CHECKLIST OF THE FAMILY ACRIDIDAE MACLEAY, 1821 (ORTHOPTERA) BASED ON VOUCHER SPECIMENS OF MAJOR REPOSITORIES IN SARAWAK

Farah Nabillah Abu Hasan Aidil Fitri*, Ratnawati Hazali*, Fatimah Abang, Ahmad Irfan Abdul Razak & Siti Nurlydia Sazali
Faculty of Resource Science and Technology,
Universiti Malaysia Sarawak, 94300 Kota Samarahan,
Sarawak, Malaysia.
*Corresponding author: *hratnawati@unimas.my; 17020207@siswa.unimas.my*

ABSTRACT

Acrididae is a family of insects consisting of the short-horned grasshoppers and locusts. Currently, knowledge on the faunistic composition of family Acrididae in Sarawak is still scarce. This study aimed to determine the species composition and to provide a current checklist of acridid fauna in Sarawak, using voucher specimens from Insect Reference Collection of Universiti Malaysia Sarawak (UIRC), and Research, Development and Innovation Division (RDID) of Forest Department Sarawak. A total of 925 specimens of acridid were examined, representing 5 subfamilies, 17 genera and 22 species. Subfamily Catantopinae was recorded with the highest number of species (8 genera; 10 species), followed by Oedipodinae (4 genera; 4 species), Cyrtacanthacridinae (2 genera; 3 species), Oxyinae (2 genera; 3 species), and Acridinae (1 genus; 2 species). The most abundant species was *Traulia azureipennis* followed by *Valanga nigricornis*. The least abundant species were *Coloracris coerulescens*, *Coloracris* sp., *Craneopsis olivacea*, *Perakia borneensis* and *Phalaca waterstradti*, which is represented by a singleton. This study serves as a fundamental data which will aid future taxonomic and ecological studies on Acrididae in Malaysia, particularly Sarawak.

Keywords: Acrididae, checklist, grasshoppers, Sarawak, species composition.

ABSTRAK

Acrididae merupakan famili serangga yang terdiri daripada belalang tanduk pendek. Maklumat tentang komposisi fauna famili Acrididae di Sarawak masih lagi kurang diketahui. Kajian ini bertujuan untuk mengkaji komposisi spesies dan menyediakan senarai semak fauna acridid di Sarawak dengan merujuk spesimen baucar daripada Koleksi Rujukan Serangga di Universiti Malaysia Sarawak (UIRC) dan Bahagian Penyelidikan, Pembangunan dan Inovasi di Jabatan Hutan Sarawak (RDID). Sebanyak 925 spesimen telah dikaji yang merangkumi 5 subfamili, 17 genera dan 22 spesies belalang. Subfamili Catantopinae mencatatkan jumlah spesies tertinggi (8 genus; 10 spesies), diikuti oleh Oedipodinae (4 genera; 4 spesies), Cyrtacanthacridinae (2 genus; 3 spesies), Oxyinae (2 genera; 3 spesies) dan Acridinae (1 genus; 2 spesies). Spesies yang merekodkan kelimpahan tertinggi ialah *Traulia azureipennis*, diikuti oleh *Valanga nigricornis*. Spesies yang paling kurang direkodkan ialah *Coloracris*

coerulescens, *Coloracris* sp., *Craneopsis olivacea*, *Perakia borneensis* dan *Phalaca waterstradtii* yang diwakili oleh satu individu. Kajian ini berfungsi sebagai data asas yang akan membantu dalam kajian taksonomi dan ekologi famili Acrididae di Malaysia, khususnya Sarawak, pada masa akan datang.

Kata kunci: Acrididae, senarai semak, belalang, Sarawak, komposisi spesies.

INTRODUCTION

Grasshoppers belong to the order Orthoptera and further classified into two suborders, namely Caelifera, which includes pygmy grasshoppers, groundhoppers, short-horned grasshoppers, grouse locusts and locusts, and Ensifera, which consists of crickets, mole crickets and katydids (Mandal 2014; Willemse 2001). Suborder Caelifera are distinguished from Ensifera by having short antennae while the latter possessed very long antennae (Ali & Panhwar 2017). Acrididae (short-horned grasshoppers and locusts) comprise the largest family of the suborder Caelifera (Smith et al. 2004), and further classified into subfamilies such as Acridinae, Cyrtacanthacridinae, Oxyinae, Catantopinae, and Oedipodinae, to name a few (Cigliano et al. 2019).

