



Consultation Document on Listing Eligibility and Conservation Actions

***Phyllorhina kundagungan* (Mountain Frog)**



Phyllorhina kundagungan (copyright: H.B. Hines, Queensland Department of Environment and Science)

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

- 1) the eligibility of *Phyllorhina kundagungan* (Mountain 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
Biodiversity Conservation Division
Department of Agriculture, Water and the Environment
PO Box 787
Canberra ACT 2601

Responses are required to be submitted by 24 July 2020.

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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/system/files/pages/d72dfd1a-f0d8-4699-8d43-5d95bbb02428/files/tssc-guidelines-assessing-species-2018.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>.

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>.

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.

Philoria kundagungan

Mountain Frog

Taxonomy

Conventionally accepted as *Philoria kundagungan* Ingram & Corben, 1975. No subspecies are recognised.

Species/Sub-species Information

Description

Philoria kundagungan (Mountain Frog) is a small, squat, pear-shaped frog, with a snout-to-vent length (SVL) to 28 mm. The skin is smooth, with the occasional low ridge or tubercle present in some specimens, which increase in frequency in individuals to the south of the distribution range. Like other *Philoria* species, individuals are variable in colour and pattern. The dorsal surface can be a base colour of yellow, orange, bright red or black, with patches of alternative colours. Two black V-shaped markings may be present on the back above the groin. In about half of the specimens, a pair of raised ridges is present, starting behind the eye and continuing posteriorly about a third of the way along the dorsum. The ventral surface is usually yellow or red with smaller patches of either colour, including a red patch on the throat and/or sides of the belly. Brown patches and white dots are also sometimes present. The under surfaces of the limbs range from yellow to yellow with red or brown wash, with small irregular shaped white marks when limbs are a dark colour. A black patch is present covering the cloaca and sometimes the adjacent upper thighs or entire upper thighs. The head is wider than it is long, and the snout is bluntly rounded. The tympanum is indistinct. A dark facial stripe is present in about half the specimens, running from near the tip of snout, crossing the eye, and through to the base of the forelimb. The eyes are brown and prominent. The hind-limbs are short and stocky, and the arms more robust in males than females. Fingers and toes are unwebbed. Breeding males have a poorly developed nuptial pad on first finger and females have spatula on the first and second fingers. The description of the adult is drawn from Knowles et al. 2004; Cogger 2014; Anstis 2017; OEH 2019.

Metamorphs are very small, with an SVL to 7.3 mm. They are a dark brown to black colour, with some white speckling on the underside (Anstis 2017).

Tadpole are small, growing 22mm in total length. The body is very small (5.5 mm) and oval, with the abdomen wider than it is deep. The snout is rounded. The intestinal mass is visible. At later stages the dorsal surface darkens with increased grey pigmentation. Fins are shallow and clear, with numerous blood vessels. The dorsal fin begins from just onto body, with the tail tip broadly rounded. The eyes are lateral in earlier stages and dorso-lateral later. Oral disc edges are slightly keratinised (Anstis 2017).

Distribution

The Mountain Frog has a restricted geographical range, being known from only a few breeding sites within a small area of the Gondwana rainforests, either side of the Queensland-NSW border. However, a PhD thesis by Bolitho (unpublished) is expected to increase both the number of localities and records of the species. Presently, the Mountain Frog is known to be distributed from the Mistake Mountains, in the Main Range National Park (NP), south-east Queensland, to Beaury State Forest (SF), north-east NSW (15 km south of the Queensland-NSW border) (Knowles et al. 2004; Parris 2004; Cogger 2014; Anstis 2017; Bolitho 2018).

Most of the Mountain Frog population is found within the Main Range NP (L Bolitho pers comm, cited in Newell 2018), with sites at Blackfellow Creek, Dalrymple Creek (main and northern branch), Flaggy Creek, Warrill Creek, Gap Creek (East and West), Menura Creek, Farm Creek, Shady Creek, and Teviot Brook. The species is rare in NSW, with small populations found at

Tooloom NP, Koreelah NP, Mount Clunie NP, Beaury SF and Donaldson SF (Newell 2018; OEH 2019).

The Mountain Frog is restricted to mid to high elevations throughout its range (above 700-800 m). However, within the Main Range NP, peaks are not particularly high (Mount Superbus is the highest peak, measuring 1375 m (DNPRSR 2013)), effectively limiting available habitat. At higher elevations the habitat is characterised by cooler temperatures and greater moisture content due to high rainfall and cloud interception (Laidlaw et al. 2011; Hero et al. 2015).

Relevant Biology/Ecology

The biology and ecology of the Mountain Frog is not fully understood. Further studies are required to provide information on population (size, structure and dynamics), habitat requirements, and breeding biology. However, the habitat and reproductive biology of all *Philoria* species are recognised as being similar and can be described in general (Hollis 2004; Knowles et al. 2004).

The Mountain Frog is a terrestrial breeding species and does not use water bodies for tadpole development (instead laying eggs in water-filled cavities). However, it is found in close association with rainforest streams (Knowles et al. 2004). Most records are males calling from nest sites under rocks or leaf litter in the boggy margins of first and second order streams in upland rainforests (Knowles et al. 2004; Cogger 2014; Anstis 2017), although in a few instances the species is also known from seepages in adjacent wet sclerophyll forest (H Hines 2020. pers comm 14 May). There are no records of this species (or congeners) from cleared or highly modified habitats.

