ASIAN MYRMECOLOGY Volume 2, 63 - 70, 2008
ISSN 1985-1944 © R. J. KOHOUT & MARYATI MOHAMED

A preliminary list of the *Polyrhachis* ants of the Maliau Basin Conservation Area in Sabah, Borneo (Hymenoptera: Formicidae: Formicinae)

RUDOLF J. KOHOUT[1*] & MARYATI MOHAMED[2]

[1]Biodiversity Program, Queensland Museum, PO Box 3300, South Brisbane, Queensland, 4101, Australia
[2]Institute for Tropical Biology and Conservation, Universiti Malaysia Sabah, Locked Bag 2073, 88999 Kota Kinabalu, Sabah, Malaysia

*Corresponding author's e-mail: rudolf.kohout@qm.qld.gov.au

Abstract. A preliminary list of the *Polyrhachis* ants collected during the 2005 Maliau Basin Scientific Expedition is presented. A total of 49 species are recorded, including 36 previously described taxa and 13 species recognised as new to science. This suggests that the *Polyrhachis* fauna of the Maliau Basin is amongst the most diverse of any area in not only Borneo, but possibly the whole of Southeast Asia.

Keywords: Formicidae, *Polyrhachis*, Borneo, Sabah, Maliau Basin, species list

INTRODUCTION

The tropical rainforests of Borneo embrace some of the world richest ant communities and in terms of diversity may, perhaps, even surpass the lowland rainforests of the lower Busu-Bupu rivers in Papua New Guinea (Wilson 1959). Among the many rainforest ant genera, *Polyrhachis* is one of the most common, diverse and widespread. Many Bornean *Polyrhachis* species were first collected by the early explorers, such as A.R. Wallace, J. Doria, O. Beccari, Bedot & Pictet and many others. Borneo is the type locality for over 30 *Polyrhachis* species and the fauna of the island has been studied by many leading myrmecologists, including A. Forel, C. Emery, G. Mayr and Fr. Smith. Wheeler (1919) listed 46 valid species from Borneo and commented that, with the exception of *Hagiomyrma*, *Hedomyrma* and *Myrmatopa*, all the other subgenera of *Polyrhachis* were known to occur on the island. The recent introduction of modern collecting methods, such as the use of the insecticide fogging, has resulted in the discovery of many new species, notably those inhabiting the rainforest canopy. For example, insecticide fogging of the canopy of rainforest trees in the Danum Valley and Kinabalu Park, including Poring Hot Springs, yielded at least 15 species of the subgenus *Myrmatopa*, with 13 of them recognised as new to science (C. Brühl, A. Floren, E. Widodo – all unpublished). However, the occurrence of the subgenera *Hagiomyrma* and *Hedomyrma* in Borneo is highly unlikely; their distribution, together with that of the subgenus *Aulacomyrma*, described subsequently by Emery (1921), is evidently restricted to the Australasian biogeographical region. A review of the Bornean *Polyrhachis* fauna, which is presently in preparation, lists 74 described valid species with at least as many species undescribed.

HISTORICAL REVIEW

Maliau Basin (4°41'- 4°56'N, 116°44'-117°3'E), also called Sabah's 'Lost World', is situated in the southern central part of the state, near the Indonesian border. It was 'discovered' for the outside world in 1946 by a pilot flying over the

area. The basin forms an almost circular bowl guarded by rocky cliffs and high slopes reaching to more than 1700 m in elevation. The whole area is covered by almost pristine forests and remained virtually unknown until 1970, when it become a part of the Yayasan Sabah timber concession and was assigned for logging. However, due to its 'natural defences', most attempts at timber extraction were unsuccessful. In 1981 the area's biological significance was formally recognised when the 390-km^2 Basin was designated as a Conservation Area for the purposes of research and education. In 1997 the area was upgraded to a Class 1 Protection Forest Reserve and extended by incorporating forested land to the east and north of the basin. The two established buffer zones that surround the Conservation Area extend its present size to 588 km^2 and increase its protection against poachers and illegal logging (Fig. 1).

