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OCCURRENCE AND SPECIES DIVERSITY OF GROUND-DWELLING WORKER ANTS (FAMILY: FORMICIDAE) IN SELECTED LANDS IN THE DRY ZONE OF SRI LANKA

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ABSTRACT

Ants are an essential biotic component in terrestrial ecosystems in Sri Lanka. Worker ants were surveyed in six forests, uncultivated lands and, vegetable and fruit fields in two Districts of the dry zone, Anuradhapura and Polonnaruwa, from November, 2007 to October, 2008 by employing several sampling methods simultaneously along five, 100 m transects. Soil sifting, litter sifting, honey-baiting and hand collection were carried out at 5 m intervals along each transect. Twenty pitfall traps were set up throughout each site and collected after five hours. Air and soil temperatures, soil pH and soil moisture at each transect were also recorded.

Use of several sampling methods yielded a higher value for species richness than just one or two methods; values for each land ranged from 19 – 43 species. Each land had its own ant community and members of Amblyoponinae, Cerapachyinae, Dorylinae, Leptanillinae and Pseudomyrmecinae were recorded for the first time from the dry zone. Previous records of 40 species belonging to 23 genera in 5 subfamilies for the Anuradhapura District are updated to 78 species belonging to 36 genera in 6 subfamilies. Seventy species belonging to thirty one genera in 9 subfamilies recorded from the first survey of ants in Polonnaruwa lands can be considered a preliminary inventory of the District; current findings updated the ant species recorded from the dry zone to 92 of 42 genera in 10 subfamilies. Consequent to this sum, the estimate of ant diversity of Sri Lanka rises to 202 species in 64 genera while 12 subfamilies remain unchanged.

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Keywords: Dry zone ant fauna, ant sampling methods, Anuradhapura ants, Polonnaruwa ants, rare ants

INTRODUCTION

Ants (Order: Hymenoptera; Family: Formicidae) are common and important elements of tropical terrestrial ecosystems because they act as seed dispersers, decomposers, janitors of the world and are functional as predators, prey, detritivores, mutualists and herbivores (Wilson 1971; Alonso 2000). Also, many ant species are useful tools for land management practices (Underwood & Quinn 2010) and ecosystem monitoring in the mining industry, sustainability of fire and grazing management in grasslands (McGeoch 1998; Bisevac & Majer 1999; York 2000). Medicinal properties of ants (Read 1982) as well as their ability to cause allergic reactions and the death of humans (Ratnatilake *et al*. 2011) have also been documented.

Diversity and distribution of worker ant fauna in selected forests, cultivated and uncultivated lands in several wet zone Districts of Sri Lanka were documented by Dias & Perera (2005, 2007a, 2007b, 2007c, 2011), Dias (2006, 2008) and Gunawardene *et al*. (2008) by using several methods of collection simultaneously (Bestelmeyer *et al*. 2000; Ogata 2001). According to current records, 182 species belonging to 62 genera in 12 subfamilies have been recorded from Sri Lanka (Dias 2008). Forty species of ants of twenty three genera in five subfamilies have been recorded from four selected lands in Anuradhapura District (Dias & Gunathilake 2007a & b). Forests, uncultivated lands and vegetable and fruit fields in the dry zone appear to have rich ant diversity but very little information on the worker ant fauna of such lands has been documented. This paper presents the species richness and distribution of worker ants in six dry mixed evergreen forests, six uncultivated lands and six vegetable and fruit fields situated in two Districts of the dry zone of Sri Lanka.

METHODOLOGY

Field and laboratory Methods

The sites selected for this survey consisted of forests, uncultivated lands and vegetable and fruit fields from Anuradhapura and Polonnaruwa Districts (Table 1).

Six forests were of dry, mixed evergreen type and F1, F3 and F5 consisted of a dense upper canopy. Among uncultivated lands, U1 and U6 were wild grasslands whereas other lands had trees occasionally. All cultivated lands had been applied herbicides, fungicides, insecticides and fertilizers by the owners. The lands are described in detail in Kosgamage (2011). Five locations of each land (Table 1) were surveyed for ants on the dates shown, using several sampling methods simultaneously along a 100 m transect laid at each location; ants were extracted by (a) soil sifting, (b) leaf-litter sifting (where leaf-litter was available), (c) honey baiting and (d) timed hand collection. Within each transect:

(a) Twenty soil samples (each 10 x 10 cm; 5 cm deep) taken at 5 m intervals along a line which was parallel and 2 m left of transect, were sifted through mesh into a white tray. All ants seen with the naked eye were collected into glass vials filled with 85% ethanol.