Breeding is known to occur in late August to early December (Anstis 2017; M Mahony 2020. pers comm 15 April). Males call from nest sites with a low-pitched, resonant, deep, guttural 'ork' (Lemckert & Mahony 2008; Hoskin et al. 2009; Anstis 2017). Breeding congregations are small, with Knowles et al. (2004) recording a group of eight males (Mt Superbus, Queensland), Hines (unpublished data) estimating a maximum of ten males calling from two sites (Flaggy and Dalrymple Creeks – twice at the latter site), and Schulz et al. (unpublished data from Queensland Government's WildNet database) recording 11 individuals at Dalrymple Creek (H Hines 2020. pers comms 14 May).

Willacy et al. (2015) observed calling for *P. richmondensis* (Richmond Mountain Frog) to be primarily influenced by spring and early summer rainfall events, with the highest frequency of calling overlapping with temperatures between 15–16 °C. It is thought that rainfall cues all *Philoria* species to commence calling in response to increased nest moisture, which provides a suitable environment for egg and tadpole survival (Knowles et al. 2004; Lopez 2016; Newell 2018).

Females lay a small clutch of eggs (under 50) in the nest (Knowles & Mahony 2004). At the time of egg-laying, the female excretes a jelly like mucous and beats air bubbles into it and the contained eggs with her flanged fingers. Over time, the resulting foam loses its bubbles to become a still jelly, but whilst present, provides adequate oxygen for the early embryo stage (Seymour et al. 1995; Knowles et al. 2004; Anstis 2017).

Tadpoles (and at least one parent) remain in the nest throughout their entire development, until they emerge post metamorphosis. While in the nest, tadpoles develop in a mixture of jelly and the very shallow water that drains through the nest (Hollis 2004; Knowles et al. 2004; Anstis 2017). Tadpoles are non-feeding and rely upon a residual yolk reserve for nutrition (Hollis 2004; Knowles et al. 2004; Hero et al. 2015).

There are no detailed studies on movement patterns of adult Mountain Frogs. However, Newell (2018) observed that *Philoria* species rarely move far from the nest sites. Tracking of the related *P. frosti* (Baw Baw Frog) show the range of movement is relatively small (0–11 m² in breeding periods and approximately 3–1000 m² post breeding season). This conforms to studies on other

amphibian movement that show most species do not move further than several hundred metres from their breeding sites (Hollis 2004).

The diet of adult Mountain Frogs is not known, although other *Philoria* species feed on *Hymenoptera* species (sawflies, wasps, bees, and ants), *Collembola* species (wingless arthropods), *Arachnia* species (spiders), *Amphipoda* species (crustaceans), *Orthoptera* species (crickets), *Diptera* species (true flies), *Coleoptera* species (beetles), *Hemiptera* species (true bugs), and insect larvae (Lima et al. 2000).

The longevity of the Mountain Frog is also not known. However, sampling of the related Baw Baw Frog has identified the maximum age of individuals of this species, at similar montane elevations (960–1299 m), to be 9.5 years for males and 11.5 years for females. Males reach reproductive maturity at 3.5 years and females at 5.5 years (Hollis 2004). This gives a potential generation length of six–eight years for the Baw Baw Frog. The Mountain Frog is likely to be on the lower end of this range, given the colder climate in the distribution range of the Baw Baw Frog (endemic to the Central Highlands of Victoria) likely increases the maximum age of individuals. Therefore, generation length for the Mountain Frog is tentatively set at six years but should be adjusted as ecological knowledge of the species improves.

Threats

Table 1: Threats impacting the Mountain Frog in approximate order of severity of risk, based on available evidence

Number	Threat factor	Threat type and status	Evidence base
1.0	Climate Change		
1.1	Increased temperature intensity/frequency and change to precipitation patterns	known current	<p>Climate change is expected to cause a pronounced increase in extinction risk for frog species over the coming century, with terrestrial breeding frogs identified as some of the most vulnerable taxa (Hero et al. 2005; Lemckert & Penman 2012; Hagger et al. 2013; Pearson et al. 2014; Lopez 2016).</p> <p>Climate projections for eastern Australia include reduced rainfall, increased average temperatures, and more frequent droughts. These conditions will increase the scale, frequency and intensity of wildfires (CSIRO 2007; CSIRO & Bureau of Meteorology 2015) and could affect Mountain Frog recruitment levels. Rainfall and temperature have been observed to influence the duration and frequency of male choruses in <i>Philoria</i> species (Hollis 2004; Willacy et al. 2015; Lopez 2016), with a change in pattern potentially shortening the breeding season. In addition, any reduction in moisture levels in nesting sites may impact on egg and larval development (Lemckert & Penman 2012).</p>

