THE ANT FAUNA OF A MALLEE OUTLIER NEAR MELTON, VICTORIA

ALAN N. ANDERSEN[1,3], BRONWYN A. MYERS[1] AND KAREN M. BUCKINGHAM[2]

[1]School of Botany, University of Melbourne, Parkville, Victoria 3052
[2]Department of Zoology, University of Melbourne, Parkville, Victoria 3052
[3]Present address: Division of Wildlife and Ecology, CSIRO Tropical Ecosystems Research Centre, PMB 44 Winnellie, Northern Territory 0821

ANDERSEN, A. N., MYERS, B. A. & BUCKINGHAM, K. M., 1991:06:30. The ant fauna of a mallee outlier near Melton, Victoria. *Proceedings of the Royal Society of Victoria* 103 (1): 1–6. ISSN 0035-9211.

Long Forest mallee, near Melton, Victoria, occurs 110 km from the nearest other mallee vegetation and is therefore of considerable biogeographic interest. Ants were sampled directly by hand and by pitfall trapping during 1983–1985, with a total of 77 species from 21 genera recorded. The fauna was dominated by the meat ant, *Iridomyrmex purpureus* (29% of all ants in traps), with species of *Monomorium* (8 species, total of 25% of all ants), *Pheidole* (5 species, 13% of all ants), and *Notoncus "enormis"* (8% of all ants) also abundant. In many respects the fauna resembles that at Wyperfeld National Park located in the major mallee region of northwestern Victoria: many species and species-groups are shared, and the overall biogeographical profiles and composition of functional groups are similar. However, the Long Forest fauna has several important differences which reflect the site's southerly location, including a lower species to genus ratio, a lower representation of Eyrean taxa, a higher abundance of Bassian elements, and the occurrence of some species characteristic of cooler and wetter parts of southern Victoria.

AN ISOLATED outlier of mallee vegetation (hereafter referred to as Long Forest mallee) occurs south of the Great Dividing Range in a rain-shadow area (mean annual rainfall approximately 500 mm) near Melton, 50 km west of Melbourne. It is by far the most southerly patch of mallee in southeastern Australia, occurring 110 km southeast from the nearest similar vegetation at Bendigo. Several plant species found in Long Forest mallee, such as *Rhagodia parabolica* (only found in Victoria in the immediate region), *Sclerolaena diacantha* and *Myoporum deserti*, are characteristic of the arid zone (Myers et al. 1986).

The insect fauna of Long Forest mallee is poorly known but clearly is of considerable biogeographic interest. Here we document the ant fauna of a site within Long Forest mallee and compare it with those of two well-studied sites which represent biogeographic contrasts in Victoria. One of these sites is at Wyperfeld National Park (mean annual rainfall approximately 400 mm) in the major mallee region of semi-arid northwestern Victoria (Andersen 1983, 1984, Andersen & Yen 1985), and the other is Wilsons Promontory (mean annual rainfall 1000–1200 mm) on the southern coast (Andersen 1986a, b, 1988). These sites support contrasting ant faunas. The major elements at Wilsons Promontory are Bassian taxa (Andersen 1991a) such as the *nitidiceps–foetans* complex of *Iridomyrmex, Rhytidoponera tasmaniensis, R. victoriae*, and species of *Notoncus* and *Prolasius*. Arid-adapted (Eyrean) taxa such as *Melophorus* spp. are poorly represented. A substantial number of Bassian elements are also present at Wyperfeld but they occur within a framework of predominantly arid-adapted taxa, particularly species of *Iridomyrmex, Camponotus* and *Melophorus*. These three genera represent the "core" taxa of Australian arid-zone communities, together usually contributing about half the total species (Greenslade 1979, Greenslade & Greenslade 1989).

STUDY SITE

Long Forest mallee is described in detail by Myers et al. (1986). It occupies an area of approximately 1.5 km^2 (it was three times this size before clearing commenced 25 years ago), and is dominated by the mallee eucalypt *E. behriana* of up to 10 m in height, with a sparse understorey of grasses, perennial herbs and chenopods. The soil is a Tertiary sandy clay. The study was conducted within an area of approximately 1 ha, located in a property owned by Dr and Mrs M. Baker.

