FROG CENSUS 1999

Environment Protection Agency
Government of South Australia

FROG CENSUS 1999

Cover photographs:

Top: Smooth Frog (*Geocrinia laevis*)
Photograph by Steven Walker

Middle: Desert Froglet (*Crinia deserticola*)
Photograph from Bayly C, Hunwick J, Hutchinson M, Mahony M. 1990.
FrogWatch Resource Materials, South Australian FrogWatch Committee, Adelaide.

Bottom: Peron's Tree Frog (*Litoria peroni*)
Photograph by Steven Walker

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FROG CENSUS

1999

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

By

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South Australia

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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 1999 our most successful year to date.

The media were again very positive in their promotion of the FROG CENSUS, through various channels on television, on radio and in newspapers. Without their help many participants and the wider public would not have been aware of the programme.

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

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This programme is fully funded by the Environment Protection Agency.

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 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.

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. This programme is now starting to build a good picture of the distribution and abundance of each of the frog species in the State, and it is anticipated that future strategies will include overlaying other data on river and catchment conditions to help identify problem areas in the State.

Frogs recorded

The distribution of recordings in 1999 was similar to previous years, with sites concentrated around the Adelaide metropolitan area and the South-East. The range of recordings extended as far north as Tirrawarra Waterhole in the North-East, south to Port MacDonnell near Mount Gambier, east to Sheepwash Swamp, and west as far as Port Lincoln.

The 1999 FROG CENSUS recorded the second greatest diversity of species so far, with 17 of the 28 frog species found in South Australia being taped. The highest number of species recorded from any location was six, from two sites on the River Murray: downstream of Purnong Landing and at the wetland near Teal Flat opposite Younghusband.

The Common Froglet (*Crinia signifera*) was the most commonly recorded species, representing 43% of the total number of frogs recorded. The next most common species were the Spotted Grass Frog (*Limnodynastes tasmaniensis*) with 18.7%, the Eastern Banjo Frog (*Limnodynastes dumerili*) with 15.1% and the Brown Tree Frog (*Litoria ewingi*) with 14.7%. This is similar to previous years.

Species recorded at low frequencies included: Peron's Tree Frog (*Litoria peroni*), Southern Bell Frog (*Litoria raniformis*), Red Tree Frog (*Litoria rubella*), Desert Froglet (*Crinia deserticola*), Eastern Sign Bearing Froglet (*Crinia parinsignifera*), Streambank Froglet (*Crinia riparia*), Smooth Frog (*Geocrinia laevis*), Long Thumbed Frog (*Limnodynastes fletcheri*), Brown Striped Marsh Frog (*Limnodynastes peroni*), Trilling Frog (*Neobatrachus centralis*), Painted Frog (*Neobatrachus pictus*), Sudell's Frog (*Neobatrachus sudelli*) and Bibron's Toadlet (*Pseudophryne bibroni*).

Two species were recorded for the first time in the FROG CENSUS: the Desert Froglet from the North-East, and the Smooth Frog from the South-East.

A total of 89 sites were visited where no frogs were calling, representing 4.8% of all recordings. These sites were concentrated around the Mt Lofty Ranges, Mid-North, and South-East. This was the highest proportion of sites with no frogs calling for any FROG CENSUS.

Forty-eight of the sites have been visited consistently in each census. While there have been slight fluctuations between years in the number of species recorded at these sites, frog species diversity and numbers appear overall to be relatively stable.

Despite widespread concern over a newly discovered fungus which has been found to infect and kill frogs, there does not seem to be any evidence to show that the number of species of frogs in the Adelaide Hills region, where the fungus has been found, is experiencing any decline.

A recent field survey by the EPA has mapped the State's distribution of a rarely recorded frog species. The Smooth Frog has a limited distribution in the Reedy Creek/Dismal Swamp drainage area, but does not appear to be under any threat of decline. A similar survey is planned in 2000 for the threatened Southern Bell Frog, which once had a distribution that included the River Murray, South-East and parts of the Mt Lofty Ranges. Both of these surveys are funded by the Wildlife Conservation Fund.

Observer participation

The FROG CENSUS has grown considerably since its inception in 1994, with a total of 769 participants taking part in 1999. They made 1013 recordings of frogs from 913 different locations.

Each participant in the 1999 FROG CENSUS was sent personalised results of their recordings. These included:

- a summary of each site visited by the participant and the species recorded, with a brief description of each species
- a table listing the sites visited and species recorded in each census
- an information sheet summarising all data collected in the 1999 census
- tips on how to improve the quality of recordings.

The 1998 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 form on the EPA FROG CENSUS website (*www.epa.sa.gov.au/frogcensus*), which has information, calls, and a key to identifying the frogs found in South Australia. This site was visited 672 times between October 1999 and the end of March 2000, and we encourage all participants to look up this website to improve their knowledge and skills in identifying the frogs of South Australia.

1. INTRODUCTION

The 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 programme (Bayly *et al.* 1990, Hunwick 1991), which has been carried out by schools since 1991. The 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 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 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 successfully complete their life-cycle, frogs require a habitat free of environmental pollutants. Changes to the presence and abundance of frog populations may mirror those occurring to other organisms in the environment. The census thus provides a simple assessment of the health of aquatic environments—on the assumption that healthy catchments provide appropriate conditions for diverse and abundant frog populations and, conversely, that 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; this allows frogs vocalising at a location to be accurately identified, making frogs a useful biological monitor (see website *www.epa.sa.gov.au/frogcensus).* This is particularly applicable in a community-based programme that embraces the valuable resource of public involvement, where participants do not require any previous experience in collecting samples or the ability to identify frogs in the field.

The diversity of the frog fauna of South Australia is relatively low compared with the rest of Australia, with only 28 out of a total of 210 described species having been recorded in this State (Johnston 1990). The Streambank Froglet (*Crinia riparia*) from the Flinders Ranges is the only endemic species (Tyler 1994). 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 a range of human-related activities, including excessive clearance of vegetation, flood mitigation activities (including the draining of swamps and re-channelling of urban streams), stormwater and drainage disposal schemes, poor riparian management activities (eg 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, and Landcare and WATERWATCH groups have been very active in recent years in tackling many of the issues relating to aquatic and riparian management, largely through revegetation and public education programmes. 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 exposes the community to local environmental conditions. Participation in urban wildlife projects has been shown to increase personal awareness of both the local surroundings and history (Mostyn 1984). Community environmental monitoring also gives participants a sense of responsibility for environmental health through their direct involvement (Alexandra *et al.* 1996). Involving the community in monitoring allows a large number of samples to be collected over a broad area in a short space of time, usually at only small cost to agencies. This can lead to the discovery of new species in specific areas (Gynther 1995).

This report provides details of the FROG CENSUS carried out in 1999, and includes comparisons with previous years to show any trends that are beginning to become evident as more detailed datasets are compiled through this programme.

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, Heritage and Aboriginal Affairs invited members of the public to register their interest at the EPA.
- Letters were sent to scouts and guides associations asking for volunteers.
- A letter was sent to the Farmers Federation asking for volunteers.
- Involvement was promoted during National Biodiversity month.
- Promotional brochures were distributed at the Royal Adelaide Show.

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

Most recordings were made during 'Frog Week' (12–18 September 1999), predominantly between dusk and midnight. Participants chose all locations. 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.

Participants were sent the results of their recording(s), with specific information on the life history of each frog recorded at their site(s), and a general information sheet with overall results from the 1999 FROG CENSUS. This year, participants were also sent a summary of their results for each year they have been involved.
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).

3. RESULTS

3.1 Observer and location details

FROG CENSUS 1999 had 769 participants recording frogs from 913 sites (1013 separate recordings were made) throughout South Australia. With some recordings providing a record of more than one species, a total of 1901 records were obtained for frog abundance and distribution throughout the State. This is the largest number of records for the FROG CENSUS thus far. There were additional recordings by some participants, but the poor quality of these recordings did not permit identification of frogs.

Table 1 details the public participation in the FROG CENSUS for the past six years (see Goonan *et al.* (1997, 1998) and Walker *et al.* (1999)). This year the number of participants increased slightly. Although more sites were recorded this year, the geographic range of recordings across the State (Figure 1) decreased from 1998 (Walker *et al.* 1999). There was, however, an increase in the number of recordings in the Flinders Ranges. There were no recordings from the North-West or Nullarbor Plain regions in 1999.

A total of 48 sites have been recorded consistently each year the FROG CENSUS has been running (Figure 2). This appears to be an increase from the 47 reported in the 1998 FROG CENSUS, but some tapes from earlier years were returned with those for 1999 and have been added to the database. The numbers of species recorded for each of these sites during the 1999 FROG CENSUS are listed in Table 2. There have been fluctuations between years in the numbers of species recorded at each site, but overall there appears to be little change in the frog abundance at these sites. Six years is a relatively short time for a monitoring project, so it is important that these sites continue to be visited in future years to provide information over time on the health of the frog fauna of South Australia.

Table 1 Number of observers involved and sites visited in the FROG CENSUS 1994–1999

	1999	1998	1997	1996	1995	1994	Total
Observers	769	673	653	591	610	285	1587
Locations	913	794	812	786	787	456	2140

3.2 Frog species abundance and distribution

A total of 17 species was recorded in 1999 (Table 3). This is the second highest number of species ever recorded in the FROG CENSUS. Two previously unrecorded species were recorded in 1999, the Smooth Frog and Desert Froglet. Due to the decrease of recordings from the northern part of the State, some of the arid zone species were not recorded in 1999. Once again, no recordings of the Southern Toadlet were made in the South-East of the State.

Figure 1 shows the distribution of all FROG CENSUS sites in 1999. The geographic range of recordings has decreased slightly compared with 1998 (Walker *et al.* 1999), due to the loss of some sites from the North-West and North-East. The most northerly recording was taken at Tirrawarra Waterhole in the North-East of the State. As in 1998, the most southerly recording was made at Port MacDonnell in the South-East. The eastern-most recording was from Sheepwash Swamp in the South-East. The western-most site was a stream at Port Lincoln. Many recordings were again made in the Mount Lofty Ranges and on the Fleurieu Peninsula. A small number of recordings was made at the northern and southern ends of the Eyre Peninsula. The number of recordings from Yorke Peninsula increased over that taken in 1998 and included some sites that had not previously been visited. The River Murray recordings were taken along most of its length in South Australia. Kangaroo Island and the South-East had a similar number of recordings to 1998 (Walker *et al.* 1999). As indicated above, there was an increase in the number of sites from the Flinders Ranges.