(b) Twenty leaf-litter samples (each approximately 20 x 20 cm wide; 4 cm deep), taken at 5 m intervals along a line which was parallel and 2 m right of the transect, were sifted into a white tray and the worker ants seen with the naked eye were collected into glass vials filled with 85% ethanol.

(c) Twenty pieces of gauze (each 5 cm × 5 cm), each with a drop of honey, were placed on the ground at 5 m intervals along the transect, and the pieces of gauze and attending ants were collected after one hour into a plastic bottle filled with 85% ethanol.

(d) Hand collection was done for 5 minutes, around a point approximately 5 m apart from the next, with twenty such points in a line parallel and 1 m right of the transect. At each point, worker ants crawling on the ground within a radius of about 80 cm were collected over five minutes and ants were preserved in 85% ethanol.

In addition, twenty honey-baited cups were set in the soil, with the mouth of the cups flush with the surface soil level, throughout each sampling area. The cups and the attending ants were collected after five hours and ants

Table 1: Lands, GPS co-ordinates, sampling dates and number of samples collected by each method from each land B – Honey baiting; H – Hand collection; S – Soil sifting ; L – Leaf - litter sifting; P – Pitfall trapping.

			No. of samples				
Land	GPS co-ordinates	Date	S	L	B	H	P
1. Kahalle – Pallekele Forest (F1)	08° 12' N and 080° 31' E	02/11/2007	100	100	100	-	-
2. Unculltivated land Pohoranwewa, Dambulla. (U1)	07° 51' N and 080° 37' E	03/11/2007	100	No litter	100	100	20
3. Bittergourd field Pohoranwewa, Dambulla (C1)	07° 51' N and 080° 37' E	03/11/2007	100	No litter	100	100	20
4. Nachchaduwa Forest (F2)	08° 16' N and 080° 28' E	02/02/2008	100	100	100	100	20
5. Uncultivated land Pulliyarahandiya, Anuradhapura (U2)	08° 21' N and 080° 26' E	03/02/2008	100	100	100	100	20
6. Vegetable and papaya field Kawarakkulama Anuradhapura (C2)	08° 20' N and 080° 28' E	03/02/2008	100	No litter	100	100	20
7. Mihintale Forest (F3)	08° 20' N and 080° 30' E	21/04/2008	100	100	100	100	20
8. Uncultivated land Mihintale (U3)	08° 21' N and 080° 30' E	22/04/2008	100	No litter	100	100	20
9. Brinjal field, Thulana (C3)	08° 20' N and 080° 28' E	22/04/2008	100	No litter	100	100	20
10. Giritale Forest (F4)	07° 58' N and 080° 54' E	02/07/2008	100	100	100	100	20
11.Vegetable, peanuts and corn field, Nikawewa, Polonnaruwa (C4)	07° 57' N and 080° 56' E	03/07/2008	100	100	100	100	20
12. Uncultivated land Jayanthipura, Polonnaruwa (U4)	08° 00' N and 080° 59' E	03/07/2008	100	No litter	100	100	20

Table 1 continued….

Land	GPS co-ordinates	Date	No. of samples				
			S	L	B	H	P
13.Nagalakanda Forest, Minneriya (F5)	08° 03’ N and 080° 55’ E	05/09/2008	100	100	100	100	20
14. Surrounding area of Minneriya tank (U5)	08° 02’ N and 080° 53’ E	06/09/2008	100	No litter	100	100	20
15. Papaya field Sinhapura, Polonnaruwa (C5)	07° 59’ N and 081° 00’ E	05/09/2008	100	No litter	100	100	20
16. Somawathiya Sanctuary (F6)	08° 01’ N and 080° 05’ E	19/10/2008	100	No litter	100	100	20
17. Grassland Pulathisigama, Polonnaruwa (U6)	08° 01’ N and 081° 05’ E	19/10/2008	100	No litter	100	100	20
18. A field of vegetables, corn and grapes Hathamuna, Polonnaruwa (C6)	08° 02’ N and 080° 57’ E	20/10/2008	100	No litter	100	100	20

were preserved in 85% ethanol. The methods employed in each land and total number of samples collected by each method from each land is shown in Table 1.

