

## **A Preliminary Survey and Assessment of Ant (Formicidae: Hymenoptera) Fauna of Bario, Kelabit Highlands Sarawak**

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### **ABSTRACT**

*An eight-day collection from Bario Highlands resulted in about 71 morphospecies of ants. The collection was done manually using fine forceps in a one day journey from the surrounding area of the expedition base camp. The specimens collected were put into coded vials filled with 80% ethanol and mounted on card points for dry specimen and preserved in 80% ethanol for wet specimen. The 71 morphospecies of ants collected were representatives of 6 subfamilies. They were Dolichoderinae (5), Aenictinae (1), Formicinae (29), Myrmicinae (19), Ponerinae (16) and Pseudomyrmicinae (1). The genus Polyrhachis has the highest number of species (19), followed by Tetramorium with 6 species. From the specimen collected, Bario Highlands appears to have a mixture of ants from the lowland and highland species. A brief comparison was made with ant fauna of other parts of Borneo such as Gunung Danum, Bukit-Bukit Tawau and Sayap-Kinabalu.*

### **INTRODUCTION**

The ants (Formicidae: Hymenoptera) are probably the most successful of all the insect groups, occurring everywhere in terrestrial habitats and outnumbering most of other terrestrial animals in individual (Borror, D.J. et al. 1981). The most distinctive structural feature of ants is the form of the abdomen pedicel; of which one or two is segmented and bears an upright lobe, and the first segment of antenna which are usually in elbowed form and often very long (Borror, D.J. et al. 1981).

The abundance of ants in the Malaysian forest ecosystem has been reported in 1984 by Marina (Maryati, M. 1991). Their main role in the tropical forest ecosystem has not been fully understood. It has been suggested that ants play a major role in the nutrient recycling as decomposers and aeration and drainage of soil leading to the good reconditioning of forest soil. It has been reported also that some ants such as *Meranoplus* may be an agent of seed dispersal (Maryati, M. 1991).

The scientific expedition to the Bario Highlands gave the author an opportunity to carry out a preliminary survey and assessment of the ant fauna found here. It also provided a more diverse picture of ant fauna in Borneo, enabling the comparison of ant fauna found in Bario Highlands with other parts of Borneo such as Bukit-Bukit Tawau, Gunung Danum and Sayap-Kinabalu.

### **MATERIALS AND METHODS**

Ant collection at Bario Highlands (Fig. 1) was carried out at different trails located within one-day journey from the expedition base camp in 8-day period. At least three types of forests were found in the collection area: secondary forest, highland primary forest and Kerangas forest. Bario Highlands form a plateau of approximately 1,200m above sea level with the mean daily temperature ranging from 19.9 to 22.1°C. and an annual rainfall of about 2,213mm per year (7-year average).

Fine forcep was used to collect the ants. They were found mainly on the ground or forest floors, on tree trunks and branches at eyes' level. Some ants were also collected along the road encircling the expedition base camp. The ants were put into coded vials filled with 80% ethanol. In the laboratory the ants were mounted on card points for dry specimens or preserved with 80% ethanol in coded vials for wet specimens. The ant specimens were then incorporated into the main reference collection and deposited in Sabah Parks Entomology Museum at Kinabalu Park. The collections were identified to generic level using keys identification in Bolton, B. (1990) and with the assistance of two entomologist; Dr. Yamane and Dr. Maryati, M. (Pers. comm.). Identification to species level was only based on the morphological features due to lack of key reference in species identification of tropical ants (Maryati, M. 1995. pers. comm.). Cross reference with the ant specimens at Sabah Parks Entomology Museum and Universiti Kebangsaan Malaysia, Sabah Campus was made.

## RESULTS AND DISCUSSION

A total of seventy-one morphospecies of ants were collected manually in this expedition. The genera representatives of each subfamily were listed in Table 1. There were species in the subfamily of Dolichoderinae represented by one genus and 2 unidentified individuals. In the subfamily of Aenictus there was only one species from the genus Aenictus. Formicinae has the highest number of species (29) represented by 6 genera. Ponerinae was represented by 12 species from 5 genera and 4 unidentified individuals. Myrmicinae has the second highest of species (19) represented by 9 genera.

