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Taxonomy of the ant genus *Protanilla* Taylor in Bolton, 1990 (Hymenoptera: Formicidae: Leptanillinae) from China, with descriptions of two new species

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Abstract

Leptanillinae, recognized as the most phylogenetically basal ant subfamily of Formicidae, comprises the genus *Protanilla*—the second most species-rich lineage within this subfamily. *Protanilla* species exhibit strong ecological specialization, being restricted to pristine primary forests where they inhabit subterranean environments or decayed wood. These ants are characterized by their completely vestigial eyes and extremely cryptic biology, which remains poorly understood. Globally, 20 valid species have been described, with half occurring in China, indicating this region represents the center of diversity for the genus. This study systematically reviewed the Chinese species of the *Protanilla* Taylor in Bolton, 1990, including two new species: *P. xui* **sp. nov.** and *P. shanyii* **sp. nov.**, and provided an illustrated key to the worker caste of this genus in China.

Key words: updated key, Leptanillini, cryptic, hypogaeic

Introduction

The genus *Protanilla* Taylor was established with the type species *Protanilla rafflesi*, and placed within the tribe Anomalomyrmini (subfamily Leptanillinae) by Bolton (1990). For decades, the monophyly and generic boundaries within Leptanillinae remained highly contentious among myrmecologists (Borowiec *et al*., 2019; Griebenow, 2020, 2022). A seminal work by Griebenow (2024) recently addressed these taxonomic uncertainties through an integrative systematic revision combining molecular phylogenetic analyses with comprehensive morphological examinations. This groundbreaking study achieved four major advances: (1) it resolved long-standing disputes regarding generic-level classification; (2) established standardized protocols for species delineation; (3) formally synonymized *Anomalomyrma* under *Protanilla*, thereby unequivocally demonstrating the monophyly of the latter genus; (4) recognized 18 valid *Protanilla* species with an exclusively East Asian distribution, including eight documented from China prior to this study.

This study describes two new species, *Protanilla xui* **sp. nov.** (type locality: Sichuan Province) and *Protanilla shanyii* **sp. nov.** (type locality: Yintiaoling National Nature Reserve, Chongqing Municipality). These discoveries elevate China's documented *Protanilla* fauna to ten species, representing 50% of the genus' global diversity (20 species), thereby unequivocally establishing China as the center of species richness for this taxon. Additionally, a key to Chinese *Protanilla* species based on the worker caste is provided.

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Materials and methods

The examined specimens have been deposited in the following repositories: (1) GXNU (Insect Collection, Guangxi Normal University, Guilin, China); (2) SWFU (Insect Collection, Southwest Forestry University, Kunming, China); (3) IZCAS (Institute of Zoology, Chinese Academy of Sciences, Beijing, China). Holotype images for *P. jongi* and *P. lini* can be accessed on AntWeb (http://www.antweb.org). The specimens were examined using a Leica M205A stereomicroscope, and multifocused montage images were generated with the KEYENCE (VHX–6000) digital imaging system. Standard measurements and indices adhere to the definitions outlined in Bolton (1987) and supplemented by Xu & Zhang (2002). All measurements are expressed in millimeters.

Measurements and indices

TL—Total outstretched length of the individual, from the mandibular apex to the gastral apex.

HL—The length of the head in full-face view, measured in a straight line from the midpoint of the anterior clypeal margin to the mid-point of the posterior margin, in full-face view. In species where the posterior margin or the clypeal margin is concave, the measurement is taken from the midpoint of a transverse line spanning the anteriormost or posteriormost projecting points, respectively.

HW—Maximum width of head in full-face view, excluding the eyes.

SL—Straight–line length of the antennal scape, excluding the basal constriction or neck.

ML—The straight-line length of the mandible from the apex to the base.

MSL—The diagonal length of the mesosoma in lateral view from the point at which the pronotum meets the cervical shield to the posterior base of the metapleuron.

PW—Maximum width of pronotum measured in dorsal view.

WL—Weber's Length, maximum diagonal distance measured from most anterior extent of pronotum excluding cervical shield to most posteroventral extremity of the mesosoma, including propodeal lobes if present

PNL—With the petiolar node in lateral view, the maximum longitudinal length of the node without its anterior and posterior peduncles.

PNH—With petiolar node in lateral view, the maximum vertical height of the node from the summit to the lower-most part of subpetiolar process.

PNW—Maximum width of petiole in dorsal view.

PPNL —With the petiolar node in lateral view, the maximum longitudinal length of the node without its anterior and posterior peduncles.

PPNH—With the postpetiolar node in lateral view, the maximum vertical height of the node from the summit to lowermost part of the subpostpetiolar process.

