SHORT COMMUNICATION

Preliminary survey of ants at Tarutao National Park, Southern Thailand

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Abstract

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Songklanakarin J. Sci. Technol., 2003, 25(1) : 115-122

Tarutao National Park is the first national marine park of Thailand. It consists of 51 islands. Though flora and fauna are very rich, there is no record of ant fauna. Thus, this study is a pioneer ant report on this marine park. Six sites were randomly chosen in the largest island of the archipelago, namely Tarutao. Two sampling methods, hand collecting and litter sifting, were applied to ant collecting within a time limit of 30 minutes for each method. There were 3 replications of each sampling method in each study site. This study was conducted during 10-17 March 2001. Five subfamilies of ants, comprising 61 species were found. The results also showed that sites had no effect on species number of ants but sampling methods differed significantly in species number of the subfamily Formicinae ($P<0.05$).

Key words: Tarutao National Park, Formicidae, sampling methods, Southern Thailand

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Received, 30 April 2002 Accepted, 9 August 2002

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การสำรวจมดเบื้องต้นของอุทยานแห่งชาติตะรุเตา ภาคใต้ของประเทศไทย

ว. สงขลานครินทร์ วทท. 2546 25(1) : 115-122

อุทยานแห่งชาติตะรุเตาเป็นอุทยานแห่งชาติทางทะเลแห่งแรกของประเทศไทย ประกอบด้วยเกาะน้อยใหญ่ถึง 51 เกาะ อุทยานแห่งชาติตะรุเตามีความหลากหลายชนิดทั้งพืชและสัตว์ แต่การศึกษายังไม่ได้ครอบคลุมชนิดของมด ดังนั้นการศึกษาเบื้องต้นในครั้งนี้เป็นการศึกษามดเป็นครั้งแรกของอุทยานแห่งชาติตะรุเตา โดยทำการเลือกสถานที่จำนวน 6 แห่งของเกาะที่ใหญ่ที่สุดคือเกาะตะรุเตา ในการเก็บตัวอย่างมดใช้ 2 วิธีคือการจับด้วยมือและการใช้ตะแกรงร่อนซากใบไม้และดินที่มดอาศัยอยู่ แต่ละวิธีเก็บตัวอย่างเป็นเวลา 30 นาทีในบริเวณที่ศึกษา แต่ละวิธีของสถานที่ศึกษา เก็บตัวอย่าง 3 ซ้ำ การศึกษาครั้งนี้อยู่ระหว่างวันที่ 10-17 มีนาคม 2544 ผลการศึกษาพบมดทั้งหมด 61 ชนิดใน 5 วงศ์ย่อย และพบว่าถิ่นที่อยู่อาศัยของมดในแหล่งศึกษาไม่มีผลต่อจำนวนชนิดของมดแต่วิธีการเก็บตัวอย่างมีความแตกต่างอย่างมีนัยสำคัญทางสถิติของจำนวนชนิดของมดในวงศ์ย่อย Formicinae ($P<0.05$)

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Tarutao National Park was established as the first marine park in Thailand in 1974. Later UNESCO proclamimed Tarutao National Park as the " Heritage of ASEAN" (Tourism Authority of Thailand, 2000). Tarutao National Park is composed of 51 large and small islands. There are only 7 large islands, namely Tarutao, Adang, Rawi, Lipe, Dong, Lek and Klang. Tarutao island itself has many large and small caves and bays. The park is rich in wildlife with 30 species of mammal, 268 species of bird and 30 species of reptile and many kinds of amphibians. However, six species are threatened and 13 species are on the endangered list (Pate, 1990).

Insects are a major group on this island but few studies have reported on the insect, e.g. Watanasit (1984). Ants are important not only because of their diversity (Alonso and Agosti, 2000) but also because of their function part of the ecosystem, turning forest soil, dispersing seeds and helping with decomposition (Maryati, 1996). However, there is no report on ant diversity here.

Sampling method and site affect the estimated diversity of ants. Many studies showed that a combination of ant sampling methods yielded better results in the evaluation of ant species than one sampling method (Watanasit, 2000, Yamane and Hashimoto, 1999). Moreover, study site is an important variable in the distribution of ant species (Watanasit, 2001). Thus, the aim of this study was to determine the effect of study site and sampling methods on the estimated number of ant species.

