fact sheet

Pitfall trapping

The honey possum

is a tiny and elusive animal that can fit snugly into the palm of your hand. It ventures out to feed between dusk and dawn, running from plant to plant in search of large, nectar-rich flowers, such as those from the *Banksia* genus.

When nectar is abundant, honey possums are able to produce up to four litters in a year.

The southwest region of Western Australia is a world biodiversity hotspot with a multitude of different and amazing flora and fauna. It is also the most populated region of the state, and human impact is increasingly noticeable. To help maintain a high level of ecological value to remaining natural areas, research scientists must understand delicate interactions between these unique organisms and their environment.

Professor Don Bradshaw from the University of Western Australia, is one such scientist. He has researched the honey possum, *Tarsipes rostratus*, in Scott National Park and, after 20 years, has become expert at catching these beautiful animals.

And how does he do that? With pitfall traps — lots of them!

What is a pitfall trap?

Pitfall traps are actually 40 cm lengths of 15 cm diameter PVC pipe dug into the ground so that the rim is level with the soil surface. Traps, arranged in a grid, are spaced five metres apart. Usually, one hundred traps are used per study site grid, but this can vary, depending on the size of the research area. When not in use, traps are fitted with lids to prevent anything from falling in.

At least three different study site grids are set up in a research area. Each trapping period lasts about four days, with every trap checked each morning at dawn. That sounds like a lot of work!

Counting possums!

Research scientists often estimate the relative size of a population of a given species from trapping success rates (%). This is a useful indication in ecological studies, however it may not necessarily directly correlate with total population size as possums can be more or less likely to fall into traps, depending upon the weather.

Trap success rate (TSR) is the number of animals captured divided by the number of trap nights. One trap night is equal to one trap set for one night.

Example:
300 pitfall traps are set each night for a period of four nights. A total of 54 honey possums is captured.

Number of trap nights = 4 X 300 = 1200
TSR = (54/1200) X 100
TSR = 4.5%

So … you may be wondering what the point of all this digging, walking, trapping and getting up before the rooster crows is about? Well, Professor Bradshaw has 20 years worth of data regarding different aspects of honey possum ecology. This has enabled him and his research team to monitor the stability of honey possum populations over time and the possible environmental and human impacts on numbers, health and reproduction. But what could possibly go wrong?

An ecological problem

A researcher begins trapping honey possums in 1994 in a 30 000 hectare National Park in southwest Western Australia. Three study site grids (A, B and C) are established in an homogenous *Banksia* woodland, unburnt for at least 40 years. Each grid comprises 200 pitfall traps. Trapping sessions are carried out four times a year in summer, autumn, winter and spring. Each trapping session runs over a four night period.

During the last trapping session in 1998, the researcher notices signs of dieback infection within the park. Further investigation reveals that the outbreak has had a significant impact on *Banksia* species.

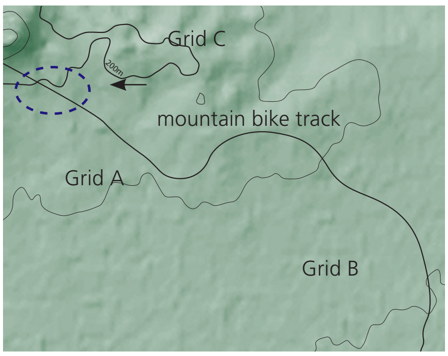
The researcher continues trapping for the next seven years. Data regarding rainfall, plant flowering times and topography are also collected to help analyse the population data. The researcher also learns that a mountain bike race was held in spring of 1997 on an ecotourism track that runs through the park.

The researcher uses the following data to answer the research question:

'Has the outbreak of dieback had an adverse effect on the honey possum population within the national park?'

dieback infected area

scale: 1 cm = 1 km



topographical map of study site showing grid locations.

Some facts about dieback

- Dieback is caused by infection of plant roots by the soil-borne pseudofungus, *Phytopthora cinnamomi*.
- More than 2000 species of plants in WA's southwest are at risk of infection.
- Species belonging to the *Banksia* genus are particularly susceptible.
- The growth, reproduction and spread of *P. cinnamomi* is favoured by presence of water in the soil and soil surface.