			<p>Studies have suggested a continuing contraction of climate suitable envelopes for subtropical rainforest by 2050, isolating remnant vegetation and dependent fauna to small pockets along suitable ranges (Mellick et al. 2013; Lopez 2016). In addition, shifts in distribution to higher altitudes by endemic montane communities, mirroring any increase in temperature, may cause further geographical range contraction and increase the risk of extinction (Hagger et al. 2013; Lopez 2016).</p> <p><i>Phyllorhina</i> species may be buffered to a degree from climate change due to inhabiting closed canopy rainforests, which are a thermally stable environment (Lopez 2016), and through their burrows, with a barrier of soil and water further reducing temperature extremes (Willacy et al. 2015; Lopez 2016). However, despite this protection, impacts from climate change have already been observed. Patch occupancy surveys failed to detect frogs at formerly known lower elevation sites during the 2017-19 breeding seasons, with prolonged drought conditions thought to be responsible for frog absence (D Newell 2020. pers comm 15 April).</p>
1.2	Increased intensity/frequency of wildfire	known current	<p>Localised extinction of frogs has been observed through wildfire events. Johnson (1971) found the limit for <i>Taudactylus diurnus</i> (Day Frog), a climatically similar montane rainforest species, was 31.1 ± 1.2 °C. However, as a burrowing species, the Mountain Frog may face a reduced threat from fire, although this is not confirmed at this time.</p> <p>Climate projections for eastern Australia of higher temperatures and change to rainfall patterns will increase the scale, frequency and intensity of wildfires in the region (CSIRO 2007; CSIRO & Bureau of Meteorology 2015). In 2019-20, following years of drought (DPI 2020), catastrophic wildfire conditions culminated in fires that covered an unusually large area of eastern and</p>

			<p>southern Australia. In many places, the fires burnt with high intensity. The full impact of the 2019-20 bushfires has yet to be determined. The bushfires will not have impacted all areas equally: some areas burnt at very high intensity whilst other areas burnt at lower intensity, potentially even leaving patches unburnt within the fire footprint. However, an initial analysis estimates that 52 percent of the Mountain Frog's distribution range in Queensland and 5–10 percent in NSW was impacted. This sort of event is increasingly likely to reoccur as a result of climate change.</p>
2.0	Habitat loss and fragmentation		
2.1	Vegetation clearance/habitat fragmentation	known current	<p>Due to large-scale clearing, much of the remaining subtropical rainforest of south-east Queensland and north-east NSW occurs in a discontinuous arc along the Great Dividing Range (Hagger et al. 2013). This clearing is likely to have substantially reduced the distribution range of <i>Philoria</i> species (Knowles et al. 2004).</p> <p>Much of the remaining Mountain Frog habitat is protected within the National Park network (over 70 percent), with the core distribution located in the Main Range NP (Bolitho unpublished data). However, historic disturbance (grazing, logging and wildfire) has opened the canopy in some areas, encouraging weeds to establish in the understorey. These weeds have expanded into undisturbed areas and reduced habitat quality (DNPRSR 2013). Other disturbances include logging in the immediate vicinity of known Mountain Frog sites at Beaury SF and Koreelah SF, NSW (Knowles et al. 2004); large areas of plateau rainforest converted to plantation forestry in the Acacia Plateau and Koreelah SF; and a commercial ecotourism venture in the Main Range NP. In addition, an anticipated decline in the amount of montane rainforest habitat is predicted under moderate (RCP6.0) and extreme (RCP8.5) climate change scenarios (Lopez 2016).</p>

			<p>The Mountain Frog population is severely fragmented, encompassing several habitat fragments which are geographically isolated from one another. The core population in the Main Range NP is naturally fragmented, given the species strong association with drainage lines, with sites separated from each other over its length, including at Mount Mistake (top), Cunningham Gap (mid-point), and Mount Superbus (bottom) (Knowles et al. 2004). This fragmentation continues south into NSW, where isolated sites are identified in three separate National Parks (OEH 2019). This isolation, together with probable low dispersal ability of the species (and associated poor recolonisation potential) (Newell 2018), reduces the likelihood of recovery from future extreme events (Hollis 2004; Hagger et al. 2013) and is recognised as a major threat to the persistence of the Mountain Frog (OEH 2019).</p>
3.0	Disease		
3.1	Chytridiomycosis caused by chytrid fungus	known current	<p>Chytridiomycosis is an infectious disease caused by the amphibian chytrid fungal pathogen <i>Batrachochytrium dendrobatidis</i> (<i>Bd</i>). Infected populations exhibit diverse susceptibility to <i>Bd</i>. Some species do not exhibit any apparent symptoms, whilst others are extremely vulnerable, resulting in mass die-off and extinction (DOEE 2016).</p> <p>The Mountain Frog has been identified as having the greatest susceptibility of <i>Bd</i> infection of all <i>Phyllorhina</i> species (Murray & Skerratt 2012) and sampling across its geographical range showed infection prevalence at 47.3 percent, with 11 of 19 sampled headwater streams containing infected individuals (Bolitho et al. unpublished). In addition, the Mountain Frog is found at mid-high elevations (above 700–800 m), and in close association with rainforest streams (Knowles et al. 2004), where environmental conditions are suitable for <i>Bd</i>, raising the chance of infection (Hero & Morrison 2004; Skerratt et al. 2010; Hero et al. 2015; Lopez 2016).</p>

