

**TAXONOMIC KEY FOR THE SUBFAMILIES OF
WORKER ANTS (FAMILY: FORMICIDAE) IN SRI LANKA
AND SOME INFORMATION ON
Aneuretus simoni EMERY IN RATNAPURA**

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TAXONOMIC KEY FOR THE SUBFAMILIES OF WORKER ANTS (FAMILY:
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Abstract

Key Words : Taxonomic key, Subfamilies of worker ants in Sri Lanka, morphometrics and the microhabitat of *Aneuretus simoni* Emery

Diverse ant fauna of Sri Lanka demands the preparation of taxonomic keys locally for the identification of ants to the lower taxonomic levels and the initial step to fulfill this demand was to prepare a taxonomic key to distinguish nine Subfamilies recorded from Sri Lanka. Based on the morphological features seen in the worker ants that belonging to nine Subfamilies and thirty six genera collected from Gampaha, Ratnapura, Colombo and Galle districts, a taxonomic key was prepared to sort worker ants to the Subfamilies, Aenictinae, Aneuretinae, Cerapachyinae, Dolichoderinae, Dorylinae, Formicinae, Myrmicinae, Ponerinae and Pseudomyrmecinae. *Aneuretus simoni* Emery was found in Ratnapura only and *Aenictus* Shuckard, *Cerapachys* Smith and *Dorylus* Fabricius were only recorded from Gampaha district. A single specimen of *Strumigenys* Smith was found in Galle. Other ant genera were common to two or more districts.

The sole living representative of Subfamily Aneuretinae, *Aneuretus simoni* Emery, is endemic to Sri Lanka and the morphometrics of different castes of this species collected from city-reservoir associated forest in Ratnapura are presented with some important notes on its current microhabitat in Sri Lanka. A preliminary quantitative study revealed that the colonies of this species were absent in decaying pieces of wood or fallen twigs but present in the soil layers just beneath the leaf litter in this forest.

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Introduction

Worker ant fauna (Order : Hymenoptera, Family : Formicidae) belonging to different taxonomic categories are common and widely distributed in Sri Lanka (Bolton & Belshaw, 1993 ; Dorow & Kohout, 1995; Chaminda and Dias, 2001; Dias & Chaminda, 2000, 2001; Dias, 2002). Bingham (1903) provided descriptions and simple taxonomic keys for the Ceylonese ants but this information is almost outdated and currently invalid. Identification of these ants to lower taxonomic levels has to be based on the taxonomic keys published by foreign myrmecologists (Holldobler & Wilson, 1990; Bolton, 1987, 1994; Japanese Colour Image Database). Sorting of the worker ants in Sri Lanka to the Subfamily level according to these keys is a time-consuming effort due to the higher number of Subfamilies than that recorded from Sri Lanka is included in the keys (Holldobler & Wilson, 1990; Bolton, 1994) or some Subfamilies recorded from Sri Lanka are not included in them (Japanese Colour Image Database; Tiwari, 1999). Therefore, the aim of this paper is to provide a simple taxonomic key to distinguish the nine Subfamilies of worker ants, namely, Aenictinae, Aneuretinae, Cerapachyinae, Dolichoderinae, Dorylinae, Formicinae, Myrmicinae, Ponerinae and Pseudomyrmecinae, recorded from four districts in the wet zone of Sri Lanka.

Aneuretus simoni Emery is the only living species belonging to Subfamily Aneuretinae and so far, it has been recorded only from Sri Lanka (Bolton, 1994, 1995). Wilson et al. (1956) reported that *A. simoni* was abundant in the area between Ratnapura and Adam's Peak and it was extremely abundant in the second-growth forest associated with the city-reservoir and several other forests in Ratnapura. According to Jayasuriya and Traniello (1985) this species was present only in a forest in Gilimale in 1979 but was absent in city-reservoir forest in Ratnapura. The microhabitats of this species were mostly the decaying wood or fallen twigs (Wilson et al., 1956; Jayasuriya & Traniello, 1985) and a single colony was found under a layer of leaf litter (Jayasuriya & Traniello, 1985). If *A. simoni* still lives in the city-reservoir associated forest ("Pompekelle") in Ratnapura was investigated in 2001 and this paper also provides the morphometrics of different castes of *A. simoni* and information on its current microhabitat in this forest.

