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**Report**

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Tetrigid pygmy grasshoppers and their associations with altitude and habitats in Mt. Trus Madi, Sabah, Borneo (Insecta: Orthoptera)

ITO<sup>1</sup> Gen, AZRIE Alliamat<sup>2</sup> and MARYATI Mohamed<sup>2</sup>

<sup>1</sup> *Systematic Entomology, Faculty of Agriculture, Hokkaido University, Sapporo, 060-8589 Japan*

<sup>2</sup> *Institute for Tropical Biology and Conservation, Universiti Malaysia Sabah, Locked bag No. 2073, 88999, Kota Kinabalu, Sabah, Malaysia*

**ABSTRACT.** The present study recorded 15 species of tetrigid pygmy grasshoppers collected in Mt. Trus Madi from 30 Oct. to 6 Nov. 2001. According to altitude and habitat type, species compositions are listed as follows: (A) 1,500-1700m above sea level, the lower part of craggy bluffs: *Paraphyllum antennatum* Hancock and *Synalibas* sp.; (B) 1,500m a.s.l., grassland of forest edge: *Coptotettix rotundatus* Hancock, *Euparatettix* sp., *Pseudoparatettix* sp., *Bolivaritettix* sp. and *Hyboella* sp.; (C) 1,500m a.s.l., trunks of fallen trees on the forest floor: *Potua coronata* Bolívar, *Metamazarredia borneensis* Günther, *Bolotettix* sp. 1, sp. 2 and *Amorphopus* (?) sp.; (D) 1,200m a.s.l., mudstone open land nearby forest edge: Gen. sp.; (E) 800-1,000m a.s.l., trunks of fallen trees by the sides of small stream: *Discotettix belzebth* (Serville) and *Falconius* sp. In addition, ecological notes on another orthopteran species, *Gymnogryllus borneensis* Ichikawa (Gryllidae), are also provided.

## INTRODUCTION

Faunal surveys of particular areas and taxa are not only aimed at making species lists of the taxa in the area, but also at focusing on patterns in nature and factors producing those patterns. For montane faunas, altitudinal change of

species composition is one of such objects. Mt. Trus Madi (2,642 m above sea level) is the second highest mountain in Malaysia, located in the northern part of Borneo. It contains four vegetation zones (Kitayama, 1993). In this mountain we studied distribution patterns of tetrigid pygmy grasshoppers that are ground dwellers generally associated with forest. Except Hancock (1913) and Günther (1935), no intensive works have been done on tetrigid fauna in Borneo. The present work is a preliminary survey on Bornean tetrigid fauna and taxonomy.

## MATERIALS AND METHODS

We collected pygmy grasshoppers by the "look-and-catch" method, i.e., walking along the road and trail from 800m a.s.l. to the summit (2,642 m a.s.l.) during our stay from 30 Oct. to 6 Nov. 2001. Only one day was spent for sampling from 800m to 1,500m a.s.l., two days for sampling from 1,700m a.s.l. to the summit and three days for sampling from 1,500m to 1,700m a.s.l. During sampling, the altitude and habitat types were recorded.

## RESULTS AND DISCUSSION

A total of 15 species from 14 genera of tetrigids were collected from 800m to 1,700m a.s.l. Tetrigids were not found above 1,700m a.s.l. According to the altitude and habitat types, collection sites can be classified as in Table 1.

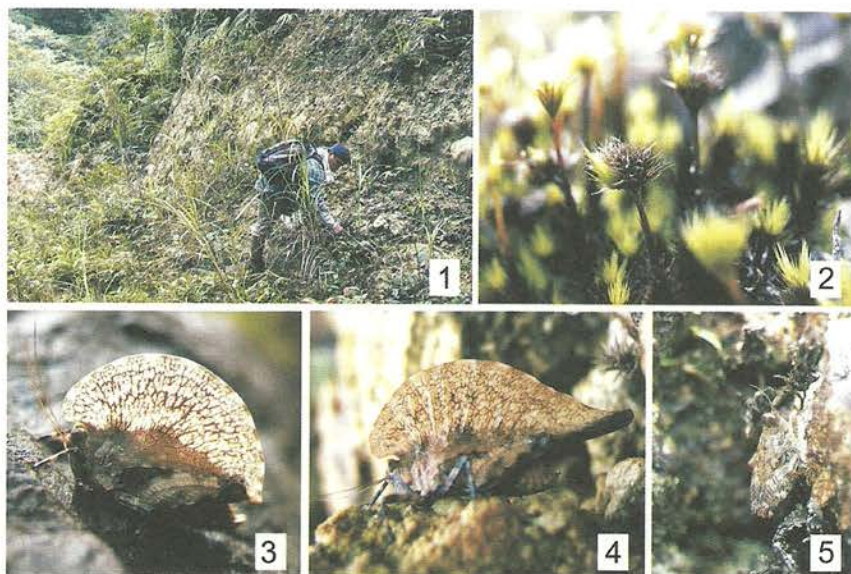
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**Key words:** Distribution, biogeography, Scelimeninae.

