

Preliminary survey of ants at a reserve area of Prince of Songkla University, Songkhla Province, Southern Thailand

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Abstract

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Prince of Songkla University is the first university established in the southern part of Thailand. A reserve area is planned at Ko Hong Hill near the university. The flora of this area has been previously explored but a few fauna species have been studied. Although ants are one of dominant groups in this forest, there is no record of their diversity. Thus, the aim of this study is to determine the ant diversity in terms of species composition. Three sampling methods, pitfall trap (PF), hand collecting (HC) and leaf litter sifting (LL) were applied to collection of ants along 3 line transects each of 90 meter in length and 500 meter apart during April 2001. Six subfamilies (Formicinae, Myrmicinae, Dorylinae, Ponerinae, Dolichoderinae and Pseudomyrmecinae) of ants, comprising 44 species, were found. The results also showed that HC was the most sufficient method resulting in the highest number of ant species, while the combination of two methods (HC and LL) yielded the highest number of ant species.

Key words : ants, sampling method, diversity, Prince of Songkla University

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บทคัดย่อ

ศุภฤกษ์ วัฒนสิทธิ์ นาวี หนูนอนันต์ และ นิรานี บินนิมา
 การสำรวจมดเบื้องต้นบริเวณพื้นที่อนุรักษ์ของมหาวิทยาลัยสงขลานครินทร์ จังหวัดสงขลา
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มหาวิทยาลัยสงขลานครินทร์เป็นมหาวิทยาลัยแห่งแรกที่จัดตั้งในพื้นที่ภาคใต้ของประเทศไทย พื้นที่อนุรักษ์พันธุ์พืชและสัตว์กำลังจัดตั้งในบริเวณเขาคอหงส์ที่อยู่ติดกับมหาวิทยาลัย ได้มีการศึกษาและสำรวจพันธุ์พืชของบริเวณนี้มาก่อน แต่การศึกษาทางด้านสัตว์ยังมีไม่มาก มดเป็นกลุ่มแมลงเด่นที่พบในพื้นที่ป่าแต่ยังไม่มียางทางด้านความหลากหลายของมดในบริเวณนี้ ดังนั้นวัตถุประสงค์ในการสำรวจครั้งนี้เพื่อดูความหลากหลายและองค์ประกอบชนิดของมดที่อาศัยอยู่ในพื้นที่อนุรักษ์แห่งนี้ โดยวางแผนเก็บตัวอย่างมดที่มีความยาว 90 เมตร จำนวน 3 เส้น แต่ละเส้นห่างกัน 500 เมตร จากนั้นทำการเก็บตัวอย่างมดด้วย 3 วิธี คือ การวางกับดักหลุม การเก็บด้วยมือ และการเก็บด้วยตะแกรงร่อนซากใบไม้ ในเดือนเมษายน 2544 จากการศึกษาพบมดทั้งหมด 6 วงศ์ย่อย ได้แก่ Formicinae, Myrmicinae, Dorylinae, Ponerinae, Dolichoderinae และ Pseudomyrmecinae ซึ่งประกอบด้วยมด 44 ชนิด นอกจากนี้ยังพบว่าวิธีการเก็บตัวอย่างมดด้วยการเก็บด้วยมือให้ตัวอย่างชนิดมดมากกว่าวิธีอื่น ๆ แต่ถ้าใช้วิธีการเก็บร่วมกันหลายวิธีพบว่าวิธีการเก็บด้วยมือและการเก็บด้วยตะแกรงร่อนซากใบไม้ร่วมกันจะได้ชนิดมดมากที่สุด

ภาควิชาชีววิทยา คณะวิทยาศาสตร์ มหาวิทยาลัยสงขลานครินทร์ อำเภอหาดใหญ่ จังหวัดสงขลา 90112

Prince of Songkla University was established in 1971 and was the first in southern Thailand. The university is currently comprises 5 campuses, which are located in Hat Yai, Pattani, Phuket, Trang and Surat Thani along the east Gulf of Thailand and west coasts of Thailand. The Hat Yai Campus is the largest and is about 50 km north of the Malaysian border. It is surrounded by old rubber plantation, secondary forest and undisturbed forest. Thus, diversity of flora and fauna should be high. Only the flora has been well studied (Maxwell, 1986). However it is known that insects are a dominant group among the fauna (Groombridge, 1992) and ants make up the main part of the insect community in the forest (Pholpunthin *et al.*, 1999).