Materials and Methods

a. The study site

This study was conducted at Tarutao National Park, which is located in Satun province, southern Thailand (Figure 1). The park is under the influence of the southwest monsoon from May to October. It brings westernly wind and high rainfall during these six months. The average annual rainfall is 2,600 mm. The mean annual temperature is 27-28 ^{o}c, warmest in April and coolest in November and December (Dobias, 1982).

b. Sampling procedures

The largest island, Tarutao, was chosen as representative of the national park. The study sites included Pante Mallaca Bay, Talok Wau Bay, Mo Lae Bay, Son Bay and Rusie Bay. Two subsites

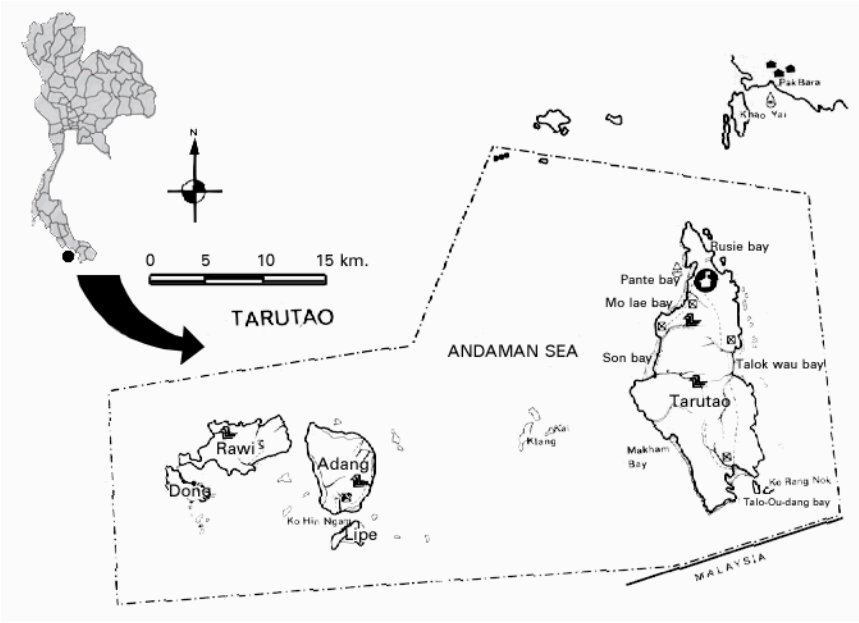

Figure 1. Map of Tarutao National Park and location of study sites (modified from Dobias, 1982).

of Talok Wau Bay (natural trail with historical remains and undistrubed area) were chosen. Thus, there were totally 6 study sites. Hand collecting and litter sifting were applied to collecting ants. At each site, the collecting was carried out 30 minutes per method to cover a distance of 50 m. So collecting was done for one hour at each study site. Three replications of each sampling method were used for each study site. The study was conducted during 10-17 March 2001.

c. Ant identification

Bolton (1994) and Hölldobler and Wilson (1990) were used for identification of the ants to genus. The species level was confirmed by Dr. Seiki Yamane and Dr. Katsuyuki Eguchi, Kagoshima University, Japan. Dr. Rudolf J. Kohout, world *Polyrhachis* expert from Queensland Museum, Australia, also confirmed the species level of genus *Polyrhachis*.

d. Data analysis

Two-way ANOVA was used to compare mean values of species number of ants in each subfamily. Calculations were performed on SPSS for Windows.

Results

Five subfamilies and 61 species of ants from Tarutao National Park during 10-17 March 2001 were identified. Myrmicinae, Formicinae, Ponerinae, Dolichoderinae and Pseudomyrmecinae contained 30, 16, 9, 4 and 2 species respectively (Table 1). The mean species number in subfamilies were compared among study sites and between collecting methods (Table 2). The results showed that the study sites had no influence on species number. There was significant difference between collecting methods in species number of subfamily Formicinae only (Table 3).

Discussion

This study is the first report of archipelago ants from Thailand. We found that there were 61 species belonging to 5 subfamilies, while Zanini and Cherix (2000) collected 23 species of 13

Table 1. Ant diversity at Tarutao National Park at various study sites. The samplings were conducted during 10-17 March 2001. (note: ht= historical trail, nt = natural trail, + = present, - = absent)

