



Consultation Document on Listing Eligibility and Conservation Actions

Cophixalus aenigma (Tapping Nursery Frog)

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

- 1) the eligibility of *Cophixalus aenigma* (Tapping Nursery Frog) for inclusion on the EPBC Act threatened species list in the Endangered category; and
- 2) the necessary conservation actions for the above species.

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

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

Responses are to be provided in writing either by email to:
species.consultation@environment.gov.au

or by mail to:

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

Responses are required to be submitted by 22 October 2018.

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General background information about listing threatened species

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

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

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

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

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

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

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

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

Information about this consultation process

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

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

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

Privacy notice

The Department will collect, use, store and disclose the personal information you provide in a manner consistent with the Department's obligations under the Privacy Act 1988 (Cth) and the Department's Privacy Policy.

Any personal information that you provide within, or in addition to, your comments in the threatened species assessment process may be used by the Department for the purposes of its functions relating to threatened species assessments, including contacting you if we have any questions about your comments in the future.

Further, the Commonwealth, State and Territory governments have agreed to share threatened species assessment documentation (including comments) to ensure that all States and Territories have access to the same documentation when making a decision on the status of a potentially threatened species. This is also known as the '[common assessment method](#)'. As a result, any personal information that you have provided in connection with your comments may be shared between Commonwealth, State or Territory government entities to assist with their assessment processes.

The Department's Privacy Policy contains details about how respondents may access and make corrections to personal information that the Department holds about the respondent, how respondents may make a complaint about a breach of an Australian Privacy Principle, and how the Department will deal with that complaint. A copy of the Department's Privacy Policy is available at: <http://environment.gov.au/privacy-policy>

Cophixalus aenigma

(Tapping Nursery Frog)

Taxonomy

Conventionally accepted as *Cophixalus aenigma* (Hoskin, 2004).

Species Information

Description

The Tapping Nursery Frog is a moderately small (snout-to-vent length 16.8–22.6 mm) frog, belonging to the family Microhylidae. The dorsal pattern and colour of the Tapping nursery frog is highly variable, ranging from even grey, brown or sand, to mottled brown or orange, to dark brown or pale with dark flecking, to grey or dark with a gold 'cap' and golden ankles and elbows. Some individuals have a thin pale vertebral stripe while others have a broad dark mid-dorsal area and paler flanks. The ventral surfaces are evenly pale, grey or flushed with orange, especially in the axilla and groin. The last digits of the fingers and toes are pale and the discs are often orange or red. The pupil is bordered by a thin red line and the iris is dark but heavily flecked with grey or lime green in the lower and, particularly, upper sections (Hoskin 2004).

The Tapping Nursery Frog can be distinguished from other *Cophixalus* species by a combination of the following characters: moderate size, eye to naris distance less than distance between the nares, short hind legs (tibia length/snout-to-vent length ratio is 0.36–0.44), and the tip of the first finger is disc-like though not expanded. The male call is a slow to medium-paced tapping, said to be reminiscent of a marble dropping on a tile (Hoskin 2004).

There is no evident sexual dimorphism (Hoskin 2004). The eggs are relatively large compared to other frog species 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). Clutch sizes average 15 (8-21) and the eggs are laid linked in a "rosary chain" by a thin, gelatinous cord (Anstis 2017). Newly hatched froglets average 5.0 mm and are light brown with darker brown patches over the shoulders and lower back (Anstis 2017).

Distribution

The Tapping Nursery Frog was relatively recently described (Hoskin 2004) as it had previously been included in the species *C. concinnus*. The range of the Tapping Nursery Frog is from Mount Lewis (inland from Mossman) to just south of Cooktown in the Wet Tropics of northern Queensland. It has been mainly found in high-elevation rainforest across the Carbine, Thornton, Finnigan and Bakers Blue Mountain uplands, north-east Queensland (Hoskin 2004) over an area of 930 km² (Williams 2007). Hoskin (2004) described its distribution as above 750 m asl (above sea level) but later extensive altitudinal surveys have found that while the species was frequently encountered within their known distribution it was not found at altitudes below 850 m (Shoo and Williams 2004).

Relevant Biology/Ecology

The Tapping Nursery Frog occurs in vine-fern forest and vine-fern thicket. Males generally call from concealed sites among leaf litter, exposed roots, rocks and fallen debris on the forest floor. Occasionally, males call from slightly elevated sites (less than 0.3 m) on logs, rocks and low vegetation.