Ants in each collection were sorted and identified to the furthest possible taxonomic levels under a low power stereo-microscope at suitable magnifications, by reference to Bingham (1903), Bolton (1994) and Bolton et al. (2006) and the reference collection at the Department of Zoology, University of Kelaniya. Richness of ant species observed by each method and all methods from each land was recorded.

Measurement of environmental parameters

During each survey, air and soil temperature at a representative point of each transect was measured using a thermometer and the mean value per land was recorded. A soil sample from each transect was brought to the laboratory and soil humidity (Brower *et al*., 1998) of each land was calculated from five mean values. Soil pH (Soil pH meter - Spectrum Technologies) at a representative point of each transect was also recorded and mean soil pH for each land was calculated.

RESULTS

Species richness and distribution of species

Ant fauna of Anuradhapura and Polonnaruwa District lands comprised of ten subfamilies, Aenictinae, Amblyoponinae, Cerapachyinae, Dolichoderinae, Dorylinae, Formicinae, Leptanillinae, Myrmicinae, Ponerinae and Pseudomyrmecinae, from which thirty seven genera and eighty six species were recorded (Tables 2 and 3). Thirty two genera and 72 species belonging to six subfamilies were recorded from Anuradhapura lands whereas thirty genera and 70 species in nine subfamilies were recorded from Polonnaruwa lands (Table 2). Species richness in the eighteen lands surveyed ranged from 19 – 43. The lowest species richness, 19, was recorded from F1 and C2; the highest value, 43, was recorded from U2. Each land had its own ant community and each of 21 species was observed only in a single land (Table 2). Among them, 12 from the forests, 8 in uncultivated lands and a single species from a cultivated land were recorded. *Pheidole* sp. 4 inhabited 17 lands whereas *Crematogaster dohrni, P. longicornis, S. geminata* and *Tetramorium smithi* occupied 16 lands. Two to 15 lands were inhabited by each of the other species.

Effects of using several sampling methods on recorded species richness

Higher species richness values than that resulted with a single method was clearly observed using several simultaneous sampling methods at each land (Table 3). A single method was only effective (Table 2) in catching *Aenictus fergusoni, A. pachycerus, Amblyopone* sp. 1, *Anochetus graeffei, Cerapachys* sp. 1, *Dorylus orientalis* , *Lepisiota fergusoni, Leptanilla* sp. 2, *Lophomyrmex* sp. 1, *Solenopsis* sp. 4 and *Tapinoma* sp. 1 (soil sifting); *Myrmecina striata* and

Table 2 Ant community in each land, distribution of ant species in the eighteen lands and methods effective for catching each species

F1 – C6: as in Table 1; S – Soil sifting, L – Litter sifting, B – Honey baiting, H – Hand collection, P – Pitfall trapping

