Internal use only	
Reference Number	/

Nomination to change the conservation class of a species under the Queensland *Nature Conservation Act 1992*

Complete this form to nominate a species for assessment of its conservation class under the *Nature Conservation Act 1992* (NC Act). Any subspecies, variety, race, hybrid, mutation or geographically separate population (hereafter 'species') can be nominated. The appropriate conservation class will be selected during an expert assessment process and, following approval processes, reflected in the next suitable update of the NC Act.

A species may be nominated to an appropriate conservation class from any other conservation class. The nomination assessment process may result in a species being recommended to the conservation class as nominated, or to a class better supported by scientific data and expert opinion. Assessments and nominations will be shared with the Commonwealth and other Australian jurisdictions within the species' distribution.

All plant and vertebrate species native to Queensland are protected under the NC Act and classified as Least Concern unless found eligible for a different conservation class. Invertebrate species are only protected under the NC Act if specifically named under a conservation class. A species can be nominated for listing or reassignment from any conservation class to:

A national threat category:

- Extinct (EX), Extinct in the Wild (EW), Critically Endangered (CR), Endangered (E) or Vulnerable (V) if it meets at least one of the International Union for Conservation of Nature (IUCN) criteria for species at risk of extinction

A state threat class:

- Near Threatened (NT) if the species meets at least one of the criteria for species at risk of becoming threatened in the future based on concerns relating to population dynamics or threats
- Least Concern (LC) if evidence is provided that no criteria for a higher class have been met, and the species won't become eligible for a higher class in the foreseeable future should conservation actions cease due to reclassification.

The assessment of species against the national threat categories reflected in this form complies with the Memorandum of Understanding for the Common Assessment Method (CAM) between the Commonwealth and Australian states and territories. The objective of the CAM is for partner jurisdictions to adopt each other's national assessments as appropriate. Information about the CAM can be found at https://www.qld.gov.au/environment/plants-animals/wildlife-permits/common-assessment.

To nominate a species with an Australian distribution that is not restricted to Queensland, use the nomination form and guidelines at http://www.environment.gov.au/biodiversity/threatened/nominations/forms-and-guidelines and email the completed form to the Australian Government at EPBC.nominations@environment.gov.au.

Important notes for completing this form

- **To enable a species eligibility for listing to be assessed against the criteria, please complete the form as comprehensively as possible by providing a response in each box with an orange border.**
- Completing a nomination is a demanding task. Nominators are encouraged to seek advice from experts where appropriate to assist in completing the nomination form.
- The opinion of scientific experts may be cited as personal communication with their approval. Please provide the experts' names, qualifications and contact details (including employment in a government agency if relevant) in the reference list at the end of the form.
- Include any available information and analysis or state when the required information is not available.
- Figures, tables and maps can be included at the end of the form or provided as separate electronic files or hardcopy documents (referenced as appendices or attachments in your nomination).
- Cross-reference relevant areas of the nomination form where needed.
- **Reference all information sources**, both in the text and in a reference list at the end of the form. Identify confidential material and the reason it is sensitive. With the exception of information you have identified as confidential, nominations under the CAM process may be made available by a state, territory or the Commonwealth Government to experts or the public for comment, and their contents may be published.
- If the species becomes listed nationally, the Australian Government will publish nomination information on its SPRAT website as a Conservation Advice. Your details as nominator will not be released and will be treated as confidential information.
- Guidance on interpreting this nomination form can be found in the "*Guidelines for Assessing the Conservation Status of Native Species*" developed by the Australian Government under the EPBC Act here http://www.environment.gov.au/biodiversity/threatened/nominations/forms-and-guidelines. Although not fully relevant under the NC Act, the guidelines provide assistance on several aspects of this form. Please email SpeciesTechnical.Committee@des.qld.gov for further advice on completing the nomination.

Further information on selected questions

INTRODUCTION

In accordance with the CAM, the Commonwealth Government is the default assessment 'lead' for species occurring across multiple Australian jurisdictions. Upon receipt, the nomination will be subject to a prioritisation and assessment process under the EPBC Act. Download the nomination form here http://www.environment.gov.au/system/files/pages/d72dfd1a-f0d8-4699-8d43-5d95bbb02428/files/nomination-form-species.pdf, and email it to epbc.nominations@environment.gov.au. For further information on the EPBC Act nomination, prioritisation and assessment process go to http://www.environment.gov.au/biodiversity/threatened/nominations.

Note: where the relevant jurisdictions agree, a State or Territory (rather than the Commonwealth) may lead the assessment of a cross-jurisdictional species in consultation with the Commonwealth and other relevant jurisdictions.

A nomination for a species endemic to Queensland or with its only Australian distribution in Queensland, for example a species that occurs in Queensland and Papua New Guinea, can be assessed under the NC Act. Completed nomination forms should be submitted to SpeciesTechnical.Committee@des.qld.gov.au.

Species native to Queensland may be nominated for addition to any conservation class under the NC Act, or to be transferred between classes. If the taxon at risk is a population or hybrid, or if you wish to know if a species has

been unsuccessfully nominated under the NC Act in the past, please contact the Queensland Department of Environment and Science for advice at SpeciesTechnical.Committee@des.qld.gov.au.

To search for a species' conservation class under the NC Act refer to the *Nature Conservation (Wildlife) Regulation 2006*: https://www.legislation.qld.gov.au/view/html/inforce/current/sl-2006-0206.

You may also search the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) list of threatened species in the Species Profile and Threats Database (SPRAT) at www.environment.gov.au/cgi-bin/sprat/public/sprat.pl.

The full lists of threatened fauna and flora under the EPBC Act are available here:
www.environment.gov.au/cgi-bin/sprat/public/publicthreatenedlist.pl?wanted=fauna
www.environment.gov.au/cgi-bin/sprat/public/publicthreatenedlist.pl?wanted=flora.

A list of nominated species that did not meet the assessment criteria for listing under the EPBC Act are available at www.environment.gov.au/biodiversity/threatened/unsuccessful-species.html.

Nominations to transfer species from a threatened conservation class to Least Concern or Near Threatened under the NC Act can ignore sections marked with an asterisk (*).

SCIENTIFIC AND COMMON NAMES OF NOMINATED SPECIES

- Provide the currently accepted scientific and common name(s) for the species (including Indigenous names, where known). Note any other scientific names that have been used recently such as superseded names.

TAXONOMY

- Record the species' authority and the taxonomic group to which it belongs (Family name is sufficient for plants; both Order and Family name are required for fauna).
- Is the species known to hybridise with other species? Describe any cross-breeding with other species in the wild, indicating where and how frequently this occurs.

DISTRIBUTION

- Describe the species' current geographic distribution within Queensland, and where applicable, outside Australia.
- Summarise current presence and absence information for the species including knowledge of regular or sporadic structured survey, intentional searches in nearby locations or likely habitat, or were the sightings incidental? Is there a high level of confidence that all possible locations are known, or is moderate or substantial additional survey required? If so, are high priority locations for further survey known? What is expert opinion on the likelihood of additional locations?
- Provide a map, if available, indicating latitude, longitude, map datum and location names
  - Indicate the percentage of the global population that occurs in Queensland, and what is its significance?
  - Is the Queensland population distinct, geographically isolated, or does part or all of the population migrate into/out of the Queensland jurisdiction?
  - Explain the relationship between the Queensland population and the global population.
  - Do global threats affect the Queensland population?
- Give locations of other existing or proposed populations such as populations that are captive, propagated, naturalised outside their range, recently re-introduced to the wild, and planned to be re-introduced. Note if these sites have been identified in recovery plans. Provide latitude, longitude, map datum and location name, where available, in an attached table.
- Give details of fauna species' home ranges/territories including any relevant daily and seasonal or irregular movement patterns, such as arrival/departure dates if migratory.
- Does the species occur within an EPBC Act listed ecological community? You will find a list of EPBC Act listed ecological communities here: www.environment.gov.au/cgi-bin/sprat/public/publiclookupcommunities.pl.

BIOLOGY/ECOLOGY

- **Life cycle**: Provide detail on the age at sexual maturity, average life expectancy, natural mortality rates, and generation length
  - "*Generation length*" is defined as the average age of parents of the current cohort (i.e. newborn individuals in the population) and reflects the turnover rate of breeding individuals in a population. Generation length is greater than the age at first breeding and less than the age of the oldest breeding individual, except in species that breed only once. Where generation length varies under threat, use the more natural pre-disturbance generation length. It is often calculated as = (longevity + age at maturity)/2. Provide details of the method(s) used to calculate the generation length.

- **Reproduction**: Provide detail on the reproductive requirements of this species.
  - **Flora**: When does the species flower and set fruit? What conditions are needed for this? What are the pollinating and seed dispersal mechanisms? If the species reproduces vegetatively, describe when, how and what conditions are needed. Does the species require a disturbance regime (e.g. fire, cleared ground) to reproduce?
  - **Fauna**: provide an overview of the species' breeding system and breeding success, including: when it breeds; what conditions are needed for breeding; whether there are any breeding behaviours that may make it vulnerable to a threatening process.
- **Habitat**
  - Provide information on aspect, topography, substrate, climate, forest type, associated species, sympatric species and anything else that is relevant to the species' habitat.
  - Explain how habitats are used (e.g. breeding, feeding, roosting, dispersing, basking, etc.).
  - Does the species use refuge habitat (e.g. in times of fire, drought or flood)? Describe this habitat.
- **Feeding (fauna):**
  - Summarise the feeding behaviours, diet, and the timing/seasonality associated with these. Include any behaviour that may make the species vulnerable to a threatening process.
- **Movement (fauna)**: provide information on daily and seasonal movement patterns.

IDENTIFICATION OF KNOWN THREATS AND IMPACTS OF THE THREATS

- For each threat, describe:
  a. whether it is actual or potential
  b. how and where it impacts on this species
  c. what its effect has been so far (is the threat known or suspected, does it only affect certain populations?) Present supporting information/research).
  d. its expected effect in the future (is the threat known or suspected, does it only affect certain populations, is there supporting research/information?) Present supporting information/research).
  e. its relative importance or the magnitude of the impact on the species.
- Identify and explain any additional biological characteristics particular to the species that are threatening to its survival (e.g. low genetic diversity).
- If subject to natural catastrophic events, i.e. events with a low predictability that are likely to severely affect the species, identify the type of event, its likely impact, and its likelihood of occurrence (e.g. a drought/cyclone in the area every 100 years). If **climate change** is an important threat to the species, provide referenced information on how climate change might significantly increase the species' vulnerability to extinction. Please refer to the *Guidelines for Assessing the Conservation Status of Native Species*: http://www.environment.gov.au/system/files/pages/d72dfd1a-f0d8-4699-8d43-5d95bbb02428/files/tssc-guidelines-assessing-species-2018.pdf.

*CONSERVATION ADVICE: THREAT ABATEMENT AND RECOVERY ACTIONS

- Describe how threats are or could be abated and/or species recovered.
- Identify who is undertaking these activities and how successful the activities have been to date.
- Describe any mitigation measures or approaches that have been developed specifically for the species at identified locations. Identify who is undertaking these activities and how successful the activities have been to date.
- For species nominated as Extinct in the Wild, provide location details for any naturalised or captive populations and the level of human intervention required to sustain the species.