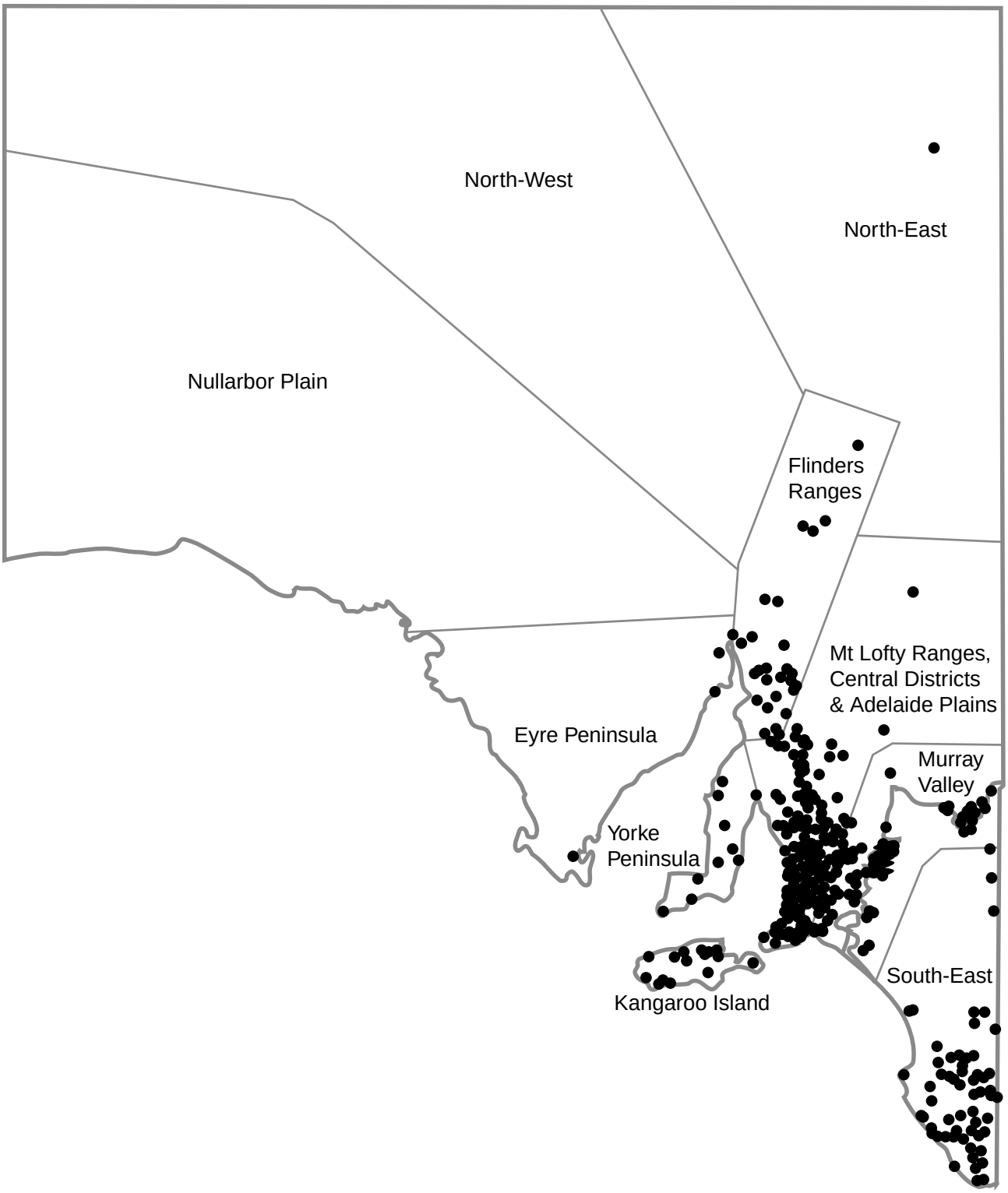


Figure 1 Geographic range of recording sites for the 1999 FROG CENSUS
Region names follow Tyler (1977).

Figure 2 Locations at which recording has been conducted each year of the FROG CENSUS

Table 2 1999 species counts for the sites recorded in the FROG CENSUS

Site name	No. of species 1999
Allan St, Vista	2
Angas River, Willyaroo	1
Apex Wetland, West Beach	5
Arbury Park Outdoor School, Bridgewater	5
Bald Hills Rd, Mt Barker, creek	3
Bald Hills Rd, Mt Barker, dam	4
Berri Reserve, Hope Valley	4
Brabham Grv, Aberfoyle Park	3
Bradey Rd, Windsor Gardens	1
Californian Cres, Glenalta	2
Dalton Ave, Aldgate	2
Leslie Creek, Mylor, dam	2
DeMole River, Kangaroo Island	1
Dry Creek, Modbury North	1
Ferry Crossing, Wellington	2
Fife St, Vale Park	3
First Creek, Hazelwood Park	2
Francis St, Port Adelaide	1
Glynburn Rd, Burnside	3
Gorge Rd, Cudlee Creek	2
Grant's Gully Rd, Clarendon	2
Hampstead Hill Rd, Aldgate, dam	4
Hawkers Creek Rd, Kapunda	3
Highland Valley, Mt Barker, shearing shed pond	2
Inverbrackie Creek, Pfeiffer Rd, Woodside	1
Ironbank Rd, Ironbank	2
Kingfisher Drv, Modbury Heights	2
Knotts Hill Rd, Ashton	2
Leabrook Drive, Rostrevor	5
Long Gully Rd, Mannum	3
Marshall Rd, Lenswood, dam	2
Morris Rd, Prospect Hill	1
Nicholls Rd, Scott Creek	1
Paech Rd, Wistow	3
Parawa Dam, trib. of Yankalilla R, south site	1
Ray Orr Drv, Mt Barker	3
Renown Ave, Crafers	2
Salter Springs Rd, Rhynie	1
Sandison Rd, Hallet Cove	1
Selma Ave, Hahndorf	3
Shannon Tce, Maitland	3
Springs Rd, Mt Barker, site 1	3
Stoneybrook Drive, Paradise	2
Swamp Rd, Lenswood	2
Tugwell Rd, Encounter Bay	2
Waite Arboretum, Urrbrae	5
Walker Flat Rd, Mt Pleasant	1
Winkler Park, Saddleworth	2

Table 3 Frog species recorded by the FROG CENSUS in 1994–1999

Species	Common name	1999		1998		1997		1996		1995		1994	
		No. of records	% of total	No. of records	% of total	No. of records	% of total	No. of records	% of total	No. of records	% of total	No. of records	% of total
Cyclorana platycephala	Water Holding Frog	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	1	0.1	0	0.0	1	0.1	0	0.0	0	0.0
Litoria ewingi	Brown Tree Frog	280	14.7	290	17.3	269	17.4	184	12.0	182	11.4	85	11.6
Litoria peroni	Peron's Tree Frog	11	0.6	17	1.0	3	0.2	28	1.8	18	1.1	2	0.3
Litoria raniformis	Southern Bell Frog	8	0.4	17	1.0	3	0.2	16	1.0	19	1.2	1	0.1
Litoria rubella	Red Tree Frog	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	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Crinia parinsignifera	Eastern Sign Bearing Froglet	16	0.8	24	1.4	14	0.9	28	1.8	20	1.3	3	0.4
Crinia riparia	Streambank Froglet	2	0.1	2	0.1	0	0.0	0	0.0	0	0.0	3	0.4
Crinia signifera	Common Froglet	818	43.0	695	41.5	750	48.5	661	43.1	644	40.3	343	46.8
Geocrinia laevis	Smooth Frog	2	0.1	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Limnodynastes dumerili	Eastern Banjo Frog	287	15.1	240	14.3	128	8.3	229	14.9	303	18.9	93	12.7
Limnodynastes fletcheri	Long Thumbed Frog	6	0.3	4	0.2	1	0.1	0	0.0	0	0.0	1	0.1
Limnodynastes peroni	Brown Striped Marsh Frog	15	0.8	21	1.3	20	1.3	3	0.2	16	1.0	5	0.7
Limnodynastes spenceri	Spencer's Frog	0	0.0	2	0.1	0	0.0	0	0.0	0	0.0	0	0.0
Limnodynastes tasmaniensis	Spotted Grass Frog	356	18.7	269	16.1	278	18.0	292	19.1	331	20.7	171	23.3
Neobatrachus centralis	Trilling Frog	1	0.1	4	0.2	0	0.0	0	0.0	0	0.0	0	0.0
Neobatrachus pictus	Painted Frog	2	0.1	9	0.5	12	0.8	4	0.3	3	0.2	5	0.7
Neobatrachus sudelli	Sudell's Frog	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	1	0.1	0	0.0	0	0.0	0	0.0	0	0.0
Pseudophryne bibroni	Bibron's Toadlet	3	0.2	10	0.6	6	0.4	81	5.3	62	3.9	21	2.9
Pseudophryne semimarmorata	Southern Toadlet	0	0.0	0	0.0	1	0.1	5	0.3	0	0.0	0	0.0
No frogs		91	4.8	57	3.4	60	3.9	0	0.0	0	0.0	0	0.0

Table 4 Number of frogs recorded in each habitat in the 1999 FROG CENSUS

Species	Dam	Drain	Pond	River	Spring	Stream	Swamp	Reservoir	Wetland
Litoria ewingi	85	5	42	20	1	83	23	0	20
Litoria peroni	0	0	0	2	0	1	5	0	3
Litoria raniformis	0	0	0	1	0	2	2	0	3
Litoria rubella	0	0	0	0	0	1	0	0	0
Crinia deserticola	0	0	0	0	0	1	0	0	0
Crinia parinsignifera	0	0	1	3	0	2	2	0	8
Crinia riparia	0	0	1	0	0	1	0	0	0
Crinia signifera	190	17	111	108	5	313	39	2	32
Geocrinia laevis	0	0	0	0	0	0	2	0	0
Limnodynastes dumerili	74	8	36	54	0	75	22	0	17
Limnodynastes fletcheri	0	0	0	0	0	0	6	0	0
Limnodynastes peroni	0	4	1	0	0	1	3	0	6
Limnodynastes tasmaniensis	90	9	74	40	3	97	21	0	22
Neobatrachus centralis	0	1	0	0	0	0	0	0	0
Neobatrachus pictus	2	0	0	0	0	0	0	0	0
Neobatrachus sudelli	0	0	0	0	0	0	1	0	0
Pseudophryne bibroni	1	0	1	0	0	1	0	0	0
No frogs	10	4	15	10	3	39	4	0	6

Does not include records where habitat type was unknown.

Table 5 Number of locations where different abundance values were recorded for each species of frog during 1999

Species	One	Few (2–9)	Many (10–50)	Lots (>50)
Litoria ewingi	33	205	38	3
Litoria peroni	1	4	6	0
Litoria raniformis	0	5	3	0
Litoria rubella	0	1	0	0
Crinia deserticola	0	0	1	0
Crinia parinsignifera	0	5	8	3
Crinia riparia	0	1	0	1
Crinia signifera	19	328	389	78
Geocrinia laevis	0	2	0	0
Limnodynastes dumerili	34	169	68	15
Limnodynastes fletcheri	0	2	3	1
Limnodynastes peroni	1	7	7	0
Limnodynastes tasmaniensis	43	224	79	9
Neobatrachus centralis	0	1	0	0
Neobatrachus pictus	0	2	0	0
Neobatrachus sudelli	1	0	0	0
Pseudophryne bibroni	0	3	0	0

Table 4 shows the number of records of each species from each habitat type. The majority of recordings were from streams (33%) and dams (23%). Reservoirs had the lowest number of recordings.

Table 5 shows the number of records of each species for each abundance category. Most recordings were of few (2-9) individuals of the same species.

3.3 Distribution and abundance of each species

Figures 3-19 show the sites where each species was recorded in the 1999 FROG CENSUS. Details on the abundance, distribution and habitats for each species recorded by FROG CENSUS 1999 are presented below.

