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Review of the myrmicine ant genus *Perissomyrmex* M.R. SMITH, 1947 (Hymenoptera: Formicidae) with description of a new species from Tibet, China

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Abstract

The myrmicine ant genus *Perissomyrmex* M.R. SMITH, 1947 is reviewed. *Perissomyrmex emarginatus* OGATA & OKIDO, 2007 is a junior synonym of *P. bidentatus* ZHOU & HUANG, 2006. *Perissomyrmex nepalensis* RADCHENKO, 2003 is a junior synonym of *P. monticola* DE ANDRADE, 1993. A new species collected from Tibet, China, *P. medogensis* sp.n., is described. Descriptions of soldier and queen castes and measurements of worker caste of *P. bidentatus* are supplemented based on the specimens collected from Hengduan Mountains of southwestern China. Worker dimorphism is discovered in *P. medogensis* sp.n. and *P. bidentatus* in the Old World fauna. It implies that workers of the genus are weakly dimorphic. A key to the six known species of the genus of the world is provided based on the worker caste.

Key words: Hymenoptera, Formicidae, *Perissomyrmex*, new synonyms, new species.

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Introduction

Since the establishment of *Perissomyrmex* M.R. SMITH, 1947, seven species of the myrmicine ant genus were described in the world (M.R. SMITH 1947, BARONI URBANI & DE ANDRADE 1993, RADCHENKO 2003, XU & WANG 2004, ZHOU & HUANG 2006, OGATA & OKIDO 2007, BOLTON 1995, 2012). LONGINO & HARTLEY (1995) made sure that *P. snyderi* M.R. SMITH, 1947 is native to Central America and its workers are dimorphic. The respective discoveries of the *Perissomyrmex* species in Central America and East Asia lead to the conclusion that the genus has a disjunct distribution pattern and possibly is a relic of the old temperate range in Paleogene (OGATA & OKIDO 2007).

After a careful comparison of the original descriptions, illustrations, images, and specimens in our collection, we find that *P. emarginatus* OGATA & OKIDO, 2007 is a junior synonym of *P. bidentatus* ZHOU & HUANG, 2006, and *P. nepalensis* RADCHENKO, 2003 is a junior synonym of *P. monticola* DE ANDRADE, 1993.

A new species, *P. medogensis* sp.n., and the worker, soldier, and queen castes of *P. bidentatus* were collected in the Ant Diversity Investigations of southeastern Tibet and Hengduan Mountains of southwestern China. The new species is described. Descriptions of the soldier and queen castes and measurements of the worker caste of *P. bidentatus* are supplemented. The worker dimorphism is discovered in *P. medogensis* sp.n. and *P. bidentatus* in the Old World fauna. It implies that workers of the genus are weakly dimorphic. A key to the six known species of the genus of the world is provided based on the worker caste.

Material and methods

The worker, soldier, and queen castes of *P. medogensis* sp.n. and *P. bidentatus* were collected by the sample-plot method. The latitude and longitude of the *P. medogensis* record were obtained by a GPS, and those of the *P. bidentatus* records were obtained using Google Earth. Descriptions and measurements were made under a XTB-1 stereo microscope with a micrometer. Illustrations were made under a Motic-700Z stereo microscope with illustrative equipment. Figures of the worker caste of *P. snyderi* and *P. guizhouensis* ZHOU & HUANG, 2006 were drawn from the AntWeb images.

Standard measurements and indices are as defined in BOLTON (1987); in addition, ED is supplemented:

AL Mesosoma Length: Diagonal length of mesosoma in profile view from the point at which the pronotum meets the cervical shield to posterior base of metapleuron.
CI Cephalic Index = HW × 100 / HL.
ED Eye Diameter: Maximum diameter of eye.
HL Head Length: Length of the head proper, excluding mandibles, measured in a straight line from mid-point of anterior clypeal margin to mid-point of occipital margin, in full-face view. In species where the occipital margin or the clypeal margin is concave, the measurement is taken from the mid-point of a transverse line spanning the anteriormost or posteriormost projecting points, respectively.
HW Head Width: Maximum width of head in full face view, excluding eyes.

PW Pronotal Width: Maximum width of pronotum in dorsal view.
SI Scape Index = SL × 100 / HW.
SL Scape Length: Maximum straight line length of antennal scape excluding basal constriction or neck close to condylar bulb.
TL Total Length: Total outstretched length of ant from mandibular apex to gastral apex.

All measurements are expressed in millimeters.

The type specimens are deposited in the Insect Collection, Southwest Forestry University (SWFU), Kunming, Yunnan Province, China.

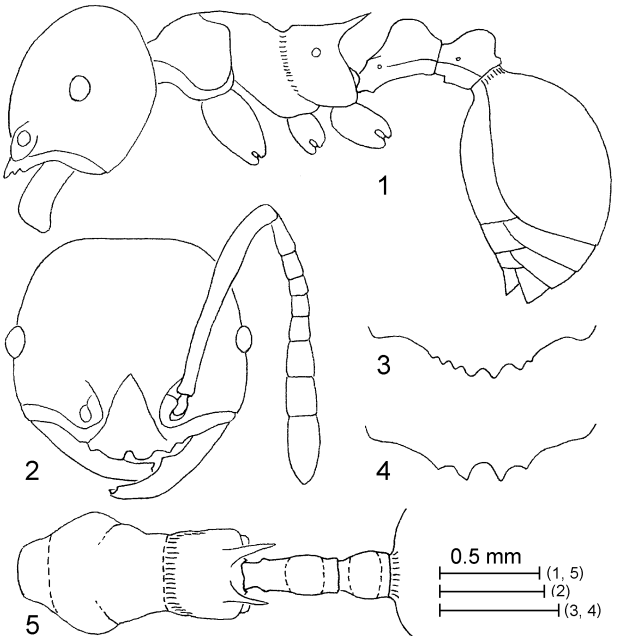
Perissomyrmex M.R. SMITH, 1947

Perissomyrmex M.R. SMITH, 1947: 281.
Type-species: *Perissomyrmex snyderi* M.R. SMITH, 1947, by original designation.

