6. Pitfall Trap Survey of Amphibians in Coffee Plantation and Sacred Grove Habitats at Coorg, South Karnataka, India.

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Abstract
1,728 pitfall trap nights over seven weeks caught 318 frogs of nine species in coffee plantation and sacred grove sites at Luckunda Estate, Coorg. Two species were caught only in the sacred grove. Two species were common in both habitats, two common only in coffee plantations and two most common in the sacred grove. One species occurred only in coffee plantations. The results suggest that heterogenous habitats support a higher number of species than plantations

Aims
The aims of the pitfall trapping experiment were to look for differences in species richness, diversity and composition in the trappable component of the amphibian community in different habitats at Luckunda Estate and to investigate the relationship between number of frogs caught and recent rainfall.

Methods
Eight pitfall lines were set at Luckunda Estate between the evening of 24 July and the morning of 29 August 1998. Positions are given in Map 2. Traps were 24 liter plastic buckets with depth of 35cm and top diameter of 35cm. Drift fencing was 70cm high corrugated plastic sheeting. Six buckets were set per line, spaced 2m apart with a total of 8m of fencing, in the manner described by Bennett (1999). The original intention was to check traps early morning, mid afternoon and late evening but logistics and safety considerations (proximity of elephants) meant that most evening checks were conducted before 1900hrs. A voucher specimen of each species caught was taken and deposited at Zoological Survey of India, Calcutta. Otherwise, frogs caught were identified, marked by toe clipping and released on paths close to the pitfall line. Reptiles caught in pitfall traps were identified to species wherever possible. Other animals were identified in an arbitary manner.

Results
In total 304 animals were caught in pitfall traps, of which 185 were frogs and 183 identified to species. Nine species, represented by 1-45 individuals, were caught. Eleven to 45 frogs were caught per pitfall line, 3-6 species per line. Other animals were agamids (4), skinks (19), worm snakes (7), snakes (3), crabs (10), rodents (28) and insectivores (48).

The most ubiquitous amphibians were *Bufo melanostictus* and and *Limnonectes limnocharis*, which were caught on all pitfall lines. *Rana curtipedes* and *Ramanella triangularis* were recorded on six lines, *H. tigerinus* (metamorphs) on five lines, Microhylids on four lines, white spot ranid and *Polypedates pseudocruciger* (metamorphs) on two lines. A single specimen of *Kalouala taprobanica* was caught and constitutes our only adult record of this species at Luckunda. *Microhyla rubra* was most clustered species, with 15 of 19 individuals caught on line E. Line E was also the site of greatest *Hoplobatrachus tigerinus* activity (12 of 22 captures).

	Sacred Grove (A-D)	Coffee Plantation (E-H)
Bufo melanostictus	26	17
Polypedates pseudocruciger	0	3
Kaloula taprobanica	1	0
Limnonectes limnocharis	22	23
Microhyla rubra	2	17

Rana curtipedes	28	2
Ramanella triangularis	14	6
Hoplobatrachus tigerinus	8	21
Nanobatrachus sp.	8	0

Table 1. Summary of pitfall captures.

Bufo and *Limnonectes* are equally common in both habitats. *Hoplobatrachus* and *Microhyla* were common in the plantation but rare in the sacred grove. *Ramanella* occured in both habitats but most abundant in the sacred grove. *Rana curtipes* was abundant in the sacred grove but rare in the coffee plantation. The white spot frog was only found in the sacred grove.

Activity levels were highest overnight for all species in both habitats except for two species in the sacred grove; *Ramanella* were most active in the early evenings, *Limnonectes* were equally active early evenings and overnight. All species show an incremental increase in activity with time of day, except for *Hoplobatrachus* metamorphs (more activity recorded in the afternoon than early evening and *Ramanella* (equal numbers of active individuals in early evening and overnight). Lowest daylight activity was recorded for the most common species *Bufo* and *Limnocharis*

Discussion

This study suggests that certain species of frogs were characteristic of sacred grove and coffee plantation habitats. White spot frogs, *Rana curtipides* and *Ramanella triangularis* were characteristic of sacred grove habitats and *Microhyla* were characteristic of coffee plantations. The experiment also demonstrates some of the spatial and temporal differences between frog species that are suggested by other parts of this study. Some species become active earlier than others, in the sacred grove at least. The cooler temperatures and higher humidity experienced in the herb layer during the day may be responsible for this.

