FROG CENSUS 2002

Community monitoring of water quality and habitat condition in South Australia using frogs as indicators

August 2003

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I would like to thank all the volunteers, old and new, for recording the frogs calling from their waterways, despite the dry conditions. Clearly, without their dedication there would be no FROG CENSUS.

Thanks also to those people who kindly gave their permission for the use of their photographs on the web page and in this document. Unless otherwise acknowledged, I took all photographs in this report.

The media again enthusiastically promoted the FROG CENSUS, through various channels on television and radio and in newspapers. Without their support, the general community would not have been aware of the program.

I would particularly like to give special thanks to the community and special interest groups that promoted the census in their newsletters and invited me to talk at their meetings.

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The FROG CENSUS is fully funded by the Environment Protection Authority.

Steven Walker
July 2003

SUMMARY

The FROG CENSUS is a community survey of frogs throughout South Australia, initiated and coordinated by the Environment Protection Authority (EPA). The FROG CENSUS provides a 'snapshot' of the distribution and abundance of frogs in South Australia, based upon the collection of frog recordings from as many different locations as possible over a one-week period.

The aims of the FROG CENSUS are to:

- increase public awareness of the health of South Australian waterways
- encourage public involvement in monitoring the water quality in the state
- improve knowledge of the distribution and abundance of frogs in South Australia
- assess the current and long–term health of the state's waterways
- assist in assessing the impact of EPA policies on water quality in this state.

This program began in 1994 and, with nine years of data, is now starting to build a good picture of the distribution and abundance of each of the frog species in the state. It is important to develop long-term ecological databases to understand the effects of climate and broad-scale landscape change on biological communities. Future directions will include overlaying other data collected around the state regarding river and catchment condition, to help identify problem areas in the state.

Frogs recorded

The distribution of recordings in 2002 was similar to that of previous censuses, with sites concentrated around the Adelaide metropolitan area and the South East. The range of recordings extended from Innamincka Station in the north, to Ewen's Ponds near Port MacDonnell in the south and across from Topperwein Native Forest Reserve near the SA-Victoria border, to Streaky Bay on Eyre Peninsula.

The 2002 FROG CENSUS recorded only 15 of the 28 frog species found in South Australia. The highest number of species recorded at a single location was six, at the Kangaroo Flat Native Forest Reserve (Site 2) in the South East.

Most of South Australia experienced below average rainfall in 2002. In the areas with rainfall very much below average, few sites had three or more species of frog calling. Only in the South East, where average rainfall occurred during that period, were sites with five or six species found. Sites with four species were found in the Central Districts, Mount Lofty Ranges & Adelaide Plains, Eyre Peninsula, the Murray Valley and the South East.

The most commonly recorded species was the Common Froglet (*Crinia signifera*). The next most common species were the Brown Tree Frog *(Litoria ewingi*), Spotted Grass Frog *(Limnodynastes tasmaniensis*) and Eastern Banjo Frog (*Limnodynastes dumerili*).

For the first time in the FROG CENSUS, Brown Tree Frogs were the second most common species. In all other years, Spotted Grass Frogs have been the second most common.

Other species were recorded in much lower numbers, including: Water Holding Frog (*Cyclorana platycephala*), Green Tree Frog (*Litoria caerulea*), Peron's Tree Frog (*Litoria peroni*), Southern Bell Frog (*Litoria raniformis*), Eastern Sign Bearing Froglet (*Crinia parinsignifera*), Streambank Froglet (*Crinia riparia*), Long Thumbed Frog (*Limnodynastes fletcheri*), Brown Striped Marsh Frog (*Limnodynastes peroni*), Trilling Frog (*Neobatrachus centralis*), Painted Frog (*Neobatrachus pictus*) and Bibron's Toadlet (*Pseudophryne bibroni*).

Peron's Tree Frog was observed at the local duck pond at Kapunda. In South Australia, this species has a natural distribution restricted to the Murray Valley and a number of swamps in the South East. It is the third year in a row that this species has been found outside its normal range.

The Southern Bell Frog was recorded calling from a drain at Beachport, in the South East. This recording is of great interest because this species was not recorded calling from any sites near Beachport, Robe or Kingston during a recent survey for this species (September 2000–May 2001). The Southern Bell Frog is protected in South Australia and in the FROG CENSUS between 1996 and 2002 it had not been detected further west than Mundulla (for the South East region).

One hundred and thirty one sites were visited that had no frogs calling (132 recordings, 12.4% of the total number of recordings). This result represents a large increase from the 52 sites with no frogs calling in the 2001 FROG CENSUS—in fact, it is the largest number of sites with no frogs that have been visited since the program commenced.

Only 29 sites have been visited in all censuses. However, 299 sites have been monitored in six or more of the nine years the census has been running. There have been slight fluctuations in the number of species recorded at these sites between years, but overall frog diversity and abundance appears to be relatively stable—the years 1994, 1998 and 2002 had below average number of species; the years 1995, 1999 and 2000 were above average and 2001 was just above average.

This demonstrates that frogs are able to build up in numbers relatively quickly following suitable wet conditions. If 2003 has improved levels of rainfall, frog numbers could quickly return to average or above average levels.

Observer participation

The FROG CENSUS has grown considerably since its inception in 1994; however, participation reduced in 2002, corresponding with the extended dry periods across the state. In 2002, 608 groups participated, representing a total of more than 1328 participants—112 groups were involved for the first time. They made 1070 recordings of frogs from 1000 different sites.

Each group in the 2002 FROG CENSUS was sent personalised results of their recordings. These included:

- a summary for each site visited by the group of the species recorded, as well as a brief description of each species
- a table listing the sites visited and species recorded by the group during each census that they have contributed recordings
- an information sheet summarising all data collected in the 2002 census.

1. INTRODUCTION

FROG CENSUS is a survey of frogs throughout South Australia initiated and coordinated by the Environment Protection Authority (EPA) and undertaken by members of the public. The survey was developed as an extension of the state FROGWATCH program that was developed for schools (Bayly, Hunwick, Hutchinson and Mahony 1990; Hunwick 1991). FROG CENSUS provides a 'snapshot' of the distribution and abundance of frogs in the waterways of South Australia.

The aims of the FROG CENSUS are to:

- increase public awareness of the health of South Australian waterways
- encourage public involvement in monitoring the water quality in the state
- improve knowledge of the distribution and abundance of frogs in South Australia
- assess the current and long-term health of the state's waterways
- assist in assessing the impact of EPA policies on water quality in this state.

Frogs are the highest forms of life to lay a naked egg in water (Tyler 1994). This characteristic makes them sensitive biological indicators because many aquatic pollutants can pass directly through the jelly coating to the developing embryo. Pollution can cause the death of the embryo or have more subtle effects, such as producing skeletal abnormalities or altering the behaviour of tadpoles, which may make them more vulnerable to predation. Accordingly, to complete their life cycle successfully, frogs require a habitat free of significant levels of environmental pollutants.

Changes to the presence and abundance of frog populations may mirror those that occur to other organisms in the environment. Consequently, the census provides a simple assessment of the health of aquatic environments using the assumption that healthy catchments provide appropriate conditions for a diverse and abundant range of frog populations and, conversely, unhealthy habitats have correspondingly reduced frog populations.

Every species of frog has a distinctive mating call and this allows frogs vocalising at a location to be accurately identified, making frogs a useful biological monitor[1]. This distinctiveness is particularly useful in a community-based program that embraces the valuable resource of public involvement but does not require participants to have any previous experience in collecting samples or skill in identifying frogs in the field.

The diversity of the frog fauna of South Australia is relatively low, compared with the rest of Australia. Only 28 out of the more than 210 described Australian species have been recorded in this state .The Streambank Froglet (*Crinia riparia*) from the Flinders Ranges is the only endemic species (Tyler 1994). This low diversity generally means there are few species that occur together at each site, reducing the possibility of misidentifying calls. Despite the similarity of calls within some genera (e.g. *Pseudophryne* and *Neobatrachus*), the frogs found in South Australia can be distinguished by subtle differences in their calls and reference to the location where they were recorded. Of those species recorded in the state, 15 are likely to be found in the southern part of the South Australia where most people live and where most FROG CENSUS recordings are usually taken.

Many of the rivers, creeks and wetlands in South Australia have been degraded by different sorts of human impacts. These impacts include:

- excessive clearance of vegetation
- flood mitigation activities (including draining swamps and re-channelling urban streams)
- stormwater and drainage disposal schemes

[1] See www.epa.sa.gov.au/frogcensus/

- poor riparian management activities (e.g. spraying and removal of aquatic plants, excessive grazing)
- invasion by exotic species
- inappropriate flood plain and catchment development.

These impacts have reduced the habitat available for aquatic and riparian fauna and flora and have increased erosion, nutrient inputs and salinisation of waterbodies. Government agencies, catchment management boards and community groups (such as Landcare and Waterwatch groups) have been very active in recent years—tackling many of the issues relating to aquatic and riparian management, largely through revegetation and public education programs. The FROG CENSUS provides a monitoring tool that can help assess the success of efforts being made to improve the condition of freshwater habitats in this state.

The FROG CENSUS also provides an exposure of local environmental conditions to the community. Participation in urban wildlife projects is known to increase personal awareness of both the local surroundings and history (Mostyn 1984). Community environmental monitoring also gives participants a sense of responsibility towards environmental health through their direct involvement in different projects (Alexandra, Haffenden and White 1996).

Involving the community in monitoring also allows a large number of samples to be collected over a broad area in a short space of time, usually with only a small cost to agencies. This sampling can lead to the discovery of new species records (Gynther 1995) and range extensions. This was the case for Bibron's Toadlet, which was recorded outside its known range in the 2001 FROG CENSUS (Walker 2002).

This report provides details of the FROG CENSUS carried out in 2002 and includes comparisons with previous years, to show any trends that are beginning to become evident as more detailed datasets are compiled through this program.

2. METHODS

The 2001 FROG CENSUS report was published and posted to all schools involved in the 2001 census and all major public libraries. The report was also included in digital format on the EPA FROG CENSUS web page (*http://www.epa.sa.gov.au/frogcensus/*), which also has information, calls, and keys to identifying the frogs present in South Australia.

Many participants for the 2002 FROG CENSUS were registered as a result of previous involvement. New participants were recruited by a number of methods, including:

- a media release by the EPA inviting members of the public to register their interest
- presentations to school and community groups
- registration by e-mail.

All registered participants were sent a FROG CENSUS kit containing a blank audio cassette, a return-addressed and postage-paid post-pak and a datasheet (see appendix 1). The datasheet described the methods to be used to record frog calls on the cassette. Participants were to provide their own recording equipment.

Participants were requested to make a three- to five-minute recording in the evening during 'Frog Week' (9–15 September) at sites of interest to them. Participants who were unable to make recordings during Frog Week were still encouraged to be involved and record as close as possible to these dates. The recordings were analysed by the FROG CENSUS Coordinator, who identified the frogs calling and assigned abundance categories for each species detected at each site.

All location, participant and frog data were stored on an ORACLE EDMS database at the EPA. Data were also converted and placed into a Microsoft Access database for report writing and feedback. All maps were produced using ArcMap. Charts were produced using Microsoft Excel.

The distribution of each species recorded during FROG CENSUS was compared with the records published by Barker, Grigg and Tyler (1995), Tyler (1977; 1978) and Brooks (1984). All scientific names follow those used by Tyler (1978), with the following exceptions: the Genus *Crinia* replaces Genus *Ranidella* and *Cyclorana platycephala* has replaced *Cyclorana platycephalus*.

Participants were sent the results of their recording(s) with specific information on the life history of each frog calling at the site(s) where they recorded and a general information sheet (see appendix 2) with overall results from the FROG CENSUS. Some additional recordings were received after the initial mail-out; numbers relating to participation and species abundance have therefore been revised from those presented on the information sheet. Participants were also sent a summary of their results for each year that they had been involved in the program.

3. RESULTS

3.1 Observer and location details

Table 1 details the public participation in the FROG CENSUS for the past nine years. FROG CENSUS 2002 involved 608 groups—this represents at least 1328 individuals, with 112 groups participating for the first time. Frogs were recorded from 1000 sites throughout South Australia (1070 separate recordings were made). In total, 1805 records were obtained for frog abundance and distribution throughout the state. This is a considerable drop from the large number of records collected for the 2001 FROG CENSUS. The poor quality of 11 of these recordings and a lack of recordings sent with the datasheets by a small number of participants did not permit identification of frogs.

Table 1 Number of groups, sites, recordings and database records collected in the Frog Census.

	1994	1995	1996	1997	1998	1999	2000	2001	2002	Total
Groups	302	608	602	656	672	774	701	762	608	*2031
Sites	452	778	771	813	790	918	996	1194	1000	*3091
Audio Recordings	507	917	852	886	869	1019	1082	1292	1070	8464
Database records	833	1861	1667	1549	1674	1908	2185	2604	1805	16087

* Total is the number of different groups or sites that have been included in the FROG CENSUS to date, not merely a summation of the groups or sites in each year.

Only 496 (46.4%) recordings were made in Frog Week. However, 934 (87.5%) of the recordings were made during the month of September (see Figure 1).

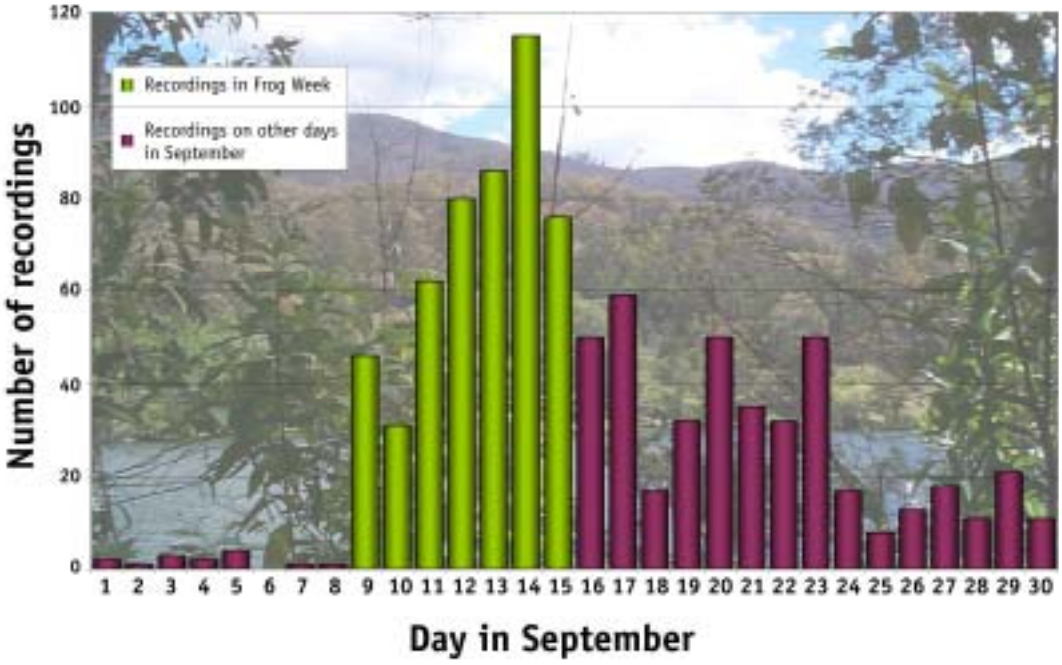


Figure 1 Number of recordings made in September 2002

Most recordings (79.2%) were made between 7 pm and 9.30 pm. The range of recordings was from 12:15 am until 11.59 pm (see Figure 2).

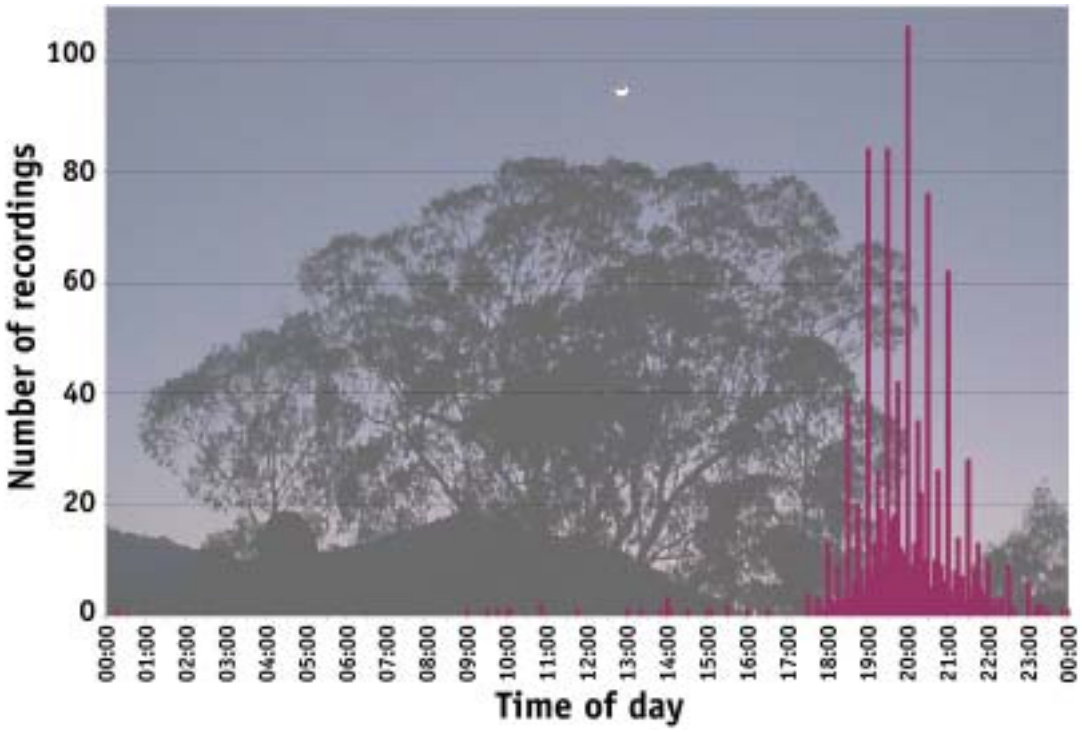


Figure 2 Time of day when recordings were made

Figure 3 shows the distribution of all FROG CENSUS sites. In 2002, the most northerly recording was taken at Innamincka Station in the North East. The most southerly recording was at Ewen's Ponds near Port MacDonnell in the South East. The easternmost recording was from Topperwein Native Forest Reserve near the SA-Victoria border. The westernmost recording was from Streaky Bay on the Eyre Peninsula.

