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

Rudolf J. Kohout^{1*} & Maryati Mohamed²

¹Biodiversity Program, Queensland Museum, PO Box 3300, South Brisbane, Queensland, 4101, Australia ²Institute 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species of the subgenus Myrmatopa, with 13 of them recognised as new to science (C. Brühl, A. Floren, E. Widodo - all unpublished).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-km² 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 km² 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 handcollected 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).

SpeciesCampCampFallsTrophySubgenus Campomyrna Kohout $\circleft or the standard structure\circleft or the structure\circleft or the structureSubgenus Cyrtomyrna Forel2. danum Kohoutxx3. lepida KohoutxxSubgenus Monite Rogerxx4. boltoni Dorow & KohoutxSubgenus Myrna Bilberg5. beccarit Mayrxxx6. illaudata Walkerxxx9. noseasenis Forelxxx9. noseasenis Forelxxx10. obseior Viehneyer (Fig. 8)xxx11. pruinosa Mayrxxx12. striata Mayrxxx13. villiges Fr. Smithxxx15. deil Emeryx16. P. (Myrnatopa) sp. 12"x16. P. (Myrnatopa) sp. 13" (Fig. 5)xx20. armata (Le Guillou)xxx21. borghaasi Viehneyerxxx23. boetcheryxxx24. caeciliae Forelxx25. doppos Forelxx26. cephalote Filterxx27. chabbasi Filterxx28. forcata Filterxx29. hector Fr. Smithxx30. dotterxx31. dotterxx32. boetcheryxx33. multer Forelx34. caeciliae Forelx33. boetchery$		Ginseng	Agathis	Maliau	Camel
Subgenus Camponyrma Wheeler	Species	Camp	Camp	Falls	Trophy
1. sukarmani Kohout \bigcirc onlySubgenus Cyrtomyrna Forel2.2. danum Kohoutxxx3. lepida KohoutxSubgenus Hemioptica Roger4.4. bolton Dorow & KohoutxSubgenus Myrma Billberg5. beccarit Mayrxc. illaudata Walkerxxxnermis Fr. Smithxxxnermis Fr. Smithxxxnermis Forelxxxxy. noseansis Forelxxxx1. sultimeser, Fig. Sxxx1. sultimeser, Fig. Sxxx1. sultimeser, Fig. Sx1. sultimeser, Fig. Sxxxxy. sultimeser, Fig. Sxxxxxy. sultimeser, Fig. Sxxy. sultimeser, Fig. Sxxy. sultimeser, Sxy. sultimeser, Sxy. sultimeser, Sxy. sultimeser, Sxy. sultimeser, Sxy. sultimeser, Sxy. sultimeser, Sy. sultimeser, Sxy. sultimeser, Sy. sultimeser, Sy. sultimeser, Sy. sultimeser, Sy. sultim	Subgenus Campomyrma Wheeler				
Subgenus Cyrtomyrma Forel x x 2. donum Kohout x x Subgenus Hemioptica Roger x x 4. boltoni Dorow & Kohout x Subgenus Myrma Billberg x x 5. beccari Mayr x x 6. iilaudata Walker x x 7. inernis F.Smith x x 8. nigropilosa Mayr x x 9. noesaensis Forel x x 10. obesior Viehmeyer (Fig. 8) x x 11. pruinosa Mayr x x 12. striata Mayr x x 13. villipes Fr. Smith x x 14. windex Fr. Smith x x 15. elit Emery x x 16. P. (Myrmatopa) sp. 13 (Fig. 5) x x Subgenus Myrmhopia Forel x x 18. abdominalis Fr. Smith x x x 20. armata (Le Guillou) x x x 21. bool Forel x x x 22. abcoler Fr. Smith x x x	1. sukarmani Kohout ***			\mathcal{Q} only	