Diagnosis of worker: Weakly dimorphic terrestrial myrmicine ants with the following combination of characters.

1. Head nearly square, slightly divergent forward.
2. Mandibles elongate and roughly rectangular; inner margin long, with distinct triangular tooth; masticatory margin short, with apical tooth, subapical tooth, diastema, and basal tooth.
3. Palp formula 4, 2.
4. Anterior clypeal margin protruding, with developed teeth or lobes, and significantly notched or depressed between teeth or lobes; posterior extension between antennal sockets roughly triangular.
5. Frontal lobes absent; frontal carinae poorly developed.
6. Antennal sockets exposed.
7. Antennae nine-segmented, scapes reach to or surpass occipital corners; antennal clubs three-segmented.
8. Antennal scrobes absent.
9. Eyes developed and convex, situated at about midpoints of lateral sides of head, or slightly behind midpoints.
10. Promesonotal profile is a convexity distinctly higher than propodeum.
11. Promesonotal suture present and weakly impressed.
12. Metanotal groove deeply depressed.
13. Propodeal spines developed, long and acute.
14. Propodeal spiracles circular, situated in middle of lateral surfaces of propodeum.
15. Propodeal lobes short and obtuse at apices.
16. Petiole pedunculate anteriorly, the petiolar spiracles situated at about midlength of peduncle; petiolar node roughly triangular or trapezoidal, with distinct anterodorsal corner, posterodorsal corner usually indistinct and rounded. Subpetiolar process usually reduced, sometimes weakly toothed.
17. Postpetiolar node roughly triangular and strongly inclined backward, anteroventral corner of postpetiole toothed.
18. Head and mesosoma usually strongly striate.
19. Pilosity abundant.

The genus *Perissomyrmex* is most similar to *Pristomyrmex* MAYR, 1866 (MAYR 1866) in the tribe Myrmecinini, but mandibles rectangular, with two basal teeth on the masticatory margin; clypeus without longitudinal central carina; antennae nine-segmented; antennal scrobes absent; pronotum without teeth; anteroventral corner of mesopleuron not extruding; propodeal lobes short and obtuse at apices; sting usually not extruding; head and mesosoma striate.



Figs. 1 - 5: Worker of *Perissomyrmex snyderi*. (1) Head and body in profile view; (2) head in full face view; (3, 4) anterior clypeal margin variations in full face view; (5) mesosoma, petiole, and postpetiole in dorsal view. Drawn from the AntWeb images, sculpture and pilosity omitted.

Key to known species of *Perissomyrmex* of the world based on worker caste

1 In profile view, petiolar node thick, much longer than anterior peduncle, dorsum weakly convex. Anteroventral corner of petiole with distinct small tooth (Figs. 1 - 5) (Central America: Guatemala, Mexico). ..... *P. snyderi* M.R. SMITH, 1947

– In profile view, petiolar node narrow, about as long as anterior peduncle, dorsum strongly convex. Anteroventral corner of petiole without distinct small tooth (East Asia). 2

2 Head and mesosoma smooth. Color black (Figs. 6 - 11) (China: Tibet). ..... *P. medogensis* sp.n.

– Head and mesosoma coarsely longitudinally striate. Color mainly brown. 3

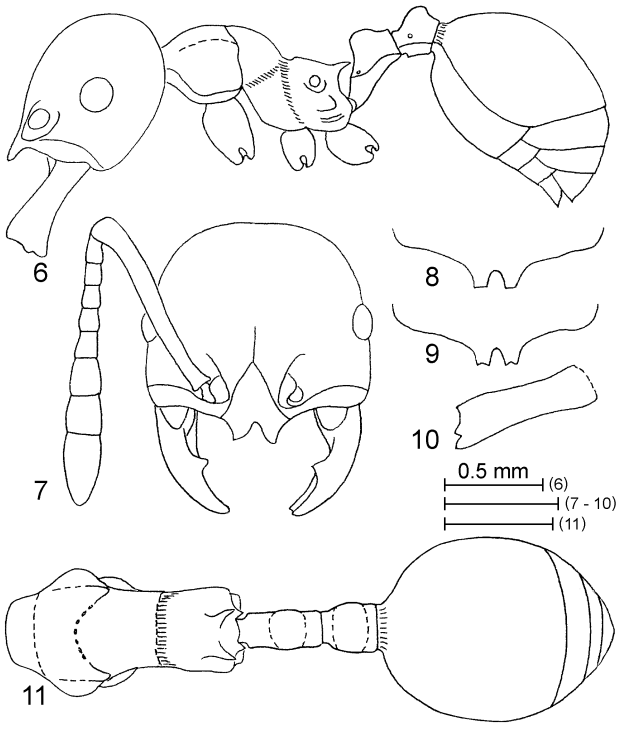
3 Anterior margin of clypeus with only one pair of stout teeth, apices of teeth usually obliquely truncated, sometimes weakly bifid (Figs. 22 - 26) (China: Henan, Shaanxi, and Sichuan Provinces). .... *P. bidentatus* ZHOU & HUANG, 2006