			<p>However, there is no evidence of <i>Bd</i> related declines for the species and its disappearance from historical sites is thought to be related to climate change (drought) rather than disease.</p> <p>Eradicating <i>Bd</i> is difficult. Some amphibian species are reasonably tolerant, acting as a natural reservoir, spreading the pathogen, which persists even at low host densities. There is no evidence that <i>Bd</i> has disappeared from any known location in eastern Australia (Voyles et al. 2009; Newell et al. 2013).</p>
4.0	Invasive species		
4.1	Invasive weeds	known current	<p>In the distribution range of the Mountain Frog, significant areas of Lantana (<i>Lantana camara</i>), Crofton Weed (<i>Ageratina adenophora</i>) and Mistflower (<i>A. riparia</i>) infestations are prevalent. Other encroaching noxious weeds include Madeira Vine (<i>Anredera cordifolia</i>), Moth Vine (<i>Araujia sericifera</i>), Blackberry (<i>Rubus fruticosus</i>), Annual Ragweed (<i>Ambrosia artemisiifolia</i>), and exotic grasses (DNPRSR 2013).</p> <p>The effect of these weeds is not known, but they may have negative impacts on the thermal buffering providing by the rainforest canopy (Lopez 2016), suitability of areas for egg laying, and changes to invertebrate assemblages, which are an important component of the diet of <i>Phyloria</i> species (Lima et al. 2000).</p> <p>In addition, many of the exotic grasses were introduced to Australia for cattle grazing because of their high biomass. They compete with native species and can produce very high fuel loads, leading to higher intensity wildfires that can damage native vegetation and impact wildlife (DNPRSR 2013).</p>
4.2	Invasive fauna	potential current	<p>Feral Pigs (<i>Sus scrofa</i>) are known in the Main Range NP, where their grazing on native vegetation, trampling, and use of breeding habitat as wallows is a potential threat (DNPRSR 2013; DOEE 2017).</p>

			<p>Areas of habitat have also been damaged by domestic cattle trampling in the Main Range NP, with effects on water quality similar to those described for feral pigs. Strategic fencing has removed this impact from known habitat along Dalrymple Creek (H Hines 2020. pers comm 14 May).</p> <p>Little is known about predation on the Mountain Frog but introduced predators, such as the feral cat (<i>Felis catus</i>), may present a threat to adults (Hollis 2011).</p>
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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) cannot be used for A3]</p> <p>A4 An observed, estimated, inferred, projected or suspected population reduction where the time period must include both the past and the future (up to a max. of 100 years in future), and where the causes of reduction may not have ceased OR may not be understood OR may not be reversible.</p>	<p>based on any of the following</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 for the Mountain Frog is not known. However, at montane elevations (960–1300 m), the related Baw Baw Frog is believed to have a generation length of six to eight years (Hollis 2004). Due to the warmer climate in the distribution range of the Mountain Frog, the lower-end of this timeframe can be tentatively used but should be adjusted as ecological knowledge improves. Therefore, the relevant timescale for this criterion is considered to be 18 years.

The population size of the Mountain Frog is not known with certainty. However, it is suspected to be very small and considered likely under 2500 individuals. Knowles et al. (2004) identified *Philoria* species as among the rarest vertebrates in eastern Australia. The Mountain Frog’s core distribution is within Main Range NP, Queensland, with the species considered rare outside of this area (L Bolitho pers comm, cited in Newell 2018). All observations are restricted to a small

number of calling males. The largest number of calling males found at any one site is 11 (Schulz et al. unpublished data) (H Hines 2020. pers comm 14 May), and a total of 306 records of the Mountain Frog (across all known sites) are recorded in the Atlas of Living Australia (as of 6 February 2020) (ALA 2020). In addition to these low surveyed numbers, *Philoria* species are habitat specialists, restricted to higher elevations (Knowles et al. 2004). These elevations are home to the largest concentration of threatened anuran species (41 percent) (Hero & Morrison 2004) and from where populations of the related Baw Baw Frog have experienced significant declines (Hollis 2004; Knowles et al. 2004).

Following the 2019-20 bushfires and into the immediate future (within three generations), a substantial population reduction of over 30 percent is suspected. The direct and indirect impacts of the bushfires are the primary factors in this decline, with the surviving population further fragmented and vulnerable to climate change, a decline in habitat quality (as a result of climate change and bushfires), and the ongoing impacts from *Bd* (Murray & Skerratt 2012; Bolitho et al. unpublished). This level of reduction meets the threshold for listing as Vulnerable under criterion A4(c)(e).

The recent 2019-20 bushfires are likely to have greatly reduced the Mountain Frog population, with 52 percent of the Mountain Frog's distribution range in Queensland (where the majority of the Mountain Frog population is located) and 5–10 percent in NSW overlapping with the fire-affected areas. These fires covered an unusually large area and, in many places, burnt with an unusually high intensity. The impact of the bushfires on the Mountain Frog has yet to be fully examined but its pre-fire imperilment, together with the extent of potential mortality as a result of fire and the unfavourable post-fire conditions (loss of shelter, increased susceptibility to predators, and loss of food-stuff), as well as a reduction in future recruitment (egg and tadpole death), has led the Department to identify it as one of the highest priority species for urgent management intervention (DAWE 2020a).