Ants play an important role in ecosystem. Maryati (1996) reported that ants improved the forest soil, assisted in the decomposition process, served as food resources and exerted a positive effect in the regeneration processes of forest trees. Diversity of ants at Prince of Songkla University is very interesting but there is only one report on diversity of ant in rubber plantations (Watanasit, 2003).

There are a few sampling methods for ant collection, for example, hand collection (Romeo and Jaffe, 1989; Samson *et al.*, 1997; Yamane and Hashimoto, 1999), leaf litter sampling (Olson, 1991; Romeo and Jaffe, 1989; Noon-anant, 2003), pitfall trap (Watanasit *et al.*, 2000; Samson *et al.*, 1997) and soil sampling (Noon-anant, 2003; Watanasit, 2003). Many studies showed that a combination of ant sampling methods yields better results in the evaluation of ant species than a single sampling method (Watanasit, 2003; Yamane and Hashimoto, 1999; Noon-anant, 2003). Thus, the aim of this study was to evaluate the diversity of ants by different sampling methods at the reserve area of the Hat Yai Campus.

Materials and Methods

1. The study site

This study was conducted at the Prince of Songkla University, Hat Yai campus. It is an 80 acre reserve area for the establishment of a botanical garden near Ko Kong Hill (Figure 1).

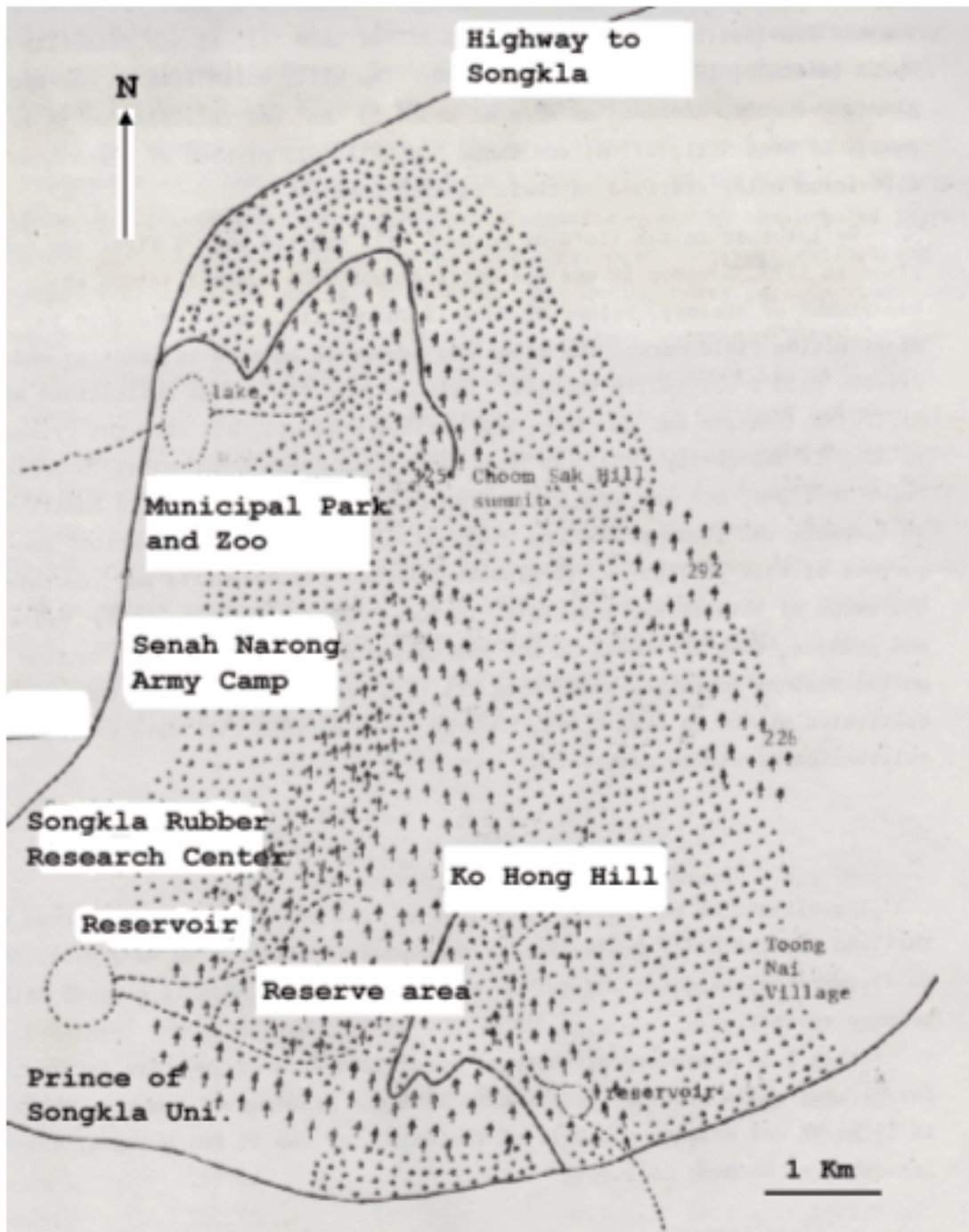


Figure 1. Map of Ko Hong Hill and location of the reserve area near Prince of Songkla University (Modified from Maxwell, 1986)

Legend: + + + para rubber estate ↑↑↑ secondary forest
 ————— road ○ stream, lake, reservoir

2. Sampling procedures

Sampling collections were carried out in April 2001, in the dry season. Three line transects, 500 meters apart, and 90 meters in length, were set up on the ground floor under the forest canopy. Three sampling methods were applied to collection as follows.

2.1 Hand collecting (HC)

Any ants found in the line transects were collected using forceps and an aspirator. Thirty minutes was spent to each line transect. Ant samples were then transferred to plastic containers (7.5×15 cm). This method could be used for ants living on the ground and on trees.