3.3.1 Family Hylidae

In South Australia there are two genera which make up the family Hylidae:

A. *Litoria* species are predominantly tree frogs; they have flattened discs on the tips of their fingers and toes which secrete a sticky mucous to aid in climbing, and the undersurface of the disc has an indentation around the circumference. The vast majority of *Litoria* species have long legs and broad webbing between the toes, while the fingers may have only slight webbing.

B. *Cyclorana* species are burrowing frogs, which 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 shovel or 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.

Brown Tree Frog *Litoria ewingi*

The Brown Tree Frog is the only tree frog commonly found in Adelaide and the Mt Lofty Ranges, and is often seen climbing windows. It is a slender, medium-sized frog (22–46 mm) with 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 backs of the thighs are yellow-orange and sometimes have small black spots. In the South-East the brown colouration may be partly or completely replaced with green.

The advertisement call is a loud, distinctive, high-pitched 'weep-eep-eep' of 10 to 20 notes.

The Brown Tree Frog made up 15% of the recordings for 1999, being recorded from 280 sites within its published distribution range. This species changed from being the second most abundant species in 1998 (Walker *et al*. 1999) to the fourth most abundant in 1999. Recordings were taken from all habitats, with the exception of reservoirs. Most recordings were of few (2–9) frogs.

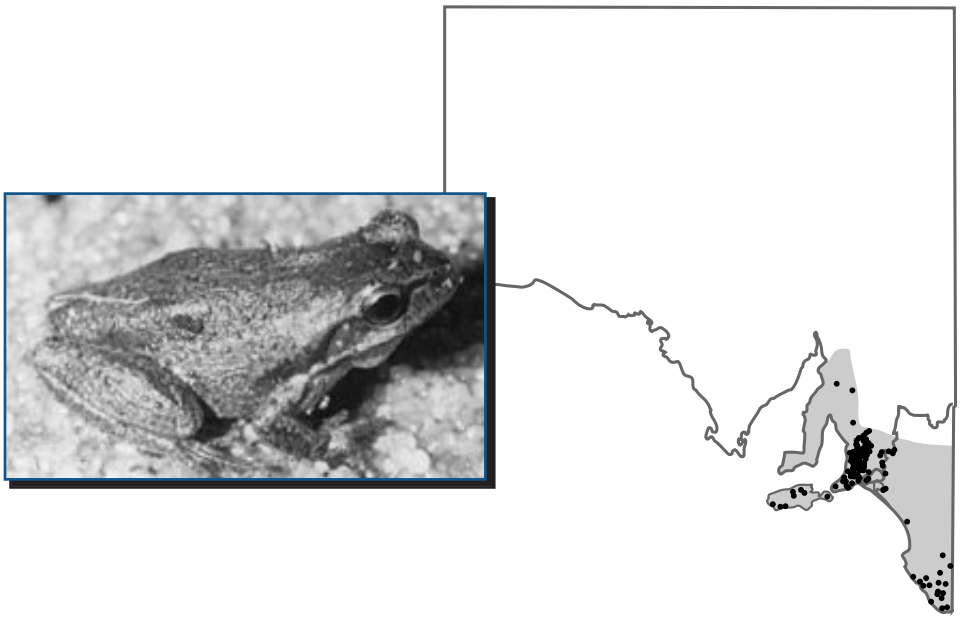
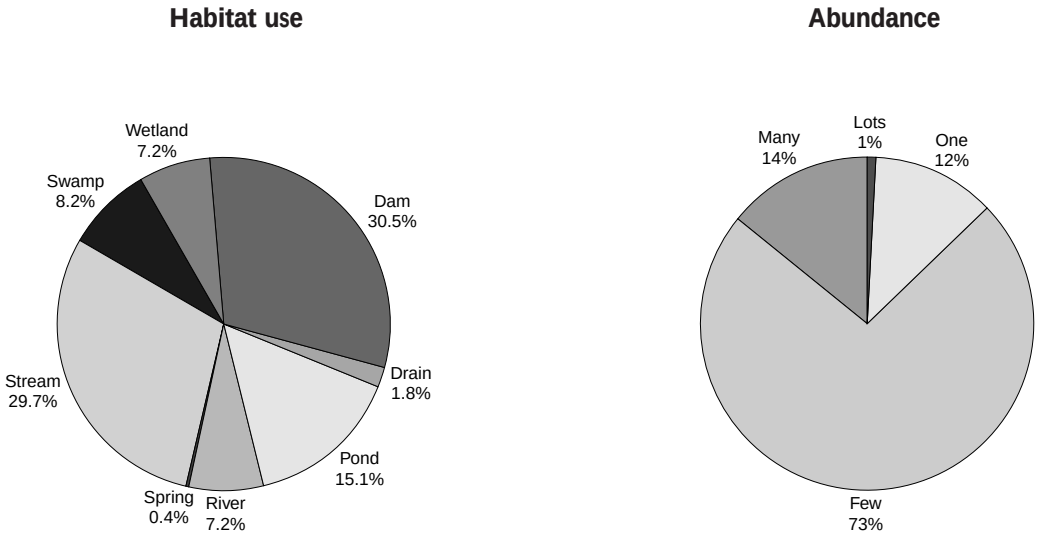


Figure 3 FROG CENSUS recording locations of the Brown Tree Frog (*Litoria ewingi*)



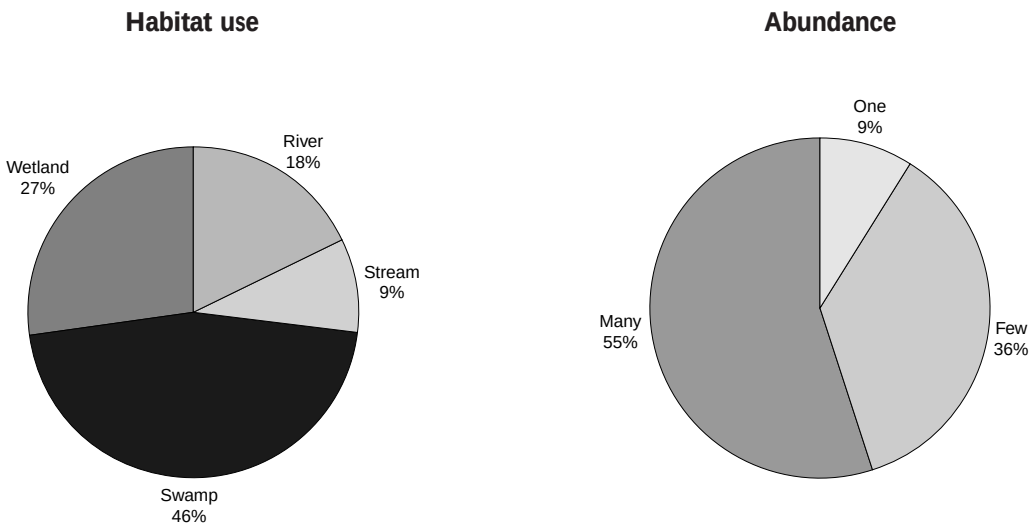
Peron's Tree Frog *Litoria peroni*

In South Australia, Peron's Tree Frog is only found along the River Murray. It is grey or brown and has a number of small, pale emerald spots. The skin fold above its ear is marked by a thin black line and the back of the thighs are heavily marked with black on yellow or orange. Peron's Tree Frog ranges in size from 44–65 mm.

Its call, which is a long series of 29–50 explosive notes, often described as a 'maniacal cackle', is the frog's most distinguishing characteristic.

The number of recordings of Peron's Tree Frog decreased in 1999 from previous years (Walker *et al.* 1999). The most obvious explanation for this decrease is that it results from drier conditions in 1999. Just over half of the recordings were for many (10–50). All recordings were made within their known distribution in the Murray Valley. Consequently, recordings were only made in streams, rivers, swamps and wetlands.

Figure 4 FROG CENSUS recording locations of Peron's Tree Frog (*Litoria peroni*)



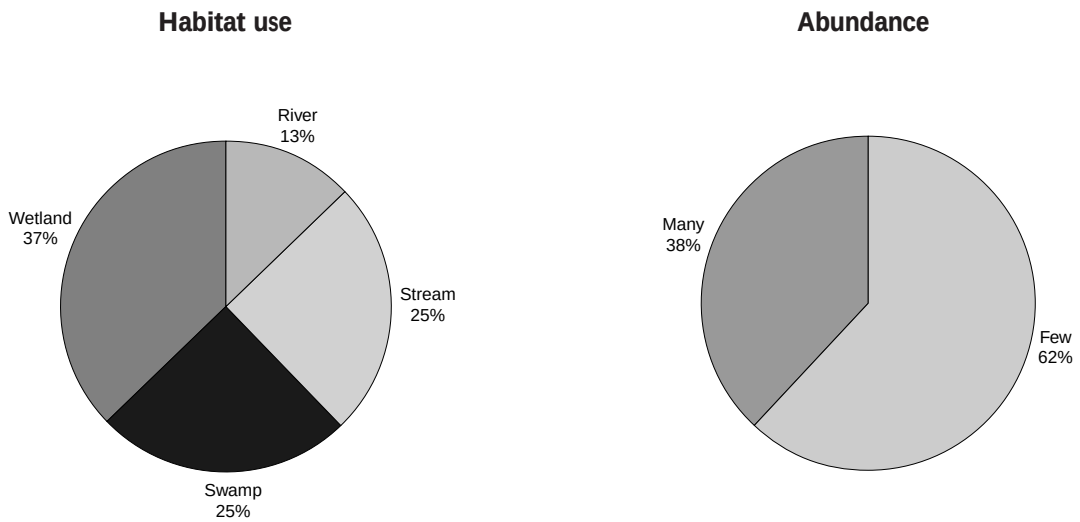
Southern Bell Frog *Litoria raniformis*

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 turquoise. Fingers are not webbed and the toes are almost fully webbed.

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

Following the wet conditions experienced between FROG CENSUS 1997 and 1998, the number of recordings of the Southern Bell Frog jumped from a low of 3 (0.2%) in 1997 to 17 (1%) in 1998 (Walker *et al.* 1999), similar to the pattern observed for Peron's Tree Frog. In 1999 just 8 recordings were made throughout its range in the Murray Valley and none were taken in the South-East. The abundance of frogs at the sites was many (10–50) or few (2–9). All recordings were taken in typically wet habitats: rivers, swamps and wetlands.

Figure 5 FROG CENSUS recording locations of the Southern Bell Frog (*Litoria raniformis*)



Red Tree Frog *Litoria rubella*

This species has a wide geographic distribution, occupying most of the arid zone in the State's north-east. The frog is pale grey to red-brown with some small black flecks. A dark band extends along the side of the head and body. Underneath, the skin is white, except the throat of breeding males which is a very dark grey. The limbs are short and robust, and the fingers and toes have large discs. The fingers have slight webbing while the toes are half webbed. Its size ranges 28–43 mm.

The mating call of this species is a loud screeching or high-pitched, distinctly pulsed note—much like the screech of a seagull.

The Red Tree Frog was recorded from only one location, at Lubra Waters on Brachina Creek in the Flinders Ranges. Few (2–9) frogs were recorded at this site. This species was recorded at a number of sites in the Flinders Ranges in 1998 (Walker *et al.* 1999).

