

# NSW SCIENTIFIC COMMITTEE

## Spotted Tree Frog *Litoria spenceri*

Review of Current Information in NSW

July 2008

### Current status:

The Spotted Tree Frog *Litoria spenceri* is currently listed as Endangered under the Commonwealth *Environment Protection and Biodiversity Conservation Act* 1999 (EPBC Act) and Threatened in Victoria under the *Flora and Fauna Guarantee Act* 1988 (FFG Act). The NSW Scientific Committee recently determined that the Spotted Tree Frog meets criteria for listing as Critically Endangered in NSW under the *Threatened Species Conservation Act* 1995 (TSC Act), based on information contained in this report and other information available for the species.

### Species description:

The following description was taken directly from Cogger 2000:

'...grey to olive-green above, with irregular darker mottling or marbling, the latter often forming irregular cross-bands on the limbs. Ventral surface white or yellow. Lower and concealed surface of limbs yellowish. Skin shagreened, with a few tiny whitish tubercles on the back becoming numerous on the sides. Skin granular below. Small but prominent vomerine teeth, mostly behind choanae. A slight pectoral fold. Finger and toes discs moderate, only a little wider than digits. Fingers with distinct basal webbing; toes fully webbed. A small but prominent inner metatarsal tubercle, no outer. Tympanum indistinct. Second finger larger than first, 45 mm.

### Taxonomy:

Originally this species was described as *Hyla maculata* by Spencer (1901) from a specimen found in Powong, Victoria. Australian treefrogs previously referred to the genus *Hyla* are now placed within the genus *Litoria* (Tyler, 1971). The species was renamed as *Litoria spenceri* by Dubois (1984) when it was demonstrated that the name '*Litoria maculata*' had been used previously for another species.

Synonyms are: *Hyla maculata* (Spencer, 1901), *Litoria maculata* (Tyler 1971; Cogger 1988).

The warty back of *Litoria spenceri* distinguishes this species from *L. nudidigitus* and its lack of a distinct tympanum distinguishes it from *L. citropa*.

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## Distribution and number of populations:

The Spotted Tree Frog is restricted predominantly to the western side of the Great Divide, from Lake Eildon in the Central Highlands of Victoria to Mount Kosciuszko in NSW (Gillespie & Hollis 1996).

In New South Wales, the species has an extremely limited range, only known from three sites along streams within Kosciuszko National Park. There is no evidence to suggest that the Spotted Tree Frog was more widely distributed in the past (NSW NPWS 2001).

The Spotted Tree Frog was first discovered in New South Wales in January 1970 near the Alpine Way bridge over Bogong Creek, Kosciuszko National Park (site 1 in Figure 1). Later surveys conducted by Ehmann *et al.* (1993), Gillespie & Hollis (1996) and Hunter & Gillespie (1999) failed to re-detect the species at this site. However, Ehman *et al.* (1993), located a significant population elsewhere on Bogong Creek (site 2).

Another population in the upper Murray River (site 3) was first detected in 1996 by Hunter & Gillespie (1999). Only one sub-adult frog was ever found at this location and repeat surveys of the same area have failed to locate this or other individuals (Hunter & Gillespie 1999, NSW NPWS 2001). All the evidence suggests that the density and size of this population was extremely low, and that it may now well be extinct in the wild (expert advice, 2008).



**Figure 1:** Sites where *Litoria spenceri* have been recorded (Source: NPWS 2001).

## Summary of survey effort:

In New South Wales, three major surveys have been conducted for Spotted Tree Frogs. All searches were undertaken on the western side of Kosciuszko National Park as this area is thought to contain all of the potentially suitable habitat for the species within the State (as described by Gillespie & Hollis 1996). The surveys were:

- Ehmann *et al.* (1993) searched for this species in late-1992 and early-1993 at nine sites on five streams within Kosciuszko NP. Three of these sites were on Bogong Creek and included the

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locality of the specimen collected in the early 1970's. Details of the other four streams surveyed have not been provided. The species was only detected at one site, on Bogong Creek (site 2).