- Zoospores produced by *P. cinnamomi* are released and 'swim' through soil water to the roots of neighbouring plants.
- *P. cinnamomi* invades and feeds on living roots and stems, reducing a plant's ability to absorb necessary water and nutrients.
- Symptoms include yellowing of foliage due to root-rot, followed by 'dieback' of the whole plant from tip to trunk.
- Human activities are the main cause of the spread of dieback.
- Rainfall, topography and soil-type can increase the risk of spread.
- *P. cinnamomi* spreads more slowly up slopes (1 – 3 metres per year) as it is restricted to growth in plant roots.

Table 1. Flowering times of plants most often visited by honey possums

Plant species	Species in flower											
	Summer			Autumn			Winter			Spring		
	D	J	F	M	A	M	J	J	A	S	O	N
Adenanthos meisneri	•	•	•	•	•			•	•	•	•	•
Adenanthos obovatus	•					•	•	•	•	•	•	•
Banksia grandis	•	•								•	•	•
Banksia ilicifolia	•	•	•	•	•	•	•	•	•	•	•	•
Banksia littoralis				•	•	•	•	•	•			
Banksia meisneri					•	•	•	•	•	•		
Banksia occidentalis	•	•	•	•	•	•				•	•	•
Beaufortia sparsa		•	•	•	•					•	•	•
Corymbia calophylla	•	•	•	•	•	•						
Hakea lissocarpha						•	•	•	•	•		

Data from Florabase, florabase.calm.wa.gov.au (images of flowers are available)

Table 2. Monthly rainfall (mm) and mean monthly rainfall (mm) for research area 1994 – 2004

year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Mean
1994	1.2	2.2	13.5	2.6	42	18.8	25.2	31.4	26.2	36.2	12.8	2	17.8
1995	38.2	44	31.6	10	29.8	33.4	65.2	18.4	63.6	52.8	11.6	91	43.9
1996	0.9	9.2	13.4	22.4	23	40.6	64.6	30.2	68.4	22.2	25	9.8	27.4
1997	2.4	108	77.4	25.8	57.2	31.6	44.2	67.8	105	19.8	34.8	35.2	50.8
1998	0.8	2.2	32	88.8	23	56	51.2	75.4	28.2	36	26.4	14.6	36.2
1999	69.8	8.6	49.6	57	35	42.3	54	32.6	44.1	35.2	33.4	40	41.8
2000	210.2	42.4	58	22.4	9	26.6	30.2	35.6	10.8	12.2	10.5	8.4	39.7
2001		11	14.8	8	34.5	29	90.1		38.2	38.6		104	40.9
2002	16.8	3.6		22.2	5	18.9	31.4	24.6	22	25.4	49.6	43.4	23.9
2003	0	30.2	77.6	55.7				74.6	65.2			8.4	44.5
2004	41	42	13.2	14			28.6	55.6	21.8	10.6	29.4	0	26.6

Data from Bureau of Meteorology, www.bom.gov.au/weather/wa (blank cells are from months when data is not available)

Table 3. (a-f) Honey possum captures for grids A, B and C, 1994 – 2004

(a) 1994

Season	A	B	C	Total all grids
Summer	20	28	30	78
Autumn	21	15	30	66
Winter	25	36	87	148
Spring	16	19	48	83
Annual total	82	98	195	375

(b) 1996

Season	A	B	C	Total all grids
Summer	19	23	25	67
Autumn	17	22	26	65
Winter	29	20	39	88
Spring	16	24	28	68
Annual total	81	89	118	288

(c) 1998

Season	A	B	C	Total all grids
Summer	17	23	26	66
Autumn	15	14	23	52
Winter	22	17	33	72
Spring	12	22	26	60
Annual total	66	76	108	250

(d) 2000

Season	A	B	C	Total all grids
Summer	13	15	25	53
Autumn	9	11	29	49
Winter	16	14	33	63
Spring	10	10	33	53
Annual total	48	50	120	218

(e) 2002

Season	A	B	C	Total all grids
Summer	8	12	31	51
Autumn	6	7	22	35
Winter	5	9	29	43
Spring	7	12	33	52
Annual total	26	40	115	181

(f) 2004

Season	A	B	C	Total all grids
Summer	3	8	25	36
Autumn	5	12	27	44
Winter	5	10	29	44
Spring	5	6	29	40
Annual total	18	36	110	164