FROG CENSUS 2000

South Australia

environment and heritage

Government of South Australia

FROG CENSUS

2000

A report on community monitoring of water quality and habitat condition in South Australia using frogs as indicators

by

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FROG CENSUS 2000

Cover photographs:

Top: Knife Footed Frog *(Cyclorana cultripes)*
Photograph from FrogWatch Resource Materials

Middle: Southern Bell Frog *(Litoria raniformis)*
Photograph by Steven Walker

Bottom: Brown Tree Frog *(Litoria ewingi)*
Photograph by Steven Walker

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CONTENTS

LIST OF TABLES

LIST OF FIGURES

SUMMARY

The FROG CENSUS is a long-term community survey of frogs throughout South Australia, initiated and coordinated by the Environment Protection Agency (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 streams and rivers, particularly the River Torrens, Sturt River and River Murray
- encourage public involvement in monitoring the water quality of our rivers, streams and wetlands
- assess the current and long-term health of the State's rivers, streams and wetlands
- assess the impact of EPA policies on water quality in this State.

This program is now starting to build a good picture of the distribution and abundance of each of the frog species in the State. It is anticipated that future directions will include overlaying other data collected regarding river and catchment condition to help identify problem areas in the State.

Frogs recorded

The distribution of recordings in 2000 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 as far north as Pandie Pandie Station in the North East, south to Germein Reserve at Port MacDonnell, east to Chowilla, and west as far as Lock on the Eyre Peninsula.

The 2000 FROG CENSUS recorded 16 of the 28 frog species found in South Australia. The highest number of species recorded at a single location was six, from two sites on the River Murray—Martin's Bend and Little Duck Lagoon, both at Berri.

The Common Froglet (*Crinia signifera*) was the most commonly recorded species, representing 37.4% of the total number of frogs recorded. The next most common species were the Spotted Grass Frog (*Limnodynastes tasmaniensis*) with 18.6% of the total, Eastern Banjo Frog (*Limnodynastes dumerili*) with 17.5%, and Brown Tree Frog (*Litoria ewingi*) with 13%. These proportions are similar to previous years.

Species which were recorded at low frequencies included: Knife Footed Frog (*Cyclorana cultripes*), Peron's Tree Frog (*Litoria peroni*), Southern Bell Frog (*Litoria raniformis*), Roth's Tree Frog (*Litoria rothi*), Desert Froglet (*Crinia deserticola*), Eastern Sign Bearing Froglet (*Crinia parinsignifera*), Smooth Frog (*Geocrinia laevis*), Long Thumbed Frog (*Limnodynastes fletcheri*), Brown Striped Marsh Frog (*Limnodynastes peroni*), Painted Frog (*Neobatrachus pictus*), Sudell's Frog (*Neobatrachus sudelli*) and Bibron's Toadlet (*Pseudophryne bibroni*).

One species was recorded for the first time in the FROG CENSUS—the Knife Footed Frog in the North East.

The Brown Tree Frog and the Eastern Banjo Frog were both recorded at Port Lincoln on the Eyre Peninsula. These records are significant because the species have not been previously known to occur in this region.

Peron's Tree Frog was recorded calling at two locations in the South East. This recording is also significant because in South Australia the species was previously known only in the Murray Valley.

Roth's Tree Frog is an introduced species, which is naturally restricted to northern Australia. It was recorded calling near Captain Sturt's cottage at Grange.

Eighty-two sites were visited that had no frogs calling, a total which represents 3.8% of all recordings. These sites were concentrated around the Mount Lofty Ranges, Mid North, and the

South East. This result represents a slight drop in sites with no frogs calling from the 1999 FROG CENSUS.

Forty-three sites have been visited in all censuses. There have been slight fluctuations in the number of species recorded at these sites between years but, overall, frog species and numbers appear to be relatively stable.

Observer participation

The FROG CENSUS has grown considerably since its inception in 1994, with a total of 694 participants taking part in 2000. They made 1052 recordings of frogs from 980 different locations.

Each participant in the 2000 FROG CENSUS was sent personalised results of their recordings. These included:

- a summary of each site visited by the participant and the species recorded, as well as a brief description of each species
- a table listing the sites visited and species recorded by the participant during each census that they have contributed recordings
- an information sheet summarising all data collected in the 2000 census.

The 1999 FROG CENSUS report was published and posted to all schools involved in the census and to 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 has information, calls, and keys to identifying the frogs present in South Australia.

www.epa.sa.gov.au/frogcensus

ACKNOWLEDGMENTS

We would like to thank all participants, both old and new, for their enthusiasm and eagerness to get out, regardless of the weather conditions, and record the frogs calling from their waterways. Clearly, without them there would be no FROG CENSUS. We thank them for helping to make 2000 a successful year.

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

Thanks also to those people who kindly gave us permission to use their photographs on the web page and in the discussion section of this document.

Thanks to KESAB, Waterwatch and the Watercare Hotline for forwarding inquiries about the FROG CENSUS to us.

Once again, the Adelaide Zoo Education Department was very supportive of the FROG CENSUS and promoted it as part of their education program.

Special thanks to Brydie Hill, who has been involved as one of the FROG CENSUS coordinators for the past four years. She has listened to recordings and assisted with data entry, the mail-out of results and the preparation of reports. She has now left to concentrate on her university studies, and we wish her the best for the future.

This program is fully funded by the Environment Protection Agency.

1. INTRODUCTION

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

The EPA FROG CENSUS aims are as follows:

- increase public awareness of the health of South Australian streams and rivers, particularly the River Torrens, Sturt River and River Murray
- encourage public involvement in monitoring the water quality of our rivers, streams and wetlands
- assess the current and long-term health of the State's rivers, streams and wetlands
- assess the impact of EPA policies on water quality in this State.

Frogs are the highest form of life to lay a naked egg in water (Tyler 1994). This characteristic makes them sensitive biological indicators because any aquatic pollutant that comes in contact with the egg 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 environmental pollutants, and 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 by 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 in terms of both diversity and abundance. In this way, the ecological health of waterways can be inferred.

Every species of frog has a distinctive mating call, which allows frogs vocalising at a location to be accurately identified, and which makes frogs a useful biological monitor (see www.epa.sa.gov.au/frogcensus). This distinctiveness is particularly useful in a community-based program that embraces the valuable resource of public involvement, whereby participants do not require 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 a total of more than 210 described species have been recorded in this State (Johnston 1990). The Streambank Froglet (*Crinia riparia*) from the Flinders Ranges is the only endemic species (Tyler 1994). This low diversity means that there are generally few species that occur together at each site, which reduces the possibility of misidentifying calls. Of the frogs found in South Australia, all can be distinguished despite the similarity of calls in some genera (e.g. *Pseudophryne* and *Neobatrachus*) by subtle differences in their calls and reference to the location where they were recorded. Of those species recorded in South Australia, 15 are likely to be found in the southern part of the State where most people live and where most FROG CENSUS recordings are likely to be taken.

In South Australia, many of our rivers, creeks and wetlands have been degraded by different sorts of human impacts. These impacts include the excessive clearance of vegetation, flood mitigation activities (including draining swamps and re-channeling urban streams), stormwater and drainage disposal schemes, poor riparian management activities (e.g. spraying and removal of aquatic plants, excessive grazing), invasion by exotic species, and inappropriate flood plain and catchment development. These impacts have reduced the habitat available for aquatic and riparian fauna and flora, and have increased erosion and nutrient and salt inputs into waterbodies. Government agencies, catchment management authorities, 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 et al. 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 at a small cost to agencies. This sampling can lead to the discovery of new species (Gynther 1995) and range extensions; as was the case for Sudell's Frog, which was recorded outside its known range in the 1998 FROG CENSUS (Walker et al. 1999).

This report provides details of the FROG CENSUS carried out in 2000 and includes comparisons with previous years to show any trends that are beginning to show as more detailed datasets are compiled through this program.

Due to recent concerns about the possible decline of the Southern Bell Frog *(Litoria raniformis*) in the eastern states and the South East of this State, a separate survey of this species, funded by the Wildlife Conservation Fund, was undertaken to record its current distribution and status. The survey had not been completed at the time of writing, but initial results have been included.

2. METHODS

Participants in the FROG CENSUS were recruited by a number of methods:

- many participants were registered from previous years
- a media release by the Department for Environment and Heritage invited members of the public to register their interest at the EPA
- letters were sent to all schools in the arid zone inviting their participation.

All registered participants were sent a FROG CENSUS kit. The kit contained a blank audio cassette (30–90 minutes in length), a return-addressed and postage-paid post-pak and a data sheet (see appendix 1). The data sheet described the methods to be used to record frog calls on the audio cassette. Participants were to provide their own recording equipment.

Participants were requested to make a recording of 3–5 min in the evening at sites of interest to them. Most recordings were made during 'Frog Week' (11-17 September), predominantly between dusk and midnight. The recordings were analysed by EPA staff, who identified the frogs calling and assigned abundance categories for each species detected at each site.

All location, observer 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 participant information retrieval. All maps were produced using Mapinfo.

The distribution of each species recorded during FROG CENSUS was compared with the records published by Barker et al. (1995), Tyler (1977; 1978) and Brooks (1984). All scientific names follow those used by Tyler (1997).

Participants were sent the results of their recording(s), with specific information on the life history of each frog calling at the site where they recorded and a general information sheet (see appendix 2) with overall results from the 2000 FROG CENSUS. Some additional recordings were received after the initial mail-out; numbers relating to participation and species abundance on the information sheet have therefore been revised. 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

FROG CENSUS 2000 involved 694 participants recording frogs from 980 sites throughout South Australia (1052 separate recordings were made). A total of 2156 records was obtained for frog abundance and distribution throughout the State. This total is the largest number of records for the FROG CENSUS thus far. The poor quality of a small number (17) of these recordings did not permit identification of frogs.

Table 1 details public participation in the FROG CENSUS for the past seven years. This year, the number of participants decreased slightly. Although more sites were recorded this year, the geographic range of recordings throughout the State was similar to 1999 (Walker et al. 2000). There were, however, regional increases in the number of recordings from the Eyre Peninsula, Murray Valley and South East. There were recordings from all regions except the Nullarbor Plain.

Table 1. Number of observers involved and individual sites visited in the FROG CENSUS.

	2000	1999	1998	1997	1996	1995	1994	Total*
Observers	694	772	673	653	591	610	285	1701
Locations	980	916	792	810	786	787	456	2439

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

Figure 1 shows the distribution of all FROG CENSUS sites from 2000. The most northerly recording was taken at Pandie Pandie Station in the North East. The most southerly recording was from Germein Reserve at Port MacDonnell in the South East. The easternmost recording was from Chowilla in the Murray Valley, and the westernmost recording was at Lock on the Eyre Peninsula.

Many recordings were again made in the Mount Lofty Ranges and on Fleurieu Peninsula. The number of recordings from Yorke Peninsula decreased from the number taken in 1999. The River Murray recordings were taken along most of its length in South Australia. Kangaroo Island had a similar number of recordings to 1999 (Walker et al. 2000).

Forty-three sites have been recorded during each year that the FROG CENSUS has been running (figure 2). The number of species recorded for each of these sites during the FROG CENSUS is listed in table 2. There have been fluctuations in the number of species recorded at each site between years but, overall, there appears to be little change in the frog abundance at these sites. Statistical analysis shows that the only exception was in 1994, when there were generally fewer species recorded than in 1995, 1999 and 2000.

Seven years is a relatively short time for a monitoring program to show consistent patterns, so it is important that these sites continue to be visited in future years to provide information on the health of the frog fauna of South Australia over time.

3.2 Frog species abundance and distribution

A total of 16 species of frog was recorded in 2000 (table 3). The most commonly recorded species were the Common Froglet (*Crinia signifera*), Spotted Grass Frog (*Limnodynastes tasmaniensis*), Eastern Banjo Frog (*Limnodynastes dumerili*) and the Brown Tree Frog (*Litoria ewingi*). One previously unrecorded species was included in 2000, the Knife Footed Frog (*Cyclorana cultripes*). Species recorded at a small number of sites included: Peron's Tree Frog (*Litoria peroni*), Southern Bell Frog (*Litoria raniformis*), Roth's Tree Frog (*Litoria rothi*), Desert Froglet (*Crinia deserticola*), Eastern Sign Bearing Froglet (*Crinia parinsignifera*), Smooth Frog (*Geocrinia laevis*), Long Thumbed Frog (*Limnodynastes fletcheri*), Brown Striped Marsh Frog (*Limnodynastes peroni*), Painted Frog (*Neobatrachus pictus*), Sudell's Frog (*Neobatrachus sudelli*) and Bibron's Toadlet (*Pseudophryne bibroni*). Once again, no recordings of the Southern Toadlet (*Pseudophryne semimarmorata*) were taken from the South East.

