Cavernicolous species of phlebotomine sand flies from Kanchanaburi Province with a note on anthropophilic species

Chamnarn Apiwathnasorn
Chotechuang Panasopolkul
Yudthana Samung
Samrerng Prummongkol
Anon Phayakaphon

Department of Medical Entomology,
Faculty of Tropical Medicine
The objectives of this study are to:

- conduct a biological inventory of cave adapted arthropod species;
- identify potential harmful arthropods of the caves sampled in;
- discover new species or additional species;
- Perform knowledge management on exploratory type of entomological survey.
Cave fauna types

- **Troglobites** (cave-limited species)
- **Troglophiles** (species that can live in caves, but also occur in other environments)
- **Trogloxenenes** (species that use caves, but cannot complete their life cycle in caves)
- **Accidentals** (animals not in one of the previous categories).

Based on their degree of cave adaptation.
1. Ma Ha Mongkon, Hed Kon Cave
2. Thep Pa Tan Porn Cave
3. Kuan Im Goddess Cave
4. Ma Ha Mong Kon Cave
5. Wat Phrom Lok Cave
6. Da-Wa-Dung Cave
7. Wat Benjarat Cave
8. Nam Thip Cave
9. Prong Fa Cave
10. Wanon Cave
11. Pu Toei Cave
12. Chaloei Cave
13. Badan Cave
14. Klang Cave
15. Lava Cave
16. Nam Cave
Limestone caves
Limestone caves

Wat Phrom Lok Cave
Kuan Im Goddess Cave
Da-Wa-Dung Cave
Lava Cave
Pu Toei Cave: ถ้ำพู่เตย
Nam Cave: ถ้าน้ำ
Chaloei Cave: ถ้ำเชลย
Wat Benjarat Cave: ถ้ำวัดเบญจรัตน์
Nam Thip Cave
Badan Cave
Klang Cave
Methodology

- Direct search by hand or aspirators, pipette
- Baiting: Disney traps
- Light traps
- Pitfall traps

Macrofauna were counted visually with helmet-mounted lights.
Macro fauna were inspected with aid of helmet-mounted lights. Collections were limited to those fauna that were impossible to identify in the field. Voucher specimens were collected mainly by hand, aspirator, and dipnet and preserved in 75–90% ethanol, and brought back to the laboratory for identification and cataloging.
Team Work

Camera man
Spider man
Sand fly man
Bug man
Roach man
Support man
Results
Insects and Arthropods dominated the cave habitats, especially crickets, sand flies, cockroaches and spiders.

>30 species
A total of >500 specimens representing:

- Mosquitoes (*Aedes cavaticus, Tripteroides* sp.),
- Cockroaches,
- Phlebotomine sand flies,
- Bat flies,
- Bat bugs,
- Ants (*Camponotus* sp., *Pheidole* sp.),
- Beetles (cave beetles, *Cercyon* sp.),
- Crickets (Camel cricket, *Diestrammena* sp.),
- Ticks (reptile tick, *Aponomma* sp.),
- Mites,
- Spiders (whip spider, *Phrynichus orientalis*),
- Centipedes (cave centipedes, *Scutigera*),
- Millipedes (cave millipedes, *Glyphiulus*; Pill millipedes, *Armadillidium* sp.), and
- Springtails
Cave Mosquitoes

Aedes cavaticus
Culex species

Level of cave adaptation: troglobite
An. dirus sl

Level of cave adaptation: troglobite
Aedes cavaticus
Anopheles dirus sl.
Culex species

Lava Cave
Wanon Cave
Chaloei Cave
Benjarat Cave
Armigeres subalbatus

Nam Cave

Level of cave adaptation: accidental
Level of cave adaptation: trogloxene

Hard tick

Nam Cave
Pu Toei Cave
Reptile tick
*Aponomma* sp.

The tick *A. hydrosauri* is associated with reptiles and is the arthropod reservoir for *Rickettsia honei* on Flinders Island (Australia).

They are ectoparasites of snakes or lizards.
Bat flies
Leptocimex sp.
New/additional species

Bat bug
Wat Phrom Lok Cave
Cave cockroach

*Blattella cavernicola*

all caves
Spiders

Level of cave adaptation: troglophile
Whip spider (แมงมุมแส้) are members of the Arachnids group which are strongly flattened animals, with strong raptorial pedipalps, armed with large spines and very long front legs.
Phrynichus orientalis

Level of cave adaptation: Troglobite
Lava Cave
Wanon Cave
Benjarat Cave
Chaloei Cave
Da-Wa-Dung Cave
Wat Phrom Lok Cave
Ma Ha Mong Kon Kon Cave
Tarantula

Level of cave adaptation: troglobite
Harvestman are not real spiders, but resembles the spiders very much. They belong to the class Arachnida. 3,500 known species are known. Most species feed on other invertebrates although some consume plant matter. Others are scavengers and feed on the bird carcasses or mammals.
Order Opiliones: Harvestman

Pu Toei Cave

Level of cave adaptation: troglobite
Brown Huntsman spiders (Araneae: Sparassidae) *Heteropoda* sp.