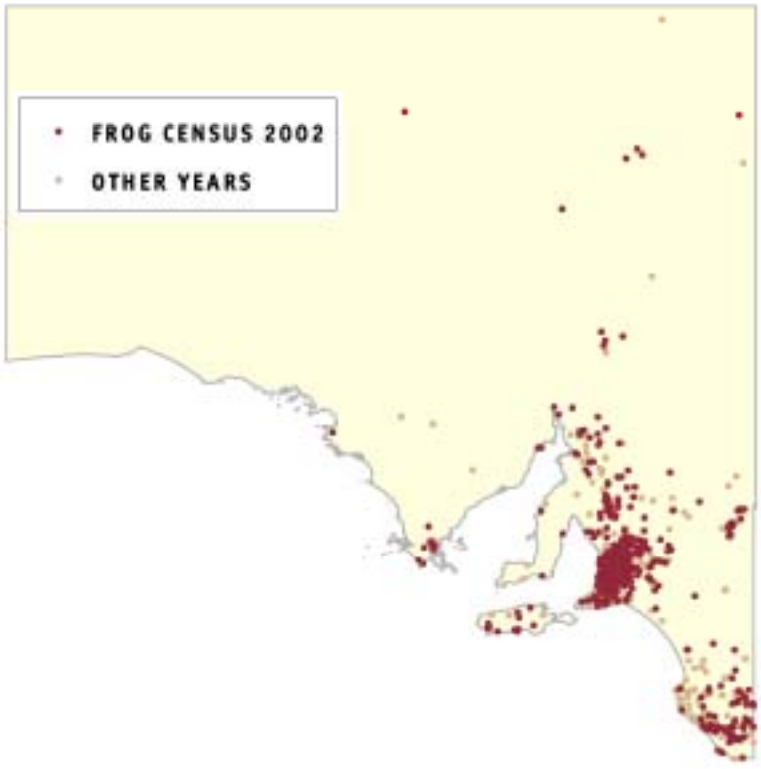


Figure 3 Geographic range of recording sites for the FROG CENSUS

3.2 Frog species abundance and distribution

Fifteen species of frog were recorded in 2002 (Table 2). Table 3 lists the number of recordings that were made of each species and the total number of different locations at which those species were found. Some sites were recorded more than once, by the same participant or by numerous participants. On occasion, there were different species or numbers of frogs calling on the different recordings. The most commonly recorded species were the Common Froglet (*Crinia signifera*), Brown Tree Frog *(Litoria ewingi*), Spotted Grass Frog *(Limnodynastes tasmaniensis*), and the Eastern Banjo Frog (*Limnodynastes dumerili*). Other species recorded included: Water Holding Frog (*Cyclorana platycephala*), Green Tree Frog (*Litoria caerulea*), Peron's Tree Frog (*Litoria peroni*), Southern Bell Frog (*Litoria raniformis*), Eastern Sign Bearing Froglet (*Crinia parinsignifera*), Streambank Froglet (*Crinia riparia*), Long Thumbed Frog (*Limnodynastes fletcheri*), Brown Striped Marsh Frog (*Limnodynastes peroni*), Trilling Frog (*Neobatrachus centralis*), Painted Frog (*Neobatrachus pictus*) and Bibron's Toadlet (*Pseudophryne bibroni*).

Table 4 shows the number of recordings for each species by abundance category. As in 2001, half of the records (50.1%) were of few (2–9) individuals of the same species and 28.4% of records had many (10–50) frogs. The categories of one frog and lots (>50) were much less frequently recorded (7.6% and 5.8% respectively). Recordings of no frogs calling represented 12.4% of the total number (1070) of recordings.

Table 5 shows the number of records of each species by habitat type. Recordings were most commonly made in streams/creeks (33.2%), dams (19.8%), ponds (16.0%) and rivers (9.9%). Of the major 'natural' habitats (i.e. excluding mines, quarries, sheep dips, swimming pools and toilet blocks), springs had the lowest number of recordings (0.8%).

The greatest diversity of species were found in swamps/flooded paddocks/marshlands (nine species). Streams/creeks and wetland/billabongs also had large numbers of species present (eight species) (Figure 4).

Table 2 Number of recordings of different species in the FROG CENSUS

Scientific Name	Common Name	1994		1995		1996		1997		1998		1999		2000		2001		2002	
		#	%	#	%	#	%	#	%	#	%	#	%	#	%	#	%	#	%
Cyclorana cultripes	Knife Footed Frog	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	1	0.1	0	0.0	0	0.0
Cyclorana platycephala	Water Holding Frog	0	0.0	0	0.0	0	0.0	0	0.0	1	0.1	0	0.0	1	0.1	0	0.0	1	0.1
Litoria caerulea	Green Tree Frog	0	0.0	0	0.0	1	0.1	0	0.0	1	0.1	0	0.0	0	0.0	0	0.0	2	0.2
Litoria ewingi	Brown Tree Frog	92	18.1	214	25.1	203	23.4	268	24.8	290	27.2	281	27.6	286	26.4	393	30.4	357	33.5
Litoria peroni	Peron's Tree Frog	1	0.2	19	2.2	22	2.5	3	0.3	17	1.6	11	1.1	29	2.7	12	0.9	3	0.3
Litoria raniformis	Southern Bell Frog	1	0.2	23	2.7	16	1.8	3	0.3	17	1.6	8	0.8	42	3.9	6	0.5	2	0.2
*Litoria rothi**	Roth's Tree Frog	1	0.2	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	1	0.1	0	0.0	0	0.0
Litoria rubella	Desert Tree Frog	0	0.0	0	0.0	0	0.0	0	0.0	2	0.2	1	0.1	0	0.0	2	0.2	0	0.0
Crinia deserticola	Desert Froglet	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	1	0.1	1	0.1	0	0.0	0	0.0
Crinia parinsignifera	Eastern Sign Bearing Froglet	3	0.6	21	2.5	30	3.5	14	1.3	24	2.2	16	1.6	32	3.0	20	1.5	11	1.0
Crinia riparia	Streambank Froglet	3	0.6	0	0.0	1	0.1	0	0.0	2	0.2	2	0.2	0	0.0	1	0.1	2	0.2
Crinia signifera	Common Froglet	368	72.6	734	86.2	699	80.4	753	69.6	695	65.1	821	80.6	813	75.1	1097	84.9	825	77.2
Geocrinia laevis	Smooth Frog	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	2	0.2	1	0.1	3	0.2	0	0.0
Limnodynastes dumerili	Eastern Banjo Frog	99	19.5	356	41.8	243	28.0	128	11.8	241	22.6	287	28.2	384	35.5	381	29.5	152	14.2
Limnodynastes fletcheri	Long Thumbed Frog	2	0.4	0	0.0	0	0.0	1	0.1	4	0.4	6	0.6	4	0.4	1	0.1	1	0.1
Limnodynastes peroni	Brown Striped Marsh Frog	6	1.2	19	2.2	8	0.9	20	1.8	21	2.0	15	1.5	60	5.5	68	5.3	38	3.6
Limnodynastes spenceri	Spencer's Frog	0	0.0	0	0.0	0	0.0	0	0.0	2	0.2	0	0.0	0	0.0	0	0.0	0	0.0
Limnodynastes tasmaniensis	Spotted Grass Frog	185	36.5	378	44.4	309	35.6	278	25.7	269	25.2	357	35.0	406	37.5	502	38.9	253	23.7
Neobatrachus centralis	Trilling Frog	0	0.0	0	0.0	0	0.0	0	0.0	4	0.4	1	0.1	1	0.1	1	0.1	2	0.2
Neobatrachus pictus	Painted Frog	5	1.0	5	0.6	7	0.8	12	1.1	9	0.8	2	0.2	12	1.1	24	1.9	3	0.3
Neobatrachus sudelli	Sudell's Frog	0	0.0	1	0.1	0	0.0	1	0.1	8	0.7	1	0.1	8	0.7	20	1.5	0	0.0
Neobatrachus sutor	Shoemaker Frog	0	0.0	0	0.0	0	0.0	0	0.0	1	0.1	0	0.0	0	0.0	0	0.0	0	0.0
Pseudophryne bibroni	Bibron's Toadlet	21	4.1	68	8.0	88	10.1	6	0.6	10	0.9	3	0.3	1	0.1	2	0.2	3	0.3
No frogs		45	8.9	22	2.6	36	4.1	60	5.5	56	5.2	93	9.1	87	8.0	55	4.3	132	12.4
Poor quality recording		1	0.2	1	0.1		0.0	1	0.1	0	0.0	0	0.0	17	1.6	16	1.2	11	1.0
No recording		0	0.0		0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	4	0.4

* Introduced individuals from Northern Australia.

Table 3 Number of recordings and sites where each species was recorded in the 2002 FROG CENSUS

Species*	Recordings**		Sites**	
	#	%	#	%
Cyclorana platycephala	1	0.1	1	0.1
Litoria caerulea	2	0.2	2	0.2
Litoria ewingi	357	33.6	341	34.2
Litoria peroni	3	0.3	3	0.3
Litoria raniformis	2	0.2	2	0.2
Crinia parinsignifera	11	1.0	11	1.1
Crinia riparia	2	0.2	2	0.2
Crinia signifera	825	77.3	774	77.6
Limnodynastes dumerili	152	14.2	142	14.2
Limnodynastes fletcheri	1	0.1	1	0.1
Limnodynastes peroni	38	3.6	37	3.7
Limnodynastes tasmaniensis	253	23.7	250	25.0
Neobatrachus centralis	2	0.2	2	0.2
Neobatrachus pictus	3	0.3	3	0.3
Pseudophryne bibroni	3	0.3	3	0.3
No frogs	132	12.4	131	13.1
No recording	4	0.4	4	0.4
Poor quality recording	11	1.0	11	1.1

*See Table 2 for common names. **A total of 1070 recordings were made at 1000 different sites.

Table 4 Number of recordings in abundance categories for each species in the 2002 FROG CENSUS

Species*	One	Few (2–9)	Many (10–50)	Lots (> 50)
Cyclorana platycephala	0	0	1	0
Litoria caerulea	1	1	0	0
Litoria ewingi	45	254	57	1
Litoria peroni	1	2	0	0
Litoria raniformis	1	1	0	0
Crinia parinsignifera	1	5	5	0
Crinia riparia	0	1	1	0
Crinia signifera	23	389	343	70
Limnodynastes dumerili	33	76	27	16
Limnodynastes fletcheri	1	0	0	0
Limnodynastes peroni	1	11	17	9
Limnodynastes tasmaniensis	27	160	57	9
Neobatrachus centralis	2	0	2	0
Neobatrachus pictus	0	2	1	0
Pseudophryne bibroni	1	1	1	0
Total number of recordings	**138**	**903**	**512**	**105**

*See Table 2 for common names. There were 131 sites with no frogs calling.

Table 5 Number of sites in each habitat for each species in the 2002 FROG CENSUS

Species*	Dam	Drain	Garden/ Grass	Mine	Pond	Quarry	Reservoir/ Lake	River	Sand Dunes	Sheep Dip	Spring	Stream/ Creek	Swamp/ Flooded Paddock/ Marshland	Swimming Pool	Toilet Block	Wetland/ Billabong
Cyclorana playtcephala	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
Litoria caerulea	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1	0
Litoria ewingi	110	12	5	0	55	1	2	25	0	0	3	76	40	0	0	11
Litoria peroni	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	2
Litoria raniformis	0	1	0	0	0	0	0	0	0	0	0	0	1	0	0	0
Crinia parinsignifera	0	0	0	0	1	0	0	0	0	0	0	1	2	0	0	7
Crinia riparia	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0
Crinia signifera	174	28	3	1	93	3	8	84	0	1	6	272	69	0	0	32
Limnodynastes dumerili	33	7	0	0	11	2	1	28	0	0	1	20	24	0	0	15
Limnodynastes fletcheri	0	0	0	0	0	0		0	0	0	0	0	0	0	0	1
Limnodynastes peroni	1	1	0	0	2	1	2	0	0	0	0	2	25	0	0	3
Limnodynastes tasmaniensis	52	10	3	0	56	0	1	15	0	2	2	61	26	0	0	18
Neobatrachus centralis	0	1	0	0	0	0	0	0	0	0	0	0	1	0	0	0
Neobatrachus pictus	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0	0
Pseudophryne bibroni	0	0	0	0	0	0	0	0	0	0	1	2	0	0	0	0
No frogs	21	4	3	0	27	1	0	10	0	0	2	46	12	1	0	4
No recording	0	0	0	0	1	0	0	0	0	0	0	2	1	0	0	0
Poor quality recording	0	0	0	0	0	0	1	2	1	0	0	5	2	0	0	0
Total number of species	5	7	3	1	7	4	5	5	0	2	5	8	9	0	1	8
Total number of sites**	198	36	12	1	160	4	9	100	1	3	8	331	90	1	1	44

*See Table 2 for common names. **Total is the total number of sites with each habitat, not a summation of species totals for each habitat.

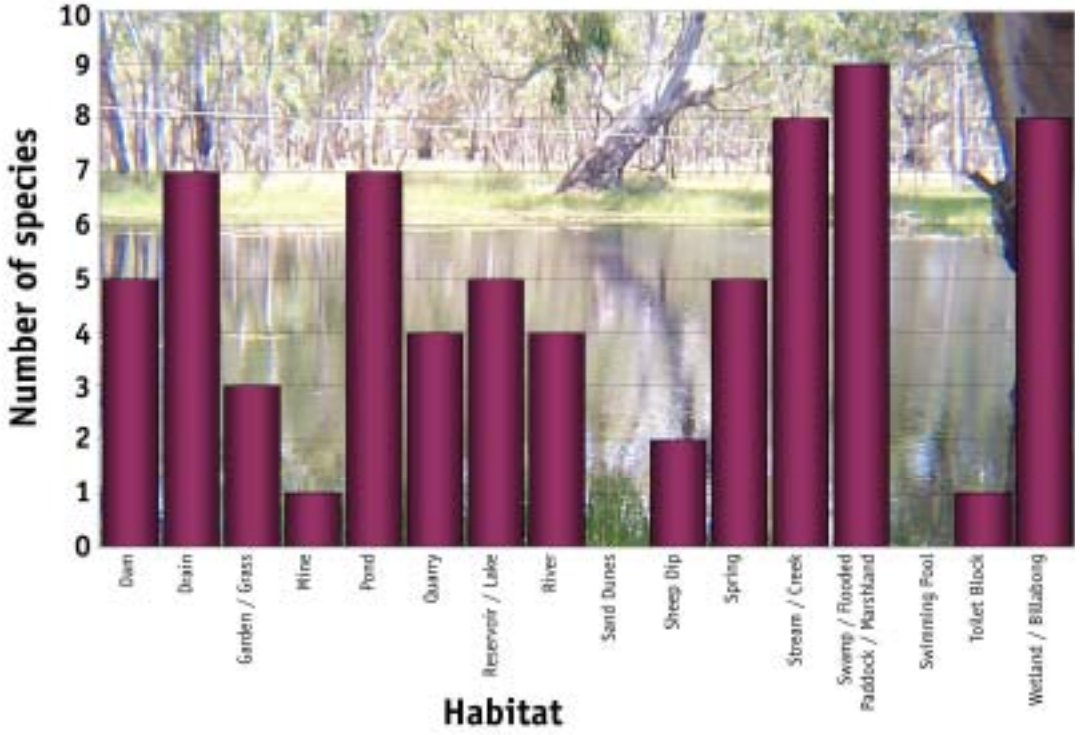


Figure 4 Species diversity in different habitats

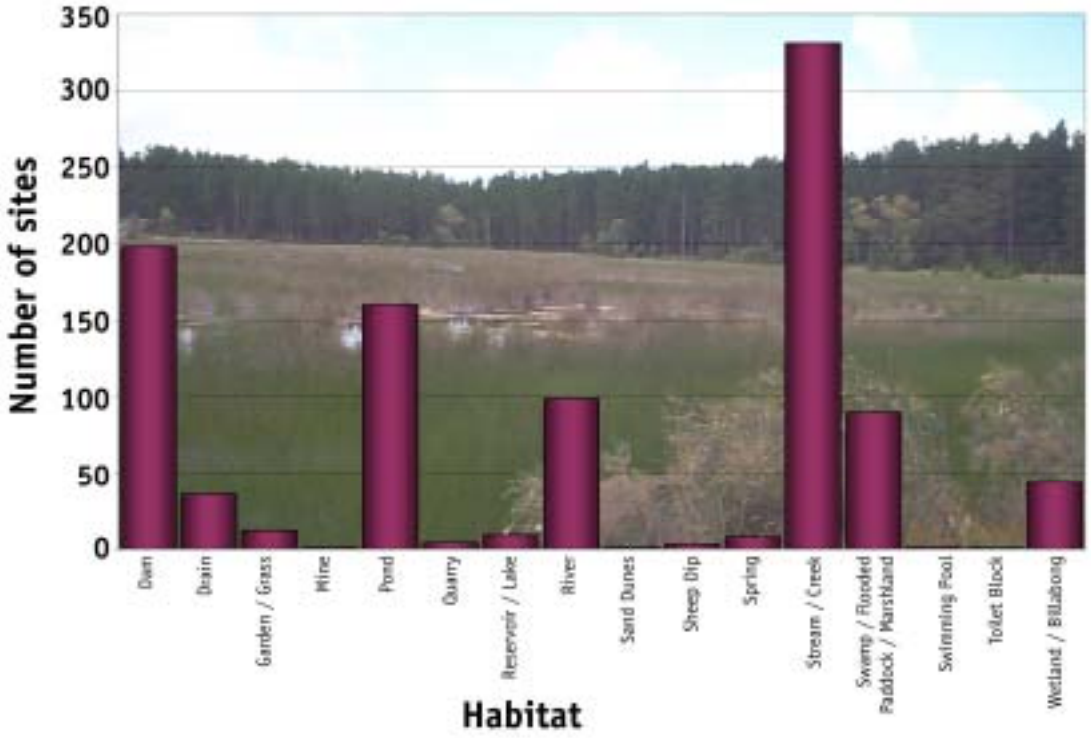


Figure 5 Number of sites visited for each habitat type

3.3 Geographical variation

Tyler (1977) split the state into a number of geographical regions based upon known species distribution at that time (Figure 6). The number of sites visited and species recorded in each region during the FROG CENSUS are shown in Table 6 and Table 7 respectively. Although fewer sites were recorded in 2002, the geographic range of recordings was similar to previous years (Walker 2002) and, for some regions, the number of sites visited was greater than all other years except 2001.

Figure 6 Geographic frog regions of South Australia

Most recordings were again made in the Central Districts, Mount Lofty Ranges & Adelaide Plains. The Murray Valley and South East regions also had a large number of recordings. Only the North East had more sites visited than in 2001 but, with the exception of the sighting of the Green Tree Frog from Innamincka Station, species could not be identified from the recordings.

Table 6 Number of sites visited in each geographical region during the FROG CENSUS

Region	1994	1995	1996	1997	1998	1999	2000	2001	2002
Central Districts, Mt Lofty Ranges & Adelaide Plains	310	519	468	547	522	629	577	738	676
Eyre Peninsula	3	3	4	8	6	5	10	18	15
Flinders Ranges	10	18	19	15	17	24	15	32	26
Kangaroo Island	10	2	7	13	10	26	14	17	12
Murray Valley	91	177	169	134	144	152	192	207	163
North East	1	0	1	0	8	2	3	2	4
North West	0	0	0	0	4	0	2	2	2
Nullarbor Plain	0	0	1	0	1	0	0	0	0
South East	25	54	89	88	71	70	175	171	98
Yorke Peninsula	2	5	13	8	7	10	9	7	3

Table 7 Number of species recorded in each geographical region during the FROG CENSUS

Region	1994	1995	1996	1997	1998	1999	2000	2001	2002
Central Districts, Mt Lofty Ranges & Adelaide Plains	7	7	6	7	6	6	6	8	7
Eyre Peninsula	2	2	2	3	2	1	5	5	5
Flinders Ranges	3	4	7	3	5	7	3	5	3
Kangaroo Island	5	3	5	5	4	4	5	5	5
Murray Valley	9	9	8	9	8	8	9	9	7
North East	1	0	1	0	6	1	2	1	1
North West	0	0	0	0	5	0	1	5	1
Nullarbor Plain	0	0	1	0	1	0	0	0	0
South East	6	9	8	7	8	7	10	9	6
Yorke Peninsula	1	1	2	4	1	3	3	1	1

The Central Districts, Mount Lofty Ranges & Adelaide Plains and the Murray Valley had the greatest frog diversity (seven species). The South East had the next highest number of species (six) but this represented a big drop from the number recorded in 2001 (nine species). There was also a drop in the number of species recorded in the Flinders Ranges (five in 2001; three in 2002) and North West (five species in 2001; one species in 2002). Eyre Peninsula and Kangaroo Island had the same number of species as in 2001 (five species). In both the North East and Yorke Peninsula, only one species was recorded. No recordings were made on the Nullarbor Plain.