Species	F1	U1	C1	F2	U2	C2	F3	U3	C3	F4	U4	C4	F5	U5	C5	F6	U6	C6	Effective methods
Aenictus fergusoni Forel	-	-	-	-	-	-	+	-	-	-	-	-	-	-	-	-	-	-	S
Aenictus pachycerus (Dalla Torre)	-	-	-	-	-	-	+	-	-	-	-	-	-	-	-	-	-	-	S
Amblyopone sp. 1	-	-	-	-	-	-	-	-	-	-	-	-	-	+	-	-	-	-	S
Cerapachys sp. 1	-	-	-	-	-	-	-	-	-	-	-	-	+	-	-	-	-	-	S
Tapinoma melanocephalum (Fabricius)	+	+	+	+	+	-	-	+	+	+	+	-	-	+	+	+	+	+	S, L, B, H, P
Tapinoma indicum Forel	-	-	+	-	+	-	-	+	-	+	+	+	+	-	-	-	+	+	S, B, P
Tapinoma sp. 1	-	-	-	-	-	-	-	+	-	-	-	-	-	+	-	-	-	-	B
Technomyrmex albipes (Smith F.)	-	-	+	+	+	-	+	+	+	+	-	-	+	-	+	-	+	+	S, L, B, H, P
Technomyrmex bicolor Forel	-	-	-	-	+	-	-	+	-	+	-	-	-	-	-	-	-	-	S, L, P
Dorylus orientalis Westwood	-	-	-	-	-	-	-	-	-	-	-	-	-	+	-	-	-	-	S
Acropyga acutiventris Roger	-	-	-	+	+	-	+	-	-	-	-	+	+	+	-	-	-	-	S, L, B, P
Anoplolepis gracilipes (Smith F.)	+	-	-	+	+	-	-	+	-	+	+	+	+	+	+	-	+	+	S, L, B, H, P
Camponotus irritans (Smith F.)	-	+	+	+	+	-	+	+	+	-	+	-	+	+	-	-	+	-	S, L, B, H, P
Camponotus compressus Fabricius	-	+	+	+	+	+	-	+	-	+	-	+	+	+	+	+	+	-	S, L, B, H, P
Camponotus rufoglaucus (Jerdon)	-	+	-	-	+	-	+	+	+	+	-	+	+	+	+	-	+	+	S, L, B, H, P
Camponotus sericeus (Fabricius)	-	-	-	+	+	+	-	-	+	-	+	-	+	-	+	+	+	+	S, B, H, P
Camponotus reticulatus Roger	-	+	-	-	+	+	-	+	+	-	+	-	-	-	-	-	-	-	B, H, P
Camponotus oblongus Forel	-	+	-	+	+	-	-	+	-	-	-	-	+	-	-	-	-	-	B, H, P
Lepisiota capensis Mayr	-	-	-	+	-	-	+	-	-	+	-	+	+	-	-	-	-	-	S, L, B, H, P
Lepisiota fergusoni (Forel)	-	-	-	-	-	-	-	-	-	-	+	-	-	-	-	-	-	-	S
Lepisiota modesta (Forel)	-	-	-	-	-	+	-	-	-	-	-	+	+	-	-	-	-	-	S, L, P
Nylanderia yerburyi (Forel)	-	-	-	+	+	-	+	+	-	+	+	+	+	-	+	+	+	+	S, L, B, H, P
Oecophylla smaragdina Fabricius	-	+	-	-	+	-	-	-	+	-	+	-	-	+	-	-	-	-	S, L, B, H, P
Paratrechina longicornis (Latrielle)	+	+	+	+	+	+	+	+	-	+	+	+	+	+	-	+	+	+	S, L, B, H, P
Paratrechina indica Forel	-	-	-	+	+	+	-	-	-	-	-	-	+	-	-	-	-	-	L, B, H, P
Plagiolepis exigua Forel	-	-	-	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	P

Table 2 Continued.

