

Notes on the millipede fauna of the Phong Nha – Ke Bang region

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1. Introduction of the Phong Nha – Ke Bang region

The Phong Nha – Ke Bang region is located in the middle of the Annamite Mountain Range to the southwest of the Gianh River, and close to the Vietnam-Laos border to the west. The region shares the boundary with Hin Namno Nature Reserve of Laos to the west. Its location ranges from 17021'12" to 17039'44"N and 105057'53" to 106024'19"E.

The region consists of a core area of 85,754 ha and 10 communes of 203,245 ha that share their land boundaries with core zone. These are Hung Trach, Phuc Trach, Son Trach, Xuan Trach, Tan Trach, Thuong Trach and Phu Dinh (Bo Trach District), Thuong Hoa and Trung Hoa (Minh Hoa District), and Truong Son (Quang Ninh District).

The diversity of geology, geomorphology and landforms in Phong Nha - Ke Bang NP has caused corollary of the diversity of ecosystems such as land mountainous ecosystems, karst ecosystems and river ecosystems. Vegetation and habitats have been developed for a long time in those ecosystems. Forest cover of the Park is 93.57%, of which primary forest covers 83.74%. So that Phong Nha – Ke Bang NP has one of the highest percentage forest coverage of protected areas in Vietnam. The diversity of vegetation and habitat in this area causes high floral biodiversity. Preliminary surveys of the botanical diversity of Phong Nha – Ke Bang NP have been less than comprehensive. However, the results indicate a rich and diverse flora at Phong Nha – Ke Bang with the preliminary list of vascular plant standing at 193 families, 906 genera and 2,651 species. The extensive ecosystems with a high percentage of forest cover in the Park are excellent habitats for animals. Results of faunal surveys from 1991 to 2006 have identified 735 vertebrate species, comprising of 132 mammal species, 141 reptile and amphibian species, 338 bird species and 124 fish species. (Phong Nha – Ke Bang NP, 2007).



Figure 1: Limestone Mountains in Thuong Hoa commune, Minh Hoa District, Quang Binh Province, Vietnam

