

GENUS *Protanilla* TAYLOR, 1990 (HYMENOPTERA: FORMICIDAE: LEPTANILLINAE) FROM SUMATRA, WITH THE DESCRIPTION OF A NEW SPECIES

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ABSTRACT

We herein report the first record of the genus *Protanilla* Taylor, 1990 from Sumatra, Indonesia. A new species of this genus is described and illustrated based on the worker caste under the name *Protanilla eguchii* sp. nov. This species was collected from the leaf-litter layer in a highland forest in West Sumatra Province. This species is discriminated well from the other named congeners by a combination of the following characteristics: body uniformly reddish yellow, with antenna and legs paler; relatively large in size; head in full-face view with posterior margin almost straight, and anterolateral corner not forming a distinct, tooth-like prominence; antennal scape long, slightly exceeding posterior margin of head; antennal segments 2–3 somewhat conical and longer than wide; antennal segments 4–11 nearly as long as wide; petiole in lateral view with its ventral outline of subpetiolar process sinuate. An update information is also given to the worker-based key to the species of the genus *Protanilla*.

Keywords: Ant, alpha-taxonomy, Indonesia, highlands, new species

ABSTRAK

Semut genus *Protanilla* Taylor, 1990 dilaporkan pertama kali dari Sumatra, Indonesia. Spesies baru dari genus ini diperihalkan dan diilustrasikan berdasarkan kasta pekerja dengan nama *Protanilla eguchii* sp. nov. Spesies ini dikumpulkan dari serasah daun di hutan dataran tinggi di Provinsi Sumatera Barat. Spesies ini dibezakan dengan spesies lain dari gabungan ciri berikut: tubuh berwarna kuning kemerahan, dengan antena dan kaki lebih pucat; ukurannya relatif besar; margin posterior dari kepala hampir lurus, dan sudut anterolateral tidak membentuk benjolan seperti gigi; antenal skapus panjang, sedikit melebihi margin posterior kepala; segmen antena ke-2 dan ke-3 agak berbentuk kon, dengan ukuran lebih panjang dari

lebar; antena segmen ke-4 sampai ke-11 dengan ukuran yang sama antara panjang dan lebar; petiol dilihat dari sisi lateral dengan garis ventral dari subpetiolar proses sinuate. Penambahan maklumat juga diberikan pada kekunci pengecaman spesies bagi genus *Protanilla* berdasarkan kasta pekerja.

Kata Kunci: Semut, taksonomi alpha, Indonesia, dataran tinggi, spesies baru

INTRODUCTION

The ant genus *Protanilla* Taylor, 1990 is characterized by its fully exposed antennal sockets in full-face view; clypeal disc trapezoidal, raised and flattened, and margined laterally with a sharp edge; inner surface of mandible with peg-like teeth; promesonotal suture present and flexible (Eguchi et al. 2014). This genus distributed across the Indo-Malayan, Warm-temperate Palaearctic, Australasian and southern-Paleotropical regions of the world (Janicki et al. 2016). A total 13 valid species was described, and no records of this genus in Sumatra (Antwiki 2022). The *Protanilla* spp. were known by its cryptic and hypogeaic life style which makes them rarely collected.

In the course of our inventory and taxonomic studies of ants in Sumatra, Indonesia, we have described new species and recorded species new to Sumatra (Musfira et al. 2022; Satria et al. 2015; Satria et al. 2017; Satria & Yamane 2019; Satria & Herwina 2020; Satria & Jannatan 2021; Satria et al. 2022; Satria & Eguchi 2022). We herein report the new discover of the genus *Protanilla* from Sumatra and described a new species of this genus. This new species were collected by using winkler extraction method in the highlands of Sumatra. An update is also given to the worker-based key to Asian species of this genus.

MATERIALS AND METHODS

Insect Specimens

The present study was conducted based on the materials from Sumatra (for details of the materials see the species accounts). Abbreviations of specimen depositories are as follows. RSC, Collection managed by Rijal Satria, Universitas Negeri Padang, Padang, West Sumatra, Indonesia. MZB, Bogor Zoological Museum, Bogor, Indonesia; RSC, Collection managed by Rijal Satria, Department of Biology, Faculty of Mathematics and Natural Sciences, Universitas Negeri Padang, West Sumatra, 35171, Indonesia.