IMPACT OF TRANSFERRING A THREATENED SPECIES TO NEAR THREATENED OR LEAST CONCERN

- Only complete this section if you are nominating a species for transfer to Near Threatened or Least Concern from a class of nationally threatened wildlife (Extinct, Extinct in the Wild, Critically Endangered, Endangered or Vulnerable).
- Provide details of the expected impact on the species if conservation actions ceased following its transfer out of a threatened wildlife class.

CURRENT LISTING CLASS AND CATEGORY

- Note: The term 'class' under the NC Act is equivalent to the term 'category' under the EPBC Act.
- Select the species' current class under the NC Act where applicable. Search the species' NC Act class here: https://www.legislation.qld.gov.au/view/html/inforce/current/sl-2006-0206.
- Select the species' current category under the EPBC Act where applicable. Search the Australian Government SPRAT Database here: www.environment.gov.au/cgi-bin/sprat/public/sprat.pl.

NOMINATED LISTING CLASS

- **After completing the section 'Eligibility against the criteria'** sufficient evidence should be available to determine your response to this section. Please select the NC Act class to which the species is being nominated.

REASONS FOR A NOMINATION TO TRANSFER TO ANOTHER CLASS

Please describe why the species is being nominated to transfer to another conservation class in Queensland:

- *Genuine.* The change in class is the result of a genuine status change that has taken place since the previous assessment. For example, the change is due to an increase in the rate of decline, a decrease in population or range size or habitat, or declines in these for the first time (owing to increasing/new threats).
- *Knowledge.* The change in class is the result of new knowledge, e.g. owing to new or newly synthesised information about the status of the taxon (e.g. better estimates for population size, range size or rate of decline).
- *Taxonomy.* The change in class is due to a taxonomic change adopted during the period since the previous assessment. Such changes include:
  - *newly split* (the taxon is newly elevated to species level)
  - *newly described* (the taxon is newly described as a species)
  - *newly lumped* (the taxon is recognised following lumping of two previously recognised taxa)
  - *no longer valid/recognised* (either the taxon is no longer valid, e.g. because it is now considered to be a hybrid, variant form or subspecies of another species, or the previously recognised taxon differs from a currently recognised one as a result of a split or lump).
- *Mistake*. The previous class was applied in error.
- *Other.* The change in class is the result of other reasons not easily covered by the above, and/or requires further explanation. Examples include change in assessor's attitude to risk and uncertainty.

INITIAL LISTING

- The reasons for the initial NC Act listing may be available in the original nomination for the species. This can be obtained by emailing the Department of Environment and Science's Species Technical Committee at SpeciesTechnical.Committee@des.qld.gov.au.
- The reasons for EPBC Act listing may also be available. Search for the species' EPBC Act listing and conservation advice for threatened species in the SPRAT Database www.environment.gov.au/cgi-bin/sprat/public/sprat.pl.
- If there is insufficient information to provide details of the reasons for the original listing, please state this.

CHANGES IN SITUATION LEADING TO THE NOMINATION TO TRANSFER TO ANOTHER CLASS

- Describe the changes that have occurred or are likely to occur to the species' population, range or habitat that influence the nomination to change the species' conservation class.

STANDARD OF SCIENTIFIC EVIDENCE AND ADEQUACY OR SURVEY

- Provide statements or expert opinion on the standard of evidence supplied in the nomination form, and the adequacy of the information provided.

ELIGIBILITY AGAINST CRITERIA

- For a species to be eligible as Near Threatened or a class of threatened wildlife, it must be assessed as meeting **at least one** of the five 'criteria' on this nomination form. For example, for a species listed as Vulnerable to be transferred to the Endangered class, it must meet the threshold/s for at least one of the five criteria for Endangered.
- A species does not have to be found eligible for the same class under all criteria; however, all questions must be answered. If information is not available for a criterion, a statement to this effect is required.
- If you hold unpublished data that support assessment of a criterion, you must provide them with the nomination.
- Standards for assessing a species' conservation status in Australia align with the IUCN Red List Criteria and Categories. Please refer to the IUCN guidelines for explanations of how to address the criteria https://www.iucnredlist.org/resources/redlistguidelines.
- Using the GeoCat assessment tool is highly recommended to ensure maps and calculations for Area of Occupancy (AOO) and Extent of Occurrence (EOO) meet IUCN standards (http://geocat.kew.org/, Bachman, S., Moat, J., Hill, A. W, De La Torre, J., & Scott, B. (2011), Supporting Red List threat assessments with GeoCAT: geospatial conservation assessment tool. ZooKeys, (150), 117).

  GeoCat provides the IUCN compatible estimates required by the CAM, for example: AOO must be greater than or equal to 4km2; all AOOs will be multiples of 4km2; and EOO must be greater than or equal to AOO. Re-centring the grid to ensure AOO doesn't look inaccurately large and detrimentally effect the true recognition of the threat level to the species is acceptable.

PUBLICATION APPROVAL AND CITATION

- Place a tick in the box and complete the suggested citation to have your name retained on the nomination form if it is published in full or provided outside the nomination process, for example, for ecological or other research purposes. You will not be contacted in relation to publication opportunities.

DECLARATION

- In signing this nomination form, you agree to grant the Queensland Government (as represented by the Department of Environment and Science) a perpetual, non-exclusive, worldwide, royalty-free licence to use, reproduce, publish, communicate and distribute information that you have provided in the nomination form that is not referenced to other sources with the exception of information specifically identified by you as confidential, in websites and publications and to promote those websites and publications in any medium.

  The Commonwealth, State and Territory governments have agreed to collaborate on national threatened species assessments using the CAM. As part of this collaboration, your nomination, including your details as nominator, may be provided to other government jurisdictions, who will also observe these privacy and confidentiality arrangements.

  As a nominator, your details are automatically subject to the provisions of the *Privacy Act 1988* and will not be divulged to third parties outside the species listing process unless you complete the publication and citation permission at the end of this form.

Nomination to change the conservation class of a species in Queensland

Details of the nominated species

SCIENTIFIC NAME OF SPECIES

Specify subspecies, variety, etc. where relevant

Euastacus maidae (Riek, 1956)

COMMON NAME(S)

Hinterland Spiny Crayfish, Hinterland crayfish

TAXONOMY

Provide any relevant detail on the species' taxonomy (e.g. authors of taxon or naming authority, year and reference; synonyms; Family and Order).

Crayfish in the Order Decapoda, Family Parastacidae. Formally described in Riek (1956) as *Euastacoides maidae. Euastacoides* was synonymised with *Euastacus* in Morgan (1988) because some species have intermediate characters of the two formerly different genera.The phylogenetic analyses of Shull et al. (2005) and molecular taxonomic analysis of Austin et al (2022) confirm its validity as a distint taxon.

*CONVENTIONAL ACCEPTANCE OF TAXONOMY

Is the species' taxonomy conventionally accepted?

☒Yes
☐No

If the species is not conventionally accepted, please provide the following information:

- a taxonomic description of the species in a form suitable for publication in conventional scientific literature

OR

- evidence that a scientific institution has a specimen of the species, and a written statement signed by a person who is a taxonomist and has relevant expertise (has worked with, or is a published author on, the group of species nominated) that the species is considered to be a new species.

Click or tap here to enter text.

*DESCRIPTION

Provide a description of the species. Include where relevant its distinguishing features, size and social structure. How distinct is this species in its appearance from other species? How likely is it to be misidentified?

Euastacus maidae is a small crayfish from the Springbrook National Park area of Southeast Queensland and Northeast NSW, on the QLD – NSW border. Coughran (2008) reported the maximum occipital carapace length (OCL) of *E. maidae* as 24.8 mm, which is Morgan's (1988) measurement of Riek's (1956) original type series. Recently, specimens up to about 50% larger have been measured (McCormack et al. in prep a). This species' back is generally dark green to brown, with a blue tint along the sides (McCormack 2012). However, colour is not a useful diagnostic characteristic in freshwater crayfish, since colour can vary greatly within species, even within a section of stream (J. Furse pers. comm. 2020). *Euastacus maidae* is relatively smooth, lacking most of the characteristic spines of many species of the genus on its thorax and abdomen (Riek 1956). This places it in the Poorly Spinose group of *Euastacus* species, which is characterised by a small body size, few spines and generally a restricted distribution (Coughran 2008). However, *Euastacus maidae* does have 4-5 mesial carpal spines, which may be yellow-tipped (McCormack 2012).

A section of the Gondwana Rainforest World Heritage Area along the Queensland – NSW border is home to *Euastacus maidae* and also hosts at least eight other species of broadly similar, poorly spinose *Euastacus* (Furse et al. 2013). These species are almost never sympatric with each other, but they are frequently sympatric with larger *Euastacus* species from the Spinose group (Coughran 2008). This is true for *E. maidae,* which is sympatric with *E. sulcatus* (Mountain Crayfish) in more upstream habitats (Riek 1956), and with *E. valentulus* (Strong Crayfish) in lower, downstream areas (Riek 1969). *Euastacus maidae* can be differentiated from these two species as they are more spiny and much larger in overall size (*E. valentulus* maximum OCL 91.1 mm; *E. sulcatus* maximum OCL 99.5 mm, Coughran 2008, reportedly as large as 120 mm; McCormack 2012). *Euastacus maidae* has been found sympatrically with juveniles of these other *Euastacus* species (Riek 1956), probably because they all share a similar habitat preference for smaller, more marginal creeks (Riek 1969; McCormack 2012). *Euastacus maidae* can be differentiated from juveniles of *E. sulcatus* and *E. valentulus* as these have white bands on somites 1 and 6 (McCormack 2012). At lower altitudes, *E. maidae* can also be sympatric with crayfish from other genera, *Cherax* and *Tenuibranchiurus* (McCormack 2012; McCormack et al. in prep a). *Euastacus maidae* can be differentiated from *Cherax* as the propodus (the fixed part of the chelae/claw) is smooth for *Cherax* and rough for *Euastacus,* with small ridges and spines. *Tenuibranchiurus* (25 mm body length) is often even smaller than *E. maidae* and has claws which close vertically rather than horizontally (Davie 2007).

While *E. maidae* is not known to be sympatric with other similar species from the poorly spinose group, they are geographically proximate. *Euastacus binzayedi* (Embezee's Crayfish) is found close by in Lamington National Park on the western side of the Numinbah Valley, with known sites for *Euastacus binzayedi* no more than 4 km to the west of known *E. maidae* sites (McCormack et al. in prep a,b). *Euastacus binzayedi* can be differentiated from *E. maidae* as *E. binzayedi* has many bumps and protrusions on the dorsal and ventral surfaces of its chelae (Furse et al. 2013). Another similar species, *Euastacus gurughi* (Swollen Crayfish), is found less than 20 km to the south at Wollumbin National Park near Mt. Warning. In *E. guruhgi* specimens, the ventromesial carpal spine nearest the mid-line (mesial) is the largest spine and is immediately ventral to another carpal spine of similar size, whereas in *E. maidae* a similar large mesial spine is more ventral (Coughran 2005).

DISTRIBUTION

Provide a succinct overview of the species' known or estimated current and past distribution, including international/national distribution. Provide a map if available.

What is the current evidence for the presence and absence of the species in its known or nearby locations, and in potential habitat? Is there a high level of confidence that all locations are known, or is moderate or substantial additional survey effort required? If so, where should further survey be undertaken?

