Threatened Species Assessment

Litoria raniformis
Growling Grass Frog

Taxonomy

Litoria raniformis (Keferstein, 1867)

Current conservation status

Listed as Vulnerable under the *Environment Protection and Biodiversity Conservation Act 1999*.

Listed as threatened under the *Flora and Fauna Guarantee Act 1988* (SAC 1996).

Categorised as Endangered in the 2013 Advisory list of threatened vertebrate fauna in Victoria (DSE 2013).

Proposed conservation status

Vulnerable in Victoria

Criterion B2ab(i,ii,iii,iv,v)

Species Information

Description and Life History

The Growling Grass Frog is a large frog, with females growing to at least 100 mm snout-urostyle length. Colouration varies from dull olive to bright emerald-green on the dorsum, with large irregular golden-bronze blotches. The groin and hind side of the thighs are usually bright bluish, while the lower sides and underside are off-white. The skin has numerous rounded warty projections on the back and sides. They are active during both the day and night, and highly mobile - they are known to move up to one kilometre in 24 hours. Tadpoles have an aquatic period lasting 2 - 15 months, grow to 110 mm in total length and, in the later stages of development, have a characteristic green to yellowish dorsal colouration (Anstis 2013).

Within the broad distribution of the taxon, there are two apparently distinct biogeographical groups, differentiated by differences in biology and ecology. For populations in the northern and western parts of its range (NSW and parts of Victoria and South Australia bordering the Murray River), breeding is triggered by flooding of ephemeral waterbodies during spring or summer, and the larval period can be as short as two months. In this area, the frogs are concentrated in refugia prior to flooding, then disperse across the landscape during flooding/breeding events. The second group (south-eastern NSW, much of Victoria, far south-eastern South Australia and Tasmania) typically breeds in spring and summer, and does not appear to be reliant upon flooding. The larval stage may last up to 15 months, although it is often shorter than this (Anstis 2013). The spatial organisation of many populations within this group conform to a metapopulation structure (Robertson et al. 2002; Heard et al. 2004).

Generation Length

The generation length of the Growling Grass Frog is estimated to be 3 to 6 years. This is derived from published mark-recapture studies. Geoff Heard is reconstructing age structures, historic and current. It is plausible that, prior to the arrival of the amphibian chytrid fungus, adults lived longer than they currently do in the presence of the disease. The generation length provided here is what is believed to be the pre-chytrid generation length based on skeletochronological study of voucher specimens collected prior to the putative arrival of the fungus (Ben Scheele and Geoff Heard, unpublished data).

The age at first breeding is about 1 and the animals continue breeding all their lives. Museum specimens from the 1960s (pre-chytrid) were aged at least six years old. The breeding age is therefore assumed to have been about 1-

7 years. Older, bigger animals produce more young than younger ones, so the average of the breeding range is skewed towards the older age group.

Distribution

The taxon is endemic to south-eastern Australia, including South Australia, Victoria, Tasmania, New South Wales and the Australian Capital Territory. It occurs throughout much of Victoria except for the semi-arid north-west, far east Gippsland and higher parts of the Eastern Highlands.

Habitat

Habitat critical to the survival of the Growling Grass Frog differs throughout its range. In the more mesic areas, including Tasmania, most of Victoria and the south-east of South Australia, the taxon is usually found among vegetation within or at the edges of permanent water such as slow-flowing streams, swamps, lagoons and lakes. In disturbed areas, it also commonly occurs in artificial waterbodies such as farm dams, irrigation channels, irrigated rice crops and disused quarries, particularly where natural habitat is no longer available. Favoured sites frequently have a large proportion of emergent, submerged and floating vegetation, and slow-flowing or still water (Clemann and Gillespie 2012). Since the taxon breeds in spring and summer, and populations in the southern part of the taxon's range often have a long larval phase, the taxon favours permanent waterbodies, or those in close proximity to permanent water. In these areas, frogs overwinter beneath thick vegetation, logs, rocks and other ground debris, sometimes at considerable distances from waterbodies (Clemann and Gillespie 2012).

Threats

The Growling Grass Frog relies on aquatic and riparian habitats and, in some areas, specific hydrological regimes, for breeding and the subsequent development of the larval stage. The loss, modification, degradation and fragmentation of aquatic and adjacent terrestrial habitats are likely to have had a considerable adverse impact on the taxon. Most of its historic range has been subjected to land clearing for agriculture, urban and industrial development, changed hydrological regimes for irrigation and other purposes, increasing salinity and draining of wetlands. As a relatively mobile taxon that relies on movement between waterbodies to maintain the integrity of populations, the Growling Grass Frog is also vulnerable to loss of habitat and connectivity between breeding and non-breeding habitats. Expanding urban and industrial development, especially throughout Melbourne's urban growth area, also threatens populations.