2. daman Kohout x x x 3. lepida Kohout x x x Subgenus Hemioptica Roger 4. boltoni Dorow & Kohout x Subgenus Myrma Billberg 5. beccaril Mayr x x x 6. illaudata Walker x x x x x 7. inernis Fr. Smith x x x x x 9. noesaensis Forel x x x x x 10. obesior Vichmeyer (Fig. 8) x 11. pruinosa Mayr x x x x 12. striata Mayr x x x x 13. villges Fr. Smith x x x 14. vindex Fr. Smith x x x 15. elli Emery x 16. P. (Myrmatopa) sp. 12 x x 17. P. (Myrmatopa) sp. 13 (Fig. 5) x Subgenus Myrmatopa Forel 18. abdominalis Fr. Smith x x x x 19. acantha fr. Smith (Fig. 2) x x x 20. armata (Le Guillou) x x x x 21. bicolor Fr. Smith x x x 22. bicolor Fr. Smith x x x 23. boetcheri Stitz (Fig. 3) x x 24. acaeillae Forel x x 25. calypso Forel \qquad x 26. cephalotes Emery x 26. cephalotes Emery x 27. chalpbear Fr. Smith x x x 27. chalpbear Fr. Smith x x x 28. bicolor Fr. Smith x x x 29. hector Fr. Smith x x x 21. boetcheri Stitz (Fig. 3) x x 24. acaeillae Forel x x 25. calypso Forel \qquad x 26. cephalotes Emery x 27. chalpbear Fr. Smith x x x 29. hector Fr. Smith (Fig. 4) x x 20. armata (Le Guillou) x x x x 21. boetcheri Stitz (Fig. 3) x x 23. boetcheri Stitz (Fig. 3) x x 24. acaeillae Forel x x 25. calypso Forel \qquad x 26. cephalotes Emery x x 27. chalpbear Fr. Smith (Fig. 4) x x 28. furctar Fr. Smith (Fig. 4) x x 29. hector Fr. Smith (Fig. 4) x x 20. hodgsoni Forel x x 31. margiate Kohout x x 31. margiate Kohout x x 32. mittate Menozzi x 33. muelleri Forel x x 34. oedacantha Wheeler x x x 35. nuffnest Fr. Smith (Fig. 4) x x 37. P. (Myrmhopla) sp. 12 (Fig. 6) x 37. P. (Myrmhopla) sp. 12 (Fig. 6) x 37. P. (Myrmhopla) sp. 12 (Fig. 6) x 37. P. (Myrmhopla) sp. 19 (Fig. 4) x x x 37. P. (Myrmhopla) sp. 19 (Fig. 4) x x x x x 37. P. (Myrmhopla) sp. 19 (Fig. 4) x x x x x x x x x x x x x x x x x x	Subgenus Cyrtomyrma Forel			1 5	
1nn3. lepida KohoutxSubgenus Hemioptica Roger4. boltoni Dorow & Kohoutx5. beccarii Mayrx7. inernis Fr. Smithx8. nigropilosa Mayrx9. noesaensis Forelx10. obesior Viehmeyer (Fig. 8)x11. pruinosa Mayrx12. striata Mayrx13. villipes Fr. Smithx14. vindex Fr. Smithx15. elii Emeryx15. elii Emeryx16. P. (Myrmatopa) sp. 12 *x17. P. (Myrmatopa) sp. 13 (Fig. 5)x19. ocaunal Fr. Smithx19. ocaunal Fr. Smithx20. armata (Le Guillou)x21. baoghaasi Viehmeyerx22. bicolor Fr. Smithx23. boetcheri Stiz (Fig. 3)x24. caeciliae Forelx25. calypso Forel φ only26. cephalotes Emeryx27. chalybae Fr. Smithx28. furcata Fr. Smithx29. hector Fr. Smithx20. hodgron Forelx21. starta Menozzix22. alicolor Fr. Smithx23. multeri Forelx24. caeciliae Forelx25. calypso Forel φ only26. caphalotes Emeryx27. chalybae Fr. Smithx28. furcata Fr. Smithx	2 danum Kohout	x	x		
Note: N	3 <i>lenida</i> Kohout ***	x	x		
Sougenis Finitespect x Subgenus Myrma Billberg x 5. beccarii Mayr x 6. illaudata Walker x x x 7. inermis Fr. Smith x x x 8. nigropilosa Mayr x x x 9. noesaensis Forel x x x 10. obesior Viehmeyer (Fig. 8) x 11. pruinosa Mayr x 2. striata Mayr x 12. striata Mayr x 13. villipes Fr. Smith x x x Subgenus Myrmatopa Forel 15. elit Emery x 16. P. (Myrmatopa) sp. 12 * x 17. P. (Myrmatopa) sp. 13 * (Fig. 5) x Subgenus Myrmahopa Forel 18. abdominalis Fr. Smith x x x 20. armata (Le Guillou) x x x 21. banghaasi Viehmeyer x x x 22. bicolor Fr. Smith x x x 23. boetcheris Stüz (Fig. 3) x x x 24. caeciliae Forel x x x x x x	Subgenus Hemiontica Roger				