PPNW—The maximum width of the postpetiolar node in dorsal view.

SI—Scape index = SL × 100 / HW.

PI—lateral petiole index = PNW × 100 / PNL.

CI—Cephalic index = HW × 100 / HL.

PPI—lateral petiole index = PPNW × 100 / PPNL.

Taxonomy

Genus *Protanilla* Taylor, 1990

Protanilla Taylor, in Bolton, 1990: 279.
Anomalomyrma Taylor, in Bolton, 1990: 278. Junior synonym of *Protanilla*: Griebenow, 2024: 117.
Furcotanilla Xu, 2012: 481. Junior synonym of *Protanilla*: Hsu, *et al*. 2017: 119; Griebenow, 2024: 117.

Diagnosis of worker (after Borowiec *et al*. 2011): (1) mandibles elongate, triangular in full-face view, apical portion strongly downcurved in lateral view; masticatory margin bearing numerous peg-like denticles, dorsolateral surface typically with one longitudinal groove; (2) clypeus trapezoidal in shape; (3) antennae 12-segmented; (4) eyes completely absent; (5) mesosoma distinctly constricted, metanotal groove deeply impressed, spiracle of propodeum large and circular, ventrally positioned; (6) petiole (abdominal segment II) free (not fused to adjacent segments), anterior portion lacking peduncle, tergite and sternite completely fused, ventrolateral anterior corner

with well-developed projection; (7) Postpetiole (abdominal segment III) free (not fused), both anterior and posterior portions constricted, occasionally broadly connected to gaster posteriorly, tergite larger than sternite, ventral surface of sternite strongly convex and rounded; (8) gaster terminating with functional sting.

Key to Chinese species of *Protanilla* based on the worker caste

1. Lateroventral margin of mandibles with one or two teeth. Postpetiole broadly attached to abdominal segment IV (Fig. 4D). . **2**
- Lateroventral margin of mandibles without tooth. Postpetiole narrowly attached to abdominal segment IV (Fig. 1D) **3**
2. In lateral view, postpetiolar sternite as saddle-shaped, with an acute-angled anteroventral corner; lateroventral margin of mandible with one tooth (Fig. 4) . . . . . ***P. furcomandibula***
- In lateral view, postpetiolar sternite as a rectangle, with a right-angled anteroventral corner; lateroventral margin of mandible without any tooth (Fig. 6). . . . . ***P. jongi***
3. In full-face view, anterior margin of clypeus deeply concave (Figs. 2A, 5A). Laterodorsal surface of mandible without longitudinal groove (Figs. 2A, 5A) **4**
- In full-face view, anterior margin of clypeus straight to weakly concave (Figs. 1A, 3A). Laterodorsal surface of mandible with a distinct longitudinal groove (Figs. 1A, 3A). **5**
4. In lateral view, petiolar node trapezoidal, with a broad dorsum; head brownish yellow (Fig. 2) . . . . . ***P. bicolor***
- In lateral view, petiolar node triangular, with a narrow and round dorsum; head black to blackish brown (Fig. 5) . . .***P. gengma***
5. Surface of mandibles finely retirugose, dull (Figs. 1A, 10A) **6**
- Surface of mandibles smooth and shining, except for a longitudinal groove (Fig. 7A). **7**
6. The surface of the head smooth and shining; in lateral view, with a marked transverse groove between petiolar tergite and petiolar sternite; posterior face of postpetiole forward-sloping (Fig. 1) . . . . . ***P. beijingensis***
- The surface of the head surface dense rough punctures; petiolar tergite and petiolar sternite completely coalesced, without a transverse groove between them; posterior face of postpetiole short and vertical (Fig. 10) . . . . . ***P. shanyii* sp. nov.**
7. In dorsal view, the petiolar node nearly square, as broad as long, and slightly narrowed backward (Figs. 7C, 9C). In lateral view, anterior face of petiolar node vertical, postpetiolar node not inclined forward (Figs. 7D, 9D). **8**
- In dorsal view, petiolar node compressed anteroposteriorly, distinctly broader than long, and slightly widened backward (Figs. 3C, 8C). In lateral view, anterior face of petiolar node steeply sloped. Postpetiolar node strongly inclined forward (Figs. 3D, 8D) **9**
8. In lateral view, dorsum of postpetiole weakly convex, gently sloping down posteriorly and forming a narrowly rounded posterodorsal corner (Fig. 7) . . . . . ***P. lini***
- In lateral view, dorsum of postpetiole strongly convex, steeply sloping down posteriorly and forming a broadly rounded posterodorsal corner (Fig. 9D) . . . . . .***P. xui* sp. nov.**
9. In lateral view, petiolar node relatively thin and roughly triangular, dorsal face very short, about 1/2 length of anterior face (Fig. 2). . . . . ***P. concolor***
- In lateral view, petiolar node relatively thick and roughly trapezoidal, dorsal face as long as the anterior face (Fig. 8) .***P. tibeta***

Protanilla beijingensis Man, Ran, Chen & Xu, 2017

Fig. 1

Protanilla beijingensis Man, Ran, Chen & Xu, 2017: 6, figs 4–9 (w.q.) CHINA.