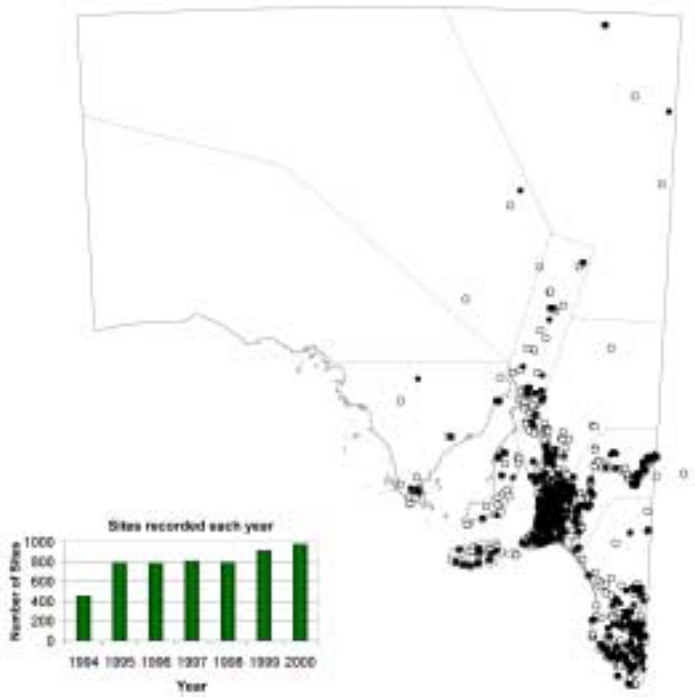


Figure 1. Geographic range of recording sites for the 2000 FROG CENSUS (• recorded in 2000, **o** recorded in previous years, region boundaries follow Tyler (1977))

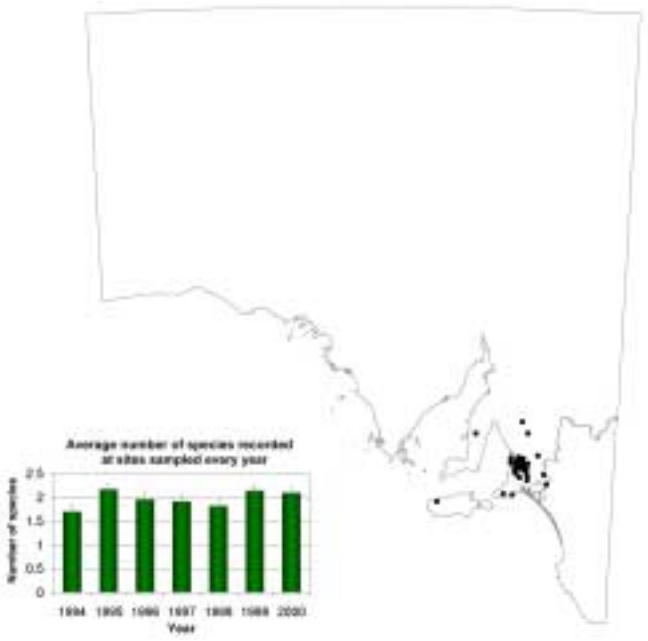


Figure 2. FROG CENSUS recording locations sampled in all years

Table 2. Species counts for the sites recorded in every FROG CENSUS

Site	1994	1995	1996	1997	1998	1999	2000
Allan St, Vista	4	2	1	1	1	1	1
Angas River, Roper Rd, Willyaroo	1	2	3	1	2	1	2
Apex Wetland, Burbridge Rd, West Beach	3	3	3	3	4	3	3
Arbury Park Outdoor School, Bridgewater	2	2	3	4	3	5	3
Bald Hills Rd, Mt Barker, creek	1	3	3	2	1	3	3
Bald Hills Rd, Mt Barker, dam	2	3	2	3	2	4	4
Berri Reserve, Hope Valley	1	3	4	3	3	2	2
Brabham Gr, Aberfoyle Park	2	1	2	1	1	3	2
Californian Crs, Glenalta	1	2	1	2	1	2	2
Dalton Ave, Aldgate	4	2	1	2	1	2	2
DeMole River, Kangaroo Island	1	1	1	1	2	1	3
Dry Creek, Modbury North	1	3	1	1	1	1	3
Ferry crossing, Wellington	2	3	2	3	1	2	3
Fife St, Vale Park	1	1	1	3	1	2	3
First Creek, Hazelwood Park	1	2	1	1	1	3	2
Francis St, Port Adelaide	1	3	2	1	2	1	3
Glynburn Rd, Burnside	3	2	1	1	2	2	1
Gorge Rd, Cudlee Creek	1	2	2	2	2	2	2
Grant's Gully Rd, Clarendon	1	1	2	3	1	2	1
Hampstead Hill Rd, Aldgate, dam	2	3	2	3	3	4	3
Hawkers Creek Rd, Kapunda	1	2	2	2	2	3	2
Highland Valley, Mt Barker, shearing shed pond	2	2	2	2	2	2	1
Inverbrackie Creek, Pfeiffer Rd, Woodside	3	2	2	2	2	1	2
Ironbank Rd, Ironbank	1	3	2	2	2	2	2
Kangarilla General Store	1	2	1	1	2	1	1
Kingfisher Dr, Modbury Heights	1	1	1	1	1	1	1
Knotts Hill Rd, Ashton	1	1	1	1	1	2	1
Leabrook Dr, Rostrevor	1	2	1	1	1	2	2
Leslie Creek, Mylor, dam	1	3	2	2	3	2	2
Morris Rd, Prospect Hill	2	3	1	1	1	1	2
Murray Bridge City Council Wetland Reserve	3	4	4	3	4	3	3
Paech Rd, Wistow	1	2	3	2	2	3	2
Parawa Dam, trib. of Yankalilla R, southern site	3	2	1	2	2	1	1
Ray Orr Dr, Mt Barker	5	3	4	3	3	3	3
Renown Ave, Crafers	1	1	2	3	2	2	2
Selma Ave, Hahndorf	2	2	4	3	3	3	3
Shannon Tce, Maitland	1	1	2	1	0	2	1
Stoneybrook Dr, Paradise	1	1	2	1	1	2	1
Swamp Rd, Lenswood	1	3	2	1	2	2	3
Tugwell Rd, Encounter Bay	1	3	1	1	1	2	1
Waite Arboretum, Urrbrae	2	2	3	2	2	3	2
Walker Flat Rd, Mt Pleasant	2	2	1	2	2	1	2
Winkler Park, Saddleworth	1	2	2	2	2	2	2

For sites recorded more than once, the count is the total number of species recorded in that year.

Table 3. Number of recordings of different species in the FROG CENSUS from 1994–2000

Species	Common name	2000		1999		1998		1997		1996		1995		1994	
		#	%**	#	%	#	%	#	%	#	%	#	%	#	%
Cyclorana cultripes	Knife Footed Frog	1	0.1	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Cyclorana platycephala	Water Holding Frog	0	0.0	0	0.0	1	0.1	0	0.0	0	0.0	0	0.0	0	0.0
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
Litoria ewingi	Brown Tree Frog	280	13.0	280	14.7	290	17.3	269	17.4	184	12.0	182	11.4	85	11.5
Litoria peroni	Peron's Tree Frog	28	1.3	11	0.6	17	1.0	3	0.2	28	1.8	18	1.1	1	0.1
Litoria raniformis	Southern Bell Frog	41	1.9	8	0.4	17	1.0	3	0.2	16	1.0	19	1.2	1	0.1
**Litoria rothi*	Roth's Tree Frog	1	0.1	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	1	0.1
Litoria rubella	Red Tree Frog	0	0.0	1	0.1	2	0.1	0	0.0	0	0.0	0	0.0	0	0.0
Crinia deserticola	Desert Froglet	1	0.1	1	0.1	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Crinia parinsignifera	Eastern Sign Bearing Froglet	31	1.4	16	0.8	24	1.4	14	0.9	28	1.8	20	1.3	3	0.4
Crinia riparia	Streambank Froglet	0	0.0	2	0.1	2	0.1	0	0.0	0	0.0	0	0.0	3	0.4
Crinia signifera	Common Froglet	807	37.4	818	43.0	695	41.5	750	48.5	661	43.1	644	40.3	343	46.7
Geocrinia laevis	Smooth Frog	1	0.1	2	0.1	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Limnodynastes dumerili	Eastern Banjo Frog	378	17.5	287	15.1	240	14.3	128	8.3	229	14.9	303	18.9	90	12.2
Limnodynastes fletcheri	Long Thumbed Frog	4	0.2	6	0.3	4	0.2	1	0.1	0	0.0	0	0.0	1	0.1
Limnodynastes peroni	Brown Striped Marsh Frog	59	2.7	15	0.8	21	1.3	20	1.3	3	0.2	16	1.0	6	0.8
Limnodynastes spenceri	Spencer's Frog	0	0.0	0	0.0	2	0.1	0	0.0	0	0.0	0	0.0	0	0.0
Limnodynastes tasmaniensis	Spotted Grass Frog	402	18.6	356	18.7	269	16.1	278	18.0	292	19.1	331	20.7	177	24.0
Neobatrachus centralis	Trilling Frog	0	0.0	1	0.1	4	0.2	0	0.0	0	0.0	0	0.0	0	0.0
Neobatrachus pictus	Painted Frog	12	0.5	2	0.1	9	0.5	12	0.8	4	0.3	3	0.2	5	0.7
Neobatrachus sudelli	Sudell's Frog	8	0.4	1	0.1	8	0.5	1	0.1	0	0.0	1	0.1	0	0.0
Neobatrachus sutor	Shoemaker Frog	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	1	0.1	3	0.2	10	0.6	6	0.4	81	5.3	62	3.9	21	2.8
Pseudophryne semimarmorata	Southern Toadlet	0	0.0	0	0.0	0	0.0	1	0.1	5	0.3	0	0.0	0	0.0
No frogs		82	3.8	91	4.8	57	3.4	60	3.9	0	0.0	0	0.0	0	0.0

* Introduced individuals from Northern Australia

** Does not include recordings of poor quality

Some sites were recorded on different nights by the same participant or visited by more than one participant. On occasion, there was a different species or abundance of frogs calling. Most double-ups were located in the Mount Lofty Ranges. Table 4 lists the number of recordings that were made of each species and the total number of different locations at which those species were found. Table 5 shows the number of records of each species from each habitat type. Most recordings were from streams (30%), dams (21%) and swamps (16%). Reservoirs had the lowest number of recordings (0.1%).

Table 4. Number of recordings and number of different sites where each species was recorded in the 2000 FROG CENSUS

Species	Number of recordings	Number of sites
Cyclorana cultripes	1	1
Litoria ewingi	280	268
Litoria peroni	28	26
Litoria raniformis	41	38
Litoria rothi	1	1
Crinia deserticola	1	1
Crinia parinsignifera	31	26
Crinia signifera	807	744
Geocrinia laevis	1	1
Limnodynastes dumerili	378	358
Limnodynastes fletcheri	4	4
Limnodynastes peroni	59	57
Limnodynastes tasmaniensis	402	382
Neobatrachus pictus	12	12
Neobatrachus sudelli	8	8
Pseudophryne bibroni	1	1
No frogs	82	81
Poor quality recording	17	17

Table 5. Number of recordings per species in each habitat in the 2000 FROG CENSUS

Species	Dam	Drain	Pond	Reservoir	River	Spring	Stream	Swamp	Wetland
Cyclorana cultripes	0	0	0	0	0	0	1	0	0
Litoria ewingi	75	12	41	0	20	1	77	40	14
Litoria peroni	0	0	0	0	7	0	5	6	10
Litoria raniformis	0	0	2	0	5	0	3	17	13
Litoria rothi	0	0	0	0	0	0	1	0	0
Crinia deserticola	0	0	0	0	0	0	1	0	0
Crinia parinsignifera	0	0	1	0	7	0	6	4	13
Crinia signifera	174	36	95	0	82	9	280	85	40
Geocrinia laevis	0	0	0	0	0	0	0	1	0
Limnodynastes dumerili	93	14	44	0	48	2	64	72	37
Limnodynastes fletcheri	0	0	0	0	0	0	1	2	1
Limnodynastes peroni	0	6	0	0	0	1	1	42	9
Limnodynastes tasmaniensis	95	18	60	1	36	4	105	39	39
Neobatrachus pictus	3	0	1	1	0	0	0	4	2
Neobatrachus sudelli	1	0	1	0	0	1	2	2	0
Pseudophryne bibroni	1	0	0	0	0	0	0	0	0
No frogs	5	5	17	1	6	2	23	20	2
Poor quality recording	2	0	1	0	2	1	6	3	2

Does not include records where habitat type was unknown

Table 6 shows the abundance of each species at each site. Most recordings (47%) were of few (2–9) individuals of the same species and 35% of recordings had many (10–50) frogs. The categories of one frog and lots (>50) were less frequently recorded.

