Six New Species of Collembola in the Genera *Cyphoderopsis* and *Cyphoderus* of Thailand

แมลงหางดีดชนิดใหม่ 6 ชนิดในสกุล *Cyphoderopsis* และ *Cyphoderus* ของประเทศไทย

Sopark Jantarit (โสภาค จันทฤทธิ์)* Dr.Chutamas Satasook (ดร.จุฑามาส ศตสุข)**

Dr.Louis Deharveng (ดร.หลุยส์ ดีฮาร์เวง)***

ABSTRACT

The Collembola in genera *Cyphoderopsis* Carpenter, 1917 and *Cyphoderus* Börner, 1906 were studied throughout the country both cave and forest habitats. The results reveal that *Cyphoderopsis* Carpenter, 1917 is recorded for the first time in Southeast Asia, with four new species described from peninsular Thailand that is restricted to the South of the Isthmus of Kra. They are 1) *Cyphoderopsis phangnga* **sp. nov.**, 2) *Cyphoderopsis thachana* **sp. nov.**, 3) *Cyphoderopsis khaophang* **sp. nov.** and 4) *Cyphoderopsis cavicola* **sp. nov.** The genus *Cyphoderus* Börner, 1906 with two new species were described in Thailand, 1) *Cyphoderus songkhlaensis* **sp. nov.** and 2) *Cyphoderus khaochakanus* **sp. nov**.

บทคัดย่อ

การศึกษาแมลงหางดีดในสกุล *Cyphoderopsis* Carpenter, 1917 และสกุล *Cyphoderus* Börner, 1906 โดยเก็บตัวอย่างทั่วทั้งประเทศ ทั้งถิ่นอาศัยในถ้ำและป่า ผลการศึกษาพบว่า แมลงหางดีดใน สกุล *Cyphoderopsis* Carpenter, 1917 ถูกค้นพบครั้งแรกในเอเชียตะวันออกเฉียงใต้ และเป็นชนิดใหม่จำนวน 4 ชนิด จากคาบสมุทรไทย โดยมีขอบเขตการแพร่กระจายอยู่เฉพาะภาคใต้ทางตอนล่างของคอคอดกระเท่านั้น คือ ชนิด1) *Cyphoderopsis phangnga* **sp. nov.** 2) *Cyphoderopsis thachana* **sp. nov.** 3) *Cyphoderopsis khaophang* **sp. nov.** และ 4) *Cyphoderopsis cavicola* **sp. nov.** และพบแมลงหางดีดในสกุล *Cyphoderus* Börner, 1906 ชนิดใหม่ 2 ชนิด คือ 1) *Cyphoderus songkhlaensis* **sp. nov.** และ 2) *Cyphoderus khaochakanus* **sp. nov**.

Key Words: Collembola, New species, Isthmus of Kra

คำสำคัญ: แมลงหางดีด สิ่งมีชีวิตชนิดใหม่ คอคอดกระ

* *Student, Doctor in Philosophy Program in Biology, Faculty of Science, Prince of Songkla University*

** *Associate Professor, Department of Biology, Faculty of Science, Prince of Songkla University*

*** *Origine, Structure et Evolution de la Biodiversité, Museum National d'Histoire Naturelle*

Introduction

Soil animal communities have the most remarkable biodiversity and abundance reservoirs in terrestrial biota (Decaëns *et al*., 2006). Collembola (Springtails) are among the most widespread, extremely abundant terrestrial arthropods on earth and play an important role in almost all terrestrial ecosystems (Hopkin, 1997; Rusek, 1998). Globally, ca. 8,000 species have been described and many are expected to be discovered as new to science. Thailand is one of the "hotspot" areas for biodiversity and expected to sustain countless undescribed species.

Surveys of the recent study revealed that Collembola in the genus *Cyphoderopsis* and *Cyphoderus* were the dominant group in both cave and forest environments (Jantarit *et al*., 2013; 2014). Unfortunately, research on Collembola in Thailand has seldom been carried out. Approximately 100 species were recorded and most researches have been carried out primarily on groups from the northern part of the country. Most intensive studies have been conducted over the past two decades and the knowledge domain is fragmented. Hence, the species richness, taxonomic and biogeographic study is poorly known. The gap of knowledge opens up an avenue for the study of this work.

Objectives of the study

To elucidate the taxonomic problems of the Collembola in genera *Cyphoderopsis* and *Cyphoderus* and introduce the new species.

Methodology

Collembola individuals were collected throughout Thailand from both forest and cave habitats. A total of, 33 places in 23 provinces were sampled (Fig. 1). The specimens were collected by visual searching, pitfall traps, and Berlese funnel extractions. All specimens were kept in 90% ethanol and the collembola were sourced and mounted on microscope slides in Marc Andre II medium after clearing in lactic acid. Powerful morphological characters were examined for identification for example an arrangement of chaetae on all antenna segments both dorsal and ventral side; morphological characters of antennal chaetae; outer maxillary lobe; maxilla head and ventral complex of the labrium; mandible; labial palp; labrum; chaetotaxy of labial basis; frontal chaetae and pseudopore of head; dorsal head chaetotaxy; morphological chaetae of tergites; dorsal tergites chaetotaxy; trichobothrial complex of Abd.II, III, IV; chaetae of furca; morphological scale of furca; trochanteral organ; claw and distal part of tibiotarsus; tenaculum; anterior face of the ventral tube; posterior face of the ventral tube; furca; mucro and genital plate both male and female. Morphological characters were studied using Leica DMLB microscope. Figures were improved with Photoshop CS5/PC (Adobe Inc.).