Is the species' habitat protected within the reserve system (e.g. national parks, Indigenous Protected Areas, or other conservation estates, private land covenants, etc.)? If so, which populations? Which reserves are actively managed for this species? To your knowledge, which reserves are being actively managed in way that provides incidental benefits for this species? Give details.

Euastacus maidae was originally described from a single site in the upper reaches of Currumbin Creek (Riek 1956) which flows off of the Springbrook Plateau at the eastern end of the McPherson Range (Furse et al. 2013) in Southeast Queensland. *Euastacus maidae* was known only from the upper Currumbin Creek area for half a century (Riek 1956; Morgan 1988; Ponniah & Hughes 2004; Sewell et al. 2006; McCormack 2012; McCormack et al. in prep a) and so was considered exceedingly rare (Coughran & Furse 2010). It has since also been recorded from the upper, headwater sections of a number of other creeks in the South Coast Basin of southern Queensland (Fig. 1): Tallebudgera Creek (Shull et al. 2005; Sewell et al 2006; McCormack 2012; McCormack et al. in prep a; H. Hines QPWS unpub. data), Little Nerang Creek (Queensland Museum unpub. data; H. Hines QPWS unpub. data; McCormack et al. in prep a), Nerang River (Austin et al. 2022**,** McCormack et al. in prep a), Mudgeeraba Creek (Austin et al. (2022), McCormack et al. in prep a); and from upper Bilambil Creek in the

Tweed Basin, 180 m over the border into New South Wales (Austin et al. (2022), McCormack et al. in prep a). Queensland Museum data come from the VERNON Database (via P. Davie and D. Potter).

The six creeks where *E. maidae* are reported all arise next to each other in the same relatively small upland rainforest area on the northern flank of the Tweed Volcanic Crater, and all drain north/east to meet the ocean at the Gold Coast (Fig. 2). Most of these sites are within the Scenic Rim Biogeographic Subregion within the South Eastern Queensland Region, although a few of the Currumbin sites are in the Burringbar - Conondale Ranges Subregion (Interim Biogeographic Regionalisation for Australia, IBRA7; Commonwealth of Australia 2012). The Springbrook and Lamington Plateaux (just to the west) both form a section of the Gondwana Rainforests of Australia World Heritage Area that straddles the Queensland – NSW border, and consists of the World's largest area of subtropical forest (Furse el a. 2013), much of it montane rainforest.

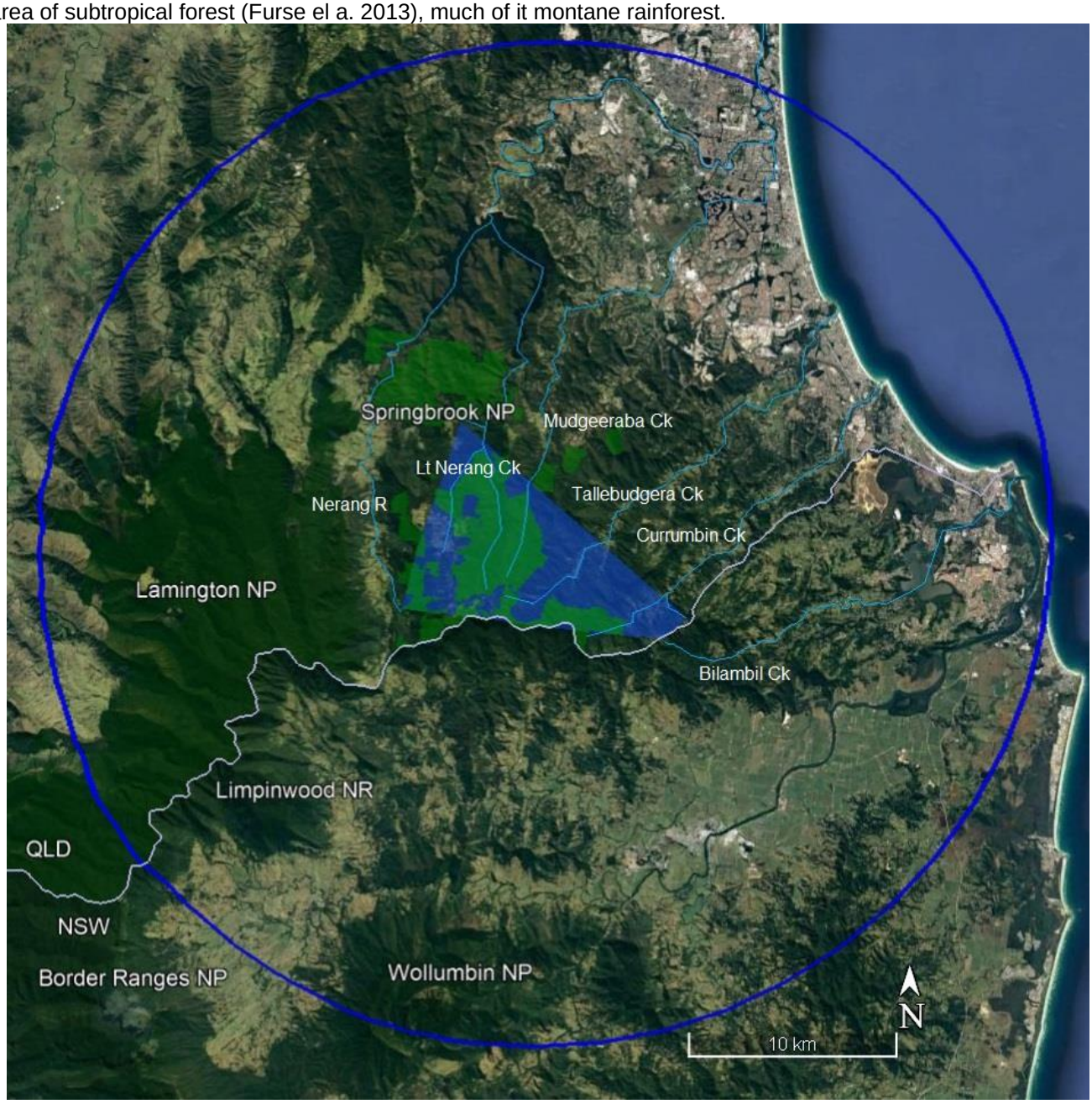


Fig. 2: Twenty-five kilometre radius from *Euastacus maidae* type location showing relevant creek systems and other local reserves within Gondwana Rainforests of Australia World Heritage Area (*E. maidae* Extent of Occurrence = blue shaded area; Springbrook National Park = light green shaded area; 25 km radius for Species Distribution Model = blue circle).Displayed in Google Earth Pro (version 7.3.2.5776).

For CAM assessment purposes, the species' Area of Occupancy (AOO) is 60 km^2, and Extent of Occurrence (EOO) is 74.70 km^2 (calculated with GeoCat, available at: geocat.kew.org; Bachman et al. 2011). A new site close by in NSW has recently been discovered (R. McCormack pers. comm. 2021), but this does not change the threat category. *Euastacus maidae* is considered to inhabit a single location (marginal streams flowing from the Springbrook Plateau) as defined by the IUCN (IUCN Standards and Petitions Subcommittee 2019), based on common threats (see Criterion B below for more information) and a relatively small contiguous area.

A third of *E. maidae* sites are within Springbrook National Park, including sites from five of the six creek systems (not Bilambil Creek). A number of sites are within conservation areas (Austinville, Springbrook), and about half of the sites are on freehold land (Fig. 3). The *Euastacus maidae* sites within the National Park (and World Heritage area) receive the umbrella protection of being found there. *Euastacus* species in general are recognised as "notable species" within the Springbrook National Park, although *E. maidae* is not actively managed within it (QDNPRSR 2013). Some of the freehold sites at the top of the drainages are very close to the national park, whereas some of the ones more downstream are in altered habitats near suburban areas (McCormack 2012; McCormack et al. in prep a).

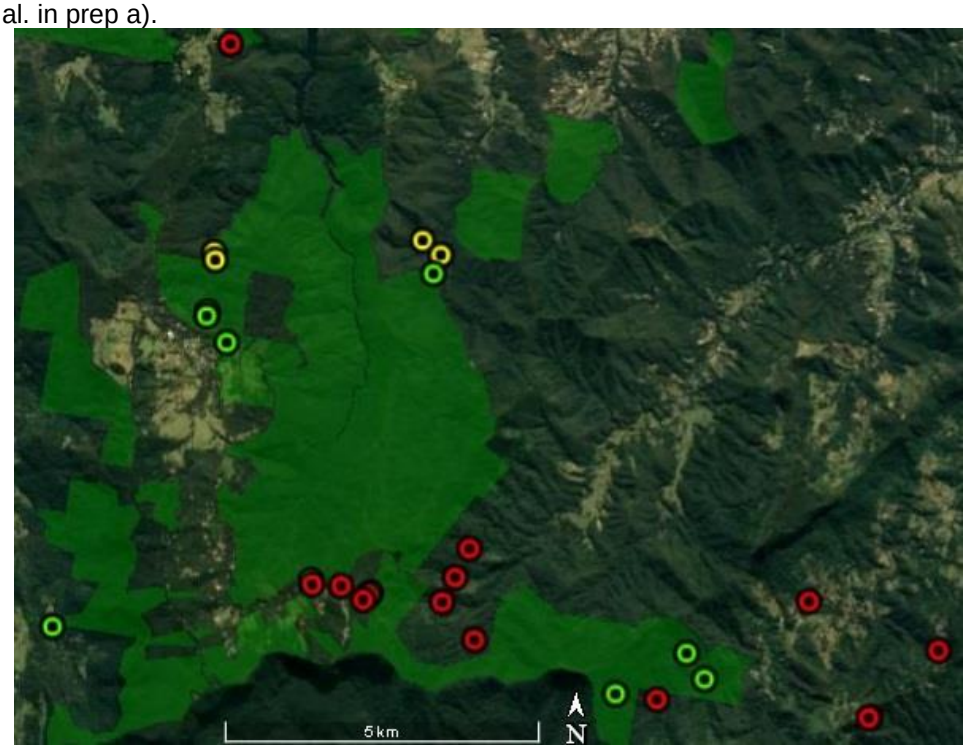


Fig. 3: *Euastacus maidae* records related to reserve areas (records: in national park = green circles, in conservation areas = yellow circles, on freehold land = red circles; Springbrook National Park = green shading). Displayed in Google Earth Pro (version 7.3.2.5776).

In contrast to some other small *Euastacus* species, *E. maidae* has a relatively wide altitudinal distribution of about 100–800 m ASL (McCormack et al. in prep a). While *Euastacus binzayedi*, from nearby Lamington National Park, has only been reported from above 550 m (McCormack et al in prep b), there are *E. maidae* sites from all six creek systems that are below 550 m. The Springbrook Plateau area encompasses a large altitudinal gradient (ARCS 2009), which is reflected in its sequence of different habitat types (QCMU 2009). Therefore a related by-product of *E. maidae's* relatively wide altitudinal range is its presence in a correspondingly wide range of ecosystems, whereas *Euastacus binzayedi* is almost entirely confined to complex notophyll vine rainforest (Page 2020a). While *E. maidae* has been recorded most often in rainforest and vine forests (57% of sites), many sites are recorded within open eucalypt forests (43%), within 8 Regional Ecosystems (RE; Queensland Herbarium 2019) and 5 Broad Vegetation Groups (BVG; Neldner et al. 2019) (see Table 1 in Biology section below for more details).