Initial observations of fire impacts on habitat for this species at Main Range NP has shown severe fire damage to two eucalypt dominated calling sites. Within Main Range NP significant areas of upland mesic forests, including rainforest and cloud forest (up to 1350m altitude) are known to have burnt and in some areas, fires have burnt down to and across significant drainage lines, likely resulting in significant mortality. In addition, rainforest patches within Main Range NP are often relatively narrow and the risk of future fire incursions may now be significantly increased. However, many rainforest gullies within Main Range NP were unburnt, with the relatively large subpopulations in Dalrymple Creek and Teviot Brook catchments largely unaffected by the fires (H Hines 2020. pers comm 14 May).

Terrestrial breeding frogs have been identified as some of the most vulnerable taxa to climate change (Hero et al. 2005; Lemckert & Penman 2012; Hagger et al. 2013; Pearson et al. 2014; Lopez 2016), with *Philoria* species restricted to higher elevations (Knowles et al. 2004), where climate change is likely to have the greatest impact (Hero et al. 2015). Climate projections for eastern Australia include reduced rainfall, increased average temperatures, and more frequent droughts. These conditions will increase the scale, frequency and intensity of wildfires (CSIRO 2007; CSIRO & Bureau of Meteorology 2015) and could affect Mountain Frog recruitment levels. In *Philoria* species, the duration and frequency of male choruses has been observed to be influenced by rainfall and temperature (Hollis 2004; Willacy et al. 2015; Lopez 2016), with a change in pattern potentially shortening the breeding season, and a reduction in moisture levels in nesting sites possibly impacting on egg and larval development (Lemckert & Penman 2012).

Impacts from climate change have already been observed. Patch occupancy surveys failed to detect frogs at formerly known lower elevation sites during the 2017-19 breeding seasons, with prolonged drought conditions thought to be responsible for frog absence (D Newell 2020. pers comm 15 April). In addition, the general trend in endemic mountain species is to move to higher altitudes, mirroring the increase in temperature. However, these shifts in distribution may cause geographical range contractions, resulting in a significant reduction of suitable habitat and increased risk of extinction (Hagger et al. 2013; Lopez 2016).

The impact of the *Bd* on the Mountain Frog is uncertain. However, the species has been identified as having the greatest probability of *Bd* infection of all *Philoria* species (Murray & Skerratt 2012), being found at mid-high elevations (above 700–800 m) and in close association with rainforest streams (Knowles et al. 2004), where environmental conditions are suitable for *Bd* (Hero & Morrison 2004; Skerratt et al. 2010; Hero et al. 2015; Lopez 2016). Sampling across the geographical range has shown infection prevalence at 48 percent, with 11 of 19 headwater streams sampled containing infected individuals. Despite this high rate of infection, no signs of clinical chytridiomycosis has been observed and there is no evidence of *Bd* related population declines. However, given the typically short duration of clinical chytridiomycosis, and the cryptic nature of the species, this is not unexpected (Bolitho et al. unpublished).

A precautionary approach on the extent of the population reduction has been taken as on-ground surveys following the 2019-20 bushfires still have to be conducted and baseline data is missing on population size and pre-fire declines (Knowles et al. 2004). Therefore, the Committee has inferred a significant cumulative decline of 30 percent over three generations, in-line with the extent of the Mountain Frog’s distribution range overlapping with the fire-affected areas, combined with the species’ low resistance and low resilience to anticipated climate change and ongoing susceptibility to *Bd*.

The data presented above appear to demonstrate that the species is **eligible for listing as Vulnerable (A4(c)(e))** 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 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:

The Mountain Frog has a restricted geographical range, all within a small area of montane subtropical rainforest, distributed from the Mistake Mountains, in the Main Range NP, south-east Queensland, to Beaury State Forest, north-east NSW (Knowles et al. 2004; Parris 2004; Cogger 2014; Anstis 2017). The Mountain Frog has an Extent of Occurrence (EOO) estimated at 8136 km², and an Area of Occupancy (AOO) estimated at 120 km². These figures are based on the mapping of point records from 1986 to 2005, obtained from state governments, museums and CSIRO. 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 meets the threshold for listing as Vulnerable under subcriterion B1 and the AOO meets the threshold for listing as Endangered under subcriterion B2.

The Mountain Frog population is considered severely fragmented, meeting sub criterion (a), with a projected greater than 50 percent of AOO in habitat patches that are not viable and with habitat patches separated by large distance (IUCN 2019). The Mountain Frog population spans several habitat fragments which are geographically isolated from one another. The core

population in Main Range NP is naturally fragmented (given the species strong association with drainage lines and the species limited dispersal ability), with sites separated from each other over its length, including Mount Mistake (top), Cunningham Gap (mid-point), and Mount Superbus (bottom) (Knowles et al. 2004). This fragmentation continues into NSW, where isolated sites are identified in three separate National Parks. This isolation is recognised as a major threat to the persistence of the Mountain Frog (OEH 2019).

Based on ongoing threats, the Mountain Frog population is projected to continue to decline in EOO, AOO, extent and quality of habitat, number of locations or subpopulations, and number of mature individuals, thereby meeting sub criterion (b)(i,ii,iii,iv,v). In particular, the small population size, already high degree of isolation of subpopulations (Knowles et al. 2004; OEH 2019), and the low dispersal ability (and associated poor recolonisation potential) of the species (Newell 2018), reduces the likelihood of recovery from extreme events associated with climate change and disease (Hagger et al. 2013) (as identified in Criterion 1).

