

THREATENED SPECIES SCIENTIFIC COMMITTEE

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

The Minister approved this conservation advice and included this species in the Critically Endangered category, effective from 04/07/2019

Conservation Advice

Cophixalus concinnus

(Elegant Frog)

Taxonomy

Conventionally accepted as *Cophixalus concinnus* Tyler (1979).

Summary of assessment

Conservation status

Critically Endangered: Criterion 2 B1 and B2 (a),(b)(i,ii,iii,v)

The highest category for which *Cophixalus concinnus* is eligible to be listed is Critically Endangered.

Cophixalus concinnus has been found to be eligible for listing under the following categories: Criterion 2: B1 and B2 (a),(b)(i,ii,iii,v): Critically Endangered

Cophixalus concinnus has been found to be eligible for listing under the Critically Endangered category.

Species can be listed as threatened under state and territory legislation. For information on the listing status of this species under relevant state or territory legislation, see <http://www.environment.gov.au/cgi-bin/sprat/public/sprat.pl>

Reason for conservation assessment by the Threatened Species Scientific Committee

This advice follows assessment of new information provided to the Committee to list *Cophixalus concinnus*.

Public consultation

Notice of the proposed amendment and a consultation document was made available for public comment for 30 business days between 7 September 2018 and 22 October 2018. Any comments received that were relevant to the survival of the species were considered by the Committee as part of the assessment process.

Species Information

Description

The Elegant Frog has considerable external sexual dimorphism (Hoskin 2004). Males are uniformly dark dorsally (often appearing black) with red markings that are particularly bright on the vocal sac. The classic ventral patterning and colouration in males consists of an irregular, unbroken dark area extending from the chin across the central portion of the throat. The remainder of the ventral surfaces consist of small stippled areas on a white background, with orange concentrated laterally. The female is distinctive in her very pale dorsal colouration,

almost appearing white. Ventrally, the female is of the colouration described for the male except that the black markings and areas of orange are relatively subdued. The iris of both sexes is dark, often heavily speckled with grey in the upper half.

The Elegant Frog and the Cape Melville Nursery Frog are the only Australian *Cophixalus* in which the distance between the eye and naris is greater than that between the nares. The Elegant Frog can be separated from its Australian congeners by a combination of the following characters: large size (snout-to-vent length 17.9–26.5 mm), short hind legs, large finger discs, third finger disc slightly larger to twice the size of the fourth toe disc, and call a rapidly pulsed short trill. The call is similar to that of *C. monticola* but differs in being of lower dominant frequency and longer duration (Hoskin 2004).

The eggs of microhylids are relatively large and are laid in very moist soil. The tadpole develops inside the egg and when it has completed metamorphosis it hatches from the egg as a fully formed froglet (Zweifel 1985). The eggs of this species are joined in a string by a strong mucilaginous cord (Hoskin 2004). The eggs are large relative to other frog species and clutch sizes small, with a clutch of 17 eggs being collected and preserved in 1983 (Hoskin 2004; Anstis 2017).

Distribution

The Elegant Frog is one of the most restricted amphibian species in Australia. Found only on Thornton's Peak, within the Daintree National Park in the Wet Tropics of northern Queensland, in the 718 ha that occurs over 1100 m above sea level (Hoskin 2004). Within that area the species is restricted to approximately 300 ha (Williams 2007). This species is known to co-occur only with *C. aenigma* (Hoskin 2004).

Relevant Biology/Ecology

The Elegant Frog is a high altitude rainforest specialist. It is particularly common in areas where vegetation grows amongst large jumbled boulders. Such habitat is characteristic of the higher altitudes of Thornton Peak, but does not appear to be the primary determinant of the lower altitudinal limit of the Elegant Frog as apparently suitable boulder habitat occurred below the lowest calling male down to 900m asl (above sea level) (Hoskin & Higgie 2005). The Elegant Frog occupies only a small part of the the Wet Tropics (0.02 percent), requiring moderate precipitation (2500 to 3500 mm) and cooler temperatures (17 to 19 °C)(Williams 2007).