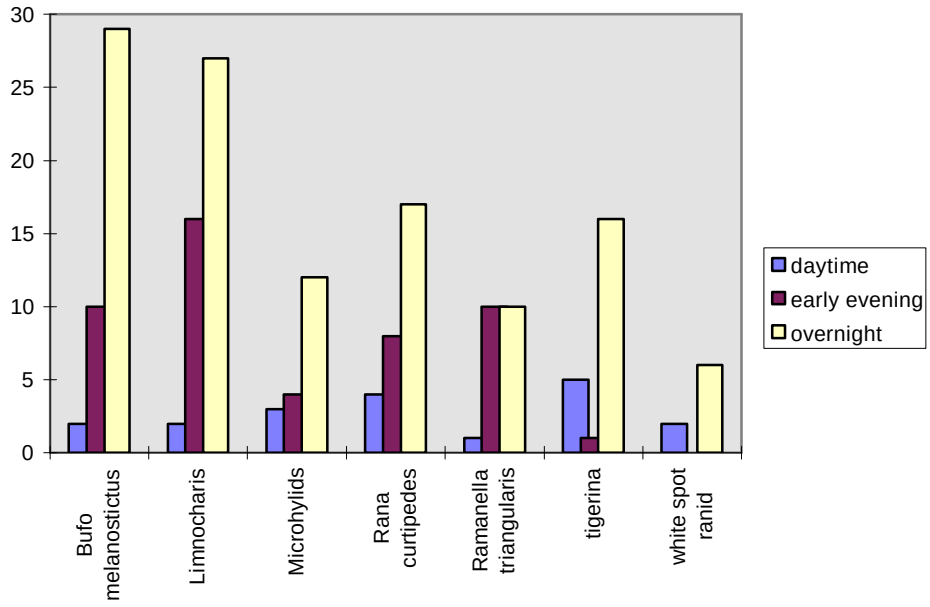

Figure 1. Activity periods for frogs from pitfall traps

The main advantages of pitfall trapping are that it removes the bias associated with individual researcher's ability to see frogs and provides data on activity levels that are difficult to glean from data generated by other survey techniques. The discovery of *Kaloula taprobanica* by pitfall trapping was significant because it was the only specimen found during the project. The principle disadvantages of the method are that only a proportion (here 50%) of species in the community are catchable, and that sampling is confined to a small, two dimensional transect to which no area can be attached. Many species do not frequent the ground level habitat that is being sampled and most of those that do are probably able to jump out of buckets or over drift fences. Additional drawbacks are the time and effort involved in constructing traplines and the risk of damage to roots inflicted during construction.

An important assumption that must be made when examining community properties from pitfall data is equal catchability between species sampled. Here catchability refers to the likelihood of any individual encountering and entering the trap and its subsequent ability to escape. In fact some species show evidence of clustering within habitats that suggests encounters with traps are more likely on some lines than others. This bias could be reduced by using more traplines per habitat . Some individuals may be better at jumping or climbing out of traps. We suspect that *Ramenella* are able to escape from buckets with relative ease. It is possible that *Ramanella* were using the buckets as temporary shelters. It is also possible that some individuals are induced to enter traps by the presence of prey items there (invertebrates or other frogs). It is also presumed that predation of animals from traps is equally distributed between species. We found no evidence that trapped animals were predated upon, but it is quite possible that snakes, larger frogs or even birds feed from the traps.

Summary

Pitfall trapping can yield valuable data on habitat use and activity in certain amphibian species, but is too biased to use for community studies. Its primary value in surveys lies in its ability to detect very rare or cryptic species that are overlooked by other methods.

References

Bennett, D. 1999. Expedition Field Techniques. Reptiles and Amphibians. EAC, Royal Geographical Society, London.

Appendix: Pitfall captures of frogs

	A	B	C	D	E	F	G	H	
Bufo melanostictus	**6**	**17**	**1**	**2**	**2**	**1**	**11**	**3**	**43**
Polypedates metamorphs	**0**	**0**	**0**	**0**	**1**	**2**	**0**	**0**	**3**
Kaloula taprobanica	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**1**
Limnocharis	**2**	**3**	**12**	**5**	**11**	**5**	**3**	**4**	**45**
Microhylids	**0**	**0**	**2**	**0**	**15**	**1**	**1**	**0**	**19**
Rana curtipedes	**9**	**9**	**6**	**4**	**0**	**0**	**1**	**1**	**30**
Ramanella triangularis	**7**	**1**	**6**	**0**	**4**	**1**	**0**	**1**	**20**
tigerina	**0**	**1**	**0**	**0**	**12**	**3**	**2**	**4**	**22**
Nyctobatrachus	**2**	**6**	**0**	**0**	**0**	**0**	**0**	**0**	**8**
	27	**37**	**27**	**11**	**45**	**13**	**18**	**13**	**183**