Figure 6 FROG CENSUS recording location of the Red Tree Frog (*Litoria rubella*)

3.3.2 Family Leptodactylidae

The frogs in the family Leptodactylidae (known as Myobatrachidae by some authors) are usually terrestrial, but occupy a wide variety of habitats, ranging from wet areas around streams and in swamps to desert regions that have very little water. There are very few morphological characteristics to help distinguish these species, of which there are six different genera in South Australia. There are also many and varied reproductive strategies used, even within a genus, highlighting the diversity within this family. They may lay eggs in clumps that they attach to submerged vegetation, produce a floating foam nest, lay long chains of eggs, or even use direct or semi-direct development within the egg capsule laid on land. 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*).

Desert Froglet *Crinia deserticola*

The Desert Froglet occurs predominantly in the Cooper Creek system. It has robust hind limbs, warty skin and a pale, unspotted belly. 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. The Desert Froglet is mostly found in creek beds, soaks and claypans associated with broad river channels. Individuals often can be found sheltering under leaves, rubbish and timber.

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.

In 1999 the species was found near the Tirrawarra Waterhole during a University of South Australia field trip. A number of individuals were sheltering in cracks in the claypans and many were also heard calling. There was a suggestion that this species may have been among those recorded in the 1998 FROG CENSUS, but the recording was of poor quality and the species calling on the tape could not be accurately identified.

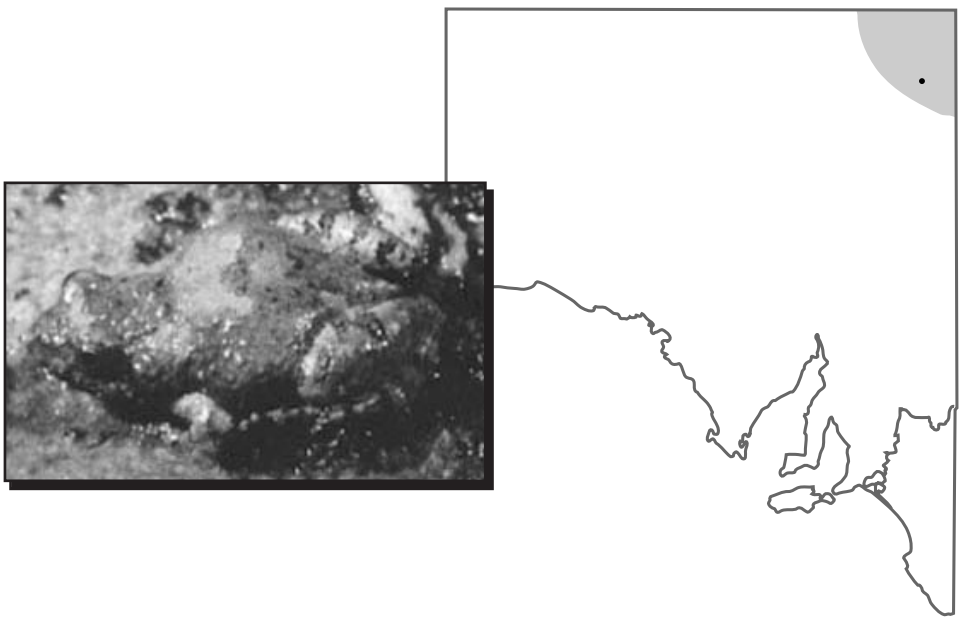


Figure 7 FROG CENSUS recording location of the Desert Froglet (*Crinia deserticola*)

Eastern Sign Bearing Froglet *Crinia parinsignifera*

The Eastern Sign Bearing Froglet is distributed along the River Murray north of Walker's Flat. It is small with variable colour patterns. The grey or brown skin on the back is smooth or may have ridges or other raised areas. The belly is rough.

The mating call is a long, harsh, slowly repeated 'squelch'. Tyler (1977) suggests that the call is like the noise made when a wet finger is drawn over an inflated balloon.

There was a reduction in the number of recordings of the Eastern Sign Bearing Froglet, from 24 in 1998 (Walker *et al.* 1999) to 16 in 1999. The number of recordings in 1999 was similar to 1997, which was also a dry year, although in 1999 it made up a lower proportion of recordings (0.8%). All recordings were made within the known distribution of this species, covering the extent of its range along the River Murray. Most recordings were of many (10–50) or few (2–9) frogs. The majority of recordings were from wetlands (Table 4) along the River Murray.

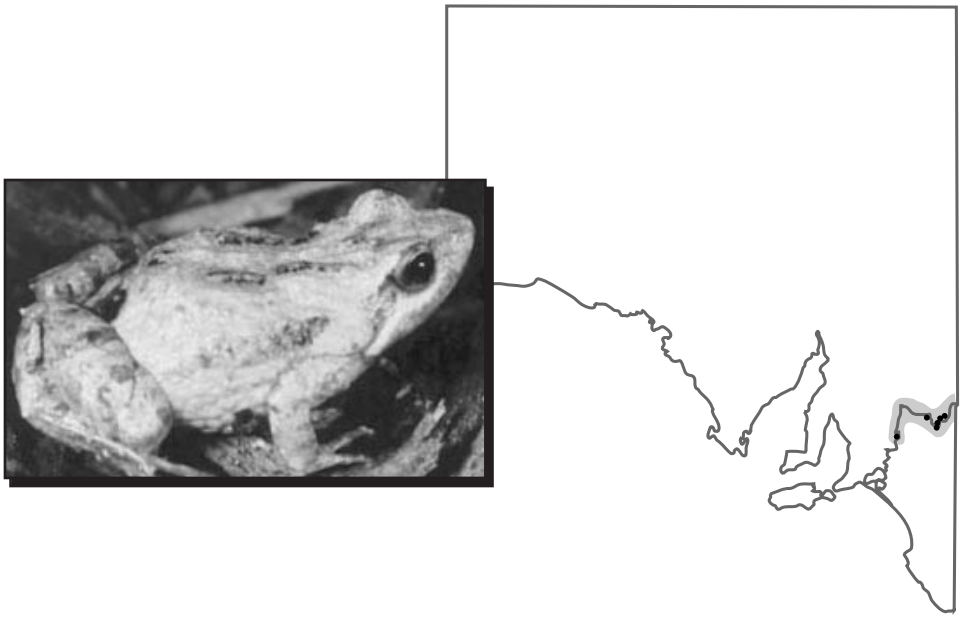
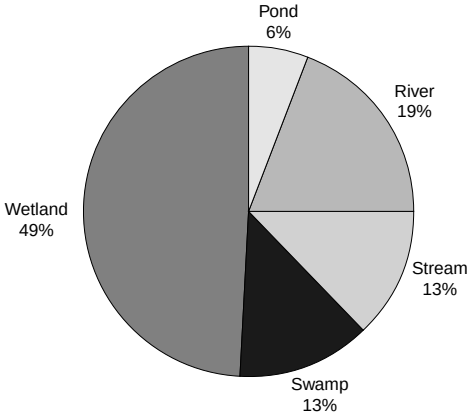
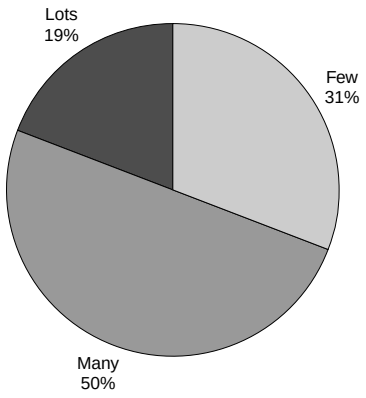


Figure 8 FROG CENSUS recording locations of the Eastern Sign Bearing Froglet (*Crinia parinsignifera*)

Habitat use



Abundance



Streambank Froglet *Crinia riparia*

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

The advertisement call is a soft 'kra-a-a-a-a-a-ack' that is repeated slowly and sounds like a squeaking door.

The number of FROG CENSUS sites in the Flinders Ranges increased slightly in 1999, yet the number of sites with the Streambank Froglet was the same as in 1998 (two); they were, however, recorded at different sites. Lots (>50) of froglets were seen by a pond at Oraparinna Ranger's Station, and few (2–9) were recorded from Oraparinna Creek at the nearby Dingley Dell Camping Ground.

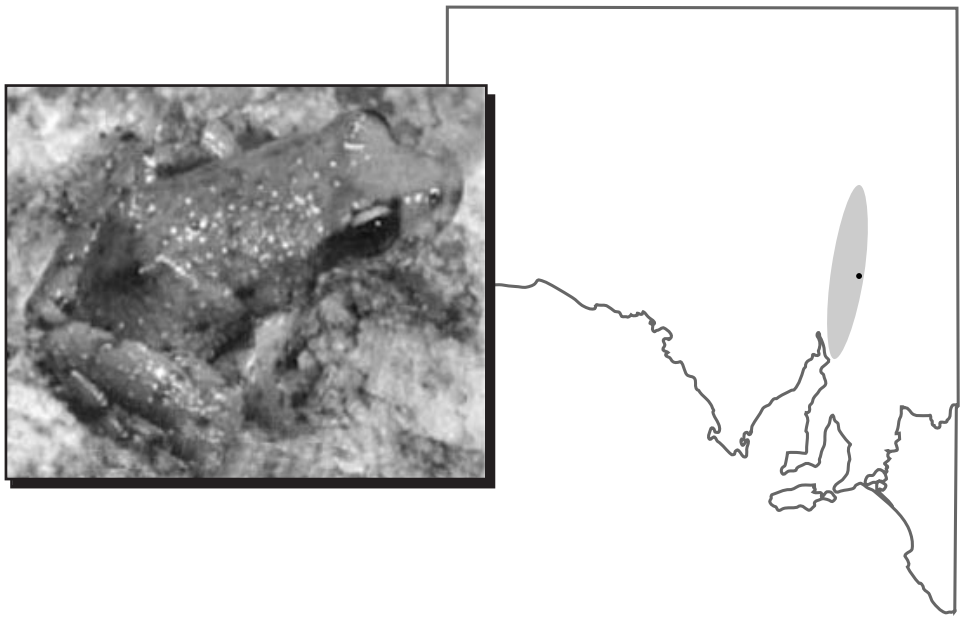


Figure 9 FROG CENSUS recording locations of the Streambank Froglet (*Crinia riparia*)

Common Froglet *Crinia signifera*

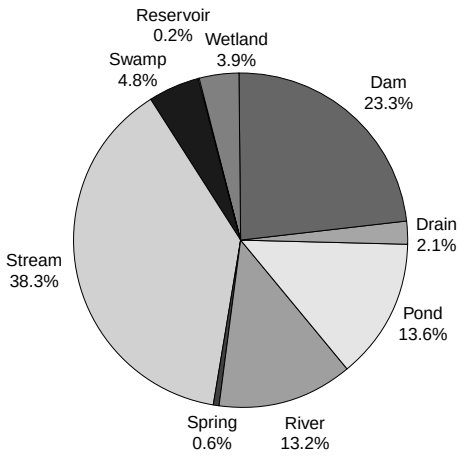
The Common Froglet is the most commonly found frog in streams of the Mt Lofty Ranges and the South-East of South Australia. It also occurs on southern Eyre Peninsula and Kangaroo Island. The species has skin that is highly variable in colour and texture; it may be plain, striped or spotted, smooth, warty or rigid. The belly is usually white with black markings.