Euastacus maidae's distribution likely relates to a number of interacting factors, which include elevation and vegetation, both of which are correlated with each other, as well as to temperature and water availability. Springbrook has very high annual rainfall (~3500 mm), making it the wettest area in Australia outside the Wet Tropics (ARCS 2009). To investigate the complex factors behind *Euastacus maidae*'s distribution and to highlight other potentially suitable areas for the species, a species distribution model (SDM) was built for *E. maidae* using the presence-only site data collected for this study and then applied to all areas within a 25 km radius of the type location (see Fig. 2). This form of analysis might identify other areas where *E. maidae* could be resident but unsampled, or highlight places for future translocation programs should they ever become necessary.
A prediction of possible *E. maidae*–suitable habitat was made with an SDM constructed with Maxent (maximum entropy; Phillips et al. 2006) through the Spatial Portal at the Atlas of Living Australia (spatial.ala.org.au). Environmental layers were chosen to reflect factors presumed to be important for *E. maidae*, such as local vegetation (NVIS 4.1 Major Vegetation Groups & Subgroups), Elevation, and Aridity (annual mean). An SDM was created using all of these environmental layers, and then separate SDMs created using just individual factors (vegetation, elevation, aridity).

When analysed all together, Vegetation was the most influential variable (54% permutation importance), with Aridity next (37%) and then Elevation (9%). A heat map inferred with Maxent (T. Page unpub; Fig. 4a) shows that most of the areas identified by this method as particularly suitable habitat for *E. maidae* (red pixels) are already known to harbour *E. maidae* (white pixels). There are a few small partially suitable areas just to the west (in Lamington National Park), southwest (in Limpinwood Nature Reserve) and south (in Wollumbin National Park) of known sites (see Fig. 2).

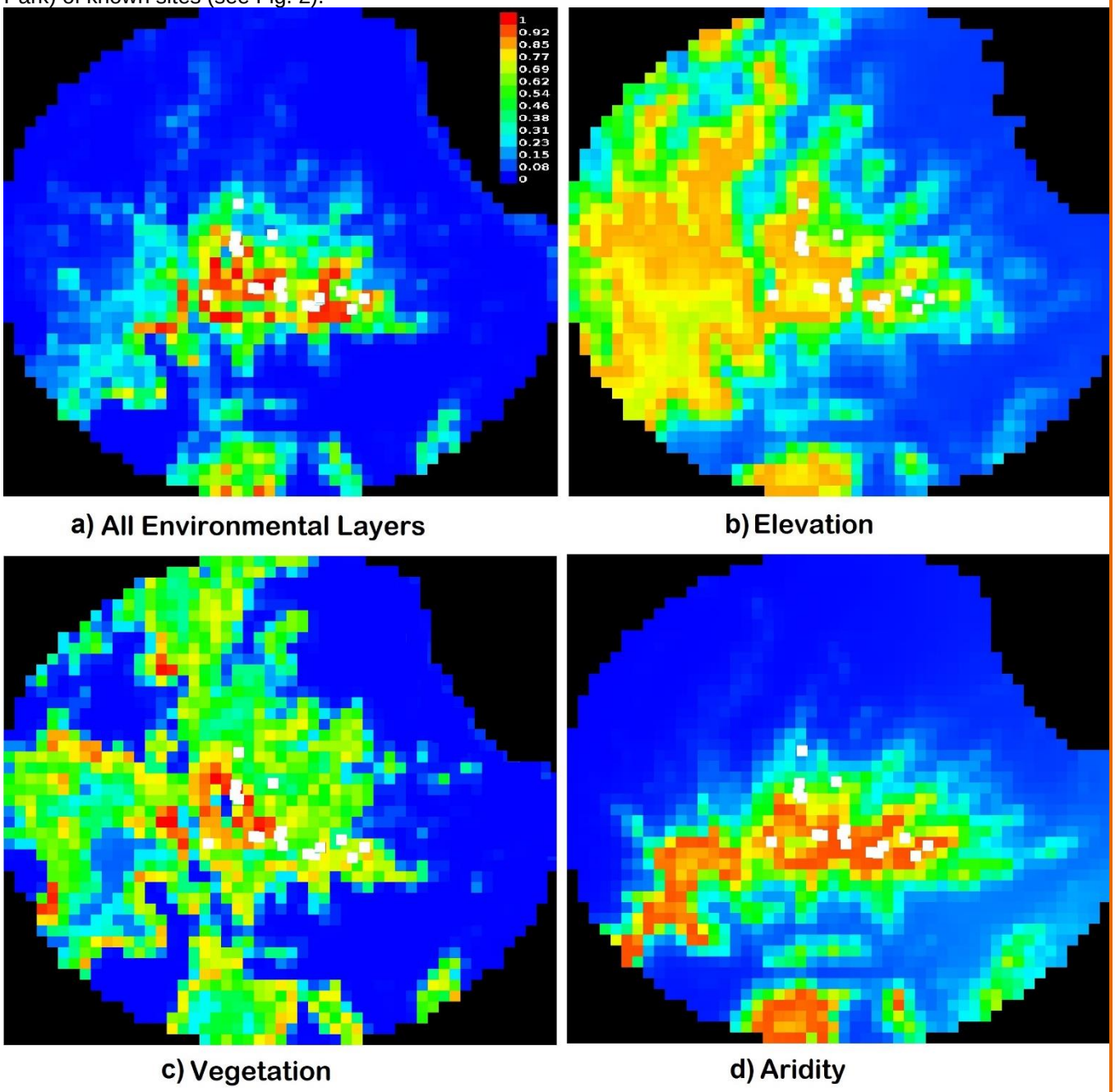


Fig. 4: *Euastacus maidae* species distribution model (SDM) heat map (T. Page unpub.) created using Maxent on the Spatial Portal at the Atlas of Living Australia (spatial.ala.org.au) of 25 kilometre radius from type location (Red pixels = most suitable habitat, Blue = least suitable, White = known *E. maidae* sites). SDMs created with following environmental layers: a) All environmental layers detailed below, b) Elevation, c) NVIS 4.1 Major Vegetation Groups & Subgroups, d) Aridity - annual mean.

When elevation is considered alone (Fig. 4b), there is a large area of moderately suitable habitat (yellow/green pixels), which includes all areas that are not lowlands. This reflects *E. maidae*'s relatively wide altitudinal distribution above 100 m. The vegetation-only analyses (Fig. 4c) paints a broadly similar picture, with widespread moderately suitable habitat (yellow/green pixels) and some highly suitable habitat (red pixels), representing notophyll vine forest areas that are the stronghold of *E. maidae* despite its occurrence in other regional ecosystems. It is possible that the vegetation analysis may not be entirely adequate for this analysis, as the Springbrook vegetation mapping is not always at a very fine scale (GCCC 2009**)**. It may be that *E. maidae* sites are lumped in with the broader vegetation communities a little away from the drainage lines, when actually it

inhabits a particular narrow riparian community that is inadequately represented in the vegetation mapping. When aridity is the only factor analysed (Fig. 4d), many areas deemed suitable in the elevation and vegetation analyses no longer appear to be feasible, and water availability may thus be a key factor in determining *E. maidae*'s actual distribution.

This result implies that *E. maidae* is most likely restricted in distribution to the Springbrook Plateau region and downstream areas close by. This fairly simplistic analysis does not take into account connectivity, which is key to a small freshwater-restricted species that is unlikely to be able to traverse any warmer, intervening lowlands. This analysis also does not consider biotic factors such as competing species or potential predators. The small areas of highly suitable habitat identified to west and south are already home to very similar species, *E. binzayedi* and *E. gurughi* respectively. Another factor to consider is that *E. maidae's* distribution might be influenced by the presence or absence of predatory eels (McCormack et al. in prep a).

BIOLOGY/ECOLOGY

Provide a summary of biological and ecological information.

Include information on:

- life cycle including age at sexual maturity, life expectancy and natural mortality rates
- specific biological characteristics
- the species' habitat requirements
- for fauna: feeding behaviour and food preference and daily/seasonal movement patterns
- for flora: pollination and seed dispersal patterns

Little is known about the life cycle of *Euastacus maidae*. The largest recorded specimen had an OCL of 24.8 mm (Morgan 1988), although recent work has recorded specimens up to 50% larger, weighing up to about 20 g (McCormack et al. in prep a). It is unclear at what size females attain sexual maturity. The timing of breeding is similarly not well known, but anecdotal observations suggest that it may be a winter brooder, mating in the winter and brooding eggs until the summer (Furse & Coughran 2011). This is because females have been observed with eggs in winter (August) and not in the summer (December), when juveniles were present (McCormack et al. in prep a). The life-cycle of *E. maidae* is probably similar to other small *Euastacus* species, meaning slow growth, late-maturing females, and a slow reproductive cycle (K-selection) (Furse & Coughran 2011). The actual growth rates, population sizes and generation lengths of *E. maidae* are not known.

Little is also known about this species' general biological characteristics, although given its distribution on or near a plateau and its absence from lowlands below about 100m ASL, it is assumed that it is cool-adapted to some degree, like many other *Euastacus* species (Furse & Coughran 2011). For example, the sympatric *E. sulcatus* is highly intolerant of high temperatures (Bone et al. 2014). *Euastacus maidae,* like many parastacid crayfish, hosts species of ectocommensal temnocephalan flatworm. At least two species have been reported from *E. maidae* specimens, the six-tentacled *Temnohaswellia comes* (Sewell et al. 2006) and the five-tentacled *Temnohaswellia bacrioniculus* (Hoyal Cuthill et al. 2016). The diet of *E. maidae* is not well understood, but the species may well be omnivorous.

Euastacus maidae appears to spend most of its time in burrows, as it is rarely seen in daytime (McCormack 2012), so the species may be nocturnal like *E. jagara* (Jagara hairy crayfish) (McCormack et al. 2010), as is typical in freshwater crayfish (Furse et al. 2006). *Euastacus maidae*'s smooth shell may result from its largely subterranean lifestyle (McCormack 2012). This species makes extensive burrows amongst rocks and gravel into the local water table, often in areas with minimal surface water (McCormack 2012). While the species is cryptic, it can be abundant in suitable habitat (McCormack et al. in prep a).

Euastacus maidae's altitudinal distribution is relatively wide for a small *Euastacus* species (~100 – 800 m ASL) and quite evenly spread (39% sites 100 - 300 m, 39% 300 – 500 m, 22% 500 – 800 m). Consequently, its habitat varies with altitude, being associated with various vegetation types (Table 1). Most sites (57%) are in notophyll vine forest, but a significant number are also in areas mapped as open eucalypt forests. *Euastacus maidae* is found largely in more marginal, ephemeral areas, like dry creek beds and soaks, rather than deep permanent creeks (McCormack 2012). It probably requires access to groundwater and is often in its burrow. While it is found in some altered habitats (small creek lines in farm land), it is not found in open-sky paddocks (McCormack et al. in prep a), presumably because of high temperatures. It is sympatric with *E. sulcatus* in upstream habitats, and with *E. valentulus* in lower downstream areas, where it also occurs with *Cherax* (McCormack 2012; McCormack et al. in prep a).