METHODS

Ants were sampled between 1983 and 1985 by collecting them directly from the ground and from vegetation, and by pitfall trapping. Pitfall traps were 35 mm diameter plastic vials, partly filled with 70% ethanol, which were buried with their rims flush to the soil surface. Traps were similar to those used at Wilsons Promontory and Wyperfeld, and the catches are likely to provide a good indication of the relative abundance of species on the ground (Andersen 1983, 1986a, 1991b). The traps were arranged in a 5 × 6 grid with 5 m spacing (area of grid 500 m^2), and operated for 4-day periods during January 1983, October 1983 and May 1985. Hand collections were conducted during these periods and also on other occasions covering all seasons. Ant species captured in traps were scored according to a five point abundance scale (1 = 1 ant; 2 = 2–5 ants; 3 = 6–20 ants; 4 = 21–50 ants; 5 = > 50 ants) in order to reduce distortions caused by large numbers of ants falling into a few traps (see Andersen 1991b). These abundance scores were used directly as counts when calculating relative abundances.

Most of the ants collected could not be identified to species with certainty because of our generally poor taxonomic knowledge of Australian ants. Where possible, these species were assigned to informal species-groups (denoted by inverted commas, eg. *Camponotus "claripes"*) derived by the senior author from type specimens held in the Museum of Victoria and in the Australian National Insect Collection, CSIRO Division of Entomology, Canberra (see Andersen 1991a). A complete set of voucher specimens is held by the senior author.

In the absence of a published biogeographic treatment of the Australian ant fauna, each species was judged to belong to groups with Bassian, Eyrean or widespread distributions according to the senior author's understanding of Australian ants. The pattern of community organisation was investigated by classifying species into functional groups according to their presumed habitat requirements and competitive interactions. This classification is modified from Greenslade (1978), and has been used extensively in studies of Australian ant communities (see Greenslade & Greenslade 1989, Andersen 1990, 1991c).

The biogeographic profile and pattern of community organisation of the Long Forest mallee fauna was compared with those of Wyperfeld and Wilsons Promontory. The species lists from these other localities were obtained from detailed studies of small plots, as at Long Forest mallee. The Wilsons Promontory data are from two woodland sites each of approximately 0.25 ha (Andersen 1986a, 1988), and the Wyperfeld data are from adjacent heath and mallee sites each of 0.13 ha (Andersen 1983, 1984, Andersen & Yen 1985).

RESULTS

A total of 77 species from 21 genera were collected (see appendix), with 44 of these caught in traps. The species accumulation curve (Fig. 1) suggests that the number of species occurring in the 500 m^2 trapping grid was in excess of 50. The richest genera were *Camponotus* (12 species), *Monomorium* (11), *Iridomyrmex* (8), *Myrmecia* (7), *Melophorus* (5) and *Pheidole* (5). The mean number of species per genus was 3.7, midway between that at Wilsons Promontory (2.9) and at Wyperfeld (4.6). *Iridomyrmex, Camponotus* and *Melophorus* together contributed 32% of total species at Long Forest mallee, again midway between Wilsons Promontory (23%) and Wyperfeld (42%).

The biogeographic profile of the Long Forest mallee fauna resembles that at Wyperfeld far

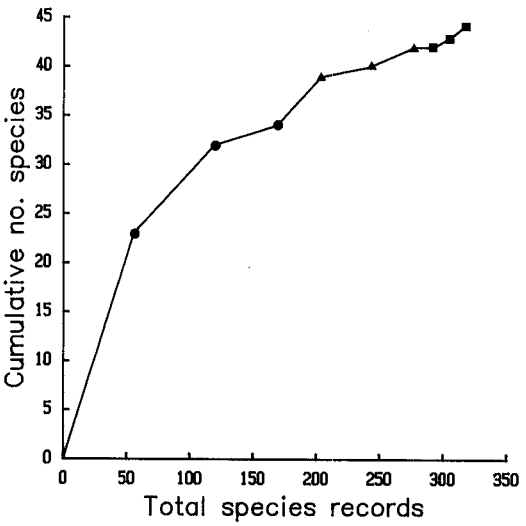

Fig. 1. Accumulation of ant species in pitfall traps (500 m^2 grid) at Long Forest mallee. Each point represents the running total of ten traps (circles = January 1983; triangles = October 1983; squares = May 1985). Number of species records is the sum of the total number of species recorded in each trap, regardless of species turnover across traps.