Results

The results reveal that the genus *Cyphoderopsis* Carpenter, 1917 is recorded for the first time in Southeast Asia, with four new species described from peninsular Thailand. They are 1) *Cyphoderopsis phangnga* **sp. nov.** from forest litter in Muang District, Phangnga Province 2) *Cyphoderopsis thachana* **sp. nov.** from Tham Yai, Tha Chana District, Surat Thani Province 3) *Cyphoderopsis khaophang* **sp. nov.** and 4) *Cyphoderopsis cavicola* **sp. nov.** from Khao Phang cave, Pha Nom District, Surat Thaini Province (details in a taxonomic pattern are provided in Jantarit *et al*, 2013). This genus is shown to be restricted to the South of the Isthmus of Kra and never presented above this zoological boundary. The genus

Cyphoderus Börner, 1906 with two new cave species was described in Thailand. There are 1) *Cyphoderus songkhlaensis* **sp. nov.** from Tham Khao Nui, Rattaphum District, Songkhla Province and 2) *Cyphoderus khaochakanus* **sp. nov**. from Tham Meud, Khao Chakan District, Sa-Kaeo Province (details in a taxonomic pattern are provided in Jantarit *et al*, 2014). This genus is ubiquitous and commonly known as myrmecophilous or termitophilous species.

Key to Thai species of the genus *Cyphoderopsis* and *Cyphoderus*

1. Dens with two rows of dental spines……2

- Dens with two rows of feather scales…..…….……5

2. Tenent hairs of tibiotarsi thick and clavate; claw with two inner teeth..... *Cyphoderopsis khaophang* **sp. nov.**

- Tenent hairs of tibiotarsi thin, smooth and acuminate……..3

3. Th.II with 3 macrochaetae; claw with one inner tooth…….....*Cyphoderopsis cavicola* **sp. nov.**

- Th.II with 4 macrochaetae…….……4

4. Ventral tube with 3+3 macrochaetae anteriorly; claw with one inner tooth…..... *Cyphoderopsis phangnga* **sp.nov.**

- Ventral tube with 4+4 macrochaetae anteriorly; claw with two inner teeth..... *Cyphoderopsis thachana* **sp.nov.**

5. Claw with 1 inner tooth..... *Cyphoderus songkhlaensis* **sp.nov.**

- Claw with 2 inner tooth..... *Cyphoderus khaochakanus* **sp.nov.**

Discussion and Conclusions

The genus *Cyphoderopsis* with four species are described in this work, all from Southern Thailand. The genus *Cyphoderopsis* are documented only in the Paleotropical region from Africa to tropical Asia, and from southern Thailand to Sumatra, but rather patchily, exclusively south of Kra isthmus. 10 species are recognized. This is the first *Cyphoderopsis* from Southeast Asia and restricted to the South of the Isthmus of Kra providing a strong support to the importance of the Isthmus of Kra as a major faunal transition zone. With regard to genus *Cyphoderus*, it is a ubiquitous distribution. They were recorded in most continents except Antarctica and North America. They at present includes 62 species worldwide, most of which are distributed in the South-East Asia (Vietnam, Myanmar downward to Thai-Malay peninsula, Indonesia and Philippines. While the two new species of genus *Cyphoderus* are described from cave as well suggesting that many more species may exist in the highly fragmented karsts in Thailand.

Acknowledgements

This study was supported by the Graduate School, Prince of Songkla University (PSU) and the Science Achievement Scholarship of Thailand (SAST).

References

Decaëns, T., Jiménez, JJ., Gioia, C., Measey, GJ. and Lavelle, P. 2006. The values of soil animals for conservation biology. European Journal of Soil Biology. 42: S23-S38.

Hopkin, SP. 1997. Biology of the springtails (Insecta: Collembola). Oxford University Press.

Jantarit, S., Satasook, C., and Deharveng, L. 2013. The genus *Cyphoderopsis* Carpenter in Thailand and the faunal transition at the Isthmus of Kra among Troglopedetinae (Collembola: Paronellidae). Zootaxa. 3721 (1): 049-070.

Jantarit, S., Satasook, C., and Deharveng, L. 2014. *Cyphoderus* (Cyphoderidae) as a major component of collembola cave fauna in Thailand, with description of two new species. ZooKeys. 368: 1-21.

Rusek, J. 1998. Biodiversity of Collembola and their functional role in the ecosystem. Biodiversity and Conservation. 7: 1207–1219.

Figure 1. Sampling location of Collembola in Thailand.

Black circles = genus *Cyphoderopsis*; C1, *Cyphoderopsis phangnga* **sp. nov.** ; C2, *Cyphoderopsis thachana* **sp. nov.**; C3, *Cyphoderopsis khaophang* **sp. nov.** and 4) *Cyphoderopsis cavicola* **sp. nov.**

Red-half circles = with genus *Cyphoderus*; C4, *Cyphoderus songkhlaensis* **sp. nov.**; C5, *Cyphoderus khaochakanus* **sp. nov**.

Empty blue circles = without population of the genus *Cyphoderopsis* and *Cyphoderus*