The species recorded in each region during the 2002 FROG CENSUS are as follows (species names in **bold** are from recordings taken outside the previously published range for that species):

Central Districts, Mount Lofty Ranges & Adelaide Plains
Green Tree Frog, Brown Tree Frog, **Peron's Tree Frog**, Common Froglet, Eastern Banjo Frog, Spotted Grass Frog and Bibron's Toadlet.

Eyre Peninsula
Brown Tree Frog, Common Froglet, Spotted Grass Frog, Trilling Frog and Painted Frog.

Flinders Ranges
Streambank Froglet, Common Froglet and Spotted Grass Frog.

Kangaroo Island
Brown Tree Frog, Common Froglet, Eastern Banjo Frog, Spotted Grass Frog and Bibron's Toadlet.

Murray Valley
Brown Tree Frog, Peron's Tree Frog, Eastern Sign Bearing Froglet, Common Froglet, Eastern Banjo Frog, Long Thumbed Frog and Spotted Grass Frog.

North East District[2]
Green Tree Frog.

North West District
Water Holding Frog.

Nullarbor Plain
No recordings were made in this region.

South East
Brown Tree Frog, Southern Bell Frog, Common Froglet, Eastern Banjo Frog, Brown Striped Marsh Frog and Spotted Grass Frog.

Yorke Peninsula
Common Froglet.

[2] Poor quality recordings were made at three of the four sites visited.

3.4 Species diversity

Table 8 shows species diversity categories for sites recorded in the FROG CENSUS. In 2002, only 4.8% of sites had four or more species—in 2001, 10.9% of sites had four or more species.

Table 8 Number of sites with different numbers of species present in the FROG CENSUS

	1994		1995		1996		1997		1998		1999		2000		2001		2002	
Diversity*	#	%	#	%	#	%	#	%	#	%	#	%	#	%	#	%	#	%
Unknown	1	0.2	1	0.1	0	0.0	1	0.1	0	0.0	0	0.0	16	1.6	16	1.3	13	1.3
0	43	9.5	19	2.4	32	4.2	55	6.8	54	6.8	84	9.2	82	8.2	49	4.1	121	12.1
1	201	44.5	229	29.4	278	36.1	316	38.9	281	35.6	301	32.8	282	28.3	374	31.3	379	37.9
2	121	26.8	280	36.0	235	30.5	293	36.0	241	30.5	299	32.6	319	32.0	399	33.4	323	32.4
3	61	13.5	178	22.9	157	20.4	112	13.8	134	17.0	172	18.7	186	18.7	226	18.9	115	11.5
4	21	4.6	54	6.9	60	7.8	34	4.2	62	7.8	49	5.3	84	8.4	115	9.6	40	4.0
5	4	0.9	15	1.9	6	0.8	2	0.2	16	2.0	11	1.2	25	2.5	13	1.1	7	0.7
6	0	0.0	2	0.3	3	0.4	0	0.0	1	0.1	2	0.2	2	0.2	2	0.2	1	0.1
7	0	0.0	0	0.0	0	0.0	0	0.0	1	0.1	0	0.0	0	0.0	0	0.0	0	0.0

*Includes all species recorded at a site, regardless of which group made the recording.

As well as having more sites with no frogs, there is also an increase in the proportion of sites with only one species and the number of sites with two or more species has decreased. There is, therefore, a slight reduction in overall species diversity at sites in the 2002 FROG CENSUS, when compared to 2001.

Figure 7 shows the species diversity at sites for the 2002 FROG CENSUS. Also shown on the map is an overview of average rainfall[3] recorded by the Bureau of Meteorology for the period June–November 2002, which represents the period when rainfall was expected to influence frog calling throughout most of the state.

As can be seen from the map, most of South Australia experienced below average rainfall for that period. In the areas with rainfall very much below average, very few sites had three or more species of frog calling.

The highest number of species recorded at any site in 2002 was six, at Kangaroo Flat Native Forest Reserve (Site 2) in the South East. Only in the South East, where average rainfall occurred during that period, were sites with five or six species found. Sites with four species were found in the Central Districts, Mount Lofty Ranges & Adelaide Plains, Eyre Peninsula, the Murray Valley and the South East.

[3] The analyses are computer generated using the Barnes successive correction technique that applies a weighted average to data reported within set grids across Australia. On most maps, each grid represents a square area with sides of approximately 25 km. The size of the grids is limited by the relatively coarse average data separation throughout Australia. Maps for southeastern Australia can be analysed at finer resolution with approximately 10 km grid spacing, due to greater data density in this region. Finer resolution maps are able to show greater analysis detail so may differ slightly from maps analysed at the coarser resolutions (Bureau of Meteorology, 2003).

This grid point analysis technique provides an objective average for each grid square and enables useful estimates of rainfall and temperature in data-sparse areas such as central Australia. However, in data-rich areas, such as southeastern Australia or in regions with strong rainfall or temperature gradients, 'data smoothing' will occur—resulting in values at point locations which may differ slightly from the exact rainfall or temperature recorded (Bureau of Meteorology, 2003).

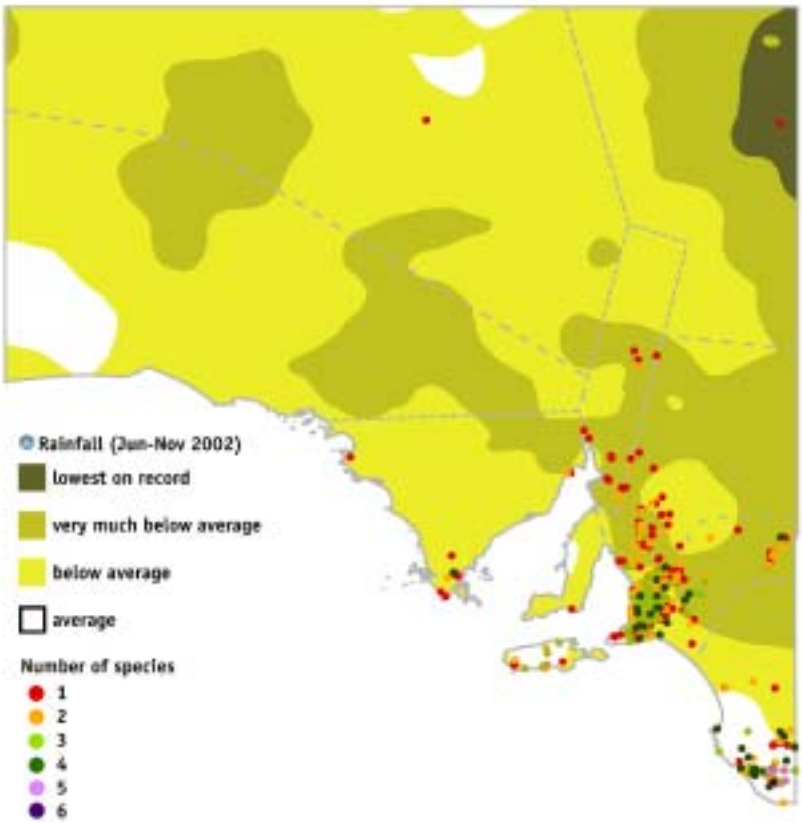


Figure 7 Species diversity in the 2002 FROG CENSUS

3.5 Specific frog distribution and abundance

Details on the abundance and habitat distribution for each species recorded in FROG CENSUS 2002 and the geographical distribution of recordings from 1994–2002 are presented below.

FAMILY HYLIDAE (3.5.1–3.5.5)

In South Australia, there are only two genera in the family Hylidae—*Cyclorana* and *Litoria*:

- *Cyclorana* species are burrowing frogs that are commonly called water holding frogs because of the large amounts of water they store. They do not possess toe discs but have a metatarsal tubercle, a hardened ridge on the undersurface of the foot, which acts like a spade to assist in digging. In most species, there is very little, if any, webbing between the toes.
- *Litoria* species are predominantly tree frogs that have flattened discs on the tips of their fingers and toes that secrete sticky mucus to aid in climbing. The undersurface of the disc has an indentation around the circumference. Most *Litoria* species have long legs and large amounts of webbing between the toes, while the fingers may have small amounts of webbing.

All South Australian hylids lay clumps of eggs in the water.

FAMILY LEPTODACTYLIDAE (3.5.6–3.5.15)

The vast majority of frogs in South Australia are in the family Leptodactylidae (also known as Myobatrachidae), of which there are six genera in South Australia (*Crinia*, *Geocrinia*, *Limnodynastes*, *Neobatrachus*, *Pseudophryne* and *Uperoleia*). They range in size from about 1.3 cm (*Crinia deserticola*) to 8.3 cm (*Limnodynastes dumerili*). These frogs have a very diverse range of habitats, lifestyles, body forms and reproductive strategies. Most are terrestrial, but they occupy a wide range of habitats from wet areas around streams and swamps to desert regions that have very little water.

There are varied reproductive strategies used, even within a genus. Some lay eggs in clumps attached to submerged vegetation, others produce a floating foam nest, long chains of eggs or have semi-direct development within the egg capsule laid on land.

There were no recordings of any *Geocrinia* or *Uperoleia* species in 2002.

3.5.1 Water Holding Frog (Cyclorana platycephala)

The Water Holding Frog is a medium-sized frog with a distinctive flat head and small eyes. The colour of the skin ranges dull grey to dark brown or green. The toes are completely webbed. The mating call is a long, drawn out 'maw-w-w-w…maw-w-w-w'.

It is probably the best known example of a frog traditionally used by Aborigines in the desert. This frog seals itself in a waterproof cocoon made up of layers of shed skin and spends the majority of its life burrowed underground. It may spend many years underground waiting for sufficient rains to enable them to breed. It avoids dehydration by storing water in their bladder or in pockets under the skin. If slight pressure is applied by hand, the frog will release this water. The water is very fresh and, after drinking it, the frog can be released unharmed.

A single report was made of the Water Holding Frog from Stewart's Waterhole on the floodplain of Neale's River in the North West. Many (10–50) frogs were calling following rain in March.

Figure 8 Frog Census locations with the Water Holding Frog
Photograph: Janet Pritchard

3.5.2 Green Tree Frog (*Litoria caerulea*)

The Green Tree Frog is a large frog (66–110 mm) limited to the far north of the state. A species that tolerates humans well, it can be found at homesteads along the banks of the Cooper Creek or observed on rocks, trees and on the ground, near water. It is also a popular pet.

The Green Tree Frog is smooth with large glands on the back of its head. It is usually bright green but may change colour to olive-brown. Some specimens have pale spots on their back, sides and limbs. The back of the thighs varies from yellow to maroon and the iris is pale gold.

The mating call is a deep 'crawk' that is repeated continuously.

Only two reports of the Green Tree Frog were made in the 2002 FROG CENSUS (Figure 9). They were not recorded, but instead low numbers were seen. They were encountered in a toilet block at Innamincka Station, in the North East and also by a pond within the enclosed Bicentennial Conservatory at the Adelaide Botanic Gardens, where they have been released.

Figure 9 FROG CENSUS locations with the Green Tree Frog

3.5.3 Brown Tree Frog (*Litoria ewingi*)

The Brown Tree Frog is the only tree frog commonly found in Adelaide and the Mount Lofty Ranges; it is sometimes seen climbing on windows in search of food. It is a slender, medium-sized frog (22–46 mm) with prominent toe and finger discs, a broad head and rounded snout. There is a narrow, black or brown stripe from the snout to the shoulder and a pale stripe beneath the eye. The back of the thighs is yellow or orange, occasionally with small, black spots. In the South East, the brown colouration may be partly or completely replaced with green.

The advertisement call is a loud and distinctive, high pitched 'weep-eep-eep' of ten to 20 notes.

The Brown Tree Frog was present on 357 recordings (33.5%) in 2002. They were found throughout the southern portion of their range in South Australia, particularly the southern Mt Lofty Ranges and South East (Figure 10). Most recordings (71.1%) were of few (2–9) frogs (Figure 11). This species was the second most commonly recorded species during the census; the first time there have been more Brown Tree Frogs than Spotted Grass Frogs in the FROG CENSUS. Recordings were taken primarily from dams (32.4%) and streams or creeks (22.4%) (Figure 12).

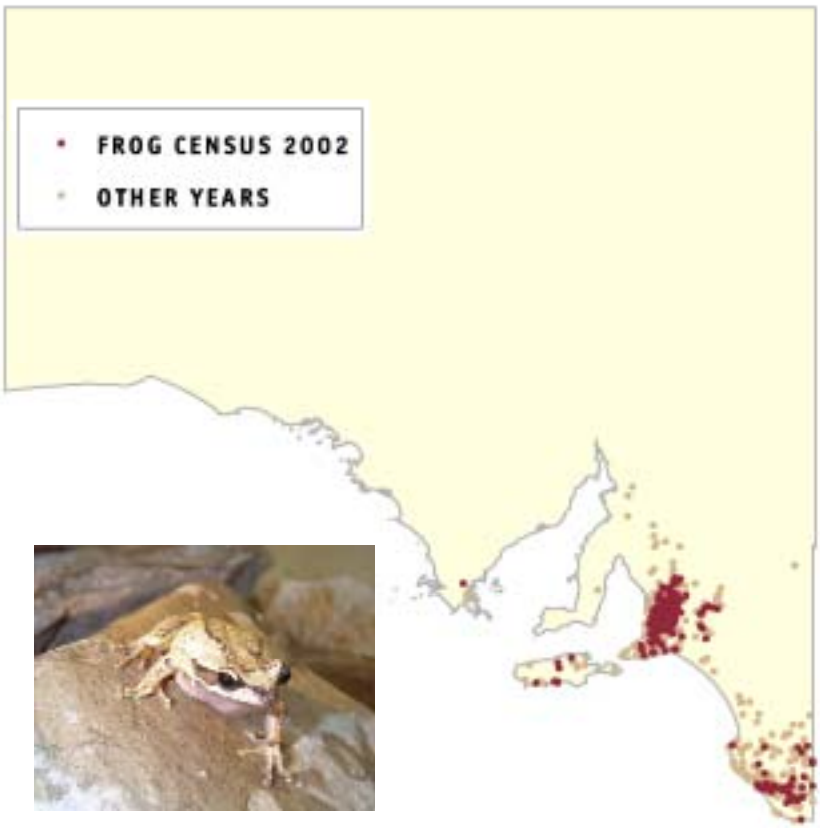


Figure 10 FROG CENSUS locations with the Brown Tree Frog

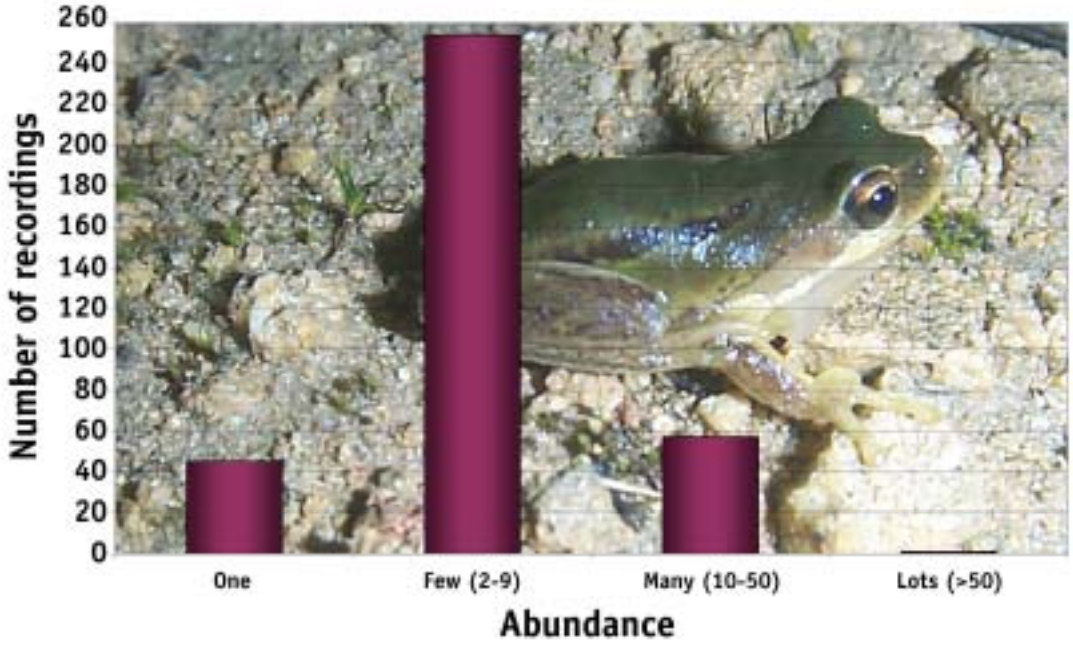


Figure 11 Brown Tree Frog abundance categories in the 2002 FROG CENSUS

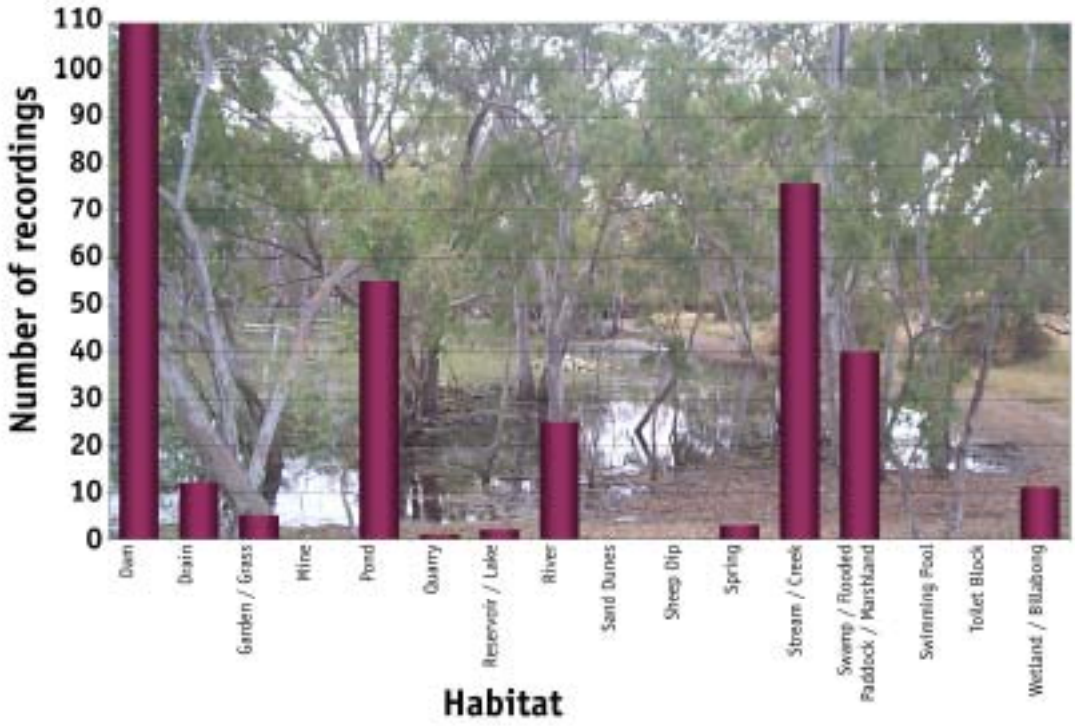


Figure 12 Brown Tree Frog habitat use in the 2002 FROG CENSUS

3.5.4 Peron's Tree Frog (*Litoria peroni*)

In South Australia, Peron's Tree Frog has been reported along the River Murray and swamps in the South East. It is grey or brown and has a number of small, emerald spots. A thin black line marks the skin fold above its ear and the back of the thigh is heavily marked with black on yellow or orange. Peron's Tree Frog has distinctively large toe and finger discs and ranges in size from 44–65 mm.

