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

Conservation Advice

Litoria myola

(Kuranda Tree Frog)

Taxonomy

Conventionally accepted as *Litoria myola* (Kuranda Tree Frog) (Hoskin, 2007).

Summary of assessment

Conservation status

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

Endangered: Criterion 3 C2(a)(i)

Vulnerable: Criterion 4

The highest category for which *Litoria myola* is eligible to be listed is Critically Endangered.

Litoria myola has been found to be eligible for listing under the following categories:
Criterion 2: B1 and B2 (a),(b)(i-v): Critically Endangered
Criterion 3: C2(a)(i): Endangered
Criterion 4: Vulnerable

Litoria myola 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 *Litoria myola.*

Public consultation

Notice of the proposed amendment and a consultation document was made available for public comment for 31 business days between 17 January 2018 and 2 March 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

Litoria myola (Kuranda Tree Frog) is a medium-sized stream and forest dwelling frog with a broad, flattened head and slender body. Males and females are generally a mottled pattern of tan and brown on the upper surface and pale underneath. A green crescent is present in the

upper iris and the back edge of the forearms and legs is fringed with small skin extensions (Hoskin 2007). The skin on the back is smooth with scattered small tubercles and the skin on the belly is granular. There is considerable sexual dimorphism in size: males are 35–45 mm snout-to-vent length (SVL) and weigh 2–5 g and females are 57–69 mm SVL and weigh 9–19 g (Hoskin 2007). The male call is a short, fast series of relatively soft 'tocs'.

Eggs are laid in streams in a clutch of approximately 500 as cohesive clump. The tadpoles have not been formally described, but are similar to those of *L. serrata* (Green-eyed Tree Frog) (Hoskin 2007; Hoskin & Hero 2008; Richards et al. 2010).

Distribution

The Kuranda Tree Frog is endemic to a small area west of Cairns in north-east Queensland. The species is known from 12 discrete breeding aggregations in the lower sections of streams entering the Barron River between the localities of Kuranda, Myola, Mantaka, Kowrowa and Oak Forest. This species occurs within the Wet Tropics IBRA Bioregion and the Wet Tropics Natural Resource Management Region. The largest breeding aggregation of Kuranda Tree Frog is located partly in a reserve, Jumrum Creek Conservation Park. Other breeding aggregations exist on private land and Mareeba Shire Council Land (Hoskin 2007).

Relevant Biology/Ecology

The Kuranda Tree Frog is a nocturnal, arboreal species found in rainforest near slow-moving permanent and ephemeral streams (Hoskin 2007; Hoskin & Hero 2008). All sites from which the species is known are close to the Barron River and between 300 and 400 m altitude. The sites are generally sheltered and experience little wind. At these mid altitudes the climate is warm and humid. There are pronounced wet and dry seasons, with most rain falling in the warmer ‘wet season’ between November and April. Streams inhabited by the Kuranda Tree Frog are meandering and consist of long, slow pools separated by short, shallow sections of riffles or cascades. The streams are small to moderate-sized, with low levels of flow (except following heavy rain) (Hoskin 2007).

Male Kuranda Tree Frogs are encountered calling along streams through the spring and summer months, primarily near riffle areas and small cascades (Hoskin 2007). Males are rarely encountered away from streams. Calling males clump around the shallower, flowing sections of streams (Hoskin 2007).

Males and females lead noticeably different lifestyles. A few females have been observed in the mid and upper strata of rainforest trees (both near and some distance from streams) and Hoskin (2007) suggests that this is where they live when not visiting streams to breed. The Kuranda Tree Frog breeds primarily in spring and summer. Tadpoles live in streams for about 2 months. Metamorphs have been observed on stream-side vegetation but sub-adults have rarely been observed in streams, suggesting that they move into the forest to mature. The fact that the species breeds only in the lower sections of streams means that it is vulnerable to impacts not just at occupied sites but also in upstream areas of the catchments (Hoskin 2007).

The species has been observed in relatively mature rainforest as well as in areas of regenerating rainforest. The species appears to require reasonably thick riparian forest and is generally absent from sites where only narrow strips of riparian forest have been retained (Hoskin 2007).

The generation length in the Kuranda Tree Frog is not known with certainty but is estimated to be 3.5 years based on two similar-sized *Litoria* species found in similar habitats: *L. chloris* (Red-eyed Tree Frog and *L. lesueuri* (Lesueur’s Tree Frog)(Morrison et al. 2004).