Much of the data on *E. maidae* are inferred from presumably phylogenetically related and/or ecologically similar *Euastacus* species from the poorly spinose group (Coughran 2008). There are a many *Euastacus* species near the QLD – New South Wales border region that share biological, ecological and environmental traits (Coughran 2007; Furse et al. 2013). However, some caution must be taken with this as *Euastacus* phylogenetic relationships often recapitulate geographical proximity rather than ecological similarity (Shull et al. 2005). Phylogenetically, *E. maidae* falls within a group of species largely found in eastern New South Wales ("Central" *sensu* Shull et al. 2005), that includes both small poorly spinose and large spinose group species. While certainly

related to “Central” species (Shull et al. 2005), currently available data suggest it is not particularly closely related to any species, even poorly spinose species of the Gondwana Rainforest World Heritage Area (Furse et al. 2013). These relationships represent a large amount of evolutionary time (Toon et al. 2010), allowing unique adaptation that is not always predictably transferrable from other species.

Table 1. Breakdown of vegetation categories at *Euastacus maidae* sites (Queensland Herbarium 2019; Neldner et al. 2019)

Major Vegetation Group	Regional Ecosystem (RE) Description	RE	No. sites	% sites	Altitude sites (m)	Broad Vegetation Group
Rainforests & vine thickets	Complex notophyll vine forest	12.8.3	7	25%	200-487	2a
	Complex notophyll vine forest	12.8.5	3	11%	758-774	6a
	Simple notophyll vine forest	12.11.1	6	21%	113-270	4a
Eucalypt tall open forests	*Eucalyptus oreades* tall open forest	12.8.2	3	11%	796-806	8a
	Eucalyptus saligna subsp. *saligna* or *E. grandis* tall open forest	12.8.8	3	11%	346-353	8a
	Lophostemon confertus open forest	12.8.9	1	4%	350	8a
	Eucalyptus saligna subsp. *saligna* or *E. grandis, E. microcorys, Lophostemon confertus* tall open forest	12.11.2	3	11%	109-280	8a
Eucalypt open forests	*Eucalyptus siderophloia, E. propinqua +/- E. microcorys, Lophostemon confertus, Corymbia intermedia, E. acmenoides* open forest	12.11.3	2	7%	330-426	9a

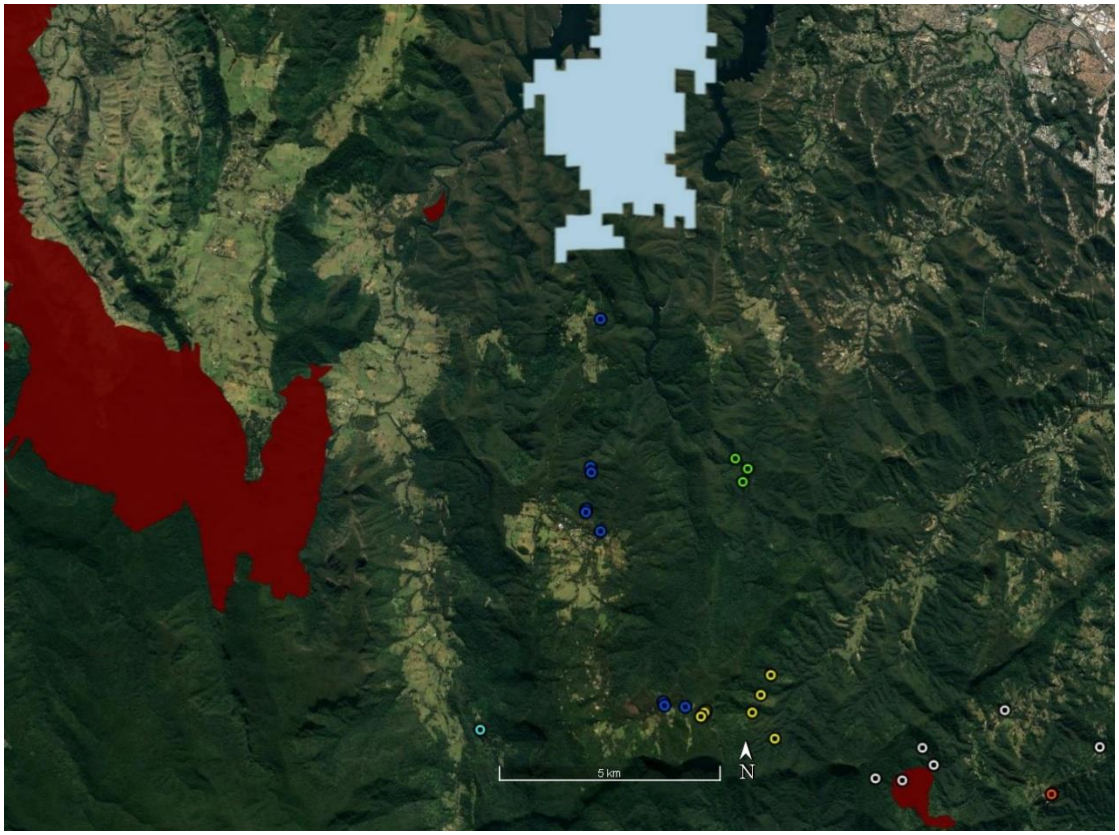
Threats

IDENTIFICATION OF KNOWN THREATS AND IMPACT OF THE THREATS

Identify any known threats to the species in the table below. Describe **past, current or future** threats, whether the threats are **actual or potential**, and the **type and level of impact** you believe each threat is having on the species.

Past threats	Impact of threat
Bushfire	Bushfire is a common feature of the general Australian environment, however this is typically more prevalent in sclerophyll forests than rainforests (Murphy et al. 2012). The steep slopes on the plateau allow bushfire to move quickly, often spreading up from the lowlands in the north (QCMU 2009). Springbrook is often very wet, dampening the effects of some bushfires, but there is often a great deal of potential fuel (QCMU 2009). Most of the rainfall generally falls from December to April, with September the driest month, and bushfires most likely have occurred between September and November, when the temperatures also increase (QCMU 2009). Extreme fire seasons generally occur every 6-8 years (e.g. 1986, 1991, 2000). Fires are a recognised major threat to the rainforests of the Gondwana World Heritage Area, as when bushfires do reach the rainforest, it can change the boundary between it and the sclerophyll forest (Hunter 2003). The notophyll vine forest (QLD RE 12.8.5, 12.8.3, 12.11.1) that is home to a majority of *E. maidae* sites (Table 1) is fire sensitive and does not usually burn (Queensland Herbarium 2019). A significant proportion of *E. maidae* sites are also located in open eucalypt forests that experience more frequent fires. However, these sites are mostly in riparian zones that are also highly fire sensitive (QCMU 2009). The prevalence of Lantana (*Lantana camara*) in the Springbrook area has led to an increased fire risk (QDNPRSR 2013), providing a large amount of highly flammable fuel at the interface between rainforest and sclerophyll forests (QCMU 2009). The small, restricted distribution of *E. maidae* in a single location places it at great risk in the event that fire does impact its limited area. Level of past impact = low.

Drought	Drought is also a common feature of the general Australian environment, including in Southeast Queensland, over a long timescale (Barr et al. 2019). Severe drought is obviously a challenge for a freshwater species. Total annual rainfall decreased by 75.8 mm between 1950 and 2003 in the Gondwana Rainforest World Heritage Area (ANU 2009). This continued during the Millennium Drought (1996 – 2010), when rainfall in the Springbrook NP area was very much below average (BOM 2015). *Eustacus maidae* probably requires groundwater, which retreats in the face of extended drought, potentially making much of the habitat unsuitable. Level of past impact = low.
Land clearing	Half of the known *E. maidae* sites are on private property (Fig. 3), and so do not benefit from the passive protection of a national park. This is unlike similar *Eustacus* species (*E. binzayedi, E. jagara*) nearby that are found entirely within national parks (McCormack et al. 2010; Page 2020a; Page 2020b; McCormack et al. in prep b). The freehold sites that host *E. maidae* are both at the top of the catchment and lower down in the valleys, both of which have land cleared for agriculture and suburban blocks (McCormack et al. in prep a). Much of the suitable habitable area for *E. maidae* is in private backyards (McCormack 2012). Land management of these private properties could lead to negative impacts on water quality due to pesticides, pollution, etc. (Coughran & Furse 2010), as well as the clearing of riparian vegetation (McCormack et al. in prep a). Water tables can also be lowered by water extraction for drinking water, mining, forestry and agriculture, among other human activities. The attractive valleys that host *E. maidae* are close to the Gold Coast. Southeast Queensland has seen a lot of recent land clearing and human population growth, leading to fragmented remnant vegetation (Neldner et al. 2017). Level of past impact = low.
Unauthorised collection	All *Euastacus* species are “no take” species under the Queensland *Fisheries Act 1994* (Furse & Coughran 2011). In NSW, *Euastacus* smaller than 90 mm (OCL) cannot be collected legally (NSW DPI 2013), which covers all *E. maidae* specimens. It is unknown if *E. maidae* in particular has been the subject of illegal collecting for the aquarium trade (Coughran & Furse 2012), however the sympatric *E. sulcatus* has definitely been taken (see Current Threats below). An individual of *E. sulcatus* was even taken from the Springbrook visitor centre in the 1990s (W. Buch pers. comm. 2020). There has also been crayfish poaching in neighbouring Lamington NP at Gwongoorool Pool on the Coomera River in 2012-2013, which included leaving opera house traps that ended up drowning platypuses (W. Buch pers. comm. 2020). Springbrook NP receives a very large number of visitors per year, so if even a very small percentage of these people take crayfish, it could affect populations badly. As *E. maidae* is rare, it could be targeted for illegal collection as it may be even more valuable on the black market than *E. sulcatus*. For this reason, *E. maidae* could be particularly at risk. Another possibility is that *E. maidae* could be inadvertently captured instead of *Cherax*, which are commonly caught as bait, which is illegal within a national park but legal outside. *Euastacus maidae* are relatively smooth and thus could be mistaken for *Cherax* (Coughran & Furse 2010). Given the very small, restricted distribution of *E. maidae*, any removal of specimens could be very harmful to the population as a whole. If this species has been targeted, there is the possibility that collectors who have handled other crayfish species could introduce new pathogens to the isolated *E. maidae* populations. Level of past impact = unknown/low.
Current threats	**Impact of threat**
Bushfire	Very intense and broad-scale fire activity (2019-2020) has taken place in many parts of Queensland, burning about 6,617,430ha (3.8% of the State) and impacting at least 648 threatened species (Threatened Species Operations 2020). These fires were associated with a severe drought, which would have already depleted much surface and groundwater prior to the fires. The 2019 fires impacted a small area in the southeast of Springbrook NP, very close to known *E. maidae* sites, and were severe and widespread a few kilometres to the west in Lamington NP (Fig. 5). In 2014, a fire impacted the northern part of Springbrook NP, also close to known *E. maidae* sites. The distribution of *E. maidae* falls within the Gondwana Rainforest World Heritage Area of the Southern Queensland Post-fire Response Project Areas, as do four focal flora species in Springbrook NP (Threatened Species Operations 2020). Because the entire known world distribution of *E. maidae* is within a single block of a few dozen square kilometres, any bushfire impacts could be very significant to its long-term future. It is not clear what the direct impact of fire on crayfish populations may be, however another rainforest crayfish (*Euastacus clarkae* (Ellen Clark’s crayfish) suffered a mass kill directly as a