Table 6. Number of locations where different abundance categories were recorded for each species during 2000

Species	One	Few (2–9)	Many (10–50)	Lots (> 50)
Cyclorana cultripes	0	0	1	0
Litoria ewingi	33	206	40	1
Litoria peroni	2	20	6	0
Litoria raniformis	3	18	19	1
Litoria rothi	1	0	0	0
Crinia deserticola	0	0	0	1
Crinia parinsignifera	0	8	14	9
Crinia signifera	25	294	383	104
Geocrinia laevis	0	1	0	0
Limnodynastes dumerili	52	152	127	47
Limnodynastes fletcheri	1	3	0	0
Limnodynastes peroni	2	20	21	16
Limnodynastes tasmaniensis	43	227	107	25
Neobatrachus pictus	2	7	3	0
Neobatrachus sudelli	1	7	0	0
Pseudophryne bibroni	0	1	0	0

3.3 Species diversity

There was a slight increase in species diversity at many sites in 2000 compared with 1999. Table 7 shows species diversity categories for sites recorded in 2000 and 1999. In 2000, the highest number of species recorded at any site was six, from two sites at Berri in the Murray Valley. Sites with five species were found in the Murray Valley and the South East. Compared with 1999, there were many more sites with multiple species calling, especially sites with four or more species. Figure 3 shows the location of sites with four or more species, along with annual average rainfall zones for the State. Perhaps not unexpectedly, most of the high abundance sites are in areas with high annual rainfall and along the River Murray.

Table 7. Number of sites with different numbers of species present (some sites were recorded multiple times)

Number of Species	Number of Sites 2000	% of Total 2000	Number of Sites 1999	% of Total 1999
Unknown	17	1.6	–	–
0	82	7.8	89	8.8
1	307	29.2	347	34.4
2	345	32.8	335	33.2
3	193	18.3	178	17.6
4	82	7.8	48	4.8
5	24	2.3	11	1.1
6	2	0.2	2	0.2

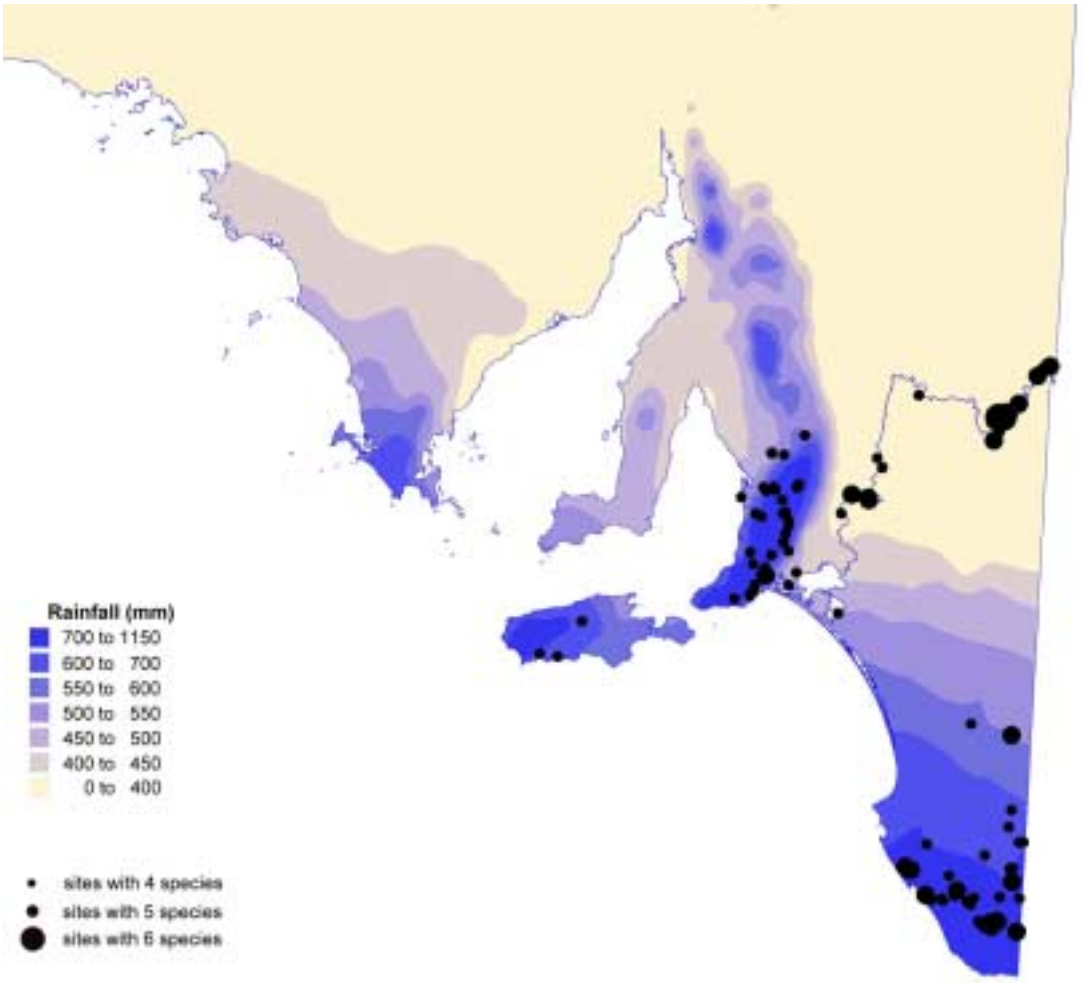


Figure 3. FROG CENSUS location hot spots

3.4 Specific frog distribution and abundance

Figures 4–21 show the sites where each species was recorded in the 2000 FROG CENSUS. Details on the abundance, distribution and habitats for each species recorded by FROG CENSUS 2000 are presented below.

3.4.1 Family Hylidae

In South Australia there are two genera that make up the family Hylidae—*Litoria* and *Cyclorana*.

Litoria species are predominantly tree frogs, with 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.

Cyclorana species are burrowing frogs, 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.

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

Knife Footed Frog *Cyclorana cultripes*

The Knife Footed Frog is a burrowing frog that is found in the extremely arid North East, within the Diamantina River and Cooper Creek basin. The frog is dull grey in colour with a pale, mid-vertebral stripe. It also has a pale bar across the head behind the eyes and a broad, dull stripe on the side of the head. The skin is slightly warty. Its tympanum (ear) is small and its fingers are not webbed. Its toes are one third webbed.

(Photograph: FROGWATCH Resource Materials)

The advertisement call is a harsh note approximately one quarter of a second in length.

A single recording of many (10–50) Knife Footed Frogs was recorded at Pandie Pandie Station near the Diamantina River. This is the first time that this species has been recorded in the FROG CENSUS.

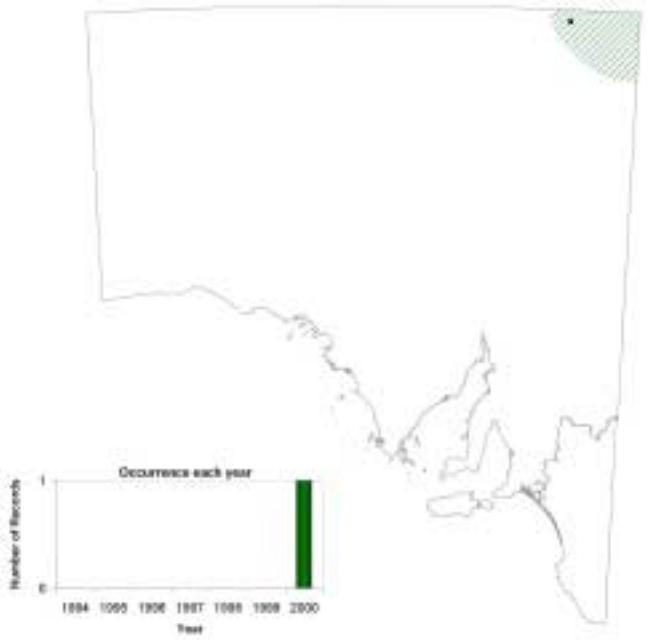


Figure 4. FROG CENSUS location of the Knife Footed Frog (shaded area shows the published range)

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 with occasionally some small, black spots. In the South East the brown colouration may be partly or completely replaced with green.

(Photograph: Steve Walker)

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

The Brown Tree Frog was recorded from 280 sites (13% of recordings) in 2000. This species was again the fourth most abundant species recorded during the census. Recordings were taken from all habitats, with the exception of reservoirs. Most recordings were of few (2–9) frogs.

This year, the Brown Tree Frog was recorded from two sites at Port Lincoln. Previously published distribution maps do not show this species on the Eyre Peninsula.

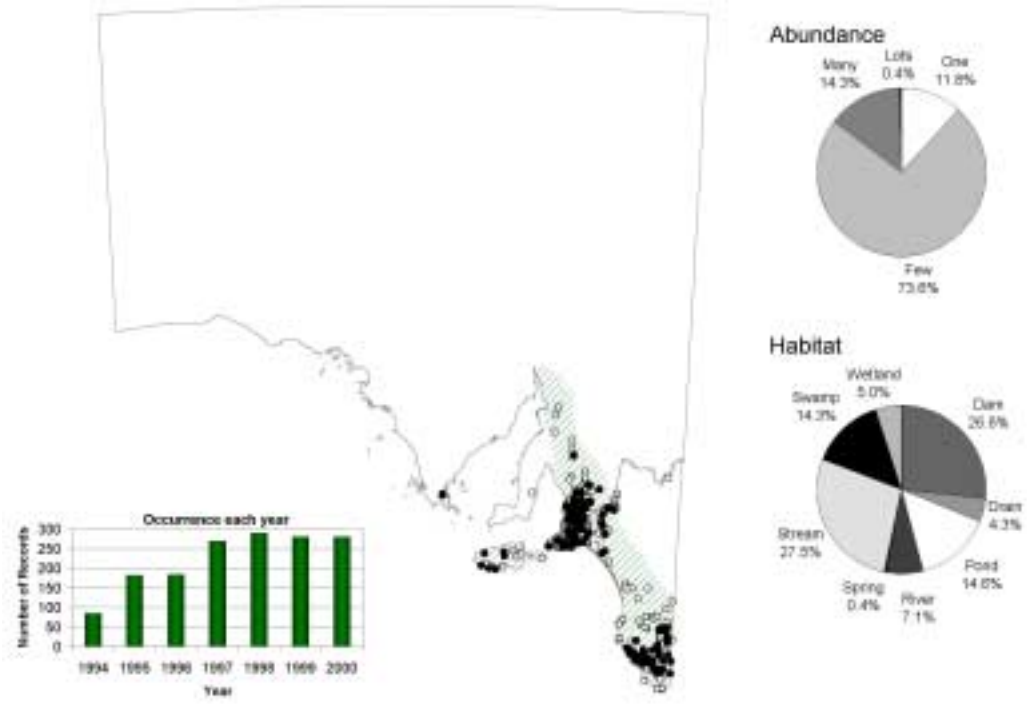


Figure 5. FROG CENSUS locations with the Brown Tree Frog (• recorded in 2000; **o** recorded in previous years; shaded area shows the published range)

Peron's Tree Frog *Litoria peroni*

In South Australia, Peron's Tree Frog has previously only been reported along the River Murray. It is grey or brown and has a number of small, pale emerald spots. A thin black line marks the skin fold above its ear and the back of the thighs 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'.

(Photograph: Steve Walker)

The number of recordings of Peron's Tree Frogs increased from 11 in 1999 (Walker et al. 1999) to 28 in 2000. The most obvious explanation for this increase is the result of recent wetter conditions. The survey looking for the Southern Bell Frog did, however, visit six sites where this frog was calling.

Most of the recordings were of few (2–9) frogs calling. Most recordings were made within their known distribution in the Murray Valley, but it was also detected at a site in Round Waterhole Native Forest Reserve in the South East, and was collected near Mundulla during the Southern Bell Frog survey. The large distance between these two sites suggests that this species has not spread as a result of a single introduction, and it is quite possible that the species has a natural distribution in the area.

