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STICK INSECT (PHASMIDA) DIVERSITY IN RANCHAN, SERIAN, SARAWAK

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ABSTRACT

The diversity of the Stick Insect (Phasmida) assemblages in the forests of Ranchan Recreational Park (1º 08'N, 110º 35'E), Serian, Sarawak was investigated. The overall diversity was considerably high with 13 species from 12 genera recorded from a total of 254 individuals. These species belong to four families: Bacillidae, Heteronemiidae, Pseudophasmatidae and Phasmatidae. Two species are new records for Sarawak, being not found in existing collections in the Sarawak Museum and the Sarawak Forestry Department (*Neoclides* sp. and one unidentified species). The subfamily Necrosciinae is found to be the most diverse subfamily encountered (H' = 0.254) while *Haaniella grayi* was the dominant species found at the site. The occurrence and abundance of phasmids in Ranchan were found to be mostly dependent on the presence of suitable food plants.

ABSTRAK

Kajian kepelbagaian serangga ranting (Phasmida) telah dijalankan di Taman Rekreasi Ranchan (1º 08'N,110º 35'E), Serian, Sarawak. Sejumlah 254 individu serangga ranting yang terdiri dari 13 spesies dari 12 genus diperolehi. Ini mewakili empat famili; Bacillidae, Heteronemiidae, Pseudophasmatidae and Phasmatidae (H' = 0.721). Dua spesies (Spesies 1 dan Neoclides sp.) yang diperolehi merupakan rekod baru bagi Sarawak. Necrosciinae merupakan subfamili yang paling banyak dijumpai di kawasan kajian (H' = 0.258) manakala *Haaniella grayi* adalah spesies yang dominan. Kajian ini mendapati kehadiran dan kelimpahan spesies adalah bergantung kepada kehadiran tumbuhan makanan yang sesuai.

INTRODUCTION

Stick insects or phasmids are classified in the order Phasmida and are predominantly tropical in distribution, including Borneo. Two thousand and five hundred species of these insects had been named (Richard & Davies, 1988). Cranbrook and Edward (1994) estimated the occurrence of 2,900 stick insects species worldwide of which 300 species have been recorded from Borneo.

As in most other insect groups, local documentation on the stick insects of Sarawak is very much lacking. Some of the early documentations of the stick insects of Sarawak are included in Westwood (1859), while later documentation include those of Bragg (1992).

Being largely arboreal and phytophagous, the stick insects feed on young leaves or shoots and other soft tissues of plants. Species from the subfamily Lonchodinae could possibly be important in limiting plant growth and become a crop pest in certain circumstances (Bragg, 1992). However, no report of stick insects as pests has ever been documented locally.

Phasmids are hemimetabolous and undergo metamorphosis development until they reach the maturity stage. Generally, female phasmids have 6 larval instars while the males have 5 larval instars (Brock, 1992).

Eggs may vary for each family but the egg structure within genera is very similar and this makes it difficult to determine of which species they belong to. The eggs are either with of without capitulum. Generally, there are two different modes of egg deposition. The eggs are either dropped on the ground or attached to other substrates such as leaves, bark or any accessible spot.

Sexual dimorphism is common among phasmids. There is often a considerable sexual dimorphism in secondary characteristics such as the size of body and antenna, coloration and the presence of wings (Wood, 1993).

Most phasmids rely on effective camouflage as a defense mechanism. Besides the advanced camouflaging techniques, their anatomical structure and coloration are resemblances of the various *environments*. The presence of spines on the body *(Eurycantha horrida*) and fluid secretion (*Anisomorpha bupestroides*), which can cause temporary blindness, are however, effective to the predator (Brock, 1992). Apart from that, species such as *Haaniella echinata* produce hissing sound with their wings and some flip their abdomen to mimic other insects. The apterous Phasmids are very passive and simply drop to the ground and often feign death for a period of time when disturbed.

Like other flora and fauna, phasmids are not spared from the extinction threat such as land clearing and over collecting of specimens. Brock (1994) and Chan and Lee (1994) reported that numerous phasmids were supplied to butterfly farms and local souveneir outlets in Tapah Hill, Perak. The aim of this study was to investigate the diversity of phasmids in Ranchan, Serian, Sarawak. It is hoped that this study would serve as a supplement for future references and research on the study of phasmids, particularly in Sarawak.