	result of fire, perhaps due to water heated by fire (McCormack 2015). Similarly, *E. bispinosus* (Glenelg spiny crayfish) abundances declined after fire events, perhaps due to associated lessening of habitat quality (Johnston et al. 2014). Indirect impacts of fire are potentially long-lasting, and include serious habitat degradation and/or destruction, and ensuing water quality issues that highly impact freshwater species (Bryant et al. 2012). Sediment and ash run-off from fires can degrade water quality, leading to a change in the pH of the water and low dissolved oxygen (Silva et al. 2020). A Federal Government report (Legge et al. 2020) on the impacts of the recent fires on wildlife across Australia found that many *Euastacus* species should be given management priority, because of their small distributions and particular biological traits (22 species with >10% fire-affected distributions). Level of current impact = moderate to high.  **Fig. 5:** Extent of bushfires in 2014 (in light blue; fire scars, 250 m pixel; NAFI 2020) and 2019 (in red; Queensland Government 2020) in the Springbrook/Lamington area (circles = *Euastacus maidae* sites). Displayed in Google Earth Pro (version 7.3.2.5776).
Drought	Severe drought is a potential driver of habitat and population loss for *E. maidae*, even within a national park. Recent rainfall deficits (2017 – 2019) have been extreme in Southeast Queensland, with cool season rain the lowest on record in most of subtropical Queensland (BOM 2019). Reduced rainfall means less water in the creeks from run-off and lower water tables. The effects of drought are likely being exacerbated by water extraction activities currently occurring on the Springbrook plateau, e.g. in high-elevation areas along Repeater Station Road. The impacts of these activities on groundwater flows have not been adequately investigated. Level of current impact = low/moderate.
Drawdown of local water table through commercial water extraction	Concerns regarding the drawdown of the local water table on the Springbrook plateau via water extraction have been ongoing for some time (e.g. Gecko 2014; Australian Rainforest Conservation Society 2018). Whilst it is difficult to predict any long-term effects, *E. maidae* appears to be reliant on groundwater. Further, the climate changes forecast for the region (CSIRO 2015) that includes a predicted reduction in water availability (Narsey et al. 2020), are likely to exacerbate the impacts that water table drawdown has on this species and its habitat. Level of current impact = low/moderate.
Land clearing	Southeast Queensland is the fastest growing metropolitan region in Australia, with an ensuing boom in housing development, resulting in habitat and biodiversity loss (Field et al. 2012). The population of Southeast Queensland increased 2.2% in 2018 to 2019 (.id 2020). Level of current impact = low/moderate.
Unauthorised collecting	There are recent reports of poachers taking the sympatric *E. sulcatus* illegally from Springbrook NP (ABC Gold Coast, 2019). Australian crayfish are for sale in Australia and

	overseas (legally and illegally, including online), although it is not known if *E. maidae* are among these (none were found offered for sale on the internet on 10 July 2020).
Future threats – actual	**Impact of threat**
Bushfire	The widespread nature of the 2019-2020 fires has led to an inevitable discussion of the role of future climate change in increased fire risk. Climate projections for Southeast Queensland indicate the likelihood of harsher fire conditions, meaning that fires like those of 2019-2020 may not be unusual events in the near future (ANU 2009; DEHP 2016a). The fires of the future are likely to be even more intense and come with a greater frequency. A drier climate will make the fire-sensitive rainforest and riparian habitat of *E. maidae* more likely to burn, especially with the encroachment of more fire-prone sclerophyll forest species and Lantana and other weeds moving up the slope in response to a warming climate, and the prediction of more fuel being made available in future (ANU 2009; Murphy et al. 2012; Queensland Herbarium 2019). The entire distribution of *E. maidae* is in an area of proven fire risk, and because the species has such a small, restricted distribution (which will shrink further with climate change), there is a real possibility of future extinction in the wild given the predicted more intense and more frequent bushfires in coming decades. Level of future impact = high.
Drought	The frequency and intensity of drought is likely to increase (see Climate change below) (ANU 2009). Predictions for the northern part of the Gondwana Rainforest World Heritage Area (where *E. maidae* is located) are that annual rainfall will decrease by 3.5% by 2030, especially in the autumn, winter and spring (ANU 2009). Increased evaporation from higher temperatures will also reduce the amount of water available (ANU 2009), which would exacerbate any water extraction impacts. Level of future impact = moderate/high.
Land clearing	The urban and suburban development of the Gold Coast is likely to continue, with a projected 64% increase in the human population of the Gold Coast over the next 25 years (2016 to 2041), which is 2.5% per year (Queensland Treasury 2018). Level of future impact = moderate.
Future threats – potential	**Impact of threat**
Climate change	The Earth is warming rapidly and the climate changing. Global climate projections predict a greater than 99% probability that most of the years between 2019 and 2028 will be in the top 10 warmest years on record for the planet (Arguez et al. 2020). Climate modelling for the Southeast region of Queensland in general (DEHP 2016a), and the Springbrook Area in particular (ANU 2009), predicts significant, rapid future changes to climate. This includes higher temperatures, more hot days, reduced rainfall, increasing drought, more extreme and frequent weather events, and harsher fire weather (ANU 2009; QCMU 2009; DEHP 2016a). Climate change works in concert with, and as an intensifier of, many of the previously mentioned threats (e.g. bushfires, droughts). Similarly, more extreme weather events, such as cyclones and floods, can also severely impact freshwater crayfish. Intense storm events can scour high-altitude streams and this can be deadly to juvenile *Euastacus* that seek refuge under leaves/fallen palm fronds, small loose rocks and logs (R. McCormack pers. comm. 2020). Mass mortality has been recorded in *E. valentulus* in the Nerang River in the Numinbah Valley on the western edge of Springbrook NP, when a very intense rain storm and flash flood killed hundreds, and probably thousands, of crayfish locally (Furse et al. 2012). Most of the crayfish killed in this event were about the same size range as adult *E. maidae* (30-40 mm OCL). There are also reports of *E. sulcatus* in neighbouring Lamington NP having been killed in large numbers in large log jams following flooding associated with Ex-Tropical Cyclone Debbie in March 2017 (W. Buch pers. comm. 2020). Warmer temperatures have already begun to occur, as maximum and mean temperatures rose by 1.5°C and 1.0°C respectively between 1950 and 2003 in the Gondwana Rainforest World Heritage Area, and are predicted to increase by 1.3°C by 2030 (over 1990 levels) (ANU 2009; GCCC 2009). *Euastacus maidae*, and the cool montane rainforests of southern Queensland as a whole, are at great risk from climate change, since these areas are refugia for many cool-adapted flora and fauna species. Available habitat will shrink as narrow, suitable “climatic envelopes” migrate up the mountains in the face of rising temperatures, and may eventually disappear completely (Krockenberger et al. 2003). For example, a rise of only 1.0°C by 2030 could result in a 50% decrease in the area of upland tropical rainforests (Hilbert et al. 2001). Many of these habitats may already be near a threshold of survival (Murphy et al. 2012), having progressively shrunk in the face of the natural warming and drying of the last few million years, and now facing the accelerated warming due to human activities. The upland subtropical rainforest that is home to a majority of *E. maidae’s* sites, in particular the

	notophyll vine forest, is at great risk from the higher temperatures and reduced rain associated with climate change (ARCS 2009). As the rainforest habitat degrades with climate change, the pressure from invasive species is predicted to increase, including from Lantana (see Past Threats - Bushfire), Feral pigs (*Sus scrofa*), and Cane toads (*Rhinella marina*). Cane toads are a potential threat to crayfish (Coughran & Furse 2012) and are present at lower altitudes in Springbrook NP (GCCC 2009). As the climate becomes warmer on the plateau, it will become more suitable for the relatively warm-adapted toads (Kearney et al. 2008). Feral pigs can lead to direct negative impacts for crayfish, like predation, digging and rooting, and indirect impacts, like changing plant species composition, and poor water quality (Commonwealth of Australia 2017). Current Feral pig levels are likely not high in Springbrook National Park (QDNPRSR 2013; QDES 2020), but pig management activities may need to increase in future in bushfire areas. Even where the relevant habitat did not burn, predation pressure from Feral pigs may increase as hungry pigs move out of adjacent burned areas into unburned ones. Climate change is a real threat to freshwater crayfish since *Euastacus* are very sensitive to changes in temperature, tend to be highly specialised, and often have distributions that are highly fragmented and very limited ("short-range endemics" *sensu* Harvey 2002) (Richman et al. 2015; Hossain et al. 2018). These factors combine to make them particularly vulnerable to the effects of intensifying climate change (Richman et al. 2015). Many *Euastacus* species in eastern Australia are already "climate refugees" (Bone et al. 2014), having been restricted to cool montane areas by the increase in Australia's temperature and aridity over the last few million years (Ponniah & Hughes 2004). This is certainly the case for *E. maidae*, which has not been found below 100 m. The precise thermal tolerance of *E. maidae* is not known, but a sympatric rainforest species, *E. sulcatus,* becomes distressed at about 22ºC, and was effectively incapacitated at 27ºC, and all died (Bone et al. 2014). *Euastacus sulcatus* is much larger than *E. maidae* and so perhaps *E. sulcatus* can handle temperature variation better, but there are no thermal studies on *E. maidae*. However, increased temperatures will almost certainly severely impact *E. maidae*. Higher temperatures, increased drought, and an intensified bushfire regime could also cause a change in the species composition of riparian vegetation, which could restrict the distribution of *E. maidae* further (R. McCormack pers. comm. 2020). Bland (2017) undertook a large-scale meta-analysis that considered the multiple interacting factors that influence extinction risk in freshwater crayfish. The single most important factor in extinction risk was range size. Another study (Owen et al. 2015) considered freshwater crayfish species from around the world, and ranked them according to a combination of evolutionary distinctiveness and conservation status (EDGE); in effect, which species are the most unique evolutionarily and are most at risk. *Euastacus maidae* scored 11th highest of 719 species in one analysis and 7th of 719 in the other (Owen et al. 2015). Because of its highly restricted, small distribution, any impact on one part of the population is likely to influence the entire species' distribution, and greatly increase extinction risk. Even a small adverse change could have a long-term impact, since a single stochastic event (fire, cyclone, heatwave, etc.) could potentially wipe out an already reduced/weakened population as a result of climate change. So what could *E. maidae* do in the face of climate change? One possibility is adaptation, *as E. sulcatus* has shown some ability to adapt to higher temperatures, although this was a very small effect, much smaller than the predicted increases in temperature (Bone et al. 2014). Adaptation does not seem likely as *E. maidae* is likely cool-adapted, and has been so for a long time. The rate of current climate change makes this unlikely. Another possibility is that *E. maidae* could move to cooler, higher altitudes to retain its preferred climate envelope as temperatures decrease about 0.65ºC per 100 m of altitude (ARCS 2009). This is not likely as the highest local peaks (Mt. Mumdjin 1010 m, Mt. Bilbrough 960 m) are not much higher than the species' current distribution (ARCS 2009). A third possibility is that *E. maidae* could migrate to other areas. This is very unlikely as similar nearby rainforest areas will feel the same effects of climate change, already host their own species of *Euastacus*, and would require crossing unsuitable, warm lowland habitat. Level of future impact = high.
Unauthorised collecting	The level of future unauthorised collecting is difficult to estimate. However, *E. maidae*'s rarity and very small distribution places it at a great risk of depletion of numbers from any level of exploitation or collection (legal or otherwise) or an accidental introduction of a pathogen during this collection.

