, pathogens, pollutants, competitors or parasites</p>			

#### **Evidence:**

*Euastacus bindal* was first described in 1989 (Morgan 1989). However, until recently, no further information was documented regarding the status of this species in the wild (Furse & Coughran, 2011a). Surveys conducted in September 2011 recorded a total of 24 crayfish, all restricted to a very limited area (Furse et al., 2012a). These surveys recorded densities of up to three crayfish per square metre; however an estimate of the total population size of the species was not provided (Furse et al., 2012a). Due to the lack of data available on the current and past population size of *Euastacus bindal*, is not possible to assess whether this species has undergone any reduction in population size over a three generation period.



There is insufficient data available to demonstrate if this species is eligible for listing under this criterion. However, the purpose of this consultation document is to elicit additional information to better understand the species' status. This conclusion should therefore be considered tentative at this stage, as it may be changed as a result of responses to this consultation process.

Criterion 2. Geographic distribution as indicators for either extent of occurrence AND/OR area of occupancy			
	Critically Endangered Very restricted	Endangered Restricted	Vulnerable Limited
B1. Extent of occurrence (EOO)	< 100 km <sup>2</sup>	< 5,000 km <sup>2</sup>	< 20,000 km <sup>2</sup>
B2. Area of occupancy (AOO)	< 10 km <sup>2</sup>	< 500 km <sup>2</sup>	< 2,000 km <sup>2</sup>
AND at least 2 of the following 3 conditions indicating distribution is precarious for survival:			
(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:

The Department of the Environment estimate the extent of occurrence (EOO) of *Euastacus bindal* as 4 km<sup>2</sup>, based on the IUCN minimum convex hull method, and estimate the species' area of occupancy (AOO) as 4 km<sup>2</sup>, based on the IUCN 2x2 km grid cell method (DotE 2016). These figures are derived from the mapping of point records from 1996 to 2016, obtained from state governments, museums and Geoscience Australia (DotE 2016). Conversely, Furse et al. (2012a) estimate the species' EOO as 1.06 km<sup>2</sup>, based on the IUCN minimum distance polygon method, and suggest the species' AOO is likely to be a few hundred square meters of habitat at most. In both instances, the species' EOO (significantly <100 km<sup>2</sup>) and AOO (<10 km<sup>2</sup>) are considered to be very restricted based on the IUCN Red List Guidelines (IUCN 2016).

*Euastacus bindal* is known to occur at a single location on Mount Elliot and the species distribution within this location is fragmented between two streams which are separated by near-vertical terrain that is mostly impassable to humans, and almost certainly to crayfish as well (Furse et al., 2012a). In addition, the small patches of suitable stream habitat are surrounded by far larger areas of unsuitable habitat (i.e. dry/wet sclerophyll forest, with no streams) or barren rock faces (Furse et al., 2012a).

Surveys on Mount Elliot in 2011 noted declines in quality of habitat available to *Euastacus bindal* as a result of severe weather events and drying of streams (Furse et al., 2012a). Furthermore, studies on the thermal tolerance limits of other *Euastacus* species suggest that members of the genera are likely to be at risk from increasing environmental temperatures (Bone et al., 2014), which are predicted by climate change modelling of the region (IPCC 2007). Therefore, continuing declines in area, extent and/or quality of habitat can be inferred based on likely impacts of climate change, including increased temperatures, decreased rainfall and increased frequency of severe weather events (Furse et al., 2012a).

The data presented above appear to demonstrate that *Euastacus bindal* is **eligible for listing as critically endangered** under this criterion. However, the purpose of this consultation document is to elicit additional information to better understand the species' status. This conclusion should therefore be considered to be tentative at this stage, as it may be changed as a result of responses to this consultation process.