Threats

Threats to the Kuranda Tree Frog include amphibian chytrid fungus (*Batrachochytrium dendrobatidis*), hybridisation, habitat degradation and invasive 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	Disease		
1.1	Amphibian chytrid fungus	Known current	Chytridiomycosis is an infectious disease caused by the amphibian chytrid fungus that affects amphibians worldwide, causing mass die-offs and some species extinctions (Department of the Environment and Energy 2016). The amphibian chytrid fungus has been found on the sympatric, and closely related, Green-eyed Tree Frog (Hoskin 2007). Female Kuranda Tree Frogs are believed to be at a higher risk of mortality during their seasonal breeding movements between forest and stream habitats (TSSC 2010).
2.0	Invasive species		
2.1	Yellow Crazy Ants *(Anoplolepis gracilipes)*	Known current	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 Wet Tropics World Heritage Area and Little Mulgrave National Park in 2012 and now cover up to 61 ha within these protected areas (Wet Tropics Management Authority 2016). In December 2013 yellow crazy ants were also detected in the Kuranda area (Wet Tropics Management Authority 2016) and have become established at one of the few breeding sites of the Kuranda Tree Frog (Lach & Hoskin 2015).
2.2	Feral Pigs (*Sus scrofa*)	Suspected	Feral Pigs are responsible for riparian habitat damage and potentially cause adult frog mortality (Richards et al. 1993).
3.0	Habitat loss and degradation		
3.1	Clearing, trampling, fragmentation, altered hydrology, salinity	Known potential	Changes in water flow, water quality and sedimentation, may occur due to current and proposed residential development (Hoskin 2007). These changes can occur as a result of impacts both at the sites where the species occurs as well as upstream in the catchments. The species has a very limited range which is close to the township of Kuranda, around which there is significant, and increasing, urban and semi-urban development (Hoskin 2007).
3.2	Climate change (temperature	Known potential	Climate change is predicted to result in increased rainfall across northern Australia

	increase, extreme weather events e.g. cyclones, droughts)		(Haylock & Nicholls 2000). This may alter the hydrology and breeding frequency of stream-dwelling frogs, and make them vulnerable to being dislodged in high flows. Changes in hydrology and other effects of climate change (e.g. reduction in food supply) may also alter the susceptibility of frogs to the chytrid fungus, but these impacts are likely to be variable among species and sites (DoEE 2016).
4.0	Hybridisation		
4.1	Hybridisation	Known potential	The species is potentially threatened by hybridisation with the closely related *Litoria serrata* (Green-eyed Tree Frog) (Richards et al. 2010). Currently the two species co-exist in this region but levels of hybridisation are very low. However, disruption to the natural levels of interaction due to captive breeding and release or movement of individuals in and out of the region or between sites may increase levels of hybridisation.

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 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 the followin

(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:

Insufficient data to determine eligibility

Given that the generation length in the Kuranda Tree Frog is estimated to be 3.5 years (Morrison et al. 2004), the appropriate time scale for this criterion is likely to be 11 years.

Between 2000 and 2006, stream surveys and density estimates revealed a Kuranda Tree Frog population of approximately 1000 mature individuals (Hoskin 2007). During that period the species was known from five streams. Additional surveys and monitoring performed over the summer wet season of 2006–07 showed a noticeable decline in abundance of the species at four of these five sites. In particular, numbers at the only site with a significant breeding aggregation, Jumrum Creek, declined from 500 adults to 200 in November 2008, based on detection of 100 calling males and assuming a 1:1 ratio of males:females (Hoskin pers. comm. 2009). This represents a 30 percent reduction in total population size (300 out of a population size of 1000 mature individuals) over two years. In addition, declines recorded at the other four sites in 2006–07 are continuing (Hoskin pers. comm. 2009).

The Committee considers this overall reduction in numbers to be substantial. However, the species may experience natural fluctuations in number due to seasonal and climatic variation. 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 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:

Eligible under Criterion 2 B1 and B2 (a),(b)(i-v) for listing as Critically Endangered

The calculated current extent of occurrence (EOO) for the Kuranda Tree Frog is 4 km^2 and the area of occupancy (AOO) is also calculated to be 4 km^2 (Hoskin 2007; unpublished data DoEE 2017) but may be larger given seasonal movements of females. These figures are based on the mapping of point records from 2007, 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.

This distribution is somewhat fragmented, as the species occurs in 12 breeding aggregations (Hoskin 2007). These aggregations are geographically discrete clusters of breeding individuals that are largely independent of each other, as individuals have not been found in areas between these breeding aggregations (Hoskin 2007). Distances between some of the breeding aggregations are large compared to the likely dispersal ability of the species, and rainforest habitat has been cleared for rural sub-division and urban development between some breeding aggregations, most likely limiting movement of the species (Hoskin 2007).

While the distribution is fragmented, the entire range of the species is within a few kilometres in any straight line distance. Given that significant threats such as the amphibian chytrid fungus and yellow crazy ants may spread over this distance quickly, the species can be considered to be contained at a single location (IUCN Standards and Petitions Subcommittee 2017). The IUCN defines the term 'location' as "a geographically or ecologically distinct area in which a single threatening event can rapidly affect all individuals of the taxon present. The size of the location depends on the area covered by the threatening event and may include a part of one or many subpopulations. Where a taxon is affected by more than one threatening event, location should be defined by considering the most serious plausible threat" (IUCN 2001; 2012).