Species	F1	U1	C1	F2	U2	C2	F3	U3	C3	F4	U4	C4	F5	U5	C5	F6	U6	C6	Effective methods
Plagiolepis jerdonii Forel	-	-	-	-	-	-	-	-	-	+	-	-	-	-	-	-	-	-	S, B
Polyrhachis convexa Roger	-	-	-	-	+	-	-	-	-	+	+	-	-	+	+	-	-	-	S, L, B, H, P
Polyrhachis jerdonii Forel	-	-	-	-	+	-	-	-	-	-	+	-	-	-	-	+	+	-	S, H, P
Polyrhachis punctilata Roger	-	-	+	+	+	-	-	-	-	-	-	+	-	+	-	+	+	-	S, B, H, P
Pseudolasius isabellae Forel	-	+	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	H
Leptanilla sp. 2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	-	-	-	S
Calyptomyrmex sp. 1	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	S, L, B, H
Cardiocondyla nuda Mayr	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	-	+	S, B, H
Cataulacus taprobanae Smith F.	-	-	-	-	-	-	+	+	-	-	-	-	-	+	-	-	-	-	S, L, H
Crematogaster dohrni Mayr	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	-	+	-	S, L, B, H, P
Crematogaster biroi Mayr	-	-	-	-	+	-	-	-	-	-	-	-	-	-	-	-	-	-	B, H
Crematogaster rothneyi Forel	-	-	-	-	+	+	-	+	+	+	-	+	+	+	+	-	+	-	S, L, B, H, P
Crematogaster sp. 1	-	-	-	-	-	-	-	-	-	-	-	+	+	-	-	-	-	+	P
Lophomyrmex quadrispinosus (Jerdon)	-	-	-	+	+	+	+	+	+	-	+	-	+	+	+	+	+	+	S, L, B, H, P
Lophomyrmex sp. 1	-	-	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	S
Meranoplus bicolor (Guerin-Meneville)	+	+	+	-	+	+	+	+	+	+	+	+	+	-	+	-	+	+	S, L, B, H, P
Monomorium destructor (Jerdon)	-	-	-	-	+	-	+	+	+	-	-	-	-	+	+	+	-	-	L, B, H, P
Monomorium floricola (Jerdon)	-	-	-	+	+	+	+	+	+	-	-	-	+	-	-	-	-	-	S, L, B, H
Monomorium pharaonis L	+	+	+	-	+	-	+	+	+	-	+	-	-	+	+	+	+	+	S, L, B, H, P
Monomorium criniceps (Mayr)	-	-	+	+	-	+	-	-	-	-	+	-	+	-	+	-	-	+	S, B, H
Monomorium sp. 1	-	+	-	+	+	-	-	-	+	-	-	-	+	-	-	-	+	-	S, B, H, P
Monomorium sp. 2	+	+	+	-	-	-	+	-	+	-	-	-	-	-	-	-	-	-	S, L, B, H, P
Monomorium sp. 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	-	-	-	P
Myrmecina striata Emery	-	-	-	-	-	-	+	-	-	-	-	-	-	-	-	-	-	-	L
Myrmicaria brunnea Saunders	-	-	-	+	+	-	-	+	+	-	+	-	+	-	-	-	-	-	S, L, H, P

Species	F1	U1	C1	F2	U2	C2	F3	U3	C3	F4	U4	C4	F5	U5	C5	F6	U6	C6	Effective methods
Pheidole sp. 1	-	-	+	+	-	-	+	+	+	+	-	-	-	+	+	-	+	+	S, B, P
Pheidole sp. 3	-	+	-	+	+	+	+	+	+	+	+	-	+	+	+	+	+	+	S, L, B, H, P
Pheidole sp. 4	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	-	+	S, L, B, H, P
Pheidole sp. 5	+	+	+	-	+	+	+	-	-	-	+	+	+	+	+	+	-	+	S, L, B, H, P
Pheidole sp. 6	-	+	+	-	-	-	-	-	+	-	-	-	-	-	-	-	-	-	S, H
Pheidole sp. 7	-	+	+	+	+	-	+	+	+	+	-	+	+	+	-	-	+	+	S, B, H, P
Pheidole sp. 8	-	-	-	-	-	-	+	-	-	+	-	-	-	+	-	+	-	+	S, L, B, P
Pheidole sp. 9	-	-	-	-	-	-	+	-	-	+	-	-	-	-	-	-	-	-	L, B, P
Pheidole sp. 10	-	-	-	-	-	-	+	+	-	-	-	-	-	-	-	-	-	-	B
Recurvidris recurvispinosa (Forel)	-	-	-	-	-	-	-	+	-	+	-	-	-	-	-	-	-	-	B, P
*Solenopsis geminata (*Fabricius)	-	+	+	+	-	+	+	+	+	+	+	+	+	+	+	+	+	+	S, L, B, H, P
Solenopsis sp. 1	+	-	-	-	+	-	+	-	-	-	-	+	+	-	-	-	-	+	S, L, B
Solenopsis sp. 2	-	-	-	-	-	-	-	-	-	-	+	-	-	-	-	-	-	-	S, H
Solenopsis sp. 3	-	-	-	-	-	-	-	-	-	-	+	-	+	+	-	-	-	-	S, P
Solenopsis sp. 4	-	-	-	-	-	-	-	-	-	-	-	-	-	+	-	-	-	-	S
Strumigenys lyroessa (Roger)	+	-	-	-	+	-	+	-	-	-	-	-	-	-	-	-	-	-	S, L
Tetramorium bicarinatum (Nylander)	+	-	-	+	+	-	+	+	+	+	-	+	+	+	+	-	-	+	S, L, B, H, P
Tetramorium smithi Mayr	+	+	+	+	+	-	+	+	+	+	+	+	+	-	+	+	+	+	S, L, B, H, P
Tetramorium tortuosum Roger	-	-	-	-	-	-	-	+	+	-	+	+	+	+	+	-	-	+	S, B, P
Tetramorium walshi (Forel)	+	+	+	+	+	+	+	+	+	+	-	+	+	+	+	-	-	-	S, L, B, H, P
Anochetus longifossatus Mayr	-	-	-	-	+	-	+	-	-	-	-	-	-	-	-	-	-	-	S, L
Anochetus graeffei Mayr	-	-	-	-	-	-	-	+	-	-	-	-	-	-	+	-	-	-	S
Harpegnathos saltator Jerdon	-	-	-	-	-	-	+	-	-	-	-	-	-	-	-	-	-	-	P
Hypoponera sp. 1	+	-	-	+	+	-	+	-	-	+	-	-	-	-	-	-	-	-	S, L, H
Hypoponera sp. 2	+	-	-	-	-	-	+	+	-	+	+	-	-	-	+	-	-	-	S, L
Hypoponera sp. 3	-	-	-	-	-	-	+	-	-	+	-	-	-	-	-	-	-	-	S, L
Leptogenys processionalis (Jerdon)	-	-	-	+	+	-	+	+	+	+	+	-	+	-	-	+	-	-	S, L, B, H, P