Its call is a variable series of 'Crick . . .Crick . . .Crick', repeated at irregular intervals.

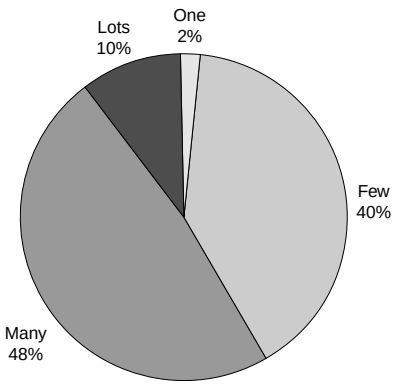
The Common Froglet was the most common species recorded in 1999, making up approximately 43% of all calls and being recorded from 739 of the 913 sites sampled (81%). There were more Common Froglets recorded this year than in any other year. As a proportion of total recordings, this species has consistently made up nearly half of all calls recorded in each year (Table 3). Common Froglets were recorded in every habitat type, although most were from streams and dams (Table 4). Most sites had many (10–50) or few (2–9) frogs calling. With the exception of the Eyre Peninsula, the Common Froglet was calling from all parts of its known distribution and does not appear to be experiencing any population declines. Three recordings were made between the River Murray and Bordertown, just outside of the published distribution.

Figure 10 FROG CENSUS recording locations of the Common Froglet (*Crinia signifera*)

Habitat use



Abundance



Smooth Frog *Geocrinia laevis*

The Smooth Frog can be found in leaf litter in dry sclerophyll (*Eucalyptus*) and pine forests that are subject to temporary flooding. 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 consists of a variable number of pulses, the first often being longer than the rest repeated at irregular intervals; 'cra-a-a-a-a-a-ck . . ..cra-a-a-ck . . .cra-a-ck'. The call is very similar to the call of the Common Froglet, found in the same region.

1999 marks the first appearance of the Smooth Frog in the FROG CENSUS, at Honan's Scrub (a site that has been sampled during a number of other censuses) and also at a new location. Due to the fact that it had not previously been recorded in the FROG CENSUS, a separate EPA survey for this frog was carried out during 1999, prior to the 1999 FROG CENSUS. In that study it was collected or recorded calling from 13 sites within the Reedy Creek/Dismal Swamp drainage area in the South-East, including Honan's Scrub, and also from Canunda National Park. It is certainly possible that the Smooth Frog has been confused with the Common Froglet in previous years. The survey provided a greater ability to recognise the call of this species.

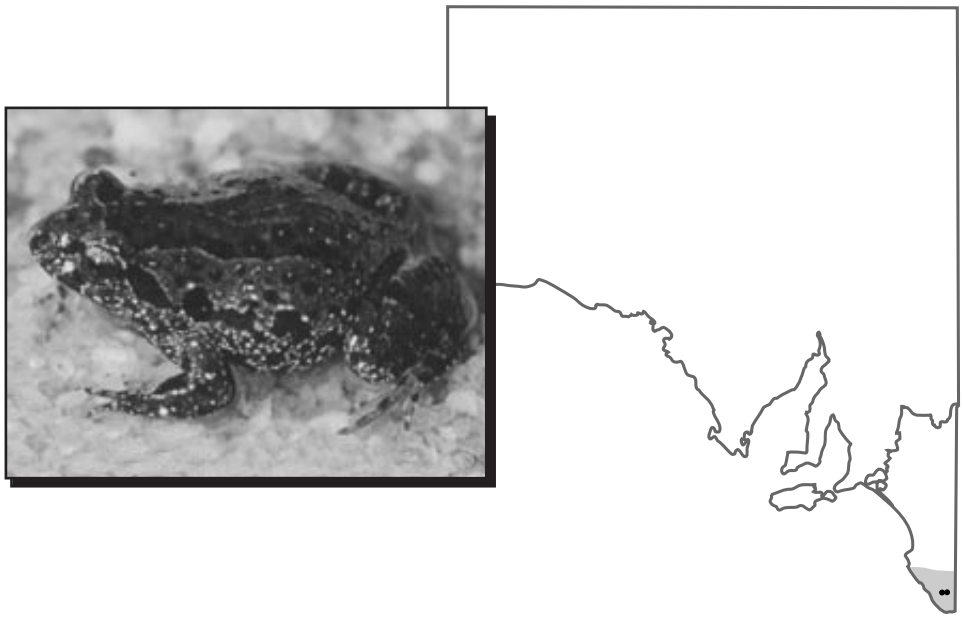


Figure 11 FROG CENSUS recording locations of the Smooth Frog (*Geocrinia laevis*)

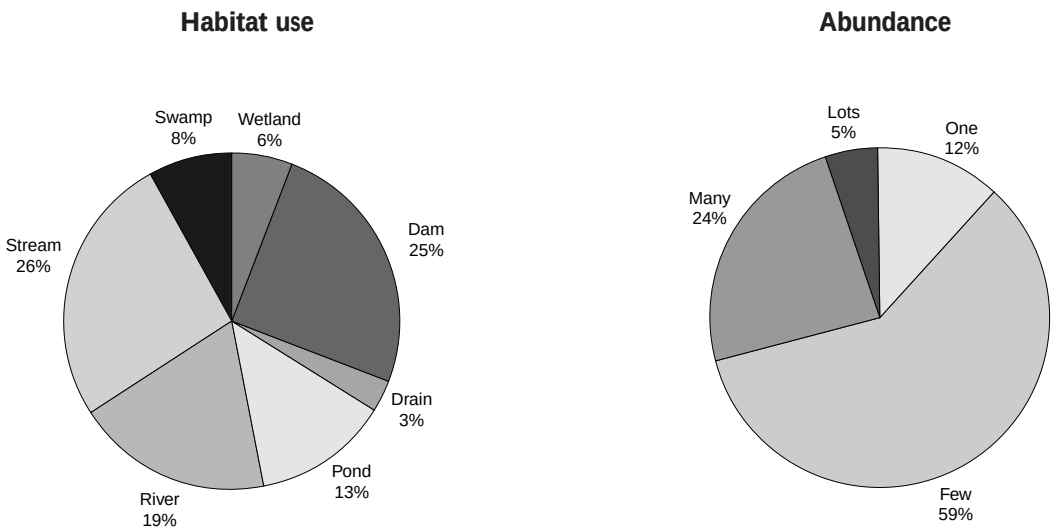
Eastern Banjo Frog *Limnodynastes dumerili*

The Eastern Banjo Frog is a common inhabitant of wetlands and rivers. During dry periods it spends its time in a burrow and is often dug up by gardeners who 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. Eggs are laid in a large foam nest attached to floating or emergent vegetation.

The mating call is a loud, explosive 'Bonk'.

The number of Eastern Banjo Frog recordings in 1999 was the highest since 1995. Recordings were made throughout its known distribution. The majority of recordings were of few (2–9) frogs. Eastern Banjo Frogs were found in all habitats, with the exception of springs and reservoirs, with most recordings being taken at streams and dams.

Figure 12 FROG CENSUS recording locations of the Eastern Banjo Frog (*Limnodynastes dumerili*)



Long Thumbed Frog *Limnodynastes fletcheri*

In South Australia the Long Thumbed Frog is restricted to the Murray Valley. It is a medium-sized frog which is 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*).

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

The highest number of recordings of the Long Thumbed Frog since the beginning of the FROG CENSUS was made in 1999. Six recordings of this species were made in the lower reaches of the River Murray. The recordings were of few (2–9), many (10–50) or lots (>50%) of frogs. All recordings were made in swamps adjacent to the main river channel. Recordings were only made within the southern portion of the known range for this species.

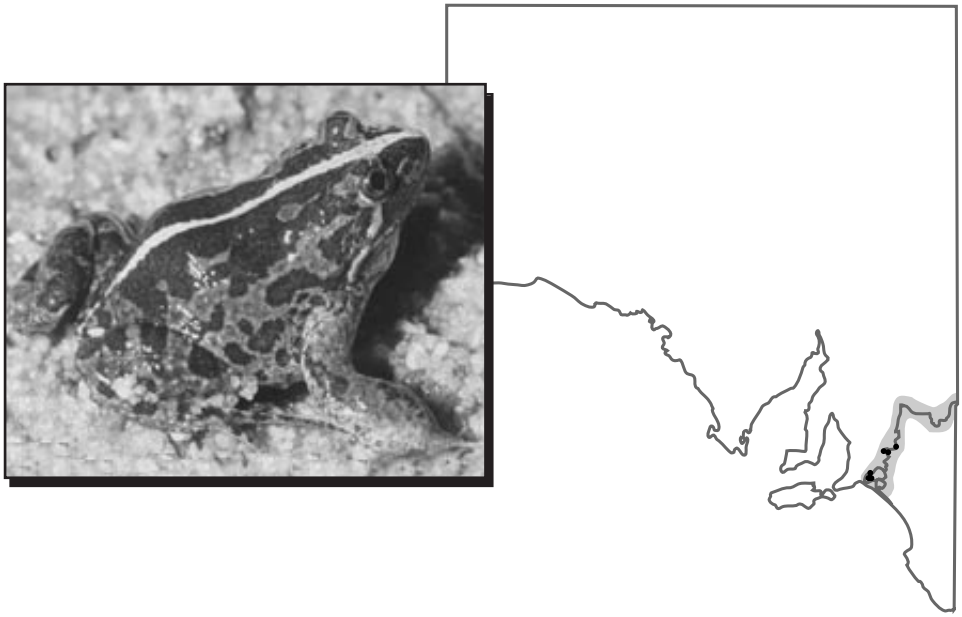
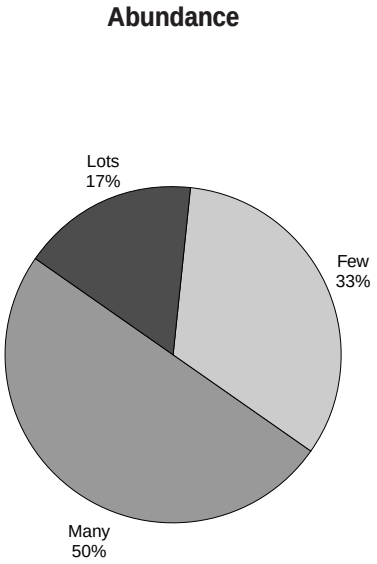


Figure 13 FROG CENSUS recording locations of the Long Thumbed Frog (*Limnodynastes fletcheri*)



Brown Striped Marsh Frog *Limnodynastes peroni*

The Brown Striped Marsh Frog is a medium-sized frog whose dorsal (top) surface is marked with brown longitudinal stripes. The longitudinal 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 call is a loud 'Tok' or 'Pok', much like the sound of a tennis ball being hit, or of corn popping.

All recordings of this species were within its known distribution range in the South-East of the State. The number of recordings (15) was less than last year (21). Most recordings were of few (2–9) or many (10–50). One site had one frog calling. Most recordings were taken in wetlands and drains.