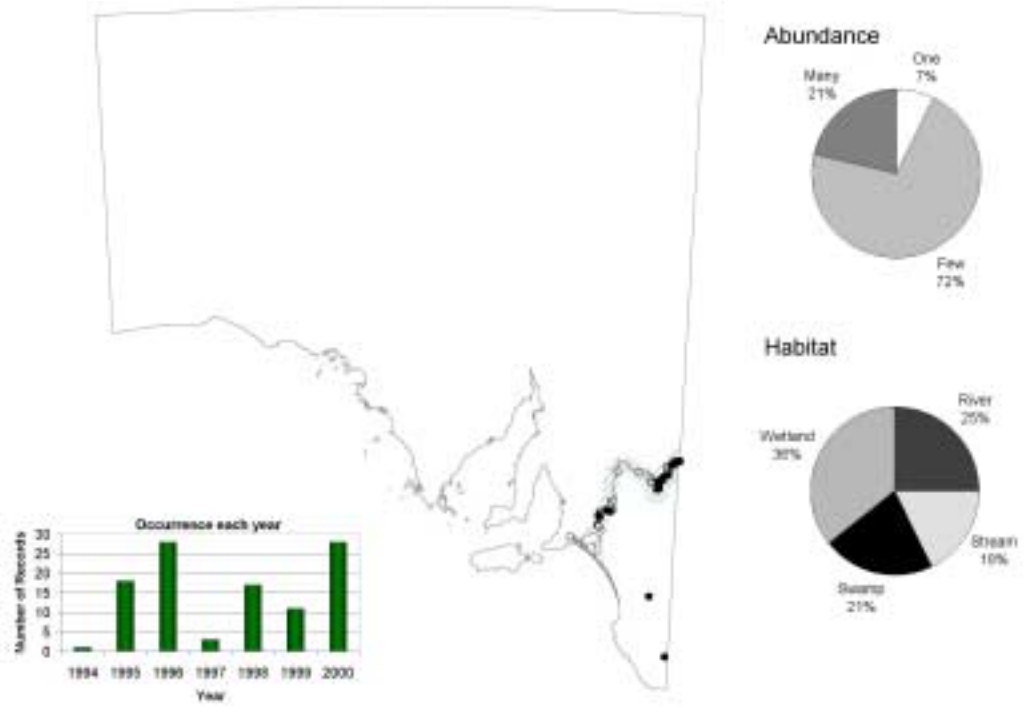


Figure 6. FROG CENSUS locations with Peron's Tree Frog (• recorded in 2000; **o** recorded in previous years; shaded area shows the published range)

Southern Bell Frog *Litoria raniformis*

The Southern Bell Frog is a large frog (55–104 mm) found throughout the swamps of the River Murray and 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.

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

(Photograph: Steve Walker)

In 1999, just eight recordings were made throughout its range in the Murray Valley and none were taken in the South East. Following the wet conditions experienced between FROG CENSUS 1999 and 2000, the number of recordings of the Southern Bell Frog increased to 41. All recordings were taken in typically wet habitats: rivers, swamps and wetlands. The abundance of frogs at most sites was many (10–50) or few (2–9) frogs. A separate study looking to document the distribution and conservation status of this species in the State commenced in September (River Murray) and continued in November (South East); to date, 74 locations have been visited. The Southern Bell Frog was heard calling at 16 of these locations, 11 in the South East where it has only rarely been reported in recent years. Additional surveys will be carried out in the South East in April–May 2001 to help define its distribution and complete the study.

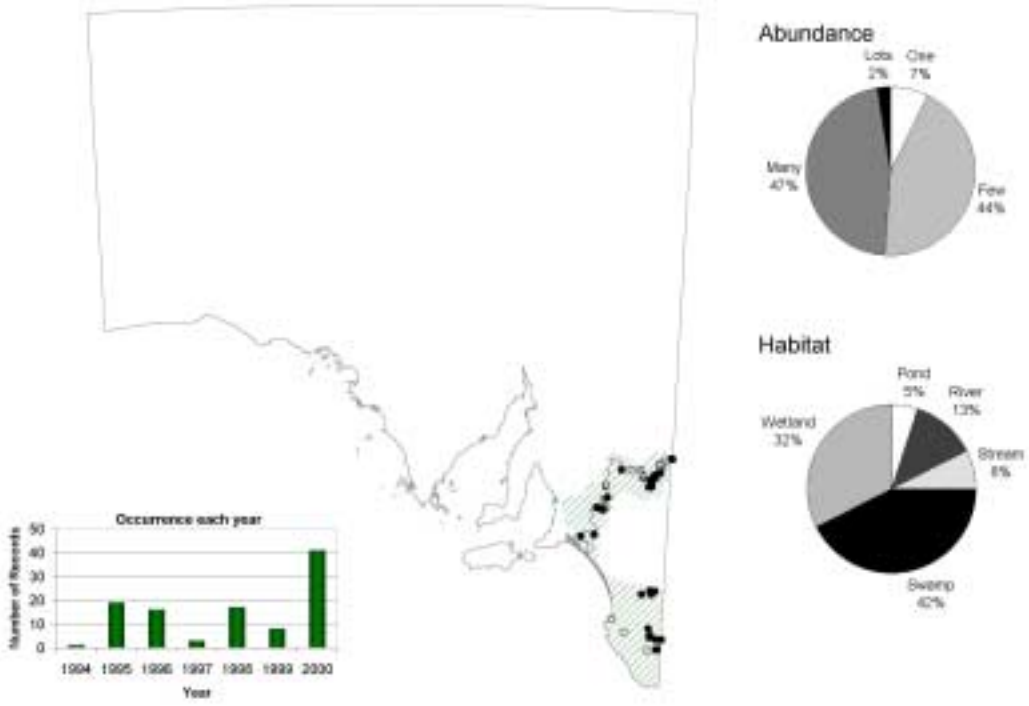


Figure 7. FROG CENSUS locations with the Southern Bell Frog (• recorded in 2000; **o** recorded in previous years; shaded area shows the published range)

Roth's Tree Frog *Litoria rothi*

(Photograph: Steve Walker)

Closely related to Peron's Tree Frog, Roth's Tree Frog has a distribution covering much of the northern part of Australia. It is generally found in vegetation around streams or waterholes. It is usually a very pale grey colour during the day, often changing to pale brown with dark markings at night. A thin, black line marks the skin fold above its ear and the back of the thighs is black with small yellow or orange patches. The upper half of the eye is red. This frog ranges in size from 37–57 mm.

Its call is a series of 7–9 explosive notes resembling laughter.

A single Roth's Tree Frog was recorded from Kircaldy Park, near Captain Sturt's cottage at Grange. The most obvious explanation for the frog being outside its normal distribution is that it entered South Australia in a box of fruit and either escaped or was released by a well-meaning member of the public. As this species is found in tropical Australia, it is unlikely to survive in South Australia due to our wet winters and very dry summers.

This species was also recorded calling from Flagstaff Hill in the 1994 FROG CENSUS.

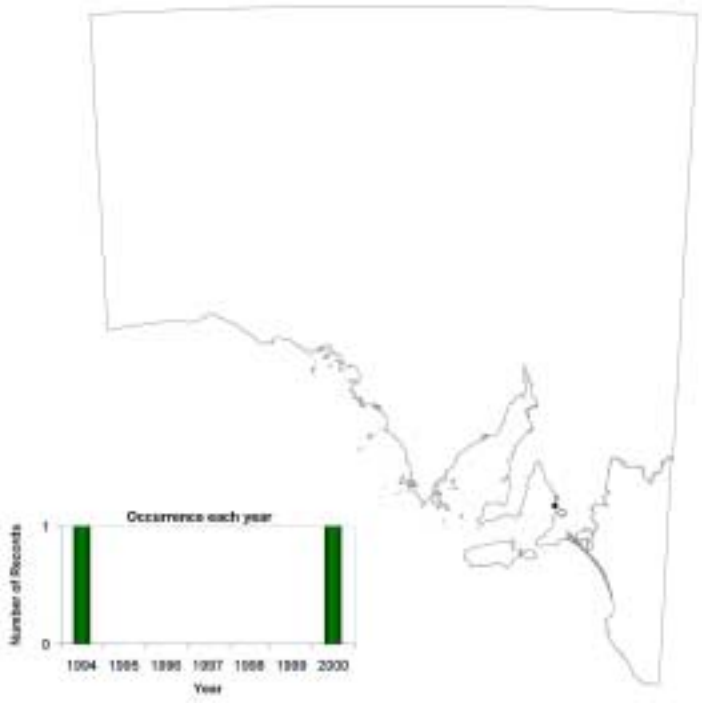


Figure 8. FROG CENSUS locations with Roth's Tree Frog (• recorded in 2000; **o** recorded in previous years)

3.4.2 Family Leptodactylidae

The frogs in the family Leptodactylidae (also known as Myobatrachidae by some authors) are usually terrestrial but occupy a wide range of habitats ranging from wet areas around streams and swamps to desert regions that have very little water. There are very few physical characteristics to help distinguish all the species and, indeed, genera from this family. The vast majority of frogs in South Australia are Leptodactylids, which range in size from about 1.6 cm (*Crinia riparia*) to 8.3 cm (*Limnodynastes dumerili*).

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

Desert Froglet *Crinia deserticola*

The Desert Froglet occurs predominantly in the Diamantina River and Cooper Creek systems. It has robust hind limbs, a pale, unspotted belly and warty skin. The skin colour is mostly a pale grey with complex triangular and rectangular markings on the back. They range in size from 13–20 mm and are mostly found in creek beds, soaks and claypans associated with broad river channels. Individuals often can be found sheltering under leaves, rubbish and timber.

(Photograph: FROGWATCH Resource Materials)

The breeding season is from August to April, with spawn clumps attached to vegetation in swamps. The mating call is a melodious 'chirruping', often described as similar to a house sparrow.

A single recording was made of this species calling from the Diamantina River region in the North East. Lots (>50) of frogs were seen and heard calling at the site.

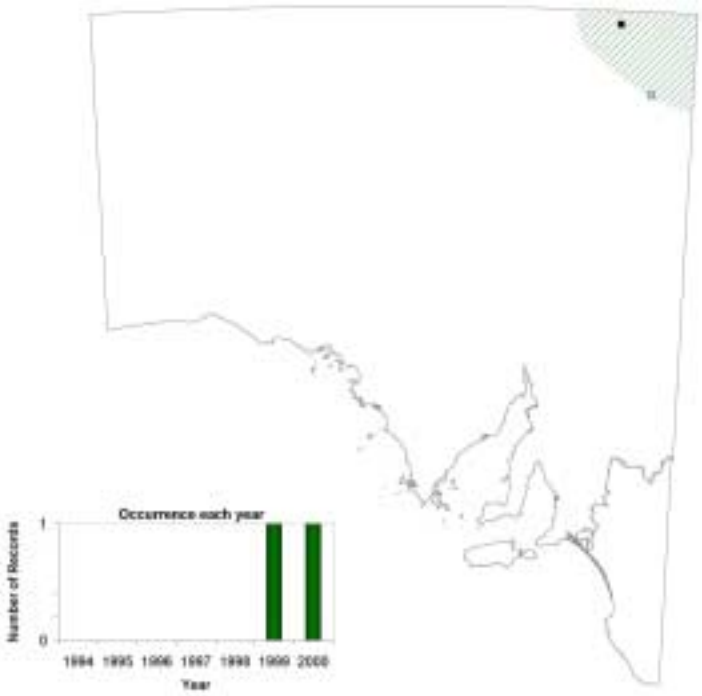


Figure 9. FROG CENSUS locations with the Desert Froglet (• recorded in 2000; **o** recorded in previous years; shaded area shows the published range)

Eastern Sign Bearing Froglet *Crinia parinsignifera*

(Photograph: Mike Mahony-FROGWATCH Resource Materials)

The Eastern Sign Bearing Froglet is distributed along the River Murray north of Walker's Flat. 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 like the noise made when a wet finger is drawn over an inflated balloon.

Thirty-one recordings were made of this species in 2000, the highest in the FROG CENSUS to date. Most recordings (45%) were of many (10–50) frogs that were calling from wetlands (42%), the River Murray (23%), streams (19%), swamps (13%) and a pond (3%) in the Murray Valley. When participants designate habitat categories for sites in this region, it would be appropriate to group swamps and wetlands into a single category (55%). Similarly, rivers and streams should also be combined (42%).

