



The First Description of the Larva of *Neoperla gordonae* Stark, 1983 and Redescription of *Cryptoperla meo* Stark, 1989 from Huai Nam Dung National Park, Thailand.

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ABSTRACT

The larva of *Neoperla gordonae* Stark, 1983 has not been described in previous studies, and some characteristics of *Cryptoperla meo* Stark, 1989 in the larva stage do not resemble the previous descriptions. Therefore, the purpose of this study was to describe the morphological characteristics of the larva stage of *Neoperla gordonae* and *Cryptoperla meo* from Huai Nam Dung National Park, Thailand. The larvae of *Neoperla gordonae* were collected from two streams of Huai Nam Dung National Park: Huai Hea and Mae Yen Streams, whereas the larvae of *Cryptoperla meo* were collected from three streams: Nam Dung, Mae Jok, and Mae Ping Streams. The larvae of the two species were reared and emerged in the laboratory, that both larvae and adults could be used for the purpose of identification.

Keywords: *Neoperla gordonae*, *Cryptoperla meo*, descriptions, Huai Nam Dung National Park

1. INTRODUCTION

Peltoperlidae (roach-like stonefly) is a small family of Plecopterans. They prefer to live among leaf packs and detritus accumulations because the large larvae feed as shredders [1]. Most of the previous researches studies and reports on the Peltoperlidae have been recorded in the Palearctic, North America, and Asia [2, 3].

The previous studies of the Peltoperlidae of Thailand have been revised by Kawai [4], and Stark and Sivec [3]. Two genera of Peltoperlidae were recorded in Thailand; consisting of *Peltoperlopsis* and *Cryptoperla*. Nevertheless, the limited quantity of data on

Thai Plecopteran has made it difficult to estimate the exact number of species. The larva of *Cryptoperla meo* was described by Stark [2]. However, some morphological characteristics of the previous descriptions do not resemble the specimens that have been found from the streams of Mae Hong Son Province, Thailand.

Neoperla is a genus of the family Perlidae. They originated in the oriental region [5], and they are indigenous to tropical areas [6]. Several previous studies on *Neoperla* in Thailand have revealed that twelve species of *Neoperla* were identified, including *Neoperla microtumida*

[7], *N. mnong* [7], *N. distincta* [8, 9], *N. fallax* [8], *N. labu* [10], *N. gordonae* [6, 9, 10], *N. thai* [10], *N. leptophallus* [6], *N. saraburi* [6], *N. serrata* [6], *N. asperata* [6, 9], and *N. banksi* [6, 9, 11].

The larvae of *Neoperla* were simply identified to the genus level, but several species remain undescribed [12]. In this study, the larvae of *Neoperla* were reared under laboratory conditions, the larva can be associated with adults and then both larvae and adults can be used for the purpose of identification [13].

The purpose of this study was to describe the morphological characteristics of the larva stage of *Neoperla gordonae* and to redescribe the larva of *Cryptoperla meo* from Huai Nam Dung National Park, Thailand

2. MATERIALS AND METHODS

2.1 Study Area

Nam Dung Stream, Mae Jok Stream, and Mae Ping Stream, which are the mountain streams of Mae Hong Son Province, Thailand, were selected as sample collecting areas. Many larvae of *Cryptoperla meo* have been used for the purpose of re-description and illustration. Mae Ping Stream is located in Pai District, Mae Hong Son Province at approximately 19°18.422' N, 98°35.627' E, and is 1,397 m above sea level. It is the headwater of the Mae Ping River. It flows through forested areas. Mae Jog Stream is located in Mae Taeng District, Chiang Mai Province at approximately 19°16.827' N, 98°37.024' E, and is 1,210 m above sea level. It is the tributary of the Mae Taeng River. Nam Dung Stream is located in Pai District, Mae Hong Son Province at approximately 19°19.370' N, 98°37.224' E, and is 1,163 m above sea level. It originated from the Nam Dung Waterfall. It flowed through forested areas, and drains to the Pai River. All three streams were the undisturbed streams in terms

of human activity.

The larvae of *Neoperla gordonae* were collected from two streams of Huai Nam Dung National Park, Thailand. Huai Hea Stream is located at 19°29.902' N, 98°30.574' E and is 662 m above sea level. This stream is the tributary of the Pai River, Pai District, Mae Hong Son Province. Mae Yen Stream is located at 19°21.722' N, 98°27.841' E and is 539 m above sea level. This stream originated from the Mae Yen Waterfall, Pai District, Mae Hong Son Province.

2.1 Sampling and Identification

The larvae materials were randomly collected by kick and pick sampling techniques from riffle habitats in each study area. All larvae were put into the plastic box, which remained aerated at all times. Then, the specimens were immediately transported to the laboratory.