The Maliau Basin area was never permanently inhabited by humans and the findings of the first preliminary survey, conducted in 1982, confirmed the significance of this virtually untouched world with a wealth of diversity in its self-contained ecosystem. A second scientific expedition, organised in 1988 by Yayasan Sabah and WWF Malaysia, reinforced the findings of the first survey and recommended that the unique features of the basin be set aside for the preservation, conservation and enhancement of Malaysia's cultural heritage. Several follow-up surveys, including the 1996 and 2005 scientific expeditions jointly organised by the Institute for Tropical Biology and Conservation, Academy of Sciences Malaysia, Sabah Foundation and Yayasan Sabah, under the Bornean Biodiversity and Ecosystems Conservation Program, were conducted in the Basin, but even today only about 25% of the basin's total area has been mapped and even less has been studied in detail. In spite of this many new species of plants and animals have already been discovered there and the recent establishment of improved research facilities within the basin will surely increase the pace of new scientific discoveries. Today, the Maliau Basin Conservation Area is recognised as a unique wilderness of global importance that fully deserves its nomination as a World Heritage Site.

METHODS

The main collections were made by the first author during a period of about three weeks from 26 February to 19 March 2005, with two weeks spent at Ginseng Camp (04°44'N, 116°55'E) and four days at Agathis Camp (04°41'N, 116°54'E). In addition, the results include a one-day collecting visit to Maliau Falls (04°46'N, 116°55'E) and Camel Trophy Camp (04°44'N, 116°52'E). Ants were hand-collected foraging on low foliage and other vegetation; however, at Ginseng Camp a number of species were taken from the trunks of recently felled trees and logs, including structural timber. Because collecting was restricted to the lower arboreal zone, close to ground level, several groups, such as the subgenera *Myrmatopa* and *Myrmothrinax*, are rather poorly represented. The vast majority of species belonging to these groups are known to inhabit the rainforest canopy and the use of insecticide fogging would be expected to yield many more additional species.

RESULTS AND DISCUSSION

A total of 49 species of *Polyrhachis* ants were recorded from the Maliau Basin Conservation Area during the duration of the survey. The principal collecting locality was situated at a rather moderate elevation (Ginseng Camp at about 700 m asl) with the secondary locality slightly lower (Agathis Camp at about 500 m). The survey did not include the lowland rainforests along the lower reaches of the Maliau and Kuamut Rivers that could well be the most species-rich part of the Maliau Basin. For example, in Sulawesi the diversity of ants is highest in lowland rainforest compared with submontane and montane forests, with the species richness evidently declining with rising altitude (Stork & Brendell 1990). In spite of the exclusion of lowland rainforest, this survey still recorded many more *Polyrhachis* species than several recent surveys conducted at other locations in Sabah. These include the 1992, 12-month diversity and ecology study of ants at the Danum Valley Conservation Area (22 *Polyrhachis* species recorded) (Chung & Maryati 1996), the 1998 Scientific Expedition to the Tabin Wildlife Reserve