Material examined. Holotype worker: China, Beijing City, Mentougou District, Xiaolongmen National Forest Park, N 39°58’25’’, E115°25’30’’, 1247 m, collected by subterranean pitfall trap in monsoon deciduous forest, 2015.X.15, Pei Man leg., No. IOZ(E) 227911 [worker, IZCAS]. **Paratypes**: same data as holotype [1 worker, GXNU; 1 worker, SWFU].

Diagnosis (worker). Concolorous species, with a reddish-brown body, except for the black portions on the posterior half of the mesothorax and anterior half of the metathorax, as well as the brownish-yellow posterior two-thirds of the gaster. In lateral view, the petiolar node trapezoidal and narrow dorsally, with a steep forward-facing posterior face. In lateral view, the postpetiolar tergite inclining forward, with a strongly convex anterior face; the postpetiolar sternite rectangular, with a rounded apical face, and the entire sternite pointing forward and downward. Mandibles finely retirugose, while the head and body smooth and shining.

Distribution. China (Beijing); Pakistan (Khyber Pakhtunkhwa).

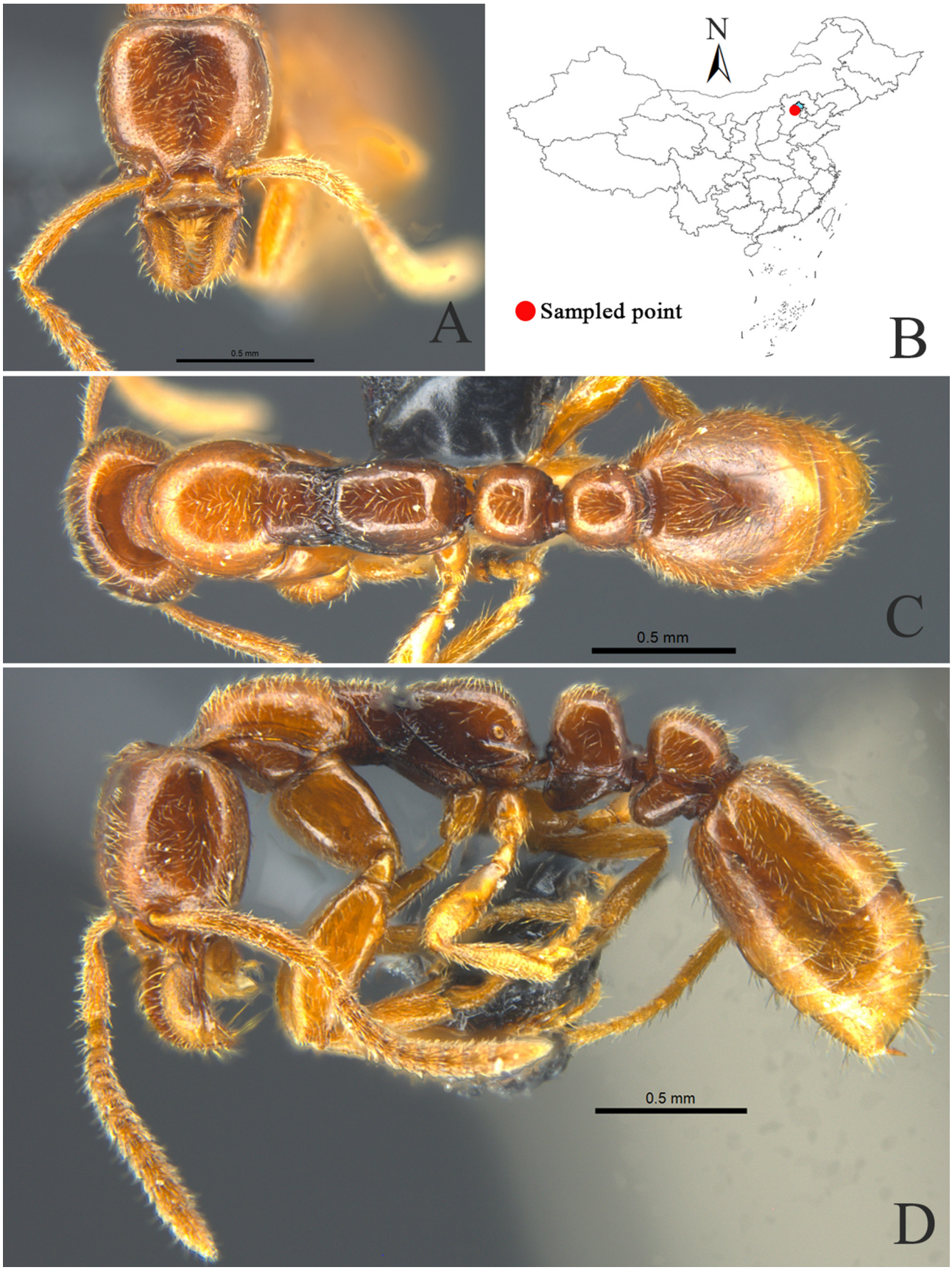

FIGURE 1. *Protanilla beijingensis*, holotype worker (Imaged by Zhilin Chen). Head in full-face view (A), distribution map (B), body in dorsal view (C), body in lateral view (D).

Protanilla bicolor Xu, 2002

Fig. 2

Protanilla bicolor Xu, 2002: 119, figs 21–23 (w.) CHINA. See also: Xu & Zhang 2002: 140.

Material examined. Holotype worker: China, Yunnan Province, Menghai County, Meng'a Town, Papo Village, 1600 m, collected from a colony nesting in soil in deciduous broad-leaf forest, 1997.IX.9, Xu Zhenghui leg., No. A97-2240 [worker, SWFU]. **Paratype**: same data as holotype [1 worker, GXNU].

Diagnosis (worker). Bicolored species, body in color brownish yellow, except for the black parts of posterior portion of mesothorax, metathorax, propodeum, petiole, postpetiole and first gastral segment. In full face view, head triangular (including mandibles). In lateral view, petiolar node trapezoidal and narrowed dorsally, both anterior and posterior faces slope-like. In lateral view postpetiole node strongly inclined forward, sternite longer than high. In dorsal view both petiolar node and postpetiolar node elliptic and longer than broad. Mandibles and body smooth and shining.