Table 2 Continued.

*Leptogenys peuqueti (*Andre)	-	-	-	-	-	-	-	-	-	+	-	-	-	-	-	-	-	-	L
Leptogenys pruinosa Forel	+	-	-	+	-	+	+	-	+	-	-	-	-	-	-	+	-	-	S, B, H, P
Pachycondyla tesseronoda (Emery)	-	+	-	+	+	+	+	+	+	-	+	+	+	+	-	+	-	-	S, L, B, H, P
Pachycondyla rubiginosa (Emery)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	-	-	-	S, H, P
*Platythyrea parallela (*Smith F.)	-	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	H
Tetraponera allaborans (Walker)	+	-	-	-	-	-	+	+	+	-	+	-	-	-	-	+	-	-	S, L, H, P
Tetraponera rufonigra (Jerdon)	-	-	+	+	+	-	-	-	-	-	-	-	+	+	-	+	+	+	S, B, H, P
Tetraponera petiolata (Smith F.)	-	-	-	-	-	-	+	-	-	-	-	-	-	-	-	-	-	-	H
Total 86	19	24	23	33	43	19	42	38	31	31	30	24	38	33	29	22	24	26	

Scientific names are given according to the Bolton *et al.* (2006); morphospecies numbers are according to the first author's collection kept at the Department of Zoology, University of Kelaniya, Sri Lanka.

Table 3: Species richness in each land recorded by each method and all methods and, species accumulation along 18 lands H – Hand collection; S – Soil sifting; L – Leaf litter sifting; B – Honey baiting; P – Pitfall trapping

District	Land	Species richness						
		Sampling method					All methods	Overall
		S	L	H	B	P		
Anuradhapura	F1	10	14	0	11	12	19	19
	U1	10	-	10	13	10	24	33
	C1	14	-	15	11	0	23	40
	F2	15	15	23	23	11	33	50
	U2	16	17	20	28	22	43	57
	C2	9	-	9	13	5	19	58
	F3	14	17	13	21	15	42	68
	U3	20	-	16	26	17	38	72
	C3	12	-	10	19	20	31	72
Polonnaruwa	F4	14	17	5	20	12	31	74
	U4	10	-	12	2	10	30	77
	C4	14	15	13	12	17	24	78
	F5	13	16	21	11	21	38	79
	U5	23	-	20	12	17	33	82
	C5	20	-	17	14	20	29	85
	F6	12	-	10	15	11	22	86
	U6	17	-	16	12	14	24	86
	C6	18	-	16	18	8	26	86