Methodology

Preparation of the taxonomic key

Six hundred and twenty six samples of worker-ants were collected by sifting leaf litter, baited traps and manually from the premises of Kelaniya University, other regions in Gampaha district, Colombo, Ratnapura and Galle districts. All the samples were preserved in 85% ethanol and a light microscopic study of the morphology and systematics of worker ants in each sample was carried out at suitable magnifications. A simple taxonomic key was prepared to distinguish nine Subfamilies recorded from Sri Lanka on the basis of common and major morphological features present in all ant genera belonging to each Subfamily seen in the collection.

Investigation on *A. simoni*

Sieving of leaf litter was carried out along the forest-edge exposed to the road which runs through the second-growth forest associated with the water-pumping station in Ratnapura in April 2001. Presence of *A. simoni* in a sample collected in April led to the search for colonies in May 2001. Some members of the colony observed in the soil in May 2001 were collected by soil sieving followed by manual collection into a glass vial filled with 85% ethanol.

Total body length, head length, head width, eye length, scape length pronotal width and alitrunk length of the minor (16 individuals) and major (09 individuals) workers and, the winged queen (01) of *A. simoni* were measured at suitable magnifications using a calibrated micrometer-eyepiece.

Search for *A. simoni* workers and colonies among the leaf litter and the superficial soil layers in the same forest was carried out using a 1 m² quadrat in April 2002 from 10.30 a.m. to 4.30 p.m. The quadrat was made up of a cord and four pegs were fixed at the four corners of the quadrat. Twenty quadrats were placed randomly along a 57 m transect along the forest edge exposed to the road and, the leaf litter within each quadrat was sieved using a sieve and a white tray. After sieving, the leaf litter was transferred into a white polythene sheet and carefully examined further for any ants left among them. All fallen twigs, decaying pieces of wood and other plant parts within each quadrat were opened by breaking them manually and ants observed within those parts were collected into glass vials filled with 85% ethanol. Ants collected in this manner were examined under a portable low power microscope (battery-operated) and the presence or absence of *A. simoni* workers and colonies was recorded. Several worker ants of all other genera/species present in association with *A. simoni* within each quadrat were collected into glass vials filled with 85% ethanol after sieving the leaf litter.

Results

Taxonomic levels of worker ants

Subfamilies and genera / species of the worker ants collected from Gampaha, Colombo, Ratnapura and Galle districts are presented in Table 1. The genera, *Aenictus*, *Cerapachys*, *Dolichoderus*, *Ochetellus*, *Leptogenys* and *Platythyrea* were recorded from Gampaha district only and *Aneuretus simoni*, *Acropyga*, and *Myrmoteras* were recorded only from Ratnapura district. A single worker of *Strumigenys* was observed only in Galle district collection. *Tapinoma*, *Technomyrmex*, *Anoplolepis gracilipes*, *Camponotus*, *Oecophylla smaragdina*, *Paratrechina*, *Monomorium*, *Pheidole*, *Solenopsis*, *Diacamma*, *Odontomachus* and *Tetraponera rufonigra* were common to the four districts and *Dorylus*, *Anochetus* and *Pachycondyla* were recorded from Gampaha and Galle districts. *Lepisiota*, *Polyrhachis* and *Crematogaster* were observed in Gampaha and Ratnapura districts whereas *Prenolepis* was recorded from Gampaha and Colombo districts. *Lophomyrmex* and *Meranoplus* were common to Gampaha, Galle and Ratnapura districts whereas *Pheidologeton* was present in the samples collected from Gampaha, Colombo and Ratnapura districts. *Hypoponera* was recorded only from Gampaha, Colombo and Galle districts. Although all species are not known yet two or more morphospecies of other genera were noticeable in this collection except for the genera *Aneuretus*, *Anoplolepis*, *Oecophylla* and *Tetraponera*.

Table 1. Subfamilies and genera/species of worker ants in the collection.