All larvae were classified using the differences of morphotaxa, and the morphological characteristics were described. The mature larvae in each taxa were then reared in the glass box (30×20×20 cm), which was covered by fabric mesh, under natural photoperiod with full aeration.

The emergent adults were stored in 70% ethyl alcohol, and identified using available keys [2, 14, 15].

All specimens were deposited at Freshwater Biomonitor Research Laboratory (FBRL), Department of Biology, Faculty of Science, Chiang Mai University.

3. RESULTS

3.1 *Neoperla gordonae* Stark, 1983

Larva: Biocellate. Large Ocelli. Body length 3.2-11.5 mm. General color pale brown to golden. Distinct dark band on the labrum, labium with deep notch, labial palps slender, and paraglossa extending beyond glossa. Margin of thoracic tergum segment 1-3,

anterior margin of every abdomen (Figure 1A), and the outer margin of femur (Figure 2). Among the family Perlidae, all species had thoracic gills. (Figure 1B). Metathorax had two pairs of posterior supracoxal gills. Elevated occipital ridge extending near ocelli. Without row of stout bristles on occipital. (Figure 3). Usually numerous dark hairs on head, thoracic tergum, abdominal. Posterior of abdominal terga with mostly short setae (Figure 4). Posterior of abdomen sterna with row of

short setae but continuous only at segment 8-10 (Figure 5). Anal gills present (Figure 1A). Lateral pronotal margin with an interrupted fringe of bristles; the fringe of bristles usually found at the corner of pronotum (Figure 6).

Outer margin of femur and tibia with row of setae; inner margins of femur and tibia with long hairs (Figure 2). Femur and tibia with numerous dark hairs. Cerci with irregular row of setae on basal segment, and without fringe of long setae (Figure 7).

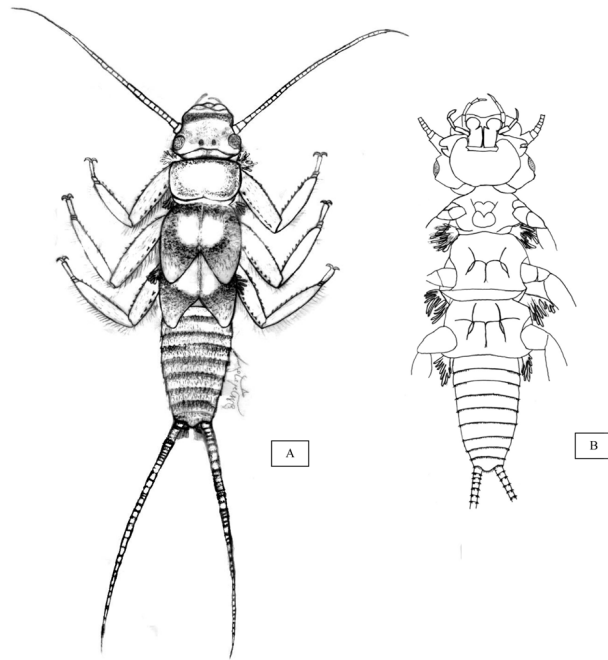


Figure 1. *Neoperla gordonae*, A. dorsal view; B. ventral view.

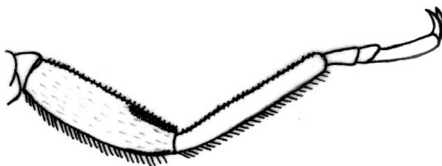


Figure 2. Leg of *Neoperla gordonae*.

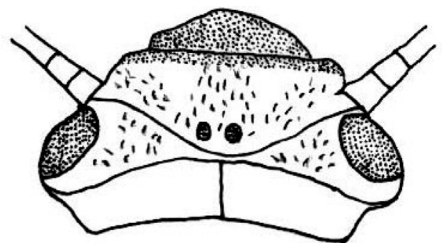


Figure 3. Head of *Neoperla gordonae*.



Figure 4. Abdominal tergum of *Neoperla gordonae*.

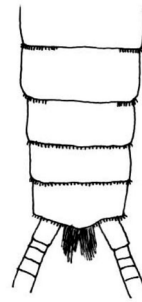


Figure 5. Abdominal sternum of *Neoperla gordonae*.

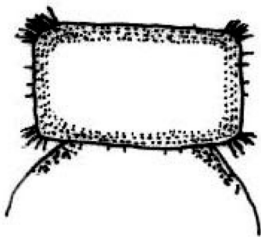


Figure 6. Prothorax of *Neoperla gordonae*.