Distribution. China (Yunnan).

Protanilla concolor Xu, 2002

Fig. 3

Protanilla concolor Xu, 2002: 118, figs 18–20 (w.) CHINA. See also: Xu & Zhang 2002: 140.

Material examined. Holotype worker: China, Yunnan Province, Mengla County, Peak of Nangongshan Mountain, 1980 m, collected from a soil sample of the mossy evergreen broad-leaf forest, 1998.III.16, Xu Zhenghui leg., No. A98-993 [worker, SWFU].

Diagnosis (worker). Concolorous species, whole body reddish brown. In lateral view petiolar node narrowed dorsally, anterior face slightly concave, posterior face steep forward; anterior face of postpetiolar node almost subvertical, and posterior face obvious. Mandibles punctured sparsely, body smooth and shining.

Distribution. China (Yunnan).

Protanilla furcomandibula Xu & Zhang, 2002

Fig. 4

Protanilla furcomandibula Xu & Zhang, 2002: 140, figs. 1–3 (w.) CHINA. Combination in *Furcotanilla*: Xu 2012: 483; in *Protanilla*: Hsu *et al*. 2017: 129.

Material examined. Holotype worker: China, Yunnan Province, Kunming City, Xishan Forest Park, Huatingsi Temple, 2250 m, collected in a soil sample in conifer-broadleaf mixed forest, 2001.III.31, Xu Zhenghui leg., No. No. A00250 [worker, SWFU].

Diagnosis (worker). Concolorous species, whole body yellowish brown. The lateroventral margin of the mandible with 2 teeth. The anterior margin of clypeus obviously concave in the middle. In lateral view, the ventral face of postpetiolar sternite saddle-like; in lateral view, anterior 1/4 of first segment of abdominal segment IV with a narrow deep notch between tergite and sternite.

Distribution. China (Yunnan).

Protanilla gengma Xu, 2012

Fig. 5

Protanilla gengma Xu, 2012: 485, figs. 13–16 (w.) CHINA.

Material examined. Holotype worker: China, Yunnan Province, Gengma County, Mengding Town, Nantianmen, 1760 m, collected from a soil sample in monsoon evergreen broadleaf forest, 2011.III.10, Hai-Bin Li leg., No. A11-29. [worker, SWFU]. **Paratype**: same data as holotype [1 worker, GXNU].