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 generation length of the Tapping Nursery Frog is unknown. Males with nests have been found aged between 4 and 14 years (Williams 2007).

Threats

Threats to the Tapping Nursery 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	The Tapping Nursery Frog is found only at high altitude on two mountains in the wet tropics of northern Queensland. Distribution modelling for this species suggests a population reduction of greater than 40% if temperatures increase by 1°C (Shoo 2005). 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).
2.0	Habitat loss and degradation		
2.1	Clearing, trampling, fragmentation, altered hydrology	Known potential	Feral pigs are responsible for riparian 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 (Department of the

			Environment and Energy 2016). However, the prevalence of chytrid is extremely low in Australian microhylids (Hauselberger & Alford 2012).
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Assessment of available information in relation to the EPBC Act Criteria and Regulations

Criterion 1. Population size reduction (reduction in total numbers)			
Population reduction (measured over the longer of 10 years or 3 generations) based on any of A1 to A4			
	Critically Endangered Very severe reduction	Endangered Severe reduction	Vulnerable Substantial reduction
A1	≥ 90%	≥ 70%	≥ 50%
A2, A3, A4	≥ 80%	≥ 50%	≥ 30%
<p>A1 Population reduction observed, estimated, inferred or suspected in the past and the causes of the reduction are clearly reversible AND understood AND ceased.</p> <p>A2 Population reduction observed, estimated, inferred or suspected in the past where the causes of the reduction may not have ceased OR may not be understood OR may not be reversible.</p> <p>A3 Population reduction, projected or suspected to be met in the future (up to a maximum of 100 years) [(a) <i>cannot be used for A3</i>]</p> <p>A4 An observed, estimated, inferred, projected or suspected population reduction where the time period must include both the past and the future (up to a max. of 100 years in future), and where the causes of reduction may not have ceased OR may not be understood OR may not be reversible.</p>	<p><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 		

Evidence:

The generation length has not been determined for any species of Australian microhylids (Williams 2007). There are no data available to evaluate the population trend over any three generation period.

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

Criterion 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 km²	< 5,000 km²	< 20,000 km²
B2. Area of occupancy (AOO)	< 10 km²	< 500 km²	< 2,000 km²
AND at least 2 of the following 3 conditions indicating distribution is precarious for survival:			
(a) Severely fragmented OR Number of locations	= 1	≤ 5	≤ 10

(b)	Continuing decline observed, estimated, inferred or projected in any of: (i) extent of occurrence; (ii) area of occupancy; (iii) area, extent and/or quality of habitat; (iv) number of locations or subpopulations; (v) number of mature individuals
(c)	Extreme fluctuations in any of: (i) extent of occurrence; (ii) area of occupancy; (iii) number of locations or subpopulations; (iv) number of mature individuals

Evidence:

The calculated extent of occurrence (EOO) is 1220 km², and the area of occupancy (AOO) is 44 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.

There are four major subpopulations at Carbine Tablelands, Thornton Uplands, Finnigan Uplands and Bakers Blue Mountain (Hoskin, 2004). A continuing decline in area of occupancy and area, extent and/or quality of habitat may be inferred based on climate change (Shoo, 2005).

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

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

Evidence:

Surveys of calling males estimated density of the Tapping Nursery Frog at approximately 17 per hectare (Shoo and Williams, 2004; Williams, 2007). Over a range of 44 km² this equates to approximately 75 000 male frogs and thus the number of mature individuals is not limited.

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

Criterion 4. Number of mature individuals			
	Critically Endangered Extremely low	Endangered Very Low	Vulnerable Low (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 km ² 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:

Surveys of calling males estimated density of frogs at approximately 17 per hectare (Shoo and Williams, 2004; Williams, 2007). Over a range of 44 km² this equates to approximately 75 000 male frogs and thus the number of mature individuals is not low.

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

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

Evidence:

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

Conservation Actions

Recovery Plan

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

Primary Conservation Actions

- The primary conservation action for the Tapping Nursery Frog is to manage known threats to the species, resolve knowledge gaps relating to potential threats to the species and prioritise conservation actions to address them.

Conservation and Management Priorities

Habitat loss and disturbance

- Implement a program ensuring suitable habitat is maintained in areas currently supporting populations of the Tapping Nursery Frog and investigate options for providing new habitat that would be suitable for the species under climate change scenarios.