– Anterior margin of clypeus with two or three pairs of teeth or denticles. 4

4 Anterior margin of clypeus with two pairs of subequal teeth (Figs. 36 - 38) (China: Guizhou Province). ..... *P. guizhouensis* ZHOU & HUANG, 2006

– Anterior margin of clypeus with one pair of large median teeth and one or two pairs of small lateral denticles. 5

5 Anterior margin of clypeus with one pair of large median teeth and two pairs of small lateral denticles. Color brown, gaster black (Figs. 39 - 42) (China: Yunnan Province). .. *P. fissus* XU & WANG, 2004



Figs. 6 - 11: Worker of *Perissomyrmex medogensis* sp.n. (6) Head and body in profile view; (7) head in full face view; (8, 9) anterior clypeal margin variations in full face view; (10) mandible in ventral view; (11) body in dorsal view. Sculpture and pilosity omitted.

– Anterior margin of clypeus with one pair of large median teeth and one pair of small lateral denticles. Color blackish brown, gaster reddish brown (Figs. 43 - 45) (Bhutan, Nepal, India). .... *P. monticola* DE ANDRADE, 1993

Description of new species, treatments of new synonyms, and supplementary descriptions and measurements to *P. bidentatus*

***Perissomyrmex medogensis* sp.n**. (Figs. 6 - 21)

Type material. Holotype worker: China, Tibet, Medog County, Damu Town, 70K, N 29° 42.224', E 95° 31.346', 2750 m, collected from a nest inside decayed wood in a ground sample in *Abies* forest, on the south slope of Himalaya Mountain, 22.VII.2011, Cheng-Lin Zhang leg., No. A11 - 4178. Paratypes: 27 workers, two soldiers, and one queen, with the same data and collected from the same nest with the holotype worker.

Description of holotype worker (Figs. 6 - 11): TL 4.0, HL 1.00, HW 1.00, CI 100, SL 0.88, SI 88, ED 0.16, PW 0.58, AL 1.10.

In full face view, head nearly square, as broad as long. Occipital margin weakly convex, occipital corners rounded. Lateral sides evenly convex, widened forward. Mandibles rectangular, inner margin with one tooth, masticatory margin with three teeth; with diastema between subapical and basal tooth. Backward extended median portion of clypeus triangular, posterior corner acutely angled, and followed by short longitudinal furrow. Anterior margin of clypeus with one pair of large triangular median teeth, apices curved outward, with deep notch between teeth. Antennae nine-segmented, scape surpassing occipital corners by about $^{2}/_{7}$ of its length, antennal clubs three-segmented. Eyes circular and convex, located slightly before midpoints of lateral sides of head.

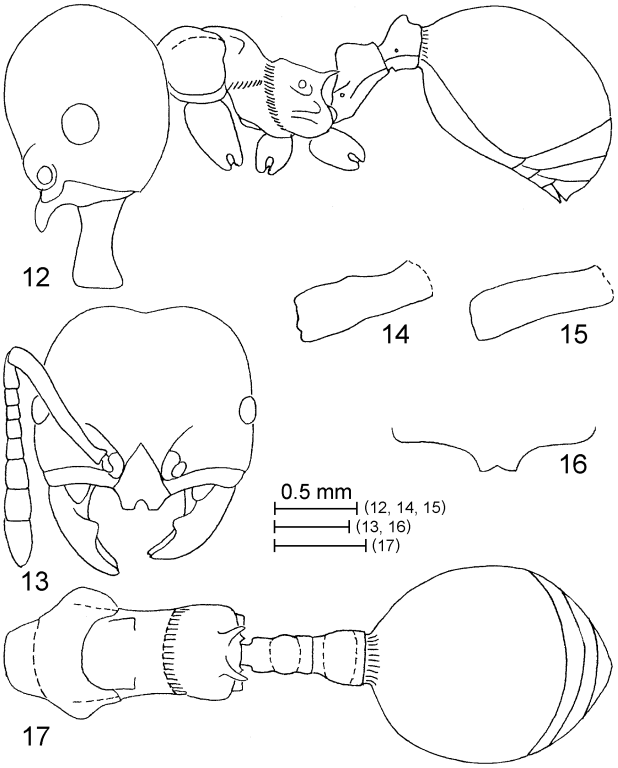
In profile view, promesonotum roundly convex, lateral sides of pronotum weakly marginate. Promesonotal suture distinct but not depressed, consisting of row of large punctures on the dorsum. Metanotal groove deeply depressed. Mesopleuron with oblique furrow. Dorsum of propodeum straight, weakly sloped down backward. Propodeal spines short and stout, apices slightly curved down, about $^{1}/_{3}$ length of propodeal dorsum. Declivity weakly concave, about half length of propodeal dorsum. Propodeal lobes very short, rounded apically. Propodeal spiracle circular, high up on the lateral side, ventral and posterior sides of spiracle depressed. Petiolar node roughly triangular, anterodorsal corner prominent, posterodorsal corner weakly convex, anterior peduncle about as long as node. Ventral face of petiole weakly concave, anteroventral corner weakly convex. Postpetiolar node inclined backward, dorsum roundly convex, posterior face nearly vertical, posterodorsal corner prominent; ventral face of postpetiole nearly straight, anteroventral corner toothed.