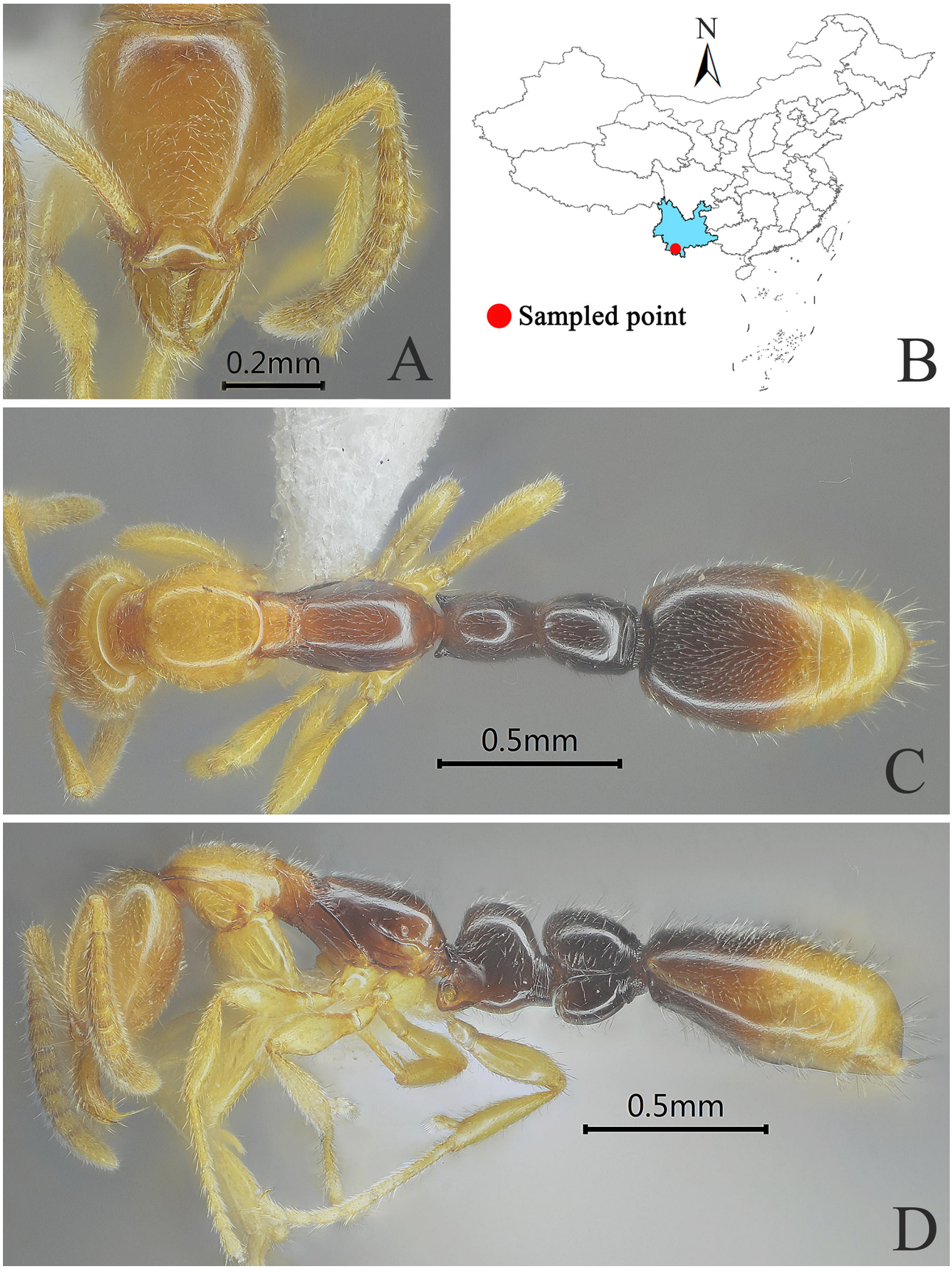

FIGURE 2. *Protanilla bicolor*, holotype worker (Imaged by Zhenghui Xu). Head in full-face view (A), distribution map (B), body in dorsal view (C), body in lateral view (D).