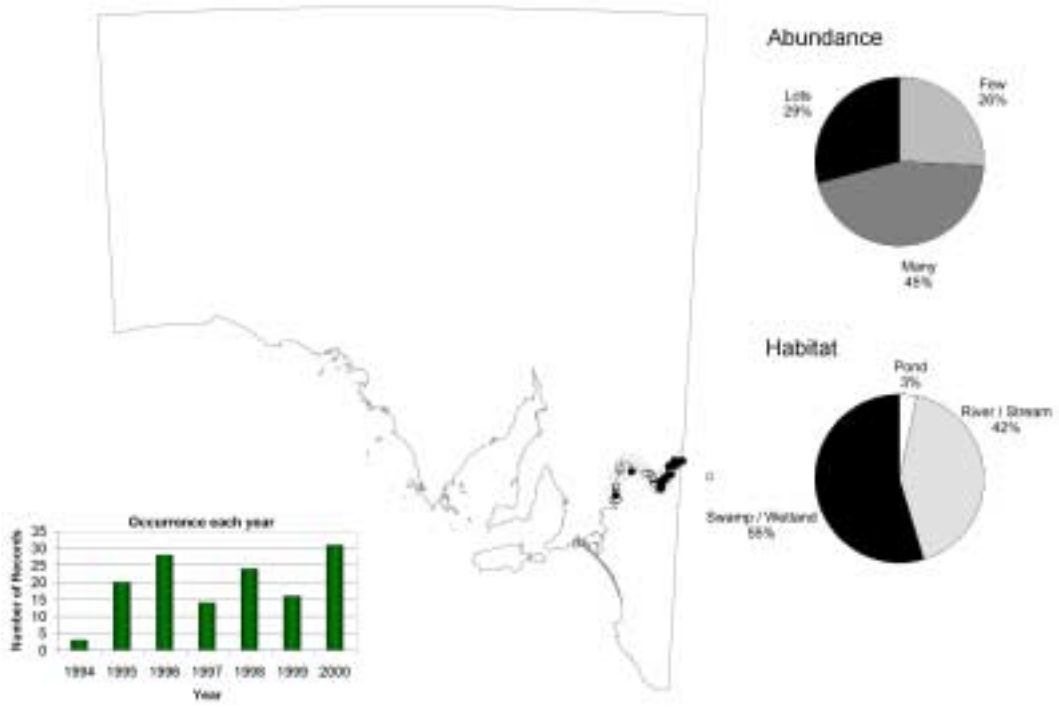


Figure 10. FROG CENSUS locations with the Eastern Sign Bearing Froglet (• recorded in 2000; **o** recorded in previous years; shaded area shows the published range)

Common Froglet *Crinia signifera*

(Photograph: Steve Walker)

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, Yorke Peninsula and Kangaroo Island. This species has a highly variable skin colour and texture that may be plain, striped or spotted, smooth, warty or rigid. The belly is usually white with black markings.

The call of this species is a series of 'crick…crick…crick', repeated at varying intervals.

Once again, the Common Froglet was the most commonly recorded species in the FROG CENSUS, making up approximately 37.4% of all calls and recorded from 744 of the 980 (75.9%) sites sampled; 63 sites were sampled on more than one occasion. Common Froglets were recorded in every habitat type except reservoirs, although most were calling from streams and dams. Most sites had many (10–50) or few (2–9) frogs calling. With the exception of the Yorke Peninsula, the Common Froglet was recorded calling from all parts of its known distribution and does not appear to be experiencing any population declines.

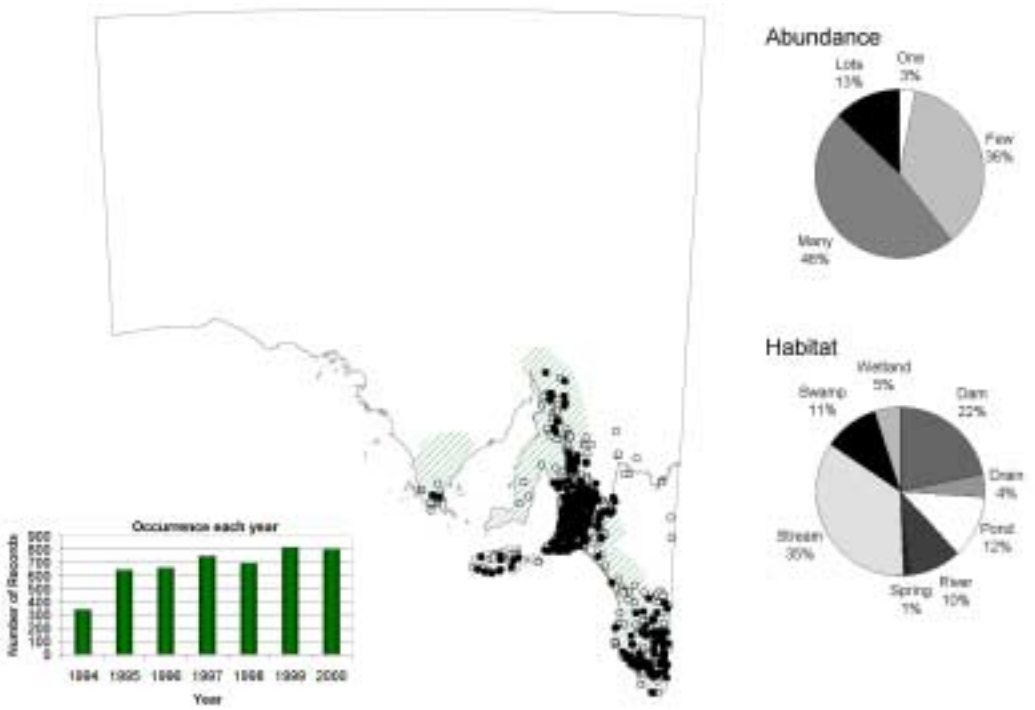


Figure 11. FROG CENSUS locations with the Common Froglet (• recorded in 2000; **o** recorded in previous years; shaded area shows the published range)

Smooth Frog *Geocrinia laevis*

(Photograph: Steve Walker)

The Smooth Frog can be found in leaf litter in dry sclerophyll (*Eucalyptus*) and pine forests subject to temporary flooding in the lower South East of the State. It is a medium-sized frog with short limbs and smooth skin. Pale pink patches are present underneath the legs and in the groin. The belly tends to be mottled or densely covered with grey or dark brown flecks. They range in size from 22–35 mm.

The Smooth Frog does not breed in water; instead, it lays large, unpigmented eggs in loose, elongated masses attached to moist vegetation. Following flooding, tadpoles hatch in the water and complete development in about six months.

The mating call is very similar to that of the Common Froglet and consists of one or more pulses, with the first often being longer than the rest–'cra-a-a-a-a-a–ack…cra-a-a-ck…cra-a-ck'.

The Smooth Frog was recorded at a single site in the South East. This species normally breeds before the spring rains and therefore the low number of recordings is not unexpected. A survey of this species in 1999 showed that it is still relatively common within a restricted distribution in the South East (Walker & Goonan 2000).

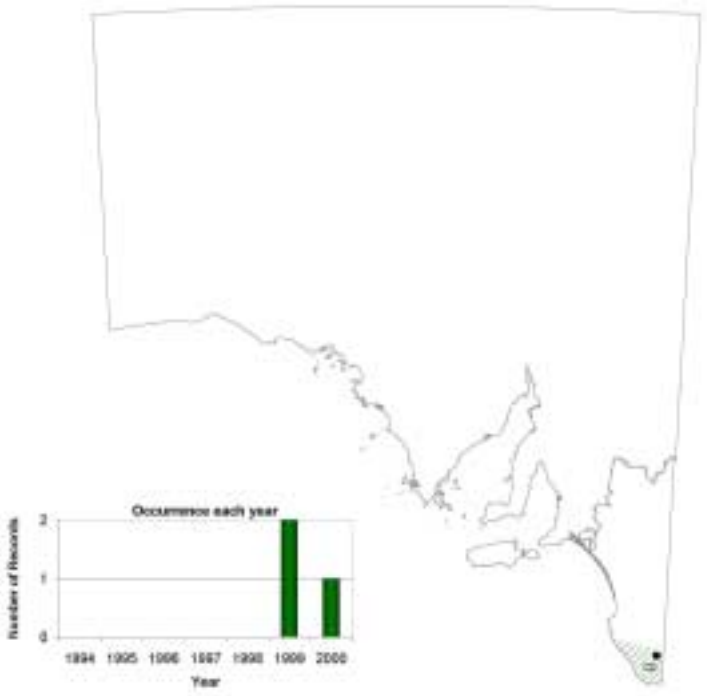


Figure 12. FROG CENSUS locations with the Smooth Frog (• recorded in 2000; **o** recorded in previous years; shaded area shows the published range)

Eastern Banjo Frog *Limnodynastes dumerili*

The Eastern Banjo Frog is a common inhabitant of wetlands and rivers throughout the wetter parts of the State. During dry periods it lives in a burrow and is often dug up by gardeners who may mistake it for a Cane Toad. It is a medium to large frog with a broad, rounded head and short, thick limbs. Large glands are present on the tibia (shin) and at the edge of the mouth. The body is rough and warty, varying from a pale grey to dark brown or black. The sides are commonly marked with bronze, purple or black.

(Photograph: Allan Cotton)

Eggs are laid in a large foam nest attached to floating or emergent vegetation. The mating call is a loud, explosive 'bonk'.

The large number of Eastern Banjo Frog recordings (378, 17.5%) made in the 2000 FROG CENSUS is the largest for any FROG CENSUS. Most of the recordings, which were made throughout its known distribution, were of few (2–9) or many (10–50) frogs. Eastern Banjo Frogs were found in all habitats, with the exception of reservoirs, with most recordings being taken at dams and swamps.

This year, the Eastern Banjo Frog was also recorded from Port Lincoln on the Eyre Peninsula. This species has not previously been reported in this region.

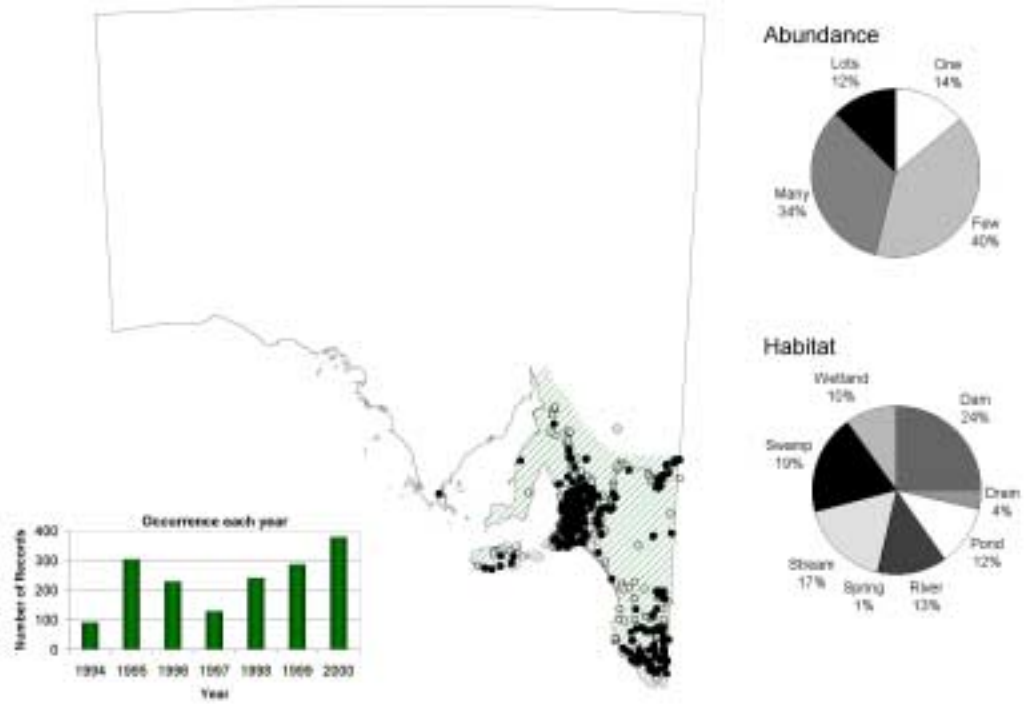


Figure 13. FROG CENSUS locations with the Eastern Banjo Frog (• recorded in 2000; **o** recorded in previous years; shaded area shows the published range)

Long Thumbed Frog *Limnodynastes fletcheri*

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 patches on the dorsal (top) surface, and a first finger (thumb) that is longer than the second. It is very similar to the Spotted Grass Frog (*Limnodynastes tasmaniensis*) in appearance.

(Photograph: Steve Walker)

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

As in 1998, only four recordings were made of the Long Thumbed Frog in 2000. In contrast to previous years, all recordings were made in the upper reaches of the River Murray. Most recordings (75%) were of few (2–9) frogs.