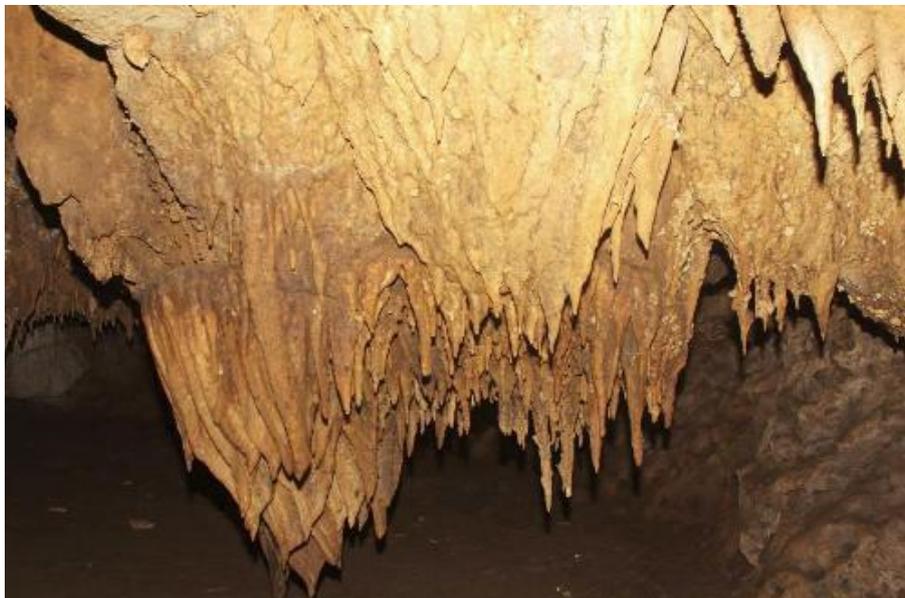


Figure 2: Humid cave in Thuong Hoa commune, Phong Nha-Ke Bang NP

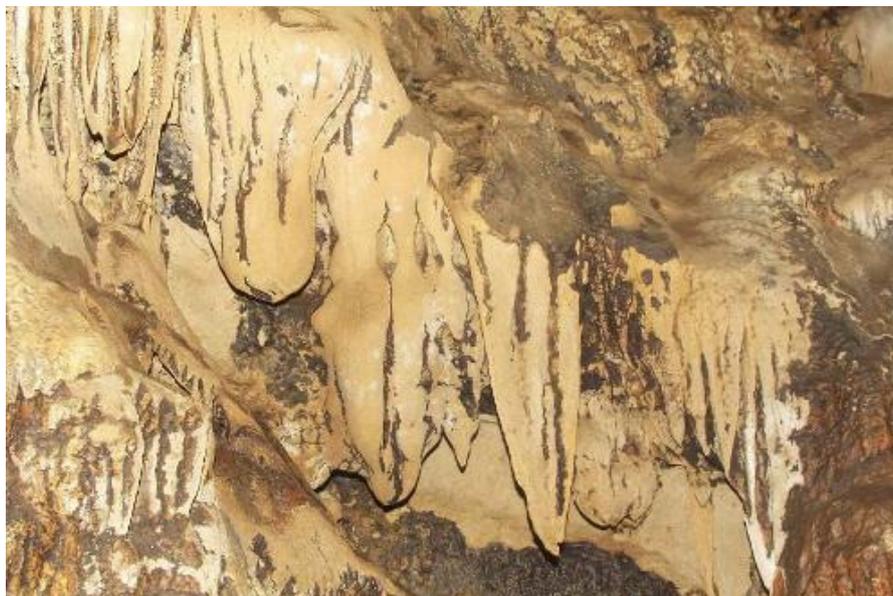


Figure 3: Dry cave in Thuong Hoa commune, Phong Nha-Ke Bang NP

2. Millipede fauna of the Phong Nha – Ke Bang region

The survey of millipede fauna has been conducted intensively in 12 caves, which are divided into wet caves and dry caves, in Thuong Hoa commune and on the road No.20 of Son Trach commune. The forest millipedes are also collected for comparing to the cave fauna, and for understanding biodiversity as well.

A total of 13 millipede species has been found in Phong Nha – Ke Bang region (Table 01). Among them, at least three species are cave-dwelling millipedes: *Sinocallipus sp* was found only in wet caves; both *Glyphiulus sp* and *Eutrichodesmus sp* were found in dry and wet caves. All of three are new species, and going to be described and published.

Table 1: Millipede species collected from Phong Nha-Ke Bang region

| No. | Species | Habitats |
|-----|---|-------------------|
| 1 | <i>Sin ocallipus sp.</i> | Wet caves |
| 2 | <i>Gly phiulus sp.</i> | Dry and wet caves |
| 3 | <i>Eut richodesmus sp.</i> | Dry and wet caves |
| 4 | <i>Sell anucheza hoffmani</i> Nguyen, 2011 | Forest |
| 5 | <i>Des moxytes enghoffi</i> Nguyen et al., 2005 | Forest |
| 6 | <i>Ort homorpha phongnha sp.nov.</i> | Forest |
| 7 | <i>Tyl opus sp.</i> | Forest |
| 8 | <i>Ano plodesmus sp.</i> | Forest |
| 9 | <i>Hel icorthomorpha holstii</i> (Pocock, 1865) | Forest |

| | | |
|----|--|--------|
| 10 | <i>Asi omorpha coarctata</i> (De Saussure, 1860) | Forest |
| 11 | <i>Nepalmatoiulus sp</i> | Forest |
| 12 | <i>Sphaerobelum sp.</i> | Forest |
| 13 | <i>Peplomeris sp.</i> | Forest |

Order CALLIPODIDA
Family Sinocalipodidae
Genus *Sinocallipus* Zhang, 1993
Sinocallipus sp



Note: The millipede of order Callipodida has been known as only predator among saprophagous millipedes. Members of this genus were previously known in Hai Phong and Quang Binh (Stoev & Enghoff, 2011). *Sinocallipus* species are only found in humid caves, so that they can be used as bio-indicator for assessing cave environment.

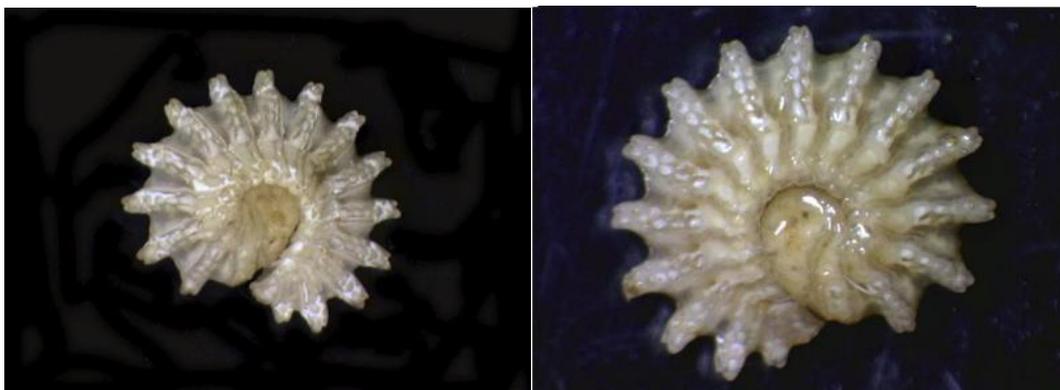
Order SPIROSTREPTIDA
Family Cambalopsidae
Genus *Glyphiulus* Gervais, 1847
Glyphiulus sp.