The genus *Polyrhachis* has the highest number of species (19) followed by the genus *Tetramorium* which has 6 species. This is followed by *Brachyponera* and *Crematogaster* represented by 4 species respectively *Camponotus*, *Colobopsis*, *Dolichoderus*, *Leptogenys* and *Odontomachus* each has 3 species *Cataulacus*, *Monorium*, *Oecophylla*, *Pheidole*, *Phildris*, *Selonopsis*, *Diacamma*, *Odontoponera* and *Tertraponera* is represented by one species. Generally the number of ant genera and species collected in this survey were comparable to those collected from other parts of Borneo such as Gunung Danum, Bukit-Bukit Tawau and SayapKinabalu (Maryati, M. 1995) (Table 2). Bario Highlands and Sayap-Kinabalu are similar in elevation with cooler climate and slightly lower average daily temperature. Therefore, there is no indication of lesser ant diversity in this area compared to the findings in Sayap-Kinabalu by Maryati (1995), although it has been reported that the ant fauna decreased with altitude and disappeared at 2,500m above sea level in the tropical forest ecosystem (Holldobler, B and Wilson, E.O. 1990).

Table 1: List of ants collected from Bario Highlands

Subfamily	Genus/Species	No. of Morphospecies
Dolichoderinae	<i>Dolichoderus</i>	3
No. of unidentified genera		2
No. of morphospecies (genera)		5(1)
Aenictinae	<i>Aenictus</i>	1
No. of morphospecies (genera)		1(1)
Formicinae	<i>Camponotus</i>	3
	<i>Cladomyrma</i>	2
	<i>Colobopsis</i>	3
	<i>Eurenolepsis</i>	1
	<i>Oecophylla</i>	1
	<i>Polyrhachis</i>	19
No. of morphospecies (genera)		29(6)
Myrmicinae	<i>Cataulacus</i>	1
	<i>Creamatogaster</i>	4
	<i>Monorium</i>	1
	<i>Myrmecaria</i>	2
	<i>Pheidologeton</i>	2
	<i>Pheidole</i>	1
	<i>Philldris</i>	1
	<i>Selonopsis</i>	1
	<i>Tetramorium</i>	6
No. of morphospecies (genera)		19(9)
Ponerinae	<i>Brachyponera</i>	4
	<i>Diacamma</i>	1
	<i>Leptogenys</i>	3
	<i>Odontomachus</i>	3
	<i>Odontoponera</i>	1
No. of unidentified (genera)		4
No. of morphospecies (genera)		16(5)
Pseudomyrmecinae	<i>Tetraponera</i>	1
No. of morphospecies (genera)		1(1)
<b>Total number of morphospecies (genera)</b>		<b>71(23)</b>

Sayap-Kinabalu and Bario Highlands are both highland areas and are richer in species compared to Gunung Danum and Bukit-Bukit Tawau, which are lowland areas. This appears contrary to the report by Holldobler and Wilson (1990) and needs further investigation especially in the altitudinal distribution of ants in Borneo. The highest diversity of ants may occur at the altitude range of 800-1,300m which was reported by Young (1982) as a transition area between the lowland and the highland and therefore has the highest diversity of insect fauna.

Table 2: A comparison of ants collection from Gunung Danum, Sabah; Bukit-bukit Tawau, Sabah; Sayap-Kinabalu, Sabah and Bario Highlands, Sarawak

Subfamily	Gunung Danum*	Bukit-Bukit Tawau*	Sayap Kinabalu*	Bario Highlands
Dolichoderinae	7(1)	2(2)	9(2)	5(1)
Dorylinae	2(1)	3(2)	1(1)	1(1)
Formicinae	15(5)	17(7)	11(6)	29(6)
Myrmicinae	20(8)	13(3)	18(8)	19(9)
Ponerinae	5(3)	3(2)	19(9)	16(5)
Pseudomyrmecinae	1(1)	3(2)	-	1(1)
Total numbers of morphospecies	50	50	58	71
Total numbers of genera	19	28	26	23
Total numbers of Subfamily	6	6	5	6