In dorsal view, lateral sides of pronotum roundly prominent. Propodeal spines slightly curved inward. Petiole rectangular, petiolar node about as broad as long. Postpetiole widened backward, broader than petiole, postpetiolar node broader than long.

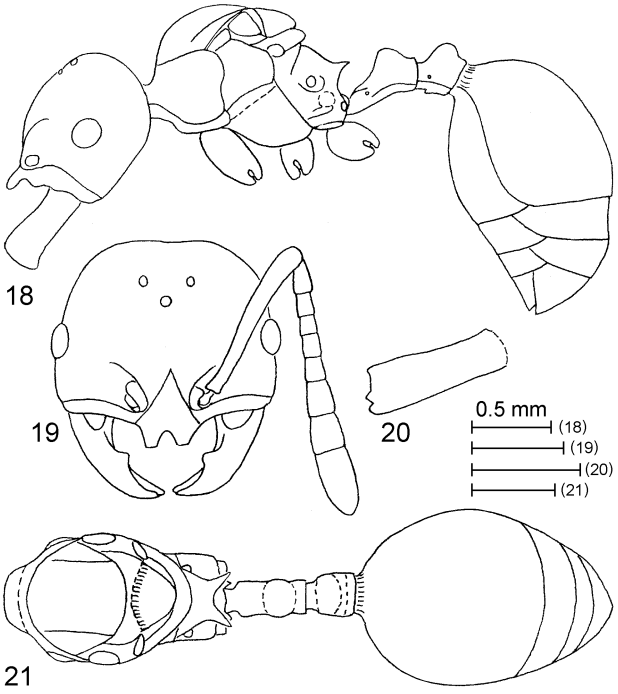
Mandibles sparsely coarsely longitudinally striate and with sparse large punctures. Head smooth and shiny, lateral areas between genae and antennal sockets sparsely coarsely longitudinally striate. Mesosoma smooth and shiny, metanotal groove with short costulae. Petiole and postpetiole smooth and shiny, posterior peduncles with short fine longitudinal striations. Gaster smooth and shiny, anterior margin with short basal costulae. Head and body with abundant erect to suberect hairs, almost without pubescence except for cervicum. Scapes with abundant subdecumbent hairs and abundant decumbent pubescence. Tibiae with abundant subdecumbent to decumbent hairs, but without pubescence. Color black. Mandibles, antennae, and legs brown.

Description of paratype workers: TL 3.9 - 4.1, HL 0.93 - 1.05, HW 0.95 - 1.05, CI 98 - 103, SL 0.85 - 0.93, SI 83 - 92, ED 0.15 - 0.16, PW 0.55 - 0.60, AL 1.08 - 1.18 (ten individuals measured). As holotype worker, but in some individuals, apices of median anterior clypeal teeth truncated or weakly bifid (Figs. 8 - 9).

Description of paratype soldiers (Figs. 12 - 17): TL 4.4 - 4.8, HL 1.28 - 1.45, HW 1.33 - 1.50, CI 103 - 104, SL 0.95 - 1.00, SI 67 - 72, ED 0.18, PW 0.65 - 0.73, AL 1.25 - 1.30 (two individuals measured). Similar to holotype worker, but body relatively larger, head proportionally larger and broader. In full face view, occipital margin weakly concave in the middle. Teeth on masticatory margins of mandibles very blunt or the whole margin edentate (Figs. 14 - 15). Median teeth of anterior clypeal margin truncated, or teeth very short and closely approximated, with very shallow notch between them (Fig. 16). Antennae relatively short, apices of scapes just reaching to occipital corners. In profile view, promesonotum relatively flat, promesonotal suture weakly depressed. Lateral sides of mesonotum with pair of prominences. Frons of head sparsely longitudinally striate. Mandibles, antennae, and legs blackish brown.



Figs. 12 - 17: Soldier of *Perissomyrmex medogensis* sp.n. (12) Head and body in profile view; (13) head in full face view; (14) mandible in ventral view; (15) mandible variation in ventral view; (16) anterior clypeal margin variation in full face view; (17) body in dorsal view. Sculpture and pilosity omitted.



Figs. 18 - 21: Queen of *Perissomyrmex medogensis* sp.n. (18) Head and body in profile view; (19) head in full face view; (20) mandible in ventral view; (21) body in dorsal view. Sculpture and pilosity omitted.

Description of paratype queen (Figs. 18 - 21): TL 5.0, HL 1.10, HW 1.18, CI 107, SL 0.90, SI 77, ED 0.16, PW 0.78, AL 1.35 (one individual measured). Similar to holotype worker, but body relatively larger. In full face view, occipital margin nearly straight. Median teeth of anterior clypeal margin truncated, as in the soldier. Antennae relatively shorter, scape surpassing occipital corners by about $^1/_7$ of its length. Vertex with three ocelli. Mesosoma winged, but dealate. In profile view, mesonotum roundly convex and sloped down backward, massive in volume. Mesopleuron with oblique furrow. Metanotum very short, about $^1/_3$ length of propodeal dorsum. Propodeal dorsum straight and sloped down backward, propodeal spines about half length of dorsum. In dorsal view, scutum of mesonotum with pair of parallel longitudinal furrows, posterior margin rounded. Anterior margin of scutellum bluntly angled, posterior margin rounded. Propodeal spines straight. Frons of head sparsely longitudinally striate, as in soldier.