Taxa	Pante	Talok wau (ht)	Talok wau (nt)	Rusie	Mo lae	Son
Subfamily Dolichoderinae						
Philidris sp.1	+	+	+	+	+	+
Dolichoderus thoracicus (Fr.Smith)	+	+	+	+	+	-
Tapinoma melanocephalum (Fabricius)	-	-	-	+	-	+
Technomyrmex sp.1	-	-	-	-	-	+
Subfamily Formicinae						
Anoplolepis gracilipes (Fr. Smith)	+	+	-	-	+	+
Camponotus (Colobopsis) leonardi Emery	-	+	-	-	-	-
Camponotus (Colobopsis) sp.1	-	+	-	-	-	-
Camponotus (Myrmosericus) rufoglaucus (Jerdon)	-	+	-	-	-	-
Oecophylla smaragdina (Fabricius)	+	+	+	+	+	+
Paratrechina sp. 1	+	+	+	-	+	+
Paratrechina sp. 2	-	-	-	+	-	-
Paratrechina sp. 3	-	-	-	+	-	-
Polyrhachis (Campomyrma) sp.1	-	-	-	-	-	+
Polyrhachis (Cyrtomyrma) laevissima Fr. Smith	-	+	+	-	-	-
Polyrhachis (Myrma) illaudata Walker	+	-	+	+	-	-
Polyrhachis (Myrma) proxima Roger	-	-	-	+	+	-
Polyrhachis (Myrmhopla) abdominalis Fr. Smith	-	+	-	-	-	+
Polyrhachis (Myrmhopla) armata (Le Guilou)	+	-	+	-	-	-
Polyrhachis (Myrmhopla) tibialis Fr.Smith	+	-	-	-	-	-
Polyrhachis (Myrmhopla) sp.1	-	-	-	-	+	-
Subfamily Myrmicinae						
Cardiocondyla wroughtonii (Forel)	-	-	-	+	-	-
Cataulacus granulatus (Latreille)	-	-	-	-	-	+
Crematogaster (Acrocoelia) rogenhoferi Mayr	+	+	-	-	-	-
Crematogaster (Crematogaster) sp.1	-	-	-	+	-	-
Crematogaster (Crematogaster) sp.2	+	-	-	-	-	-
Crematogaster (Orthocrema) sp.1	+	-	-	+	-	-
Crematogaster (Paracrema) modiglianii Emery	-	+	+	-	-	-
Crematogaster (Physocrema) sp.1	+	-	-	-	-	-
Dilobocondyla sp.	+	-	-	-	-	-
Lophomyrmex bedoti Emery	+	-	-	-	-	-
Monomorium chinense Santschi	-	-	-	-	-	+
Monomorium sp.1	-	+	-	+	+	-
Monomorium sp.2	-	-	-	+	-	-
Oligomyrmex sp.1	-	+	-	-	+	-
Pheidole longipes Fr.Smith	-	-	+	-	-	+
Pheidole planifrons Santschi	-	-	+	-	-	-
Pheidole plagiaria Fr.Smith	-	+	+	+	+	+

(to be continued)

Table 1. (continued)

Taxa	Pante	Talok wau (ht)	Talok wau (nt)	Rusie	Mo lae	Son
Pheidole rugifera sp. nov.	-	-	-	-	+	+
Pheidole sp.1	+	-	-	-	-	-
Pheidologeton affinis (Jerdon)	-	-	+	-	-	-
Pheidologeton sp.1	-	+	+	-	+	+
Solenopsis sp.1	-	-	+	-	-	-
Tetramorium aff. parvum Bolton	+	-	-	-	-	-
Tetramorium meshena (Bolton)	-	+	+	-	-	-
Tetramorium sp.1	-	+	-	+	-	-
Tetramorium sp.2	-	-	+	-	-	-
Tetramorium sp.3	-	+	-	+	-	-
Tetramorium sp.4	-	-	-	-	+	-
Tetramorium sp.5	-	-	-	-	-	+
Tetramorium sp.6	-	+	-	-	+	+
Subfamily Ponerinae						
Amblyopone reclinata Mayr	+	-	-	-	-	-
Anochetus graeffei Mayr	+	-	-	-	-	-
Anochetus sp.1	-	-	-	-	-	+
Cryptopone sp.1	-	-	+	-	-	-
Diacamma sp.1	+	-	-	-	-	-
Hypoponera sp.1	-	+	+	-	-	+
Myopopone sp.1	-	-	+	-	-	-
Odontoponera transversa (Fr. Smith)	-	-	+	-	+	-
Pachycondyla sp.1	-	-	-	-	-	+
Subfamily Pseudomyrmecinae						
Tetraponera attenuata Fr.Smith	+	-	-	-	-	-
Tetraponera sp.1	-	-	-	+	-	-
Total	**20**	**21**	**20**	**17**	**15**	**19**

genera of ants found at Myeik archipelago of Myanmar. Although we spent less time than Zanini and Cherix's study in five islands at Myanmar during 1998-2000, we found more ant species. This shows how diverse the ant species in archipelago of Thailand are.

Myrmicinae had the highest number of species in this study. *Tetramorium, Crematogaster, Pheidole* were the main genera of this subfamily. Food resources, nesting and behavioural adaptation might play an important role in the diversity of this subfamily. For example, *Tetramorium* feeds on insect prey as well as collecting honeydew and some seeds (Sudd and Franks, 1987). *Crematogaster* and *Pheidole* adapt themselves very well in warm climates so they are a dominant group in the tropics (Andersen, 2000). Moreover, Sudd and Franks (1987) said that nest habitat of *Myrmicinae* was not limited to soil and humus. It could nest in hollows under bark or inside galls or acorns on woody plants. It also lived inside the nests of other ants.