2.2 Leaf litter samples (LL)

This method was used to collect ants living on the ground and feeding on detritus. Leaf litter was collected in the line transects and placed in a sifter directly above a white pan (27×16×6 cm). Forceps and an aspirator were used to collect ants in the white pan. The time limit was also 30 minutes per transect.

2.3 Pitfall trap (PF)

This method was used to collect ants feeding on the ground and detritus. Four plastic containers (12.8 cm height, 6.7 cm in diameter) were placed along the line transect 30 meters apart. The plastic containers were filled to two third of their volume with 4 percent formaldehyde mixed with a small amount of detergent. Tuna bait was hung from the tops of the plastic containers and covered with plastic lids for protect against rain. A total of 12 plastic containers were placed in the line transect and were left for one week.

3. Preserving

The collected specimens were brought back to the Department of Biology, Prince of Songkla University, for preserving in 70% ethanol and pinning for further identification.

4. Ant Identification

Bolton (1994) and Hölldobler and Wilson (1990) were used for identification of the ant genus. The species level was confirmed by the Ant Museum at Kasetsart University.

5. Analysis

The percentage of ant species was used for comparison between combination of sampling methods as the following formula.

$$\% \text{ of combination of two sampling methods} = (N/T) \times 100$$

N = number of ant species found between two sampling methods

T = Total number of ant species

Results

There were six subfamilies and 44 species of ants from the reserve area at Prince of Songkla University in April 2001 (Figure 2). The comparison of ant species and percentage among three sampling methods are shown in Table 1. The number of ant species collected by HC, LL and PF were 25, 22 and 12, respectively.

The combination of ant sampling methods is shown in Table 2. A total of 44 species were collected using a combination of collecting methods. The combination of LL and HC was more efficient than any other form of combination.