Habitat loss and fragmentation are ongoing threats. Across non-trivial parts of the taxon's range, poor planning has facilitated destruction of occupied habitat.

Major watercourses within the taxon’s range have been substantially altered by impoundments, river regulation and irrigation release schemes. Alterations to the timing, frequency and extent of flooding events have resulted in dramatic changes to many natural processes, such as preventing or greatly reducing spring flood events across natural floodplains. The reduction of inflows to wetlands has a detrimental impact on these habitats in areas occupied by the taxon. In particular, piping and channelling of water increases the efficiency of water transport and directs water away from wetland habitat.

The Growling Grass Frog is highly mobile, moving at least one kilometre in 24 hours. Its persistence in many areas may be dependent upon the movement of adults between particular waterbodies, and between breeding and non-breeding habitats (Heard et al. 2004). Human-induced changes to landscapes have created barriers, such as fences, roads and unsuitable habitat (e.g. industrial and urban estates), to frog movement. This is likely to compromise the ability of the species to respond to periodic drought, changed hydrological regimes and fluctuations in water levels (Heard et al. 2004).

The disease chytridiomycosis, caused by the fungal pathogen *Batrachochytrium dendrobatidis*, has been strongly implicated in rapid declines of amphibians in several parts of the world (Berger et al. 1999). Chytrid fungus is known to infect Growling Grass Frogs. The nature of declines of the taxon suggest that it is highly likely that chytridiomycosis played a key role in these declines.

Other threats included grazing by domestic stock (which can damage the margins of waterbodies and remove vegetation that is used by frogs for shelter and as movement corridors), the spread of water pollutants and biocides (as their semi-permeable skin renders them particularly susceptible), predation of eggs and tadpoles by introduced fish, such as Eastern Gambusia *Gambusia holbrooki*, predation by the Red Fox *Vulpes vulpes* and Cat *Felis catus*.

Frog populations that have been suppressed by other threatening processes will be particularly susceptible to extirpation by Fox and Cat predation.

With such widespread disruption to habitats and ecological processes throughout the range of the Growling Grass Frog, the vulnerability of the taxon to stochastic processes, such as disease, drought and bushfire, is heightened. The ability of many populations to recover from these processes is compromised.

IUCN Criteria

Criterion A. Population size reduction.
Population reduction (measured over the longer of 10 years or 3 generations) based on any of A1 to A4

	Critically Endangered	Endangered	Vulnerable
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 following:

(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:

Ineligible under Criterion A

The past and future population reductions do not meet the thresholds for eligibility under criterion A.

Some urban populations were lost in the last ten years, with good data from Merri Creek. Recent losses outside the urban area are predominantly from higher altitudes e.g. Mitta Mitta River, downstream from Dartmouth Dam.

Criterion B. Geographic range in the form of either B1 (extent of occurrence) and/or B2 (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:			
(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 B2 as Vulnerable

The Area of Occupancy (AoO) across the taxon's range is estimated to be 1,160 km², based on 2 x 2 km grids derived from accepted, post-1970 records in the Victorian Biodiversity Atlas.

Populations are known to have been lost from numerous areas in recent years and decades. Some of these losses were directly witnessed (such as ongoing destruction of occupied habitat for residential, retail and industrial estates), while others involved discovery of losses in areas where the taxon was previously known to occur.

Several decades ago, this taxon was abundant and widespread, and most populations were presumably reasonably well-connected. Patterns of loss and decline in recent decades have resulted in a distribution characterised by discontinuity and fragmentation. The probable barriers that now occur throughout most of the taxon's extant distribution mean that the taxon's current distribution is severely fragmented, and there is little or no chance of recolonisation back into areas where the frogs have been lost.

It has a continuing decline in (i), (ii), (iii), (iv) and (v) above.

Criterion C. Small Population size and decline				
		Critically Endangered	Endangered	Vulnerable
Number of mature individuals		< 250	< 2,500	< 10,000
AND at least one of C1 or C2				
C1	An observed, estimated or projected continuing decline of at least (up to a max. of 100 years in future):	25% in 3 years or 1 generation (whichever is longer)	20% in 5 years or 2 generations (whichever is longer)	10% in 10 years or 3 generations (whichever is longer)
C2	An observed, estimated, projected or inferred continuing decline AND 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:

Ineligible under Criterion C

The precise number of mature individuals is unknown, as the taxon has a wide distribution across three quarters of Victoria.

Criterion D. Very small or restricted population			
	Critically Endangered	Endangered	Vulnerable
Number of mature individuals (observed or estimated)	<·50	<·250	<·1,000
D2 Only applies to the VU 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: AoO <·20 km2 or number of locations ≤·5

Evidence:

Ineligible under Criterion D

There is insufficient evidence to determine the number of mature individuals.

Criterion E (Quantitative Analysis) was not addressed as the taxon does not have a detailed Population Viability Analysis.

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