Dear Dr,

Below are details of the proceeding for your kind information:

Imbak Canyon Conservation Area, Sabah
Geology, Biodiversity & Socio-economic Environment

Proceedings of the Seminar on Imbak Canyon Scientific Expedition
14-15 March 2011

Editors: A. Latiff and Waidi Sinun

ISBN: 978-983-9445-77-0

Rove Beetles of Imbak Canyon Conservation Area
Fauziah Abdullah, Ibnu Sina & Mohd. Shukri Mohd. Sabri
Page: 95-104

Coleopterans of Imbak Canyon Conservation Area
Fauziah Abdullah, Ibnu Sina & Mohd. Shukri Mohd. Sabri
Page: 105-118

Gunung Benom, Krau Wildlife Reserve
Geology, Biodiversity & Socio-economic Environment

Proceedings of the Seminar on Gunung Benom Scientific Expedition
15-16 June 2011

Editors: A. Latiff, Mohd Shafeea Leman & A. Norhayati


Ambrosia Beetle (Coleoptera : Scolytidae) Assemblage at Gunung Benom
Fauziah Abdullah & Fatmahjihan Fauzee
Page: 139-148
It is to inform you also that the proceedings are with the appointed printers for final adjustments and printing and scheduled to be ready by end of April 2012.

Thank you.

Regards
Hafiz ASM
ABSTRACT

A study to determine the abundance of rove beetle (Coleoptera: Staphylinidae) was conducted from 10th to 17th November 2009 at the dipterocarp forest of Benom Mountain, Pahang, Malaysia. Collections were made at three sites namely Lata Bujang A, Lata Bujang B and Kongsi China A total of 46 rove beetles comprising of 10 species were sampled from all three sites of Benom Mountain. There was a high abundance (Margalef index : 2.350) and moderate diversity (Shannon Weiver index, 1.925) of rove beetles at Benom Mountain. Seven species identified are new records of Staphylinidae for Benom Mountain. However, three unidentified species are probably new species which will be reported in another paper. Diverse and abundance of rove beetles at Benom Mountain is due to diverse habitats and availability of plenty of food for the Staphylinids.

Key words: Rove beetle, Staphylinidae, Abundance, Diversity, Benom Mountain
INTRODUCTION

The family Staphylinidae includes over 47,744 described species in 3,847 genera and 31 subfamilies in the world (Herman 2001; Thayer 2005). The high diversity of the Staphylinidae is a result of remarkable radiations in diverse habitats. Most of the staphylinids are found in terrestrial habitats such as leaf litter, plant debris, and fungi. However, 442 species in 102 genera and 7 subfamilies are known to be confined to seashore habitats (Ahn & Ashe 1996, 2004; Hammond 2000; Moore & Legner 1976).

The rove beetles are a large family (Staphylinidae) of beetles, primarily distinguished by their short elytra that leave more than half of their abdomens exposed. Staphylinidae is the second largest family of beetles after the Curculionidae (the true weevils). It is an ancient group, with fossil rove beetles known from the Triassic, 200 million years ago (Ahn & Ashe 1996).

The rove beetle uses two different behavior’s tactics to prey on flies, it can track the chemical cues that some of its prey use to locate their food including dung, carrion or rotting fruit (Forsyth and Alcock, 1990). Several groups of staphylinids live as parasites of colonies of social insects such as termites, ants and leafhopper (Manley, 2006). They exhibit specialized behaviors and use allo-chemical cues to get food from the hosts or avoid attack by the ants (Betz, 2003). Rove beetles also exhibit complicated behaviors such as resource defense, mate guarding, female mimicry and egg guarding (Forsyth. and Alcock, 1990).

Rove beetles can be used as indicators of clear-cut harvesting and regeneration practices and can be used as an example as to how species react to harvesting. It has been observed that after an area of forest was harvested, the number of forest species, including rove beetles, decreased dramatically. As the forest regenerated, it never fully replicated the full characteristics of the older forest it replaced.