Its call is a long series of 29–50 explosive notes, often described as a 'maniacal cackle'.

Probably as the result of recent drought conditions, numbers of Peron's Tree Frog recordings were the lowest they have been in the FROG CENSUS since 1997. Only three recordings (0.3%) were made, including an unusual report of a single frog found at a pond in Kapunda (Figure 13). This is the third successive year in which this species has been found outside of its normal range. The other two recordings were of a few (2–9) frogs calling (Figure 14) from wetlands in the Riverland (Figure 15).

Figure 13 FROG CENSUS locations with Peron's Tree Frog

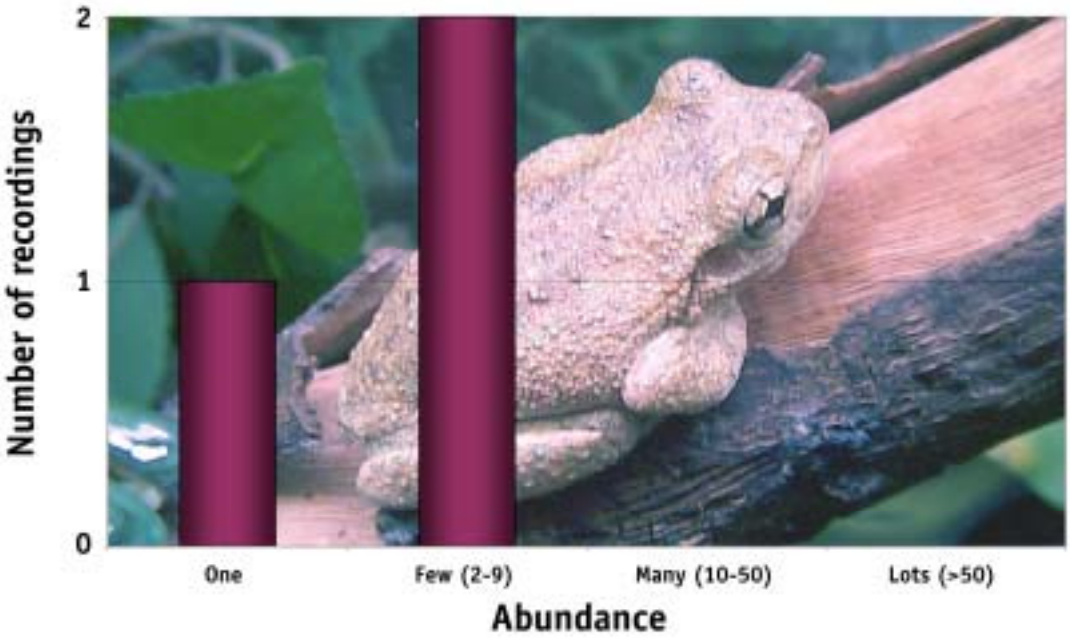


Figure 14 Peron's Tree Frog abundance categories in the 2002 FROG CENSUS

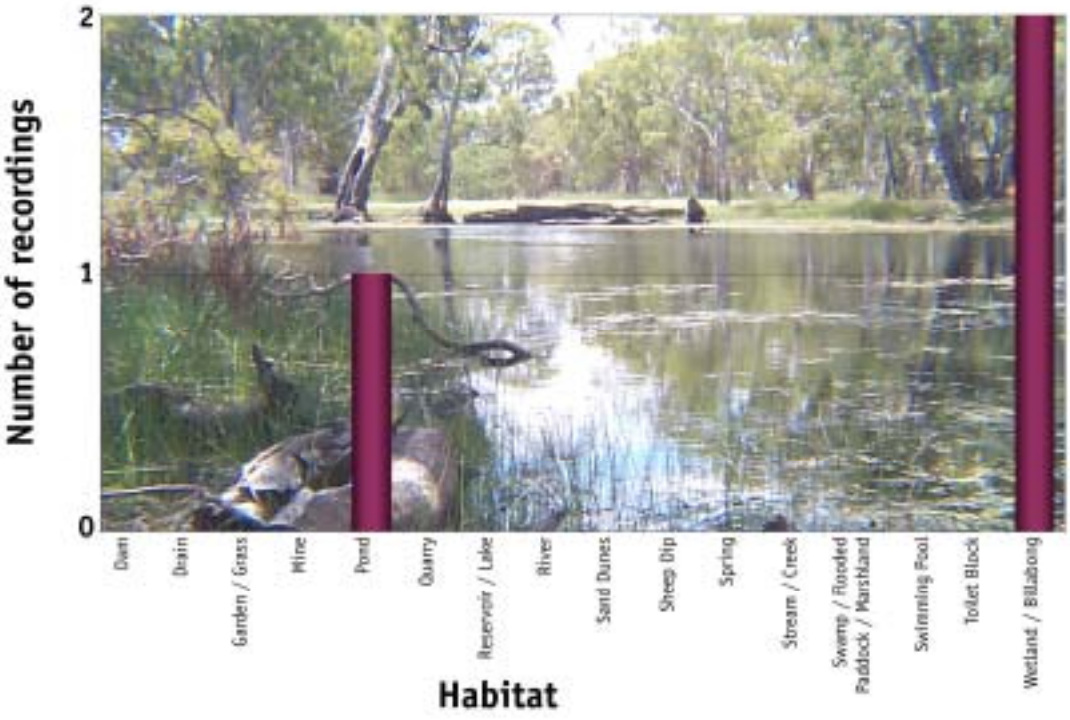


Figure 15 Peron's Tree Frog Habitat use in the 2002 FROG CENSUS

3.5.5 Southern Bell Frog (*Litoria raniformis*)

The Southern Bell Frog is a large, aquatic frog (55–104 mm) found throughout the swamps of the Murray Valley and the South East. It is characterised by a loud, barking call and distinctive, colourful skin patterns. This frog has a pale green mid-dorsal stripe with large, black spots on the back. The belly is coarsely granular and the thighs are turquoise. Fingers are not webbed, but the toes are almost fully webbed. This species is considered vulnerable and is protected in South Australia—a permit is required to collect it from the wild[4].

Its call is a loud, modulated growl, followed by a series of short grunts.

Only two recordings (0.2%) were made of the Southern Bell Frog in 2002. Both recordings were made in the South East (Figure 16); a few (2–9) frogs were calling near Beachport and one frog was calling from the Kangaroo Flat Native Forest Reserve (Site 2). Despite the low number of recordings made, it is pleasing to note their presence at Beachport. A separate study looking to document the distribution and conservation status of this species in the state between 2000 and 2001 did not encounter them at any of the locations visited in and around Kingston SE, Robe or Beachport. As this species is associated with very wet habitats—in 2002 from a drain and a swamp—it is not surprising that more were not recorded during this very dry year. Both recordings were made outside the normal FROG CENSUS week—the recording from Kangaroo Flat Native Forest Reserve was made in mid-October and the recording from Beachport in mid-

November, both after rain.

Figure 16 FROG CENSUS locations with the Southern Bell Frog

[4] National Parks and Wildlife Act 1972—Schedule 8

3.5.6 Eastern Sign Bearing Froglet (*Crinia parinsignifera*)

In South Australia, the Eastern Sign Bearing Froglet is distributed along the River Murray north of Walker Flat, with occasional records near the mouth after flood events. It is small with highly variable colour patterns. The grey or brown skin on the back may be smooth or have ridges or other raised areas. The belly is rough.

The mating call is a long, harsh, slowly repeated 'squelch'. The call is similar to the noise made when a wet finger is rubbed over an inflated balloon.

Only 11 recordings were made of the Eastern Sign Bearing Froglet in 2002. This is a drop of almost 50% from the 2001 FROG CENSUS. In fact, the number of recordings of this species has been decreasing since 2000, again likely because of dry conditions. They were recorded from the Riverland (Figure 17), with most recordings (Figure 18) being of many (10–50) frogs (45.5%) or few (2–9) frogs (45.5%) that were calling from wetlands (63.6%) (Figure 19).

Figure 17 FROG CENSUS locations with the Eastern Sign Bearing Froglet
Photograph: Mike Mahony (FROGWATCH Resource Materials)

Figure 18 Eastern Sign Bearing Froglet abundance categories in the 2002 FROG CENSUS
Photograph: Mike Mahony (FROGWATCH Resource Materials)

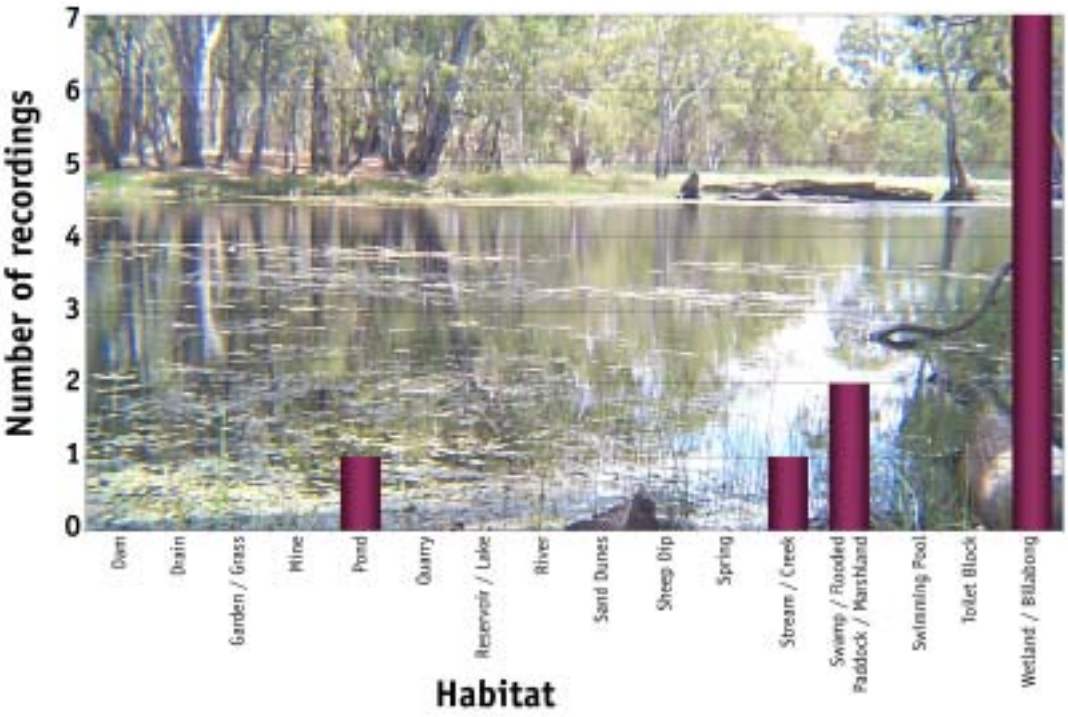


Figure 19 Eastern Sign Bearing Froglet habitat use in the 2002 FROG CENSUS

3.5.7 Streambank Froglet (*Crinia riparia*)

The Streambank Froglet is South Australia's only endemic frog, with a distribution restricted to the Flinders and Gammon ranges. As in other *Crinia* species, the Streambank Froglet, which ranges from 16–25 mm, displays highly variable skin colour and patterns. It also lacks a tympanum (disc-like external ear).

This species has numerous adaptations to life in fast flowing streams, including:

- sticky eggs that attach to the undersurface of in-stream rocks
- tadpoles with flat bodies, poorly developed tail fins and sucker-like mouths.

The mating call is a soft, slowly repeated 'kra–a–a–a–a–ack' that sounds like a squeaking door.

In the Flinders Ranges (Figure 20), only a few (2–9) froglets were recorded at Bunyeroo Creek Road, Oraparinna and many (10–50) were calling at Dead Goat Soak, Heysen Range. Although the Streambank Froglet was only recorded from two creeks, there were only four sites visited within its range in 2002. This species is still believed to be very abundant (M. Hutchinson pers. comm.).

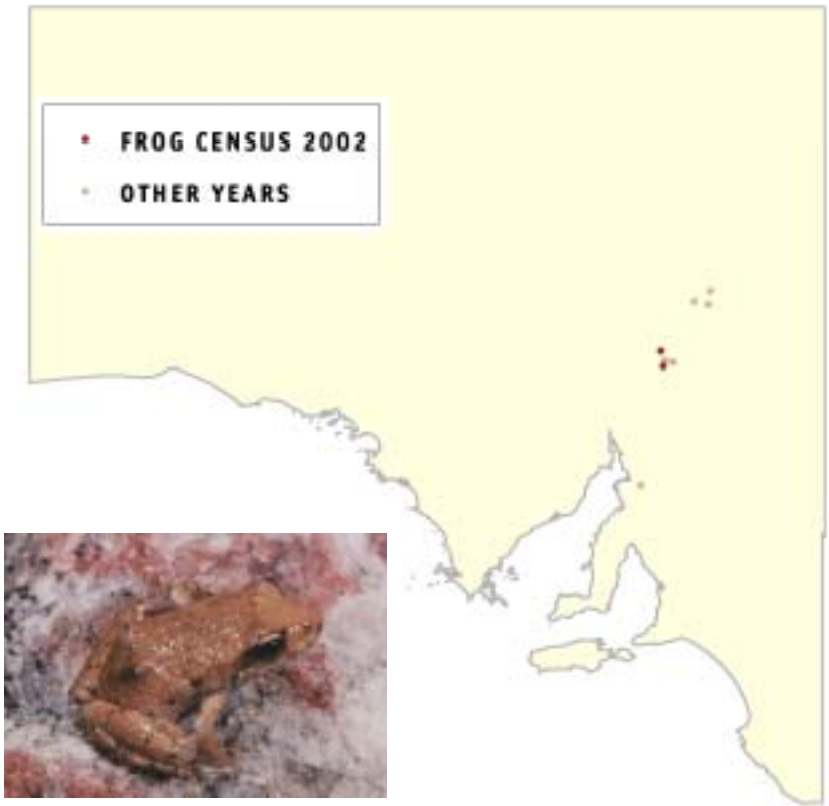


Figure 20 FROG CENSUS locations with the Streambank Froglet
Photograph: Mike Mahony (FROGWATCH Resource Materials)

3.5.8 Common Froglet (*Crinia signifera*)

The Common Froglet is the most frequently found frog in the Mount Lofty Ranges and the South East of South Australia. It also occurs on southern Eyre Peninsula, southern Flinders Ranges, Kangaroo Island, the Murray Valley and Yorke Peninsula. This species is highly variable in colour and may be plain, striped or spotted. Skin texture is also variable—smooth, warty or rigid. The rough belly is usually white with black markings.

The call of this species is a 'crick' that may be infrequently repeated or repeated in rapid succession (i.e. 'crick..crick..crick..crick').

As in previous years, the Common Froglet was the most commonly recorded species in the FROG CENSUS, being found on 77.2% of recordings throughout the south of the state (Figure 21). Most sites had few (2–9) frogs (47.2%) or many (10–50) frogs (41.6%) calling (Figure 22). Common Froglets were recorded in every habitat type except sand dunes, swimming pools and toilet blocks (Figure 23), although recordings were most commonly made from streams/creeks (35.1%) and dams (22.5%). Once again, the Common Froglet was recorded calling from all regions within its known distribution and was very common despite the dry conditions.