	Bassian	Eyrean	Widespread
Long Forest mallee (n = 77)	16	21	64
Wilsons Promontory (n = 83)	37	5	58
Wyperfeld (n = 138)	17	28	55

Table 1. Biogeographical profile of the Long Forest mallee ant fauna (see appendix for biogeographic affinities of individual species) compared with those at Wilsons Promontory (combined lists of Andersen 1986a, 1988) and Wyperfeld (list of Andersen & Yen 1985). Data are the percentages of species having Bassian, Eyrean and widespread distributions.

more than Wilsons Promontory (Table 1). The proportions of Bassian taxa are very similar at the first two locations (16% and 17% respectively, compared with 37% at Wilsons Promontory), with Eyrean taxa being slightly less prominent at Long Forest mallee (21% *versus* 28%, compared with 5% at Wilsons Promontory). The closer affinities of the Long Forest mallee fauna to that at Wyperfeld is further suggested by the distributions of individual species and species-groups. Of the 35 Long Forest taxa identified at this level, 15 (*Myrmecia* sp. nr *mandibularis, M. ?dichospila, M. "nigriceps", M. "tepperi", Mesostruma loweryi, Monomorium "insolescens", Podomyrma adelaidae, Iridomyrmex "discors", I. "nitidus", I. purpureus, Camponotus "ephippium", C. "suffusus", C. "tricoloratus", Notoncus "enormis"* and *Polyrhachis phryne*) occur at Wyperfeld but not Wilsons Promontory, whereas the reverse is true for only five (*Myrmecia urens, Rhytidoponera tasmaniensis, Monomorium "flavigaster", Tapinoma "minutum"* and *Notoncus "ectatommoides"*). The occurrence of *Myrmecia forceps* at Long Forest mallee appears to be the first record of this species in Victoria (see Clark 1951, Taylor & Brown 1985).

Dominant species of *Iridomyrmex* comprised 31% of all ants captured in pitfall traps at Long Forest mallee (Table 2). *Iridomyrmex purpureus*, a member of the meat ant complex (Greenslade 1976, Greenslade & Halliday 1982), was by far the leading dominant, comprising 29% of total catches (93% of total *Iridomyrmex*). The other major functional group was "generalised Myrmicinae" (mostly species of *Monomorium* and, to a lesser extent, *Pheidole*), which comprised 39% of total catches. "Associated subordinate Camponotinae" (primarily species of *Camponotus*) and "hot and cold climate specialists" contributed many species, but, aside from *Notoncus "enormis"* (8% total catches), none were frequently recorded in traps.

Functional group composition at Long Forest mallee is extremely similar to that at Wyperfeld, the correlation (r; n = 9) between percentage abundance sub-totals in Table 2 being 0.97. The only substantial difference is the relatively high abundance of "cold climate specialists" (primarily *N. "enormis"*) at Long Forest mallee (Table 2). However, although the total relative abundance of "generalised Myrmicinae" was similar, species of *Pheidole* and *Monomorium* were respectively more and less prominent at Long Forest mallee. The sub-totals in Table 2 for Wilsons Promontory are not related ($r = -0.17$, $p > 0.05$) to those for Long Forest mallee.

DISCUSSION

The ant fauna of Long Forest mallee is very similar to that at Wyperfeld in terms of its biogeographical profile (Table 1) and functional group composition (Table 2). Many species and species-groups occur at both sites. However, there are several important differences, all of which reflect the Long Forest mallee's higher rainfall and southerly location. The differences are: a lower species to genus ratio; a lower representation of Eyrean taxa (Table 1), particularly *Melophorus* (Table 2); a higher abundance of Bassian elements (*Notoncus*, Table 2); and the occurrence of some species characteristic of cooler and wetter parts of southern Victoria (such as *Rhytidoponera tasmaniensis*). The Long Forest site can therefore be described as supporting an ant fauna essentially typical of the mallee region of northwestern Victoria, but with a somewhat greater Bassian influence.

Several Bassian taxa that occur at Wyperfeld were not recorded at Long Forest mallee. These include *Iridomyrmex "itinerans"* and species of *Dolichoderus* and *Prolasius*. It is possible, however, that these taxa are present locally but outside the study site. A larger number of Eyrean and arid-adapted tropical taxa that occur at Wyperfeld were also not recorded at Long Forest mallee, and many of these probably do not occur there. They include species of *Cerapachys, Monomorium ("Chelaner")* (eg. *"rothsteini", "whitei"*), *Tetramorium, Camponotus* (eg. *"aurocincta", whitei*), *Melophorus* (eg. *"aeneovirens"*) and *Opisthopsis*.