- Gillespie & Hollis (1996) conducted searches in 1993-94, at ten sites on four streams; Bogong Creek, Leatherbarrel Creek, Three Rocks Creek and the Geehi River. Frogs were detected at three sites, all on Bogong Creek, within the general vicinity of the population (site 2) recorded by Ehmann *et al.* (1993).

- Hunter & Gillespie (1999) surveyed over two consecutive summer seasons in 1996 and 1997 at 25 streams within the catchments of the Upper Murray, Swampy Plains, Tooma, Tumut and Goodradigbee Rivers. A total of 43 sites, covering 57 km of watercourse, were searched. Despite this considerable effort the species was only detected at two sites, one in the upper Murray River (site 3) and the other at Bogong Creek (site 2), the latter being the same population identified earlier by Ehmann *et al.* (1993) and Gillespie & Hollis (1996).

All known and historical populations of the Spotted Tree Frog in NSW occur within the boundaries of Kosciuszko National Park.

Populations of the species are not expected to be found on adjacent lands of other tenures as the habitat (stream morphology, elevation, and levels of habitat disturbance) is not thought to be suitable (NSW NPWS 2001).

## **Ecology:**

### Key habitat requirements

Spotted Tree Frogs occur in swift-flowing remote mountain streams, with a preference for rapid sections with loose rock and steep banks (Gillespie & Hollis 1996; NSW NPWS 2001). This species has been found sheltering and basking in the adjacent riparian vegetation. The vegetation along Bogong Creek is Montane Riparian Forest, dominated by a shrub layer of *Leptospermum grandifolium* and *L. lanigerum*, with scattered *Atherosperma moschatum* and a sparse canopy of *Eucalyptus delegatensis* and *E. dalrympleana* (NSW NPWS 2001).

Eggs are deposited under large instream boulders and tadpoles develop in the shallow pools or margins of streams (Gillespie 1997b). The use of habitats away from the stream is unknown (NSW NPWS 2001).

### Life history

The diet of the Spotted Tree Frog has not been well studied but they appear to be exclusively insectivorous, feeding on a variety of flying insects (Ehmann *et al.* 1993).

Adult Spotted Tree Frogs are usually active in the stream environment between early October and late April. At Bogong Creek, adults and juveniles are mainly diurnal. Elsewhere, adult frogs may exhibit a nocturnal habit (NSW NPWS 2001).

The breeding season begins in suitable weather between late October and early December. Egg laying has been recorded between late November and the end of December (NSW NPWS 2001).

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Clutch sizes range from about 50 to nearly 1 000, averaging around 500 (Gillespie 1997b). Larval development occurs during summer and autumn, and between mid-February and late March they undergo metamorphosis (NSW NPWS 2001).

Results from mark-recapture experiments indicate that at Bogong Creek a large proportion of individuals live longer than ten years, once they reach adulthood. The oldest individual recorded so far is a female that reached 13 years (Gillespie 1997b). Age to sexual maturity is three to four years for males and five to six years for females (expert advice). Mortality levels are very high until individuals reach two to three years of age (NSW NPWS, 2001). 'Generation length' (IUCN 2008) is estimated to be 7.5 to 9.5 years.