Climate change is thought to have already impacted the population. Prolonged drought is believed to be responsible for absence of frogs at formerly known lower elevation sites during the 2017-19 breeding seasons (D Newell 2020. pers comm 15 April), and the impact of the 2019-20 bushfires is suspected to be significant, with 52 percent of the Mountain Frog's distribution range in Queensland (where the majority of the Mountain Frog population is located) and 5–10 percent in NSW overlapping with the fire-affected areas (DAWE 2020a). The NSW Scientific Committee has identified the Mountain Frog as likely to become extinct unless the circumstances and factors threatening its survival or evolutionary development cease to operate (NSW Scientific Committee 2005).

The data presented above appear to demonstrate that the species is **eligible for listing as Endangered (B2(a)(b)(i, ii, iii, iv, & v))** under this criterion. However, the purpose of this consultation document is to elicit additional information to better understand the species' status. This conclusion should therefore be considered tentative at this stage, as it may be changed as a result of responses to this consultation process.

Criterion 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:

The population size of the Mountain Frog is not known with certainty. However, it is suspected to be very small and considered likely under 2500 individuals (see Criterion 1), meeting the threshold for listing as Endangered.

Following the recent 2019-20 bushfires, and into the immediate future (within two generations), a substantial population reduction of up to 30 percent is suspected (as identified in Criterion 1). The direct and indirect impacts of the bushfires are the primary factors in this decline, with the surviving population further fragmented and less likely to recover from extreme events, such as climate change and disease (Hagger et al. 2013). This level of decline exceeds the threshold for listing as Endangered under sub criterion C1.

A precautionary approach on the extent of the population reduction has been taken as on-ground surveys following the 2019-20 bushfires still have to be conducted and baseline data is missing on population size and pre-fire declines (Knowles et al. 2004). Therefore, the Committee has inferred a significant cumulative decline of 30 percent over two generations, in-line with the extent of the Mountain Frog’s distribution range overlapping with the fire-affected areas, combined with the species’ low resistance and low resilience to anticipated climate change and ongoing susceptibility to *Bd* (as identified in Criterion 1).

The data presented above appear to demonstrate that the species is **eligible for listing as Endangered (C1)** 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 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:

The population size of the Mountain Frog is suspected to be very small, but it is not known with certainty. However, it is considered likely above 1000 individuals (see Criterion 1). Therefore, the Mountain Frog does not meet the requirements for listing under this criterion.

The data presented above appear to demonstrate the species is not eligible for listing under this criterion. However, the purpose of this consultation document is to elicit additional information to better understand the species’ status. This conclusion should therefore be considered tentative at this stage, as it may be changed as a result of responses to this consultation process.

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

Evidence:

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

Conservation and Management priorities

2019-20 bushfire response

- As per guidance developed by Southwell (2020), conduct rapid on-ground surveys to establish extent of habitat and population loss as a result of the 2019-20 bushfires, and to provide a baseline for ongoing population monitoring. Note: population monitoring should only be conducted during the breeding season, particularly during peak calling activity, from late August to early December.
- Protect unburnt areas within or adjacent to recently burnt areas from further fire, in order to provide refuge sites, as well as protecting (from fire) unburnt areas that are not adjacent to burnt areas.
- Control introduced predators and pigs to support recovery of populations affected by fires, or populations near areas that have been affected by fire.
- Control introduced herbivores in burnt areas to support habitat recovery post fire.
- Establish the impact of fire retardants, used to fight bushfires, on frog populations.
- Weed control and habitat restoration works may support the regeneration of forest habitat at some localised sites. Note that herbicide formulations can be toxic to frogs and tadpoles, particularly if they contain glyphosate and surfactants (Mann et al. 2003).

Conservation and management priorities

Habitat loss, disturbance and modifications

- Protect unburnt areas within or adjacent to recently burnt areas from further fire, in order to provide refuge sites, as well as protecting (from fire) unburnt areas that are not adjacent to burnt areas.
- Identify key sites and implement a program ensuring suitable habitat is maintained.

- Investigate options for enhancing the resilience of the species' current habitat to climate change.
- Investigate options for providing new habitat that would be suitable for the species under climate change scenarios.
- Reconnect isolated rainforest patches with corridors of wet forest, particularly along drainage lines in stream headwaters.
- Protect the areas of occupancy of the Mountain Frog during the planning and implementation of controlled burns in the region.
- Maintain tracks, particularly board-walks, and relocate recreational activities and roads away from sensitive habitat and breeding sites.

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

- In areas burnt by the 2019-20 bushfires, control of introduced predators may be required to support population recovery, and control of introduced herbivores will aid habitat recovery. Weed control and habitat restoration may be needed in localised areas to support habitat regeneration. Note that herbicide formulations can be toxic to frogs and tadpoles, particularly if they contain glyphosate and surfactants (Mann et al. 2003).
- Develop and implement longer-term strategies to control introduced and native predators by implementing eradication programs as necessary.
- Monitor and control damage to riparian areas by feral pigs. Control pig numbers and fence key sites, where feasible.
- Assess the impact of exotic weeds on habitat suitability for the Mountain Frog. If the impact is shown to be significant, develop a strategy for control or elimination of the invasive weeds. Note that herbicide formulations can be toxic to frogs and tadpoles, particularly if they contain glyphosate and surfactants (Mann et al. 2003).