Continuing decline may be inferred based on the likely reduction in number of individuals due to ongoing threats from the amphibian chytrid fungus, habitat fragmentation and degradation and the relatively recent threat of yellow crazy ants.

The Committee considers that the species' extent of occurrence is very restricted, and the geographic distribution is precarious for the survival of the species because it occurs at only two locations and a decline in habitat quality 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**
	(ii) % of mature individuals in one subpopulation =	**90 – 100%**	**95 – 100%**	**100%**
(b)	Extreme fluctuations in the number of mature individuals			

Evidence:

Eligible under Criterion 3 C2(a)(i) for listing as Endangered

The total number of mature individuals of the Kuranda Tree Frog is estimated to be approximately 700 (Hoskin pers comm 2009). The species' distribution is fragmented, occurring in 12 discrete breeding aggregations, increasing its risk of extinction. The species is subject to a number of ongoing threats including clearing of rainforest vegetation and alterations to stream characteristics due to residential development (Hoskin 2007) and the impacts of yellow crazy ants. In addition, the species is subject to potential threats including the amphibian chytrid fungus and hybridisation with the closely related Green-eyed Tree Frog (Hoskin 2007). These threats are likely to cause the species to decline in the future.

The Committee considers that the species' population size is low and likely declining. Therefore, the species has met the relevant elements of Criterion 3 to make it eligible for listing as Endangered.

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:

Eligible under Criterion 4 for listing as Vulnerable

As described above for Criterion 3, the total population is approximately 700 individuals (Hoskin pers comm 2009). Therefore, the species has met the relevant elements of Criterion 4 to make it eligible for listing as Vulnerable.

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 appears not to have 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 Kuranda Tree Frog is located in a relatively 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

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.

Habitat degradation

- Extend the area of protected habitat to include the entire distribution of the largest breeding aggregation.
- Identify additional priority populations of high conservation value, such as key breeding aggregations and manage these priority sites to reduce the impacts of habitat destruction by residential development and invasive species. Relevant measures may include fencing, signage etc.

Invasive species

- Minimise the spread of yellow crazy ants and manage their impacts by implementing an eradication program based on baiting at critical stages of the ants life cycle, as outlined on the Wet Tropics Management Authority website (Wet Tropics Management Authority 2016).

Stakeholder Engagement

- Encourage ongoing and effective coordination of state-wide action to support conservation of the Kuranda Tree Frog, including eradication programs for invasive species.
- Provide input to Wet Tropics Management Authority environmental codes of practice with land management agencies (fire, water infrastructure, transport and public utility, mining and quarrying, defence and grazing) to ensure conservation and management actions are compatible with amphibian requirements.
- Provide disease field protocols for researchers and land managers (handling, diagnostic keys, etc.) and advice to government and other relevant managers on disease management and control.
- Provide advice and information on the use of herbicides/biocides against pests and diseases in areas with threatened frogs.
- 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.

Survey and Monitoring priorities

- Conduct targeted surveys throughout the range of the Kuranda Tree Frog to better define its current distribution and abundance.
- Establish and maintain a monitoring program based on these data to:
  - determine trends in population size and distribution, mortality and timing of life history stages;
  - monitor hybridisation levels; and
  - monitor progress, including the effectiveness of management actions and the need to adapt them if necessary.

Information and research priorities

- Investigate options for linking, enhancing or establishing additional populations.
- Improve understanding of the potential for hybridisation by developing and implementing guidelines on how to detect hybrids.
- Improve understanding of the extent and impact of infection by the amphibian chytrid fungus on the Kuranda Tree Frog to better inform how to apply existing or new management actions relevant to the recovery. This includes knowledge on:
  - the different strains of the fungus;
  - levels of virulence;
  - mechanisms for resistance to the disease;
  - treatment options; and
  - the potential of other species (e.g. freshwater crayfish) to act as reservoirs or vectors for transmission of the fungus (Department of the Environment and Energy 2016).
- Determine the extent of the threat and the likely impacts from yellow crazy ants.
- Improve understanding of how climate change will likely impact on the Kuranda Tree Frog due to altered temperatures, rainfall, environmental stressors and disease virulence.
- Improve understanding of husbandry methods for the species.
- Improve understanding of the impacts of environmental toxins.

Recommendations

(i) The Committee recommends that the list referred to in section 178 of the EPBC Act be amended by **transferring** from the Endangered category to the Critically Endangered category:
Litoria myola

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

Threatened Species Scientific Committee

27/05/2018

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