ASIAN MYRMECOLOGY Volume 3, 5–8, 2010
ISSN 1985-1944

SHORT COMMUNICATION
Ant diversity in a Peninsular Malaysian mangrove forest and oil palm plantation

Nor Rasidah Hashim*, Wan Faridah Akmal Wan Jusoh and
Mohd Nassrul Safre Mohd Nasir

Department of Environmental Sciences, Faculty of Environmental Studies,
Universiti Putra Malaysia, 43400 UPM, Serdang, Selangor, Malaysia.

*Corresponding author's email: rasidah@env.upm.edu.my

Keywords: ants, oil palm, mangrove forests, Peninsular Malaysia

In Malaysia, it is a common practice to convert mangrove forests into agricultural plantations, especially oil palm (Nixon *et al*. 1984; Bennett & Reynolds 1993). For this to happen, mangroves are drained and pesticides and fertilizers are often used to encourage healthy growth and yield of the oil palms (Christensen 1983), impacting biodiversity there and nearby (Macintosh & Ashton 2002; Latiff 2005). Mangroves are challenging habitats and certain mangrove ants, such as the Australian species *Camponotus anderseni*, show a high degree of adaptation to them (Nielsen *et al*. 2006). In Malaysian oil palm plantations, ant species richness was found to be low relative to natural forest although they formed a dominant insect group (Pfeiffer *et al*. 2008). It may thus be hypothesized that both mangroves and adjacent oil palm habitats contain low ant richness, but that differences in edaphic conditions and vegetation would differentiate the ant species composition. In this study, we provide a preliminary assessment of the diversity of ground-foraging ants in mangrove forests and adjacent oil palm plantations in Peninsular Malaysia.

The study was carried out in Rembau, (2°27´N, 102°4´E), Peninsular Malaysia (see Fig. 1). The mean annual temperature in this area is 23°C, and mean annual rainfall about 117 cm (Department of Meteorology, Malaysia). The fieldwork took place in December 2007 in the rainy season. During this time, the plantation soil became waterlogged when it rained for several days, while the mangrove soil was subject to daily tides. The oil palms in the study area were part of a massive network of plantations spanning hundreds of hectares; they were first planted about seven years ago on lands that were originally mangrove forests. Prior to oil palm planting, red soil was added after extensive drainage of the mangrove swamp water (Alias Busu, Fisherman's Association of Kampung Sungei Timun, pers. comm. 15 December 2007). A small fragment of mangrove forest (c. 7.3 ha) was left where villagers could obtain timber. Our sampling plots were set up in this forest fragment and the adjacent oil palm plantations.

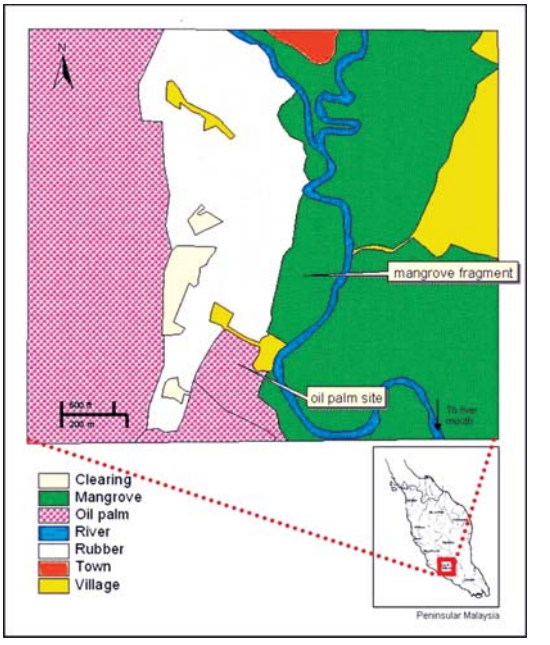

Fig. 1. Location of the study area in Peninsular Malaysia. Both sampled habitats (mangrove fragment and oil palm plantation) were located along the Rembau river.