Morphological variations: The morphology of mandibles and clypeus of the species shows rich variations in worker, soldier, and queen castes. In the worker caste, the median teeth of anterior clypeal margin may exhibit as normal outward curved (67.9% individuals), apically truncated (17.9% individuals), and weakly apically bifid (14.3% individuals). In the two soldiers obtained, median teeth of anterior clypeal margin exhibit as apically truncated, and closely approximated shorter teeth. In the queen caste, the median teeth exhibit as apically truncated. Teeth on masticatory margins of mandibles show a normal state in the worker and queen castes, but the teeth are strongly reduced or even edentate in the soldier caste.

Comparative notes: This new species is close to *P. bidentatus* ZHOU & HUANG, 2006, but head and body smooth and shiny; propodeal spines short, about $^1/_3$ length of propodeal dorsum; color black.

Etymology: The new species is named after the type locality, Medog County.

Biological notes: A nest containing about 70 individuals was found inside decayed wood in a ground sample, only one queen was included in the nest. Among the 31 individuals collected, one queen (3.2%), two soldiers (6.5%), and 28 workers (90.3%) were involved. The collection data shows that the species is monogynous and nests inside decayed wood, workers are weakly dimorphic and possibly forage on the ground, and the soldier caste only occupies a small percentage.

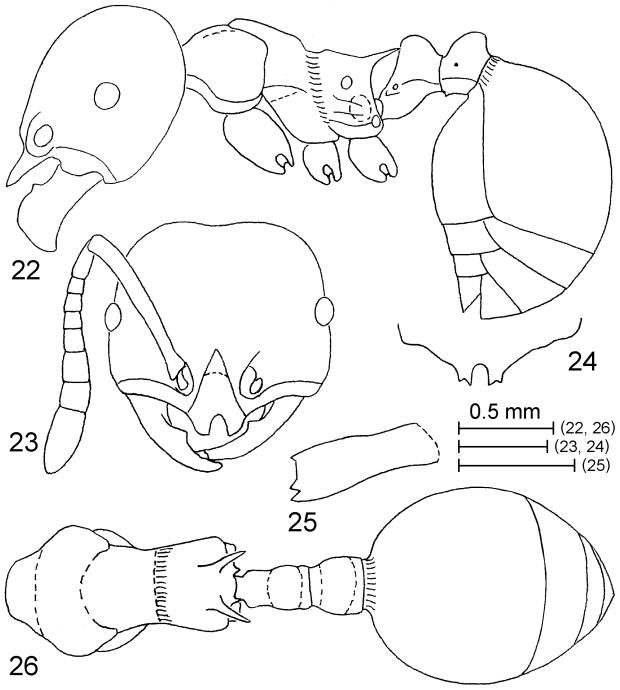
Perissomyrmex bidentatus ZHOU & HUANG, 2006

(Figs. 22 - 35)

Perissomyrmex bidentatus ZHOU & HUANG, 2006: 192. Holotype worker and paratype worker from China, Henan and Saanxi Provinces.

Perissomyrmex emarginatus OGATA & OKIDO, 2007: 359. Holotype worker, paratype workers and queens from China, Sichuan Province. **Syn.n.**

Specimens examined: 27 workers, two soldiers, and one queen: China, Yunnan Province, Yulong County, Shitou Town, Maguanzi Village, N 26.8250°, E 99.7126°, 3020 m, collected from a nest inside top soil in a ground sample in warm conifer-broad leaf mixed forest, 19.X.2004, Zheng-Hui Xu leg., No. A04 - 1147; one winged female: China, Yunnan Province, Yulong County, Shitou Town, Jinsishan Mountain, N 26.8810°, E 99.6161°, 3250 m, col-

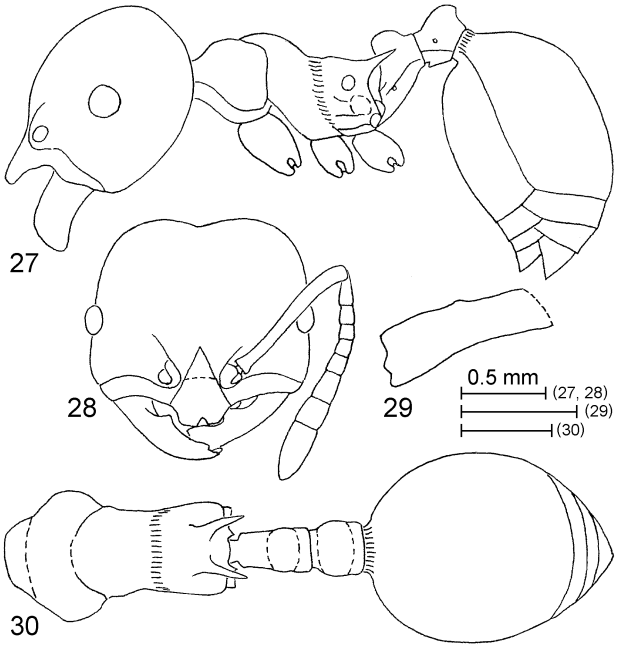


Figs. 22 - 26: Worker of *Perissomyrmex bidentatus*. (22) Head and body in profile view; (23) head in full face view; (24) anterior clypeal margin variation in full face view; (25) mandible in ventral view; (26) body in dorsal view. Sculpture and pilosity omitted.

