

A cave fauna survey in Central Kalimantan, Indonesia

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Abstract

During an Expedition to Muller range (Central Kalimantan Indonesia) in June 2004 sponsored by LIPI, fourteen caves were explored to survey cave fauna diversity. A total of 429 specimens of cave invertebrates in 40 species and 22 orders were collected. Most of the specimens are still under study. Among interesting taxa are aquatic Isopods, *Stenasellus* sp., which is a new record for the island of Borneo after Sarawak (*Stenasellus chapmani*). The Stenasellids Isopods were collected in small microgours together with a Planarian in large number. They are colorless, sometimes red. Other aquatic species are shrimps (*Macrobrachium* sp.), and crabs that are dominant in the subterranean river. The terrestrial invertebrate fauna is dominated by cockroaches (Blattaria), Reduviidae (*Bagauda* sp.; Hemiptera), cave crickets (*Rhaphidophora* sp.), and larvae of Tineidae. Most of these species live in bat guano, which is the most important food resource in caves in the area. Small Amblypygids (*Sarax* sp.), huntsman spider (*Heteropoda* sp.) and Scutigera are mostly found on the cave walls and are predators of other arthropods such as cave crickets and cockroaches. A Lycosid spider is easily found in the cave floor where it lives in small hole. Troglotic species were not found in these caves. This study is the first biological survey undertaken in Kalimantan caves, a huge territory of more than 500,000 km², and the less known island of Indonesia for cave fauna.



Fig 1. A cruising of Barito River using boat (C. Rahmadi)

Introduction

Borneo is the third largest island in the world after Greenland and New Guinea. Kalimantan as a part of Borneo Island covers 73 % (539,460 km²) of Borneo landmass that consists of 4 provinces, West Kalimantan, South Kalimantan, East Kalimantan and Central Kalimantan (MacKinnon et al. 1996). Karst areas in Kalimantan are nearly unknown about biospeleological information (Deharveng and Bedos 2000) due to the lack of biological expedition in the area (Deharveng 2002). The most complete biospeleological investigation in Borneo is only known from Mulu (Sarawak) (Chapman 1982). This survey was aimed to explore a cave biodiversity in Muller Mountains to support data for Muller as a world heritage

Karst in Kalimantan

Kalimantan is consist of several karst area from southern part of the island to northern and eastern part i.e. Mount Meratus, Sangkulirang and small karst area in Kayan Mentarang Nature Reserve, Muller Ranges Mountain in which less well-known compare to other region. The most extensive karst area in Kalimantan is Mangkalihat in Sangkulirang Peninsula in East Kalimantan (Mackinnon 1996). Unfortunately, the karst region in Kalimantan was less studied compare to other island in Indonesia due to lack of speleological expedition in the area. The last speleological expedition was conducted in Kayan Mentarang, East Kalimantan (Palawa UAJY 2000), Mount Meratus and sparsed karst area in Central Kalimantan (Roberts 1990).

Caves of Upper stream Barito River

The karst area in Central Kalimantan that had been detailed surveyed was done in upper stream of Barito River in Tumbang Topus Village. Tumbang Topus karst is a small area that have an extensive development of caves. The cave expedition was the first of cave biological survey from Kalimantan. The longest cave was found about 1,500 m but the cave fauna was very interesting due to a fauna diversity and the information will be a new record for Kalimantan.

Materials And Methods

Study site

Ponot area is small karstic area in central part of Borneo island on the upper Barito River (Sungai Murung) in Tumbang Topus Village, District Sumber Barito, Murung Raya (N. 0° 27' 45.0" E.115° 00' 55.5"). About fourteen caves were surveyed and among them, ten caves were explored for biological investigation i.e. Liang Puruk (>350 m), Liang Silam (> 211 m), Liang Koliq (>209.7 m), Liang Hajuq (>1525 m), Liang Heruwin (>125.35 m), Liang Hipoy (74 m), Liang Hintan (222 m), Liang Samali 1 (>157.67 m), Liang Samali 2 (>74 m) and Liang Pandan (60 m). Most of the caves have subterranean river that flow into the caves. Food resources in the caves were dominated by bat and swiftlet guano.

Methods

The survey was focused on invertebrate diversity whereas other faunas such as bats and swiftlets were collected as additional information. Hand collecting was done to collect cave fauna that live on cave floor, under stone, under deadwood, cave walls and in the small puddles or microgourd as well as in underground river. Soil/guano samples were taken about 1 litre and extract using Berlese funnel for a week.



Fig 2. Waterfall in front of entrance Liang Kape Boruk, flowing into subterranean river (C. Rahmadi)



Fig 3. Collecting aquatic isopods (*Stenasellus* sp.) in small pools in Liang Puruk (C. Rahmadi)



Fig 4. Collecting stenasellid isopods in Liang Hintan (C. Rahmadi)

Overview of cave fauna

General

About 429 specimens were collected and consists of 40 morphospecies and 22 orders. Most of the specimens are still under study.