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 Tapping Nursery Frog.
- Design and implement a monitoring program for the Tapping Nursery Frog.

Information and Research priorities

- Improve knowledge of the reproductive biology, age structure and growth rates of the Tapping Nursery Frog.
- Improve knowledge of the thermal tolerance limits of the Tapping Nursery Frog and assess its possible response to future climate scenarios.
- Improve understanding of how climate change will likely impact on the Tapping Nursery 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 Tapping Nursery Frog.

References cited in the advice

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- Felton A. R., Alford R. A. and Schwarzkopf L. (2006). Multiple mate choice criteria and the importance of age for male mating success in the microhylid frog, *Cophixalus ornatus*. *Behavioural Ecology and Sociobiology* 59:786-795.
- Hauselberger K. F. and Alford R. A. (2012). Prevalence of *Batrachochytrium dendrobatidis* infection is extremely low in direct-developing Australian microhylids. *Diseases of Aquatic Organisms* 100,191-200.
- Hoskin C. J. (2004). Australian microhylid frogs (*Cophixalus* and *Austrochaperina*): phylogeny, taxonomy, calls, distributions and breeding biology. *Australian Journal of Zoology* 52,237-269.
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- Shoo L. and Williams Y. (2004). Altitudinal distribution and abundance of microhylid frogs (*Cophixalus* and *Austrochaperina*) of north-eastern Australia: baseline data for detecting biological responses to future climate change. *Australian Journal of Zoology* 52,667-676.
- Williams Y. (2007). Ecological differences between rare and common species of microhylid frogs of the Wet tropics biogeographic region. Thesis. James Cook University.
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Other sources cited in the advice

- Atlas of Living Australia (2016)
<http://spatial.ala.org.au/?q=lsid%3Aurn%3Alsid%3Abiodiversity.org.au%3Aafd.taxon%3A4ca01bb0-bc9c-4f5a-bef4-160d09725a85#>
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Department of the Environment and Energy (2017). Area of Occupancy and Extent of Occurrence for *Cophixalus aenigma*. Unpublished report, Australian Government Department of the Environment, Canberra.

Wet Tropics Management Authority (WTMA) (2016). Stamp Out Yellow Crazy Ants. Viewed 2 December 2016. Available on the internet at: <http://www.wettropics.gov.au/stamp-out-yellow-crazy-ants.html>.

Wet Tropics Management Authority (WTMA) (2017). Available from: <http://www.wettropics.gov.au/nursery-frogs>

Consultation questions

1. Do you agree with the current taxonomic position of the Australian Faunal Directory for this taxon (as identified in the draft conservation advice)?
2. Can you provide any additional references, information or estimates on longevity, age of maturity, average life span and generation length?
3. Has the survey effort for this taxon been adequate to determine its national distribution and adult population size?
4. Do you accept the estimate provided in the nomination for the current population size of the taxon?
5. For any population with which you are familiar, do you agree with the population estimate provided? If not, are you able to provide a plausible estimate based on your own knowledge? If so, please provide in the form:
 - Lower bound (estimated minimum):
 - Upper bound (estimated maximum):
 - Best Estimate:
 - Estimated level of Confidence: %
6. Can you provide any additional data, not contained in the current nomination, on declines in population numbers over the past or next 10 years or 3 generations, whichever is the longer?
7. Is the distribution as described in the nomination valid? Can you provide an estimate of the current geographic distribution (extent of occurrence or area of occupancy in km²) of this taxon?
8. Has this geographic distribution declined and if so by how much and over what period of time?
9. Do you agree that the taxon is eligible for inclusion on the threatened species list, in the category listed in the nomination?
10. Do you agree that the threats listed are correct and that their effects on the taxon are significant?
11. To what degree are the identified threats likely to impact on the taxon in the future?
12. Can you provide additional or alternative information on threats, past, current or potential that may adversely affect this taxon at any stage of its life cycle?
13. In seeking to facilitate the recovery of this taxon, can you provide management advice for the following:
 - What individuals or organisations are currently, or need to be, involved in planning to abate threats and any other relevant planning issues?
 - What threats are impacting on different populations, how variable are the threats and what is the relative importance of the different populations?
 - What recovery actions are currently in place, and can you suggest other actions that would help recover the taxon? Please provide evidence and background information.
14. Can you provide additional data or information relevant to this assessment?
15. Can you advise as to whether this species is of cultural significance to Indigenous Australians?