Criterion 3. Population size and decline			
	Critically Endangered Very low	Endangered Low	Vulnerable Limited
Estimated number of mature individuals	< 250	< 2,500	< 10,000
AND either (C1) or (C2) is true			
C1 An observed, estimated or projected continuing decline of at least (up to a max. of 100 years in future)	Very high rate 25% in 3 years or 1 generation (whichever is longer)	High rate 20% in 5 years or 2 generation (whichever is longer)	Substantial rate 10% in 10 years or 3 generations (whichever is longer)
C2 An observed, estimated, projected or inferred continuing decline AND its geographic distribution is precarious for its survival based on at least 1 of the following 3 conditions:			
(a) (i) Number of mature individuals in each subpopulation	≤ 50	≤ 250	≤ 1,000
(a) (ii) % of mature individuals in one subpopulation =	90 – 100%	95 – 100%	100%
(b) Extreme fluctuations in the number of mature individuals			

### Evidence:

Surveys conducted in September 2011 recorded a total of 24 individuals of *Euastacus bindal*, of these 11 crayfish were male, eight were female and five were too small to be assigned to a gender class (Furse et al., 2012a). No females carrying eggs or young were recorded; however the presence of young of the year suggested that breeding had occurred over the previous winter (Furse et al., 2012a). Researchers noted that all specimens were restricted to a very limited area, but within this area crayfish were present at densities of up to three individuals per square metre (Furse et al., 2012a). Researchers noted that *Euastacus bindal* appears to be exceptionally rare and sparsely distributed within its highly restricted range on Mount Elliot, however they were unable to provide an estimate of the total population size of the species (Furse et al., 2012a).

Given Furse et al (2012a) estimate the extent of occurrence of *Euastacus bindal* as 1.06 km<sup>2</sup> (based on the IUCN minimum distance polygon method), and area of occupancy is restricted to a very limited amount of streamside habitat within this extent, it is highly likely that the number of mature individuals is likely to be in the order of tens to hundreds only (i.e. very-low to low). However, Furse et al (2012a) reported their survey effort in terms of time expended, rather than area or length of stream searched, so it is not possible to extend those data across the amount of habitat available to generate a robust quantitative assessment of population size. Furthermore, the lack of data available on the past and current population size of *Euastacus bindal*, prohibits any assessment of the species' population trajectory, including potential ongoing declines in the number of mature individuals.

The information presented above appears to be insufficient to demonstrate if the species is eligible for listing under this criterion. However, the purpose of this consultation document is to elicit additional information to better understand the species' status. This conclusion should therefore be considered to be tentative at this stage, as it may be changed as a result of responses to this consultation process.

Criterion 4. Number of mature individuals			
	Critically Endangered Extremely low	Endangered Very Low	Vulnerable Low
Number of mature individuals	< 50	< 250	< 1,000

#### Evidence:

As described under Criterion 3, it is likely that the population of *Euastacus bindal* is relatively small, however it is not possible to generate a robust estimate of population size from the data available.

The information presented above appears to be insufficient to demonstrate if the species is eligible for listing under this criterion. However, the purpose of this consultation document is to elicit additional information to better understand the species' status. This conclusion should therefore be considered to be tentative at this stage, as it may be changed as a result of responses to this consultation process.

Criterion 5. Quantitative Analysis			
	Critically Endangered Immediate future	Endangered Near future	Vulnerable Medium-term future
Indicating the probability of extinction in the wild to be:	≥ 50% in 10 years or 3 generations, whichever is longer (100 years max.)	≥ 20% in 20 years or 5 generations, whichever is longer (100 years max.)	≥ 10% in 100 years

#### Evidence:

Population viability analysis appears not to have been undertaken, there are insufficient data to demonstrate if the species is eligible for listing under this criterion. However, the purpose of this consultation document is to elicit additional information to better understand the species' status. This conclusion should therefore be considered to be tentative at this stage, as it may be changed as a result of responses to this consultation process.

### Conservation Actions

#### Recovery Plan

A decision about whether there should be a recovery plan for this species has not yet been determined. The purpose of this consultation document is to elicit additional information to help inform this decision.

#### Primary Conservation Actions

The primary conservation action for *Euastacus bindal* is to resolve knowledge gaps relating to the potential threats to the species and prioritise conservation actions based on the likely impacts associated with each threat.

#### Conservation and Management Priorities

Habitat loss and disturbance

- Develop a rapid response strategy for habitat rehabilitation following severe weather events. This might include the rapid replanting of vegetation in the event of widespread destruction from a cyclone or fire.
- Continue to actively manage the Siam weed infestation on Mount Elliot and consider the need to also control other invasive weeds that may impact on crayfish habitat.