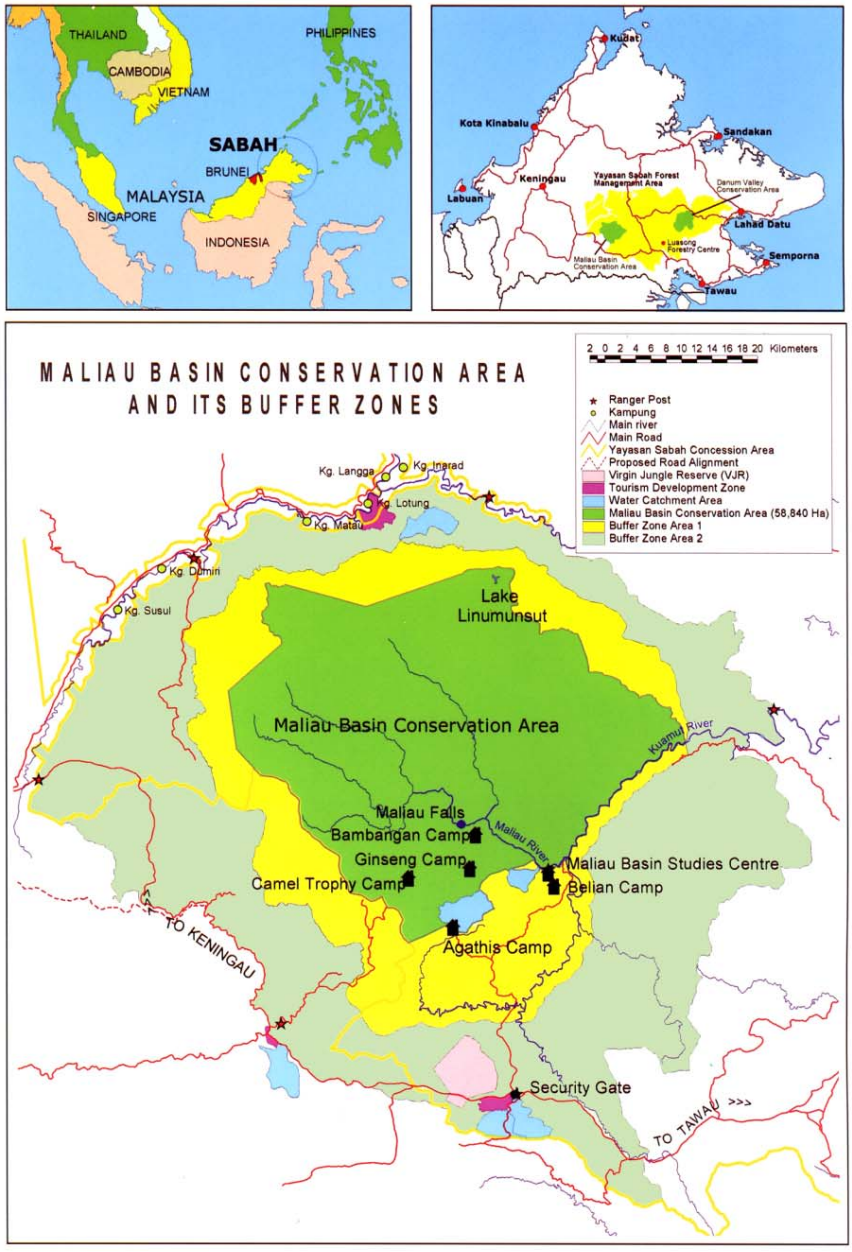


Fig. 1. Maliau Basin Conservation Area and its buffer zones (From Phillipps, 2002).

Figs 2–9. *Polyrhachis* ants from Maliau Basin: **2 –** *Polyrhachis (Myrmhopla) acantha* Fr. Smith; **3 –** *P. (Myrmhopla) boettcheri* Stitz; **4** – *P. (Myrmhopla) chalybea* Fr. Smith; **5** – *P. (Myrmatopa)* sp. MB13; **6** – *P. (Myrmhopla)* sp. MB12; **7** – *P. (Myrmothrinax)* sp. MB06; **8** – *P. (Myrma) obesior* Viehmeyer; **9** – *P. (Myrmhopla) rufipes* Fr. Smith (not to scale).

List of *Polyrhachis* species from the Maliau Basin Conservation Area

Species	Ginseng Camp	Agathis Camp	Maliau Falls	Camel Trophy
Subgenus **Campomyrma** Wheeler				
1. *sukarmani* Kohout ***			♀ only	
Subgenus **Cyrtomyrma** Forel				
2. *danum* Kohout ***	x	x		
3. *lepida* Kohout ***	x	x		
Subgenus **Hemioptica** Roger				
4. *boltoni* Dorow & Kohout		x		
Subgenus **Myrma** Billberg				
5. *beccarii* Mayr	x	x		
6. *illaudata* Walker	x	x	x	
7. *inermis* Fr. Smith	x	x		
8. *nigropilosa* Mayr	x	x	x	
9. *noesaensis* Forel	x	x	x	
10. *obesior* Viehmeyer (Fig. 8)	x			
11. *pruinosa* Mayr				x
12. *striata* Mayr	x	x		
13. *villipes* Fr. Smith	x	x		
14. *vindex* Fr. Smith	x	x		
Subgenus **Myrmatopa** Forel				
15. *elii* Emery	x			
16. *P. (Myrmatopa)* sp. 12 *	x			
17. *P. (Myrmatopa)* sp. 13 *(Fig. 5)		x		
Subgenus **Myrmhopla** Forel				
18. *abdominalis* Fr. Smith	x	x	x	x
19. *acantha* Fr. Smith (Fig. 2)	x	x		
20. *armata* (Le Guillou)	x	x	x	
21. *banghaasi* Viehmeyer	x	x		
22. *bicolor* Fr. Smith	x	x		
23. *boettcheri* Stitz (Fig. 3)	x	x		
24. *caeciliae* Forel		x		
25. *calypso* Forel	♀ only	x		
26. *cephalotes* Emery	x			
27. *chalybea* Fr. Smith (Fig. 4)	x	x		
28. *furcata* Fr. Smith	x	x		
29. *hector* Fr. Smith	x	x	x	
30. *hodgsoni* Forel			x	
31. *maryatiae* Kohout ***	x			
32. *mitrata* Menozzi	x			
33. *muelleri* Forel	x	x		
34. *oedacantha* Wheeler	x	x		
35. *rufipes* Fr. Smith (Fig. 9)	x	x		
36. *rufiventris* Forel		x		
37. *P. (Myrmhopla)* sp. 12 **(Fig. 6)		x		
38. *P. (Myrmhopla)* sp. 16 **	x			
39. *P. (Myrmhopla)* sp. 19 *		x		
40. *P. (Myrmhopla)* sp. 22 **	♀ only			
41. *P. (Myrmhopla)* sp. 23 *	x			
42. *P. (Myrmhopla)* sp. 24 *	x			
43. *P. (Myrmhopla)* sp. 25 *		x		
44. *P. (Myrmhopla)* sp. 26 *	x			