The Long Forest site is a mallee ecosystem on Melbourne's doorstep. It has suffered from poor management decisions in the past but is now a

	Long Forest	Wyperfeld	W Prom
1 Dominant Dolichoderinae			
Iridomyrmex	5 (31)	13 (35)	8 (18)
sub-total	5 (31)	15 (35)	8 (18)
2 Associated Subordinate Camponotini			
Camponotus	12 (4)	29 (2)	3 (9)
Polyrhachis	1 (—)	5 (—)	2 (—)
sub-total	13 (4)	34 (2)	5 (9)
3a Hot Climate Specialists			
Meranoplus	10 (2)	3 (1)	0
Monomorium ("Chelaner")	2 (—)	4 (—)	0
Podomyrma	1 (—)	1 (—)	0
Melophorus	5 (—)	13 (8)	0
sub-total	18 (3)	22 (9)	0
3b Cold Climate Specialists			
Epopostruma	1 (—)	2 (—)	0
Mesostruma	1 (—)	1 (—)	0
Monomorium ("Chelaner")	1 (—)	0	4 (4)
Podomyrma	1 (—)	2 (—)	1 (—)
Myrmecorhynchus	1 (—)	0	0
Notoncus	3 (8)	3 (—)	1 (10)
sub-total	8 (8)	15 (—)	9 (14)
4a Cryptic Species			
Hypoponera	1 (—)	0	1 (—)
Solenopsis	2 (1)	1 (—)	1 (14)
sub-total	3 (1)	4 (—)	3 (14)
4b Sub-cryptic Species			
Iridomyrmex "darwinianus"	2 (3)	1 (9)	0
I. "glaber"	1 (1)	2 (—)	0
Tapinoma	1 (—)	0	1 (—)
Paratrechina "minutula"	1 (7)	1 (—)	1 (—)
Stigmacros	2 (2)	13 (2)	3 (—)
sub-total	7 (13)	17 (11)	6 (5)
5 Opportunists			
Rhytidoponera	1 (1)	0	2 (27)
sub-total	1 (1)	5 (—)	3 (37)
6 Generalised Myrmicinae			
Crematogaster	1 (1)	6 (3)	1 (—)
Monomorium	8 (25)	8 (35)	1 (—)
Pheidole	5 (13)	6 (4)	4 (1)
sub-total	14 (39)	22 (42)	6 (1)
7 Large, Solitary Foragers			
Myrmecia	7 (—)	4 (—)	5 (2)
Trachymesopus	1 (—)	0	0
sub-total	8 (—)	4 (—)	6 (2)
Total	77 (100)	138 (100)	47 (100)

Table 2. Ant community organisation at Long Forest mallee compared with that at Wyperfeld (combined heath and mallee plots, data from Andersen 1983, Andersen & Yen 1985) and Wilsons Promontory (data from woodland site in Andersen 1986a). Taxa are classified into functional groups according to their habitat requirements and competitive interactions (see text). Data are numbers of species per taxon and, in brackets, their percentage abundance in pitfall traps (dashes indicate less than 1%).

Victorian National Parks and Wildlife Service Reserve. Its unique biogeography make it a significant part of Victoria's natural heritage.

ACKNOWLEDGEMENTS

We are most grateful to Dr and Mrs Baker for allowing us to work on their property, and for their efforts in protecting what remains of Long Forest mallee. Dr J. D. Majer and two anonymous referees made valuable comments on the draft manuscript. This is TERC library contribution no. 677.

REFERENCES

ANDERSEN, A. N., 1983. Species diversity and temporal distribution of ants in the semi-arid mallee region of northwestern Victoria. *Australian Journal of Ecology* 8: 127–137.

ANDERSEN, A. N., 1984. Community organization of ants in the Victorian mallee. *Victorian Naturalist* 101: 248–251.

ANDERSEN, A. N., 1986a. Diversity, seasonality and community organization of ants at adjacent heath and woodland sites in southeastern Australia. *Australian Journal of Zoology* 34: 53–64.

ANDERSEN, A. N., 1986b. Patterns of ant community organization in mesic southeastern Australia. *Australian Journal of Ecology* 11: 87–99.

ANDERSEN, A. N., 1988. Immediate and longer term effects of fire on seed predation by ants in southeastern Australia. *Australian Journal of Ecology* 13: 285–293.

ANDERSEN, A. N., 1990. The use of ant communities to evaluate change in Australian terrestrial ecosystems: a review and a recipe. *Proceedings of the Ecological Society of Australia* 16: 347–357.

ANDERSEN, A. N., 1991a. *The Ants of Southern Australia: A Guide to the Bassian Fauna.* CSIRO Press, Melbourne.

ANDERSEN, A. N., 1991b. Sampling communities of ground-foraging ants: pitfall catches compared with quadrat counts in an Australian tropical savanna. *Australian Journal of Ecology* 16 (in press).