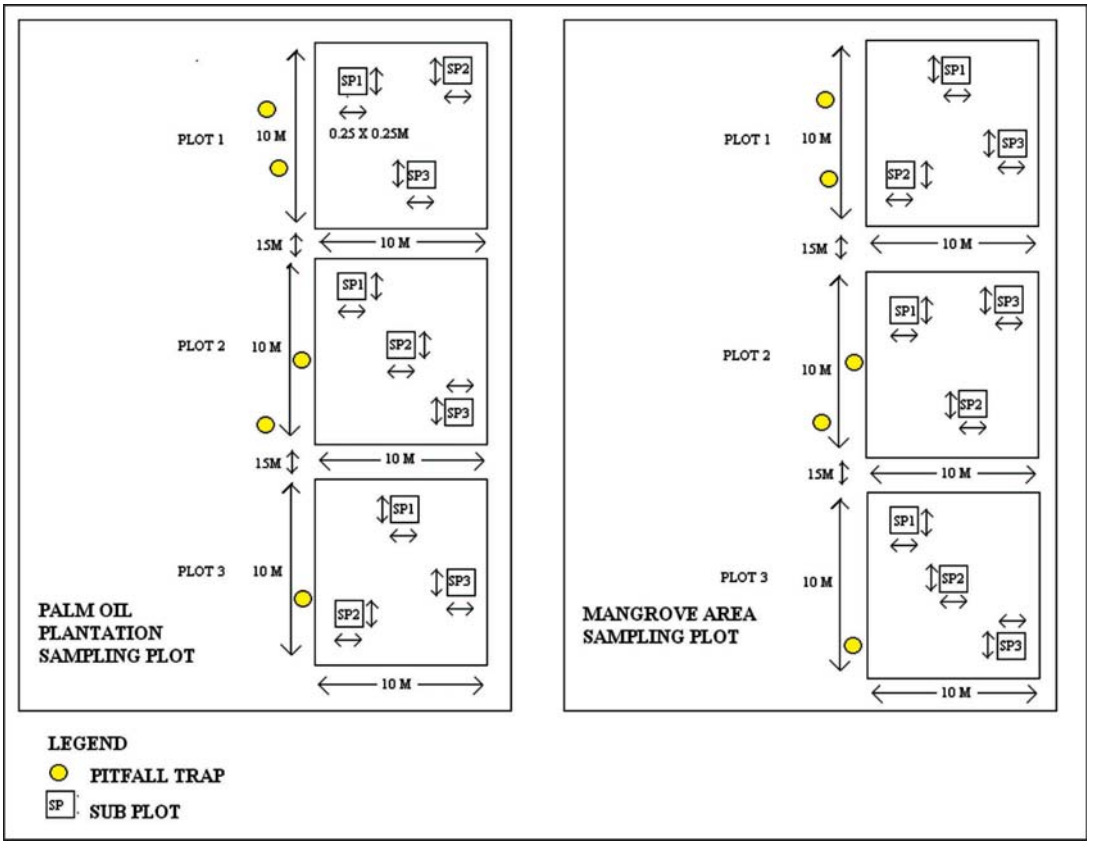

Fig. 2. Schematic of sampling layout for this study.

In each habitat type, specimens were collected by hand for a total of three days in three randomly-distributed 0.25 m^2 sampling subplots, nestled within each of three 10 m x 10 m plots (with about 45 minutes spent in each plot); these were located at least 20 m from the respective habitat boundary (Fig. 2). In each subplot, individual ants seen on the ground (on the bare surface of topsoil, horizontal roots and among dead leaves) were manually collected. Five pitfall traps (9 cm across, 10 cm deep, plastic cups filled with water and detergent) were set in each habitat type (Fig. 2); they were emptied every two days for six days but the catch was disrupted by rain and tides. After collection, all specimens were preserved in 70% alcohol. Organisms were identified in the laboratory at the Department of Agriculture, Universiti Putra Malaysia and then checked by entomologists at the Entomology Department of the Forest Research Institute Malaysia (FRIM).

A total of 9 species were found in the oil palm plantations and mangrove forests (Table 1). The number of species found in each sampling plot was low: 3-4 for oil palm plots and 2-4 for mangrove forest plots. Four species (*Paratrechina* sp., *Cardiocondyla* sp., *Monomorium* sp. 2 and *Odontomachus simillimus*) found in the plantation plots were absent in the mangrove plots, whilst two (*Anoplolepis* sp. and *Pheidole* sp.) found in the mangrove plots were not detected in oil palm.