Discussion

As shown in Table 1, the number of ant species collected by HC was the highest among LL and PF. This result is in contrast to Noon-anant (2003) and Watanasit (2003). Both of them showed that LL was a reliable technique for estimating number of ant species in lowland tropical rain forest at Hala-bala Wildlife Sanctuary (Noon-anant, 2003) and in rubber plantation (Watanasit, 2003) in Thailand. Romero and Jaffe (1989) supported this finding, however. They showed that HC was the best technique for estimating number of ant species in mainland savanas of Venezuelan Llanos. Ant habitat may be an important factor for ant sampling method. For example, leaf litter sample was found to be more useful than a pitfall trap to evaluate ant species in tropical rainforest in Costa Rica (Olson, 1991); pitfall trap was more effective than hand collection at elevational gradient in the Phillippines (Samson *et al.*, 1997) but hand collect-

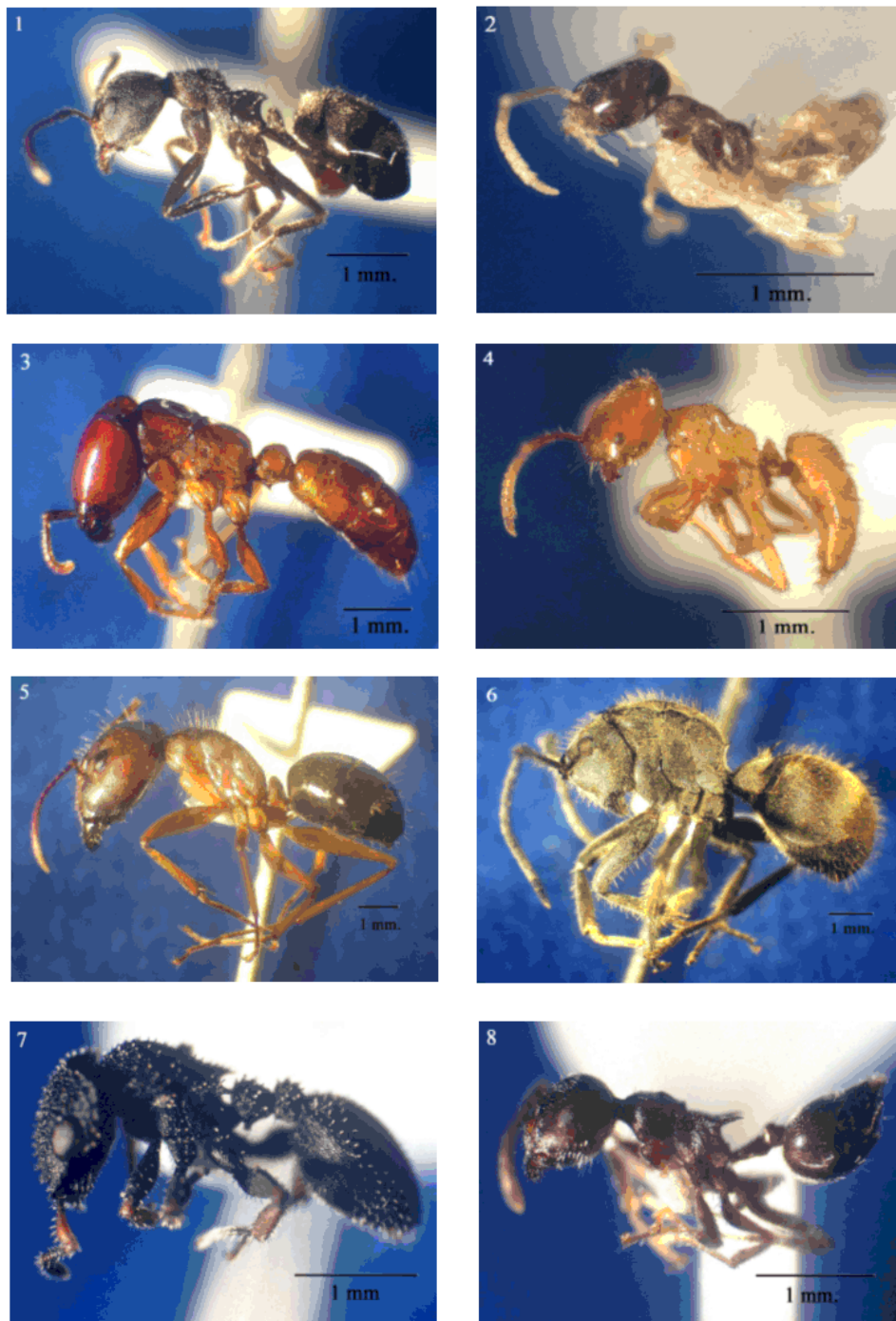


Figure 2. Some ant species were collected from reserve area of Prince of Songkla University.