Species Identification

The identification was conducted by using a Nikon SMZ1270 stereo microscope in Ecology Laboratory, Department of Biology, Faculty of Mathematics and Natural Sciences, Universitas Negeri Padang, Padang, Indonesia. All specimens were morphologically identified by using the species level identification keys which are provided by Hsu et al. (2017) and Baidya & Bagchi (2020).

Species Description

The morphological terminology follows Xu (2012), Hsu et al. (2017) and Baidya & Bagchi (2020).

Imaging of the Specimens

Multi-focused montage images were produced using Helicon Focus Pro. (Helicon Soft Ltd., <http://www.heliconsoft.com/>) from a series of source images taken by a Canon EOS KissX5

digital camera attached to a Nikon SMZ1270 stereomicroscope. Artifacts/ghosts and unnecessary parts (such as unfocused appendages, insect pin) surrounding or covering target objects were erased and cleaned up using the retouching function of Helicon Focus Pro, and the color balance, contrast and sharpness were adjusted using Adobe Photoshop CS6.

Measurements of the Specimens

The following parts of the bodies were measured using ImageJ 1.49m (National Institute of Mental Health, USA, available at <http://imagej.nih.gov/ij/>) based on the photographs taken using a Canon EOS KissX5 digital camera attached to the Nikon SMZ1270 stereomicroscope under suitable magnifications. Measurements and morphological terminology follow Bolton (1990) and Hsu et al. (2017).

Abbreviations of measurements and indices are as follows: TL, total body length excluding mandibles, roughly measured with an ordinary ruler; HL, maximum length of head in full-face view, measured from the midpoint of a line drawn across the anteriormost points of clypeus to the midpoint of posteriormost points of head; HW, maximum width of head in full-face including eyes; SL, maximum length of antennal scape excluding the basal condylar bulb; ML, maximum length of mandible measured from mandibular insertion to apicalmost point of mandible; PW, maximum width of pronotum measured in dorsal view; WL, maximum diagonal length of mesosoma from the anterior most point of pronotal slope (excluding neck) to the posteroventral margin of the propodeal lobe in lateral view; PNL, maximum longitudinal length of the petiolar node, excluding its anterior and posterior peduncles in lateral view; PNH, maximum vertical height of petiolar node from summit to lowermost part of subpetiolar process in lateral view; PNW, maximum width of petiolar node in dorsal view; PPNL, maximum longitudinal length of postpetiolar node, excluding its anterior and posterior peduncles in lateral view; PPNH, maximum vertical height of postpetiolar node from summit to lowermost part of subpetiolar process in lateral view; PPNW, maximum width of postpetiolar node in dorsal view; CI = $HW/HL \times 100$; SI = $SL/HW \times 100$.

RESULTS

Taxonomy

Protanilla eguchii sp. nov. (Figure 1-2)



Figure 1. *Protanilla eguchii* sp. nov., holotype, worker (individual code: SEMUT-13viii22A, colony code: SAGO-4viiI): A — head in full-face view; B — habitus in profile