	Crayfish poaching for *E. sulcatus*, which is sympatric with *E. maidae,* has occurred in Springbrook NP and at neighbouring Lamington NP (see details in Past & Current Threats above). *Euastacus sulcatus* is now available for legal online purchase (from a breeding stock) (see https://www.facebook.com/jardiniinternational/posts/2051993441765782). As these are being sold for high prices, this may increase their popularity and value, and thus may increase poaching for it, and potentially for any other sympatric crayfish (including *E. maidae*) (A. Northam pers. comm. 2019).
Drawdown of local water table through commercial water extraction	As above.

*CONSERVATION ADVICE: THREAT ABATEMENT AND RECOVERY ACTIONS

Give an overview of recovery and threat abatement/mitigation actions that are underway, have been formally proposed or that you would like to recommend. Address all threats listed or state threats that lack conservation advice.

Current threats	**Abatement or recovery action underway**
Bushfire	Active fire management is carried out in the Springbrook area by the QPWS, Gold Coast City Council and Queensland Rural Fire Service (QCMU 2009; QDNPRSR 2013). The fire strategies take account of the differing needs of the various ecosystems, communities and landscapes with a network of Wildfire Mitigation Zones with specific management regimes (QCMU 2009). For example, the particular rainforest ecosystem that is home to the majority of known *E. maidae* sites, notophyll vine forest (QLD RE 12.8.5, 12.8.3, 12.11.1), requires that the surrounding areas be actively managed for fire, as this community does not burn regularly (Queensland Herbarium 2019). This community needs active protection from fires in extreme conditions such as after long droughts, and ongoing protection through mosaic burns when there is high soil moisture (QCMU 2009). In contrast, sclerophyll forest needs occasional fires to maintain ecological health (QCMU 2009). A major part of fire abatement strategies is to reduce the prevalence of Lantana (GCCC 2009; QCMU 2009).
	Abatement or recovery action proposed
Bushfire	While crayfish are not mentioned specifically in the Springbrook fire plans, they would benefit from similar existing strategies to protect frogs, namely protecting riparian areas from bushfire (QCMU 2009). As there are existing programs to monitor the ongoing impacts of previous fires (QCMU 2009), it might be useful to ensure that freshwater fauna were included in these and future monitoring.
Drawdown of local water table through commercial water extraction	A critical analysis should be undertaken of the impacts of commercial water extraction at Springbrook to determine what the likely impacts on groundwater levels will be over the short, medium and longer terms. It is of particular concern that these activities are being conducted during a period when groundwater levels are already thought to be lower than normal due to drought conditions.
Unauthorised collecting	Regular checks should be made of the internet to see if *E. maidae* are offered for sale, and if so, the relevant parties prosecuted for illegal collecting, possession or sale. Further, information on correct hygiene protocols should be made available to those collecting legally to avoid introducing pathogens (for example: www.aabio.com.au/new/wp-content/uploads/2012/02/Hygiene-Protocol-2010.pdf). The Queensland Government is working on protocols at the moment (J. Furse pers. comm. 2020).
Future threats – actual	**Abatement or recovery action underway**
	Abatement or recovery action proposed
Land clearing	The population levels and health of listed species in the Gondwana Rainforest World Heritage Area (including *E. maidae*) should be monitored to detect any negative impacts of habitat loss and degradation due to land clearing for agriculture or urbanisation.
Future threats – potential	**Abatement or recovery action underway**
	Abatement or recovery action proposed

Climate change	Detailed monitoring of the health of both *E. maidae* populations (numbers, distribution, population dynamics, etc.) and its habitat (vegetation, water availability, water quality) should be undertaken to see if these are being adversely affected by the various factors associated with climate change. Species-specific thermal tolerance thresholds and environmental parameters (Richman et al 2015) are also important information for understanding *E. maidae*'s long-term extinction risk. Baseline water temperatures at a number of sites in streams known to be home to *E. maidae* should be collected to monitor any temperature change over time. In conjunction with this, there should be yearly standardised population monitoring of crayfish in the same streams to track any population change.

IMPACT OF TRANSFERRING A THREATENED SPECIES TO NEAR THREATENED OR LEAST CONCERN

Omit this section and proceed to 'Listing class/category' if the nomination does not involve transferring a species from a threatened class to Least Concern or Near Threatened.

If the threatened species (Extinct, Extinct in the Wild, Critically Endangered, Endangered or Vulnerable) were moved to Least Concern or Near Threatened, what would be the impact if conservation actions for the species were reduced or ceased? Would the species decline at such a rate that it would be eligible for listing under a threatened class again in the foreseeable future? Provide evidence, expert advice and appropriate references to support your response.

Conservation action	Impact on the species if abatement/recovery action is reduced or ceases

Listing class/category

CURRENT LISTING CLASS/CATEGORY

[Please mark the boxes that apply by double clicking them with your mouse]

In what class is the species currently listed under the **NC Act**?

☐Extinct	☐Extinct in the Wild	☐Critically Endangered	☐Endangered
☐Vulnerable	☐Near Threatened	☐Least Concern	☒Not listed

In what category is the species currently listed under the **EPBC Act**?

☐Extinct	☐Extinct in the Wild	☐Critically Endangered	☐Endangered
☐Vulnerable	☐Conservation Dependent		☒Not listed

NOMINATED LISTING CLASS

To what class under the **NC Act** is the species being nominated?

☐Extinct	☐Extinct in the Wild	☒Critically Endangered	☐Endangered
☐Vulnerable	☐Near Threatened	☐Least Concern	☐Not listed

Nominating a species to transfer to another class

REASON FOR A NOMINATION TO TRANSFER TO ANOTHER CLASS

What is the reason for the nomination?

☐Genuine change of status	☒New knowledge	☐Mistake	☐Other
Taxonomic change - ☐'split'	☐newly described	☐'lumped'	☐no longer valid

INITIAL LISTING

Describe the reasons for the species' initial listing under the NC Act and/or the EPBC Act and, if available, the criteria under which it was formerly considered eligible.

Click or tap here to enter text.

CHANGES IN SITUATION LEADING TO THE NOMINATION TO TRANSFER TO ANOTHER CLASS

Please complete (a), (b) OR (c) as appropriate to the nomination.

(a) Critically Endangered, Endangered, Vulnerable or Near Threatened

Describe the change in circumstances that make the species eligible for listing in a class other than Extinct and Extinct in the Wild.

Euastacus maidae is being nominated as Critically Endangered (CR) because of its restricted distribution (EOO = 74.70 km^2) in a single location (marginal streams flowing from the Springbrook Plateau). The entire population is threatened by bushfire, drought, land clearing and other factors (floods, invasive species) predicted to intensify and increase in frequency with climate change and increasing human pressures.

(b) Extinct in the Wild

A native species is eligible to be included in the Extinct in the Wild class if: (a) thorough searches have been conducted for the species; and (b) the species has not been seen in the wild over a period appropriate for its life cycle or form. The species may still survive in cultivation, captivity or as a naturalised population (or populations) well outside the historic range.

Describe how circumstances have changed that now make the species eligible for listing as Extinct in the Wild. Provide details of the last valid record or observation of the species in the wild.

Click or tap here to enter text.

(c) Extinct

A native species is eligible to be included in the Extinct class if there is no reasonable doubt that the last member of the species has died. A taxon is presumed Extinct when exhaustive surveys in the known and/or expected habitat, at appropriate times (diurnal, seasonal, annual), throughout its historic range have failed to record an individual.

Describe how circumstances have changed that now make the species eligible for listing as Extinct. Provide details of the last valid record or observation for the species in the wild and captivity.

Click or tap here to enter text.

Standard of scientific evidence and adequacy of survey

Please complete as appropriate to the nomination

For this assessment is it considered that the survey of the species has been adequate and there is sufficient scientific evidence to support the listing outcome.

Eligibility against the criteria

CRITERION A

Population size reduction (reduction in total numbers) measured over the longer of 10 years or 3 generations based on any of A1 to A4

	Critically Endangered (CR)	Endangered (EN)	Vulnerable (VU)	Near Threatened (NT)
A1	**≥ 90%**	**≥ 70%**	**≥ 50%**	**≥ 20%**
A2, A3, A4	**≥ 80%**	**≥ 50%**	**≥ 30%**	**≥ 20%**

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 (a) to (e)

(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, hybridisation, pathogens, pollutants, competitors or parasites

Please identify whether the species meets A1, A2, A3 or A4. Include an explanation, supported by data and information, on how the species meets the criterion (A1 – A4). If available include information on:

- whether the population trend is increasing, decreasing or static
- estimated generation length and method used to estimate the generation length

You must provide a response. If there is insufficient evidence to report on population dynamics, this must be stated.

Insufficient data to determine eligibility.

While criterion A4 may apply here, there are not adequate population data to assess this as little is known about population size of *E. maidae*. Nothing is known about any past or current changes. It is likely that the population size will decline in the face of climate change. As temperatures increase, the available amount of suitable habitat is likely to decrease as the areas of rainforest habitat contract higher up the mountain. There will also be likely population reduction due to more frequent and intense bushfires and droughts. Given the current small size of this species' distribution, any further reductions will make it susceptible to a single stochastic event which could drive it to extinction.

CRITERION B:

Geographic distribution is precarious for either extent of occurrence AND/OR area of occupancy				
	Critically Endangered (CR)	**Endangered (EN)**	**Vulnerable (VU)**	**Near Threatened (NT)**
B1. Extent of occurrence (EOO)	**< 100 km²**	**< 5,000 km²**	**< 20,000 km²**	**< 40,000 km²**
B2. Area of occupancy (AOO)	**< 10 km²**	**< 500 km²**	**< 2,000 km²**	**< 4,000 km²**
AND at least 2 of the following 3 conditions for CR, EN or VU:				AND (b) for NT
(a) Severely fragmented OR Number of locations	**= 1**	**≤ 5**	**≤ 10**	**Not applicable**
(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				**≥ 10% within the longer of 10 years or 3 generations**
(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				**Not applicable**

Please refer to the 'Guidelines for Using the IUCN Red List Categories and Criteria' for assistance with interpreting the criterion particularly in relation to calculating 'extent of occurrence', 'area of occupancy' and understanding of the definition and use of 'severely fragmented', 'locations', 'continuing decline' and 'extreme fluctuations'.

Please identify whether the species meets B1 or B2. Except for Near Threatened species, include an explanation, supported by data and information, on how the species meets at least 2 of (a), (b) or (c). For Near Threatened species, include an explanation, supported by data and information, on how the species meets (b).

Please note that locations must be defined by a threat. A location is a geographically or ecologically distinct area in which a single threatening event can rapidly affect all individuals of the species present.

Please use GeoCat to provide AOO and EOO estimates and maps whenever possible. If available, include information on:

- Whether there are smaller populations of the species within the total population and, if so, the degree of geographic separation between the smaller populations within the total population
- Any biological, geographic, human induced or other barriers enforcing separation

You must provide a response. If necessary data is lacking or the evidence does not demonstrate that the geographic distribution is precarious for either extent of occurrence AND/OR area of occupancy, this must be stated.

Euastacus maidae meets the thresholds for listing as **Critically Endangered (CR)** under criteria **B1ab(i,ii,iii,v)** based on a single location threatened by bushfire, drought, land clearing and climate change.