#### Invasive species

- Consider implementing a control program if feral species are found to be impacting upon crayfish.

#### Illegal collection

- Develop and install signage to inform people of the total ban on recreational fishing of any *Euastacus* species in Queensland.

#### Survey and Monitoring priorities

- More precisely assess the population size, distribution and ecological requirements of *Euastacus bindal*.
- Design and implement a monitoring program for *Euastacus bindal*.

#### Information and Research priorities

- Improve knowledge of the reproductive biology, age structure and growth rates of *Euastacus bindal*.
- Improve knowledge of the thermal tolerance limits of *Euastacus bindal* and assess its possible response to future climate scenarios.
- Evaluate the potential impacts of feral predators on *Euastacus bindal*.
- Identify all potential threats to *Euastacus bindal*, assess the relative impacts of each threatening process and rank threats accordingly.
- Prioritise conservation actions for the species and develop specific management guidelines for the Mount Elliot Park Rangers.
- Consider developing a strategic translocation strategy addressing the *Euastacus* group in response to the threat of climate change. Strategy should include consideration of undertaking a coordinated series of translocations of individual *Euastacus* species to mountain tops further south as increased temperatures impact on survival and breeding.

#### References cited in the advice

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## **Collective list of questions – your views**

### **Biological information**

1. Can you provide any references, information or estimates on longevity, average life span and generation length?
2. Can you provide any information regarding the general requirements for recruitment?

### **Population size**

3. Has the survey effort for this species been adequate to determine its national adult population size? If not, please provide justification for your response.
4. Can you provide an estimate of the current population size of mature adults of this species (national extent)? Please provide supporting justification or other information.

If, because of uncertainty, you are unable to provide a single number, you may wish to provide an estimated range. If so, please choose one of the ranges suggested in the table below of possible species numbers, and also choose the level of confidence you have in this estimate:

Number of mature individuals is estimated to be in the range of:	
<input type="checkbox"/> 1–50	<input type="checkbox"/> 51–250 <input type="checkbox"/> 251–1000 <input type="checkbox"/> >1000 <input type="checkbox"/> >10 000
Level of your confidence in this estimate:	
<input type="checkbox"/> 0–30% - low level of certainty/ a bit of a guess/ not much information to go on	
<input type="checkbox"/> 31–50% - more than a guess, some level of supporting evidence	
<input type="checkbox"/> 51–95% - reasonably certain, information suggests this range	
<input type="checkbox"/> 95–100% -high level of certainty, information indicates quantity within this range	
<input type="checkbox"/> 99–100% - very high level of certainty, data are accurate within this range	

### **Evidence of total population size change**

5. Are you able to provide an estimate of the total population size during any past or future three-generation period?

If, because of uncertainty, you are unable to provide a single number, you may wish to provide an estimated range. If so, please choose one of the ranges suggested in the table below of possible species numbers, and also choose the level of confidence you have in this estimate.

Number of mature individuals is estimated to be in the range of:	
<input type="checkbox"/> 1–50	<input type="checkbox"/> 51–250 <input type="checkbox"/> 251–1000 <input type="checkbox"/> >1000 <input type="checkbox"/> >10 000
Level of your confidence in this estimate:	

- ☐ 0–30% - low level of certainty/ a bit of a guess/ not much information to go on
- ☐ 31–50% - more than a guess, some level of supporting evidence
- ☐ 51–95% - reasonably certain, information suggests this range
- ☐ 95–100% -high level of certainty, information indicates quantity within this range
- ☐ 99–100% - very high level of certainty, data are accurate within this range

6. Are you able to comment on the extent of decline in the species' total population size over any past, current or future three generation period? Please provide justification for your response.

If, because of uncertainty, you are unable to provide an estimate of decline, you may wish to provide an estimated range. If so, please choose one of the ranges suggested in the table below of ranges of decline, and also choose the level of confidence you have in this estimated range.

