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Short Communication

Pitfall trapping for ants (Hymenoptera, Formicidae) in mesic Australia: the influence of trap diameter

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Abstract

Catches of ants in the two most commonly-used forms of pitfall trap ('test-tube' traps, ca 18 mm diameter; 'coffee cup' traps, ca. 70 mm diameter) are compared from samples in open grassy woodland in southern Victoria, Australia. The 25 morphospecies found in the narrower traps were all represented among the 31 morphospecies collected in the larger traps. Either pattern is adequate to collect samples for broad inter-treatment comparisons and documentation of the more typical and representative fauna, but larger traps may have some advantage if more complete inventory is sought.

Introduction

Of the many variables in pitfall trap design, the effects of trap diameter on invertebrate catches have been investigated directly in relatively few cases. Two studies in Western Australia are notable exceptions. In jarrah forest, Brennan et al. (1999) compared catches of spiders from traps of 43, 70, 111 and 174 mm diameter, and revealed increasing numbers of morphospecies (5, 6, 12, 22) along this gradient. However, the total abundance (13, 11, 36, 78) increased only with the larger two series. A study in semi-arid eucalypt woodland in Western Australia (Abensberg-Traun and Steven 1995) showed progressive increase in numbers of ant species along a series of traps of 18 mm diameter (46 species), 42 mm (56), 86 mm (62) and 135 mm (64). Griffin et al. (2004), in South Australia, compared three trap diameters (4.3, 6.8 and 11.6 cm) and suggested that trap diameter had little effect, although fewer genera were captured in the narrowest traps when catches were averaged over the whole sampling period (of 24 h once a month for 9 months). Elsewhere, in the Kruger National Park, South Africa, Parr and Chown (2001) recorded somewhat more ant species (20) from 6.2 cm diameter traps than from1.8 cm diameter (16 species), with the former also having a higher rate of species accumulation with increased sample number. Of the pool of 25 species, the two trap sizes shared only 11, with both categories yielding taxa not found in the other. However, a high proportion of invertebrate surveys utilize circular pitfall traps of only one diameter, most commonly either 'test tube' traps (18–20 mm diameter, Majer 1978) or some container akin to plastic coffee cups (70–80 mm diameter). This note presents data on ants retrieved from comparative series of these two widely-adopted basic trap categories in open grassy woodland in Victoria, Australia.

Methods

A grid of 16 traps, with the two categories (18 mm test tubes, 70 mm cups) alternating at 5 m spacing, was sited in each of four open grassy woodland plots on or near the La Trobe University Bundoora campus, some 15 km north of Melbourne, Victoria. This spatial arrangement was intended to ensure sampling of the same species pool by the two trap forms. Traps contained 70% ethyl alcohol as a preservative, and were opened for four 48 h periods (the period recommended in a standard protocol for ant sampling advanced by Agosti and Alonso (2000)), with a week between each of these trapping periods, in March–May 2003, so giving a total of 128 individual samples of each trap diameter across plots. Ants were sorted in the laboratory and identified to genus and morphospecies using keys by Andersen (1991) and Shattuck (1999), together with more specialist literature on some taxa.

Results

The total of 4787 individual ants comprised 3130 from cup traps and 1657 from test tubes. The 31 morphospecies represented are listed in Table 1; all 31 occurred in cup traps, and 25 of these in test tubes, to give an overall compositional similarity (Sorenson index) of 0.89. No species was found only in the smaller traps. The six species found only in the larger traps included five represented by singletons, and only one (*Anonychomyrma biconvexa*) in greater numbers. These singletons included three genera not taken in the smaller traps.

Most morphospecies found in both trap sizes were more abundant in the larger traps, but some showed little difference between the two categories. *Monomorium 'sydneyense'* was common in both trap types, whilst *Meranoplus* sp. was somewhat more abundant in smaller traps.

Table 1. Ants collected in two patterns of pitfall trap in southern Victoria, Australia, 2003.

Ant taxon	Numbers of individuals in	
	test tube traps	Cup traps
Myrmecia forficata	2	3
M. pilosula	8	8
Anonychomyrma biconvexa	–	12
A. itinerans	100	585
Iridomyrmex bicknelli	31	57
I. gracilis	131	350
I. vicinus	–	1
Ochetellus glaber	6	14
Tapinoma minutum gp	15	23
Camponotus claripes	4	11
C. consobrinus	1	17
C. nigroaeneus	2	5
Prolasius nitidissimus	11	120
Melophorus (*froggatti* gp)	10	44
Melophorus sp. 4	54	186
Notoncus ectatommoides	–	1
Paratrechina (*vaga* gp)	–	1
Paratrechina sp.2	3	5
Polyrhachis sidnica	2	1
Stigmacros (*flavinodis* gp)	32	33
Crematogaster (*laeviceps* gp)	–	1
Mayriella sp.	4	1
Meranoplus sp.	157	132
Monomorium (*sydneyense* gp)	96	94
M.'kiliani'	1	2
Pheidole sp. 1	11	5
Pheidole sp. 2	265	392
Amblyopone ferruginea	–	1
Rhytidoponera metallica	79	194
R. tasmaniensis	2	5
R. victoriae	630	826

Discussion

Not unexpectedly, the larger traps yielded higher numbers of individuals and morphospecies than the smaller traps. For either diameter, capture of the less abundant ant species is likely to be a chance event, as reflected in the very low numbers obtained, and larger trap size may then be advantageous in increasing species richness in the catches.

Bestelmeyer et al. (2000, following Abensberg-Traun and Steven 1995) noted that smaller traps may bias against larger ant species in an area. This was not evident in our study; the two large species of *Myrmecia* were captured almost equally across the trap categories, and the three species of *Camponotus* were represented in both categories. These authors also noted that smaller traps may be satisfactory for surveys in which ants are the major target group, whereas larger traps may be preferred if a larger representation of other taxa is also sought.

However, simple 'diameter' (as the most frequently cited trap dimension in studies of this nature) may not be as relevant a consideration as 'rim length' (here, circumference) as reflecting the

extent of direct access of ants to the trap. The difference in circumference between these two trap forms is almost fourfold (5.7, 22 cm). A similar (or greater) difference in ant abundance occurred for only four ant species (*Anonychomyrma itinerans*, *Camponotus consobrinus*, *Prolasius nitidisimus*, *Melophorus 'froggatti'*), and the overall ant abundance in the larger traps was less than twice that of the smaller traps. It could thus be argued that the smaller traps are more 'efficient' than the larger ones. Ranking the morphospecies in order of abundance gave three species (*Rhytidoponera victoriae*, *Iridomyrmex gracilis, Pheidole 2*) common to the top four in each trap category, with the combined top seven for each including eight morphospecies, so that the overall assemblages represented by more abundant ants are broadly similar in the two trap forms. The very high proportion of shared species suggests that the narrower traps may be entirely satisfactory for surveys in which the primary aim is to broadly characterize a local assemblage or provide data for inter-site comparisons, rather than to achieve total species inventory. The precise objectives of a survey may thus dictate preference for one or other of these trap categories.

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