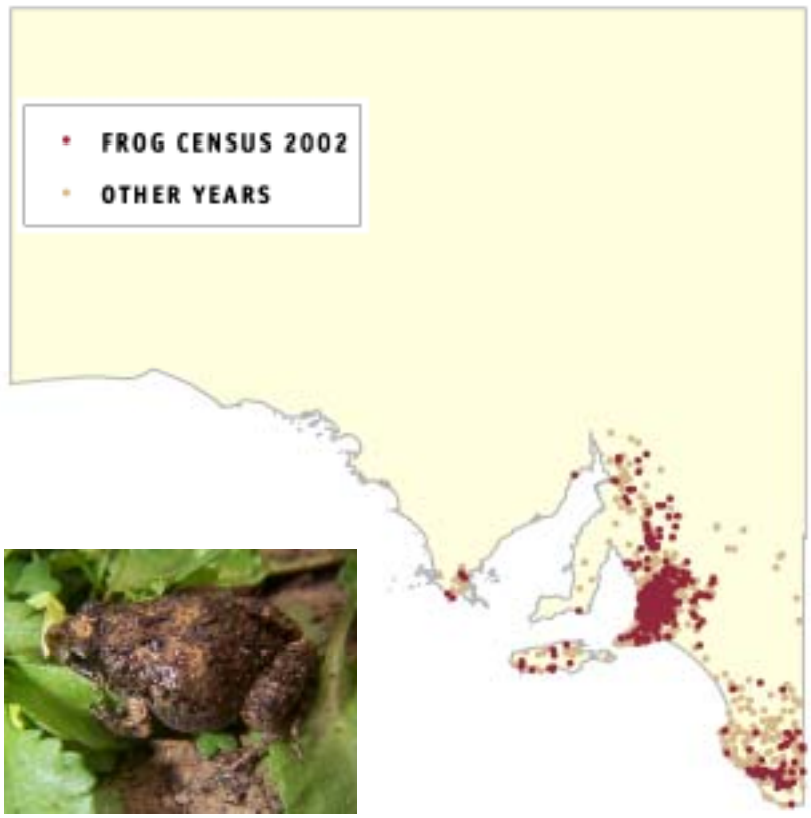


Figure 21 FROG CENSUS locations with the Common Froglet

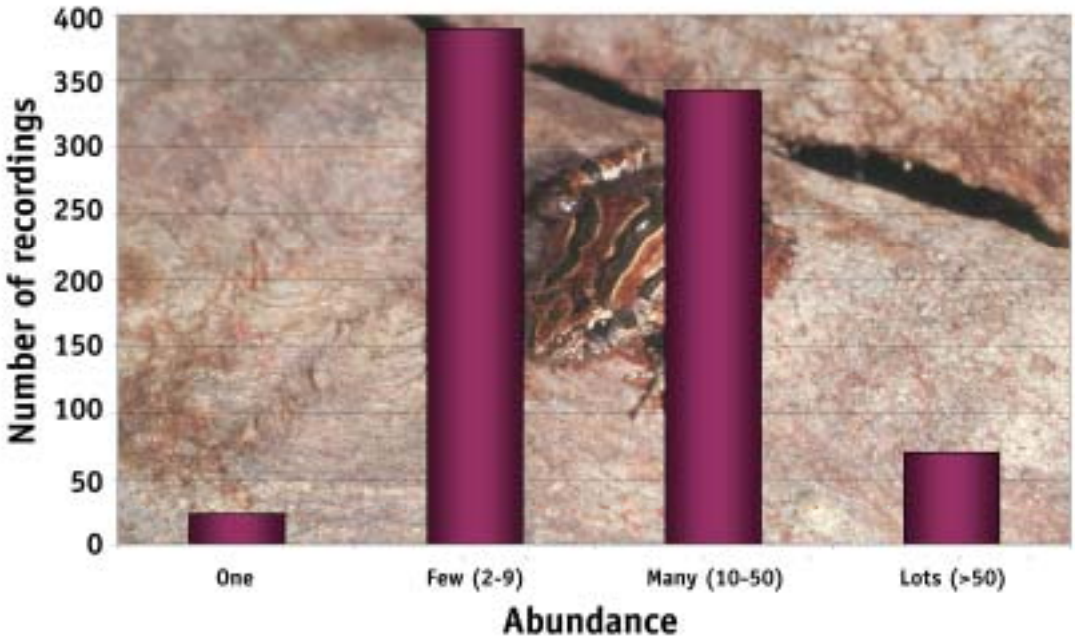


Figure 22 Common Froglet abundance categories in the 2002 FROG CENSUS

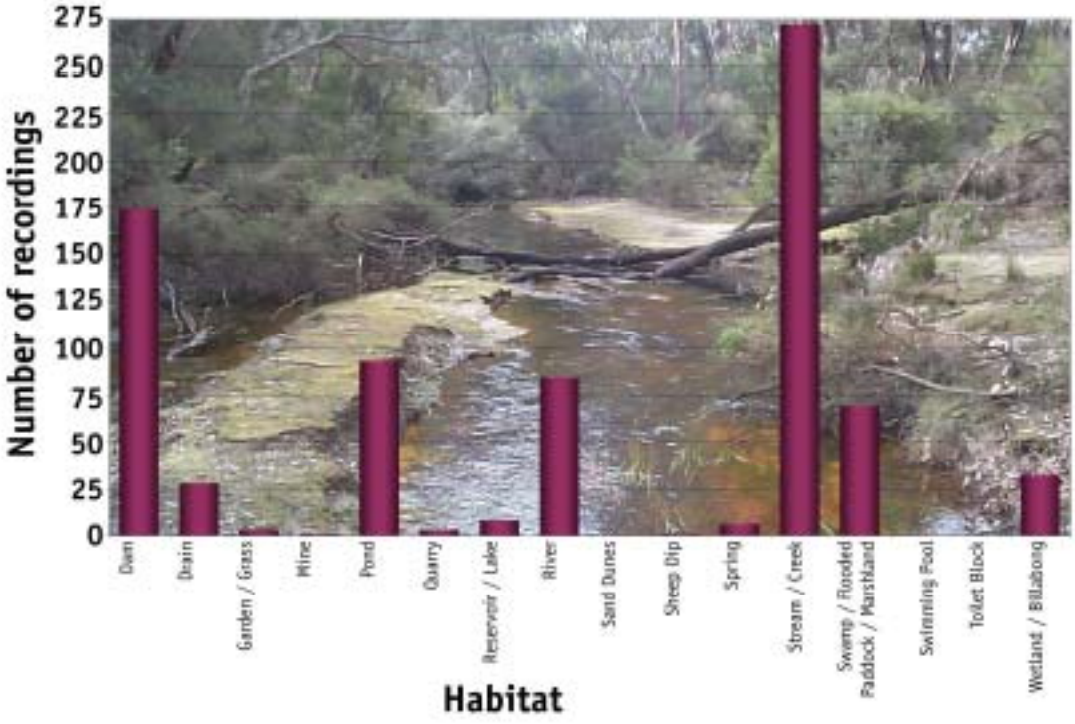


Figure 23 Common Froglet habitat use in the 2002 FROG CENSUS

3.5.9 Eastern Banjo Frog (*Limnodynastes dumerili*)

The Eastern Banjo Frog is a common inhabitant of wetlands and rivers throughout the wetter parts of the state. It is a medium to large burrowing frog with a broad, rounded head and short, thick limbs. Large glands are present on the tibia and at the edges of the mouth (supralabial gland). Eggs are laid in a large foam nest attached to floating or emergent vegetation. The mating call is a loud, explosive 'bonk'. Two subspecies are found in South Australia:

- *L. dumerili dumerili* has a rough, warty, dark brown or black body, sometimes with a dorsal stripe. The sides are marked with bronze, purple or black but the belly is usually cream or white with only slight flecking, if any. Toes are moderately webbed. It is found from the Eyre Peninsula and lower Flinders Ranges to the Murray Valley and upper South East.
- *L. dumerili variegatus*, found only in the lower South East, has dark patches on a pale back, a highly variegated belly, unwebbed toes and no dorsal stripe.

The number of Eastern Banjo Frog recordings (152, 14.2%) made in the 2002 FROG CENSUS is the lowest number that has been recorded since the 1997 FROG CENSUS (128 recordings). Most were made throughout the southern portion its known distribution. It was recorded only as far north as the Wakefield River at Auburn and was not recorded on either the Eyre Peninsula or Yorke Peninsula (Figure 24). Most recordings were of few (2–9) frogs (50%) (Figure 25). Eastern Banjo Frogs were found in most habitats (Figure 26), with recordings typically being taken at dams (23.2%) and rivers (19.7%). Other recordings were mainly in areas with abundant water (swamps, flooded paddocks, marshland, wetlands and billabongs). Many participants reported that no Eastern Banjo Frogs were present at their site during Frog Week. Subsequently, two-thirds of the Eastern Banjo Frog recordings were made after the official FROG CENSUS recording period.

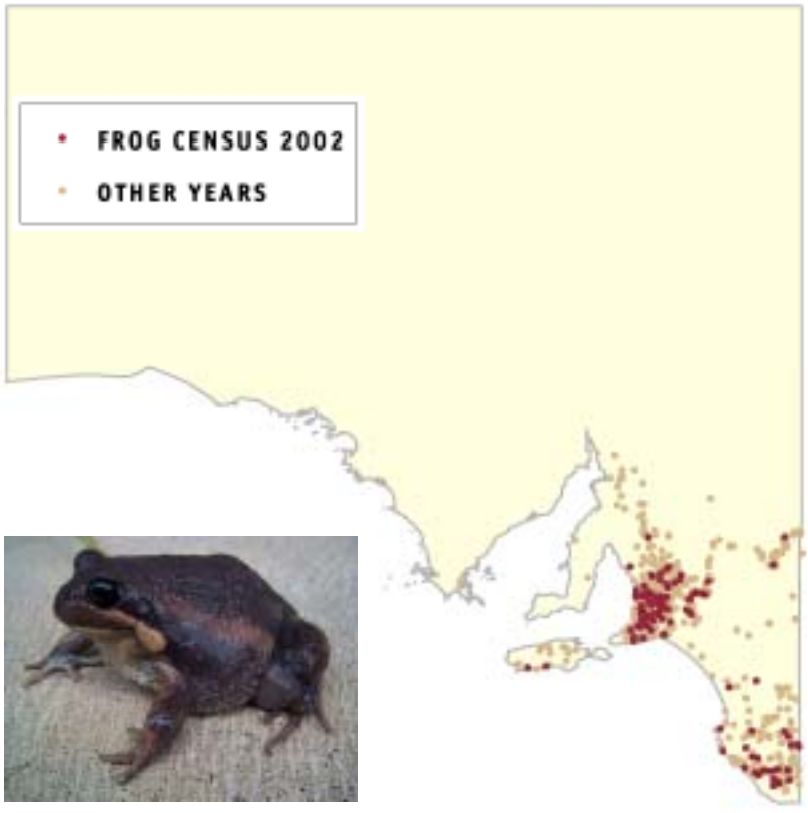


Figure 24 FROG CENSUS locations with the Eastern Banjo Frog

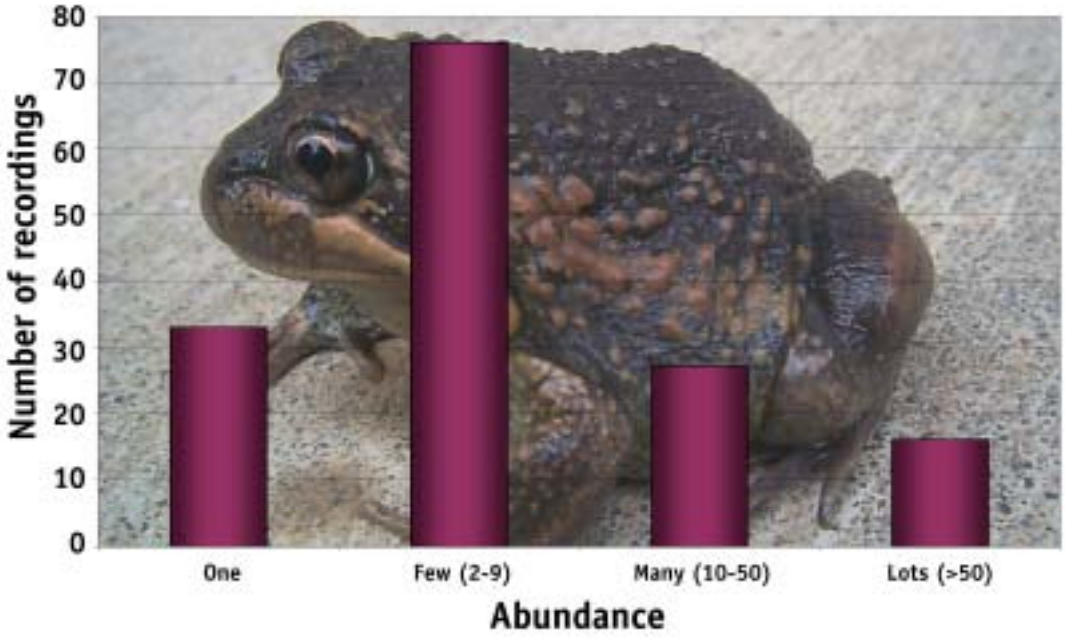


Figure 25 Eastern Banjo Frog abundance categories in the 2002 FROG CENSUS

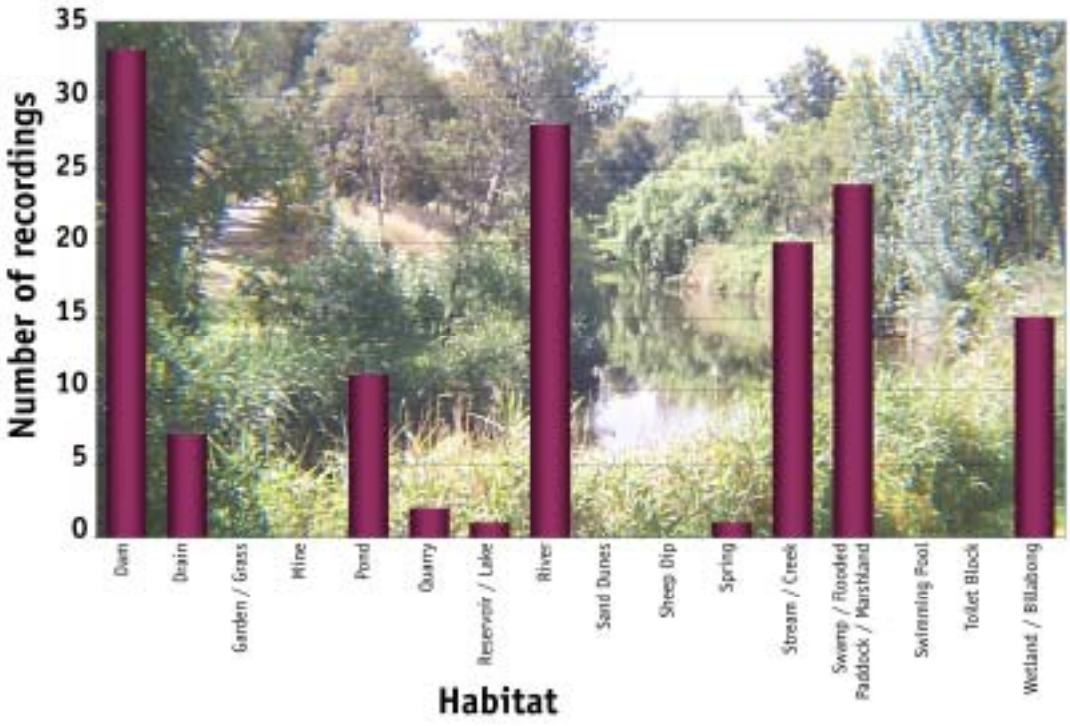


Figure 26 Eastern Banjo Frog habitat use in the 2002 FROG CENSUS

3.5.10 Long Thumbed Frog (*Limnodynastes fletcheri*)

In South Australia, the Long Thumbed Frog is restricted to the Murray Valley. It is a medium-sized frog characterised by rose-coloured patches above the eyes, irregular dark green patches on the dorsal surface and a first digit (thumb) that is longer than the second. Some individuals have a pale yellow mid-vertebral stripe. The dorsal and ventral surfaces are entirely smooth and, as in many other *Limnodynastes* species, there is a well-developed supralabial gland.

Breeding follows rains, with males calling from deep within clumps of floating debris. The mating call is like the sound of a distant barking dog 'whuck…..whuck'. Eggs are laid in a foam nest.

As in 2001, there was only one recording of the Long Thumbed Frog in the 2002 FROG CENSUS (Figure 27). A single frog was heard in a wetland at Lake Merreti, Calperum Station, near Renmark in the Murray Valley. As this species breeds after rainfall, it is not surprising that, following the dry conditions experienced in recent years, there have been very few recordings of this frog.

Figure 27 FROG CENSUS locations with the Long Thumbed Frog

3.5.11 Brown Striped Marsh Frog (*Limnodynastes peroni*)

The Brown Striped Marsh Frog is a medium-sized frog whose dorsal surface is marked with brown, longitudinal stripes. These stripes break up laterally to form a series of spots or blotches. The iris of the eye is golden at the top and dark brown at the bottom. A long spine on the tip of the male's first finger is used to improve grip during mating.

The mating call is a loud 'tok' or 'pok', much like the sound of a tennis ball being hit, or of corn popping.

In the 2001 FROG CENSUS, this species had the highest number of recordings for the FROG CENSUS (68 recordings, 5.3%). In 2002, however, they were only recorded at 37 sites (3.7% with 38 recordings made) in the South East (Figure 28). The frog was abundant at most of the locations where it was recorded, with 44.7% of sites having many (10–50) frogs, 28.9% few (2–9) frogs and 23.7% lots (>50) of frogs (Figure 29). Brown Striped Marsh Frogs were found in a variety of habitats, but the majority of recordings (67.6%) were taken in swamps, flooded paddocks or marshlands (Figure 30).

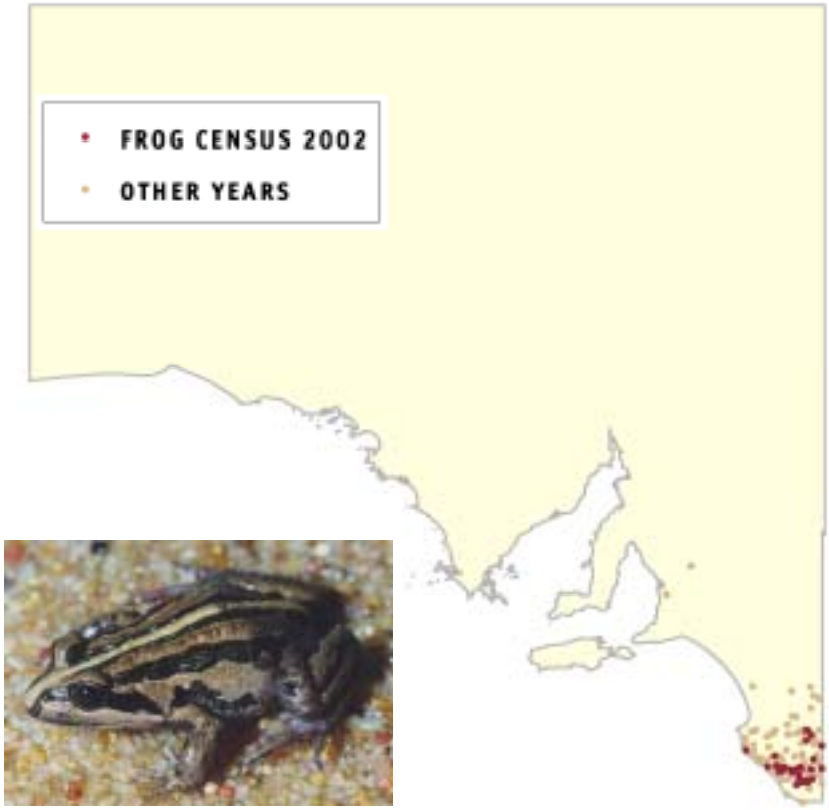


Figure 28 FROG CENSUS locations with the Brown Striped Marsh Frog

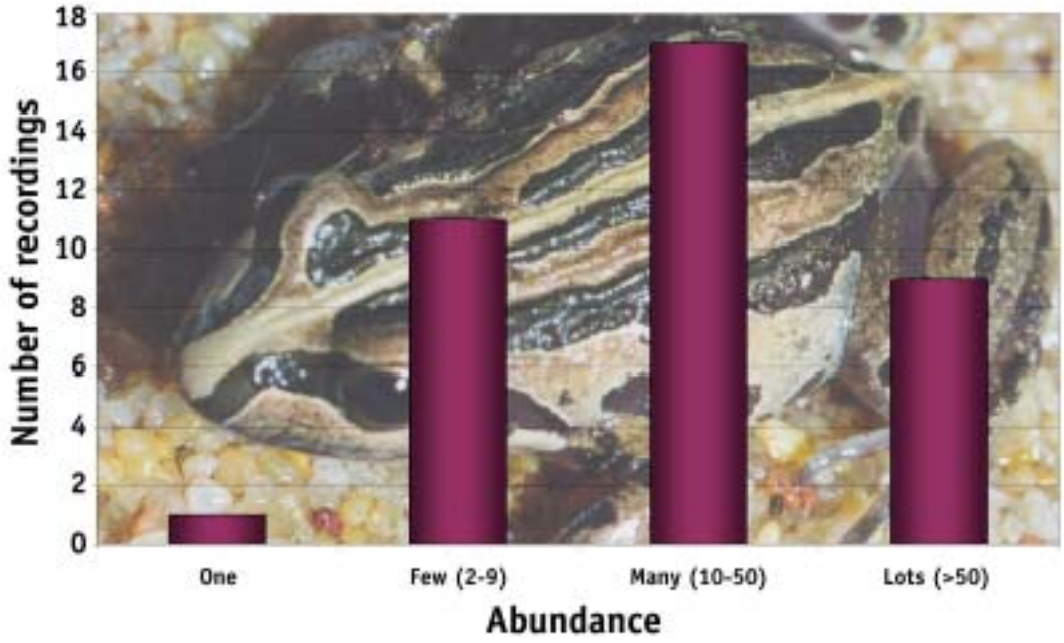


Figure 29 Brown Striped Marsh Frog abundance categories in the 2002 FROG CENSUS

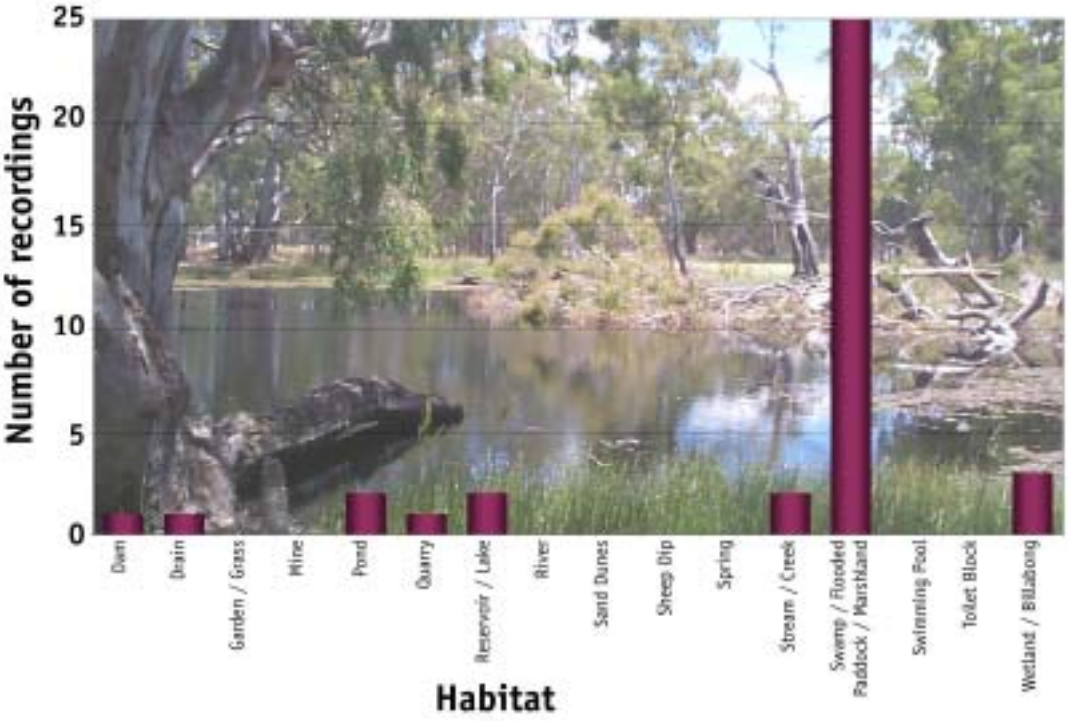


Figure 30 Brown Striped Marsh Frog habitat use in the 2002 FROG CENSUS

3.5.12 Spotted Grass Frog (*Limnodynastes tasmaniensis*)

The Spotted Grass Frog is one of the most common frogs in Australia, with a distribution including South Australia, Tasmania, Victoria, New South Wales and Queensland. It has green or brown spots on a pale grey or brown back. The belly is smooth and white. Many specimens have a mid-dorsal stripe that may be white, yellow or rusty red. Adult males have a dark yellow or green throat and females have flaps of skin on the first two fingers. These 'flanges' are used to create the foam nest in which the eggs are deposited; however, Tyler (1978) reports that females in the lower South East do not have flanges and do not produce a foam nest.