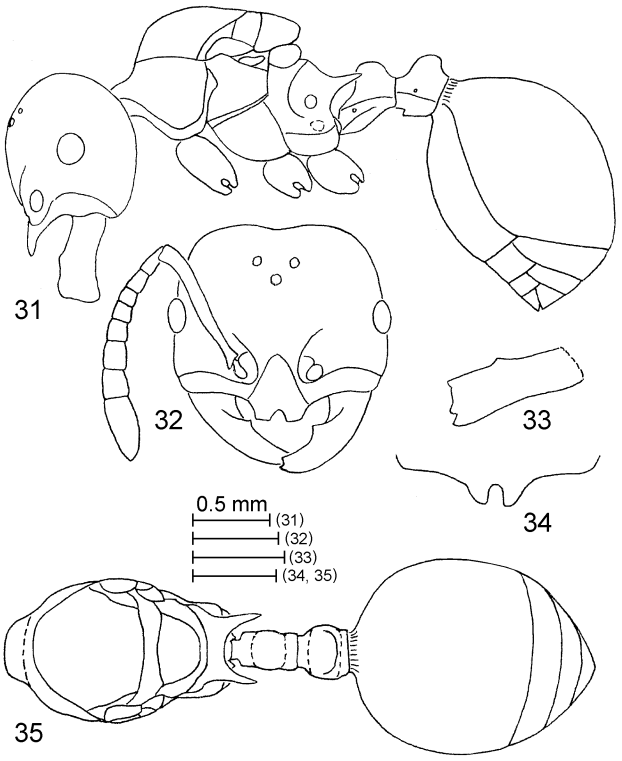
lected from a tree crown sample in warm conifer-broad leaf mixed forest, 19.X.2004, Xiao Guo leg., No. A04 - 1146; one worker: China, Yunnan Province, Yulong County, Ludian Town, Ludian Village, N 27.1893°, E 99.4585°, 3270 m, collected from a soil sample in warm conifer-broad leaf mixed forest, 17.X.2004, Jun-Wu Yang leg., No. A04 - 939; three workers, one queen, and one winged female: China, Yunnan Province, Deqin County, Yunling Town, Mingyong Village, N 28.4688°, E 98.7850°, 3000 m, collected from ground and soil samples in warm conifer-broad leaf mixed forest on the east slope of Meili Snow Mountain, 10.X.2004, Xiao Guo leg., Nos. A04 - 547 (one worker, ground sample), A04 - 555 (one worker, one queen, and one winged female, ground sample), A04 - 556 (one worker, soil sample).

Description of workers (Figs. 22 - 26): TL 3.7 - 4.1, HL 1.00 - 1.20, HW 1.00 - 1.20, CI 95 - 100, SL 0.83 - 0.93, SI 75 - 88, ED 0.13 - 0.15, PW 0.58 - 0.68, AL 1.08 - 1.25 (11 individuals measured). Well conform to the measurements, description, and images of the species, but median teeth of anterior clypeal margin are variable, which show a normal apically obliquely truncated state (Fig. 23) or weakly apically bifid state (Fig. 25).

Description of soldiers (Figs. 27 - 30): TL 4.3 - 4.4, HL 1.25 - 1.33, HW 1.28 - 1.38, CI 102 - 104, SL 0.90 - 0.95, SI 67 - 71, ED 0.16 - 0.20, PW 0.70 - 0.73, AL 1.23 - 1.25 (two individuals measured). Similar to worker caste, but body relatively larger, head proportionally larger. Occipital margin more deeply concaved. Teeth on masticatory margin of mandibles moderately reduced and blunt. Median teeth of anterior clypeal margin broad and truncated at apices, with shallow notch between teeth. Antennae relatively short, apices of scapes just reaching occipital corners.



Figs. 27 - 30: Soldier of *Perissomyrmex bidentatus*. (27) Head and body in profile view; (28) head in full face view; (29) mandible in ventral view; (30) body in dorsal view. Sculpture and pilosity omitted.



Figs. 31 - 35: Queen of *Perissomyrmex bidentatus*. (31) Head and body in profile view; (32) head in full face view; (33) mandible in ventral view; (34) anterior clypeal margin variation in full face view; (35) body in dorsal view. Sculpture and pilosity omitted.

Description of queens and winged females (Figs. 31 - 35): TL 4.6 - 5.0, HL 1.18 - 1.25, HW 1.23 - 1.33, CI 100 - 106, SL 0.90 - 0.96, SI 68 - 76, ED 0.18 - 0.23, PW 0.83 - 0.95, AL 1.35 - 1.45 (four individuals measured).