Studies on acridids in Malaysia had been conducted by Mahmood et al. (2007, 2008), and Tan and Kamaruddin (2014, 2016). According to Willemse (1938), an earlier expedition by the entomologists of Oxford University conducted in Sarawak, successfully documented five subfamilies and 25 species of Acrididae. Mahmood et al. (2007) recorded six subfamilies (Oxyinae, Acridinae, Coptacridinae, Cyrtacanthacridinae, Catantopinae and Eyprepocnemidinae), 22 genera and 30 species of acridids from students' collections that were deposited to the Centre for Insect Systematics (CIS) of Universiti Kebangsaan Malaysia (UKM). In December 2012 to December 2013, Tan and Kamaruddin (2014) conducted a study in Fraser's Hill, Pahang and documented five subfamilies of 17 species. In addition, a faunistic survey done in Bukit Larut, Perak recorded five subfamilies of 24 species with the richest family being the family Acrididae represented by 15 species that make up for about 63% of the Caelifera diversity in Bukit Larut (Tan & Kamaruddin 2016). Furthermore, another study was conducted in Felda Chini, Pahang and Universiti Kebangsaan Malaysia (UKM), Bangi, Selangor for five months starting from May to October 2014 to explore the diversity and abundance of nocturnal insects between two different ecosystems. Nevertheless, the result from the study for the specific order were discouraging as not much acridids were able to be collected and identified to species level (Nur Atiqah et al. 2017). However, most of these studies were conducted in Peninsular Malaysia and knowledge on the faunistic composition of family Acrididae in Sarawak is still scarce. Thus, this study aimed to determine the species composition and to provide a current checklist of acridid fauna in Sarawak, using voucher specimens from Insect Reference Collection of Universiti Malaysia Sarawak (UIRC), and Research, Development and Innovation Division (RDID) of Forest Department Sarawak.

MATERIALS AND METHODS

This study was based on an examination of specimens deposited in UNIMAS Insect Reference Collection (UIRC) of Universiti Malaysia Sarawak and Research, Development and Innovation Division (RDID) of Forest Department Sarawak. Specimens deposited in RDID were collected from major expeditions since the year 1976 until 2016. Collections of specimens from UIRC were more recent from 1994 to 2019, as various expeditions had been conducted by the institution. Collecting data such as collecting date, locality, and collector's name were

recorded. Specimens were sorted according to the morphological structures, then identified and classified into respective subfamily, genus and species. This data was then used to calculate relative abundance (by dividing the number of individuals recorded per species with the total number of individuals from all species) of each acridid species.

Classification of Acrididae follows the terminology by Cigliano et al. (2019). Specimens were identified using species descriptions, identification keys (e.g. Mahmood et al. 2007, 2008; Rehn & Rehn 1940; Tan 2010, 2012; Tan & Kamaruddin 2014, 2016; Tan & Wahap 2018; Uvarov 1923a, 1923b; Willemse 1938, 1956, 1957, 2001) and images of type specimens where available (e.g. Natural History Museum, London and DORSA-German Orthoptera Collections Database) for species confirmation.

RESULTS AND DISCUSSION

A total of 925 specimens of Acrididae were examined from UNIMAS Insect Reference Collection (UIRC) and Research, Development and Innovation Division (RDID) of Forest Department Sarawak. Table 1 shows the current checklist of Acrididae documented in Sarawak based on specimens deposited in both insect repositories. Acrididae of Sarawak was represented by five subfamilies, namely Acridinae, Catantopinae, Cyrtacanthacridinae, Oedipodinae and Oxyinae, which comprising 17 genera and 22 species.