There are three 'call races' present in South Australia: *Northern* (Murray Valley and North East)—rapid, sharp 'duk–duk–duk' (two to four notes, average of three in SA); *Southern* (mid-Coorong and South East)—a short, single 'click'; and *Western* (Mount Lofty Ranges, Kangaroo Island, Yorke Peninsula, Eyre Peninsula and Flinders Ranges)—rapid, soft 'uk–uk–uk–uk' (three to six notes, average of four in SA).

For the 2002 FROG CENSUS, the call races were noted and the locations where they were present have been highlighted on the distribution map (Figure 31). There were three locations where both the northern and western call races were present. These locations, with the exception of a dam north of Waikerie, are along the boundary of the two races near Encounter Bay. There were also recordings of both the western and northern call races at separate sites on Kangaroo Island.

This species was the third most commonly recorded in 2002 (253 recordings, 23.7%). Recordings were made in each region throughout its known range with the exception of the North East and Yorke Peninsula, where only a small number of sites were visited. Recordings were usually of few (2–9) frogs (63.2%) calling (Figure 32). Recordings were most commonly made in streams or creeks (24.8%), ponds (22.8%) and dams (21.1%) (Figure 33).

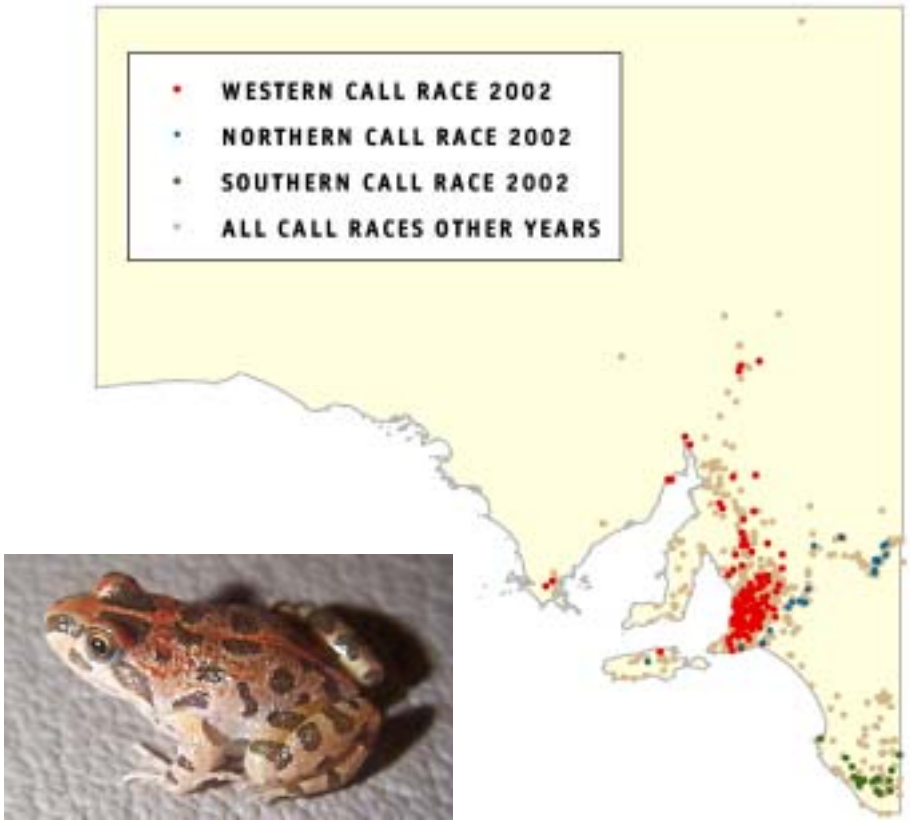


Figure 31 FROG CENSUS locations with the Spotted Grass Frog

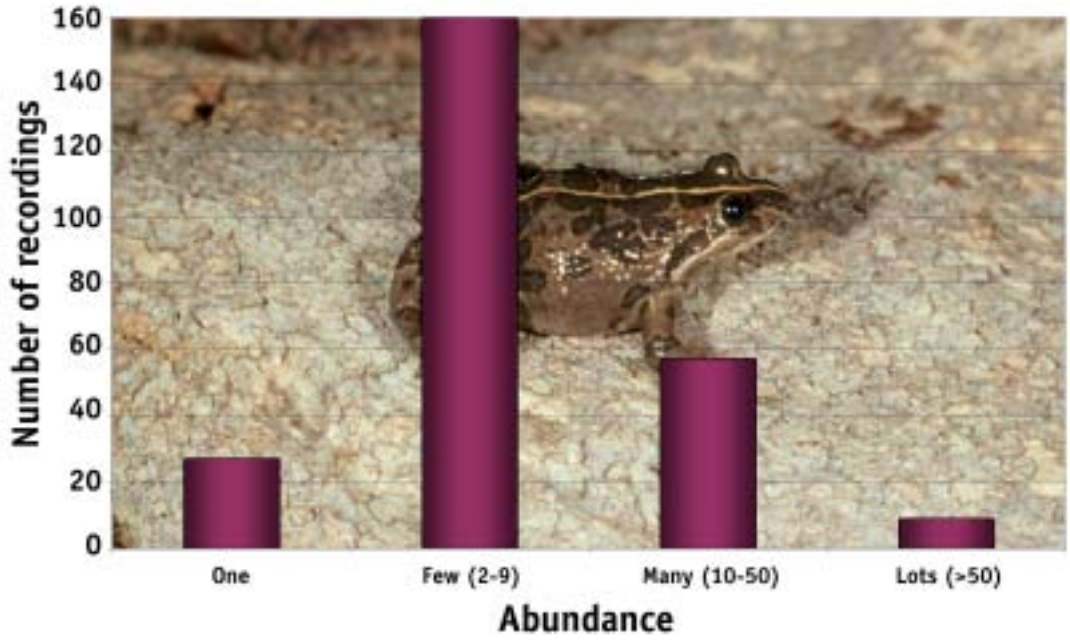


Figure 32 Spotted Grass Frog abundance categories in the 2002 FROG CENSUS

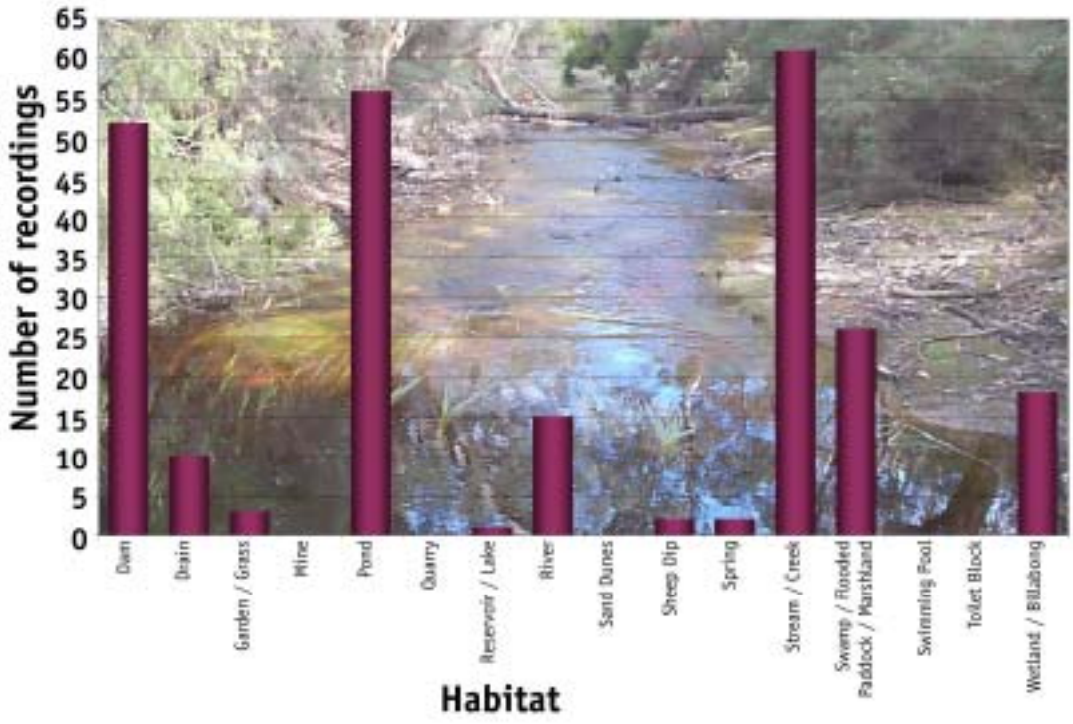


Figure 33 Spotted Grass Frog habitat use in the 2002 FROG CENSUS

3.5.13 Trilling Frog (*Neobatrachus centralis*)

The Trilling Frog is a burrowing frog characterised by large eyes, a high, broad head and short limbs. The smooth skin is mostly sandy-grey to brown with irregular markings. The frog may also have a narrow, pink or red stripe running down the centre of its back. The tympanum is not visible. The fingers are unwebbed; the toes are cylindrical, extensively webbed and have lateral fringes. The foot has a large, black-edged, sharp inner metatarsal tubercle that acts like a spade to aid burrowing. The Trilling frog is an opportunistic breeder, emerging from its burrow in grassy sandhills or clay soil near sparse woodland after rainfall.

The call is a prolonged, loud and high-pitched trill.

Although the Trilling Frog is one of the most widespread species in South Australia, it was only detected at two sites, on the Eyre Peninsula, in 2002 (Figure 34). Only a small number of Trilling Frogs was encountered in the census. During drain excavation works near Edillilie in April, a single specimen was accidentally unearthed and many (10–50) frogs were calling from a swamp at North Shields, following 14.5 mm of rain.

Figure 34 FROG CENSUS locations with the Trilling Frog
Photograph: Marco Sacchi

3.5.14 Painted Frog (*Neobatrachus pictus*)

The Painted Frog is of moderate size (46–58 mm), with a stocky build and short limbs. It is generally a deep olive colour with darker diffuse markings on the head and body. The eyes are prominent and have a vertical pupil. The tympanum is not visible. The fingers are cylindrical and lack webbing. The toes have broad flanges and extensive webbing. A large, black metatarsal tubercle on the foot aids digging. The skin is smooth, except during the mating season when the male will develop tiny black thorns.

Breeding occurs after rains; approximately 1000 eggs are laid in a chain wrapped amongst vegetation in the water. The mating call is a long, rapidly pulsed, musical trill made whilst the males float in water.

The Painted Frog was recorded calling from only three sites (0.3%) in 2002. Like other burrowing frogs, this species has a breeding season dependent on sporadic rain events. The year 2002 was a very dry year; there was very little rain to promote breeding in frog week. The Painted Frog was recorded only at three sites on the Eyre Peninsula (Figure 35). Most recordings (66.7%) were of few (2–9) frogs calling (Figure 36)—all were from swamps, flooded paddocks or marshland (Figure 37).

Figure 35 FROG CENSUS locations with the Painted Frog

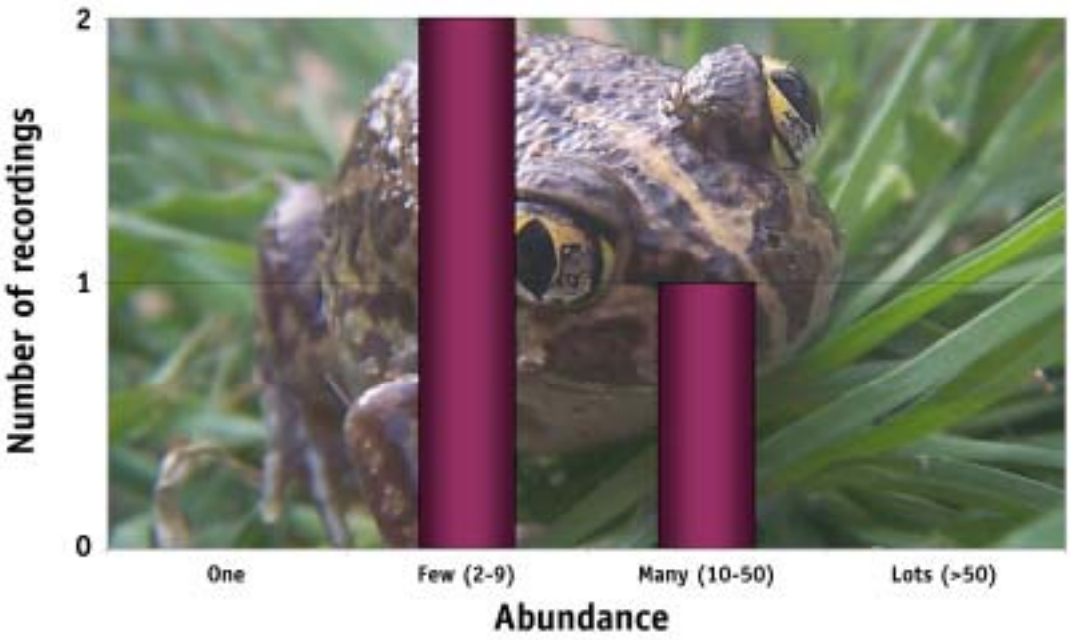


Figure 36 Painted Frog abundance categories in the 2002 FROG CENSUS

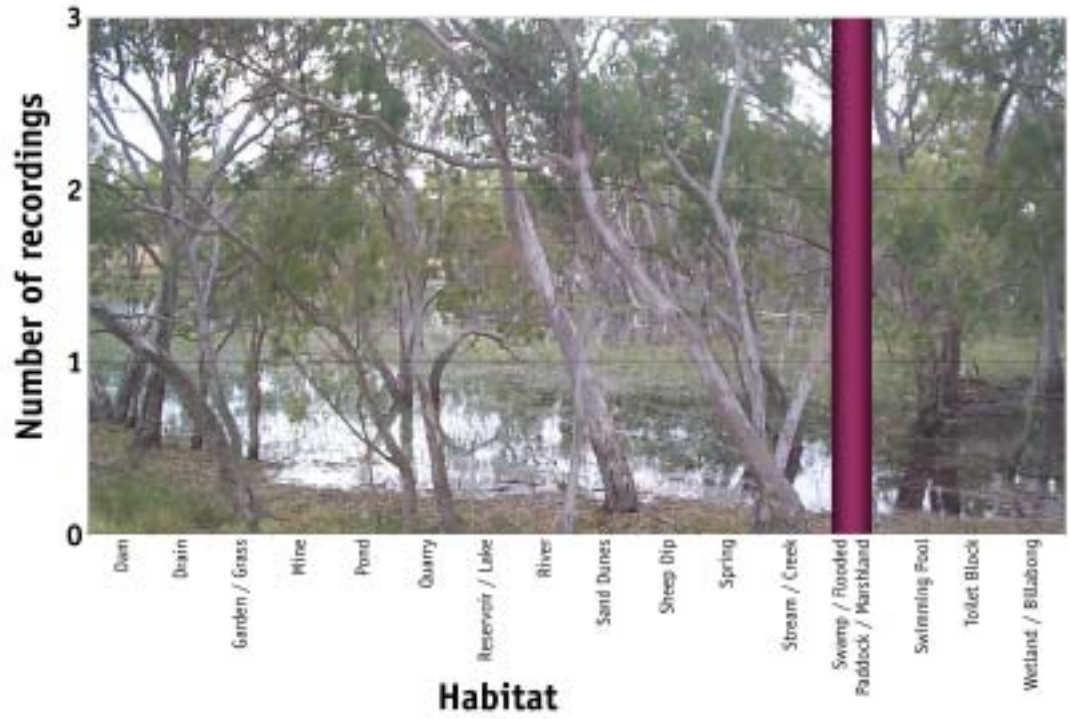


Figure 37 Painted Frog habitat use in the 2002 FROG CENSUS

3.5.15 Bibron's Toadlet (*Pseudophryne bibroni*)

Bibron's Toadlet is grey, brown or almost black with a scattering of darker flecks and reddish spots. It may have a pale vertical mark on the tip of its snout and a yellow area around the region of the 'cloaca'. The belly is marbled with black and white. They can be found singly or in low numbers under rocks, logs and leaf litter. Males generally call between February and August, and breeding occurs before major rains. Up to 200 large eggs are laid on land, in leaf-covered depressions or beneath damp debris; the tadpole undergoes advanced development inside the egg capsule, postponing hatching until rains flood the area. Complete development takes approximately six months.

The call is a short, grating, upwardly inflected 'ark' or 'squelch'.

Bibron's Toadlet was only recorded at three sites (0.3%) in 2002 (Figure 38). In most cases, only small numbers of frogs were recorded (Figure 39) and all of these sites were visited before the normal FROG CENSUS recording period in September. Many (10–50) frogs were calling in a boggy area near a stream at Rubida Grove Reserve, Aldgate in April. Few (2–9) frogs were calling in June from a stringybark forest alongside a stream in Upper Sturt and, in August, one was heard calling at a spring at Bullock Waterhole, Flinders Chase National Park on Kangaroo Island. Figure 40 shows the number of recordings that were made in each habitat type.