Note: The species have been recorded in almost all studied caves, both wet and dry caves. A group of *Glyphiulus* has been intensively studied in Vietnam and adjacent regions (Golovatch et al., 2007, 2011a, b), but only no species has been previously recorded in the Phong Nha – Ke Bang region.

One of congeners of the genus *Glyphiulus*, *Hypocambala oligotricha* Golovatch et al., 2011 was recently reported from Cha Lo of the Phong Nha – Ke Bang region (Golovatch et al., 2011c).

Order POLYDESMIDA
Family Haplodesmidae
Genus *Eutrichodesmus* Silvestri, 1910
Eutrichodesmus sp.



Note: To date, it is the first record of *Eutrichodesmus* species in the Phong Nha – Ke Bang region. This species has been found in both humid and dry caves, but more abundant in humid caves.

Family Paradoxosomatidae

Genus *Sellanucheza* Enghoff, Golovatch & Nguyen, 2004

***Sellanucheza hoffmani* Nguyen, 2011**



Note: The species is recently described from Lo Xo pass, and Phong Nha – Ke Bang region (Nguyen, 2012). Phong Nha-Ke Bang region seems to be the northern border of its distribution since its congeners, *Sellanucheza grandis* was found in Ha Tinh province, whereas it was not.

Genus *Desmoxytes* Chamberlin, 1923

***Desmoxytes enghoffi* Nguyen et al., 2005**



Note: The colourful species was recently described from Phong Nha – Ke Bang region. During the field survey, all records show that the species is very common in limestone forest.

Genus *Orthomorpha* Bollman, 1893

***Orthomorpha phongnha* sp.nov.**



Note: A new species of the genus *Orthomorpha* is described and will be published. The record of *Orthomorpha* species in Phong Nha – Ke Bang region has expanded distributional ranges of this genus in central Vietnam, since all *Orthomorpha* species have been only found in southern Vietnam, so far.

Genus *Tylopus* Jeekel, 1968

***Tylopus* sp.**



Note: The genus *Tylopus* is widely distributed in Vietnam, from northern to south central Vietnam (Nguyen, 2012). All of them are only found in primary or good forest. However, it is the first record of *Tylopus* species in the Phong Nha – Ke Bang region.

Genus *Helicorthomorpha* Attems, 1914

***Helicorthomorpha holstii* (Pocock, 1865)**



Note: The species, *Helicorthomorpha holstii* (Pocok, 1865), is widely distributed through Vietnam, and also pantropical.

Genus *Anoplodesmus* Pocock, 1895

Anoplodesmus sp.

Note: To date, there are three *Anoplodesmus* species to be found in northern and southern Vietnam. It is the first record of the genus in central Vietnam.

Genus *Asiomorpha* Verhoeff, 1939

Asiomorpha coarctata (De Saussure, 1860)

Note: The species, *Helicorthomorpha holstii* (Pocok, 1865), is widely distributed through Vietnam, and also pantropical.

Order JULIDA

Family Julidae

Genus *Nepalmatoiulus* Mauriès, 1983

Nepalmatoiulus sp.

Note: *Nepalmatoiulus* species have known to distribute on highlands of Vietnam (e.g. Sa Pa, Tam Dao...) since it is Palearctic animals. It is first time to record them in lowlands in central Vietnam.

Order SPHAEROTHERIIDA

Family Zephroniidae

Genus *Sphaerobelum* Verhoeff, 1924

Sphaerobelum sp.

Note: The species is very common and abundant in the Phong Nha- Ke Bang region.

Order GLOMERIDA
Family Glomerida
Genus *Peplomeris* Silvestri, 1917
Peplomeris sp.



Note: To date, *Peplomeris* species have been found in northern Vietnam. It is the first record of the genus in central Vietnam.

3. Evaluation of impacts of disturbance level on the cave millipede fauna

Because the survey was undertaken in a small number of caves, it is hard to give any conclusions regarding to impacts of disturbance on the cave fauna. However, based on field observations and research results, some notes are here given for further study:

- The cave with high disturbance level: some caves used to be home of local people (e.g. Bo Nun cave), or previous storage during the war time (e.g. Bay Tang cave). Such caves have been highly disturbed. Almost none of millipede has been collected in such caves.

- The cave with low disturbance level: Almost all dry caves have been disturbed, but not so much. Both *Glyphiulus sp* and *Eutrichodesmus sp* have been found in such caves, and with high number of individuals in some caves. Some caves are being exploited for tourism. Consequently, the tourism has strongly affected to millipede population, and may lead to the disappearance of cave millipedes.
- The cave without disturbance: Such caves are usually wet, and very hard to explore them. The species, *Sinocallipus sp*, has only been found in such caves. Millipedes are known as “short range – endemism” animals and easily vulnerable when their habitats are affected or changed.

4. Acknowledgments

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