ANDERSEN, A. N., 1991c. Parallels between ants and plants: implications for community ecology. In *Ant-Plant Interactions*, C. R. Huxley & D. F. Cutler, eds, Oxford University Press, 539–558.

ANDERSEN, A. N. & YEN, A. L., 1985. Immediate effects of fire on ants in the semi-arid mallee region of northwestern Victoria. *Australian Journal of Ecology* 10: 25–30.

CLARK, J., 1951. *The Formicidae of Australia I. Subfamily Myrmeciinae.* CSIRO Press, Melbourne.

GREENSLADE, P. J. M., 1976. The meat ant *Iridomyrmex purpureus* (Hymenoptera: Formicidae) as a dominant member of ant communities. *Journal of the Australian Entomological Society* 15: 237–240.

GREENSLADE, P. J. M., 1978. Ants. In *The Physical and Biological Features of Kunnoth Paddock in Central Australia*, W. A. Low, ed., CSIRO Division of Land Resources Management Technical Paper No. 4.

GREENSLADE, P. J. M., 1979. *A Guide to Ants of South Australia.* South Australian Museum, Adelaide.

GREENSLADE, P. J. M. & GREENSLADE, P., 1989. Ground layer invertebrate fauna. In *Mediterranean Landscapes in Australia: Mallee Ecosystems and Their Management*, J. C. Noble & R. A. Bradstock, eds, CSIRO Press, Melbourne, 266–284.

GREENSLADE, P. J. M. & HALLIDAY, R. B., 1982. Distribution and speciation in meat ants, *Iridomyrmex purpureus* and related species (Hymenoptera: Formicidae). In *Evolution of the Flora and Fauna of Arid Australia*, W. R. Barker & P. J. M. Greenslade, eds, Peacock, Adelaide, 249–255.

MYERS, B. A., ASHTON, D. H. & OSBORNE, J. A., 1986. The ecology of the mallee outlier of *Eucalyptus behriana* F. Muell. near Melton, Victoria. *Australian Journal of Botany* 34: 15–39.

TAYLOR, R. W. & BROWN, D. R., 1985. Hymenoptera: Formicoidea. In *Zoological Catalogue of Australia*, vol. 2, *Hymenoptera: Formicoidea, Vespoidea and Sphecoidea*, Australian Government Publishing Service, Canberra, 5–159.

APPENDIX

List of ant species recorded at Long Forest mallee. Authorities for species names are given in Taylor & Brown (1985). The biogeographical affinity of each species (B = Bassian, E = Eyrean, W = widespread) is also given.

MYRMECIINAE

Myrmecia (*teperri* gp) *dixoni* (W)
M. (*nigriceps* gp) *fasciata* (W)
M. forceps (W)
M. (*urens* gp) ?*dichospila* (W)
M. pyriformis (W)
M. urens (W)
M. (*mandibularis* gp) sp. (W)

PONERINAE

Hypoponera sp. (W)
Rhytidoponera tasmaniensis (B)
Trachymesopus rufoniger (B)

MYRMICINAE

Crematogaster sp. (W)
Epopostruma "quadrispinosa" (B)

Meranoplus spp. (× 10; W)
Mesostruma loweryi (B)
Monomorium (*"Chelaner"*) *"insolescens"* (2 spp.; E)
M. (*"Chelaner"*) *"flavigaster"* (B)
Monomorium spp. (× 8; W)
Pheidole spp. (× 5; W)
Podomyrma adelaidae (B)
P. ?rugosa (B)
Solenopsis spp. (× 2; W)

DOLICHODERINAE

Iridomyrmex "bicknelli" (E)
I. "darwinianus" (2 spp.; W)
I. "discors" (E)
I. "glaber" (W)
I. "gracilis" (E)
I. "nitidus" (W)
I. purpureus (E)
Tapinoma "minutum" (W)

FORMICINAE

Camponotus (*suffusus* gp) *bendigensis* (E)
C. "claripes" (3 spp.; W)
C. (*consobrinus–nigriceps* gp) *obniger* (W)
C. "ephippium" (2 spp.; E)
C. "nigroaeneus" (2 spp.; W)
C. "rubiginosus" (W)
C. "tricoloratus" (E)
C. suffusus (E)
Melophorus "hirsutus" (E)
Melophorus spp. (× 4; E)
Myrmecorhynchus "emeryi" (B)
Notoncus "ectatommoides" (B)
N. "enormis" (B)
N. "hickmani" (B)
Paratrechina "minutula" (W)
Polyrhachis phryne (B)
Stigmacros (*"Campostigmacros"*) sp. (W)
S. (*"Stigmacros"*) sp. (W)