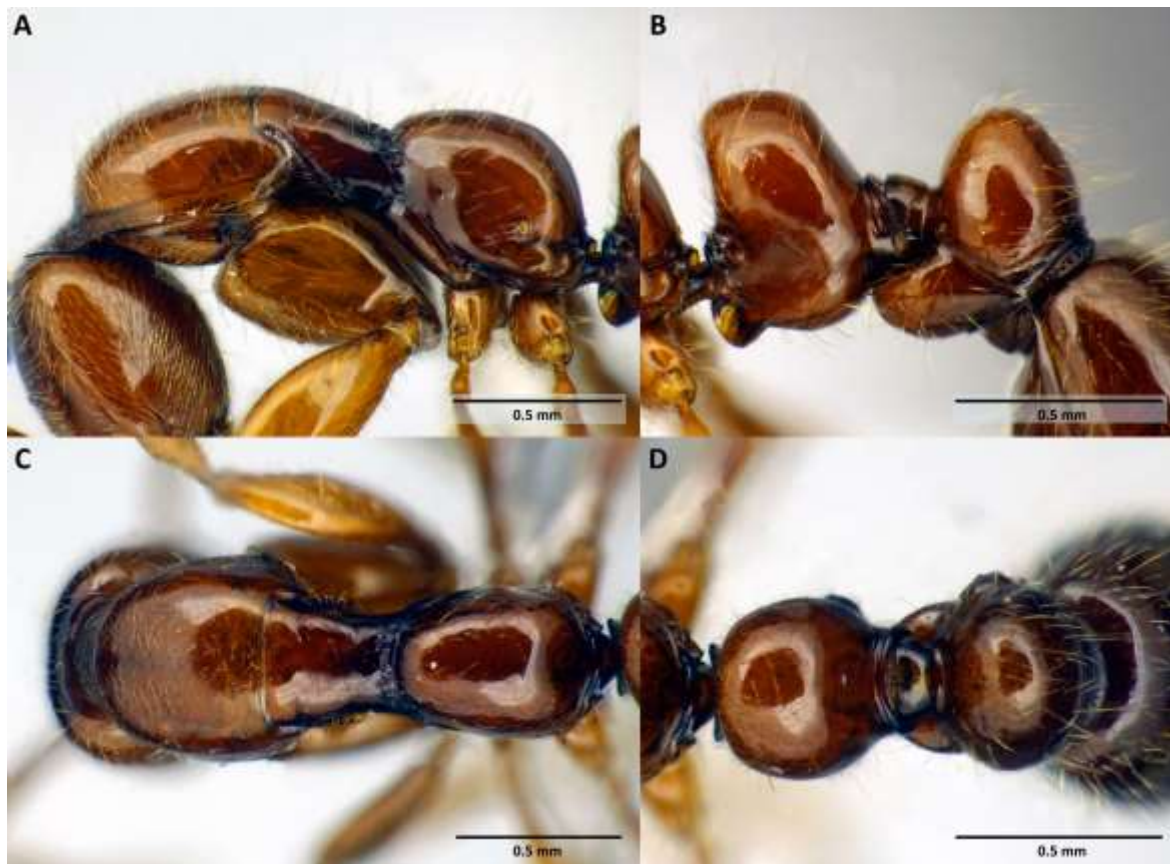


Figure 2. *Protanilla eguchii* sp. nov., holotype, worker (individual code: SEMUT-13viii22A, colony code: SAGO-4viiI): A — mesosoma in lateral view; B — petiole and postpetiole in lateral view; C — mesosoma in dorsal view; D — petiole and postpetiole in dorsal view

Holotype

INDONESIA: West Sumatra: 50 Kota District, Situjuah Limo Nagari, Situjuah Banda Dalam, Sago Mountain, -0.321152° , 100.660902° , ca. 1500 m alt., 4/vii/2022, R. Satria Leg., worker, individual code: SEMUT-13viii22A, colony code: SAGO-4viiI, (MZB).

Paratypes

INDONESIA: West Sumatra: 50 Kota District, Situjuah Limo Nagari, Situjuah Banda Dalam, Sago Mountain, -0.321152° , 100.660902° , ca. 1500 m alt., 4/vii/2022, R. Satria Leg., 5 workers (SEMUT-21ix22A, SEMUT-21ix22B, SEMUT-21ix22C, SEMUT-21ix22D, SEMUT-21ix22E), colony code: SAGO-4viiI, (RSC).

Worker Diagnosis

Body uniformly reddish yellow, with antenna and legs paler, relatively large in size (TL 5.15–5.47 mm); head in full-face view with posterior margin almost straight, and anterolateral corner not forming a distinct, tooth-like prominence; antennal scape long, slightly exceeding posterior margin of head; antennal segments 2–3 somewhat conical and longer than wide; antennal segments 4–11 nearly as long as wide; petiole in lateral view with its ventral outline of subpetiolar process sinuate.

Worker Measurements and Indices

Holotype (n=1): TL 5.35 mm, HL 1.04 mm, HW 0.84 mm, ML 0.51 mm, SL 0.86 mm, PW 0.60 mm, WL 1.60 mm, PNL 0.45 mm, PNH 0.63 mm, PNW 0.45 mm, PPNL 0.40 mm, PPNH 0.63 mm, PPNW 0.49 mm, CI 80, SI 102. Paratypes (n=2): TL 5.15–5.47 mm, HL 1.02–1.04 mm, HW 0.82–0.83 mm, ML 0.50–0.53 mm, SL 0.86 mm, PW 0.60–0.61 mm, WL 1.60–1.61 mm, PNL 0.46 mm, PNH 0.64–0.65 mm, PNW 0.45 mm, PPNL 0.40 mm, PPNH 0.64 mm, PPNW 0.49 mm, CI 102, SI 104.