A. Dottom DevicesxSubgenus Myrna Billbergx5. beccarii Mayrx7. inermis Fr. Smithx8. nigropilosa Mayrx9. noesaensis Forelx10. obesior Viehmeyer (Fig. 8)x11. pruinosa Mayrx12. striata Mayrx13. villipes Fr. Smithx14. vindex Fr. Smithx15. elit Emeryx15. elit Emeryx16. P. (Myrmatopa) sp. 12 *x17. P. (Myrmatopa) sp. 13 * (Fig. 5)xSubgenus Myrmatopa Forel18. abdominalis Fr. Smithx18. abdominalis Fr. Smithx20. armata (Le Guillou)xxx21. banghaasi Viehmeyerxxx22. bicolor Fr. Smithxxx23. boetcheri Stitz (Fig. 3)xxx24. caecillae Forel25. caphao Forel Q only26. cephalotex Emeryxxx27. chalybea Fr. Smithxx <td>4 holtoni Dorow & Kohout</td> <td></td> <td>x</td> <td></td> <td></td>	4 holtoni Dorow & Kohout		x		
Subgenits Myrina Dinocig5. beccaril Mayrxx6. illandata Walkerxx7. inermis Fr. Smithxx8. nigropilosa Mayrxx9. noesaensis Forelxx11. prainosa Mayrxx12. striata Mayrxx13. villipes Fr. Smithxx14. vindex Fr. Smithxx14. vindex Fr. Smithxx15. elii Emeryxx16. P. (Myrmatopa) sp. 12 *x7. P. (Myrmatopa) sp. 13 (Fig. 5)xSubgenus Myrmatopa Forelx18. abdominalis Fr. Smithx19. acantha Fr. Smithx20. armata (Le Guillou)xx21. bioglore Fr. Smithx22. bicolor Fr. Smithx23. boetcheri Stitz (Fig. 3)x24. caeciliae Forelx25. calypso ForelQ only29. hector Fr. Smithx20. hodgsoni Forelx21. binghaots Vichneyerx22. bicolor Fr. Smithx23. boetcheri Stitz (Fig. 3)x24. caeciliae Forelx25. calypso ForelQ only29. hector Fr. Smithx31. maryatiae Kohout ***x33. muelleri Forelx34. odacantha Wheelerx37. P. (Myrmhopla) sp. 12 ** (Fig. 6)x37. P. (Myrmhopla) sp. 16 **x39. P. (Myrmhopla) sp. 12 ** (Fig. 6)x39. P. (Myrmhopla) sp. 19 **x	Subgenus Myrma Billberg		A		
Solutionxx1xxx1intermis Fr. Smithxx2intermis Fr. Smithxx3intermis Fr. Smithxx1. pruinosa Mayrxxx1. pruinosa Mayrxxx1. pruinosa Mayrxxx1. pruinosa Mayrxxx1. pruinosa Mayrxxx1. pruinosa Mayrxxx1. striata Mayrxxx1. striata Mayrxxx1. striata Mayrxxx1. windex Fr. Smithxxx1. elit Emeryx12 *x1. f. P. (Myrmatopa) sp. 12 *xx2. data Mayr Through Sp. 13 (Fig. 5)xx3. baghaasi Viehneyerxxx2. bicolor Fr. Smithxx2. bicolor Fr. Smithxx2. bicolor Fr. Smithxx3. boettcheir Stitz (Fig. 3)xx2. caphaber Emeryxx2. caphaber Emeryxx2. caphaber Emeryxx3. multier Fr Smithxx3. maryatiae Kohout ***x3. muelleri Forelxx3. muelleri Forelxx3. muelleri Forelxx3. muelleri Forelxx3. muelleri Forelxx3. muelleri Forelx <t< td=""><td>5 beccarii Mayr</td><td>×</td><td>×</td><td></td><td></td></t<>	5 beccarii Mayr	×	×		
0.numberxxx0.internitiesinternitiesinternitiesinternities1.internitiesinternitiesinternitiesinternities1.internitiesinternitiesinternitiesinternities1.internitiesinternitiesinternitiesinternities1.internitiesinternitiesinternitiesinternities1.internitiesinternitiesinternitiesinternities1.internitiesinternitiesinternitiesinternities1.internitiesinternitiesinternitiesinternities1.internitiesinternitiesinternitiesinternities1.internitiesinternitiesinternitiesinternities1.internitiesinternitiesinternitiesinternities1.internitiesinternitiesinternitiesinternities1.internitiesinternitiesinternitiesinternities1.internitiesinternitiesinternitiesinternities1.internitiesinternitiesinternitiesinternities1.internitiesinternitiesinternitiesinternities1.internitiesinternitiesinternitiesinternities1.internitiesinternitiesinternitiesinternities1.internitiesinternitiesinternitiesinternities1.internitiesinternitiesinternities </td <td>6 illaudata Walker</td> <td>v</td> <td>v</td> <td>v</td> <td></td>	6 illaudata Walker	v	v	v	
norms in control in the interval of the inter	7 inermis Fr Smith	x	x	A	