Impacts of domestic species

- Use fencing, or other measures where applicable, to reduce the access of domestic stock to stream banks.

Stakeholder Engagement

- Provide input into the various impact assessment and planning processes on measures to protect the Mountain Frog and its habitat. These include water resource plans, park management plans and environmental impact assessments.
- 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.

Disease

- Collect and analyse samples from all monitoring programs for the species, to test for the presence of chytrid fungus, the susceptibility of the Mountain Frog to *Bd*, and improve understanding of disease spread throughout the species' range. Note: this work is being conducted as part of a PhD thesis by Bolitho.

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

Survey and Monitoring priorities

- Conduct rapid on-ground surveys to establish extent of habitat and population loss as a result of the 2019-20 bushfires, and to provide a baseline for ongoing population monitoring. Note: population monitoring should only be conducted during breeding season, particularly during peak calling activity, from late August to early December.
- Regular monitoring should be undertaken for a small number of subpopulations from late August to early December when male frogs are known to call. Note: Frogs should be disturbed at breeding sites under any circumstances.
- Broad scale regular monitoring should be undertaken over the species' known range. Sites should span the altitudinal and latitudinal range and a range of other habitat characteristics. These data will be used to assess the species' status and assess further declines or re-establishment/recovery of subpopulations.
- Survey sites within the known range of the species where the environment is considered likely to be suitable for the species to identify whether subpopulations exist that are previously unknown.

Information and research priorities

- Understand the potential influence of climate change on the long-term survival prospects of the species, due to altered temperatures, rainfall patterns, bushfires, environmental stressors and diseases.
- Model microhabitat usage of this species beyond burrows, by gathering more detailed geo-climatic (e.g. soil moisture) and physiological data (e.g. operative temperatures and water loss).
- Measure the critical thermal limits and preferred temperatures of the species to ascertain its physiological limits, sensitivity and vulnerability. Include potential impacts of temperature on other life stages.
- Investigate options for linking, enhancing or establishing additional populations.
- Improve understanding of the extent and impact of infection by the amphibian chytrid fungus on the Mountain Frog to better inform how to apply existing or new management actions relevant to the recovery. This includes knowledge on:
 - the susceptibility of the Mountain Frog to the fungus;
 - the different strains of the fungus;
 - levels of virulence;
 - mechanisms for resistance to the disease;
 - treatment options;
 - husbandry methods;

- the potential of other species to act as reservoirs or vectors for transmission of the fungus (Department of the Environment and Energy 2016).
- Investigate population genetics to provide a baseline on effective population size, heterozygosity and structure among the various populations.
- Improve understanding of husbandry methods for the species.
- Investigate options for reintroductions/translocations/augmentation from captive population if populations continue to become increasingly fragmented and isolated.

Collective list of questions – your views

SECTION A GENERAL

1. Is the information used to assess the nationally threatened status of the species robust? Have all the underlying assumptions been made explicit? Please provide justification for your response.
2. Can you provide additional data or information relevant to this assessment?
3. Have you been involved in previous state, territory or national assessments of this species/subspecies? If so, in what capacity?

PART 1 – INFORMATION TO ASSIST LISTING ASSESSMENT

SECTION B DO YOU HAVE ADDITIONAL INFORMATION ON THE ECOLOGY OR BIOLOGY OF THE SPECIES? (If no, skip to section C)

Biological information

4. Can you provide any additional or alternative references, information or estimates on longevity, average life span and generation length?
5. Do you have any additional information in the ecology or biology of the species not in the current advice/plan?

SECTION C ARE YOU AWARE OF THE STATUS OF THE TOTAL NATIONAL POPULATION OF THE SPECIES? (If no, skip to section D)

Population size

6. Has the survey effort for this taxon been adequate to determine its national adult population size? If not, please provide justification for your response.
7. Do you consider the way the population size has been derived to be appropriate? Are there any assumptions and unquantified biases in the estimates? Did the estimates measure relative or absolute abundance? Do you accept the estimate of the total population size of the species? If not, please provide justification for your response.
8. If not, can you provide a further estimate of the current population size of mature adults of the species (national extent)? Please provide supporting justification or other information.

If, because of uncertainty, you are unable to provide a single number, you may wish to provide an estimated range. If so, please choose one of the ranges suggested in the table

below of possible subspecies numbers, and also choose the level of confidence you have in this estimate:

Number of mature individuals is estimated to be in the range of:

1–50 51–250 251–1000 >1000 >10 000

Level of your confidence in this estimate:

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

SECTION D ARE YOU AWARE OF TRENDS IN THE OVERALL POPULATION OF THE SPECIES? (If no, skip to section E)

9. Does the current and predicted rate of decline used in the assessment seem reasonable? Do you consider that the way this estimate has been derived is appropriate? If not, please provide justification of your response.

Evidence of total population size change

10. Are you able to provide an estimate of the total population size in 2008-2010 (*at or soon after the start of the most recent three generation period*)? Please provide justification for your response.