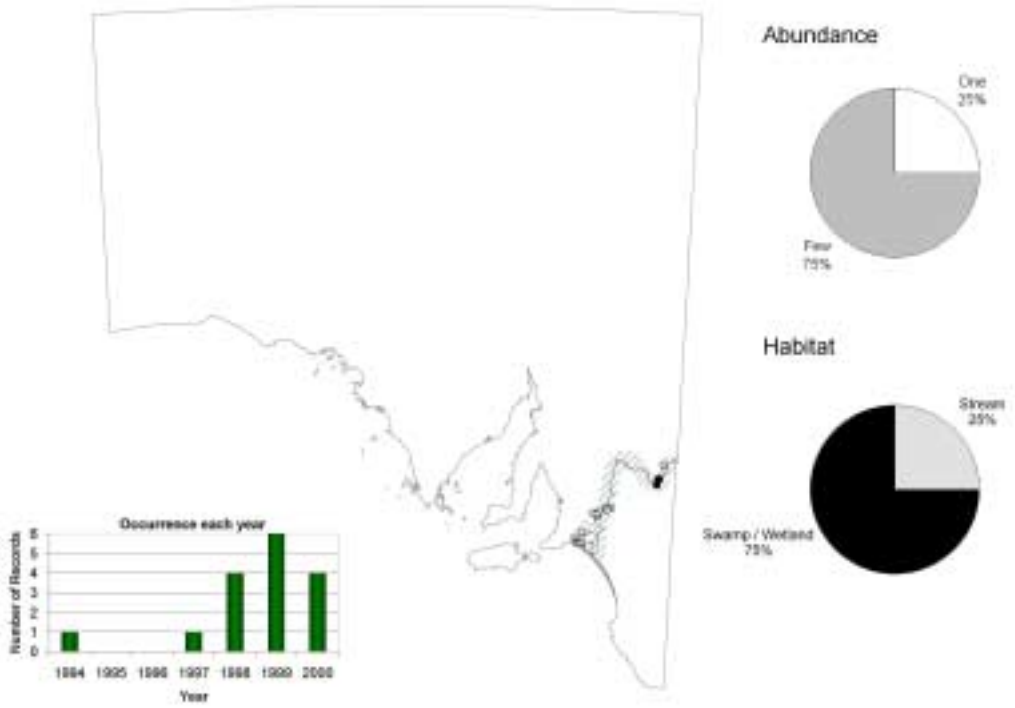


Figure 14. FROG CENSUS locations with the Long Thumbed Frog (• recorded in 2000; **o** recorded in previous years; shaded area shows the published range)

Brown Striped Marsh Frog *Limnodynastes peroni*

(Photograph: Steve Walker)

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.

Recordings of this species were within its known distribution range in the South East of the State, and the number of recordings (59) is by far the largest for the FROG CENSUS, partly due to their being recorded in the Southern Bell Frog survey. Recordings were usually of many (10–50), few (2–9), or lots (>50) of frogs. Two sites had just one frog calling. Most recordings were taken in swamps.

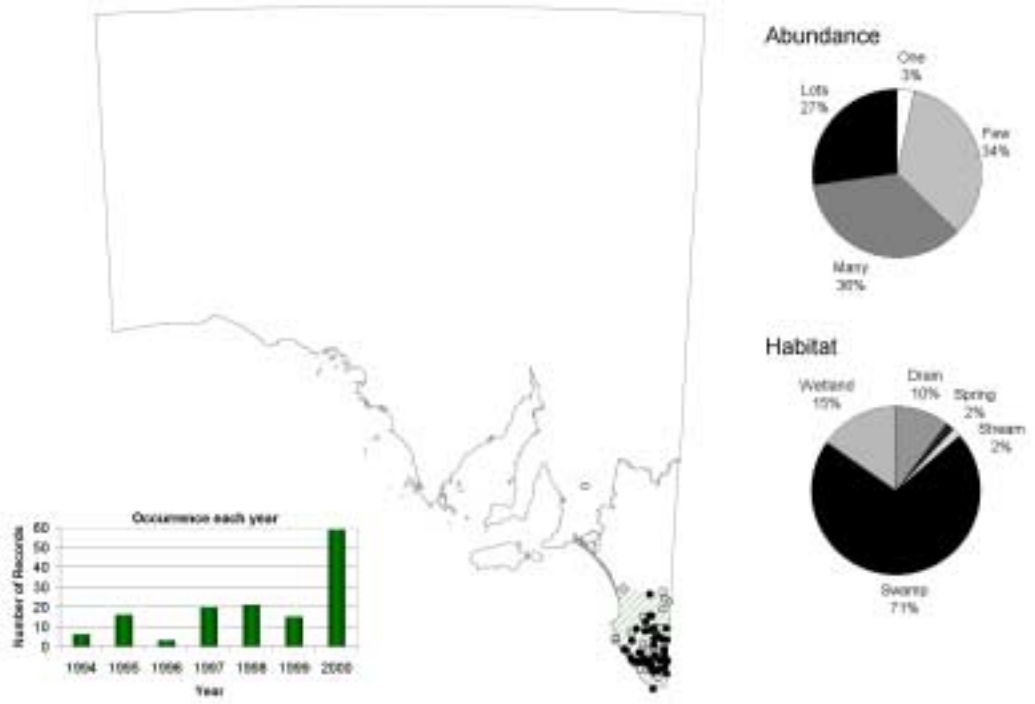


Figure 15. FROG CENSUS locations with the Brown Striped Marsh Frog (• recorded in 2000; **o** recorded in previous years; shaded area shows the published range)

Spotted Grass Frog *Limnodynastes tasmaniensis*

The Spotted Grass Frog is the most common frog in Australia. It is characterised by olive-green or brown spots on a pale grey/brown background that may change over the course of the day, being particularly pale at night. The ventral (lower) surface of the body is smooth and white. Adult males have a dark yellow or green throat. Many specimens have a mid-dorsal stripe that may range from white or yellow through to rusty red. Females have large flanges (flaps of skin) on the first two fingers that are used to create a foam nest in which to lay her eggs.

(Photograph: Steve Walker)

There are three different call races present in South Australia:

- Southern Call Race: a single 'click' (South East).
- Northern Call Race: a rapid 'uk-uk-uk-uk' (Murray River and North West).
- Western Call Race: two or three rapid 'clicks' (Mount Lofty and Flinders Ranges).

More Spotted Grass Frogs were recorded in the 2000 FROG CENSUS than in any previous census; these comprised 402 recordings from 382 sites, which represents 19% of all recordings from 39% of sites. Once again, it was the second most commonly recorded species, a pattern consistently repeated throughout the program since 1994. Recordings were made throughout its known range with the exception of the North East, where only a small number of sites were visited. It occurred in all habitats, but most recordings were made in dams, ponds and streams. Recordings were usually of few (2–9) or many (10–50) frogs.

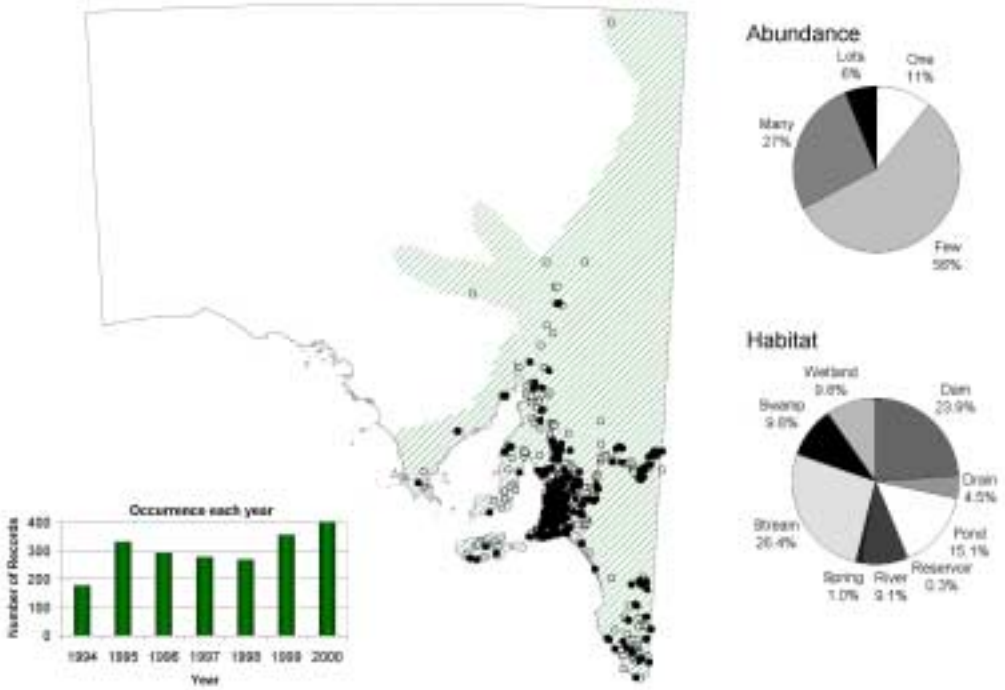


Figure 16. FROG CENSUS locations with the Spotted Grass Frog (• recorded in 2000, **o** recorded in previous years, shaded area shows the published range)

Painted Frog *Neobatrachus pictus*

Living in woodland, mallee, open or disturbed areas of South Australia, the Painted Frog has no obvious habitat preferences. The species is of moderate size (46–58 mm), with a stocky build and short limbs. It is generally a deep olive colour with darker markings on the head and body. The eyes are prominent and have a vertical pupil. The tympanum (ear) is not visible. The fingers are cylindrical and lack webbing, but the toes are extensively webbed. The skin is smooth, except during the mating season when the male will develop tiny black thorns.

(Photograph: Steve Walker)

The mating call is a long, rapidly pulsed, musical trill.

The Painted Frog was recorded calling from 12 sites in 2000, throughout its range, except in the Mount Lofty Ranges where it was not recorded. A recording was made, however, at Currency Creek in the Lower River Murray region adjacent to the Southern Mount Lofty Ranges. Most recordings were of few (2–9) individuals calling from swamps or dams.

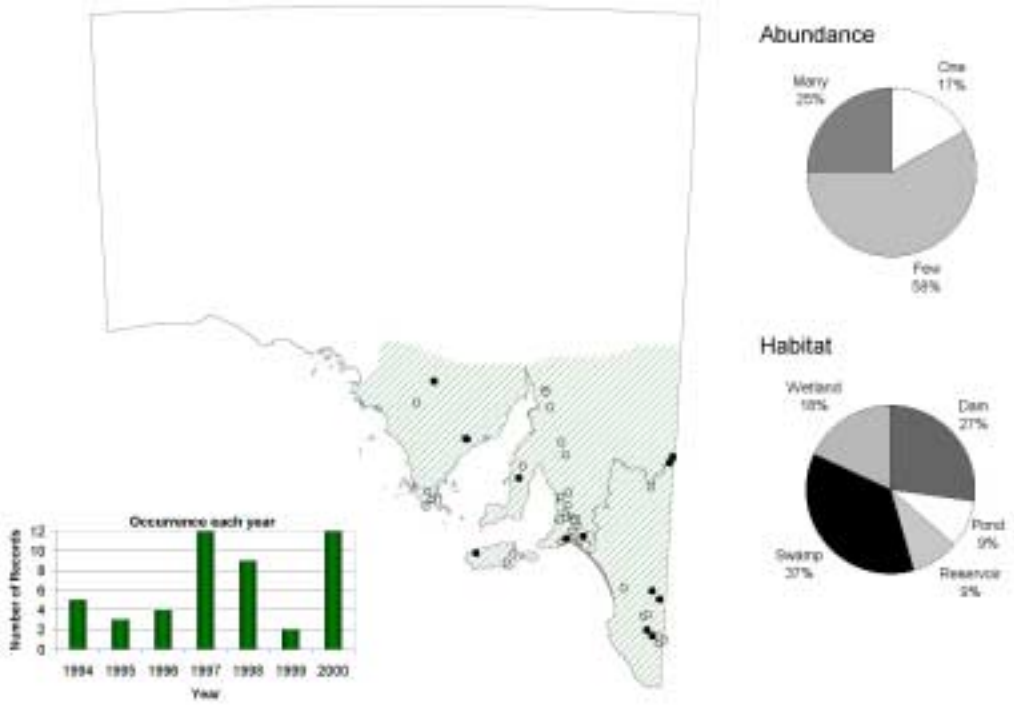


Figure 17. FROG CENSUS locations with the Painted Frog (• recorded in 2000; **o** recorded in previous years; shaded area shows the published range)

Sudell's Frog *Neobatrachus sudelli*

(Photograph: Steve Walker)

Sudell's Frog is a small (38–49 mm) frog, found in open grassland and wooded areas, that can be distinguished by the distinctive patterns on its back. The marks are mostly olive or pale green on a dark brown or tan background. A stripe along its back may also be present. There is also a membrane of skin between the knee and the side of the body, which helps distinguish it from the Painted Frog.