1 *Dolichoderus thoracicus* (Fr. Smith)

3 *Dorylus* sp.

5 *Camponotus (Tanaemyrmex)* sp. 1

7 *Cataulacus granulatus* (Latreille)

2 *Tapinoma melanocephalum* (Fabricius)

4 *Acropyga acutiventris* Roger

6 *Polyrhachis (Myrma) illaudata* Walker

8 *Crematogaster (Paracrema)* sp.

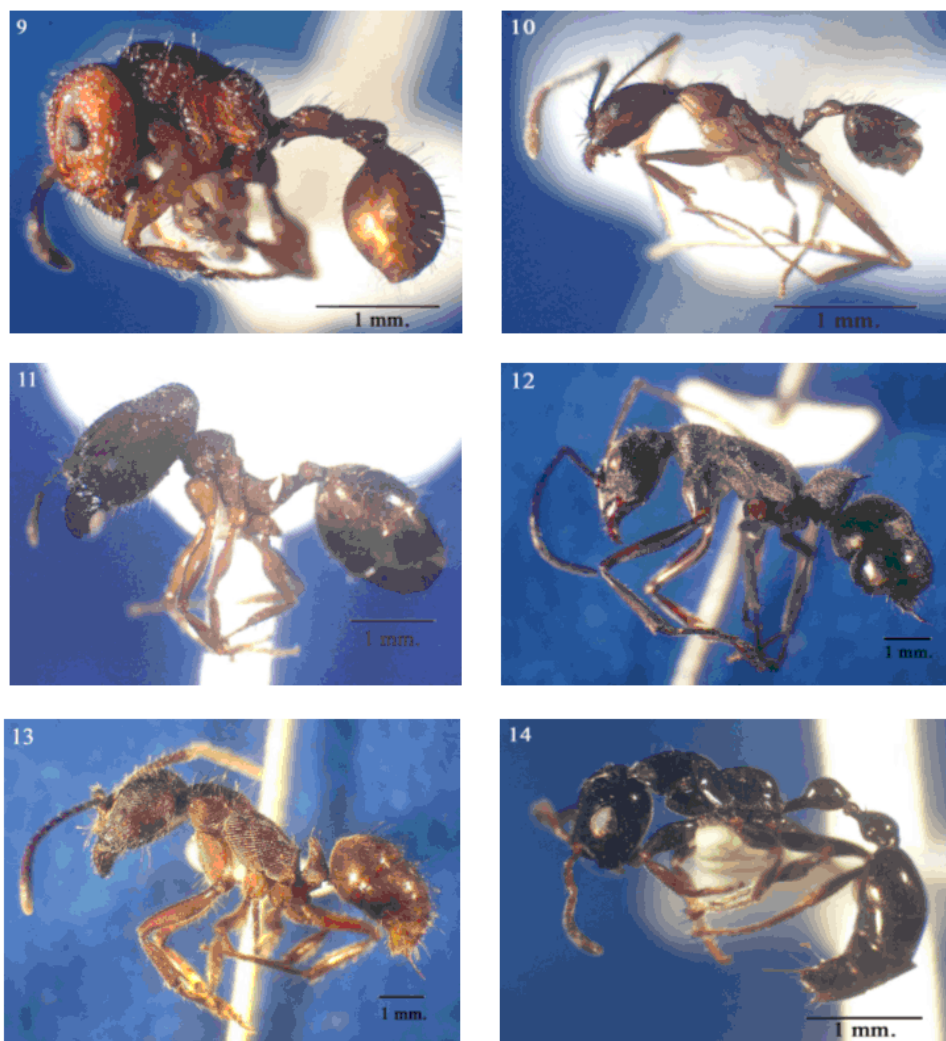


Figure 2. (Continued)

- | | |
|---|--|
| 9 <i>Dilobocondyla</i> sp. | 10 <i>Pheidole cariniceps</i> Eguchi (minor) |
| 11 <i>Pheidole cariniceps</i> Eguchi (major) | 12 <i>Diacamma</i> sp. |
| 13 <i>Odontoponera transversa</i> (Fr. Smith) | 14 <i>Tetraponera</i> sp. 1 |

ing could cover most of the ant species in the temperate region (Yamane and Hashimoto, 1999).