MATERIALS AND METHODS

The study site is located at Ranchan (1º 08'N, 110º 35'E), Serian, Sarawak. It is a recreational park of about 6 acres, situated about 2.6 km from Serian town centre. Formerly the Water Catchment Area for water supply in the Serian District,

Ranchan consists of a mixed dipterocarp forest with a small stream running alongside about 5m from the trail.

Night time collecting of Phasmids between 1900 – 2100 hours was carried out within the survey site once a month from June through December 1997. Vegetation along the trail (220m) was searched by using torchlight. There is no specific method for collecting the phasmids and besides hand picking, aerial catching (butterfly net) was used for the flying phasmids.

Phasmids from the field were brought alive to the laboratory and kept in 14" x 16" cages where they were observed and supplied daily with fresh plant materials. Phasmids were only preserved when they died and these specimens were kept permanently in the Insect Reference Collection in UNIMAS.

Eggs, whenever available, were incubated in separate jars filled with sand and covered with a piece of cloth for ventilation. Depending on the species, the eggs were then placed on or buried about 1.5 cm in the sand. Eggs were incubated under normal room temperature (27°C). Water was provided occasionally to provide moisture until the eggs hatched. First instar nymphs were observed, measured and recorded. Eggs that failed to hatch were preserved in 75% ethanol.

Species identification was based on Bradley and Galil (1977) and through cross-reference with the collections in the Sarawak Museum and the Forest Research Centre, Kuching.

RESULTS AND DISCUSSION

A total of 254 specimens of phasmids were collected and these include representatives of five subfamilies from four families: Bacilidae, Pseudophasmatidae, Heteronemiidae and Phasmatidae. Table 1 shows a list of the thirteen species of phasmids from twelve genera sampled in Ranchan. The subfamilies Heteropteryginae and Phasmatinae were each represented by two species, *Haaniella grayi a*nd *Epidares nolimetangere*; and *Baculum nematodes* and *Pharnacia kirby*, respectively while both Asciphasmatinae and Lonchodinae were represented by only one species each. The subfamily with the highest number of species was Necrosciinae (H' = 0.258) with seven species (Table 1). The

diversity index of the phasmids found in Ranchan was H' = 0.721.

Among the 13 species encountered, the three species commonly found were *Haaniella grayi*, *Acacus sarawacus* and *Lonchodes amaurops*. *Acacus sarawacus* was, however, the most common species found. Likewise, it was also reported to be commonly found in Singapore (Seow-Choen, 1996). *Asceles malaccae*, *Diesbachia tamyris* of the subfamily Nescrosiinae and *Baculum nematodes* (Phasmtinae*)* were uncommonly encountered. However, these species were reported to be common in Singapore (Seow-Choen *et al*., 1994).

Among the three species found to be very common (Table 2), *H. grayi* is the dominant species in Ranchan, with a total number of 126 individuals (H' = 0.151). The abundance and the availability of its food plants could be a contributing factor to the success of this species. According to Chan *et al*. (1996), species from the genus *Haaniella* were not choosy and they eat both fresh and dried plants. In this study, *H. grayi* had been observed to feed on several species of plants such as *Palaquium sp., Diospyros sp., Macaranga sp. and Calamus sp.* Besides the wide range of plants consumed, being the only species from this genus that was found in the Ranchan area, this species perhaps does not have to compete for food. Thus, they thrive well in such condition. The other species of *Haaniella* such as *H. scabra*, *H. saussaurei, H. echinata* and *H. dehaanii* have never been encountered during the survey in Ranchan. The presence of very few predators could also possibly explain the abundance of this species. Its predators such as the monitor lizards and bats had never been encountered and observed throughout this study.

Among the phasmid subfamilies, Necrosciinae was found to be the most diverse (H' = 0.258) and contributed to more than half (53%) of the total species collected. Seven species of Necrociinae were encountered namely *Acacus sarawacus*, *Asceles malaccae, Diesbachia tamyris, D. hellotis, Orthomeria alexis*, *Neoclides sp*. and Species *x*. (Table 1). The index obtained could be much higher if the sampling was done higher up in the tree canopy as most of the Necrosciinae members are winged and glued or spiked their eggs on leaves and bark up in the tree.