The two species most frequent in mangroves (*Pseudolasius* sp. and *Euprenolepis* sp.) were rarer in the plantations. As in lowland forests (Mohamed 1998) and oil palm plantations (Pfeiffer *et al*. 2008) in Malaysia, Myrmicinae and Formicinae were the dominant subfamilies. Ponerinae was represented by a sole species, *Odontomachus simillimus* Smith, which was in the oil palm plantation as previously reported by Room (1975) in Papua New Guinea.

Table 1: The presence / absence of species in each sampling plot of two surveyed habitats in this study. 1 indicates presence and 0 indicates absence. P1 = plot 1, P2 = plot 2, P3 = plot 3.

	Oil palm plantation			**Mangrove forest**		
Species	**P1**	**P2**	**P3**	**P1**	**P2**	**P3**
Anoplolepis sp.	0	0	0	0	0	1
Euprenolepis sp.	0	1	0	1	1	1
Paratrechina sp.	1	0	1	0	0	0
Pseudolasius sp.	0	1	0	1	1	1
Cardiocondyla sp.	0	0	1	0	0	0
Monomorium sp. 1	1	0	1	0	1	0
Monomorium sp. 2	1	0	0	0	0	0
Pheidole sp.	0	0	0	0	0	1
Odontomachus simillimus Smith	1	1	0	0	0	0
Total no. of species in plot	4	3	3	2	3	4

A more extensive study found 41 ant species on the floor of oil palm plantations in East Sabah (Brühl 2001), while Pfeiffer *et al*. (2008) found 36 arboreal species on oil palm at Tawau in Sabah and 39 species at Banting in Peninsular Malaysia. Our study revealed low ant diversity in both palm oil plantations and mangrove forests. The rainy weather and low sampling effort may have limited the detection of ants; improved sampling would be needed to elucidate the effects of habitat degradation on the ant fauna.

ACKNOWLEDGEMENTS

Our thanks to all the staff members of the Entomology unit at the FRIM and Dr Nor Azura Adam of the Faculty of Agriculture, Universiti Putra Malaysia, for their invaluable help in species identification. Dr John Fellowes provided expert advice on the paper.

REFERENCES

Bennett EL and Reynolds CJ, 1993. The value of a mangrove Area in Sarawak. *Biodiversity and Conservation* 2:359–75.

Brühl CA, 2001. *Leaf Litter Ant Communities in Tropical Lowland Rain Forests in Sabah, Malaysia: Effects of Forest Disturbance and Fragmentation.* Ph.D. thesis, Julius-Maximilians-University. Wuerzburg.

Christensen B, 1983. Mangroves: what are they worth? *Unasylva 139:35*. Downloaded from http://www.fao.org/docrep/q1093e/q1093e01.htm on 1 August 2008.

Latiff A, 2005. Conservation and management of mangroves in Peninsular Malaysia. In: *Sustainable Management of Matang Mangroves: 100 Years and Beyond*, (First ed.). Shaharuddin MI *et al*. (eds), Forestry Department of Peninsular Malaysia, 139–52.

Macintosh DJ and Ashton EC, 2002. *A Review of Mangrove Biodiversity Conservation and Management*. Centre for Tropical Ecosystems Research, University of Aarhus, Denmark.

Mohamed M, 1998. Terrestrial ants (Formicidae: Hymenoptera) of Sayap-Kinabalu Park, Sabah. *ASEAN Review of Biodiversity and Environmental Conservation* VI:1–16.

Nielsen MG, Christian K, Henriksen PG and Birkmose D, 2006. Respiration by mangrove ants *Camponotus anderseni* during nest submersion associated with tidal inundation in Northern Australia. *Physiological Entomology* 31:112–26.

Nixon SW, Furnas BN, Lee V and Marshall N, 1984. The role of mangroves in the carbon and nutrient dynamics of Malaysian estuaries. In: Soepadmo E, Rao AN and MacIntosh DJ (eds). *Proceedings of the Asian Symposium on Mangrove Environment — Research and Management.* Universiti Malaya, 534–44.

Pfeiffer M, Tuck HC and Lay TC, 2008. Exploring arboreal ant community composition and co-occurrence patterns in plantations of oil palm *Elaeis guineensis* in Borneo and Peninsular Malaysia. *Ecography* 31:21–32.

Room PM, 1975. Diversity and organization of the ground foraging ant faunas of forest, grassland and tree crops in Papua New Guinea. *Australian Journal of Zoology* 23:71– 89.