a.x.x.x.x.x.x.x.x.x.x.x.x.x.x.x.x.x.10.0. obesior Viehmeyer (Fig. 8)x.x.x.x.x.x.x.x.11.pruinosa Mayrx.x.x.x.11.pruinosa Mayrx.x.x.x.11.pruinosa Mayrx.x.x.12.striata Mayrx.x.x.x.12.striata Mayrx.x.x.12.striata Mayrx.x.x.12.striata Mayrx.x.x.12.striata Mayrx.x.x.13.15.elit Eineryx.13.15.elit Eineryx.15.elit Eineryx.x.x.x.x.x.x.13.15.elit Einerystriata Mayrx.x.x.x.x.x.x.13.13.13.13.13.13.13.13.13.13.13.13.3.13. <t< td=""><td>8 nigrapilosa Mayr</td><td>x</td><td>x</td><td>v</td><td></td></t<>	8 nigrapilosa Mayr	x	x	v	
Decoderbasion Vichmeyer (Fig. 8)xxxx10. obesion Vichmeyer (Fig. 8)xxxx11. pruinosa Mayrxxxx12. striata Mayrxxxx13. villipes Fr. Smithxxx14. vindex Fr. SmithxxxSubgenus Myrmatopa Forel15. elii Emeryx16. P. (Myrmatopa) sp. 12x17. P. (Myrmatopa) sp. 13 (Fig. 5)xxxxSubgenus Myrmhopla Forelxxxx18. abdominalis Fr. Smithxxxx20. armata (Le Guillou)xxxx21. banghaasi Viehmeyerxxxx22. bicolor Fr. Smithxxxx23. boettcheri Stitz (Fig. 3)xxxx24. caeciliae Forelxxxx25. caphaotes Emeryxxxx26. cephalotes Emeryxxxx29. hector Fr. Smithxxxx20. hodgsoni Forelxxxx31. maryatiae Kohout**xxxx32. mitruta Menozzixxxx33. muelleri Forelxxx34. oedacantha Wheelerxxx35. rufipes Fr. Smith (Fig. 9)xxx37. P. (Myrmhopla) sp. 12************************************	9 noesaensis Forel	x	x	x	
10. Distribute (1. g. 6)x11. printosa Mayrx12. striata Mayrx13. villpes Fr. Smithxxx14. vindex Fr. SmithxxxSubgenus Myrmatopa Forel15. elit Emeryx16. P. (Myrmatopa) sp. 12x17. P. (Myrmatopa) sp. 13 (Fig. 5)xSubgenus Myrmhopla Forel18. abdominalis Fr. Smithx18. abdominalis Fr. Smithxxx19. acantha Fr. Smithxxx20. armata (Le Guillou)xxx21. banghaasi Viehmeyerxxx22. bicolor Fr. Smithxxx23. boettcheri Stitz (Fig. 3)xxx24. caeciliae Forelxxx25. calypso ForelQ onlyxx28. furcata Fr. Smithxxx<	10 obesier Viehmever (Fig. 8)	x	~	Λ	
11. printod May:xx12. striata May:xx13. villipes Fr. Smithxx14. vindex Fr. SmithxxSubgenus Myrmatopa Forel15. elii Emery15. elii Emeryx16. P. (Myrmatopa) sp. 12 *x17. P. (Myrmatopa) sp. 13 * (Fig. 5)xSubgenus Myrmhopla Forel18. abdominalis Fr. Smithx19. acantha Fr. Smith (Fig. 2)x20. armata (Le Guillou)xxx21. bianghaasi Viehmeyerxxx22. bicolor Fr. Smithxxx23. boetcheri Stitz (Fig. 3)xxx24. caeciliae Forelx25. calypso ForelQ onlyxx29. hector Fr. Smithxxx31. maryatiae Kohoutxxx33. muelleri Forelxxx <td>11 nuinosa Mar</td> <td>~</td> <td></td> <td></td> <td>v</td>	11 nuinosa Mar	~			v
12. sindla wayixx12. villages Fr. Smithxx14. vindex Fr. SmithxxSubgenus Myrmatopa Forelx15. eli Emeryx16. P. (Myrmatopa) sp. 12x17. P. (Myrmatopa) sp. 13 '(Fig. 5)xSubgenus Myrmhopla Forelx18. abdominalis Fr. Smithxxx20. armata (Le Guillou)xxx21. banghaasi Vichmeyerxxx22. bicolor Fr. Smithxxx23. boettcheri Stitz (Fig. 3)xxx24. caeciliae Forelx25. calpso Forel Q only26. cephalotes Emeryx27. chalybea Fr. Smithxxx29. hector Fr. Smithxxx <td>12 striata Mayr</td> <td>×</td> <td>v</td> <td></td> <td>Α</td>	12 striata Mayr	×	v		Α
10. impositionxx11. vindex Fr. SmithxxSubgenus Myrmatopa Forel15. elii Emeryx15. elii Emeryxx16. P. (Myrmatopa) sp. 12 *x17. P. (Myrmatopa) sp. 13 (Fig. 5)xSubgenus Myrmhopla Forel18. abdominalis Fr. Smith18. abdominalis Fr. Smithxx18. abdominalis Fr. Smithxx20. armata (Le Guillou)xx21. banghaasi Viehmeyerx22. bicolor Fr. Smithx23. boetcheri Stitz (Fig. 3)x24. caeciliae Forelx25. calpso Forel \mathcal{Q} only26. cephalotes Emeryx27. chalybea Fr. Smithx28. furcata Fr. Smithxxx29. hector Fr. Smithxx </td <td>13 villines Fr. Smith</td> <td>x</td> <td>x</td> <td></td> <td></td>	13 villines Fr. Smith	x	x		