The subfamily Lonchodinae was only represented by one species, namely *Lonchodes amaurops*. This is rather unusual as according to Cranbrook and Edwards (1994), the genus *Lonchodes* is among the commonest phasmids that occurs in Borneo. Perhaps the host or food plants found here are not suitable for the other species of *Lonchodes*.

Two species from the subfamily Necrosiinae encountered in this study can be considered as rare, namely *Neoclides sp*. and one unidentified species, Species *x*. (H' = 0.007). Voucher specimens of these species are not found in the collections of the Sarawak Museum and the Forest Research Centre, Kuching. However, there are three species from the genus *Neoclides* (*N. laceratus, N. simyra* and another unidentified species) that are deposited in the Sarawak Museum. These were collected somewhere in the Kuching Division in 1899, 1903 and 1902 respectively. Ever since then, there is no further documentation and record of this genus. Species *x* was only collected in the first trip during this study and has never been collected ever since then. This species could perhaps be considered as a new record for Sarawak.

The occurrence and abundance of the stick insects in Ranchan is as shown in Table 2. The stick insect population was found to decrease during the month of September. This is perhaps due to haze that occurred in Sarawak between the months of August, September and October, 1997. In the tropics, insects are particularly vulnerable to landscape and climatic changes because they are adapted only to narrow temperature fluctuations (Samways, 1994). The occurrence of haze in Sarawak might have effects on the dynamic of the stick insects as observed in this study. However, further studies on the influence of haze on the insects should be carried out before further conclusions could be drawn on this effect.

The stick insect population was observed to reach the highest peak in November 1997. This was again probably due to the influence of climate factors, particularly the seasonality in rainfall patterns. Generally, in Sarawak, high rainfall usually occurs from November to February while the dry period occurs from June to August. For example, Chan and Lee (1994)

observed that species of the subfamily Heteropteryginae tend to feed actively only when it is very wet.

Basically, in the other months, the occurrence of the phasmid populations were quite constant except for the family Pseudophasmatidae and Phasmatidae that were not collected in the months of August, September, October 1997 and December, 1997, respectively. Their presence in small numbers might also account for their being uncommonly encountered

Being uncommonly encountered, none of the Phyllidae was found in the study area. However, when present, species of this family normally occurs in gregarious number such as reported by Brock (1994) in Tapah Hill, Perak. Being the master of mimicry, individual species of this family could often possibly be overlooked.

The rapidity with which the tropical vegetation is now being destroyed, added to over collecting of certain groups of insects of aesthetic values, including the stick insects call for immediate study of this interesting group of insects. To have a better understanding if this group, further systematics studies and inventory of the stick insects are much awaited for. Like the butterflies and beetles, the stick insects are among popular collectors' item much sought after by amateur insect collectors. For instance, despite of being uncommonly encountered elsewhere, the amount of dead Phyllidae specimens from Tapah Hill, Perak supplied to worldwide entomological dealer is alarming (Brock, 1994; Chan & Lee, 1994).

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Table 1. List of phasmids collected from Ranchan, Serian from June-December 1997

Family	Subfamily	Species
Bacillidae	Heteropteryginae	*Haaniella grayi*
		Epidares nolimetangere
Pseudophasmatidae	Aschiphasmatinae	*Dinophasma guttigera*
Heteronemiidae	Necrosciinae	*Acacus sarawacus*
		Asceles malaccae
		Diesbachia tamyris
		Diesbachia hellotis
		Orthomeria alexis
		Neoclides sp.
		Species x
	Lonchodinae	*Lonchodes amaurops*
Phasmatidae	Phasmatinae	*Baculum nematodes*
		Pharnacia kirbyi

Table 2. Relative abundance of phasmid species in Ranchan, Serian.

Family	Subfamily	Species	RelativeAbundance
Bacillidae	Heteropteryginae	*Haaniella grayi*	Very common
		Epidares nolimetangere	Common
Pseudophasmatidae	Aschiphasmatinae	*Dinophasma guttigera*	Common
Heteronemiidae	Necrosciinae	*Acacus sarawacus*	Very common
		Asceles malaccae	Uncommon
		Diesbachia tamyris	Uncommon
		Diesbachia hellotis	Uncommon
		Neoclides sp.	Rare
		Orthomeria alexis	Uncommon
		Sp. x	Rare
	Lonchodinae	*Lonchodes amaurops*	Verycommon
Phasmatidae	Phasmatinae	*Baculum nematodes*	Uncommon
		Pharnacia kirby	Common