Subfamily	Genus/species
1. Aenictinae	<i>Aenictus</i> Shuckard
2. Aneuretinae	<i>Aneuretus simoni</i> Emery
3. Cerapachyinae	<i>Cerapachys</i> Smith
4. Dolichoderinae	<i>Dolichoderus</i> Lund <i>Ochetellus</i> Shattuck <i>Tapinoma</i> Foerster <i>Techomyrmex</i> Mayr
5. Dorylinae	<i>Dorylus</i> Fabricius
6. Formicinae	<i>Acropyga</i> Roger <i>Anoplolepis gracillipes</i> Sanstchi <i>Camponotus</i> Mayr <i>Lepisiota</i> Sanstchi <i>Myrmoteras</i> Forel <i>Oecophylla smaragdina</i> Fabricius <i>Paratrechina</i> Motschoulsky <i>Polyrhachis</i> Swains & Shuck <i>Prenolepis</i> Mayr
7. Myrmicinae	<i>Crematogaster</i> Lund <i>Lophomyrmex</i> Emery <i>Meranoplus</i> Smith <i>Monomorium</i> Mayr <i>Myrmecaria</i> Saunders <i>Pheidole</i> Forel <i>Pheidologeton</i> Mayr <i>Solenopsis</i> Westwood <i>Strumigenys</i> Smith <i>Tetrumorium</i> Mayr
8. Ponerinae	<i>Anochetus</i> Mayr <i>Diacamma</i> Mayr <i>Hypoponera</i> Santschi <i>Leptogenys</i> Roger <i>Odontomachus</i> Latreille <i>Pachycondyla</i> Smith <i>Platythyrea</i> Roger
9. Pseudomyrmecinae	<i>Tetraponera rufonigra</i> (Smith)

Taxonomic key

1. (a) Body with a single waist segment (petiole) between the alitrunk and gaster
(Figs. 1(a)-(f)).....(2)
- (b) Body with two waist segments (petiole and post-petiole) between the
 alitrunk and gaster (Figs. 1(g)-(i)).....(7)
2. (c) Compound eyes absent (Fig. 1(a))Subfamily: **Dorylinae**
- (b) A pair of compound eyes visible(3)
3. (a) Anterior peduncle of petiole slender, long and prominent; petiolar node
 well-separated from anterior peduncle by the presence of dorsal and lateral
 swellings (Fig. 1(b)) Subfamily: **Aneuretinae**
- (b) Anterior peduncle of petiole lacking or short; petiolar node never as
 above (Figs. 1(c)-(f) & 1(h)-(i)).....(4)
4. (a) Sting clearly visible (Figs. 1(c) & (d))(5)
- (b) Sting not visible without dissection / absent (Figs. 1(e) & (f)) (6)
5. (a) First gastral segment well-separated from the second dorsally and ventrally
 by a shallow groove in profile; pygidium armed with a row of peg-like
 teeth, with more than two pairs present (Fig. 1(c))..... Subfamily
 Cerapachyinae
- (b) First gastral segment is not well-separated from the second; pygidium
 with one or two pairs / without peg-like teeth (Fig. 1(d))..... Subfamily:
 Ponerinae
6. (a) Apex of the gaster ventrally conical-shaped and with a circular
 acidopore (Fig. 1(e)).....Subfamily: **Formicinae**
- (b) Apex of the gaster ventrally with a slit-like, inverted 'V' - shaped pore
 (Fig. 1(f)).....Subfamily: **Dolichoderinae**
7. (a) Compound eyes absent (Fig. 1(g)).....Subfamily: **Aenictinae**
- (b) A pair of compound eyes present (Figs. 1(h) & (i)).....(8)
8. (a) Pretarsal claws simple; eyes small to medium in size (Fig. 1(h)).....
 Subfamily: **Myrmicinae**
- (b) Pretarsal claws with an additional tooth; eyes large and bulged out (Fig.
 1(i))..... Subfamily: **Pseudomyrmecinae**

Morphometrics of the different castes of *A. simoni* and other information

A large single colony of *A. simoni* was collected from the surface soil layer around the fibrous roots of *Alstonia macrophylla* Wall and *Sapindus trifoliatus* L. along the forest edge exposed to the road. The colony observed in May 2001 consisted of more than hundred workers apparently and eggs, larvae and pupae of *A. simoni* were also present in the colony. This colony was in close association with a colony of a *Pheidole* species. The major and minor workers were separated due to their external appearance and Table 2 shows that their morphometrics were also different. Two queens were the largest among them and the males were not found in this colony.

Microhabitat of *A. simoni*

Aneuretus simoni workers or colonies were never observed within the decaying pieces of plants, fallen twigs or in the decomposing branches of shrubs found within any of the twenty quadrats laid during this study. However, they were present among the leaf litter within eleven quadrats and in the surface soil layers under the leaf litter within another three quadrats. The latter quadrats had three small colonies and some immature stages, major and minor workers and wingless queens were only observed in these colonies.