From the combination of ant sampling methods, we found that HC and LL was more efficient than other combinations of methods, resulting in 93.18 % of the ant species. Again this study supports previous studies (such as Noonanant, 2003; Hashimoto *et al.*, 2001; Watanasit, 2003; Quiroz and Valenzuela, 1995; Romeo and Jaffe, 1989 and Yamane and Hashimoto, 1999)

that the best way of evaluating the diversity of ants is using a combination of at least two methods.

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Table 1. List of ant species and percentage of ant species collected by HC (hand collection), LL (leaf litter samples) and PF (pitfall trap) in the reserve area. (note + = present, - = absent)

Subfamily	Species	HC	LL	PF	
Dolichoderinae	1. <i>Dolichoderus thoracicus</i> (Fr. Smith)	+	-	-	
	2. <i>Phillidris</i> sp.	+	-	-	
	3. <i>Tapinoma melanocephalum</i> (Fabricius)	+	-	-	
	4. <i>Technomyrmex butteli</i> Forel	-	-	+	
	5. <i>T.</i> sp.1	-	-	+	
Dorylinae	6. <i>Dorylus</i> sp.	+	-	-	
Formicinae	7. <i>Acropyga acutiventris</i> Roger	-	+	-	
	8. <i>Anoplolepis gracilipes</i> (Fr. Smith)	+	-	-	
	9. <i>Camponotus (Tanaemyrmex)</i> sp.1	-	+	+	
	10. <i>C. (Tanaemyrmex)</i> sp.2	+	+	+	
	11. <i>C. (Myrmemblys)</i> sp.	+	-	-	
	12. <i>Oecophylla smaragdina</i> (Fabricius)	+	+	+	
	13. <i>Paratrechina</i> sp.1	-	+	-	
	14. <i>Paratrechina</i> sp.2	-	+	-	
	15. <i>Paratrechina</i> sp.3	-	+	-	
	16. <i>Polyrhachis (Myrma) illaudata</i> Walker	+	-	+	
	Myrmicinae	17. <i>Cataulacus granulatus</i> (Latreille)	+	-	+
		18. <i>Crematogaster (Paracrema)</i> sp.	+	+	-
		19. <i>C. (Physocrema)</i> sp.	+	+	-
		20. <i>Dilobocondyla</i> sp.	+	-	-
		21. <i>Lophomyrmex</i> sp.	+	-	-
		22. <i>Meranoplus castaneus</i> Fr. Smith	+	-	-
		23. <i>Monomorium destructor</i> (Jerdon)	+	-	-
		24. <i>M.</i> sp.1	+	+	-
		25. <i>M.</i> sp.2	+	-	-
26. <i>Pheidole cariniceps</i> Eguchi		+	-	-	
27. <i>P. nodifera</i> (Fr. Smith)		-	+	-	
28. <i>P. plagiaria</i> Fr. Smith		+	-	+	
29. <i>P. tandjongensis</i> Forel		-	+	-	
30. <i>P.</i> sp.1		-	+	-	
31. <i>P.</i> sp.2		-	-	+	
32. <i>P.</i> sp.3		-	+	+	
33. <i>Pheidologeton affinis</i> (Jerdon)		-	+	+	
34. <i>P. diversus</i> (Jerdon)		-	+	-	
35. <i>P. silensis</i> (Fr. Smith)	-	+	-		
36. <i>Tetramorium aff.parvum</i> Bolton	-	+	-		
37. <i>T. bicarinatum</i> (Nylander)	+	-	-		
38. <i>T.</i> sp.1	-	+	-		
Ponerinae	39. <i>Diacamma</i> sp.	-	+	-	
	40. <i>Hypoponera</i> sp.	-	+	-	
	41. <i>Odontomachus rixosus</i> Fr. Smith	+	+	+	
	42. <i>Odontoponera transversa</i> (Fr. Smith)	+	-	-	
Pseudomyrmecinae	43. <i>Tetraaponera</i> sp.1	+	-	-	
	44. <i>T.</i> sp.2	+	-	-	
Total		25	22	12	
Percentage (%)		56.82	50	27.27	

Table 2. Comparison between number of ant species collected using two combination of sampling methods in the reserve area.