## **Number of mature individuals:**

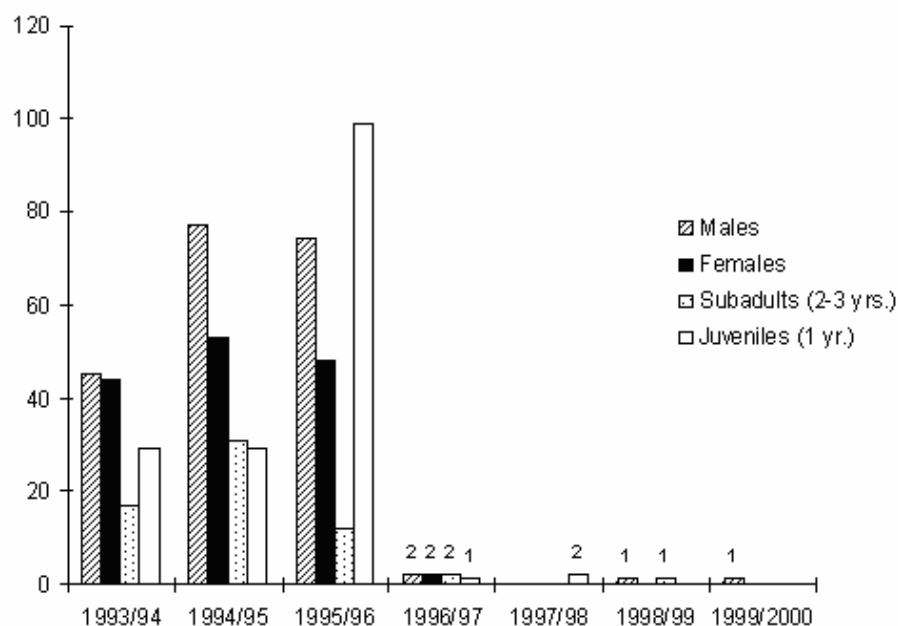
1. Site 1 subpopulation – only seen once despite searches, therefore thought to be extinct.
2. Site 2 subpopulation - During the summers from 1993 to 1996 part of this population consistently exceeded several hundred individuals and occurred at a density not recorded elsewhere for the species (Gillespie & Hollis 1996). However, sometime in 1996 the population experienced a dramatic decline (Figure 2). By 1999, despite extensive searches, only one adult male was found. In addition, breeding activity had not occurred at the site for the two years prior (Gillespie 1999).

As this population showed no signs of a recovery, the lone male was removed and placed in a captive breeding program (with females from the Victorian population) (Gillespie 2000). Three releases of the progeny have been undertaken, which consisted of 200 one-year-old frogs in 2006, 200 one-year-old frogs in 2007, and 200 one-year-old plus 100 three-year-old frogs in 2008. The estimated number of individuals currently surviving in the wild from this release is 170, plus or minus 40 (expert advice). However, as none of these released individuals have breed, the number of mature individuals in this population is the number that existed in the original wild population, which is one (IUCN 2008).

3. Site 3 subpopulation – only one male was seen once in 1996. No other individuals have been seen despite searches. All indications are that the density and size of this population was extremely low, and that it is likely to now be extinct.

Estimates of wild populations may include introduced individuals when they produce viable offspring (IUCN 2008). There is no evidence that introduced individuals of the Spotted Tree Frog have yet produced viable offspring. Hence, the most recent estimate is that the total population of Spotted Tree Frog includes a single mature individual. Given that this individual was male, that the record dates from ten years ago (1999) and that the individual was removed from the wild, there is a possibility that the species may already be Extinct in the Wild (IUCN 2001) in NSW. There is also a possibility that some individuals of the species persist and remain undetected, although a substantial search effort has not yielded any evidence of extant populations. The number of mature individuals of the species is therefore almost certainly less than 50 and possibly zero.

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**Figure 2.** Total numbers of Spotted Tree Frogs detected along at Site 2 from 1993 to 2000. Source: Gillespie (1999).

## Threats:

The population at site 2 had very high densities of individuals prior to its decline, and then crashed to near extinction during one year (Gillespie 1999). This crash is believed to be due to the introduction of the chytrid fungus *Batrachochytrium* into a previously disease-free population (expert advice).

During the season prior to the population decline (1995/96), several dead frogs were found and one sick frog was diagnosed as infected with a chytrid fungus (Berger *et al.* 1998). Subsequent screening of toe samples, collected from 90 apparently healthy frogs during the period 1993-1996, located chytrid in two animals. The positive samples were collected shortly before the population crash in March 1996 (Gillespie & Marantelli 2000). This fungus has been associated with other declining frog populations (Berger *et al.* 1999). 'Infection of frogs by amphibian chytrid causing the disease chytridiomycosis' is listed as a Key Threatening Process under the TSC Act in NSW.

Trout have also been implicated previously as a major cause of population declines of the Spotted Tree Frog (Gillespie 2001; Gillespie & Hines 1999; Robertson & Gillespie 1998). Trout species occur throughout the distribution of the Spotted Tree Frog in NSW and Victoria, and are known to exert significant predation pressure on larvae (Gillespie 1997a) but their role in the decline of this species is unknown (expert advice, 2008). A waterfall below site 2 acts as a barrier to trout movement, so this population is unlikely to have suffered any impact from this threat (Hunter & Gillespie 1999).