In general, Huntsman spiders are not regarded as dangerous, and can be considered beneficial because they feed on insects.
Unidentified Spiders all caves
Ma Ha Mong Kon Cave

Camponotus sp.
Level of cave adaptation: troglophile

Cave centipedes (Scutigera sp.)

Level of cave adaptation: troglophile
Cave centipede, which is generally carnivorous, feed upon cockroaches, mites, ants, etc. that sustain themselves on the guano.
Wat Phrom Lok Cave
Da-Wa-Dung Cave
Pu Toei Cave
Wanon Cave
Lava Cave
Level of cave adaptation: Troglobite

Millipedes eat fungus and bacteria and prefer the darker, more wet areas of the cave.
Pill millipedes (Armadillidium sp.)

Level of cave adaptation: troglobite

Nam Cave
Pill millipedes (Armadillidium sp.)
Cave cricket or Camel cricket (Diestrammena sp.)
Level of cave adaptation: trogloxene
Cave beetles live in the dry, loose, disturbed dirt and limestone floor of the cave, where it often finds cricket eggs to eat.
Triatomine bug
Pu Toei Cave
Bats are archaic mammals that originated in the Eocene period (50 mya). Predominant mammal species
Phlebotomine Sand flies

Level of cave adaptation: troglophile all caves

Phlebotomus
Chinius
Sergentomyia
Phlebotomus (Euphlebotomus) mascomai n.sp. (Diptera-Psychodidae)

Frédérique Muller · Jérôme Depaquit · Nicole Léger

Abstract A new species of sandfly is described from limestone caves in Thailand. The inclusion of this species in the subgenus Euphlebotomus is justified on the basis of characters of the male genitalia (paramere, basal lobe). The male–female gathering in the same taxon is based on ecological (cavernicolous species), morphological (length of male genital filaments and female spermathecal ducts) and

Phlebotomus (Euphlebotomus) barguesae n. sp. from Thailand (Diptera – Psychodidae)
Jérôme Depaquit*, Frédérique Muller and Nicole Léger

Published: 8 January 2009
Received: 23 October 2008
Accepted: 8 January 2009
This article is available from: http://www.parasitesandvectors.com/content/2/1/5

Abstract

Background: A few studies have been carried out on the Phlebotomine sandflies from Thailand. Within the Phlebotomine sandflies, the genus Phlebotomus Rondani & Berté, 1840 contains the vectors of leishmaniases in Europe, Africa and Asia. It includes several subgenera. Among them the subgenus Euphlebotomus Theodor, 1948 contains at the present time 12 taxa. The type-species of this subgenus is P. argenteipes Annandale & Brunetti, 1908, the vector of Leishmania donovani (Laveran & Mesnil, 1903) in India.

Results: A new species of sandfly, P. barguesae n. sp. is described from limestone caves in Thailand. The male–female gathering in the same species is based on ecological, morphological and molecular criteria (homology of mtDNA cytochrome c oxidase I sequences). The inclusion of P. barguesae n. sp. in the subgenus Euphlebotomus is justified on the basis of characters of the male genitalia (five spines on the style, bifurcated paramere, and no basal lobe on the coxite) and of female pharyngeal armature (two kinds of teeth). It well differentiated from another sympatric species: P. mascomai.

Conclusion: The new species described in the present study has smooth spermathecae. This original morphology opens a discussion on the heterogeneity of this subgenus.
A Species List of Phlebotomine Sand Flies in Caves

*Chinius barbazani*
*Phlebotomus argentipes*
*barguesae*
*major major*
*stantoni*
*teshi*
*Sergentomyia anodontis*
*bailyi*
*barraudi*
*brevicaulis*
*dentata*
*hodgsoni*
*iyengari*
*sylvatica*

25 species of Thailand

- recent new species
- man biting species
- additional species
- new species
Sand fly feeding on a lizard at Wat Phrom Lok Cave
Man biting species: *P. major major*
Biting place: Entrance of a cave
Biting time: 1900-2100 h
Biting density: 2-3 bites/person/hour
Seasonal prevalence: absence during winter
Thank You