Euastacus maidae meets Criterion B1 based on:

1) B1: EOO of 74.70 km^2. As this species is restricted to the linear-like stream bed network and nearby areas, the actual area of habitation will be significantly smaller. *Euastacus maidae* was previously assessed under IUCN criteria (Furse & Coughran 2010) also as Critically Endangered B1ab(iii). That assessment did not include any sites beyond the type location area in upper Currumbin Creek. The current nomination's addition of sites in adjacent creeks does not increase the EOO beyond the threshold of 100 km^2. This species' EOO already covers nearly all of the likely highly suitable habitat identified in the species distribution model (Fig. 4a), with a few additional areas already known to host similar species (*E. binzayedi* or *E. guruhgi*). Therefore, any new finds of *E. maidae* sites are likely not to increase the size of the EOO by much.

a: Known from single location (Fig. 1), namely the marginal streams flowing from the Springbrook Plateau. One stochastic event could drive the species to extinction. The known distribution of the species is a small contiguous area surrounding and including the Springbrook Plateau. Recent fires in the area (2014, 2019) have been bigger than the entire distribution of the species (Fig. 5). A single bushfire taking hold in this area could drive the species to extinction in a single event, and bushfires are predicted to become more frequent and fierce in future due to climate change, even in rainforests. Climate change, and in particular a warming climate, could impact the entire species' population simultaneously. Rising temperatures will likely impact *E. maidae*'s physiology directly, as well as making their current habitat less suitable, and will reduce the potential area of occupancy, with little chance of natural migration. Drought and heatwaves are also predicted to intensify, increase in frequency and worsen with climate change, and would impact the whole population simultaneously. Habitat loss, degradation due to land clearing and urban development, and commercial water extraction are also likely to intensify as the human population of the Gold Coast expands.

b(i,ii,iii,v): The various threats are projected to negatively impact (i) extent of occurrence; (ii) area of occupancy; (iii) area, extent and/or quality of habitat; and (v) number of mature individuals. This decline could be very rapid, via future intense bushfires, heat wave, drought, flooding, or slow, mediated through the various effects of climate change.

2) B2: AOO of 60 km^2 which meets the Endangered (EN) category.

N.B. *Euastacus maidae* numbered amongst Southeast Queensland Bioregion's "priority fauna" for listing as assessed by a fauna expert panel (DEHP 2016b) due to its declining population, endemism and vulnerability to the effects of climate change.

CRITERION C

Small population size and decline					
		Critically Endangered (CR)	**Endangered (EN)**	**Vulnerable (VU)**	**Near Threatened (NT)**
Estimated number of mature individuals		**< 250**	**< 2,500**	**< 10,000**	**< 20,000**
AND either (C1) or (C2) is true					AND (C1) is true
C1 An observed, estimated or projected continuing decline of at least (up to a max. of 100 years in the 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)**	**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 (a) or (b):					
(a)	(i) Number of mature individuals in each subpopulation	**≤ 50**	**≤ 250**	**≤ 1,000**	**Not applicable**
	OR				
	(ii) % of mature individuals in one subpopulation =	**90 – 100%**	**95 – 100%**	**100%**	**Not applicable**
(b) Extreme fluctuations in the number of mature individuals		**Applicable**	**Applicable**	**Applicable**	**Not applicable**

Please identify the estimated total number of mature individuals and either an answer to C1 or C2. Include an explanation, supported by data and information, on how the species meets the criteria. Note: If the estimated total number of mature individuals is unknown but presumed to be likely to be >10 000, you are not required to provide evidence in support of C1 or C2, just state that the number is likely to be >10 000.

You must provide a response. If necessary data is lacking or the evidence does not demonstrate small population size and decline this must be stated.

There are **insufficient data** to assess *Euastacus maidae* against the thresholds for listing under criterion C as there is little information available to determine a robust estimate of the number of mature individuals.

CRITERION D:

Very small population				
	Critically Endangered (CR)	Endangered (EN)	Vulnerable (VU)	Near Threatened (NT)
D1. Number of mature individuals	< 50	< 250	D1. < 1,000	D1. < 3,000
OR				
D2. [Only applies to the VU and NT categories] Restricted area of occupancy or number of locations with a plausible future threat that could drive the taxon to CR or EX in a very short time.	Not applicable	Not applicable	D2. Typically: AOO < 20 km^2 or number of locations ≤ 5	D2. Typically: AOO < 40 km^2 or number of locations ≤ 10

Please identify the estimated total number of mature individuals and evidence of how the figure was derived.

For Criterion D2, please provide information on the species' area of occupancy, number of locations and plausible threats.

You must provide a response. If necessary data is lacking or the evidence does not demonstrate eligibility, this must be stated.

There are **insufficient data** to assess *Euastacus maidae* against the thresholds for listing under criterion D1 as there is little information available to determine a robust estimate of the number of mature individuals. However, Euastacus *maidae* does qualify under Criterion D2 as **Vulnerable (VU)**. This is because of a single location, and the combined threats of enhanced bushfires, drought, and heatwaves associated with climate change could drive the species towards extinction in a short timeframe.

CRITERION E:

Quantitative Analysis				
	Critically Endangered (CR)	Endangered (EN)	Vulnerable (VU)	Near Threatened (NT)
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% within 100 years	≥ 5% within 100 years

Please identify the probability of extinction and evidence of how the analysis was undertaken.

You must provide a response. If there has been no quantitative analysis undertaken this must be stated.

Euastacus maidae is **not eligible** for listing under this criterion because no quantitative analysis of the probability of extinction of the population is available.

SUMMARY OF CRITERIA UNDER WHICH THE SPECIES IS ELIGIBLE FOR LISTING AS: CR, EN, V, NT, EW or EX

Please mark the criteria and sub-criteria that apply.

☐Criterion A	☐A1 (specify at least one of the following) ☐a) ☐b) ☐c) ☐ d) ☐e); **AND/OR** ☐A2 (specify at least one of the following) ☐a) ☐b) ☐c) ☐d) ☐e); **AND/OR** ☐A3 (specify at least one of the following) ☐a) ☐b) ☐c) ☐d) ☐e); **AND/OR** ☐A4 (specify at least one of the following) ☐a) ☐b) ☐c) ☐d) ☐e)
☒Criterion B **Critically Endangered**	☒B1 (specify at least two of the following) ☒a) ☒bi,ii,iii,v) ☐c); **AND/OR** ☐B2 (specify at least two of the following, other than NT) ☐a) ☐b) ☐c)
☐Criterion C	☐estimated number of mature individuals **AND** ☐C1 **OR** ☐C2 ☐a (i) **OR** ☐a (ii) **OR** ☐C2 ☐b)

☒Criterion D **Vulnerable**	☐D1 **OR** ☒ D2
☐Criterion E	
☐EX	
☐EW	
☐LC	Species nominated to change from a higher conservation class to Least Concern: No above boxes apply.

Other Considerations

*INDIGENOUS CULTURAL SIGNIFICANCE

Is the species known to have cultural significance for Indigenous groups within Australia? If so, to which groups? Provide information on the nature of this significance if publicly available.

Euastacus maidae occurs on the lands of the Yugambeh people, but the cultural significance of the species is undocumented. However, given the acknowledged importance to Aboriginal peoples of Connection to Country and the widespread importance of Caring for Country (which includes biodiversity, 'place', custom and totemic elements) it is considered likely that the species has or is associated with some cultural and/or community significance. The significance of the ecological community, particular species, spiritual and other cultural values are diverse and varied for the many Indigenous peoples that live in the area and care for Country. Such knowledge may be only held by Indigenous groups and individuals who are the custodians of this knowledge.
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FURTHER STUDIES

Identify relevant studies or management documentation that might relate to the species (e.g. research projects, national park management plans, recovery plans, conservation plans, threat abatement plans, etc.).

There is a need for much more information on all species of *Euastacus*, beginning with basic taxonomy (Coughran & Furse 2012) and phylogenetic relationships. Because the actual population status and health of most crayfish species is so poorly known, 88% of all crayfish listings use range-based criteria rather than data on population decline (including this nomination) (Richman et al. 2015). In particular for *E. maidae*, more targeted surveys are required lower down in the catchments in less accessible private property (McCormack et al. in prep a). As there is very little background information on *E. maidae*, research should focus on population assessment and monitoring, biology, life history, habitat requirements, and resilience to invasive species. Given that *E. maidae* is threatened by rising temperatures due to climate change, obtaining some data on its thermal tolerance is particularly vital. This is a common issue, as only 6% of crayfish worldwide have any data available on their thermal tolerance (Bland 2017).

ADDITIONAL COMMENTS/INFORMATION

Please include any additional comments or information on the species such as survey or monitoring information, and maps that would assist with the consideration of the nomination.

Click or tap here to enter text.

IMAGES OF THE SPECIES

Please include or attach images of the species if available and indicate if you can authorise their use.

Fig. 6: *Euastacus maidae*.
Photo by Rob McCormack (Australian Aquatic Biological). Used with permission.

Reviewers and references

REVIEWER(S)

Has this nomination been peer-reviewed? Have relevant experts been consulted on this nomination? If so, please include their names, current professional positions and contact details.

This nomination has been peer-reviewed by Dr. James Furse (Griffith University), and was read and commented on by Robert McCormack (Australian Aquatic Biological) and Dr. Jonathan Marshall (Water Planning Ecology, DES).

A number of experts were consulted in preparing this nomination, all of whom kindly provided information, advice and guidance. These include Rob McCormack (Australian Aquatic Biological), Jason Coughran (Sheridan College), and James Furse (Griffith University).

REFERENCE LIST

Please list key references/documentation you have referred to in your nomination.

Arguez, A., Hurley, S., Inamdar, A., Mahoney, L., Sanchez-Lugo, A., Yang, L., Arguez, A., Hurley, S., Inamdar, A., Mahoney, L., Sanchez-Lugo, A., & Yang, L. (2020). Should we expect each year in the next decade (2019-2028) to be ranked among the top 10 warmest years globally? Bulletin of the American Meteorological Society, BAMS-D-19-0215.1.

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Publication approval and citation

I approve my name being retained on the nomination form for publication and provision outside the nomination process.

Timothy J. Page

Suggested Citation:

Page, T.J. (2021). Nomination to change the conservation class of *Euastacus maidae* under the Queensland *Nature Conservation Act 1992* (minor revision of 2020 version). Department of Environment and Science, Brisbane.

Nominator's Details

Note: Your details are subject to the provisions of the *Privacy Act 1988* and will not be divulged to third parties, except for state and territory governments and scientific committees that have agreed to collaborate on national threatened species assessments using a CAM. If there are multiple nominators please include details below for all nominators.

TITLE (e.g. Mr/Mrs/Dr/Professor/etc.)

Dr

FULL NAME

Timothy J. Page

ORGANISATION OR COMPANY NAME (IF APPLICABLE)

Griffith University

CONTACT DETAILS

DECLARATION

I declare that, to the best of my knowledge, the information in this nomination and its attachments is true and correct.

Signed: Click here to enter text. * *If submitting by email, please attach an electronic signature*	Date: 24/07/2020 (original submission) 30/07/2021 (minor revision)

Lodging your nomination

Completed nominations may be lodged either:
1. by email in Microsoft Word format to: SpeciesTechnical.Committee@des.qld.gov.au
2. by mail to: The Chair
   Species Technical Committee
   Queensland Herbarium
   Mount Coot-tha Rd
   Toowong QLD 4066

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