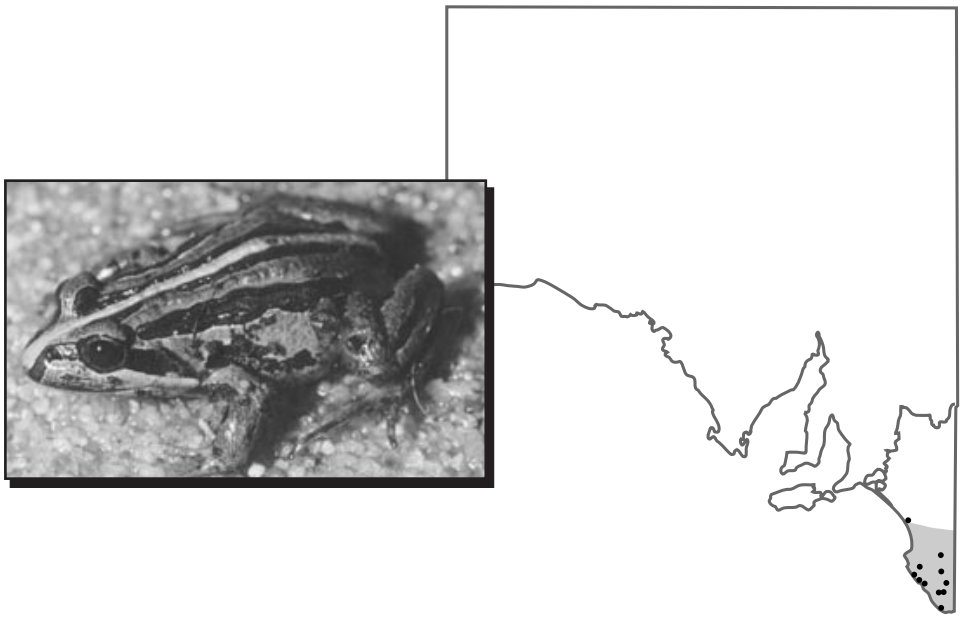
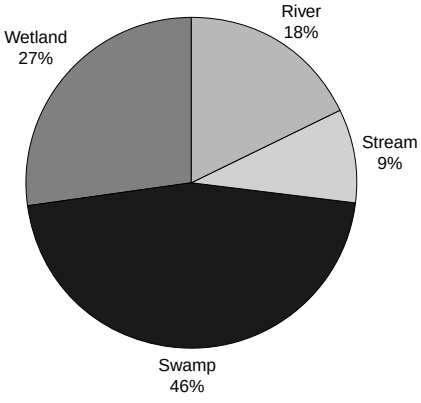
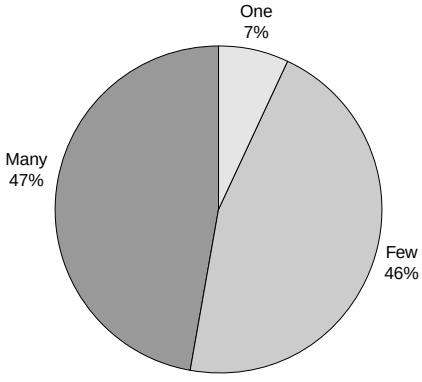


Figure 14 FROG CENSUS recording locations of the Brown Striped Marsh Frog (*Limnodynastes peroni*)

Habitat use



Abundance



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 which may change over the course of the day, being particularly pale at night. The ventral (lower) surface of the body is smooth and white. Breeding males have a dark yellow-green throat. Many specimens have a mid-dorsal stripe which may range from white or yellow through to rusty red. Females have large flanges (flaps of skin) on the first two fingers.

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’ (Mt Lofty and Flinders Ranges).

Once again this species was recorded from many locations (19%) during the 1999 FROG CENSUS, and was the second most abundant species. Recordings were made throughout much of its range, including the South-East, River Murray, Kangaroo Island, Adelaide Hills, Yorke Peninsula, Flinders Ranges, and Eyre Peninsula. It occurred in all habitats except reservoirs, with most recordings being made in streams and dams.

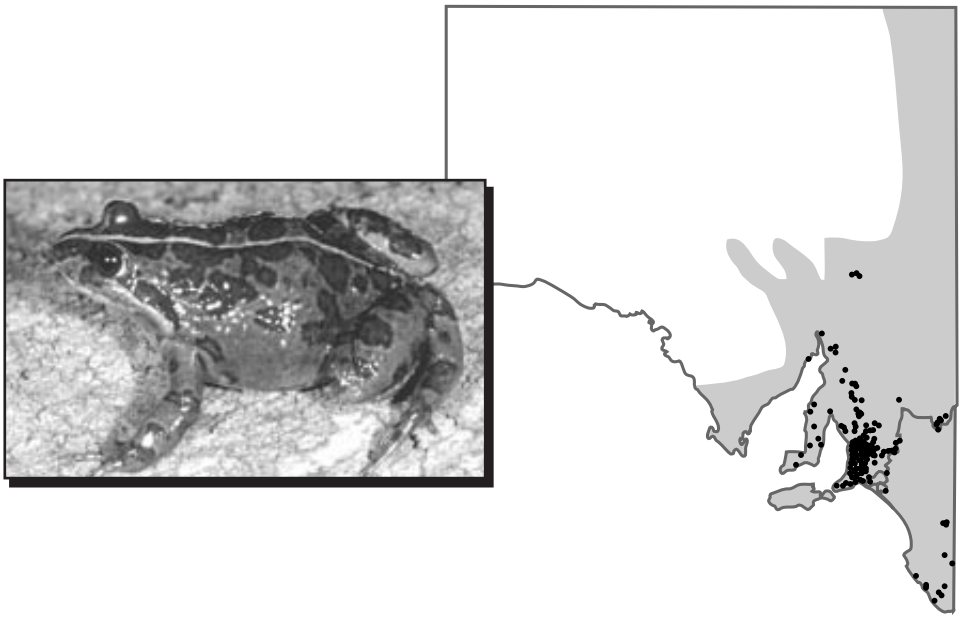
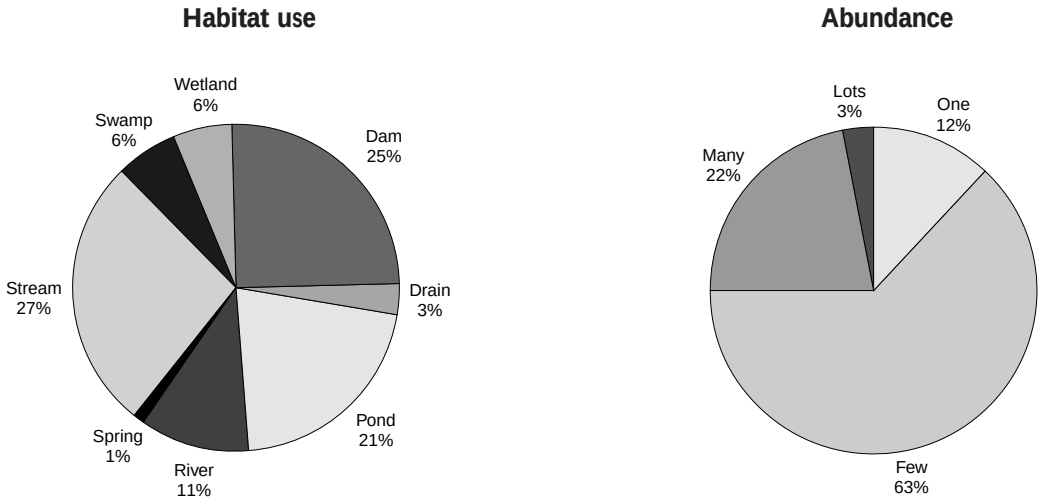


Figure 15 FROG CENSUS recording locations of the Spotted Grass Frog (*Limnodynastes tasmaniensis*)



Trilling Frog *Neobatrachus centralis*

The Trilling Frog is characterised by a high and broad head. Its colour is mostly sandy-grey to brown, with irregular dark and light markings. The frog may also have a stripe running down its back. The eyes are large and the tympanum (ear) is not visible. The limbs are short and the toes are cylindrical with extensive webbing, but the fingers are unwebbed.

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

The only site where the Trilling Frog was recorded in 1999 was from a drain at Carlton Primary School in the Southern Flinders Ranges. No recording was undertaken at the sites where this species was recorded in 1998. The recording was of few (2–9) frogs calling. While this recording is once again outside the published distribution, the species is known (Tyler pers comm) to occur in the region.

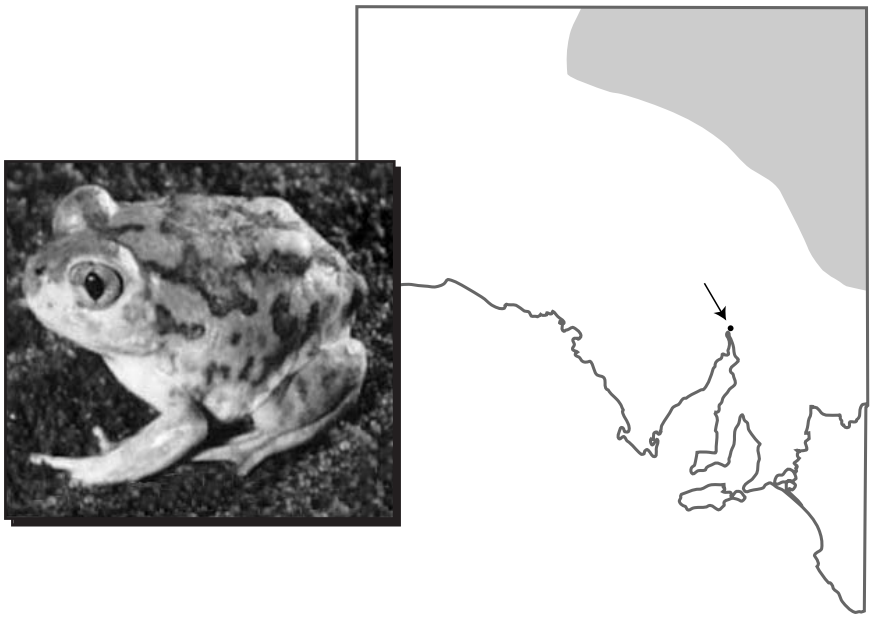


Figure 16 FROG CENSUS recording location of the Trilling Frog (*Neobatrachus centralis*)

Painted Frog *Neobatrachus pictus*

Living in woodland, mallee, open and disturbed areas of South Australia, the Painted Frog has no obvious site preferences. The species is moderate in size (46–58 mm), stockily built with short limbs, and is generally deep olive 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 Painted Frog's skin is smooth, except during the mating season when the male will develop tiny black thorns.

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

Following the extremely dry conditions experienced in 1999 there was a reduction in the number of recordings of the Painted Frog. Recordings were made at only three sites, the lowest number for any FROG CENSUS. In 1998 the number (9) had reduced from 12 in 1997. The recordings were made at dams in the Adelaide Plains area and were of few (2–9) frogs.

Figure 17. FROG CENSUS recording locations of the Painted Frog (*Neobatrachus pictus*)

Sudell's Frog *Neobatrachus sudelli*

Sudell's Frog is a small (38–49 mm) frog that can be distinguished by the 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 a membrane of skin between the knee and the side of the body.

The male calls a short 'musical trill' 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.

In 1999 only one recording of Sudell's Frog was made, similar to 1995 and 1997. In 1998, when wet conditions prevailed and there was a wider sampling range, eight recordings were taken (Walker *et al.* 1999). The 1999 recording was of a single frog at a swamp near Bordertown. A number of sites where this species was recorded in 1998 were not visited in 1999.