In what if is thatxxSubgenus Myrmatopa Forel15. elii Emeryx16. P. (Myrmatopa) sp. 12x17. P. (Myrmatopa) sp. 13 (Fig. 5)xSubgenus Myrmhopla Forel18. abdominalis Fr. Smithx19. acantha Fr. Smith (Fig. 2)x20. armata (Le Guillou)xxx21. banghaasi Viehmeyerxxx22. bicolor Fr. Smithxxx23. boettcheri Stitz (Fig. 3)xx24. caeciliae Forelxx25. calypso ForelQ onlyxxx29. hector Fr. Smithxxx<	14 vinder Fr. Smith	×	v		
Subgenus Myrnatopa Potel 15. elii Emery x 16. P. (Myrmatopa) sp. 12 x 17. P. (Myrmatopa) sp. 13 (Fig. 5) x Subgenus Myrnhopla Forel x 18. abdominalis Fr. Smith x x 19. acantha Fr. Smith (Fig. 2) x x 20. armata (Le Guillou) x x x 21. banghaasi Viehneyer x x x 22. bicolor Fr. Smith x x x 23. boettcheri Stitz (Fig. 3) x x x 24. caeciliae Forel x x 2 25. calypso Forel Q only x x 26. cephalotes Emery x x x 27. chalybea Fr. Smith (Fig. 4) x x x 28. furcata Fr. Smith x x x 29. hector Fr. Smith x x x 31. maryatiae Kohout x x x 32. mitrata Menozzi x x x 33. muelleri Forel x x x 34. oedacantha Wheeler x	Sub converting Forel	A	A		
13. etin Enderyx16. P. (Myrmatopa) sp. 12x17. P. (Myrmatopa) sp. 13 (Fig. 5)xSubgenus Myrmhopla Forel18. abdominalis Fr. Smithxx19. acantha Fr. Smith(Fig. 2)x20. armata (Le Guillou)xxx21. banghaasi Viehneyerxx22. bicolor Fr. Smithxx23. boettcheri Stitz (Fig. 3)xx24. caeciliae Forelx25. calpso ForelQ only26. cephalotes Emeryx27. chalybea Fr. Smithxx28. furcata Fr. Smithxx29. hector Fr. Smithxx31. maryatiae Kohoutxx33. muelleri Forelxx33. muelleri Forelxx34. oedacantha Wheelerxx35. P. (Myrmhopla) sp. 12 "(Fig. 6)x38. P. (Myrmhopla) sp. 12 "(Fig. 6)x39. P. (Myrmhopla) sp. 12 "Q only41. P. (Myrmhopla) sp. 22 " Q only41. P. (Myrmhopla) sp. 22	Subgenus Ny matopa Porei	v			
10. F. (Myrmatopa) sp. 12x $17. P. (Myrmatopa)$ sp. 13 (Fig. 5)xSubgenus Myrmhopla Forel18. abdominalis Fr. Smithxxx18. abdominalis Fr. Smith(Fig. 2)xx20. armata (Le Guillou)xxx21. banghaasi Vichmeyerxxx22. bicolor Fr. Smithxxx23. boettcheri Stitz (Fig. 3)xx24. caeciliae Forelx25. calypso ForelQ onlyx26. cephalotes Emeryx27. chalybea Fr. Smith (Fig. 4)xx29. hector Fr. Smithxx21. maryatiae Kohoutxx31. maryatiae Kohoutxx33. muelleri Forelxx34. ceedacantha Wheelerxx35. rufipes Fr. Smith (Fig. 9)xx36. rufiventris Forelxx37. P. (Myrmhopla) sp. 12 "(Fig. 6)xx38. P. (Myrmhopla) sp. 12 "(Fig. 6)xx34. P. (Myrmhopla) sp. 12 " (Fig. 6)xx35. P. (Myrmhopla) sp. 12 " (Fig. 6)xx36. P. (Myrmhopla) sp. 12 " (Fig. 6)xx37. P. (Myrmhopla) sp. 12 " (Fig. 6)xx34. P. (Myrmhopla) sp. 22 " Q onlyxx35. P. (Myrmhopla) sp. 22 " Q onlyxx </td <td>15. eu Ellery</td> <td>X</td> <td></td> <td></td> <td></td>	15. eu Ellery	X			
17. F. (Myrmhopla ForelxSubgenus Myrmhopla Forel18. abdominalis Fr. Smithxxx19. acantha Fr. Smith(Fig. 2)xx20. armata (Le Guillou)xxx21. banghaasi Viehmeyerxxx22. bicolor Fr. Smithxxx23. boettcheri Stitz (Fig. 3)xxx24. caeciliae Forelxx25. calypso Forel \heartsuit onlyx26. cephalotes Emeryxx27. chalybea Fr. Smithxx28. furcata Fr. Smithxx29. hector Fr. Smithxx31. maryatiae Kohoutxx33. muelleri Forelxx34. oedacantha Wheelerxxx </td <td>10. F. (Myrmatopa) sp. 12 17. P. (Asymptotic and an 13^{*} (Fig. 5)</td> <td>х</td> <td>v</td> <td></td> <td></td>	10. F . (Myrmatopa) sp. 12 17. P . (Asymptotic and an 13^{*} (Fig. 5)	х	v		