Table 4: Environmental parameters (mean ± S.D.) at the time of sampling observed in the eighteen lands

Site	Temperature (^{o}C)		Soil humidity (%)	Soil pH
	Air	Soil		
Kahalle– Pallekele forest (F1)	28.8 ± 1.1	27.4 ± 0.5	17.9 ± 2.5	6.4 ± 0.2
Unculltivatedland, Pohoranwewa, Dambulla (U1)	28.2 0.4	28.2 0.8	13.4 1.1	6.1 0.1
Cultivated land, Pohoranwewa, Dambulla (C1)	31.8 ± 0.6	32.6 ± 0.4	9.5 ± 1.0	5.8± 0.05
Nachchaduwa forest (F2)	29.0 ±1.7	27.8 ± 1.3	11.3 ± 7.4	6.2 ± 0.1
Uncultivated land, Pulliyarahandiya, Anuradhapura (U2)	29.6 ± 1.5	28.4 ± 1.5	5.5 ± 2.7	6.1 ± 0.1
Cultivated land, Kammalakkulama Anuradhapura (C2)	30.2 ± 1.1	31.0 ± 1.4	3.7 ± 2.6	5.8 ± 0.1
Mihinthale forest (F3)	29.4 ± 0.5	28.1 ± 0.2	20.4 ± 1.2	6.0 ± 0.1
Uncultivated land, Mihinthale (U3)	30.4 ± 0.5	29.2 ± 0.4	10.6 ± 5.1	6.0 ± 0.5
Cultivated land, Thulana (C3)	33.8 ± 0.8	31.8 ± 1.6	8.2 ± 2.0	6.3 ± 0.2
Giritale Forest (F4)	31.8 ± 0.4	30.6 ± 0.5	4.8 ± 1.6	6.5 ± 0.04
Uncultivated land (U4)	34.3 ± 0.4	35.2 ± 2	2.8 ± 1.3	6.2 ± 0.2
Cultivated land (C4)	34.8 ± 0.2	33.9 ± 1	1.9 ± 1.2	5.6 ± 0.2
Nagalakanda forest, Minneriya, Polonnaruwa (F5)	30.6 ± 0.7	28.1 ± 0.2	6.4 ± 2.3	7.7 ± 0.35
Surrounding area of Minneriya tank (U5)	33.4 ± 0.4	30.5 ± 0.5	7.3 ± 3.4	7.0 ± 0.38
Papaya field, Sinhapura, Polonnaruwa (C5)	30.9 ± 0.7	30.6 ± 0.4	10.3 ± 4.5	7.0 ± 0.8
Somawathiya sanctuary (F6)	25.2 ± 0.3	25.5 ± 0.5	12.2 ± 1.8	6.7 ± 0.2
Uncultivated land, Pulathisigama, Polonnaruwa (U6)	28.4 ± 0.4	29.3 ± 1.2	18.2 ± 4.6	6.6 ± 0.7
Cultivated land Hathamuna, Polonnaruwa (C6)	25.4 ± 0.4	25.6 ± 0.4	14.6 ± 2.1	6.9 ± 0.3

Leptogenys peuqueti (litter sifting); *Platythyrea parallela* and *Tetraponera petiolata* (hand collecting), *Plagiolepis exigua*, *Crematogaster* sp. 1, *Monomorium* sp. 3, *Harpegnathos saltator* (pitfall trapping) in the collection. Two or more methods caught *Anoplolepis gracilipes* , *Camponotus compressus*, *Camponotus rufoglaucus*, *Meranoplus bicolor*, *Leptogenys processionalis*, *Paratrechina longicornis*, *Nylanderia yerburyi*, *Pheidole* sp. 3, *Pheidole* sp. 4, *Pheidole* sp. 5, *Pheidole* sp. 7, *Pheidole* sp. 8, *Pheidole* sp. 9, *Solenopsis geminata*, *Tetramorium smithi and Tetramorium bicarinatum* workers.