Worker Description

Relatively large (TL 5.15–5.47 mm). Head in full-face view subrectangular, longer than wide and slightly narrower anteriorly, with posterior margin almost straight; lateral margins of head weakly convex; anterolateral corner not forming a distinct, tooth-like prominence. Eyes absent. Clypeus roughly trapezoidal, with anterior margin weakly concave. Mandibles long and triangular; masticatory margin slightly crenulate, with approximately more than 20 peg-like teeth; mandible in lateral view strongly down-curved apically; dorsolateral surface of mandible with a longitudinal groove. Antennae 12-segmented; scape long, slightly exceeding posterior margin of head; segments 2–3 somewhat conical and longer than wide; segments 4–11 nearly as long as wide; apical segment twice as long as wide. Mesosoma in lateral view relatively slender. Pronotum in dorsal view round, 1.5 times as broad as mesonotum, approximately twice as long as mesonotum; dorsal outline of pronotum in lateral view gently convex. Promesonotal suture distinct dorsally and laterally. Mesonotum in lateral view with its dorsal outline almost straight and sloping downwards, in dorsal view constricted, 0.5 times as wide as pronotum. Metanotal suture strongly notched. Dorsal outline of propodeum convex with anterodorsal corner rounded; propodeal spiracle circular and small, lower down on the side. Metapleural bulla elongate and roughly elliptical, close to spiracle. Petiolar node in dorsal view broader than long, slightly widened backward, with lateral sides weakly convex; petiolar node in lateral view with anterior and posterior outlines both straight and dorsal outline slightly convex. Subpetiolar process in lateral view with ventral outline sinuate (Figure 2B); anteroventral corner bluntly prominent, with circular semi-transparent fenestra. Postpetiolar node in dorsal view approximately as broad as long, weakly widened backward, with lateral sides, in lateral view with anterior and posterior outlines roundly convex. Gaster in dorsal view oval, strongly constricted at the base; length of tergite I more than half the length of gaster. Sting well developed.

Mandibles, head, and body smooth and shining. Dorsum of head, mesosoma, petiolar node, post-petiolar node and gaster, with short pubescence. Entire body covered sparsely with suberect hairs. Body uniformly reddish yellow; with antenna and legs paler (Figure 1-2).

Distribution

So far known only from the type locality.

Remarks

Protanilla eguchii sp. nov. is morphologically most similar to *P. tibeta* Xu (2012), among the species known from the Asia. However, it is distinguishable from the latter by the following characteristics of the worker: body relatively large with TL 5.15–5.47 mm (vs. relatively small in the latter with TL 2.7 mm); head in full-face view with anterolateral corners not forming a distinct, tooth-like prominence (vs. forming a distinct, tooth-like prominence in the latter); head in full-face view with posterior margin almost straight (vs. weakly concave in the latter); subpetiolar process in lateral view with its ventral outline sinuate (vs. almost straight in the latter). *Protanilla eguchii* sp. nov. can be easily distinguished from *Protanilla rafflesi* which

is only species recorded in Indo-Malayan Subregion previously, by using the following characteristics of the worker: body relatively large with TL 5.15–5.47 mm (vs. relatively small in the latter with TL 2.7 mm); head in full-face view with posterior margin almost straight (vs. weakly concave in the latter); dorsal outline of propodeum convex (vs. straight in the latter); petiolar node in lateral view with anterior outline straight (vs. concave in the latter).

Bionomics

Scant information is available about the biology of this species. The type series of this species was collected from leaf litter in a primary highland forest. The queen and male of this species are unknown.

Etymology

The species epithet *eguchii* is derived from a Japanese entomologist, Dr. Katsuyuki Eguchi, Associate professor of Tokyo Metropolitan University, whose contribution to entomology and taxonomy in Asia has been widely appreciated.

Update of the Key to Asian *Protanilla* Species Based on the Worker Caste

The key given in Baidya & Bagchi (2020) was modified as below to add *P. eguchii* sp. nov.

