BANJARAN BINTANG GUNUNG INAS, KEDAH
Pengurusan Hutan, Persekiteraran Fizikal
dan Kepelbagaian Biologi

Disunting oleh:
Abd. Rahman Abd. Rahim
Mohd Nasir Abu Hassan
Mohamed Zin Yusop
A. M. Richard
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Jabatan Perhutanan Semenanjung Malaysia
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Prakata 8
Ketua Pengarah,
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THE AQUATIC INSECT FAUNA ASSEMBLES FROM THE RECREATIONAL STREAMS, GUNUNG INAS (ORDER COLEOPTERA: FAMILIES DYTISCIDAE, ELMIDAE GYRINIDAE AND HYDROPHILIDAE)

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Abstract: The water beetle fauna of Sungai Sedim Recreational Forest at Gunung Inas, Bintang Range was investigated. The study was conducted at six sites Track 1, Track 2, Track 3, Track 4, Track 5 and Track 6. Samplings were conducted using light trapping from 1900 hr to 2300 hr. In total 68 individuals comprising of 8 species were sampled from four family Dytiscidae (N=41), Elmidae (N=8), Gyrinidae (N=3). and Hydrophilidae (N=16). Overall the diversity of water beetle at Gunung Inas was moderate (Shannon-Weaver index, 1.42; Margalef index, 1.66). *Canthodrurus haagi* (n=19) from family Dytiscidae was the most dominant water beetle sampled mostly at track 2. This study contributed to the list of water beetles found in Malaysia.

INTRODUCTION

Aquatic beetles have flattened flippers and hind legs with long hairs for swimming (Jách & Balke 2008). Aquatic beetles occur in a variety of habitats such as a fresh- and brackish-water habitat such as ponds, lagoons and wetlands, streams and reservoirs. They are sensitive to habitat and environmental factors (Foster & Eyre, 1992; Menetrey et al., 2005). The aquatic beetles are important part of the insect populations of water bodies and wetlands and has been used as indicators of ecological diversity and habitat conservation (Foster 1987; Eyre & Foster 1989) Sungai Sedim originated from Gunung Inas and ending at Sungai Muda. Sungai Sedim has about 15 km of natural white-water and the starting point to trails to Gunung Inas, Gunung Bintang and the Bintang range. A recent study on water beetle in Malaysia includes the work of Abdullah (2009) on Coleopteran Water Beetles (Dytiscidae, Hydrophilidae) in Kenyir Water Catchment of Terengganu, Malaysia. Among numerous environmental problems, one of the most serious is the acceleration in the rate of species extinction associated with human activities, as it involves an irreversible loss of biological information with unpredictable consequences (Fontaine et al., 2007). To determine whether Gunung Inas is disturbed by the recreational park and given that few studies on water beetles has been done in Malaysia, this study was conducted to determine the diversity of aquatic beetle fauna at Gunung Inas and to add identified water beetle to the list of water beetles found in Malaysia.
MATERIALS AND METHOD

Study area
This study was conducted at Sungai Sedim in the Recreational Forest within Gunung Inas Permanent Forest Reserve situated at 5° 32' 60" N and 100° 35' 60" E with elevation 100m above sea level covering a total of 36 979 ha forest (Figure 1).

Beetle Assemblage.
Beetle samplings were carried out from 1st to 6th November 2009 at six tracks at Sungei Sedim, Gunung Inas in the Bintang Range. The samplings were carried out using light trapping between 1700 h to 2300 h with a 160 watt mercury bulb as a light source powered by a HONDA 10i generator.

Sorting, preservation and species identification.
Water beetles was sorted from other beetle family and preserved in 70% alcohol for further identification. Specimens were cross referenced with the collections from Department of Agriculture, Peninsular Malaysia, Kuala Lumpur, Insect Museum, Sarawak.