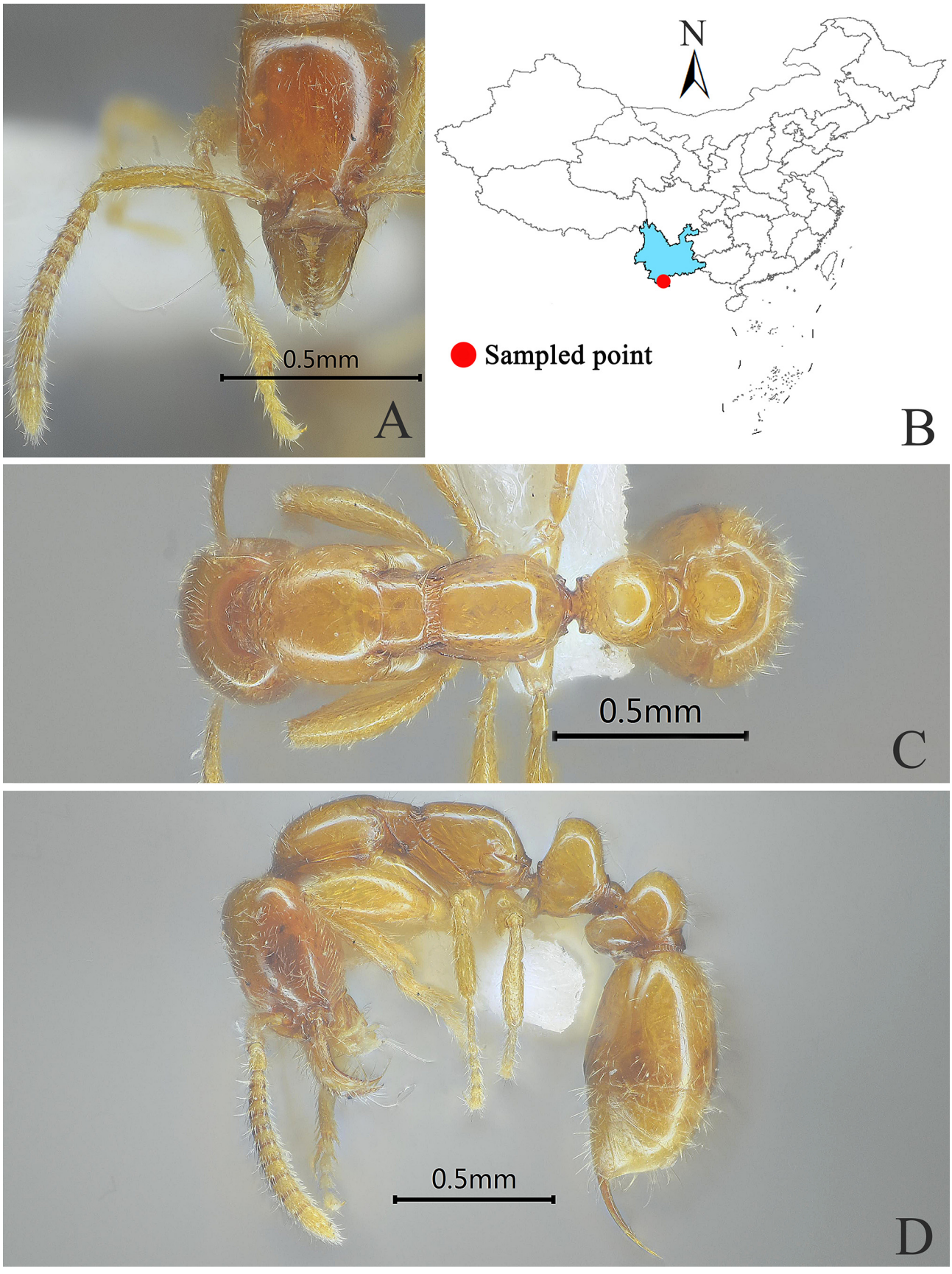

FIGURE 3. *Protanilla concolor*, holotype worker (Imaged by Zhenghui Xu). Head in full-face view (A), distribution map (B), body in dorsal view (C), body in lateral view (D).