Subgenus Myrnhopia Forel18. abdominalis Fr. Smithxxxxx19. acantha Fr. Smith(Fig. 2)xxx20. armata (Le Guillou)xxxxx21. banghaasi Viehmeyerxxxx22. bicolor Fr. Smithxxxx23. boettcheri Stitz (Fig. 3)xxx24. caeciliae Forelxx25. calypso ForelQ onlyx26. cephalotes Emeryxx27. chalybea Fr. Smithxx28. furcata Fr. Smithxx29. hector Fr. Smithxx30. hodgsoni Forelxx31. maryatiae Kohoutxx33. muelleri Forelxx34. oedacantha Wheelerxx35. rufipes Fr. Smith (Fig. 9)xx36. rufiventris Forelxx37. P. (Myrmhopla) sp. 12 ** (Fig. 6)x38. P. (Myrmhopla) sp. 19 *x40. P. (Myrmhopla) sp. 19 *x41. P. (Myrmhopla) sp. 22 **Q only41. P. (Myrmhopla) sp. 23 **x	17. P. (Myrmalopa) sp. 13 (Fig. 3)		X		
18. abaominatis Fr. Smithxxxxxx19. acantha Fr. Smith(Fig. 2)xxx20. armata (Le Guillou)xxxx21. banghaasi Viehmeyerxxx22. bicolor Fr. Smithxxx23. boettcheri Stitz (Fig. 3)xx24. caeciliae Forelxx25. calypso Forel Q onlyx26. cephalotes Emeryxx27. chalybea Fr. Smithxx28. furcata Fr. Smithxx29. hector Fr. Smithxx20. hodgsoni Forelxx31. maryatiae Kohoutxx33. muelleri Forelxx34. oedacantha Wheelerxx35. rufipes Fr. Smith (Fig. 9)xx36. rufiventris Forelxx37. P. (Myrmhopla) sp. 12"(Fig. 6)x38. P. (Myrmhopla) sp. 19xx40. P. (Myrmhopla) sp. 22Q only41. P. (Myrmhopla) sp. 23x	Subgenus Myrmnopla Forel				
19. acanina (Fig. 2)xx20. armata (Le Guillou)xxx21. banghaasi Viehmeyerxx22. bicolor Fr. Smithxx23. boettcheri Stitz (Fig. 3)xx24. caeciliae Forelx25. calypso ForelQ only26. cephalotes Emeryx27. chalybea Fr. Smithx28. furcata Fr. Smithx29. hector Fr. Smithx21. maryatiae Kohoutxxx31. maryatiae Kohoutxxx33. muelleri Forelxx </td <td>18. abdominalis Fr. Smith</td> <td>x</td> <td>x</td> <td>x</td> <td>x</td>	18. abdominalis Fr. Smith	x	x	x	x
20. armata (c)e Gulliou)xxxx21. banghaasi Viehmeyerxxx22. bicolor Fr. Smithxx23. boettcheri Stitz (Fig. 3)xx24. caeciliae Forelx25. calypso ForelQ only26. cephalotes Emeryx27. chalybea Fr. Smith (Fig. 4)x28. furcata Fr. Smithx29. hector Fr. Smithx20. hodgsoni Forelx21. maryatiae Kohoutx22. mitrata Menozzix23. muelleri Forelx24. caecatha Wheelerx25. rufipes Fr. Smith (Fig. 9)x26. cephalotes Emeryx27. chalybea Fr. Smithx28. furcata Fr. Smithx29. hector Fr. Smithx31. maryatiae Kohoutx32. mitrata Menozzix33. muelleri Forelx34. oedacantha Wheelerx35. rufipes Fr. Smith (Fig. 9)x36. rufiventris Forelx37. P. (Myrmhopla) sp. 12 "(Fig. 6)x38. P. (Myrmhopla) sp. 16 "x39. P. (Myrmhopla) sp. 19 *x40. P. (Myrmhopla) sp. 22 **Q only41. P. (Myrmhopla) sp. 23 *x	19. acantha Fr. Smith (Fig. 2)	x	x		
21. bangnaasi vienneyerxx22. bicolor Fr. Smithxx23. boettcheri Stitz (Fig. 3)xx24. caeciliae Forelx25. calypso Forel \bigcirc only26. cephalotes Emeryx27. chalybea Fr. Smith (Fig. 4)x28. furcata Fr. Smithx29. hector Fr. Smithx20. hodgsoni Forelx21. maryatiae Kohoutx31. maryatiae Kohoutx33. muelleri Forelx34. oedacantha Wheelerxxx	20. armata (Le Guillou)	x	x	x	