Another potential threat may be the alteration of natural flow regimes and increased sedimentation (NSW NPWS 2001). 'Alteration to the natural flow regimes of rivers and streams

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and their floodplains and wetlands' is listed as a Key Threatening Process under the TSC Act in NSW.

Minor threats may include invasion by blackberry (*Rubus* spp.) and atypical climatic events (NSW NPWS 2001). 'Anthropogenic Climate Change' is listed as a Key Threatening Process under the TSC Act in NSW.

The very restricted distribution and small population size make this species highly prone to reduction as a result of local environmental and demographic stochastic extinction processes and unnatural disturbances.

## **Extreme fluctuations:**

There is no information/evidence to suggest this species experiences extreme fluctuations in population size or distribution area.

## **Population reduction and continuing declines:**

The population of the Spotted Tree Frog at site 2 underwent a dramatic decline in 1996 (Gillespie 1997a). During the three years prior to the decline (since 1993), the population was intensively studied and estimated to comprise 700–1 000 adults and several thousand immature frogs, and was the only high-density population for this species (Gillespie & Hollis 1996). In the summer of 1996-1997 only six adults, three juveniles, and one clutch of tadpoles were located (Gillespie & Hines 1999). Over 130 metamorphs emerged from this clutch. In 1997/98 only two of these juveniles were located; no other frogs were found (Gillespie 1998). In 1998/99 one of these juveniles and one adult male, located in the summer of 1996/97, were found (Gillespie 1999). In 1999/2000 only one adult male was found (the same individual located in the previous summer) (Gillespie 2000). This is a decline of around 99%, a point where its future viability in the wild is in serious doubt.

In addition, at least two subpopulations have apparently gone extinct. The reason for these extinctions are not known but thought to be also a result of Chytrid fungus (expert advice, 2008).

## **Extent of Occurrence (EOO) & Area of Occupancy (AOO):**

The entire distribution of the species falls within a single 2 x 2 km grid cell (IUCN 2008). Both the EOO and AOO are therefore estimated to be less than 4 km<sup>2</sup> (NSW NPWS 2001; expert advice, 2008).

## **Severe fragmentation:**

Radio-tracking studies have shown that most adults move less than 80 m over several years (Gillespie 1997a; Gillespie 1997b). Survey results, together with this evidence of limited movement, strongly suggest that most individuals are in small relatively isolated populations and that movement of individuals between them is very infrequent (Robertson & Gillespie 1998). The Spotted Tree Frog therefore has a severely fragmented distribution (IUCN 2008) with possibly a much wider distribution in the past.

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The specific habitat requirements of this species (riffle and cascade stream sections with exposed rock banks) and sedentary existence are likely to have contributed to the highly patchy distribution along most streams (Gillespie & Hollis 1996).

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## Explanatory note

Between 2007 and 2009 the NSW Scientific Committee undertook a systematic review of the conservation status of a selection of plant and animal species listed under the Threatened Species Conservation Act. This species summary report provides a review of the information gathered on this species at the time the Review was undertaken.

The Scientific Committee's report on the Review of Schedules project and final determinations relating to species that were either delisted or had a change in conservation status can be found on the following website: [www.environment.nsw.gov.au](http://www.environment.nsw.gov.au).

The Committee gratefully acknowledges the past and present Committee members and project officers who ably assisted the Committee in undertaking the Review of Schedules Project. Information on the people involved in the project can be found in the Acknowledgement section of the project report entitled "Review of the Schedules of the Threatened Species Conservation Act 1995. A summary report on the review of selected species" which is available on the abovementioned website.

This species summary report may be cited as:

NSW Scientific Committee (2008) Spotted Tree Frog *Litoria spenceri*. Review of current information in NSW. July 2008. Unpublished report arising from the Review of the Schedules of the Threatened Species Conservation Act 1995. NSW Scientific Committee, Hurstville.