Figure 7. Cerci of *Neoperla gordonae*.

Material examined: Thailand: Huai Nam Dung National Park, Huai Hea Stream, 662 m, 19°29.902' N, 98°30.574' E, 21 December 2011, R. Jaihao, 16 larvae. 4 B&X, 7 @& (emerged in laboratory).

Mae Yen Stream, 539 m, 19°21.722' N, 98°27.841' E, 4 February 2012, R. Jaihao, 21 larvae. 7 B&X, 11 @& (emerged in laboratory).

Distribution: Nakhon Si Thammarat Province [9], Wannaset Stream, Pakthongchai, Nakhon Ratchasima [10], Nam Nao National Park [10], Khao Yai National Park [16], Thong Pha Phoom forest, Kanchanaburi Province [11].

Remark: this species is a member of the complex that included *katmanduana* [17], *kachin* [18], *siveci*, *tortipenis*, and *asperipenis* [19].

3.2 *Cryptoperla meo* Stark, 1989

Larva: Biocellate. Body length 2.3-5.5 mm. General color pale brown to dark brown with distinct pale spots on thorax

and abdomen. Head: very small and it looks to be fused with prothorax (Figure 8A). Paraglossae and glossae subequal in length. Posterior infracoxal gills absent at the thoracic segment 1-3; Posterior supracoxal gills absent on first thoracic segment, but on thoracic segment 2-3 single (Figure 9). Thorax nearly glabrous but usually numerous pale hairs on abdominal terga. Posterior of abdominal terga with mostly short setae. Anterior margin of prosternum with row of setae. Femur without row of bristle; inner margins of femur and tibia with long hairs. Paraproct apices elongated into anal gills, and with row of setae on paraproct plates (Figure 10). Cerci without fringe of long hairs, and having length of more than half of abdomen. Pro and mesosternal plates with three fringe rows near posterior angles; metasternum truncate posteriorly and completely fringed; short metasternal intercalary setal rows near coxal base (Figure 8B).

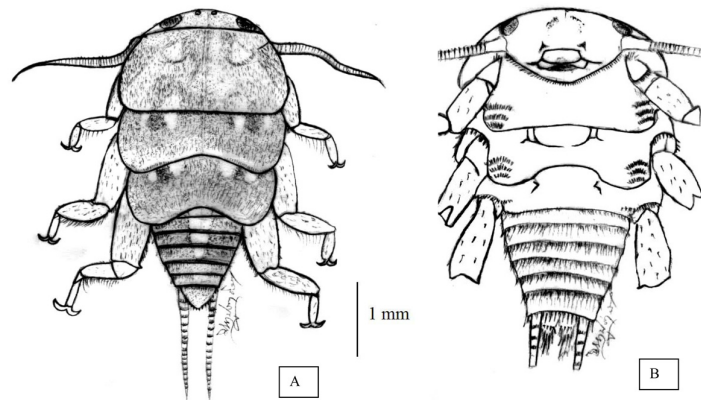


Figure 8. *Cryptoperla meo*, A. dorsal view; B. ventral view.

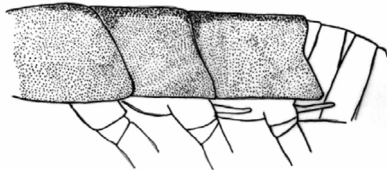


Figure 9. Thoracic gills of *Cryptoperla meo* (lateral).

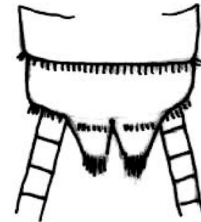


Figure 10. Paraproct of *Cryptoperla meo* (ventral).

Material examined: Thailand: Huai Nam Dung National Park, Mae Ping Stream, 1,397 m, 19°18.422' N, 98°35.627' E, 21 December 2011, R. Jaihao, 19 larvae. 5 B&, 4 @& (emerged in laboratory). Mae Jog Stream, 1,210 m, 19°16.827' N, 98°37.024' E, 2 December 2011, R. Jaihao, 11 larvae. 3 B&, 1 @& (emerged in laboratory). Nam Dung Stream, 1,163 m, 19°19.370' N, 98°37.224' E, 2 December 2011, R. Jaihao, 9 larvae. 1 B&, 1 @& (emerged in laboratory).

Distribution: Fang, Chiang Mai Province [2].

Remark: Larvae were unique among known peltoperlids in having three rows of sternal setae. The color and pattern of body of previous report was different from this report. The previous report of *Cryptoperla meo* showed that general color dark brown without conspicuous pattern. While, this report

showed that general color pale brown to dark brown with distinct pale spots on thorax and abdomen.

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