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

Number of mature individuals is estimated to be in the range of:

1–50 51–250 251–1000 >1000 >10 000

Level of your confidence in this estimate:

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

11. Are you able to comment on the extent of decline in the species/subspecies' total population size over the last approximately 10 years? Please provide justification for your response.

If, because of uncertainty, you are unable to provide an estimate of decline, you may wish to provide an estimated range. If so, please choose one of the ranges suggested in the table

below of ranges of decline, and also choose the level of confidence you have in this estimated range.

Decline estimated to be in the range of:

1–30% 31–50% 51–80% 81–100% 90–100%

Level of your confidence in this estimated decline:

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

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

SECTION E ARE YOU AWARE OF INFORMATION ON THE TOTAL RANGE OF THE SPECIES? (If no, skip to section F)

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

13. Does the assessment consider the entire geographic extent and national extent of the species/subspecies? If not, please provide justification for your response.

14. Has the survey effort for this species/subspecies been adequate to determine its national distribution? If not, please provide justification for your response.

15. Is the distribution described in the assessment accurate? If not, please provide justification for your response and provide alternate information.

16. Do you agree that the way the current extent of occurrence and/or area of occupancy have been estimated is appropriate? Please provide justification for your response.

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

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

Current extent of occurrence is estimated to be in the range of:

<100 km² 100 – 5 000 km² 5 001 – 20 000 km² >20 000 km²

Level of your confidence in this estimated extent of occurrence

- 0–30% - low level of certainty/ a bit of a guess/ not much data to go on
- 31–50% - more than a guess, some level of supporting evidence
- 51–95% - reasonably certain, data suggests this range of decline

- 95–100% - high level of certainty, data indicates a decline within this range
- 99–100% - very high level of certainty, data is accurate within this range

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

Current area of occupancy is estimated to be in the range of:

- <10 km² 11 – 500 km² 501 – 2000 km² >2000 km²

Level of your confidence in this estimated extent of occurrence:

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

SECTION F ARE YOU AWARE OF TRENDS IN THE TOTAL RANGE OF THE SPECIES? (If no, skip to section G)

Past Distribution/range/extent of occurrence, area of occupancy

18. Do you consider that the way the historic distribution has been estimated is appropriate?
Please provide justification for your response.
19. Can you provide estimates (or if you disagree with the estimates provided, alternative estimates) of the former extent of occurrence and/or area of occupancy.

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

Past extent of occurrence is estimated to be in the range of:

- <100 km² 100 – 5 000 km² 5 001 – 20 000 km² >20 000 km²

Level of your confidence in this estimated extent of occurrence

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

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

Past area of occupancy is estimated to be in the range of:

<10 km² 11 – 500 km² 501 – 2000 km² >2000 km²

Level of your confidence in this estimated extent of occurrence:

0–30% - low level of certainty/ a bit of a guess/ not much data to go on

31–50% - more than a guess, some level of supporting evidence

51–95% - reasonably certain, data suggests this range of decline

95–100% -high level of certainty, data indicates a decline within this range

99–100% - very high level of certainty, data is accurate within this range

PART 2 – INFORMATION FOR CONSERVATION ADVICE ON THREATS AND CONSERVATION ACTIONS

SECTION G DO YOU HAVE INFORMATION ON THREATS TO THE SURVIVAL OF THE SPECIES? (If no, skip to section H)

20. Do you consider that all major threats have been identified and described adequately?
21. To what degree are the identified threats likely to impact on the species/subspecies in the future?
22. Are the threats impacting on different populations equally, or do the threats vary across different populations?
23. Can you provide additional or alternative information on past, current or potential threats that may adversely affect the species/subspecies at any stage of its life cycle?
24. Can you provide supporting data/justification or other information for your responses to these questions about threats?

SECTION H DO YOU HAVE INFORMATION ON CURRENT OR FUTURE MANAGEMENT FOR THE RECOVERY OF THE SPECIES? (If no, skip to section I)

25. What planning, management and recovery actions are currently in place supporting protection and recovery of the species/subspecies? To what extent have they been effective?
26. Can you recommend any additional or alternative specific threat abatement or conservation actions that would aid the protection and recovery of the species/subspecies?
27. Would you recommend translocation (outside of the species' historic range) as a viable option as a conservation actions for this species/subspecies?

SECTION I DO YOU HAVE INFORMATION ON STAKEHOLDERS IN THE RECOVERY OF THE SPECIES? (If no, skip to Part 3)

28. Are you aware of other knowledge (e.g. traditional ecological knowledge) or individuals/groups with knowledge that may help better understand population trends/fluctuations, or critical areas of habitat?
29. Are you aware of any cultural or social importance or use that the species has?
30. What individuals or organisations are currently, or potentially could be, involved in management and recovery of the species/subspecies?
31. How aware of this species are land managers where the species is found?
32. What level of awareness is there with individuals or organisations around the issues affecting the species/subspecies?
- Where there is awareness, what are these interests of these individuals/organisations?
 - Are there populations or areas of habitat that are particularly important to the community?

PART 3 – ANY OTHER INFORMATION

33. Do you have comments on any other matters relevant to the assessment of this species?

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