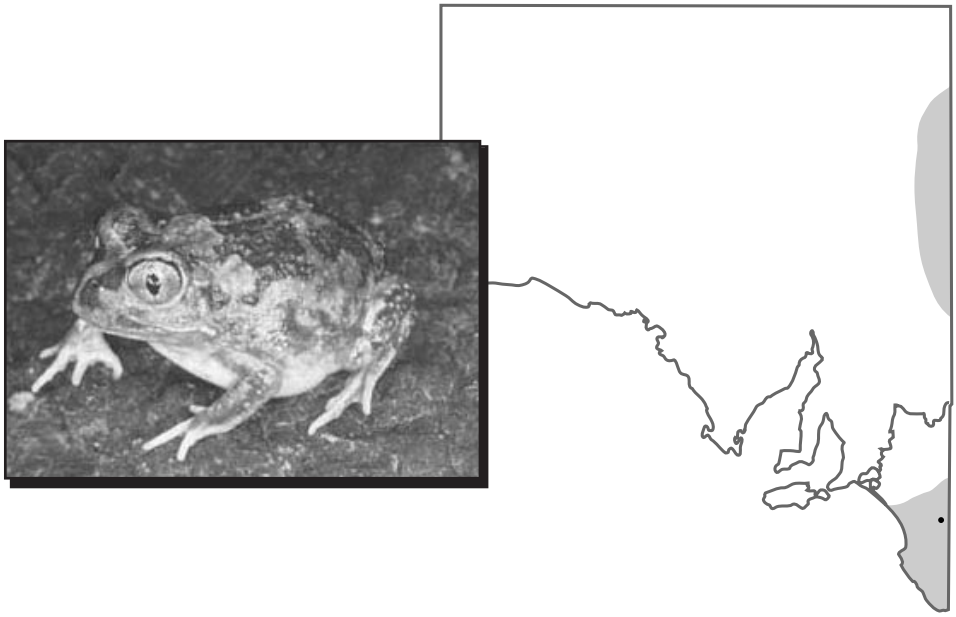


Figure 18 FROG CENSUS recording location of Sudell's Frog (*Neobatrachus sudelli*)

Bibron's Toadlet *Pseudophryne bibroni*

Although the most abundant and widespread of its genus, Bibron's Toadlet is believed to have become less abundant in recent times. They are generally found singularly or in low numbers under rocks and logs, and breed in grassy areas beside creeks.

Bibron's Toadlet 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 again decreased. Three recordings (0.2% of total) were made—at two sites in the Mt Lofty Ranges, and also at the northern end of its known range in the Flinders Ranges. No recordings were made in the South-East region. It was recorded from a pond, stream and dam. All recordings were of few (2–9) frogs.

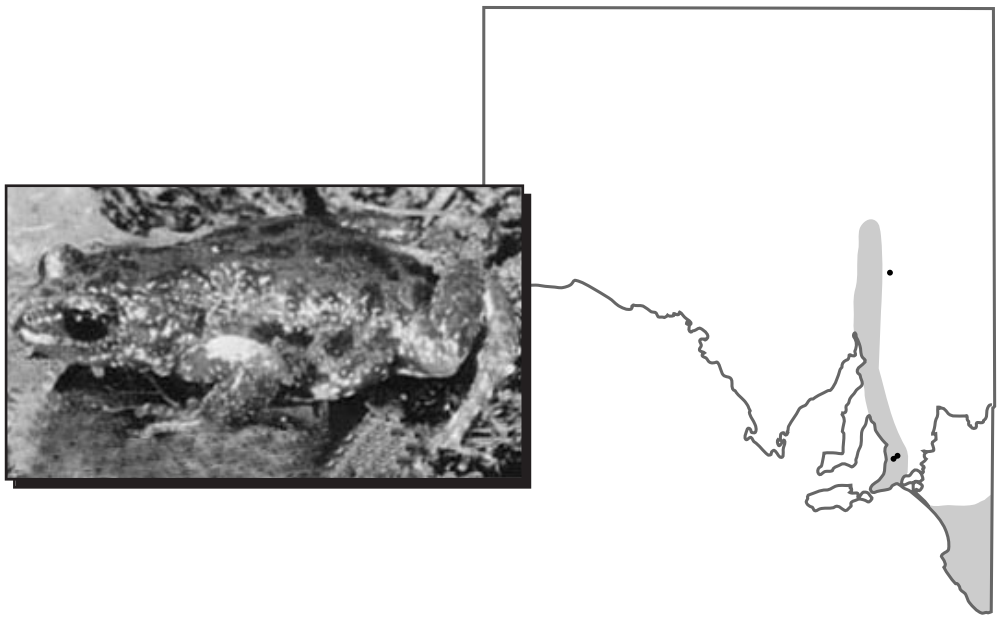


Figure 19 FROG CENSUS recording locations of Bibron's Toadlet (*Pseudophryne bibroni*)

3.4 No frogs recorded

This year the highest number of recordings with no frogs calling was returned (91 from 89 different sites). This was the largest proportion of sites with no frogs calling in any FROG CENSUS. Sites with no frogs were concentrated in the Mount Lofty Ranges, Mid-North, and South-East of the State. A number of sites on Kangaroo Island, Eyre Peninsula, Yorke Peninsula and the Murray Valley also had no frogs calling (Figure 20). There is no obvious pattern to the distribution of sites without frogs. While many of these sites are located at the lower reaches of catchments in the Mt Lofty Ranges, there are many nearby sites on the same waterways that have frogs.

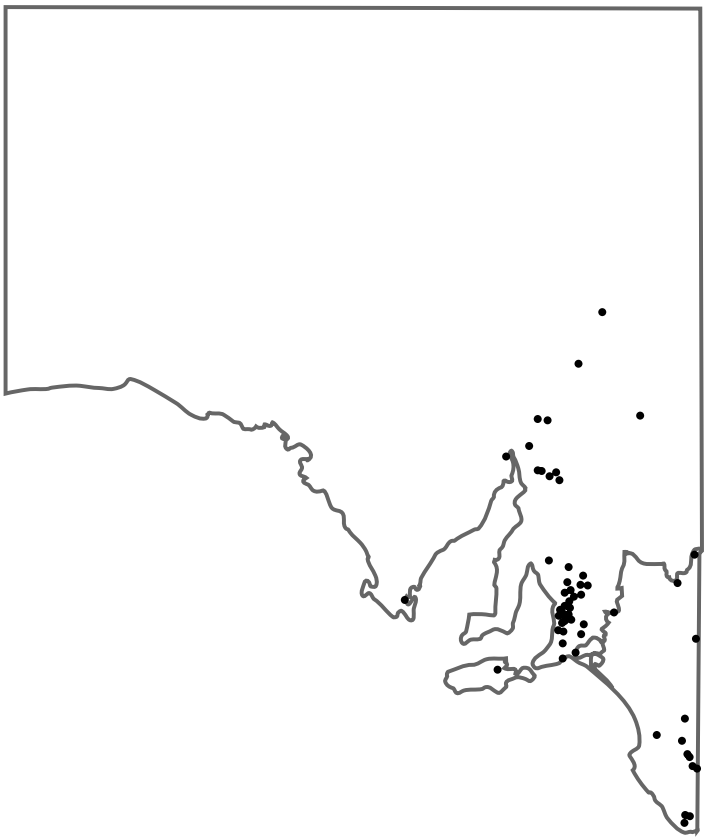
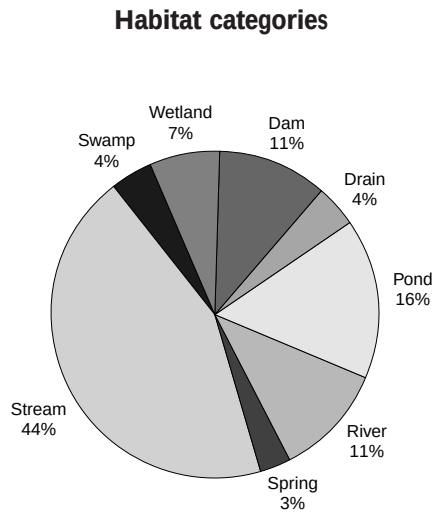


Figure 20 FROG CENSUS recording locations where no frogs were recorded



3.5 Species diversity

There was an increase in species diversity at many sites in 1999. Table 6 shows the percentages of sites with more than one species in 1999, which were higher than in 1998 (Walker *et al.* 1999). In 1999 no sites had seven species recorded, but overall there were more sites with two or three species calling. The maximum number of species recorded was six, from two sites in the Murray Valley. One area near Purnong Landing has consistently returned a high number of species calling. The other site with six species was a new site at a wetland near Teal Flat opposite Younghusband. Sites with five species recorded were located in the Mt Lofty Ranges, Murray Valley and South-East.

Table 6 Number of sites with species tally.

No. of species	No. of sites	% of total
0	89	8.8
1	347	34.4
2	335	33.2
3	178	17.6
4	48	4.8
5	11	1.1
6	2	0.2

Some sites were recorded more than one time and may therefore have been included in multiple categories.

4. DISCUSSION

The 1999 FROG CENSUS was the most successful to date. Despite a decrease in the geographic range of sites sampled, two species which had not previously been recorded by this programme were heard for the first time: the Desert Froglet in the arid North-East of the State, and the Smooth Frog at a previously recorded location in the South-East and at a new site nearby.

4.1 Frogs of South Australia

4.1.1 Novel species recorded

Two species were recorded for the first time in a FROG CENSUS: the Desert Froglet in the North-East and the Smooth Frog in the South-East.

4.1.2 Species not recorded

Thus far the FROG CENSUS programme has recorded 22 of the 28 frog species known to occur in the State. The species not recorded in any FROG CENSUS to date are the:

- Knife Footed Frog (*Cyclorana cultripes*)
- Main's Frog (*Cyclorana maini*)
- Gunther's Frog (*Litoria latopalmata*)
- Desert Spadefoot Toad (*Notaden nicholIsi*)
- 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 record 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 that it has since died out in the region.

4.1.3 Geographical variation

The number of species recorded in 1999 in each of the regions of the State (region names follow Tyler 1977) is shown below. Figure 1 shows the distribution of recording sites within these regions. Once again, the Murray Valley demonstrated the greatest frog diversity, and the drier regions the lowest.

The species recorded in each region are as follows:

Eyre Peninsula (1 species)
Spotted Grass Frog

Flinders Ranges (6 species)
Red Tree Frog, Streambank Froglet, Common Froglet, Spotted Grass Frog, Trilling Frog, Bibron's Toadlet

Kangaroo Island (4 species)
Brown Tree Frog, Common Froglet, Eastern Banjo Frog, Spotted Grass Frog

Mt Lofty Ranges and Central Districts (6 species)
Brown Tree Frog, Common Froglet, Eastern Banjo Frog, Spotted Grass Frog, Painted Frog, Bibron's Toadlet

Murray Valley (8 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

North-East (1 species)
Desert Froglet

South-East (7 species)
Brown Tree Frog, Common Froglet, Smooth Frog, Eastern Banjo Frog, Brown Striped Marsh Frog, Spotted Grass Frog, Sudell's Frog

Yorke Peninsula (3 species)
Common Froglet, Eastern Banjo Frog, Spotted Grass Frog.