The male call sounds like a short musical trill and is typically made while floating in the water. Spawn is deposited in elongated strands that become tangled in submerged vegetation. The tadpole is grey with a metallic sheen.

Eight recordings were made of this species from a variety of habitats in the South East and most were of few (2–9) frogs. It appears that the wetter conditions at the time of the FROG CENSUS in 1998 and 2000 correspond to the higher number of recordings of this species. Conversely, drier years include either one recording or none.

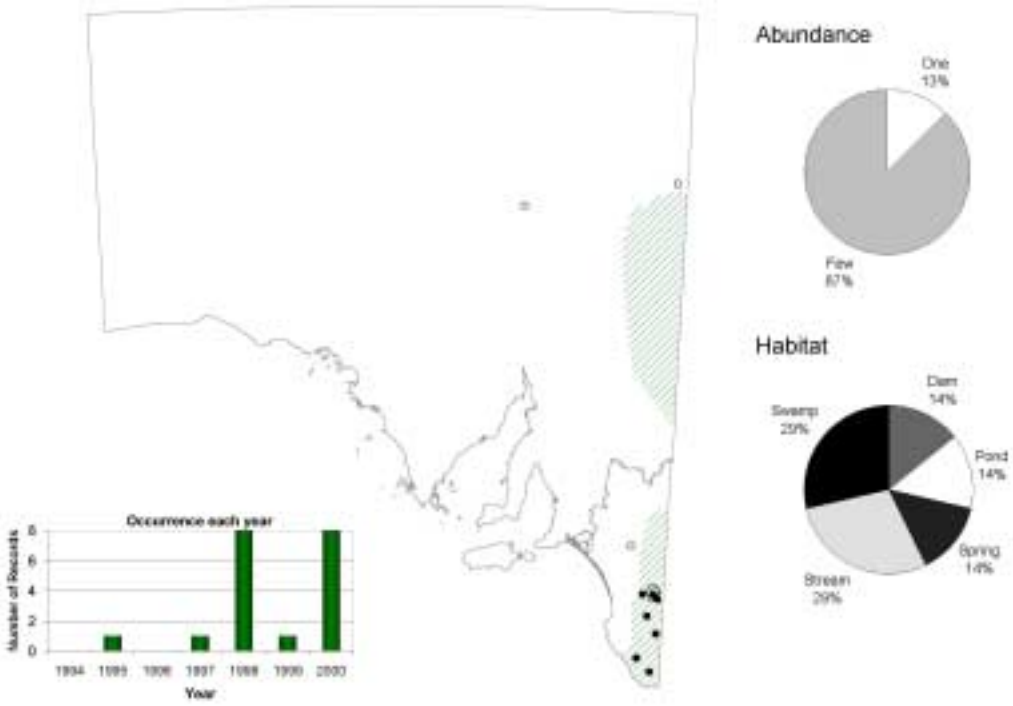


Figure 18. FROG CENSUS locations with Sudell's Frog (• recorded in 2000; **o** recorded in previous years; shaded area shows the published range)

Bibron's Toadlet *Pseudophryne bibroni*

(Photograph: Mike Mahony-FROGWATCH Resource Materials)

Although the most abundant and widespread species of its genus, Bibron's Toadlet is believed to have become less abundant in recent times. They can be found singularly or in low numbers under rocks or logs and breed in well-vegetated areas beside creeks in the wetter parts of the State. This species is brown to almost black above 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 anus. The frog's belly is marbled with black and white.

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

The number of Bibron's Toadlet recordings decreased to the lowest it has been in any census. Only one recording was made, of a few (2–9) frogs from a dam in the Adelaide Hills. It is believed that there may have been some confusion when identifying frogs in earlier censuses, and the high number of recordings between 1994 and 1996 may include Common Froglets. Bibron's Toadlet lays eggs in a shallow burrow or in leaf litter on land and males generally call before rain between February and August, so it is therefore not surprising that, in this wet year, it was not recorded in large numbers.

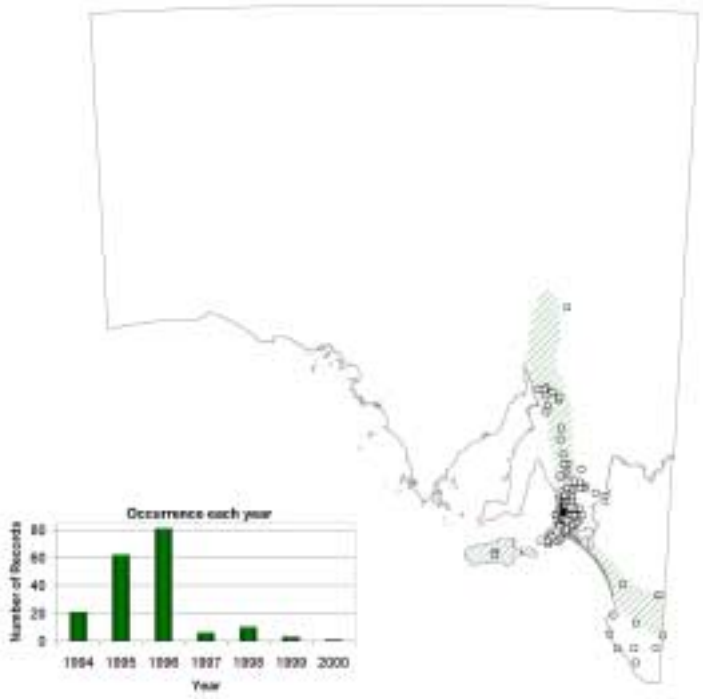


Figure 19. FROG CENSUS locations with Bibron's Toadlet (• recorded in 2000; **o** recorded in previous years; shaded area shows the published range)

3.4.3 No frogs recorded

This year, there were 82 recordings with no frogs calling (from 81 different sites). This result is not the largest proportion of sites with no frogs calling in any FROG CENSUS but, as it has been an especially wet year, this high number is still of concern. Sites with no frogs were concentrated in the Mount Lofty Ranges and the South East. Many of these sites are at the lower reaches of catchments but there are many nearby sites on the same waterways that have large numbers of frogs. Perhaps local habitat issues are responsible for the lack of frogs at these sites, or frogs may have been present but not calling when the sites were visited.

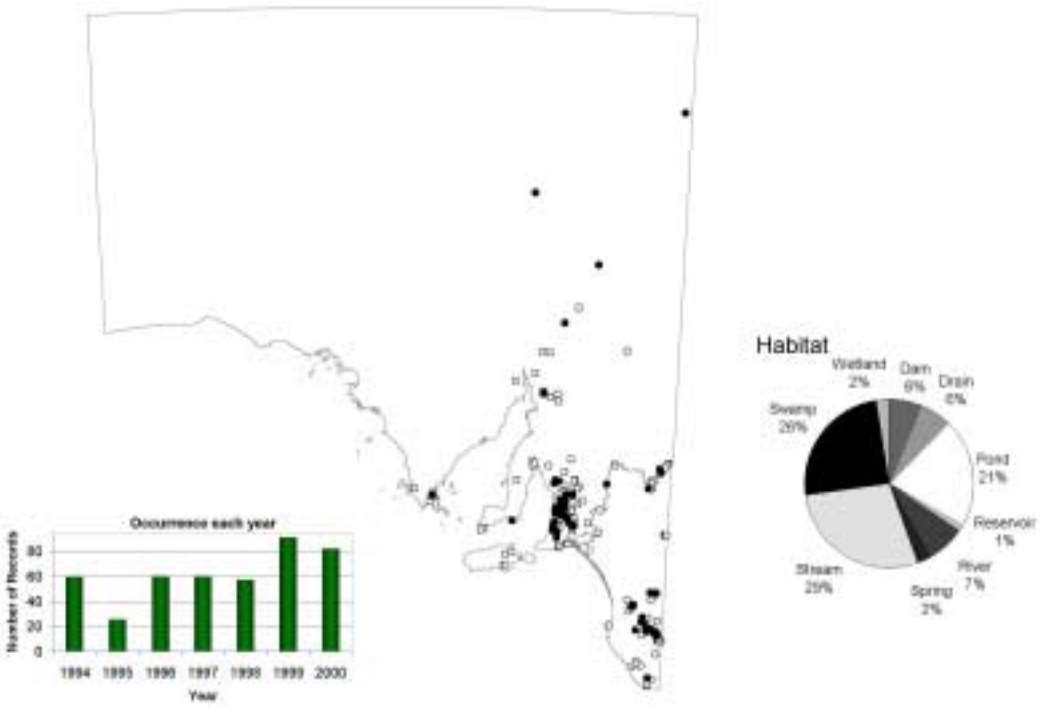


Figure 20. FROG CENSUS locations where no frogs were recorded (• recorded in 2000; **o** recorded in previous years)

3.4.4 Poor quality recordings

Seventeen recordings were of such low quality that they could not be used to provide an accurate estimate of frogs calling at the site. Some of these sites were reported by the participants to have frogs, but these reports could not be verified from the recordings returned. Some poor recordings were made by participants who successfully recorded at other sites; in these cases, the poor quality of the recording was not due to low quality equipment but was due to interference caused by wind or other noises.

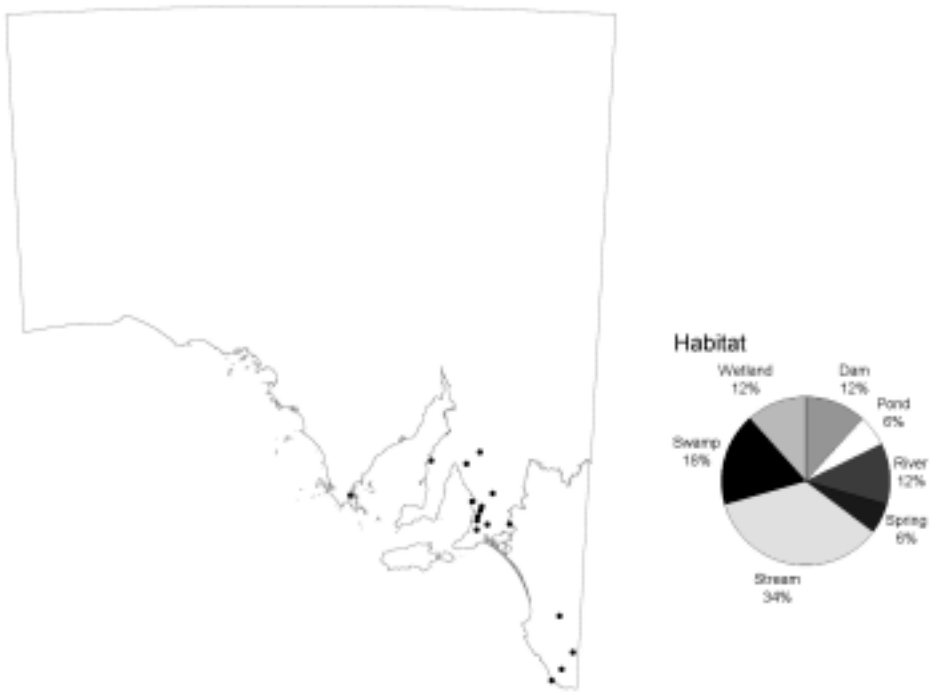


Figure 21. FROG CENSUS locations with poor quality recordings

4. DISCUSSION

In terms of sites visited and records collected, the 2000 FROG CENSUS was the most successful to date.

A number of species were recorded calling in regions where they were not previously known and a species normally not found in this State was recorded calling in the Adelaide metropolitan area.

4.1 Frogs of South Australia

4.1.1 Novel species recorded

One species which had not previously been recorded by this program was included for the first time; the Knife Footed Frog from the North East of the State.

4.1.2 Species not recorded

Thus far the FROG CENSUS program has recorded 23 of the 28 frog species known to occur in the State. The species not recorded in any FROG CENSUS to date are:

- Main's Frog (*Cyclorana maini*)
- Broad Palmed Frog (*Litoria latopalmata*)
- Desert Spadefoot Toad (*Notaden nichollsi*)
- Western Toadlet (*Pseudophryne occidentalis*)
- Small Headed Toadlet (*Uperoleia capitulata*)

All of these species are inhabitants of the more arid northern regions, and perhaps with an increase in the range of recordings a future FROG CENSUS may include some of these less common species. The Small Headed Toadlet has only been reported once in South Australia, from a location near Innamincka. It is possible that this species was only present as a result of floods bringing it into South Australia and may have since died out in the region.