Subgenus **Myrmothrinax** Forel			
45. *P. (Myrmothrinax)* sp. 05 *		x	
46. *P. (Myrmothrinax)* sp. 06 *(Fig. 7)	x		
Subgenus **Polyrhachis** Fr. Smith			
47. *bihamata* (Drury, 1773)	x		x
48. *olybria* Forel, 1912	x	x	x
49. *P. (Polyrhachis)* sp. 01*	x		

* New species known only from the Maliau Basin.
** New species also known from other Sabah localities.
*** Species described since the original collections were made (see Kohout 2006 & 2007a, b).

(15 species) (Hashimoto *et al.* 1999), the 2002 Scientific Expedition to the Lower Kinabatangan River (7 species) (Maryati 2003) and the 1999 and 2002 Scientific Expeditions to the Crocker Range (14 species) (Hashimoto & Maryati 2004). It cannot be assumed that these earlier surveys reflect the true richness within the genus at these localities, as unlike the present one they were not specialised *Polyrhachis* surveys. The fact remains that the present figures are exceptional, with Maliau Basin the richest known site for *Polyrhachis* in Borneo and possibly Southeast Asia. Whether this extreme diversity reflects the biogeographic history of the region, or the fact that it has remained relatively undisturbed for so long, is unknown.

The recently completed Maliau Basin Studies Centre, located at the southern rim of the Conservation Area, will provide further opportunities for surveys of this unique and self-contained ecosystem. Surveys of the lowland rainforests along the lower reaches of the Maliau and Kuamut Rivers will undoubtedly expand our knowledge of the *Polyrhachis* ants of the area and provide many additional records to the already impressive list of species inhabiting this spectacular "Lost World" of Sabah.

ACKNOWLEDGEMENTS

We are very much indebted to the Institute for Tropical Biology and Conservation, Universiti Malaysia Sabah, for the logistic assistance that allowed one of us (Rudy Kohout) to join the 2005 Maliau Basin Scientific Expedition. Our gratitude must also go to Ms Effazilla Waty and Lina Thomas, both of the Universiti Malaysia Sabah, for their support and collecting skills in the field. We are also grateful to Dr Arthur Y.C. Chung and Momin Binti, both of the Forest Research Centre, Sepilok, for the collection of additional specimens on their visit to Maliau Falls. We thank to Assoc. Prof. Dr Yoshiaki Hashimoto for his fine work in producing digital images of the specimens. Our final thanks go to Dr Chris Burwell, Queensland Museum, Brisbane, and to Dr Simon Robson, James Cook University, Townsville, for reading and commenting on a draft of the manuscript.