22. blcolor Fr. Smultxx23. boettcheri Stitz (Fig. 3)xx24. caeciliae Forelx25. calypso Forel \bigcirc onlyxx25. calybso Forel \bigcirc onlyxx26. cephalotes Emeryx27. chalybea Fr. Smith (Fig. 4)xxx28. furcata Fr. Smithxxx29. hector Fr. Smithxxx30. hodgsoni Forelxxx31. maryatiae Kohoutxxx32. mitrata Menozzixxx34. oedacantha Wheelerxxx <t< td=""><td>21. bangnaasi vienmeyer</td><td>x</td><td>x</td><td></td><td></td></t<>	21. bangnaasi vienmeyer	x	x		
23. boetlchert Sutz (Fig. 3)xx24. caeciliae Forelx25. calypso Forel \mathcal{Q} onlyxx26. cephalotes Emeryx27. chalybea Fr. Smith (Fig. 4)xxx28. furcata Fr. Smithxxx29. hector Fr. Smithxx <td>22. bicolor Fr. Simun</td> <td>x</td> <td>x</td> <td></td> <td></td>	22. bicolor Fr. Simun	x	x		
24. caechiae Forelx25. calypso Forel \bigcirc onlyx26. cephalotes Emeryxx27. chalybea Fr. Smith (Fig. 4)xx28. furcata Fr. Smithxx29. hector Fr. Smithxx29. hector Fr. Smithxx30. hodgsoni Forelxx31. maryatiae Kohoutxx32. mitrata Menozzixx33. muelleri Forelxx34. oedacantha Wheelerxx35. rufipes Fr. Smith (Fig. 9)xx36. rufiventris Forelxx37. P. (Myrmhopla) sp. 12 ** (Fig. 6)x38. P. (Myrmhopla) sp. 19 *x40. P. (Myrmhopla) sp. 22 ** \bigcirc only41. P. (Myrmhopla) sp. 23 *x	23. boencheri Suiz (Fig. 3)	x	x		
25. catypso Forel \bigcirc onlyx26. cephalotes Emeryxx27. chalybea Fr. Smith (Fig. 4)xx28. furcata Fr. Smithxx29. hector Fr. Smithxx29. hector Fr. Smithxx30. hodgsoni Forelxx31. maryatiae Kohoutxx32. mitrata Menozzix33. muelleri Forelxx34. oedacantha Wheelerxx35. rufipes Fr. Smith (Fig. 9)xx36. rufiventris Forelxx37. P. (Myrmhopla) sp. 12 ** (Fig. 6)x38. P. (Myrmhopla) sp. 19 *x40. P. (Myrmhopla) sp. 22 ** \bigcirc only41. P. (Myrmhopla) sp. 23 *x	24. caeciliae Forel	O ambr	x		
20. cephaloles Entryx27. chalybea Fr. Smith (Fig. 4)xx28. furcata Fr. Smithxx29. hector Fr. Smithxx29. hector Fr. Smithxx30. hodgsoni Forelxx31. maryatiae Kohoutxx32. mitrata Menozzix33. muelleri Forelxx34. oedacantha Wheelerxx35. rufipes Fr. Smith (Fig. 9)xx36. rufiventris Forelxx37. P. (Myrmhopla) sp. 12 ** (Fig. 6)x38. P. (Myrmhopla) sp. 19 *x40. P. (Myrmhopla) sp. 22 ** φ only41. P. (Myrmhopla) sp. 23 *x	25. catypso Forei	¥ oniy	. ×		
27. chalybed FI. Smith (Fig. 4) x x x 28. furcata Fr. Smith x x 29. hector Fr. Smith x x 30. hodgsoni Forel x x 31. maryatiae Kohout x x 32. mitrata Menozzi x 33. muelleri Forel x 34. oedacantha Wheeler x x x 35. rufipes Fr. Smith (Fig. 9) x 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 ** φ only41. P. (Myrmhopla) sp. 23 * x	20. cephaloles Effery	x			
$28. Jurcata Fr. Smith$ xx $29. hector Fr. Smith$ xx $29. hector Fr. Smith$ xx $30. hodgsoni Forel$ xx $31. maryatiae$ Kohoutxx $32. mitrata$ Menozzix $33. muelleri$ Forelxx $34. oedacantha$ Wheelerxx $35. rufipes$ Fr. Smith (Fig. 9)xx $36. rufiventris$ Forelxx $37. P. (Myrmhopla)$ sp. 12 ** (Fig. 6)x $38. P. (Myrmhopla)$ sp. 16 **x $39. P. (Myrmhopla)$ sp. 19 *x $40. P. (Myrmhopla)$ sp. 22 ** φ only $41. P. (Myrmhopla)$ sp. 23 *x	27. charybea Fr. Smun (Fig. 4)	x	x		
29. hector F1. shiftinxxxx30. hodgsoni Forelxx31. maryatiae Kohoutx32. mitrata Menozzix33. muelleri Forelx34. oedacantha Wheelerxxx35. rufipes Fr. Smith (Fig. 9)xxx36. rufiventris Forelx37. P. (Myrmhopla) sp. 12 ** (Fig. 6)x38. P. (Myrmhopla) sp. 16 **x39. P. (Myrmhopla) sp. 19 *x40. P. (Myrmhopla) sp. 22 ** φ only41. P. (Myrmhopla) sp. 23 *x	20. Jurcala FL Smith	X	X		