Table 1. Habitat types and tetrigids collected.

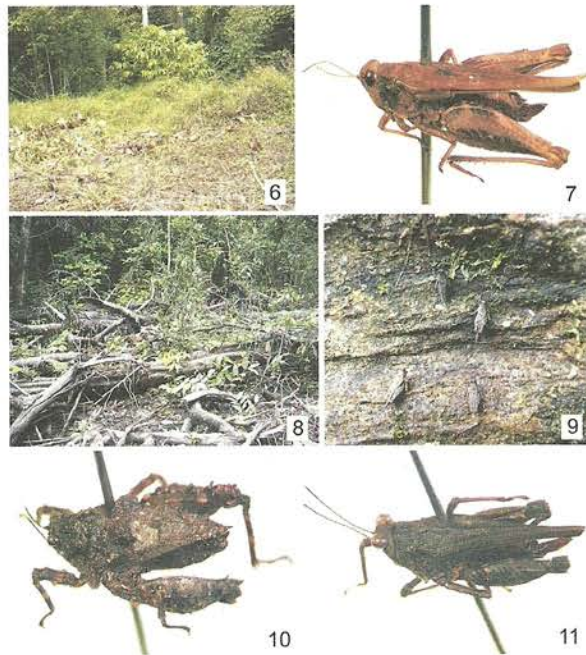
Site	Habitat type		Fig. no.
	Altitude	Species name	
A	The lower part of craggy bluffs along the road. A moss species (Fig. 2) and several lichens were conspicuous.		1, 2
	1500-1700m	<i>Paraphyllum antennatum</i> Hancock, 1913	3, 4
		<i>Synalibas</i> sp.*	5
	Grasslands nearby the forest outskirts		6
B	1500m	<i>Coptotettix rotundatus</i> Hancock, 1907	7
		<i>Euparatettix</i> sp., <i>Pseudoparatettix</i> sp., <i>Bolivaritettix</i> sp., <i>Hyboella</i> sp.	-
		Trunks of fallen trees on the forest floor	8
C	1500m	<i>Potua coronata</i> Bolívar, 1887	10
		<i>Metamazarredia borneensis</i> Günther, 1939	11
		<i>Bolotettix</i> sp. 1	9
		<i>Bolotettix</i> sp. 2, <i>Amorphopus</i> (?) sp.*	-
D	Mudstone openland at the forest edge along the road.		12
	1200m	Gen. sp.	-
	Trunks of fallen trees on the sides of small streams		16
E	800-1000m	<i>Discotettix belzebth</i> (Serville, 1839)	17
		<i>Falconius</i> sp.	-

\*: new to Borneo.



Figs. 1-5. Habitat of site A (1500-1700m) and tetrigids found there: 1, the 2nd author is collecting *Paraphyllum antennatum*; 2, a moss conspicuous at Site A; 3, *P. antennatum*, brachypterous (normal) male; 4, *P. antennatum*, long-winged female; 5, *Synalibas* sp.





**Figs. 6-11.** The habitats near the base camp (1500m) and tetrigrids found there: 6, Site B; 7, *Coptotettix rotundatus*, female; 8, Site C; 9, individuals of *Bolotettix* sp. 1, aggregating on the trunk of fallen trees; 10, *Potua coronata*, female; 11, *Metamazarredia borneensis*, female.



**Figs. 12-17.** The habitats of the lowland forest and species found there: 12, Site D (1200m), 13, the 2nd author excavating a nest of *Gymnogryllus borneensis*; 14, male of *G. borneensis*, singing at the entrance of its gallery; 15, leaves preserved in the deepest part of the gallery of *G. borneensis*; 16, Site E (800-1000m); 17, *Discotettix belzebth*.