Table 2 shows the comparison of ants collected from Bario Highlands with the collection by Maryati (1995) from Gunung Danum, Bukit-Bukit Tawau and Sayap-Kinabalu. Maryati (1995) reported that general ant collections from lowland forest yield more representatives of Myrmecinae and Formicinae species as in Gunung Danum and Bukit-Bukit Tawau. Since Bario Highlands is located in higher elevation, there should be less Myrmecinae and Formicinae species. However, this preliminary survey showed a higher number of species representative from both of the above families. Table 2 shows the sets of Bario Highlands ant fauna belonging to the highland species based on the relative number of Species representative from Formicinae, Myrmicinae and Ponerinae, Similar with Sayap-Kinabalu. There are higher species number of these three subfamilies compared with only two subfamilies in the lowland, that is Formicinae and Myrmicinae. The number of species representative of Ponerinae subfamily are usually very few in the lowland. But the following argument appears to suggest that the ant fauna in Bario Highlands also belongs to the lowland areas. *Polyrhachis* species (Formicinae) for example are generally considered as lowland species. They are represented by only 3 species in Sayap-Kinabalu (highland) and 9 species in Bukit-Bukit Tawau (lowland) (Maryati, 1995) but in this survey 19 were found. These findings indicate that the ants species found in Bario Highlands also belong to lowland species.

Another interesting finding of this preliminary survey is the presence of one species from Pseudomyrmecinae at higher elevation and belonging to the genus *Tetraoponera*. The species representative of this subfamily was not found in Sayap-Kinabalu but 3 species were found in Bukit-Bukit Tawau and one species in Gunung Danum (Maryati, M. 1995). This is also another aspect to suggest that the ant fauna in Bario Highlands belongs to the lowland species.

The number of *Polyrhachis* species collected in Bario Highlands is higher compared to those collected from Bukit-Bukit Tawau by Maryati (1991). Twenty-nine species were collected compared to three that were collected during the Sayap-Kinabalu Expedition (Maryati, 1995). This may be due to the different habitat types where the collection was done. In Bukit-Bukit Tawau and Sayap-Kinabalu, the collection was in monotype habitat, i.e., lowland primary forest and lower montane primary forest respectively while in Bario Highlands, ant collection was done in three types of habitats, i.e., secondary, kerangas and lower montane primary forest. These three habitat types which are very different in terms of vegetation may influence the diversity of ant fauna. It needs further investigation whether each type of habitat in the study area have a specific set of ants or the ants simply have a wide range of habitat types.

Three species of *Camponotus* were found in this preliminary survey and one of them is the giant carpenter ants *C. gigas*. Although located at higher elevation, there appeared to be no difference in the distribution of ant fauna in terms of ant abundance compared to the lowland areas. As an example *C. gigas* individuals were found in abundance in a primary forest located about 3km south-east from the expedition base camp. This species was scarcely found at higher elevation such as Sayap-Kinabalu (Maryati, M. 1995). *C. gigas* was commonly found in the lowlands but this genus was usually poorly represented. Similar finding was represented in Sayap-Kinabalu (Maryati, 1995).

On the whole, Bario Highlands ant collections gave a clear picture of the ant fauna in Borneo. As discussed earlier, the ants found in Bario Highlands were a mixture of lowland and highland species. It was not immediately clear whether this was caused by habitat types or geographical factors. Further investigation is needed to clarify why the Bario Highlands ant collection was different from other parts of Borneo.

The general finding of this preliminary survey shows that the ant fauna of Bario Highlands has the mixture of ants found in lowland and highland areas. Firstly some genera of ants common in lowland areas such as *Polyrhachis* were higher in terms of species representation but at the same time ants common in highland areas, such as *Ponerines*, were also high in species representation. Secondly there was no decrease of ant abundance, such as *Camponotus gigas* in Bario Highlands. The diversity of ant genera and species collected in this preliminary survey was comparable with the ant collection from other parts of Borneo. However there were differences in species representations, some genera were better represented such as *Polyrhachis* and some were poorly represented such as *Camponotus*. Further investigation is needed to clarify why the Bario Highlands ant collection is different from the ant collection from other lowland and highland areas of Borneo.

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