RESULTS
A summary of water beetles assembled at Gunung Inas Bintang Range is given in Table 1. A total of 68 water beetles belonging to four family Dytiscidae, Elmidae, Gyrinidae and Hydrophilidae were assembled. The water beetles were identified to six species but two species were unidentified and given code name Dys C and Elmi A given in Table 1. The most water beetle species caught was Canthidius haagi (n=35) (Figure 2) from family Dytiscidae followed by Coelostoma sp. (n=15) (Figure 3) from family Hydrophilidae. The other species were Lacconectus fulvescens (n=1) (Figure 4), Porhorrhyynchus sp. (n=3) (Figure 5) from the family Gyrinidae, Omicrogion sp. (n=1). (Figure 6) and Lacconectus lividus (n=4) (Figure 7). Figure 8 shows that the highest number of individuals caught (n=35) was from species Canthidius haagi (family Dytiscidae) with 19 individuals caught at track 2 compared to 6 individuals at track 4 and track 5. Nevertheless this species is most dominant compared to other species at Sungai Sedim. This is followed by species Coelostoma sp. with 15 individuals caught at track 6. This study shows that the diversity of water beetles at Gunung Inas is moderate with the value of Shannon-Weaver index of 1.42 and Margalef index of 1.66 (Figure 9). Using Shannon-Weaver index to determine diversity, the water beetle at track 3 was most diverse (Shannon-Weaver:1.33 ; Margalef index: 1.86) followed by track 6 (Shannon-Weaver : 0.9; Margalef index: 0.63) (Figure 10). Similarly using Simpson Diversity index (SDI) Figure 11 shows that the aquatic beetles are most diverse at Track 3 (SDI, 0.9) and track 6 (SDI, 0.9) with moderate diversity at track 5 (SDI, 0.67) and low diversity at track 2 (SDI, 0.32) and other tracks. According to number of individual, Figure 12 shows that 42 % of water beetles was caught at track 2 followed by 17% at 6. In total track 2 has the highest percentage of yield of 43% shown by Figure 12.
Table 1: A summary of aquatic beetles species identified from Banjaran Bintang, Gunung Inas, Kulim Kedah.

<table>
<thead>
<tr>
<th>Family</th>
<th>Species</th>
<th>No. of Individual</th>
<th>Total no in family</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dytiscidae</td>
<td><em>Laccobius lividus</em> Reg.</td>
<td>4</td>
<td>41</td>
</tr>
<tr>
<td></td>
<td><em>Cathardus haagi</em> When.</td>
<td>35</td>
<td></td>
</tr>
<tr>
<td></td>
<td><em>Dyst C</em></td>
<td>1</td>
<td></td>
</tr>
<tr>
<td></td>
<td><em>Laccobius fulvescens</em> Mots.</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Elmidae</td>
<td><em>Elmi A</em></td>
<td>8</td>
<td>8</td>
</tr>
<tr>
<td>Gyrinidae</td>
<td><em>Porhorrhynechus</em> spp.</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Hydrophilidae</td>
<td><em>Omicronsp.</em></td>
<td>1</td>
<td>16</td>
</tr>
<tr>
<td></td>
<td><em>Coelostoma</em> sp.</td>
<td>15</td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>TOTAL</strong></td>
<td><strong>68</strong></td>
<td><strong>68</strong></td>
</tr>
</tbody>
</table>

(*= unidentified species)

Figure 8. The number of each aquatic species caught at respective tracks

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Figure 9. The ecological index of water beetles showing diversity (Shannon-Weaver index) and species richness (Margalef index) at Gunung Inas.

Figure 10. Species richness (Margalef index) and diversity (Shannon-Weaver) of water beetle at each track in Gunung Inas
Figure 11. The Aquatic beetles diversity (Simpson diversity index) based on the sites at Gunung Inas, Kedah.

Figure 12. Percentage of Aquatic beetles sampled according to the sampling area at Gunung Inas, Kedah.
DISCUSSION

The water beetles caught at Gunung Inas is more diverse than water beetles sampled at Kenyir water catchment (Abdullah, 2009). At Gunung Inas 68 water beetles was caught belonging to four family (Dytiscidae, Elmidae, Gyrinidae Hydrophilidae) and eight species whereas only four species belonging to 2 family (Dytiscidae, Hydrophilidae) was sampled at Kenyir water catchment (Abdullah, 2009). Aquatic beetles are attracted to light and left the water bodies at night and flew to the light source (Borror & Delong 2005). The good quality of water at Gunung Inas contributed to diversity and abundance of the water beetle. Freshwater habitats were among the most sensitive to human alterations and they were the best indicators of the wider environmental quality (Hecker & Vives, 1995). Human activities gave severe consequences for aquatic biota and large effects on biodiversity (Sala et al. 2000, Brönmark & Hansson 2002). A part of Sungai Sedim is used for recreation and ecotourism. Rates of biodiversity losses were greater in freshwater systems than in other ecosystems (Ricciardi & Rasmussen, 1999; Darwall & Vie, 2005). Human activities also had a severe consequences for aquatic biota & were expected to continue having large effects on biodiversity (Sala et al. 2000, Brönmark and Hansson 2002). Human pressures on freshwater resources were increased in the coming decades, putting more species at the risk (Strayer, 2006). The most severe threat to freshwater species is habitat loss, followed by pollution and invasive species (Baillie et al., 2004). In addition to considerable intrinsic variation, characteristics of the surrounding terrestrial habitat can be highly variable and have dramatic effects on local aquatic communities. Fresh water is one of the most diverse and threatened components of global biodiversity (Dudgeon et al., 2006). This study has shown that Gunung Inas is still intact giving medium species richness and diversity of water beetle.

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