Males call at the entrance of a small, sheltered, elevated (1-2 m above the ground) site and the black and white vocal sac is highly visible.

The microhylids of the Australian Wet Tropics differ from most other frog species in that they are terrestrial breeders and do not need surface water to breed. They require high levels of soil and litter moisture to prevent dessication of the eggs during development (Williams 2007). One parent (usually the male) will generally attend to the eggs until hatching occurs (Felton et al 2006; Hoskin 2004; Williams 2007). The embryo develops directly in the egg and then hatches out as a tiny froglet.

The generation length of the Elegant Frog is unknown, but is estimated to be 10 years, based on the known ages of breeding males being between 4-14 years for *Cophixalus ornatus* (Ornate Nursery Frog) (Felton et al. 2006).

Threats

Threats to the Elegant Frog include climate change, habitat degradation and introduced species. The table below lists the threats impacting the species in approximate order of severity of risk, based on available evidence.

Number	Threat factor	Threat status	Evidence base
1.0	Climate change		
1.1	Temperature increase, extreme weather events e.g. cyclones, droughts	Known potential	<p>The Elegant Frog is found only at a high altitude on a single mountain top. The species is expected to lose all of its core environment with a 1°C rise in temperature (Williams & Hilbert 2006). However, the effects of temperature extremes could be buffered by the frog's use of boulder-field habitat (Shoo et al. 2010).</p> <p>Climate change distribution modelling carried out by Williams and Hilbert (2006) suggests that five <i>Cophixalus</i> species (including <i>C. concinnus</i>) would lose more than 50 percent of their core habitat with a 1 °C increase in temperature. However an increase by 3 - 5 °C is predicted to be more likely in the next 50 years. All of these five species are restricted to mountain tops and are already at the limits of their potential elevational ranges. Therefore the impacts of climate change are thought to be the greatest threat to the survival of these microhylid frogs (Williams 2007). Bioclimatic modelling predicts this species to be the first vertebrate of the Wet Tropics likely to go extinct due to climate change (Hoskin 2004).</p> <p>Changes in hydrology and associated effects of climate change (e.g. reduction in food supply) may also alter the susceptibility of frogs to disease, but these impacts are likely to be variable among species and sites (DoEE 2016).</p>
2.0	Habitat loss and degradation		
2.1	Clearing, trampling, fragmentation, altered hydrology	Known potential	Feral pigs are responsible for habitat damage and potentially cause adult frog mortality (Richards et al. 1993).
3.0	Invasive species		
3.1	Yellow Crazy Ants (<i>Anoplolepis gracilipes</i>)	Known potential	Yellow crazy ants spray formic acid to subdue prey, which causes burns and irritates the skin and eyes of animals. They can have severe impacts on a range of ecological processes and lead to significant loss of biodiversity. Yellow

			crazy ants were detected within the World Heritage Area and Little Mulgrave National Park in 2012 and now cover up to 61 ha (WTMA 2016) within these protected areas. In December 2013 yellow crazy ants were also detected in the Kuranda area (WTMA 2016).
4.0	Disease		
4.1	Amphibian chytrid fungus	Known current	Chytridiomycosis is an infectious disease caused by the amphibian chytrid fungus (<i>Batrachochytrium dendrobatidis</i>) that affects amphibians worldwide, causing mass die-offs and some species extinctions (DoEE 2016). However, the prevalence of chytrid is extremely low in Australian microhylids (Hauselberger & Alford 2012).