	PF	LL
HC	31 (70.45%)	41(93.18%)
LL	28 (63.63%)	-

Note: HC (hand collection), LL (leaf litter samples) and PF (pitfall trap)

References

- Bolton, B. 1994. Identified Guide to the Ant Genera of the World. Harvard University Press, London.
- Groombridge, B. 1992. Global Biodiversity: Status of the Earth's Living Resources. Chapman and Hall, London.
- Hashimoto, Y., Yamane, S. and Maryati, M. 2001. How to design an inventory method for ground-level ants in tropical forests. Nature and Human Activities. 6: 25-30
- Hölldobler, B. and Wilson, E.O. 1990. The Ants. The Belknap Press of Harvard University Press, Cambridge Massachusetts.
- Maryati, M. 1996. A review of research on ants in Malaysia. **In:** Turner, I.M., Diong, C.H., Lim, S.S.L. and Ng, P.K. (eds.). Biodiversity and the Dynamics of Ecosystems. DIWPA Series Vol.1: 373-383.
- Maxwell, J.F. 1986. Vascular Flora of Ko Hong Hill Hat Yai District, Songkhla Province, Thailand. Herbarium, Department of Biology, Faculty of Science, Prince of Songkla University, Hat Yai, Thailand.
- Noon-anant, N. 2003. Species Diversity and Seasonal Abundance of Ants in Bala Forest at Hala-Bala Wildlife Sanctuary, Narathiwat Province. M.Sc. Thesis. Prince of Songkla University.
- Olson, D.M. 1991. A comparison of the efficacy of litter sifting and pitfall traps for sampling leaf litter ant (Hymenoptera: Formicidae) in a tropical west forest, Costa Rica. Biotropica 23: 166-172.
- Quiroz, R., and Valenzuela, G.J. 1995. A comparison of ground ant communities in a tropical rain-forest and adjustment grassland in Los Tuxtlas, Veracruz, Mexico. Sountwest. Entomol. 20: 203-214.
- Pholpunthin, C., Watanasit, S. and Permkam, S. 1999. Biodiversity of insects at Ton-Nga-Chang Wildlife Sanctuary (Bantad Mountain Range). **In:** Baimai, V., *et al.* (eds.). Research Report on Biodiversity in Thailand. Work Press Printing, Bangkok. pp.351-354.
- Romero, H. and Jaffe, K. 1989. A comparison of methods for sampling ants (Hymenoptera, Formicidae) in Savannas. Biotropica 21: 348-352.
- Samson, D.A., Rickart, E.A. and Gonzales, P.C. 1997. Ant diversity and abundance along an elevational gradient in the Phillipines. Biotropica 29: 349-363.
- Watanasit, S. 2003. Evaluation of Sampling Method Techniques for Ants in Rubber Platations. **In:** Mohamed, M., Fellowes, J. and Yamane, S. (eds.). Proceedings of the 2nd Anet Workshop and Seminar. Universiti Malaysia Sabah, Kota Kinabalu, Malaysia 87-94.
- Watanasit, S., Phophuntin, C. and Permkam, S. 2000. Diversity of Ants (Hymenoptera: Formicidae) from Ton Nga Chang Wildlife Sanctuary, Songkhla, Thailand. ScienceAsia. 26: 187-194.
- Yamane, S. and Hashimoto, Y. 1999. Sampling protocol for a rapid assessment of ant fauna. DIPWA Network for Establishment of Ant Reference Collections (ANeT) Workshop in Thailand. Oct 30 - Nov 1 1999. Kasetsart University, Bangkok, Thailand.