James (2004) reported several new species of staphylinids of Malaysia namely, Bryothinusa hauseri Ashe,,Bryothinusa testeceipennis Cameron, Bryothinusa catalinae Casey, and Bryothinusa algorum Sawada.

Previous research on rove beetle at Malaysia has been conducted by Fauziah and Ibnu (2007) which had assembled 50 specimens of staphylinids comprising of nine species from three genera including Paederus species, Oxyletus species, and Carproporus species which are new
records for Panti Forest Reserve, Johore, Malaysia. Fauziah and Ibnu (2009) also reported 175 specimen from 17 species assembled at Lanjak Entimau, Sarawak.

The objective of this study is to determine the abundance and diversity of rove beetle and to provide a checklist of staphylinids at the Benom Mountain, Pahang, in order to ascertain whether ecotourism have had an effect on the diversity of fauna in the area.

**MATERIALS AND METHODS**

*Study area*

The study was conducted at Benom Mountain, Pahang, around 200 km from Kuala Lumpur and located at 15O N 17E

![Fig.1. Study Area of Staphylinidae Assemblage](image)
**Sampling methods**

To ensure maximum assemblage, several methods of collection were employed. A total of eight light traps, eight malaise traps, twelve pitfall traps and net sweeping were carried out from 10\textsuperscript{th} November 2009 to 17\textsuperscript{th} November 2009. All traps were set up in the morning at 0800 h for 24 h except for light trap which was set up before nightfall, at 17:00 h. The generator was switched on to collect beetles attracted to light for 4 h from 19:00 to 2300 h.

**Sorting and Preservation**

Staphylinid beetles were sorted to morpho species and preserved in 70% alcohol and brought back to University Malaya for further processing. At University of Malaya, the staphylinidae was pinned, dried at 40\textdegree{}C in oven and properly labeled.

**Species identification and calculation of ecological index**

Cross reference was done with collections from Department of Agriculture, Peninsular Malaysia, Kuala Lumpur and National Museum of Sarawak. Margalef index and Simpson Diversity index were used to calculate the abundance and diversity of staphylinid beetles.

**RESULTS**

46 specimens of rove beetles from 10 species were assembled at Benom Mountain, Pahang (Table 1). 8 specimens from 5 species were assembled at Lata Bujang A, 14 specimens from 4 species were assembled at Lata Bujang B whereas 24 specimens from 9 species were assembled at Sungai Kongsi Cina.

Table 1. The Staphylinids beetles collected from three different sites

<table>
<thead>
<tr>
<th>No</th>
<th>Species</th>
<th>Number of Individual</th>
<th>Margalef index</th>
<th>Shannon-Weaver index</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td><em>Acylophorus</em> sp</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td><em>Orphnebius</em> sp1</td>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td><em>Paederus</em> sp1</td>
<td>11</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td><em>Paederus</em> sp2</td>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td><em>Paederus</em> sp3</td>
<td>4</td>
<td>2,350</td>
<td>1.925</td>
</tr>
<tr>
<td>6</td>
<td><em>Tachnimorphus fulvipes</em></td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td><em>Orphnebius bakerianus</em></td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8</td>
<td><em>Eleusis kraatzi</em></td>
<td>3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>9</td>
<td><em>Orphnebius</em> sp2</td>
<td>12</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td><em>Unidentified</em></td>
<td>9</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>Total</strong></td>
<td><strong>46</strong></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Assemblage of Staphylinids was most successful using pitfall trap in this study. 41 individuals were collected using pitfall traps whereas 2 individuals was sampled using Malaise traps and only 3 individuals were caught in the light traps. Most species of Staphylinids were sampled from Sungai Kongs China (99.8%; N=9) followed by Lata Bujang A (50%; N=5) and Lata Bujang B (22.5%; N=2).