4.2 Frogs as indicators

It must be recognised that the FROG CENSUS approach does have limitations, many of which have been recognised by the participants in this programme. The distribution of sites sampled has always centred around the Adelaide region and does not give us a complete view of the whole State. Frogs do not call when they are not breeding, and the FROG CENSUS may not coincide with the breeding season of all South Australian species. The timing of the census was changed in 1995 from late October–early November to early September to coincide with the time when more species were expected to be breeding (Goonan *et al.* 1997).

However, the FROG CENSUS is the only programme recording frogs throughout the whole State. It is a programme which is being used to observe broad patterns and trends of species richness and, in conjunction with other EPA projects, is providing a framework to detect and monitor environmental impacts over time.

The FROG CENSUS is a programme that any member of the South Australian public can become involved in. It does not require any special knowledge or skills, and enables the whole community to actively participate to enhance our knowledge of both the aquatic and terrestrial environment in South Australia. Participants in the programme cover a wide age range, and in many cases the FROG CENSUS has become an activity which the whole family engages in and looks forward to each year. The local knowledge of participants is a valuable resource which the EPA takes great pleasure in using and fostering.

4.3 Comparisons with previous years

Generally, the frequency of common species recorded was as great or greater than in previous years. This was most likely because of an increase in the number of participants from the Adelaide Hills region, where most recordings are of common species. Regional diversity was similar to 1998 (Walker *et al.* 1999). Decreases in the number of recordings of other species in 1999 are probably due to the dry winter which was followed by a hot summer with very late rains. This is supported by the lack of records of burrowing frogs which wait until the rains for breeding. The absence this year of species that were present last year is almost entirely due to the decrease in the geographic range of recordings.

It is of great concern that there has been a decrease in the number of recordings of the Southern Bell Frog (*Litoria raniformis*) in the State, particularly in the South-East. As a result, a major survey will be undertaken in 2000 to determine the current distribution and abundance of this species in South Australia. The survey will include all of the areas where the frog has been known to occur, including the River Murray, Mt Lofty Ranges and the South-East.

There has also been a steady decline in the number of recordings of Bibron's Toadlet (*Pseudophryne bibroni*) and the Southern Toadlet (*P. semimarmorata*) in the South-East. Although they tend to have a breeding season which starts before the FROG CENSUS there have not been many reports of these species, particularly the Southern Toadlet, in recent years. It has been suggested that they may be experiencing a decline, possibly as a result of recent fires in the region. These species may also warrant further investigation if they continue to be rarely recorded during the FROG CENSUS programme.

4.4 Chytrid fungus outbreaks in South Australia

Zoologists recently discovered a mysterious new fungus that is killing the world's frogs and toads. It is not known where the fungus came from, or how it spread between continents, but it has struck at least ten species of frogs in ten areas of Australia, as well as seven species of frogs and toads in Panama and six species in American zoos and aquariums. The fungus appears to be widespread, occurring in almost all areas where sick or dying frogs have been collected, including Queensland, New South Wales, Victoria, South Australia and Western Australia.

The fungus (*Batrochytrium dendrobatidis*), which was discovered independently by researchers in the United States and Australia, belongs to a new genus of aquatic chytrid, a group thought to be related to the earliest fungi. This is the first time a chytrid fungus has been found to parasitise vertebrates. Chytrid fungi are one of the most common types of fungi and are found throughout most of the environment. Other types of chytrid fungi can live freely in the water or soil, and there are some types that are parasites of plants and insects. This new fungus lives in the top layer of the frog's skin, is microscopic, and spreads by spores that are dispersed in water. Frogs with chytridiomycosis can die, be ill or appear clinically normal. Behavioural changes are the most obvious of the clinical signs, but unless these are prominent the diagnosis of infection may not be made, since other changes are less apparent.

The high impact of the chytrid fungus on frogs suggests it has been recently introduced to Australia. In 1999 researchers from The University of Adelaide were involved in a collaborative project with catchment boards and the EPA to detect the presence of the chytrid fungus in the Adelaide metropolitan area and the hills region. The fungus was found at a number of locations in the city and surrounds, and was also detected at Kadina, Balaklava and Penola, with an unconfirmed report being received from Whyalla.

The locations where the fungus was found in the Adelaide region can be seen in Figure 21. Also shown on this map are the numbers of species of frogs which were recorded at nearby sites in the 1999 FROG CENSUS. There are no obvious trends relating the occurrence of the fungus and the presence of frogs, but the populations of frogs in the region will be closely monitored by the FROG CENSUS in future years.

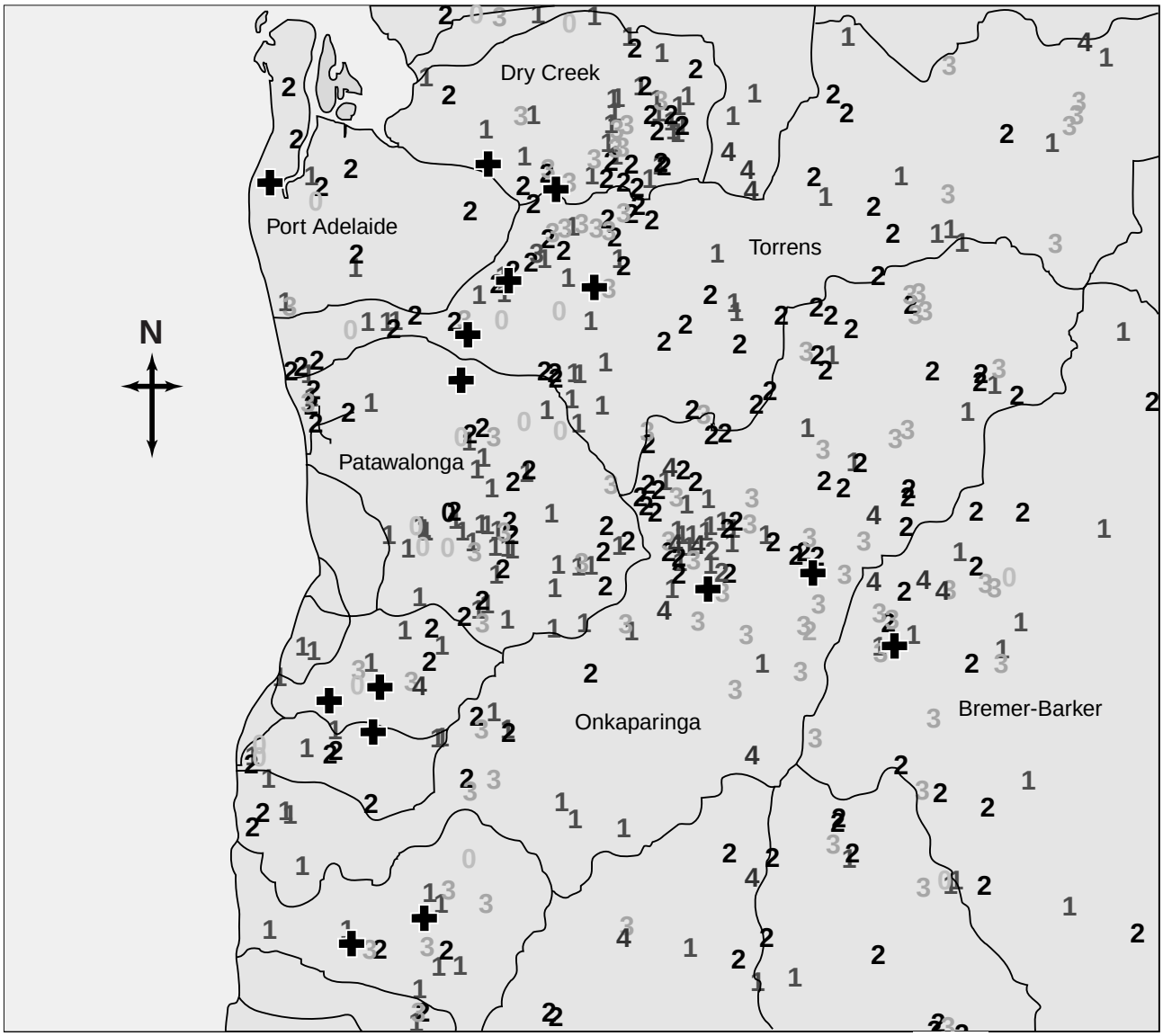


Figure 21 Chytrid fungus outbreaks in the Adelaide Hills. The number of species of frogs recorded at nearby sites during the 1999 FROG CENSUS is shown for reference.

4.5 Future directions

Next year an effort needs to be made to include sites from the northern regions of the State that were not included this year. It is likely that frogs were not calling in this area in 1999 because of the dry winter. Frogs in these areas are dependent on water for breeding, so tapes that can be used at any time of the year when frogs are calling will be mailed to landholders in these regions.

As previously mentioned, a survey will be undertaken to record the current distribution and abundance of the Southern Bell Frog (*Litoria raniformis*) in South Australia. Reports suggest that this species is undergoing a decline in the eastern states (Tyler 1997), and there have been few recordings from the southern section of its previous distribution in the South-East of South Australia during the course of the FROG CENSUS. A survey will be of great value in determining the conservation status of this frog in South Australia.

A large amount of data has now been collected during the FROG CENSUS. In the future this data will be used in conjunction with data collected through other EPA programmes to determine areas that have poor environmental health and may need further investigation.

Frog Census 1999 Datasheet

12-18 September

FROG CENSUS represents a 'snapshot' of where frogs occur and where they are absent in the waterways of South Australia. These include our rural and urban streams, drains and wetlands. The census involves a simple assessment of habitat health at the location you choose to visit, based on the assumption that healthy habitats provide suitable conditions for diverse frog populations, and that less healthy habitats have fewer frogs and less diverse frog populations. For more information visit the webpage *www.epa.sa.gov.au/frogcensus*, or call us on 8204 2099.

This year the FROG CENSUS is being run in conjunction with the Community Biodiversity Network's Earth Alive! National Biodiversity Month. For more information and other activities visit the webpage *www.cbn.org.au* or phone (02) 9380 7629.

During Frogweek from 12 to 18 September 1999 (only 1 day of recording is required), visit your location for about half an hour about 1-3 hours after dusk (or as near to this time as possible). At the start of the recording, state your name, the date, start time and location. Record any frogs calling at your location onto the cassette tape for about 5 minutes. If you have any problems, such as the tape not working, please contact us for a replacement. On the label of the tape, write your name, date, start time and location.

Please **fill in all sections** of the datasheet, except where **office use only**.

Observer's Name: _____

Contact Address: _____

_____

Postcode: _____

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

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

Location

(If this site has been recorded in a previous census please give the name we used when we posted the results for your site. **Please** use a separate datasheet for each site (neat hand-written is okay). Sites less than 100 m apart will be classed as one site, unless they are obviously separate waterbodies.)

_____

_____

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:

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, e.g. nearby street names, suburbs/towns, parks/reserves, etc)

_____

_____

Date of observation (e.g. 14 September 1999): _____

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

Habitat

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

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)

Number of frog types heard calling: _____

Approximate number of frogs heard calling (total for all species combined): _____

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. We will identify your frog calls and let you know the results of your recordings.

Please send the tape back promptly 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 at the latest.

Office use only. Please leave blank.

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

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