Isopoda

One species was found and interesting one. Previously, cave aquatic Isopods were only known from Mulu (Sarawak) (Magniez 1982), Sumatra (Magniez 1987, 1999, 2003) and Java (Rahmadi unpublished data) i.e. *Stenasellus* sp..

Arachnida

A representative taxa of Arachnids in area were Amblypygi, Schizomida, Opilionida and Araneida. The most common Arachnida was a huntsman spider (*Heteropoda* sp.) that commonly found on the cave wall. Amblypygi was found in small number and only small amblypygi that present in the area. One of interesting family Opilionida was found in cave and might be a Family Stylocellidae.

Chilopoda

A groups of Chilopoda that present in the area was Scutigera that found crawling and move fast on the cave wall especially passage with a rich organic matter (guano).

Diplopoda

Diplopoda was only found in caves with guano but they present in small number not as many as in other karst area.

Insecta

This group was dominated by Orthoptera (Rhaphidophoridae), Blattaria (Blattidae), Lepidoptera (Tineidae), Hemiptera (Reduviidae) and other orders in small number.



Fig 5. Small amblypygids (*Sarax* sp.) preying a blattid cockroach in Liang Puruk (C. Rahmadi)



Fig 6. Lycosid spider, very common in Liang Hajuq (C. Rahmadi)



Fig 7. Scutigera (Chilopoda), a common predator in Kalimantan caves (C. Rahmadi)



Fig 8. Rhaphidophoridae crickets, very abundance in caves with guano (C. Rahmadi)

Based on local diversity, the highest number of species was Liang Hajuq. Liang Hajuq was the longest cave in the area more than 1500 m, with big passage and subterranean river. Liang Hajuq was also cave with swiftlet nest and bats colony. The variability of habitat and availability of food resources were important factor to support cave fauna diversity.

Terrestrial fauna was dominated by troglophile that commonly found in caves as well as outside caves. Troglomorphic fauna was nearly absent in the area due to the lack of oligotrophic habitat and almost all caves with a subterranean river. The most common troglomorphic fauna was *Rhaphidophora* sp., *Tinea* sp., Lycosidae, *Heteropoda* sp. and Blattidae. The whips spider was present in small number and only found in two caves (Liang Hajuq and Liang Puruk). Small amblypygid from genera of *Sarax* sp. and huntsman spider (*Heteropoda* sp.) was the most common predator in caves. The most important prey was a raphidophoridae crickets and blattid cockroach. Hemiptera (Reduviidae, might be a genera of *Bagauda* sp.) was very abundant in Liang Hajuq and play a role as a predator with a sucking apparatus to kill a prey. They live in a cave wall and pumping await a prey. Scutigera, with long legs, crawling and moving fast on the cave wall, was a predator of other invertebrate that commonly found in caves in Southeast Asia that rich with organic resources such as guano. Scutigera was absent in temperate caves but commonly present in Southeast Asian caves (Deharveng and Bedos 2000).

Compare to terrestrial fauna, aquatic faunas were much more interesting. But a global diversity of aquatic fauna was relatively low. In the subterranean water was found crabs, prawns, planarians and isopods. Crabs and prawns were commonly found in subterranean river both permanent or temporal river. They have eyes and pigment that show a relation to epigean habitat. Aquatic Isopods, *Stenasellus* sp., was the most interesting fauna in the area and shows high troglomorphic adaptation such as no eyes, depigmented body and long antenna. They live in small pools with a percolation waters, crawling in a bottom of pools and live together with a planarians. In Kalimantan, *Stenasellus* sp. was the first record and in Borneo could be a second species after a species from Mulu Sarawak *Stenasellus chapmani* (Magniez 1982).

Vertebrate fauna was dominated by bats and swiftlets. They support a cave ecosystem with dropping of faeces on the cave floor. On the cave walls, racer snakes *Elaphe taeniura* was found waiting to catch a bats and swiftlets. They were commonly found in caves of Borneo island such as Mulu Caves Sarawak (Mac Kinnon 1996) and play as a predator of birds and bats.

Comparison to other karst areas

Survey in Tumbang Topus village was the first survey of cave fauna in Kalimantan karst area. Information of cave fauna in Borneo was very few except a complete ecological study of cave fauna in Mulu Sarawak (Chapman 1982). The diversity of cave-adapted fauna in the survey area compare to other region in Borneo was lower. It was caused by the lack of oligotrophic habitat to ensure the adaptation and evolution process to form troglomorphic features. There were some species absent in Kalimantan but present in Mulu Sarawak such as *Arixenia* sp. and Anthurids isopods. A linkage between Mulu caves and Kalimantan caves was found with a finding of *Stenasellus* sp. in subterranean water of Kalimantan. In region of SE Asia a linkage between other karstic areas was built by an aquatic isopods, *Stenasellus* sp. that was also found in Java, Sumatra and Thailand.

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