Table 3. List of Staphylinid beetles assembled at all study sites at Benom Mountain by using different trap

<table>
<thead>
<tr>
<th>Species</th>
<th>Trap</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Pitfall</td>
</tr>
<tr>
<td>Acylophorus sp</td>
<td>-</td>
</tr>
<tr>
<td>Orphnebius sp1</td>
<td>-</td>
</tr>
<tr>
<td>Paederus sp1</td>
<td>11</td>
</tr>
<tr>
<td>Paederus sp2</td>
<td>2</td>
</tr>
<tr>
<td>Paederus sp3</td>
<td>2</td>
</tr>
<tr>
<td>Tachnimorphus fulvipes</td>
<td>1</td>
</tr>
<tr>
<td>Orphnebius bakerianus</td>
<td>1</td>
</tr>
<tr>
<td>Eleusis kraatzi</td>
<td>3</td>
</tr>
<tr>
<td>Orphnebius sp2</td>
<td>12</td>
</tr>
<tr>
<td>Staphy A</td>
<td>1</td>
</tr>
<tr>
<td>Staphy B</td>
<td>1</td>
</tr>
<tr>
<td>Staphy C</td>
<td>1</td>
</tr>
<tr>
<td>Staphy D</td>
<td>1</td>
</tr>
<tr>
<td>Staphy E</td>
<td>1</td>
</tr>
<tr>
<td>Staphy F</td>
<td>1</td>
</tr>
<tr>
<td>Staphy G</td>
<td>1</td>
</tr>
<tr>
<td>Staphy H</td>
<td>1</td>
</tr>
<tr>
<td>Staphy I</td>
<td>1</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>41</strong></td>
</tr>
</tbody>
</table>
Fig. 2. **a.** Acylophorus sp, **b.** Orphnebius sp1, **c.** Paederus sp1, **d.** Paederus sp2, **e.** Paederus sp3, **f.** Tachnimorphus fulvipes, **g.** Orphnebius bakerianus, **h.** Eleusis kraatzi, **i.** Orphnebius sp2
DISCUSSION

Prance (1974) and Gentry (1982) stated that the extraordinarily high species diversity of tropical forest floras and faunas is often attributed to the recent and rapid accumulation of species via high speciation rates.

Composition of Staphylinids assembled by Fauziah (2007) at Endau Rompin found that Benom Mountain Reserved Forest has more abundant staphylinids with Margalef index of 2.350 than Endau Rompin (Margalef index, 2.211). This is due to many niche and different flora composition of the forests of Benom Mountain allows more speciation to happen.

Smith (1992) stated that populations are distributed according to different gradients, thus occupying those sites where conditions are adequate for completing life cycles.

Nine species unidentified in this study are probably new species. Habitat heterogeneity is a determinant cause of biological diversity in natural ecosystems, and therefore its preservation should be a priority when planning conservation strategies (Romero-alcaraz and Avila, 2000). Fjeldsa and Lovett (1997) reported that local diversity is generated and maintained by a complex of factors such as altitude, latitude, productivity, climatic variability, age of ecosystem, predation, competition, spatial heterogeneity or the stage of the biological succession.

Tropical insects undergo seasonal changes in abundance and that the seasonal fluctuation patterns are diverse and different among species and among feeding habits (Wolda 1978; 1980; 1988; 1989).

Staphylinids are important components of Benom Mountain Reserved Forest biodiversity. They are useful as surrogates for a broad portion of all biodiversity because they are relatively well known, they occupy litter habitats that characterize forests of any age, and they are sensitive to environmental variation. For maximum utility, biodiversity research should be based on species composition and abundance. It may prove useful for evaluating invertebrate communities in future conservation work in Benom Mountain.
ACKNOWLEDGEMENTS

Our appreciation goes to Haji Mokhtar Ibrahim and Kamarulnizam Shamsulaman for help in the field. Fatmahjihan Fauzee and Suwati Mat Isa help during cross reference with other institutions. Thanks are also due to Academy of Science Malaysia for facilitating our study at Benom Mountain Reserved Forest.

REFERENCES