Table 1. A checklist of Acrididae species documented from UNIMAS Insect Reference Collection (UIRC) and Research, Development and Innovation Division (RDID), Forest Department Sarawak

Subfamily	Species
Acridinae	*Phlaeoba antennata* Brunner von Wattenwyl, 1893
	Phlaeoba infumata Brunner von Wattenwyl, 1895
Catantopinae	*Apalacris varicornis* Walker, 1870
	Coloracris coerulescens Willemse, 1938
	Coloracris sp.
	Craneopsis olivacea Ramme, 1941
	Perakia borneensis Willemse, 1936
	Phalaca waterstradti Ramme, 1941
	Stenocatantops splendens (Thunberg, 1815)
	Traulia azureipennis (Serville, 1839)
	Traulia sanguinipes sanguinipes Stål, 1878
	Xenocatantops humilis (Serville, 1839)
Cyrtacanthacridinae	*Patanga luteicornis* (Serville, 1839)
	Patanga succincta (Linnaeus, 1763)
	Valanga nigricornis (Burmeister, 1838)
Oedipodinae	*Aiolopus thalassinus tamulus* (Fabricius, 1798)
	Gastrimargus marmoratus (Thunberg, 1815)
	Locusta migratoria manilensis (Meyen, 1835)
	Trilophidia annulata (Thunberg, 1815)
Oxyinae	*Oxya hyla intricata* (Stål, 1861)
	Oxya japonica japonica (Thunberg, 1824)
	Pseudoxya diminuta (Walker, 1871)

The highest number of species was recorded from subfamily Catantopinae (8 genera; 10 species), followed by Oedipodinae (4 genera; 4 species), Cyrtacanthacridinae (2 genera; 3 species), Oxyinae (2 genera; 3 species), and Acridinae (1 genus; 2 species) (Table 2). *Traulia azureipennis* or commonly known as the Black Forest Grasshopper was the most abundant species (15.78%) with 146 individuals, followed by the Short-horned Grasshopper, *Valanga nigricornis* with 129 individuals (13.95%), and the Rice Grasshopper, *Oxya japonica japonica*, with 121 individuals recorded (13.08%). Furthermore, five species were recorded as singleton, namely *Coloracris coerulescens*, *Coloracris* sp., *Craneopsis olivacea*, *Perakia borneensis* and *Phalaca waterstradti* (Table 2).

Table 2. The relative abundance of Acrididae species recorded from UNIMAS Insect Reference Collection (UIRC) and Research, Development and Innovation Division (RDID), Forest Department Sarawak

Subfamily	**Genus**	**Species**	**Number of Individuals**	**Relative Abundance (%)**
Acridinae	*Phlaeoba*	*Phlaeoba antennata*	38	4.10
		Phlaeoba infumata	6	0.65
Catantopinae	*Apalacris*	*Apalacris varicornis*	5	0.54
	Coloracris	*Coloracris coerulescens*	1	0.11
		Coloracris sp.	1	0.11
	Craneopsis	*Craneopsis olivacea*	1	0.11
	Perakia	*Perakia borneensis*	1	0.11
	Phalaca	*Phalaca waterstradti*	1	0.11
	Stenocatantops	*Stenocatantops splendens*	61	6.59
	Traulia	*Traulia azureipennis*	146	15.78
		Traulia sanguinipes sanguinipes	13	1.41
	Xenocatantops	*Xenocatantops humilis*	113	12.22
Cyrtacanthacridinae	*Patanga*	*Patanga luteicornis*	38	4.11
		Patanga succincta	10	1.08
	Valanga	*Valanga nigricornis*	129	13.95
Oedipodinae	*Aiolopus*	*Aiolopus thalassinus tamulus*	48	5.19
	Gastrimargus	*Gastrimargus marmoratus*	44	4.76
	Locusta	*Locusta migratoria manilensis*	8	0.86
	Trilophidia	*Trilophidia annulata*	34	3.68
Oxyinae	*Oxya*	*Oxya hyla intricata*	26	2.81
		Oxya japonica japonica	121	13.08
	Pseudoxya	*Pseudoxya diminuta*	80	8.65
TOTAL	**17**	**22**	**925**	**100**

CONCLUSION

This study documented five subfamilies comprising 17 genera and 22 species of Acrididae (short-horned grasshoppers and locusts) from two major insect repositories in Sarawak. The most speciose subfamily was Catantopinae with eight genera and 10 species recorded. The most abundant species was *Traulia azureipennis* (15.78%) and the least abundant species were *Coloracris coerulescens*, *Coloracris* sp., *Craneopsis olivacea*, *Perakia borneensis* and *Phalaca waterstradti*, which is represented by a singleton. Result of this study serves as a fundamental data which will aid future taxonomic and ecological studies on Acrididae in Malaysia, particularly Sarawak.

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