Figure 38 FROG CENSUS locations with Bibron's Toadlet

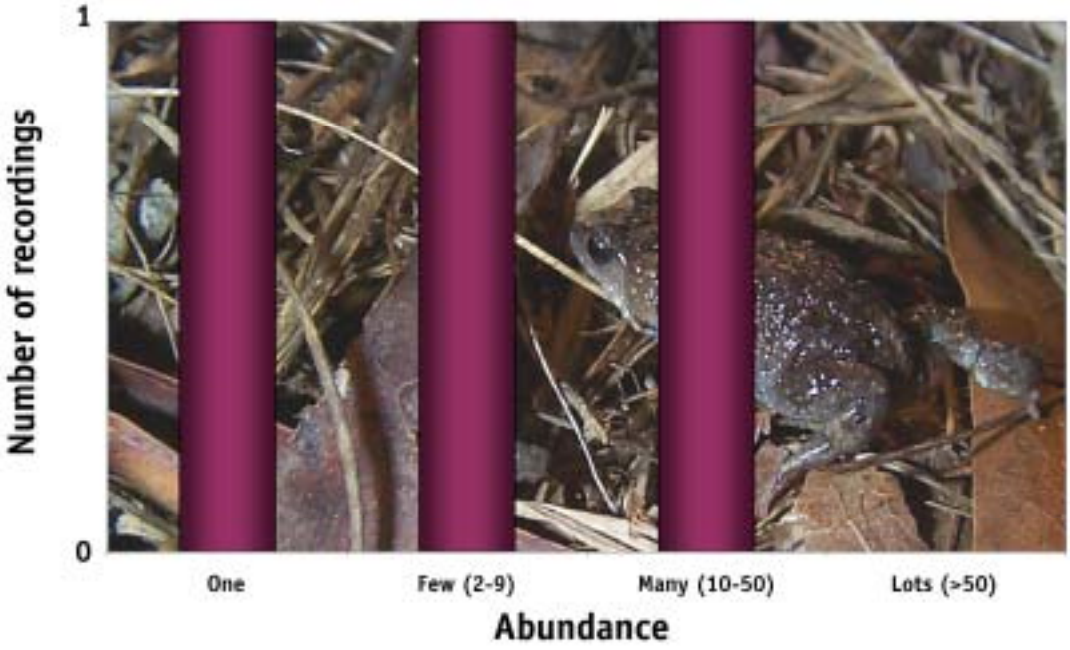


Figure 39 Bibron's Toadlet abundance categories in the 2002 FROG CENSUS

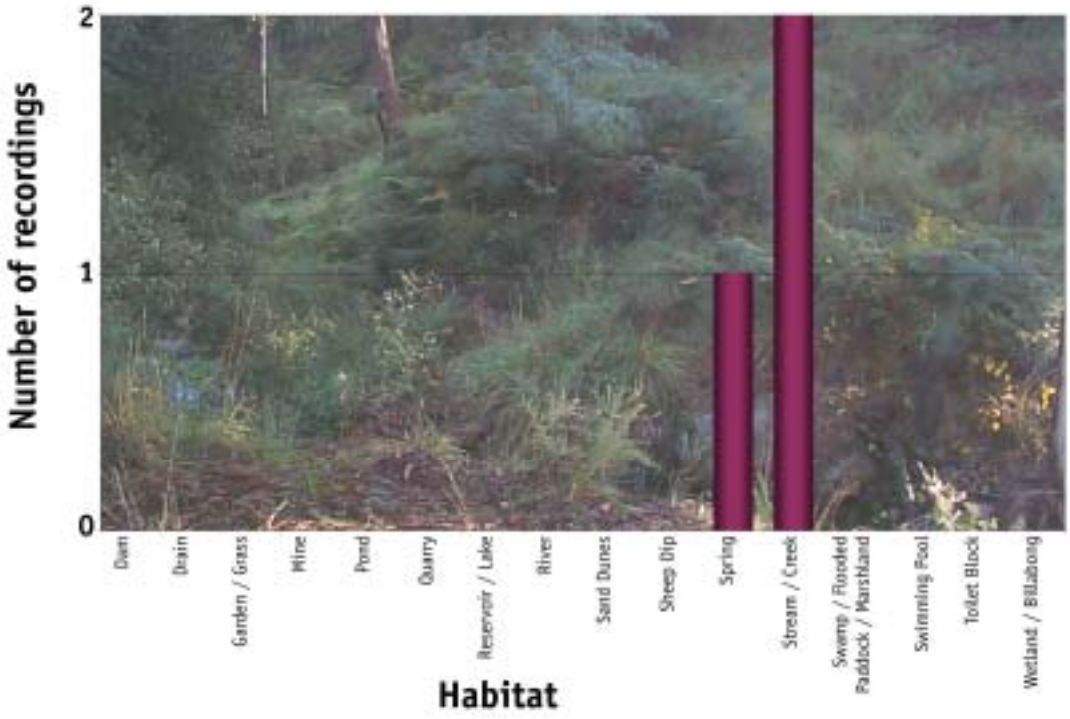


Figure 40 Bibron's Toadlet habitat use in the 2002 FROG CENSUS

3.5.16 No frogs recorded

In 2002, there were 132 recordings made that featured no frogs (12.4%). This is the highest number of recordings with no frogs present that has ever been encountered in the FROG CENSUS—the previous highest being 93 recordings (9.1%) in the 1999 FROG CENSUS. Sites with no frogs were scattered throughout the state (Figure 41) and the most obvious cause of the low number of frogs recorded in 2002 is the extended dry period. Recordings of no frogs were taken in almost all habitat types (Figure 42), but typically at streams and creeks (35.1%), ponds (20.6%) and dams (16%).

A large number of people volunteered for the 2002 Frog Census, but did not return recordings. It is speculated that many of these volunteers failed to return recordings because there were no frogs calling at the sites they visited. It is, therefore, very likely that many more sites in South Australia than have been reported here had no frogs. It is to be hoped that, in future years, more volunteers will return results even if no frogs are calling when they visit the sites.

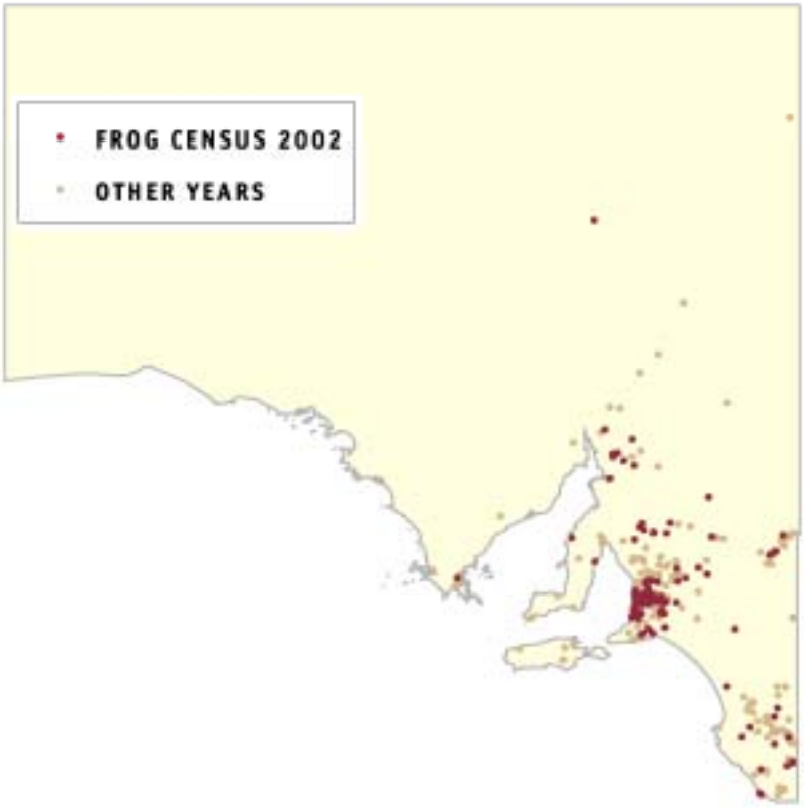


Figure 41 FROG CENSUS locations where no frogs were recorded

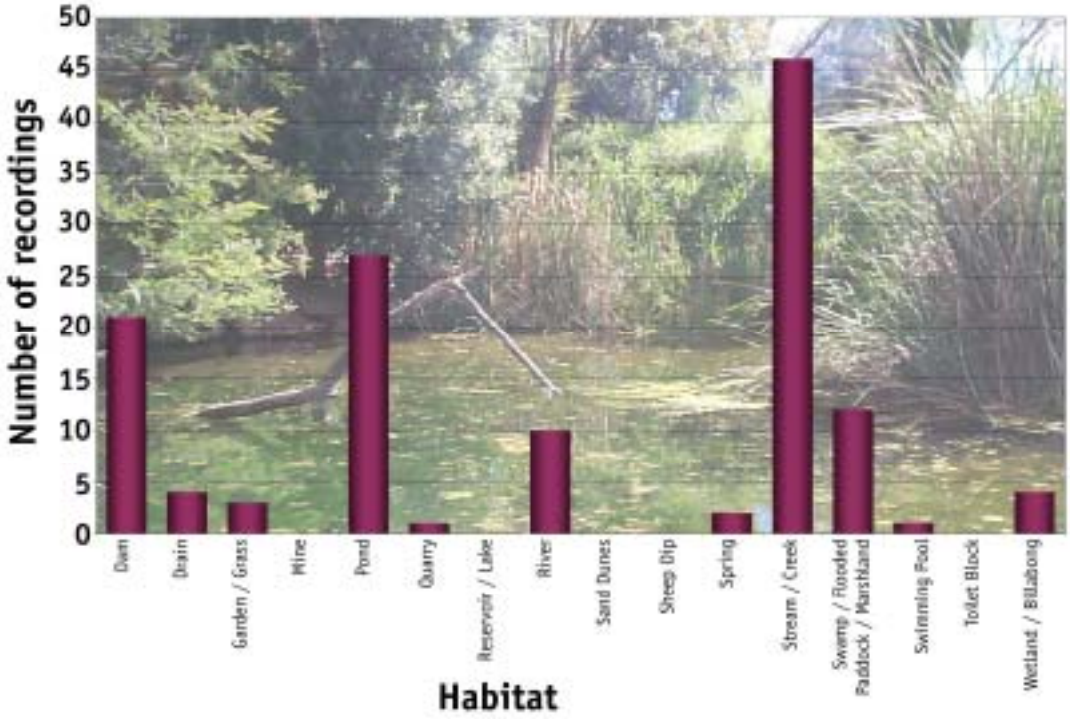


Figure 42 Habitats were no frogs were recorded in the 2002 FROG CENSUS

3.5.17 Unverified recordings

Only 11 recordings (1.0%) were of such poor quality that they did not allow an accurate estimate of frogs calling at the site (Figure 43); this represents a slight drop from the 16 poor quality recordings (1.2%) in 2001. These sites were reported by the participants to have frogs, but this could not be verified from the recordings returned. For example, three sites in the North East were subjected to strong winds that drowned out frog calls at the time of recording.

In addition, some participants (four sites, 0.4%) returned datasheets but no recording. Consequently, no frog identifications could be made.

Sites were from a variety of habitats.

Recordings could probably be improved by encouraging participants to:

- test equipment before going into the field to ensure that the recorder actually works (this includes checking batteries, tapes and microphones)
- make sure that they have good equipment and that the recording heads have been recently cleaned—dirty heads lead to dull, warped recordings
- use an external microphone, especially if squeaks and other machine noises are heard on the cassette
- avoid making a recording when there is a lot of other background noise (for example, wind and traffic)
- be still and quiet when making the recording—other noises recorded often sound much louder than the frogs, or may cause the frogs to stop calling altogether.

Figure 43 FROG CENSUS locations with unverified recordings

3.6 Talks, presentations and displays

FROG CENSUS has been promoted extensively through the media, but other successful public activities were also held in 2002. FROG CENSUS had displays at the Adelaide Zoo for National Frog Week (November 1–8), Warrawong Sanctuary (1 September), Environment Shop (6 September–25 October) and the Christian Brothers College library (11–15 November). In addition, Forestry SA produced signage for sites that they monitor for FROG CENSUS. These signs describe the program and why it is run.

Steven Walker gave many talks to school and community groups during 2002, including:

Tatachilla Lutheran School

National Waterwatch Conference (Launceston)

Monarto Zoological Park

Sheidow Park Primary School

Sturt Upper Reaches Landcare Group

St George College

Lenswood Primary School

All Saints Catholic School

Australian Plant Society (Brinkworth)

River Murray Waterwatch Steering Committee

Kangaroo Island National Parks & Wildlife Service

Townsend School

Friends of Simpson Desert

Macclesfield Bushcare

World Wide Fund for Nature Frog Conference (Adelaide)

Braeview Primary School

Friends of Scott Creek Conservation Park.

Over 1500 people not directly involved in the 2002 FROG CENSUS have been made aware of the program and environmental issues through these talks, displays and presentations. Countless more are aware because of reading or hearing about frogs and the program through media exposure.

4. DISCUSSION

The FROG CENSUS is the only large-scale program that records frogs throughout the state. It is a program that is being used to observe broad patterns and trends of species richness and, in conjunction with other EPA projects, is providing the framework to detect and monitor environmental impacts and changes over time.

The FROG CENSUS is a program in which the public of South Australia can become involved. It does not require any special knowledge or skills and enables the whole community to participate actively to enhance our knowledge of the condition of both the aquatic and terrestrial environments in South Australia. Participants in the program cover a wide range of ages and, in many cases, the FROG CENSUS has become an activity in which the whole family engages and looks forward to each year. The local knowledge of participants is a valuable resource that the EPA takes great pleasure in fostering. It is a program helping to inform the wider community about catchment conditions and general environmental issues.

4.1 Comparisons with previous years

Only twenty-nine sites have been recorded consistently during each year that the FROG CENSUS has been running (Figure 44); however, a large number of sites have been visited in many years during the census. Table 9 outlines the number of years that different groups and sites have been involved in the FROG CENSUS.

Figure 44 FROG CENSUS recording locations sampled in every census

Table 9 Number of years that different groups and sites have been involved in the FROG CENSUS

Number of years involved*	Groups	Sites
1	788	1389
2	390	623
3	258	346
4	219	248
5	118	184
6	82	102
7	61	90
8	77	78
9	38	29

*Years are not necessarily consecutive.

The number of species recorded for each of the sites visited in every FROG CENSUS is listed in Table 10.

Table 10 Number of recorded species at each site visited in every FROG CENSUS

Site	1994	1995	1996	1997	1998	1999	2000	2001	2002	*average*
Apex Wetland, Sir Donald Bradman Dr, West Beach	3	3	4	3	4	4	3	3	3	*3.3*
Arbury Park OS, Bridgewater, pond 3	2	2	3	4	3	5	3	2	2	*2.9*
Bald Hills Rd, Mt Barker, creek	1	3	3	2	1	3	3	*	1	**
Bald Hills Rd, Mt Barker, dam	2	3	2	3	2	4	4	*	3	**
Brabham Gr, Aberfoyle Park, stream	2	1	2	1	1	3	2	1	1	*1.6*
Californian Cr, Glenalta, Minno Ck	1	2	1	2	1	2	2	1	1	*1.4*
Carisbrooke Res/Boundary Park, Salisbury	3	4	3	2	4	2	3	3	2	*2.9*
CC Hood Park, Panorama	2	2	2	2	1	2	2	1	1	*1.7*
Cormorant Dr, Hallet Cove	0	1	1	1	1	1	1	1	1	*0.9*
Ferry crossing, Wellington	3	3	2	3	1	2	3	3	2	*2.4*
First Ck, Hazelwood Park	1	2	1	1	1	3	2	2	1	*1.6*
Gare's Swamp, Naracoorte	3	4	3	4	4	2	3	4	4	*3.4*
Hamilton Park, Fife St, Vale Park	1	1	1	3	1	2	3	2	1	*1.7*
Hampstead Hill Rd, Aldgate, dam	2	3	2	3	3	4	3	3	2	*2.8*
Highland Valley, Mt Barker, shearing shed pond	2	2	2	2	2	2	1	3	1	*1.9*
Kingfisher Dr, Modbury Heights	1	1	1	1	1	1	1	1	1	*1.00*
Knotts Hill Rd, Ashton, stream	1	1	1	1	1	2	1	1	1	*1.1*
Leabrook Dr & Porter Tce, Rostrevor	1	2	1	1	1	2	2	1	2	*1.4*
Leslie Ck, Mylor, dam	1	3	2	2	3	2	2	2	2	*2.1*
McIntyres Quarry Wetland, Millicent	1	4	4	2	4	3	4	3	4	*3.2*
Minno Ck, Hawthorndene Oval	1	2	2	1	1	1	2	2	1	*1.4*
Murray Bridge City Council Wetland Res	3	4	4	3	4	3	3	3	3	*3.3*
Paech Rd, Wistow	1	2	3	2	2	3	2	1	1	*1.9*
Pfeiffer Rd, Woodside, stream	3	2	2	2	2	1	2	2	2	*2.00*
Renown Ave, Crafers	1	1	2	3	2	2	2	2	1	*1.8*
Roper Rd, Willyaroo, Angas R	1	2	3	1	2	1	2	2	1	*1.7*
Swamp Rd, Lenswood, creek	1	3	2	1	2	2	3	2	2	*2.0*
Sydney Rd, Nairne	1	2	0	1	0	0	1	2	1	*0.9*
Winkler Park, Saddleworth	1	2	2	2	2	2	2	2	2	*1.9*

The count is the total number of different species recorded in that year, regardless of which group made the recording.
*Indicates that the recording was of poor quality and no species could be identified.
**Species averages are only listed for sites where species could be identified every year.

Frog mating activity and the success of breeding can change markedly with even slight variations in temperature and rainfall. For example, in wet years there may be more frogs breeding and a greater chance of offspring surviving to adulthood than in a dry year. It is, therefore, very important that sites continue to be monitored to provide ongoing information about the frog fauna in South Australia. With more information collected over a number of years, in different weather conditions, we are better able to understand the status of frogs in the state.

Figure 45 shows the species diversity at sites sampled in every census[5] as a proportion of the average number of species sampled at each site. These values are determined by calculating the average number of species for each individual site over all years (the sum of species numbers at the site in each year divided by the number of years). For example, for the site *Apex Wetland, Sir Donald Bradman Dr, West Beach,* the sum of species diversity for 1994–2002 was 30. Therefore, the average number of species at that site over nine years is 3.3 (30 divided by nine, see Table 10). Species diversity at every site in each year is then expressed as a percentage of the average (the actual number of species recorded in that year divided by the average number of species). For example, for the site *Apex Wetland, Sir Donald Bradman Dr, West Beach* the species diversity in 1996 was 120% (four species were recorded, divided by the average of 3.3 and multiplied by 100). In addition, the average species diversity for all of the sites (the average number of species at each site totalled for that year, divided by the number of sites and expressed as a percentage) is shown.