Decline estimated to be in the range of:

- ☐ 1–30%      ☐ 31–50%      ☐ 51–80%      ☐ 81–100%      ☐ 90–100%

Level of your confidence in this estimated decline:

- ☐ 0–30% - low level of certainty/ a bit of a guess/ not much information to go on
- ☐ 31–50% - more than a guess, some level of supporting evidence
- ☐ 51–95% - reasonably certain, suggests this range of decline
- ☐ 95–100% -high level of certainty, information indicates a decline within this range
- ☐ 99–100% - very high level of certainty, data are accurate within this range

7. Please provide (if known) any additional evidence which shows the population is stable, increasing or declining.

### **Current Distribution/range/extent of occurrence, area of occupancy**

8. Does the information consider the entire geographic extent and national extent of the species? If not, please provide justification for your response.
9. Has the survey effort for this species been adequate to determine its national distribution? If not, please provide justification for your response.
10. Is the distribution as described valid? If not, please provide justification for your response and provide alternate information.
11. Do you agree that the way the current extent of occurrence and/or area of occupancy have been estimated is appropriate? Please provide justification for your response.



Can you provide estimates (or if you disagree with the estimates provided, alternative estimates) of the extent of occurrence and/or area of occupancy.

If, because of uncertainty, you are unable to provide an estimate of extent of occurrence, you may wish to provide an estimated range. If so, please choose one of the ranges suggested in the table below of ranges of extent of occurrence, and also choose the level of confidence you have in this estimated range.

Extent of occurrence is estimated to be in the range of: <input type="checkbox"/> <100 km <sup>2</sup> <input type="checkbox"/> 100 – 5 000 km <sup>2</sup> <input type="checkbox"/> 5 001 – 20 000 km <sup>2</sup> <input type="checkbox"/> >20 000 km <sup>2</sup>
Level of your confidence in this estimated extent of occurrence <input type="checkbox"/> 0–30% - low level of certainty/ a bit of a guess/ not much data to go on <input type="checkbox"/> 31–50% - more than a guess, some level of supporting evidence <input type="checkbox"/> 51–95% - reasonably certain, data suggests this range of decline <input type="checkbox"/> 95–100% -high level of certainty, data indicates a decline within this range <input type="checkbox"/> 99–100% - very high level of certainty, data is accurate within this range

If, because of uncertainty, you are unable to provide an estimate of area of occupancy, you may wish to provide an estimated range. If so, please choose one of the ranges suggested in the table below of ranges of area of occupancy, and also choose the level of confidence you have in this estimated range.

Area of occupancy is estimated to be in the range of: <input type="checkbox"/> <10 km <sup>2</sup> <input type="checkbox"/> 11 – 500 km <sup>2</sup> <input type="checkbox"/> 501 – 2000 km <sup>2</sup> <input type="checkbox"/> >2000 km <sup>2</sup>
Level of your confidence in this estimated extent of occurrence: <input type="checkbox"/> 0–30% - low level of certainty/ a bit of a guess/ not much data to go on <input type="checkbox"/> 31–50% - more than a guess, some level of supporting evidence <input type="checkbox"/> 51–95% - reasonably certain, data suggests this range of decline <input type="checkbox"/> 95–100% -high level of certainty, data indicates a decline within this range <input type="checkbox"/> 99–100% - very high level of certainty, data is accurate within this range

### Change in status/rate of change

12. Is the information used to identify the nationally threatened status of the species robust? Have all the underlying assumptions been made explicit? Please provide justification for your response.

## **General**

13. Can you provide additional data or information relevant to this assessment?
14. Have you been involved in developing this nomination? If so in what capacity?

## **Threats**

15. Do you agree that the threats listed are correct and that their effect on the species is significant?
16. To what degree are the identified threats likely to impact on the species in the future?
17. Can you provide additional or alternative information on threats, past, current or potential, that may adversely affect this species at any stage of its life cycle?
18. Can you provide supporting data/justification or other information for your responses to these questions about threats?

## **Management**

19. What planning, management and recovery actions are currently in place supporting protection and recovery of the species? To what extent have they been effective?
20. Can you recommend any additional or alternative specific threat abatement or conservation actions that would aid the protection and recovery of the species?
21. What individuals or organisations are currently, or potentially could be, involved in management and recovery of the species?