Some studies on ant diversity in Thailand had reported that Myrmicinae was a dominant

Table 2. Mean (±se) species number of ants in each subfamily at Tarutao National Park. Ants were collected by using hand collecting and litter sampling during 10-17 March 2001. (Note: ht = historical trail, nt = natural trail, HC = hand collecting, LS = litter sifting)

Taxa	Pante		Talok wau (ht)		Talok wau (nt)		Rusie		Mo lae		Son	
	HC	LS	HC	LS	HC	LS	HC	LS	HC	LS	HC	LS
Subfamily Dolichoderinae	1.67 (±0.33)	0.67 (±0.33)	1.33 (±0.33)	0.67 (±0.33)	1.33 (±0.33)	0.67 (±0.33)	1.00 (±1.00)	0	0.67 (±0.33)	1.33 (±0.33)	0.67 (±0.33)	2.00 (±0.58)
Subfamily Formicinae	2.67 (±0.67)	1.00 (±0.58)	3.33 (±1.33)	1.00 (±0.58)	1.33 (±0.67)	1.33 (±0.33)	2.33 (±0.88)	1.67 (±0.33)	1.33 (±0.33)	1.33 (±0.33)	1.67 (±0.33)	1.67 (±0.33)
Subfamily Myrmicinae	2.33 (±1.20)	3.33 (±0.67)	1.33 (±0.88)	2.33 (±0.67)	1.67 (±0.88)	3.33 (±0.67)	2.00 (±1.53)	1.33 (±0.88)	1.33 (±1.33)	1.67 (±0.67)	1.67 (±0.33)	3.33 (±0.67)
Subfamily Ponerinae	0.33 (±0.33)	1.00 (±0.00)	0	0.33 (±0.33)	1.00 (±0.58)	0.67 (±0.33)	0	0	0.33 (±0.33)	0	0.33 (±0.33)	1.00 (±0.58)
Subfamily Pseudomyrmecinae	0.33 (±0.33)	0	0	0	0	0	0.33 (±0.33)	0	0	0	0	0
Total species	7.33 (±1.76)	6.00 (±0.00)	6.00 (±1.73)	4.33 (±0.88)	5.33 (±1.20)	6.00 (±0.58)	5.67 (±3.71)	3.00 (±1.15)	3.67 (±1.20)	4.33 (±0.67)	4.33 (±0.67)	8.00 (±2.08)

Table 3. Two-way ANOVA showing F-value and significance level of species number in subfamilies of ants at Tarutao National Park. (* = P<0.05, ns = non significant; degrees of freedom in parenthesis)

Taxa	Source of Variance		
	Site (5)	**Method (1)**	**Site X Method (5)**
Subfamily Dolichoderinae	0.80 ns	0.76 ns	2.48 ns
Subfamily Formicinae	0.60 ns	**4.56 ***	1.27 ns
Subfamily Myrmicinae	0.69 ns	2.45 ns	0.46 ns
Subfamily Ponerinae	2.35 ns	0.82 ns	1.04 ns
Subfamily Pseudomyrmecinae	0.80 ns	2.00 ns	0.80 ns
Total species	0.85 ns	0.02 ns	1.02 ns

group, for example, Watanasit, *et al*. (2000); Sonthichai (2000) and Wiwatwitaya (2000). Based on both the number of genera and the number of species, Shattuck (1999) also reported that Myrmicinae is the largest subfamily in Australia.

Collecting methods had a significant effect only on subfamily Formicinae (Table 3). The collecting methods for *Polyrhachis* supported this study. *Polyrhachis* was found and caught only by hand collecting. Wiwatwitaya and Rojanawong, (1999) reported that *Polyrachis* normally nested under broken tree trunk. Thus, hand collecting was suitable for collecting this species.

Sites (disturbed and non-disturbed) had no effect on ant species (Table 3). In this study we found *Oecophylla smaragdina* in all study sites, indicating that our study sites were not a primary forest and the forest had previously been disturbed (personal observation). This is consistent with Tarutao National Park being a very popular for tourist destination. There are many visitors each year. Thus our undisturbed sites were still disturbed by visitors.

Acknowledgments

This work was supported by the Conservation Biodiversity Center, Department of Biology, Faculty of Science, Prince of Songkla University. We thank the chief of Tarutao National Park , Mr. Sitthichai Wiriyagolson, for permitting us to work and collect the samples. We also thank Dr. Sunthorn Sotthibandhu for his comments on the first draft of the manuscript.

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