30. holgsom Foldx31. maryatiae Kohoutx32. mitrata Menozzix33. muelleri Forelx34. oedacantha Wheelerxxx35. rufipes Fr. Smith (Fig. 9)xxx36. rufiventris Forelxxx37. P. (Myrmhopla) sp. 12 ** (Fig. 6)x38. P. (Myrmhopla) sp. 16 **x39. P. (Myrmhopla) sp. 19 *x40. P. (Myrmhopla) sp. 22 ** \bigcirc only41. P. (Myrmhopla) sp. 23 *x	29. hector FT. Simul	X	X	x	
31. maryanae Konoutx32. mitrata Menozzix33. muelleri Forelx34. oedacantha Wheelerxxx35. rufipes Fr. Smith (Fig. 9)xxx36. rufiventris Forelx37. P. (Myrmhopla) sp. 12 ** (Fig. 6)x38. P. (Myrmhopla) sp. 16 **x39. P. (Myrmhopla) sp. 19 *x40. P. (Myrmhopla) sp. 22 ** φ only41. P. (Myrmhopla) sp. 23 *x	21 manuatian Vohout ***			х	
32. millial Mellozzix33. muelleri Forelx34. oedacantha Wheelerxxx35. rufipes Fr. Smith (Fig. 9)xxx36. rufiventris Forelx37. P. (Myrmhopla) sp. 12 ** (Fig. 6)x38. P. (Myrmhopla) sp. 16 **x39. P. (Myrmhopla) sp. 19 *x40. P. (Myrmhopla) sp. 22 ** \bigcirc only41. P. (Myrmhopla) sp. 23 *x	32. mitrata Manozzi	X			
33. mathem Foreixx $34. oedacantha$ Wheelerxx $35. rufipes$ Fr. Smith (Fig. 9)xx $36. rufiventris$ Foreix $37. P. (Myrmhopla)$ sp. 12 ** (Fig. 6)x $38. P. (Myrmhopla)$ sp. 16 **x $39. P. (Myrmhopla)$ sp. 19 *x $40. P. (Myrmhopla)$ sp. 22 ** \bigcirc only $41. P. (Myrmhopla)$ sp. 23 *x	32. militala Meliozzi	x	v		
34. beadcanina wheelerxx35. rufipes Fr. Smith (Fig. 9)xx36. rufiventris Forelx37. P. (Myrmhopla) sp. 12 ** (Fig. 6)x38. P. (Myrmhopla) sp. 16 **x39. P. (Myrmhopla) sp. 19 *x40. P. (Myrmhopla) sp. 22 ** \bigcirc only41. P. (Myrmhopla) sp. 23 *x	33. muelleri Forei	X	X		
35. rulpes F1. shift (Fig. 5) x x 36. rulpes F1. shift (Fig. 5) x 36. rulpes F1. shift (Fig. 6) 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 ** φ only41. P. (Myrmhopla) sp. 23 * x	25 milings Er Smith (Eig. 0)	X	X		
30. ru/wenris Foldx $37. P. (Myrmhopla)$ sp. $12 **$ (Fig. 6)x $38. P. (Myrmhopla)$ sp. $16 **$ x $39. P. (Myrmhopla)$ sp. $19 **$ x $40. P. (Myrmhopla)$ sp. $22 **$ \bigcirc only $41. P. (Myrmhopla)$ sp. $23 *$ x	35. ruppes r1. Sillui (rig. 9)	X	X		
37.7. (Myrmhopla) sp. 12X38. P. (Myrmhopla) sp. 16X39. P. (Myrmhopla) sp. 19X40. P. (Myrmhopla) sp. 22 \bigcirc only41. P. (Myrmhopla) sp. 23X	$37 P (A (number la) = 12^{**} (Fig. 6)$		X		
$\begin{array}{cccccccccccccccccccccccccccccccccccc$	$38 P (Murmhonla) = 16^{**}$	v	~		
40. P. (Myrmhopla) sp. 22 ** \bigcirc only 41. P. (Myrmhopla) sp. 23 ** x	$39 P (Murmhonla) = 10^*$	~	x		
41. P. (Myrmhopla) sp. 22 x	40 P (Murmhonla) = 22	O only	A.		
	$41 P (Murmhonla) \le 23^*$	+ only			
$A^{2} P (A \pi m hopla) so 24^{*}$	42 P (Murmhonla) = 24	x			
43 P. (Avrmhopla) sp. 25 x	43 P. (Myrmhopla) sp. 24	A	x		
44. P. (Myrmhopla) sp. 26 x	44. P. (Myrmhopla) sp. 26*	x			

List of Polyrhachis species from the Maliau Basin Conservation Area

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		х	
48. olybria Forel, 1912	x	x	x	
49. P. (Polyrhachis) sp. 01*	х			

* 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 selfcontained 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

ASIANMYRMECOLOGY

Published by the Institute for Tropical Biology & Conservation, Universiti Malaysia Sabah, Malaysia on behalf of ANeT — the International Network for the Study of Asian Ants