1. Mandibles with a large convex dorsal lamella and a large longitudinal groove on outer surface..... ***P. izanagi*** (Japan)
 - Mandibles thin, long and narrowly triangular, without a dorsal lamella; with or without a groove on outer surface.**2**
2. Lateral or ventral margin of mandibles with 1–2 denticles. Postpetiole broadly attached to abdominal segment IV.**3**
 - Lateral and ventral margin of mandibles smooth, without denticle. Postpetiole narrowly attached to abdominal segment IV.**4**
3. Ventral faces of mandibles with only one inconspicuous denticle. Anterior margin of abdominal segment IV in dorsal view slightly concave. Side of abdominal segment IV with a deep and narrow notch between the tergite and sternite at the anterior margin. In profile view, postpetiolar sternite nearly straight, and anterior corner forming a right angle.***P. jongi*** (Taiwan)
 - Lateroventral margins of mandibles armed with 2 distinct teeth (one long and one short). Anterior margin of abdominal segment IV in dorsal view deeply concave. Side of abdominal segment IV without a deep and narrow notch between the tergite and sternite at the anterior margin. In profile view, postpetiolar sternite deeply concave.***P. furcomandibula*** (China: Yunnan)
4. With head in full face view, anterior margin of clypeus strongly concave. In dorsal view, petiole distinctly longer than broad. Body bicolored, the middle portion black, the rest brownish yellow.**5**
 - In full-face view, anterior margin of clypeus straight to weakly concave. In dorsal view, petiole as broad as long or broader than long. Body concolorous, uniformly yellowish brown or reddish brown.**6**
5. In full-face view, anterior 1/3 of the head distinctly narrowed. In profile view, anterior and dorsal faces of petiolar node somewhat differentiated, meeting at a broadly rounded angle. Head brownish yellow. Body relatively small (HW 0.42–0.45 mm).***P. bicolor*** (China: Yunnan)
 - In full face view, anterior half of head distinctly narrowed. In profile view, petiolar node evenly rounded, with no differentiation of anterior and dorsal faces. Head light black to

- blackish brown. Body relatively large (HW 0.60–0.65 mm).
*P. gengma* Xu (China: Yunnan)
6. In profile view, anterior face of petiole distinctly concave, anterodorsal corner protruding.**7**
 - In profile view, anterior face of petiole straight, sloped or slightly convex.**8**
7. Petiole distinctly broader than long, slightly widened posteriorly. In profile view, top half of postpetiole slightly inclined anteriorly and roughly round.
*P. rafflesi* (Singapore and Malaysia)
 - Petiole nearly square in dorsal view, as broad as long, weakly narrowed posteriorly. In profile view, top half of postpetiole roughly rectangular, with straight anterior and posterior faces.*P. wardi* (India: Kerala)
8. Top half of postpetiole not inclined forward, posterodorsal corner angled. In dorsal view, both petiole and postpetiole round, as long as broad.**9**
 - Top half of postpetiole strongly inclined forward. In dorsal view, at least petiole or postpetiole compressed anteroposteriorly, broader than long.**10**
9. Scape exceeds posterior margin of head (SI 104.167).*P. lini* (Taiwan)
 - Scape does not extend beyond posterior margin of head (SI 90.986).
*P. flamma* (India: Goa)
10. In profile view, petiole relatively thin and roughly triangular, dorsal face short, approximately half the length of anterior face.*P. concolor* (China: Yunnan)
 - In profile view, petiole relatively thin and roughly triangular, dorsal face short, approximately half the length of anterior face.**11**
11. Body much smaller (TL 2.7 mm). Head in full face view, anterolateral corners of head prominent and tooth-like. Petiole in lateral view with its ventral outline of subpetiolar process almost straight.*P. tibeta* (China: Tibet)
 - Body much larger (TL 5.15–5.47 mm). With head in full face view, anterolateral corners without prominent tooth-like structures. Petiole in lateral view with its ventral outline of subpetiolar process sinuate.*P. eguchii* sp. nov. (Indonesia: Sumatra)

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AUTHORS DECLARATIONS

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Conflict of Interest

The authors declare that they have no conflict of interest.

Ethics Declarations

No ethical issue required for this research.

Data Availability Statement

Our manuscript has no associated data.

Authors' Contributions

RS conceived this research and designed experiments; RS and DHP participated in collecting and analysing of the data; RS, DHP and YA wrote the paper and participated in the revisions of it. All authors read and approved the final manuscript.

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