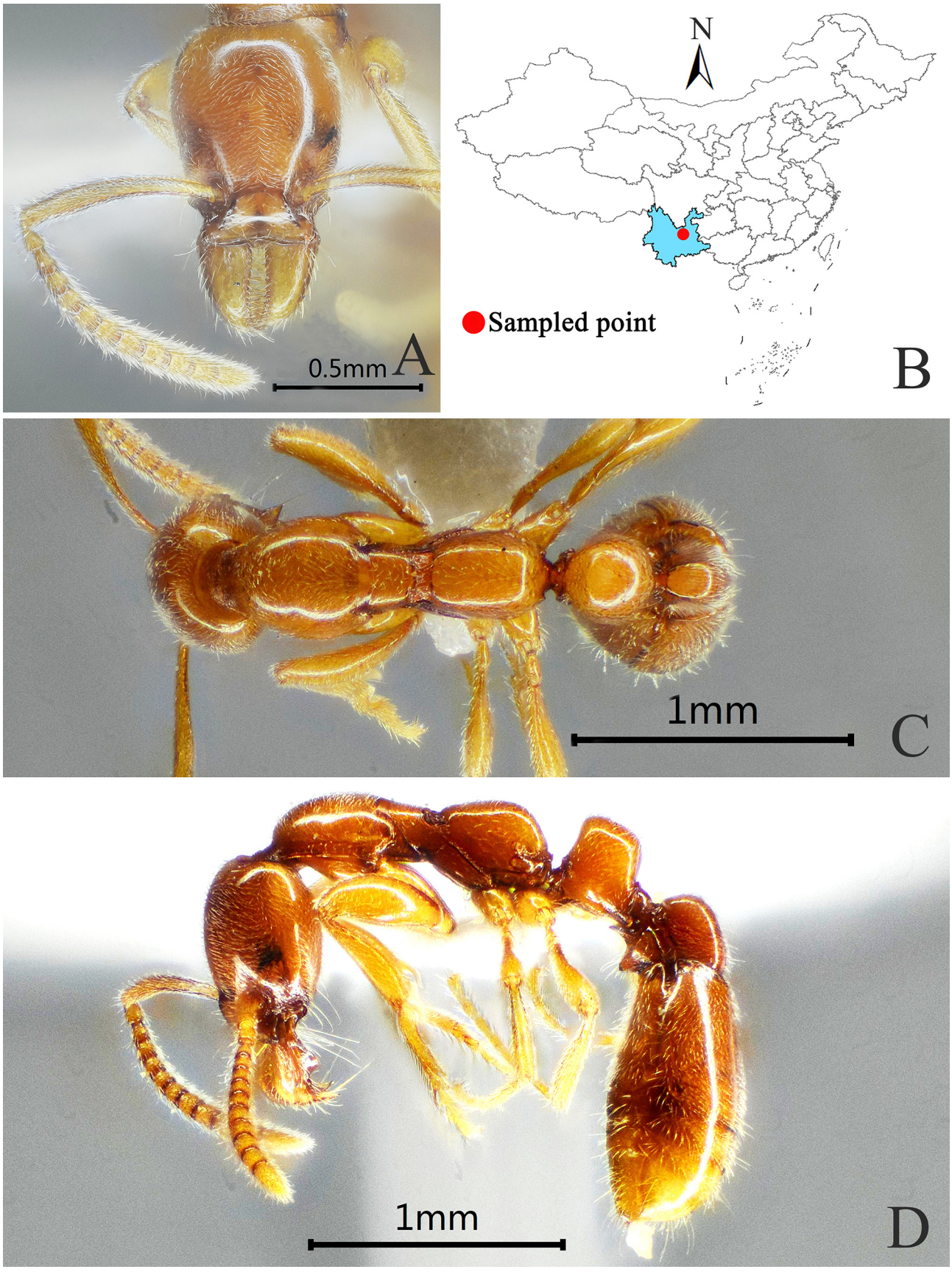

FIGURE 4. *Protanilla furcomandibula*, holotype worker (Imaged by Zhenghui Xu). Head in full-face view (A), distribution map (B), body in dorsal view (C), body in lateral view (D).