Other ant genera/species

Other ant genera present within the quadrats included *Anoplolepis gracilipes*, *Cataulacus* sp., *Crematogaster* sp., *Pachycondyla* sp., *Pheidole* sp., *Pheidologeton* sp., *Solenopsis* sp. and *Tetramorium* sp. and, *Solenopsis* sp. was apparently dominant in the study area.

Table 2. Morphometrics (mm) of minor and major workers and, the queen of *A. simoni*. The range of each measurement is provided. TL—Total length, HL—Head length, HW—Head width, EL—Eye length, SL—Scape length, PW—Pronotal width, AL—Alitrunk length.

Caste	TL	HL	HW	EL	SL	PW	AL
Minor worker	1.7 - 1.9	0.44- 0.55	0.44- 0.51	0.07- 0.09	0.44- 0.51	0.24- 0.27	0.55- 0.65
Major worker	2.2- 2.9	0.58- 0.82	0.63- 0.86	0.096- 0.103	0.51- 0.65	0.38- 0.48	0.68- 0.86
Queen	5.5	0.75	0.82	0.17	0.55	0.89	1.33

Discussion

Aneuretus simoni was recorded from Ratnapura only during this study as recorded by previous researchers (Bingham, 1903; Wilson et al., 1956). However, this observation does not strongly confirm that this species is absent in other parts of the country because a random collection of ants was carried out during this investigation. Therefore, collection of ants from other humid forests in Sri Lanka is encouraged before making such a conclusion on the presence or absence of this species. However, it was not found in the random collection made in the two forests in Maimbula and Pilikuththuwa (Gampaha district) and another forest, Sooriyakanda in Sinharaja range. Presence of other ant genera/species in one or more districts is a valuable information but absence must be considered carefully as this was a random collection of ants in the various microhabitats. Worker ants belonging to ten Subfamilies have been recorded from Oriental region (Bolton, 1994) and those of nine Subfamilies were in the present collection from Sri Lanka. In addition, members of Subfamily Leptanillinae could be expected from Sri Lanka (Prof. Seiki Yamane, personal communication). This collection consisted of a random collection of worker ants in four districts of the wet zone and future studies may, perhaps, result in the collection of leptanillines from Sri Lanka. Leptanillines have two waist segments and they lack compound eyes (Bolton, 1994). Therefore, if a sorting of a leptanilline to be carried out using this key, the absence of the eyes, feature at Step 7, may confuse its identification with the aenictines. Therefore, an additional step-Step 9- should be added to the key followed by the Step 7 and, the presence of 8-10 segmented (Aenictinae) or 12-segmented (Leptanillinae) antenna will be helpful in distinguishing the worker ants belonging to the two subfamilies.

Based on the absence of compound eyes (step 2) dorylines are to be separated from the members of other subfamilies but very occasionally some ponerines may also lack the compound eyes. Presence of a prominent constriction between the first and second gastral segments of the ponerines could be checked when there is such a doubt.

According to Bolton (1994), a single genus belonging to each of the Subfamilies, Aenictinae, Aneuretinae, Cerapachyinae, Dorylinae and Pseudomyrmecinae has been recorded from the Oriental region and, worker ants of similar genera belonging to those Subfamilies were present in the current collection. However, the number of genera of dolichoderines, formicines, myrmicines and the ponerines recorded from the Oriental region is 08, 16, 46 and 21, respectively and, lower numbers of genera belonging to each Subfamily were observed during this study. Although the number of genera were lower this key would be useful for the identification of the worker ants that were not present in the collection because the most basic and reliable features described by other authors are to be used in this key for the identification of worker ants belonging to these four Subfamilies. Based on Jayasuriya and Traniello (1985), the IUCN Red book (1996) listed *A. simoni* as a highly threatened species because those researchers did not find this species in the city reservoir associated forest in Ratnapura and the colony density was very low in the Gilimale forest. However, it is clear that contrary to their findings *A. simoni* still survives in the city-reservoir associated forest in Ratnapura and it should not

be listed as absent from this forest until a quantitative study (which is in progress) is carried out to evaluate the abundance of this species. It seems that Jayasuriya and Traniello (1985) did not find *A. simoni* colonies in Ratnapura forest because they searched for *A. simoni* in the fallen twigs, decaying wood and not in the leaf-litter associated soil.

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