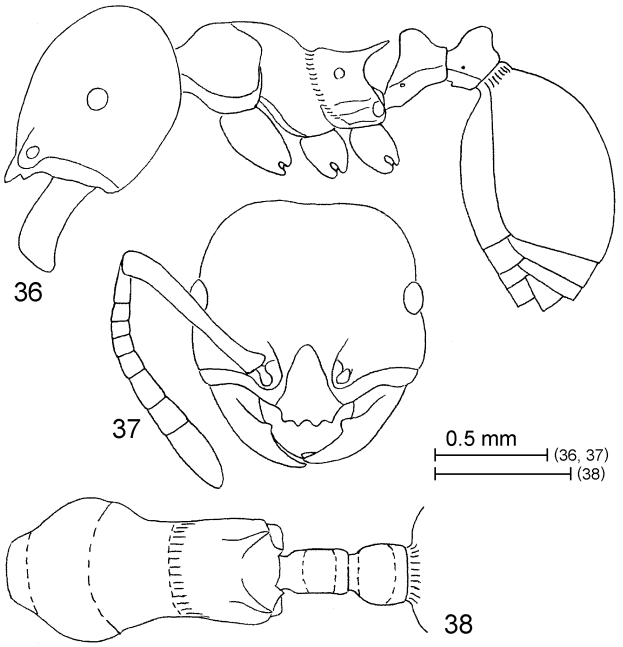
Similar to worker caste, but body relatively larger, head proportionally larger. Median teeth of anterior clypeal margin variable, showing a normal apically truncated state (as in soldier caste) (Fig. 32) or apically inward curved state (as the normal state in worker caste) (Fig. 34). Antennae relatively short, apices of scapes just reaching to occipital corners. Vertex with three ocelli. Mesosoma winged or dealate, massive in volume. In profile view, mesonotum high, weakly convex and sloped down backward. Mesopleuron with oblique furrow. Metanotum very short, overhung by scutellum. Dorsum of propodeum weakly concave, steeply sloped backward. Propodeal spines straight, slightly longer than dorsum. Declivity weakly concave, about as long as spines. In dorsal view, scutum of mesonotum without longitudinal furrows, posterior margin weakly convex. Anterior margin of scutellum very bluntly angled, posterior margin rounded. Propodeal spines strong and very obviously curved inward. Ocellus area, anterior and lateral areas of mesonotal scutum black.

Morphological variations: The morphology of the clypeus shows rich variations in worker, soldier, and queen castes. In the worker caste, the median teeth of anterior clypeal margin may be either apically obliquely truncated (60% individuals) or weakly apically bifid (40% individuals). In the two soldiers obtained, the median teeth are apically truncated and short, which is different from the worker caste. In the queen caste and winged females, the median teeth are apically truncated in three individuals (75%), or apically obliquely truncated in one winged female (25%).

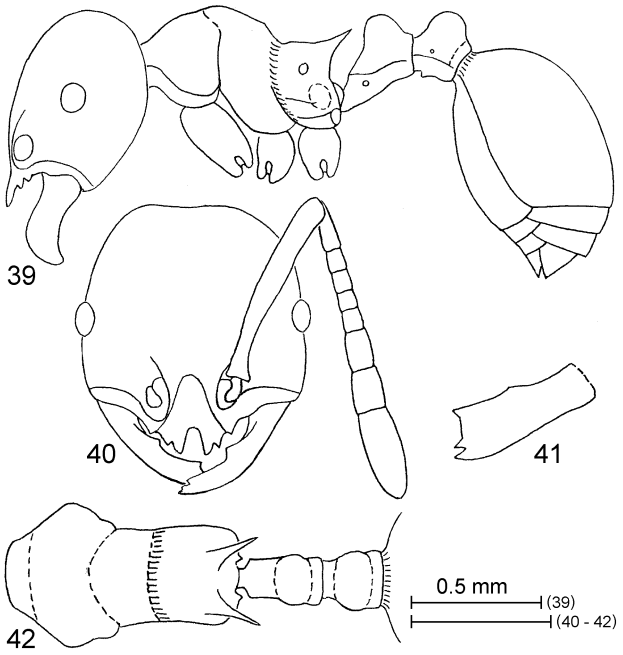
Biological notes: In a large sample, 30 individuals were collected from a nest constructed inside top soil. Among the 30 individuals, one queen (3.2%), two soldiers (6.7%), and 27 workers (90%) were involved. In addition, four workers and one queen were collected from ground and soil samples, and two winged females were collected from ground and tree crown samples respectively. The winged females were collected from October 10 to 19. The collection data show that the species is monogynous and nests in soil; workers are weakly dimorphic and forage on the ground; the soldier caste only occupies a small percentage; nuptial flight occurs on the plants and ground; and the nuptial flight time is mid October in Hengduan Mountains of southwestern China.

Discussion on synonymy: In the original description of *P. bidentatus* from Henan and Shaanxi Provinces of Central China, ZHOU & HUANG (2006) described the holotype worker as "Median region of clypeus flattened, anterior clypeal border with four teeth: the central pair slightly larger than the two external teeth". But in the key, it reads as "Central clypeal lobes without external teeth". According to the figures, the correct description is "Anterior margin of clypeus with only a pair of large teeth obliquely truncated at apices". It is obvious that ZHOU & HUANG (2006) made a mistake by copying description of the preceding species, *P. guizhouensis*, described in the same paper.