How judged by the Committee in relation to the EPBC Act Criteria and Regulations

Criterion 1. Population size reduction (reduction in total numbers)			
Population reduction (measured over the longer of 10 years or 3 generations) based on any of A1 to A4			
	Critically Endangered Very severe reduction	Endangered Severe reduction	Vulnerable Substantial reduction
A1	≥ 90%	≥ 70%	≥ 50%
A2, A3, A4	≥ 80%	≥ 50%	≥ 30%
A1	<p style="text-align: center;"><i>based on any of the following</i></p> <ul style="list-style-type: none"> (a) direct observation [except A3] (b) an index of abundance appropriate to the taxon (c) a decline in area of occupancy, extent of occurrence and/or quality of habitat (d) actual or potential levels of exploitation (e) the effects of introduced taxa, hybridization, pathogens, pollutants, competitors or parasites 		
A2			
A3			
A4			

Evidence:

Insufficient data to determine eligibility

Given that the generation length of the Elegant Frog is estimated to be approximately 10 years, the appropriate time scale for this criterion is likely to be 30 years. There are no data available to evaluate the population trend over any three generation period.

The species may experience natural fluctuations in number due to seasonal and climatic variation and there is insufficient information to conclude whether or not the observed changes

in population size are a result of natural fluctuations. The available data does not allow a quantitative estimate of decline, therefore the Committee considers that there is insufficient information to determine the eligibility of the species for listing in any category under this criterion.

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

Evidence:

Eligible under Criterion 2 B1 & B2 (a),(b)(i,ii,iii,v) for listing as Critically Endangered

The calculated extent of occurrence (EOO) is 4 km², and the area of occupancy (AOO) is 4 km² (unpublished data DoEE 2017). These figures are based on the mapping of point records from post-1997 (20 year timeframe), compiled from state and Commonwealth agencies along with museums, research institutions and non-government organisations. The EOO was calculated using a minimum convex hull, and the AOO calculated using a 2x2 km grid cell method, based on the IUCN Red List Guidelines 2014. The EOO and AOO meet the threshold for listing as Critically Endangered under subcriteria B1 and B2.

There is a single population of the species limited to altitudes over 1100 m above sea level on Thornton's Peak in northern Queensland. Significant threats such as climate change would likely impact the entire area virtually at once.

A continuing decline in area of occupancy and area, extent and/or quality of habitat, and therefore number of mature individuals, may be inferred based on climate change (Shoo 2005; Williams et al. 2003; Williams and Hilbert 2006). Species that are both geographically restricted and patchily distributed, such as *C. concinnus*, are at a high risk of extinction, as local stochastic events may affect the entire population (Williams 2007).

The Committee considers that the species' extent of occurrence is very restricted, the area of occupancy is very restricted and the geographic distribution is precarious for the survival of the species because it occurs at only one location and a decline in area of occupancy and area, extent and/or quality of habitat and number of mature individuals has been inferred. Therefore, the species has met the relevant elements of Criterion 2 to make it eligible for listing as Critically Endangered.

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

Evidence:

Not Eligible

Population density has been estimated at 78 calling males per hectare (Williams 2007). If this is applied over the estimated 300 ha above 1100 m occupied by the species, the population size is greater than 23 000 adult males. Even without taking females into account this is well in excess of the threshold of 10 000 individuals to be eligible under this criterion.

Following assessment of the data the Committee has determined that the number of mature individuals is not limited. Therefore, the species has not been demonstrated to have met the required element of this criterion.

Criterion 4. Number of mature individuals			
	Critically Endangered Extremely low	Endangered Very Low	Vulnerable Low (Medium-term future)¹
Number of mature individuals	< 50	< 250	< 1,000
D2 ¹ Only applies to the Vulnerable category Restricted area of occupancy or number of locations with a plausible future threat that could drive the species to critically endangered or Extinct in a very short time	-	-	D2. Typically: area of occupancy < 20 km2 or number of locations ≤ 5

¹ The IUCN Red List Criterion D allows for species to be listed as Vulnerable under Criterion D2. The corresponding Criterion 4 in the EPBC Regulations does not currently include the provision for listing a species under D2. As such, a species cannot currently be listed under the EPBC Act under Criterion D2 only. However, assessments that demonstrate eligibility for listing under other criteria may include information relevant to D2. This information will not be considered by the Committee in making its assessment of the species' eligibility for listing under the EPBC Act, but may assist other jurisdictions to adopt the assessment outcome under the [common assessment method](#).