Species composition of each site is also shown in Table 1. According to the vegetation zones in Mt. Trus Madi (Kitayama *et al.*, 1993), the collection sites are situated in the lower subzone of the lower montane zone (1,220-1,700m a.s.l.: sites A-C), the lowland forest zone (below 1,220m a.s.l.: site E) and the boundary between the two (site D). No species were recorded from more than two sites. Only one or a few specimens were collected for most species, except *Paraphyllium antennatum* Hancock and *Bolotettix* sp.1, which were abundant and found only in a particular habitat types, i.e., the lower part of craggy bluffs and the surfaces of fallen tree trunks at forest gaps, respectively. Individuals of *P. antennatum* were usually brachypterous, having a semicircular pronotum and hind wings not exceeding or only slightly exceeding the tip of the abdomen (Fig. 3), but some individuals in both sexes were long-winged, having extended pronotum and hind wings (Fig. 4). Among the 15 species collected, only *Falconius* sp. belongs to Scelimeninae. The tetrigid fauna in the study sites can be characterized by poor species richness in the Scelimeninae (*s. str.*, "Scelimenina verae" in Günther, 1938) and also by the unusual habitat of *Discotettix belzebth* (Serville). Scelimeninae are strongly associated with streams and usually live on fallen trees and/or rock shelves above and/or by the side of streams (Bhalerao & Paranjape, 1986; Blackith & Blackith, 1987; Reynolds *et al.*, 1988). There were several small streams in the study sites, but numbers of Scelimeninae individuals were very low. In lowlands of Sabah *D. belzebth* is very common and usually found on fallen trees in shaded forest floor (Ito, *pers. obs.*), but around site E it was found only on a sunny place. Ecological factors should be studied to explain this phenomenon.

Two taxa were newly recorded for Borneo. The genus *Synalibas* has been known only from India and New Guinea (Blackith, 1992), but this is the first record of this genus for Borneo. Examination of the insect collection in BORNEENSIS invertebrate repository centre of

Universiti Malaysia Sabah revealed that specimens of this genus were also collected in two lowland sites in Sabah: Sugud village, Kota Kinabalu; Imbak Valley, Tawau. Unfortunately, these specimens, including the specimens from Mt. Trus Madi, could not be identified to species level. But if these were the same species, the species would be widely distributed from the hilly zone to the lower montane zone in Sabah. Another taxon is the genus *Amorphopus* or a genus closely related to it. One specimen of this genus was collected in Trus Madi, and another specimen of the same species was collected from the forest floor near Nalumad Village, Ranau (alt. 700m a.s.l.) by the first author. *Amorphopus* has been previously recorded only from South America (Blackith, 1992). This genus is closely related to the two genera, *Eomorphopus* (South America) and *Cingalotettix* (Sri Lanka). The cause for the disjunct distribution of this group may be inferred from divergence time of these genera and geographic evidence.

At site D (Figs. 12, 13), several individuals of the gryllid species, *Gymnogryllus borneensis* Ichikawa, were also found. They were found to live in a gallery and males sing at the entrance of their own galleries (Fig. 14). At the deepest part of the gallery, leaves were preserved for food (Fig. 15).

The present study reports a preliminary survey of tetrigid fauna in Borneo for taxonomy and biogeography. In order to know which factors promote distribution patterns of each species, firstly, the tetrigid fauna of Mt. Trus Madi should be compared with that of Crocker Range, Mt. Kinabalu, or some other high mountains.

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#### REFERENCES

- Bhalerao A. M. & S. Y. Paranjape. (1986).** Studies on the bio-ecology of a grouse-locust *Euscelimena harpago* Serv. (Orthoptera: Tetrigidae). *Geobios*, 13:145-150.
- Blackith, R. E. (1992).** *An annotated catalogue of the Tetrigidae (Insecta; Orthoptera) of Southeast Asia - with translated partial keys and bibliography.* JAPAGA, Ireland.
- Blackith, R. E. & R. M. Blackith. (1987).** Tridactylids and Tetrigids (Orthoptera) from Sulawesi, Indonesia. *Tijdschrift voor Entomologie*, 130:1-10.
- Günther, K. (1935).** Acrydiinen (Orth. Acridiidae) aus dem mittleren Ostborneo. gesammelt von H. C. Siebers 1925. *Arbeiten über morphologische und taxonomische Entomologie aus Berlin-Dahlem*, 2(4): 257-263.
- Günther, K. (1938).** Revision der Acrydiinae. II. Scelimenae spuriae. *Stettiner Entomologische Zeitung*, 99: 117-148, 161-230.
- Hancock, J. L. (1913).** Studies of Tetriginae (Acrydiinae) from the Sarawak Museum, Borneo. *Sarawak Museum Journal*, 1 (3): 39-54.
- Kitayama, K., J. Kulip, J. Nais, & A. Biun. (1993).** Vegetation survey on Mount Trus Madi, Borneo - a prospective new mountain park. *Mountain Research and Development*, 13: 99-105.
- Reynolds, J. D., R. E. Blackith, & R. M. Blackith. (1988).** Dietary observations on some tetrigids (Orthoptera: Caelifera) from Sulawesi. *Journal of Tropical Ecology*, 4: 403-406.