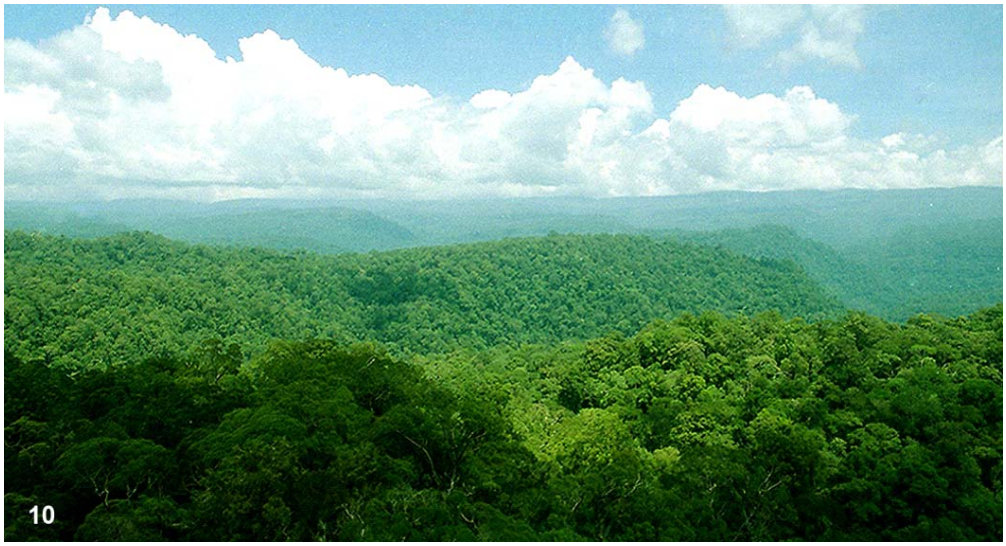
REFERENCES

Chung AYC and Maryati Mohamed, 1996. A comparative study of the ant fauna in a primary and secondary forest in Sabah, Malaysia. In: *Tropical Rainforest Research – Current Issues* (Edwards DS, Booth WE and Choy SC, eds). Kluwer Academic Publishers, 357-366.

Emery C, 1921. Le genre *Polyrhachis*. Classification; espèces nouvelles ou critiques. *Bulletin de la Société Vaudoise des Sciences Naturelles* 54: 17-25.

Hashimoto Y, Maryati Mohamed and Sakata H, 1999. The ants (Hymenoptera: Formicidae) of the Tabin Wildlife Reserve, Sabah. In: *Tabin Scientific Expedition* (Maryati M, Mahedi A, Dalimin MN and Malim TP, eds), Universiti Malaysia Sabah, Kota Kinabalu, 69-74.

Hashimoto Y and Maryati Mohamed, 2004. A preliminary survey of Ant Fauna at Crocker Range Park. In: *Crocker Range Scientific Expedition 2002* (Maryati M, Hamzah Z, Tachi T and Nais J, eds), Universiti Malaysia Sabah, Kota Kinabalu, 51-60.



Figs 10–12. 10 – Panoramic view of Maliau Basin Conservation Area (photo R.J. Kohout); **11** – Agathis Camp (photo A.Y.C. Chung); **12** – Ginseng Camp from the air (photo R.J. Kohout).

Kohout RJ, 2006. Review of *Polyrhachis (Cyrtomyrma)* Forel (Hymenoptera: Formicidae: Formicinae) of Australia, Borneo, New Guinea and the Solomon Islands with descriptions of new species. *Memoirs of the Queensland Museum* 52(1): 87-146.

Kohout RJ, 2007a. *Polyrhachis (Myrmhopla) maryatiae*, a new species of the *armata*-group from Borneo (Hymenoptera: Formicidae: Formicinae). *Asian Myrmecology* 1: 1-5.

Kohout RJ, 2007b. A review of the subgenus *Polyrhachis (Campomyrma)* Wheeler from Borneo with descriptions of new species (Hymenoptera: Formicidae: Formicinae). *Asian Myrmecology* 1: 7-17.

Maryati Mohamed, 2003. Preliminary list of ants collected from three sites at Lower Kinabatangan River. In: *Lower Kinabatangan Scientific Expedition 2002* (Maryati, M, Takano A, Goossens B and Indran R, eds), Universiti Malaysia Sabah, Kota Kinabalu, 5-12.

Phillipps A, 2002. *Secrets of the Lost World. Sabah's Maliau Basin*. Yayasan Sabah/Innoprise Corporation Sdn Bhd, 1-36.

Stork NE and Brendell MJD, 1990. Variation in the insect fauna of Sulawesi trees with season, altitude and forest type. In: *Insects and the Rain Forests of South East Asia (Wallacea)* (Knight WJ and Holloway JD, eds), The Royal Entomological Society of London, 173-190.

Wheeler WM, 1919. The ants of Borneo. *Bulletin of the Museum of Comparative Zoology at Harvard College* 63(3): 43-147.

Wilson EO, 1959. Some ecological characteristics of ants in New Guinea rain forests. *Ecology* 40(3): 437-447.

Received: 9 May 2008; accepted: 12 September 2008