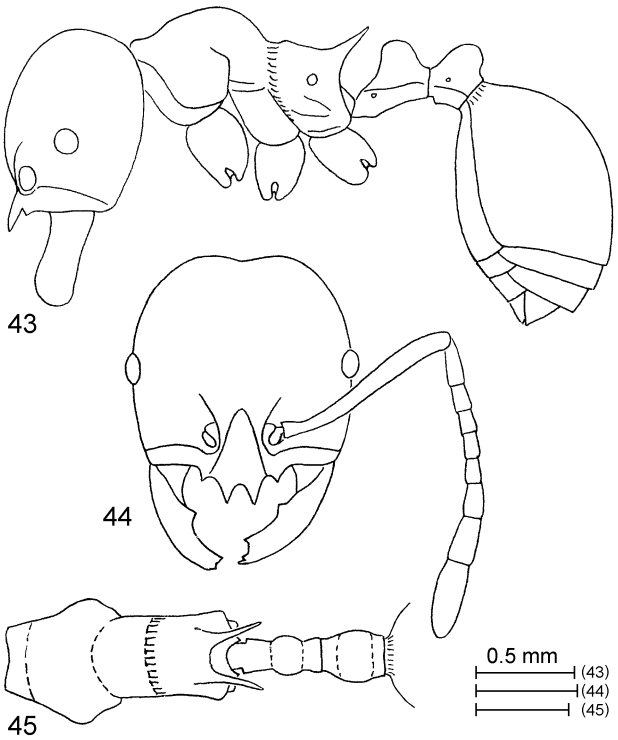
One year later, OGATA & OKIDO (2007) described *P. emarginatus* from Sichuan Province of southwestern China without reading the paper of ZHOU & HUANG (2006). The original description of holotype worker reads as "Anterior margin of clypeus with four teeth; median paired teeth large and distinct, lateral paired teeth smaller and lower; the median and lateral ones closely situated each other, sometimes fused at the base in each side; median notch distinct and deep, inverted U-shape, the bottom of notch reaching or exceeding level of anterior margin of lateral edge in front of antennal insertion". Surely, the clypeal teeth of *P. emarginatus* are quite different from that of *P. bidentatus*.



Figs. 36 - 38: Worker of *Perissomyrmex guizhouensis*. (36) Head and body in profile view; (37) head in full face view; (38) mesosoma, petiole, and postpetiole in dorsal view. Drawn from the AntWeb images, sculpture and pilosity omitted.



Figs. 39 - 42: Worker of *Perissomyrmex fissus*. (39) Head and body in profile view; (40) head in full face view; (41) mandible in ventral view; (42) Mesosoma, petiole, and postpetiole in dorsal view. Cited from XU & WANG (2003), slightly modified, sculpture and pilosity omitted.



Figs. 43 - 45: Worker of *Perissomyrmex monticola*. (43) Head and body in profile view; (44) head in full face view; (45) mesosoma, petiole, and postpetiole in dorsal view. Cited from BARONI URBANI & DE ANDRADE (1993), slightly modified, sculpture and pilosity omitted.

After observation of the specimens in our collection, we noticed that the worker caste conforms well to the original descriptions of *P. bidentatus* and *P. emarginatus* except clypeal dentition. However, both the shapes of median clypeal teeth of *P. bidentatus* and *P. emarginatus* exist in worker caste collected from Yunnan Province of southwestern China, even exist in the individuals from the same nest. The formal state exists in about 60% of the individuals (Fig. 23), and the other state exists in about 40% of the individuals (Fig. 25). The evidence based on our specimens supports that *P. bidentatus* and *P. emarginatus* represent the same species which is widely distributed in the mountainous area of central and southwestern China like Qinling, Emei, and Hengduan Mountains. *Perissomyrmex emarginatus* is a junior synonym of *P. bidentatus*.

Besides, in the original description of *P. emarginatus*, the anterior clypeal margin of the queen is quite different from that in the worker caste, the dentition of the queen looks even more like that in the worker caste of *P. guizhouensis* (Fig. 37) rather than in its own worker caste. It means that the variation of anterior clypeal margin in the queen is significant, more collections and specimens are needed in order to reach the last conclusion.

Perissomyrmex monticola DE ANDRADE, 1993
(Figs. 43 - 45)

Perissomyrmex monticola DE ANDRADE, in BARONI URBANI & DE ANDRADE, 1993: 90. Holotype worker and paratype worker and queen from Bhutan.

Perissomyrmex nepalensis RADCHENKO, 2003: 14. Holotype worker and paratype workers from Nepal and India. **Syn.n.**

Discussion on synonymy: BARONI URBANI & DE ANDRADE (1993) described the first Asian *Perissomyrmex* species, *P. monticola* DE ANDRADE, 1993, from Bhutan. Ten years later, RADCHENKO (2003) described the second Asian species of the genus, *P. nepalensis* from Nepal and India. As RADCHENKO (2003) pointed out, the main differences between the two species are: (1) Antennae and legs with long standing hairs in *P. nepalensis*, but with much shorter standing hairs in *P. monticola*; (2) With broken transverse costulation on pronotum, and much developed costulation on mesopleura and propodeum in *P. nepalensis*, but with complete transverse costulation on pronotum, and less developed costulation on mesopleura and propodeum in *P. monticola*; and (3) Body color dark brownish-black to black, gaster dark brown in *P. nepalensis*, but body color brown in *P. monticola*. However, as we know, the length of pilosity, the state of sculptures, and the body color vary inside population and are not so good to separate the two species. On the other hand, the basic important characters to distinguish species, such as the morphologies of clypeus, propodeum, petiole, and postpetiole, are very similar in the two species.

Afterwards, OGATA & OKIDO (2007) developed a new character to distinguish the two species: "Ventral margin of petiole (mistaken as "propodeum" in the key) curved behind the area below the spiracle" in *P. nepalensis*, and "Ventral margin of petiole (mistaken as "propodeum" in the key) mostly straight, curved in front of the area below spiracle" in *P. monticola*. However, even this new character may be variable inside a bigger population, and not so solid to differentiate the two species.

After a careful comparison of the original descriptions of *P. monticola* and *P. nepalensis*, and the supplementary descriptions provided by OGATA & OKIDO (2007), our conclusion is that *P. monticola* and *P. nepalensis* represent the same species which is distributed over the geographically approximated areas of Bhutan, Nepal, and northeastern India on the south slope of Himalaya Mountain. *Perissomyrmex nepalensis* is a junior synonym of *P. monticola*.

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