DISCUSSION

Previous survey on worker ants in Anuradhapura lands (Dias and Gunathilake, 2007a; 2007b) reported five subfamilies, 23 genera and 40 ant species in 2007 and current findings raised the number of subfamilies to six, genera to 36 and species to 78 in 2008. This list can be considered a preliminary inventory of ants of the Anuradhapura District. A list of 9 subfamilies, 30 genera and 70 species recorded from Polonnaruwa lands can be considered a preliminary inventory of ants of Polonnaruwa District. This survey recorded for the first time, presence of five subfamilies, Amblyoponinae, Cerapachyinae, Dorylinae, Leptanillinae and Pseudomyrmecinae in the dry zone raising the number of subfamilies present in the dry zone to ten. Also, the number of genera and species recorded from the dry zone increase to 42 and 92, respectively (Kosgamage, 2011). Therefore, number of subfamilies and genera observed in the dry zone is comparable with that of Sinharaja Forest Reserve (Subfamilies: 11, Genera: 54; Gunawardene et al. 2008) and Gilimale Forest Reserve (Subfamilies: 10, Genera: 38; Dias & Perera 2011) in the wet zone. Further studies in the Districts of Mannar, Kilinochchi, Jaffna, Mullativu, Vavuniya, Trincomalee, Batticaloa, Ampara, Badulla and Moneragala belonging to the dry zone of Sri Lanka need to be carried out to obtain a better idea of species richness for the dry zone and until then, the present findings remain tentative. Furthermore, rice fields and home gardens also need to be included in such surveys. Night foragers should also be added to the list.

Use of several simultaneous methods rather than one or two seemed to yield higher values for species richness; this indicated that multiple methods of sampling yield better estimates of species richness in Sri Lanka (Dias and

Gunathilake 2007a; 2007b; Dias and Perera 2011) and elsewhere. Rare ants, *Aenictus*, *Amblyopone* and *Leptanilla* sp. 2, earlier caught only by the litter sifting in Gilimale Forest Reserve were collected also by the soil sifting method during this survey. Also, soil sifting was the only effective method for catching *Cerapachys* workers but canned fish baits as well as soil sifting caught *Dorylus* in the Gilimale Forest Reserve (Dias & Perera 2011). Current findings support the view that the use of several methods such as soil sifting, litter sifting, honey baiting, hand collecting and pitfall trapping for sampling ground-dwelling ants within a short period of time for the preparation of an inventory of ants in a given area (Hashimoto *et al*. 2001) is obviously better than the use of one or two methods.

Members of ten subfamilies out of the twelve recorded from Sri Lanka (Bolton 2003; Dias 2008) were observed in the dry zone, except Aneuretinae and Ectatomminae perhaps due to the unfavourable environmental conditions (Table 4) for *Aneuretus simoni* Emery and *Gnamptogenys* spp. and, ineffective sampling methods or both for the latter. Sixty two genera and 182 species of ants recorded from Sri Lanka can be updated to 64 and 202, respectively with the addition of *Tapinoma* sp. 1, *Bothriomyrmex* sp. 1, *Camponotus compressus*, *C. oblongus*, *Lepisiota capensis*, *L. fergusoni*, *L. modesta*, *Paratrechina indica*, *Plagiolepis exigua*, *P. jerdonii*, *Polyrhachis convexa*, *Crematogaster rothneyi*, *Myrmecina striata*, *Lophomyrmex* sp. 1, *Recurvidris recurvispinosa*, *Tetramorium smithi*, *T. walshi*, *Anochetus graeffei*, *Pachycondyla rubiginosa* and *P. tesseronoda* to the previous list.

The species restricted to a single land can be considered as specialists whereas those common to 16 – 17 lands are generalists and may be widespread throughout the dry zone lands. Presence of its own ant species composition (Table 3) could be reflections of environmental conditions (Table 4), available food and microhabitats and other biological interactions in each land.

CONCLUSIONS

Thirty three genera and 72 species in 6 subfamilies were recorded from Anuradhapura lands whereas 31 genera and 70 species in 9 subfamilies were recorded from Polonnaruwa lands. The number of subfamilies recorded from the dry zone rose to 10, genera to 42 and species to 92 compared to the previous

information. Subfamilies, Amblyoponinae, Cerapachyinae, Dorylinae, Leptanillinae and Pseudomyrmecinae were recorded for the first time from the dry zone.

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