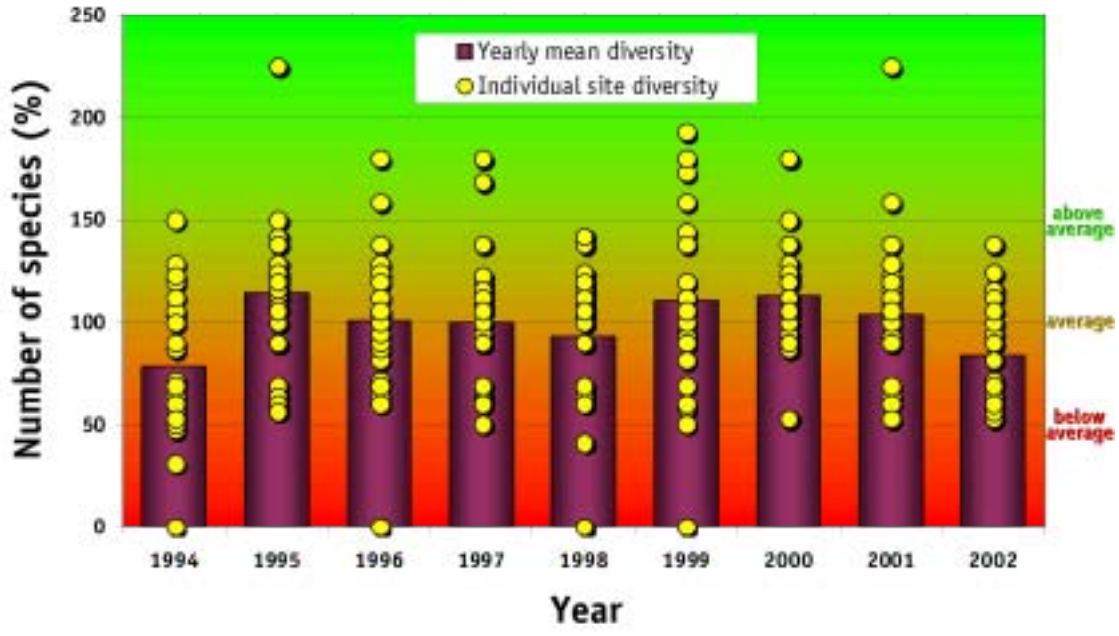


Figure 45 Species diversity at sites sampled in every census, as a proportion of the average number of species sampled at each site

5 The two sites at Bald Hills Rd, Mt Barker have been excluded from the comparison, due to the poor quality of recordings in 2001.

Therefore, the years 1994, 1998 and 2002 had below average number of species. The years 1995, 1999 and 2000 were above average and 2001 was slightly above average. This demonstrates that frogs are able to build up in numbers relatively quickly following suitable conditions. If 2003 has improved levels of rainfall, frog numbers should return to average or above average levels.

Figure 46 shows the proportion of sites that have average, below average and above average numbers of species at each of the sites recorded in all censuses. Every site's species diversity for each year is categorised based upon the average (<100% = below average; 100% = average; >100% = above average). For example, if the average number of species at a site is 4.5 and three species were recorded in 1994, then 1994 was a year with below average species at that site (66.67%). The number of sites in each category is totalled for each year and shown as a percentage. This enables us to determine which years had good species diversity (average or above average) and which years had poor species diversity (below average). If more than 50% of sites had below average species diversity, then the whole year is considered below average.

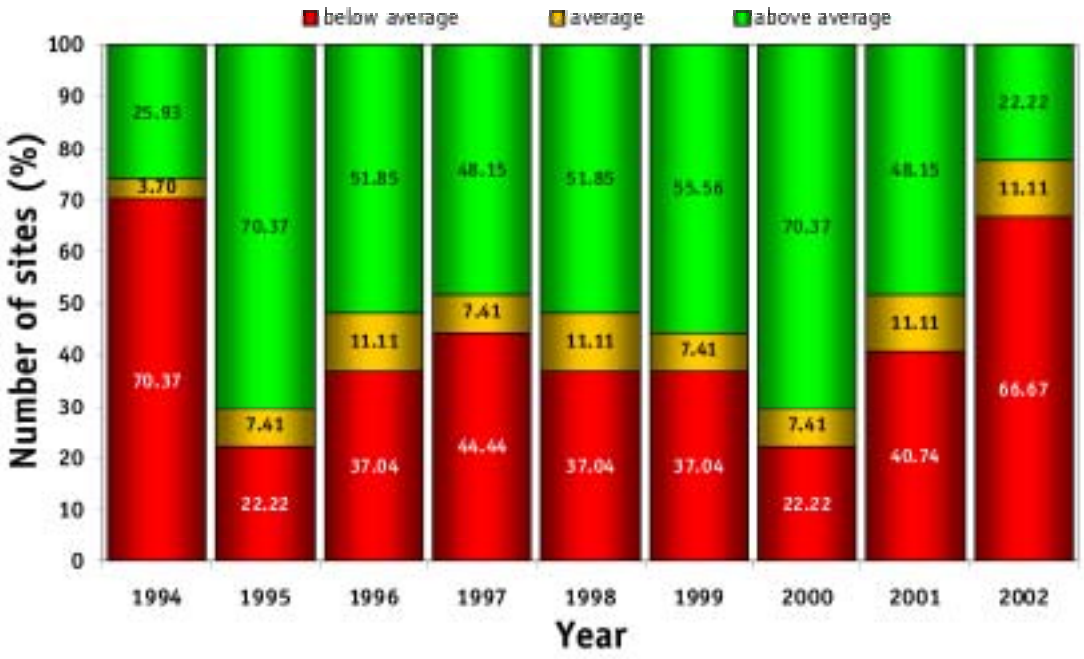


Figure 46 Proportion of sites recorded in all censuses that have average, below average and above average numbers of species

Again, after the poor year in 1994, 1995 was a very good year. Species diversity continued to be satisfactory until 2001, showing that a single poor year is not a cause of concern. If 2003 has improved levels of rainfall, frog numbers should return to average or above average levels.

4.2 Unusual recordings

Two species were recorded calling in regions where they are not known to occur in the wild. The Green Tree Frog, a species only known in the north of the state, was collected at a pond within the Bicentennial Conservatory at the Adelaide Botanic Gardens and Peron's Tree Frog was found at Kapunda.

Again, it is strongly recommended that eggs, tadpoles or frogs not be moved more than 50 km from the place where they were originally spawned. If you do not know where they came from, do not release them. Similarly, if a pet shop cannot tell you where its frogs came from, do not buy them for release into the wild (this also applies to release in a garden pond).

APPENDIX 1

FROG CENSUS 2002 DATASHEET
9–15 September

Hints and Instructions

- **Please use a separate datasheet for every recording** (a neat hand-written one is fine). Sites less than 100m apart will be classed as one site, unless they are obviously separate waterbodies. For your own safety, please make sure that you have permission to enter private property.
- **You don't need to record every night on the week, just one recording is all we need.** The best time to make recordings is about 1–3 hours after dusk. Take a torch so that you can see where you are going and be careful. Turn the torch off when you are settled at the site (the frogs will probably go quiet when the light is on and you are moving around). If you make noise, the frogs will probably stop calling. So it is best if you sit or stand still and don't talk or whisper during the recording.
- At the start of the recording, state the date, start time and location. Record any frogs calling for at least 3 minutes, but no longer than 5 minutes.
  It is very important to tell us if you didn't hear frogs calling (If you are not sure, please make a recording).
- Please check your recording to be sure that the frogs you heard calling at the site can be heard on tape. If you have any problems, such as the tape not working, please contact us for assistance, ph 8204 2099. Please rewind the tape after the recording.
- Please fill in **all** sections of the datasheet, **except** the end section **(office use only).**

Observer/Group Name:	How many people in the group/family are involved in the FROG CENSUS this year?
Postal Address:	
Postcode:	
Daytime Telephone Number:	
Do you want to be involved next year?	☐ Yes ☐ No

Date of Recording *(eg 14/09/2001)*	Starting Time *(eg 21:30)*

OLD SITE
Please write the location name we used when we posted last year's results – Not just 'as last year' or 'recorded on tape'. If you are involved in Waterwatch, please put your Sitecode in addition to the FROG CENSUS location name.

Site name:

NEW SITE
This section is only needed for a new site. If you are involved in Waterwatch, please put the Sitecode as well.

Site Name:			
Street Directory Reference Edition (eg UBD):	Year:	Page Number:	Reference:
Or *Map / GPS Reference* Northing (7 digits) or Latitude		Easting (6 digits) or Longitude:	
Map Zone (52,53 or 54):			
We do not have every street directory and they change each year, so please give us lots of information to help us find it on a map (eg nearby street names, suburbs/towns, parks/reserves etc).			

HABITAT *Please select one habitat type that best reflects the major habitat at the site.*

☐ Dam	☐ Pond	☐ Spring	☐ Swamp or Flooded Paddock or Marshland
☐ Drain	☐ River	☐ Sheep Dip	☐ Garden (eg Fernery / Grassy Area)
☐ Toilet Block	☐ Reservoir or Lake	☐ Stream	☐ Wetland or Billabong
			☐ Other_____

WATER QUALITY

If you can see the water, please indicate the condition of the site. Please select all categories that apply.

Water Appearance: ☐ Clear ☐ Polluted ☐ Foamy ☐ Oily ☐ Muddy

Site Comments or Observations: *(eg land use, unusual vegetation etc)*

FROGS HEARD CALLING

How many types of frog did you hear calling?

What was the total number of frogs you heard calling?

COMMENTS or OBSERVATIONS

Please tell us about any interesting things that happened during the census, or general comments and suggestions.

Now we need you to return your datasheet and tape (please rewind the tape first) in the POSTpak (postage has been pre-paid) to:

FROG CENSUS
Environment Protection Authority
REPLY PAID 2607
ADELAIDE SA 5001

Please send the tape back straight away or we may not be able to include it in this year's census. We need tapes returned by the beginning of December. Please let us know if you cannot make this time.

Thank you for being involved; we hope you had fun. We will identify your frog calls and let you know the results of your recordings towards the end of February.

Office use only: Please don't fill in below here

Species Name	Species 1	Species 2	Species 3	Species 4	Species 5	Species 6	Species 7
One							
Few (2–9)							
Many (10–50)							
Lots (>50)							

ENVIRONMENT PROTECTION AUTHORITY

www.epa.sa.gov.au/frogcensus/

APPENDIX 2

FROG CENSUS News 2002

Dry times

Well, hasn't it been dry this year? At the time of writing, we had the lowest number of sites and recordings since 1999 with only 1051 recordings at 983 sites.

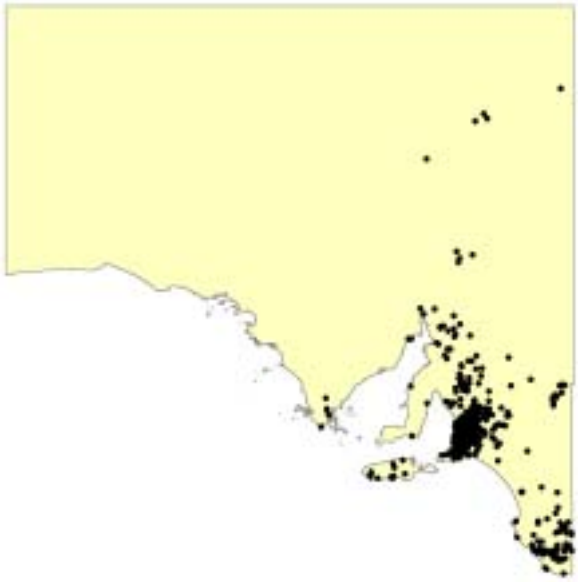
The drought conditions experienced by much of the state have resulted in a very low diversity of frogs in the recordings for the 2002 FROG CENSUS. The vast majority of sites only had one (367 sites) or two (322) species. Only 162 sites had three or more species. However, the diversity at some sites in the South East was quite high – one site had six species and there were seven sites with five species calling!

We only managed to record thirteen species of frog, compared to sixteen species in 2001. Of these 13 species, seven species were recorded at three sites or less! Once again, the four most common species were the Common Froglet *(813 recordings–roughly 77% of recordings)*, Brown Tree Frog *(357 recordings–34%)*, Spotted Grass Frog *(251 recordings–24%; for the first time since the census started, it was not the second most commonly recorded species.)* and Eastern Banjo Frog *(151 recordings–14%)*.

Brown Striped Marsh Frog

The next most commonly recorded species was the Brown Striped Marsh Frog, from the South East of South Australia, but it was only recorded 38 times *(just under 4% of recordings)*. The other species recorded were the Eastern Sign Bearing Froglet *(11 recordings)*, Peron's Tree Frog *(3 recordings)*, Bibron's Toadlet *(3 recordings)*, Green Tree Frog *(2 recordings)*, Southern Bell Frog *(2 recordings)*, Streambank Froglet *(2 recordings)*, Trilling Frog *(2 recordings)* and Long Thumbed Frog *(1 recording)*.

There were 131 sites (132 *recordings–just over 12% of recordings*) with no frogs calling (many of these sites had no water) and only 11 recordings that did not permit identification of frogs - mainly due to excessive background noise.



Probably because of the dry conditions, there was a drop in level of participation. Only 602 groups made recordings - that's at least 1314 people, but the lowest number of groups since 1996.

Recording sites were found throughout South Australia from Ewen's Ponds near Port MacDonnell in the south to Innamincka Station in the far north. The western-most site was at Fishery Bay at the bottom of Eyre Peninsula. The eastern-most site was at Topperwein Native Forest Reserve over near the SA-VIC border in the South East.

Frogs in unusual places

What is it with Peron's Tree Frog? In 2000, it was newly reported in the South East; in 2001, it was recorded at Mount Barker; this census, it was found at a pond in Kapunda - well outside its normal range in the Murray Valley! I should remind you again, there are no laws to stop you collecting and relocating frogs in South Australia. *(There are two exceptions: 1.collecting from National Parks and reserves (and private land without permission). 2.collection and release of the two protected species – Smooth Frog and Southern Bell Frog)* However, we strongly recommend that you do not move eggs, tadpoles or frogs more than 50km from the place where they were originally spawned (including new generations that you may have raised). If you don't know where they came from, don't let them go – if a pet shop can't tell you where they came from, don't buy them for release into the wild (this also applies to release in a garden pond)!

I was delighted to get a recording of Southern Bell Frogs calling at Drain M, Beachport in November. The EPA undertook a survey for this frog in 2000 and 2001, but did not find any on the western coast in the South East region. It is good to know that this rare species can still be found in the area.

Can you tell me?

If you make recordings of unusual frogs or frogs in unusual places (*any time of the year, especially burrowing frogs in the north or the small toadlets in the south*), I would really like to hear them and add the details to our database. We now have over 16,000 records in our database—but we have very little information about some of the frogs that call outside the spring months.

Your questions answered!

I have received many questions through the comment sections on the datasheet. Following are some answers to the more common questions.

Q. What do we feed tadpoles and frogs?

A. Tadpoles are usually vegetarians. In the wild, they eat an assortment of aquatic plants. In captivity (or if you need to supplement their food in a pond), you can give them some softly boiled lettuce leaves (or spinach, but not cabbage) that have been allowed to cool or a few shakes of fish flakes.

Frogs are carnivores and only eat live, moving prey. A wide assortment of insects can be fed to frogs, the more varied the better. Don't give them too many mealworms (these are very high in fat) and try avoid strange moths (*e.g.* moths with orange and black bodies) – some of these brightly coloured insects may be poisonous!

Q. Why is the Frog Census run in September (not when the frogs are calling in our area)?

A. September was chosen as the time for the census because that is when most of the frogs in South Australia (at least in the southern parts of the state) are likely to be calling. There is always variation from place to place, so some frogs start (and end) before the census and some afterwards – September is the best compromise. If you would like to record frogs at a slightly different time, I am happy to get the recordings. However, they need to be sent to me before the beginning of December, if you want the information included in that year's report. I will make exceptions, where possible, for the frogs recorded in the Arid Zone and other out of the way places.

Q. Can Brown Tree Frogs be green?

A. Yes. Just to confuse you, in the South East of the state Brown Tree Frogs have varying amounts of green on their bodies – they may even be completely green, with no trace of brown. Its just one of those things, they are still called Brown Tree Frogs, just green ones! I have heard reports of a green tree frog in the Adelaide Hills region, but have never personally seen a green one there and no-one has ever been able to provide me with a photo or specimen. I have also been informed that some pet shops have been selling green forms of the Brown Tree Frog, but these should not be released in the area if, as mentioned previously, they were not originally found there.

Q. I found a toad in my garden. Is it a Cane Toad, should I kill it?

A. Most of the frogs that people find in their gardens, and which look something like Cane Toads, are Eastern Banjo Frogs (or occasionally Painted Frogs). These native species should be made welcome in people's gardens (although some people are put off by the loud, 'bonk' mating call of Eastern Banjo Frogs). Under no circumstances should you kill an uninjured frog that you find. If you don't know what it is, please contact me (Ph 8204 2099), National Parks & Wildlife or the SA Museum for identification. *Keep the frog in an ice-cream container with a little bit of water or moist vegetation*. There is very little chance that the frog you find is a Cane Toad (they are not known in South Australia, yet!), but if you are concerned about poisoning, wear gloves and wash your hands well after picking it up. Things to look out for on Eastern Banjo Frogs are the large glands on the back legs and a golden gland on the edge of the mouth. Eastern Banjo Frogs usually have slightly moist skin. Cane Toads have very dry, warty skin and large glands on the sides of the head, just behind the prominent eardrums.

Eastern Banjo Frog

Cane Toad

Q.How do I get a copy of the FROG CENSUS report?

A. We have recently published the report for the 2001 FROG CENSUS and you can get a free copy by contacting the EPA—8204 2004, but be quick as there are limited numbers available. We will shortly put a digital copy on our web site so that you can access it on-line to download and print. Have a look at **www.epa.sa.gov.au/frogcensus/** and select *FROG CENSUS Report* from the main menu. Each year, the report is also sent to most community and school libraries around the South Australia.

Q. How can I get to sleep when the frogs are making such a racket?

A. One technique that has been suggested is to use 'white noise'. Turn a radio off the channel so a hissing sound is created. This sound blocks out all other sounds so you can get to sleep more easily.

Tiddalik

How do frogs
appear so quickly
after rain?

Biologists say
"Frogs breed
opportunistically
in ephemeral waters"

Old Timers say
"They're carried
across the country
and fall from storm clouds"

The tribal elders say
"That giant Tiddalik,
he brings the floods
that bring the frogs"

But the children know
to quickly
collect the jelly
from the reeds
at the crossing

Watch impatiently
as eggs
turn to tadpoles
turn to froglets

When the tail
has gone
slip them carefully
into the dam
whispering
"Watch out for the blue heron"

Freddo

After the rain
frogs appear
as if conjured.

In the evening
hunting crickets
under the eaves

Crowded
along a beam
under the light
waiting for moths

In the heat
tucked neatly
into the flutes
of the galvanised iron

Creamy, pale ivory
faintly tinged olive
not rich chocolate brown
but the right size
for a Freddo

Desiccated

There's a mummy frog
in the bath tub
Don't ask how
it got there

Are there any babies?

It's not a mother frog
it's a mummy

Dried out
stiff
pallid
and crisp
as parchment

Legs elongated
stretched
in rigor mortis
Looking like R2D2
on stilts

Special thanks to Patricia Luscombe for the poems and Lyn Bartlett for the illustration.

Frog Census

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LEGISLATION

National Parks and Wildlife Act 1972—Schedule 8, Vulnerable Species.