There has also been a steady decline in the number of recordings of Bibron's Toadlet (*Pseudophryne bibroni*) (see Figure 19). Similarly, the Southern Toadlet (*P. semimarmorata*), found in the South East, may be experiencing a decline in its distribution and abundance. Although these species tend to have a breeding season before the FROG CENSUS, there have been few reports of these species, particularly the Southern Toadlet, in recent years.

4.1.3 Geographical variation

The number of species recorded in each of the regions of the State is shown below. Figure 1 shows the distribution of sites within these regions. This year the South East had the greatest frog diversity (previously the Murray Valley has always had the greatest diversity) and the drier regions the lowest.

The species recorded in each region are as follows (species listed in bold are recordings outside the previously published range for that species):

Eyre Peninsula (ten sites, five species)

Brown Tree Frog, Common Froglet, **Eastern Banjo Frog**, Spotted Grass Frog, Painted Frog

Flinders Ranges (20 sites, three species)

Common Froglet, Eastern Banjo Frog, Spotted Grass Frog

Kangaroo Island (14 sites, five species)

Brown Tree Frog, Common Froglet, Eastern Banjo Frog, Spotted Grass Frog, Painted Frog

Mount Lofty Ranges and Central Districts (599 sites, six species)

Brown Tree Frog, **Roth's Tree Frog**, Common Froglet, Eastern Banjo Frog, Spotted Grass Frog, Bibron's Toadlet

Murray Valley (159 sites, nine species)

Brown Tree Frog, Peron's Tree Frog, Southern Bell Frog, Eastern Sign Bearing Froglet, Common Froglet, Eastern Banjo Frog, Long Thumbed Frog, Spotted Grass Frog, Painted Frog

North East (two sites, two species)

Knife Footed Frog, Desert Froglet

North West (one site, no frogs)

South East (167 sites, ten species)

Brown Tree Frog, Peron's Tree Frog, Southern Bell Frog, Common Froglet, Smooth Frog, Eastern Banjo Frog, Brown Striped Marsh Frog, Spotted Grass Frog, Painted Frog, Sudell's Frog

Yorke Peninsula (eight sites, three species)

Eastern Banjo Frog, Spotted Grass Frog, Painted Frog

4.2 Frogs as indicators

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 entire 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 age range; in many cases the FROG CENSUS has become an activity in which the whole family engages and to which they look forward each year. The local knowledge of participants is a valuable resource that the EPA takes great pleasure in fostering. Feedback suggests that it is helping to inform the wider community about catchment conditions and general environmental issues.

4.3 Comparisons with previous years

Generally, the number of recordings of common species was as frequent or higher than previous years. Regional diversity was similar to 1999 (Walker et al. 2000). The three species not recorded in 2000 that were present in 1999 are all found in arid areas of the State where relatively few recordings were made in 2000.

The two species recorded for the first time in the 1999 FROG CENSUS (*Crinia deserticola* and *Geocrinia laevis*) were both recorded again this year. The EPA hopes participants will continue to focus on sites within the known range of these species.

4.4 Future directions

Despite the EPA contacting many schools in the northern part of the State, there were still very few recordings taken from the arid zone. It is hoped that further contact with residents and visitors to these areas will increase the number of recordings next year.

As previously mentioned, a survey was undertaken to record the current distribution and abundance of the Southern Bell Frog (*Litoria raniformis*) in South Australia. Recent reports suggest that this species is undergoing a decline in the eastern states and in the South East of South

Australia. The National Parks and Wildlife SA has recently protected this species by listing it as a threatened species under the *National Parks and Wildlife Act 1972*; a permit is now required for collecting and keeping this species. The present survey shows that the Southern Bell Frog can still be found in reasonable numbers in the South East, particularly around Penola. It is likely that the dry conditions experienced in the area over the past few years have been at least partly responsible for the low numbers recorded in previous censuses. Future monitoring of populations through the FROG CENSUS will provide an important check on the continued presence of this species in both the South East and Murray Valley in South Australia.

APPENDIX 1:

FROG CENSUS 2000 DATASHEET

September 11–17th

Hints and instructions

- The best time to make recordings is about 1–3 hours after dusk. It is a good idea to sit and listen to what frogs are calling before you start.
- At the start of the recording state your name, the date, start time and location.
- Record any frogs calling (if you are quiet there is a better chance that the frogs will keep calling) for **at least** 3 minutes, but **no longer** than 5 minutes. Please let us know if there are no frogs calling.
- Please check your recording to be sure that the frogs 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
- On the label of the tape, write your name and location. Please rewind the tape after the recording.
- Please **fill in all sections** of the datasheet, **except where office use only**.

Observers name: _____

Contact address: _____

_____

Postcode: _____

Telephone: Home _____ **Work / Mobile** _____

Do you want to be involved next year?(Please circle) **Yes / No**

Location details

If this site has been recorded in a previous census please write the location name we used when we posted results. **Please** use a separate datasheet for each site (neat hand-written is okay).

(Sites less than 100m apart will be classed as one site, unless they are obviously separate waterbodies.)

Site name: _____

Has this location been recorded in the past? (If so, what year was it last recorded)_____

Grid Reference OR GPS Reading OR Street Directory reference (only needed for new sites)

Edition and year: _____ Page number: _____

Grid reference: _____ _____

(We do not have every street directory and they can change each year, so if this is a new site please give us lots of information to help us find it on a map. e.g. nearby street names, suburbs/towns, parks/reserves etc.)

_____

_____

_____

_____

Date of observation (e.g. 14 Sept 2000): _____

Starting time of observation (e.g. 8:30 pm or 20:30): _____

HABITAT

Habitat type (please circle just one): dam drain pond river reservoir spring stream swamp wetland

Additional Comments:_____

WATER QUALITY

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

Water appearance: Clear Polluted Foamy Oily Muddy

Comments:_____

FROGS HEARD CALLING

Please indicate your estimate of how many frogs you heard calling

(NOTE it is very important to tell us if you heard no frogs)

How many types of frog did you hear calling?:_____

What was the total number of frogs you heard calling?:_____

Comments:_____

Now we need you to return your datasheet and tape (please rewind) in the **postage-free** POSTpak addressed to: REPLY PAID 6360, Mr Peter Goonan, Environment Protection Agency, GPO Box 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. In most cases (please ring if in doubt) we need tapes returned by the beginning of December.

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.

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

Species Number	Species 1	Species 2	Species 3	Species 4	Species 5
Species Name					
None					
One					
Few (2–9)					
Many (10–50)					
Lots (>50)					

ENVIRONMENT PROTECTION AGENCY www.epa.sa.gov.au/frogcensus

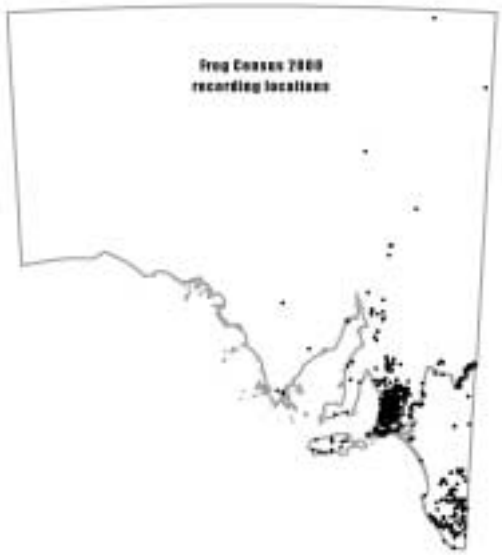
APPENDIX 2: FROG CENSUS 2000 PARTICIPANT FEEDBACK

EPA South Australia

FROG CENSUS 2000

Volunteer update

A big thanks to all you dedicated frog recorders (691 this census). One of the big advantages of the FROG CENSUS is that volunteers collect data from all over the state. EPA scientists would never have the time or budget to cover this area. This is the seventh year that the FROG CENSUS has been running and we still have 44 volunteers (individuals or groups) who have been with us since the start. They have recorded consistently from 43 different locations. Long-term records are very important because they enable us to compare the frog species present at a site over a long period of time; it allows us to see trends that may be more than just changes in weather patterns (frogs call more when it is a wet year).



Too much recording is just barely enough!

Over 1047 recordings were made from 975 sites in the 2000 FROG CENSUS.

16 species were recorded and once again the Common Froglet proved to be the most abundant. 801 recordings were made from 740 different sites. Considering the 975 different sites that were recorded in the census, this species represents nearly 76% of all frogs recorded this year!

The next most common species were the Spotted Grass Frog (381 sites), Eastern Banjo Frog (358 sites) and the Brown Tree Frog (268 sites). This is very similar to previous years, however there were significant increases in the number of sites where the Southern Bell Frog (38) and Peron's Tree Frog (26) were recorded. This is mostly due to the wetter conditions experienced in 2000 and a survey looking for the Southern Bell Frog (see over).

New frogs!

Probably the most exciting highlight of this year was the recording of a mystery frog from the Diamantina River region in Northern SA. The call was one that we have not heard before and is probably the Knife Footed Frog, *Cyclorana cultripes;* a burrowing frog that spends most of its life below ground only emerging to feed and mate after infrequent rains. Unfortunately due to the sporadic nature of this species we don't have a recording to compare it with, although we are hunting around other states to try and get a copy. If it is not the Knife Footed Frog it is possible that it is a new frog that hasn't been recorded before.

Old frogs in new places!

Another star performer, Peron's Tree Frog, was recorded in an area it has never before been recorded. This species was believed to only occur in the Murray Valley in South Australia and this year it was recorded in some swamps all the way down in the South East.

A frog that is closely related to Peron's Tree Frog is Roth's Tree Frog. This species has a distribution that is limited to Northern Australia (WA, NT & Qld). This year it was recorded from a creek near Captain Sturt's Cottage at Grange. The most likely explanation is that it had come down from Queensland in some bananas and had been released by a well-meaning member of the public. Unfortunately as this frog comes from a tropical climate it is unlikely that it will survive a winter in SA! This frog was also recorded in the 1994 FROG CENSUS.

State reporting

We are often asked how the FROG CENSUS data collected by you is used. Our frog database (no participant details) is shared amongst many environmental groups and government agencies that need to know what frogs occur in any particular region. This information is important for new developments, particularly if the frog species is of conservation significance; if official records of the frog populations exist, preventative measures can be taken to protect the populations.

The FROG CENSUS data is also being used in conjunction with other EPA projects looking at the health of our aquatic ecosystems. Sites where frogs have been consistently absent or which have experienced a sudden drop in numbers are to be investigated as part of the EPA's water monitoring program.

Furthering the course of discovery

Project officers at the EPA have been working on intensive surveys looking for species that have not been as abundant in FROG CENSUS records as we would expect. The FROG CENSUS data indicates where populations of a particular species may be declining. The recordings we get of these species give us an idea of what type of habitats they occur in, so we have a good idea where to start looking.

In 1999 the focus was on the Smooth Frog, *Geocrinia laevis*. The Smooth Frog is found in land subject to flooding in the South East. The Smooth Frog had not been recorded in the FROG CENSUS. It was unclear if the lack of records was because the Smooth Frog breeds a little earlier in the year and is therefore not calling in September when the FROG CENSUS is run, or that they were no longer found in SA. The survey began in March 1999, and found 13 populations from a search of 58 sites. We concluded that this species was not under threat of decline because each of the populations was reasonably healthy, with many frogs calling. FROG CENSUS volunteers also recorded it from two sites in 1999.

The Southern Bell Frog, *Litoria raniformis*, is the focus of our intensive frog survey this year. It occurs in swamps of the River Murray and the South East. Most of the FROG CENSUS records are from the River Murray Region and in the past only four recordings have been from the South East. This species is in decline all over Australia and the drop in numbers in the South East is a concern. The survey, which is not yet completed, so far has found large numbers in the Murray, and also a reasonable number in the South East.

FROG CENSUS 2001

We hope that you can be involved for the first FROG CENSUS of the new millennium. It is anticipated that the census will run from September 10th–16th.

FROG CENSUS web page

For more details about the FROG CENSUS or for information on all of the frogs found in South Australia please visit our web page. You can find a copy of last year's report, pictures, calls and descriptions of the frogs, or even a key to identifying the frogs in your region.

If you do not have Internet access at home or work most public libraries now have computers you can use to log on to the web.

EPA South Australia **www.epa.sa.gov.au/frogcensus**

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