Evidence:

Not Eligible

Population density has been estimated at 78 calling males per hectare (Williams 2007). If this is applied over the estimated 300 ha above 1100 m occupied by the species, the population size is greater than 23 000 adult males. Even without taking females into account this is well in excess of the threshold of 1000 individuals to be eligible under this criterion.

The Committee has determined that the number of mature individuals is not low. Therefore, the species has not been demonstrated to have met the required element of this criterion.

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

Evidence:

Insufficient data to determine eligibility

Population viability analysis has not been undertaken. Therefore, there are insufficient data to demonstrate if the species is eligible for listing under Criterion 5.

Conservation Actions

Recovery Plan

A recovery plan is not recommended because the Elegant Frog is located in a small area in a single jurisdiction and the Conservation Advice sufficiently outlines the priority research and conservation actions needed to support the recovery of this species.

Conservation and Management priorities

Habitat loss and disturbance

- Implement a program ensuring suitable habitat is maintained in areas currently supporting populations of the Elegant Frog and investigate options for enhancing the resilience of the species' current habitat to climate change.

Invasive species (including threats from grazing, trampling, predation)

- Reduce the impacts of habitat destruction by feral pigs on existing populations by using fencing (where feasible) and reducing pig numbers.
- Control yellow crazy ants by baiting at critical stages of the ants' life cycle.

Disease

- Minimise the spread of the amphibian chytrid fungus by implementing suitable hygiene protocols (Murray 2011) to protect priority populations as described in the *Threat abatement plan for infection of amphibians with chytrid fungus resulting in chytridiomycosis* (Department of the Environment and Energy 2016).
- Provide disease identification and prevention protocols (methods of handling, diagnostic keys, etc.) to researchers and land managers for use in the field.

Stakeholder Engagement

- Collaborate with land managers bordering (outside of) the Wet Tropics World Heritage Area to protect and manage rainforest areas where the species occurs, or which contain potential habitat for the species, from threats due to disease and invasive species.
- Interested nature conservation, land management and land holder groups could be engaged in conservation management activities, such as survey and monitoring, but should be made aware of the need to follow correct field practices and hygiene protocols to mitigate the risks of trampling and disease transmission. If necessary, use workshops to aid stakeholders in developing the skills and knowledge required to manage threats to this species while undertaking these activities.
- Inform the public about the status and recovery efforts for the species, e.g. by providing information to visitors to the Wet Tropics World Heritage Area and publicising the species through the media.

Survey and Monitoring priorities

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

Information and research priorities

- Improve knowledge of the reproductive biology, age structure and growth rates of the Elegant Frog.
- Improve knowledge of the thermal tolerance limits of the Elegant Frog and assess its possible response to future climate scenarios. In particular, assess the likely buffering effect of the species use of boulder field habitats and the extent to which that will protect the species from temperature increases.
- Improve understanding of how climate change will likely impact on the Elegant Frog due to altered temperatures, rainfall, environmental stressors and disease virulence.
- Improve understanding of husbandry methods for the species.
- Investigate the development of a strategic assisted colonisation (or translocation) strategy in response to the threat of climate change. The strategy should include consideration of the benefits and risks of undertaking a coordinated series of translocations of *Cophixalus* species to mountain tops further south as increased temperatures impact on their survival and reproductive success.
- Improve understanding of the impacts of feral pigs and yellow crazy ants on the Elegant Frog.

Recommendations

- (i) The Committee recommends that the list referred to in section 178 of the EPBC Act be amended by **including** in the list in the Critically Endangered category: *Cophixalus concinnus*
- (ii) The Committee recommends that there not be a recovery plan for this species.

Threatened Species Scientific Committee

26/02/2019

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