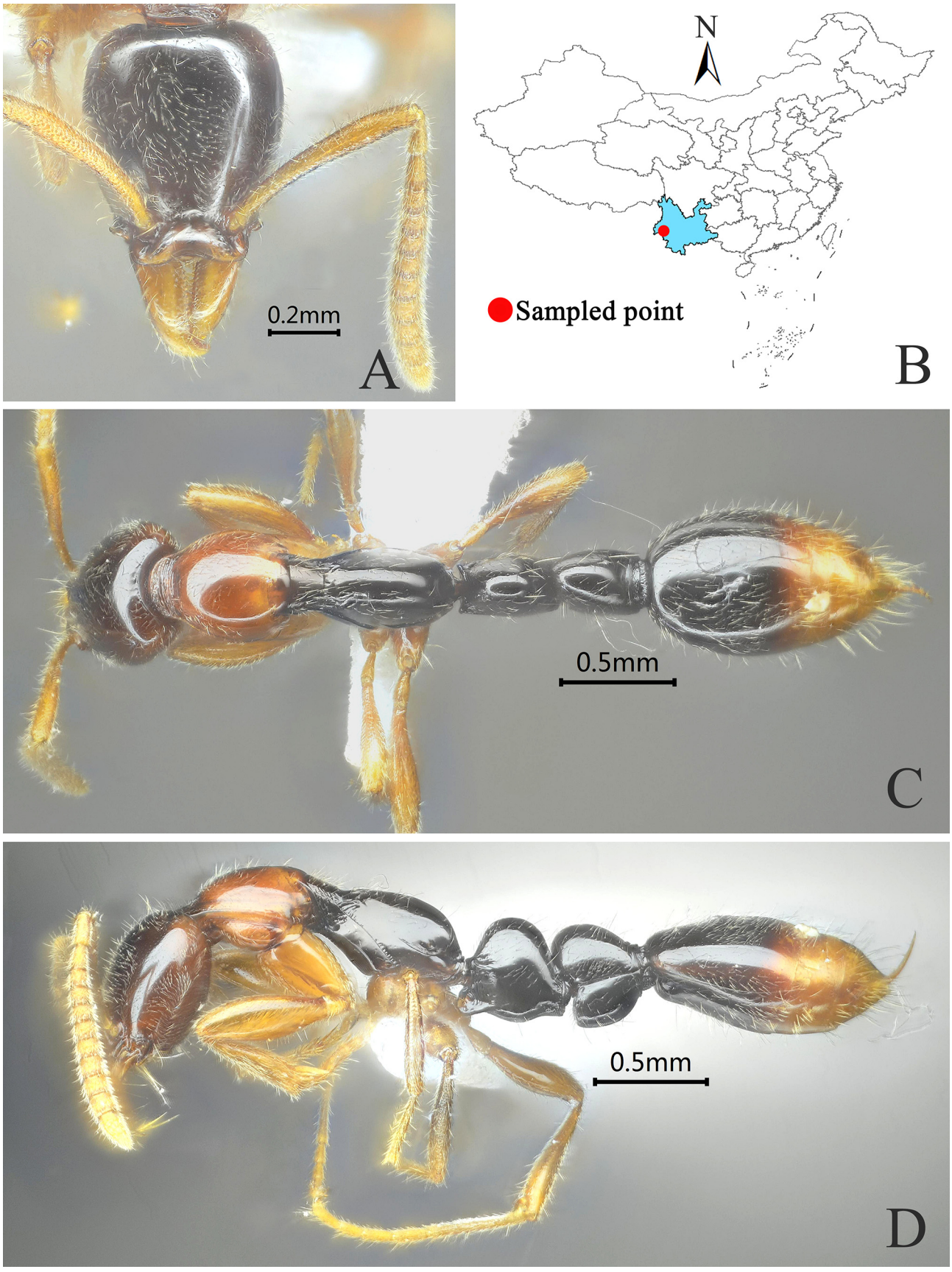

FIGURE 5. *Protanilla gengma,* holotype worker (Imaged by Zhenghui Xu). Head in full-face view (A), distribution map (B), body in dorsal view (C), body in lateral view (D).

Diagnosis (worker). This species is very similar to *P. bicolor*, but can be separated from the latter by anterodorsal corner of petiolar node rounded, head light black to blackish brown, body large (TL 4.1–4.5 mm).

Distribution. China (Yunnan); India (Mizoram); Vietnam (Ninh Binh).

Protanilla jongi Hsu, Hsu, Hsiao & Lin, 2017

Fig. 6

Protanilla jongi Hsu, Hsu, Hsiao & Lin, 2017: 119, figs 1–4 (w.q.) CHINA (Taiwan).

Material examined. Unexamined. But holotype worker and paratype queen figures from Hsu *et al*. (2017) were reviewed, and one paratype worker from https://www.antweb.org, CASENT0842693.

Diagnosis (worker). Concolorous species, whole body brownish yellow. Lateroventral margin of mandible with a small blunt denticle. In lateral view, postpetiole broadly attached to first segment of gaster, and postpetiolar sternite with a right-angled anteroventral corner or sometimes slightly produced.

Distribution. China (Taiwan).

Protanilla lini Terayama, 2009

Fig. 7

Protanilla lini Terayama, 2009: 126, figs. 113–118 (w.) CHINA (Taiwan).

Material examined. Holotype worker and one paratype worker were examined from https://www.antweb.org, CASENT0172005 & CASENT0902783.

Diagnosis (worker). Concolorous species, whole body brownish yellow. In lateral view petiolar node narrowed dorsally, anterior face straight, dorsal face convex, posterior face steep forward, anterodorsal corner roundly prominent and higher than posterodorsal rounded corner. Postpetiolar node upright, with an obvious and vertical posterior face.

Distribution. China (Taiwan).

Protanilla tibeta Xu, 2012

Fig. 8

Protanilla tibeta Xu, 2012: 487, figs 17–20 (w.) CHINA (Xizang).

Material examined. Holotype worker: China, Xizang Autonomous Region, Medog County, Damu Town, Damu Village, 1200 m, collected from a soil sample in the valley tropical rain forest, 2011.VII.20, leg. Xia Liu, No. A11-3925 [SWFU].

Diagnosis (worker). Concolorous species, whole body reddish brown. In lateral view, petiolar node nearly trapezoidal, narrowed dorsally; anterior face weakly concave, dorsal face weakly convex, and posterior face steep forward; anterodorsal blunt corner higher than posterodorsal latter rounded corner; ventral face oblique and almost straight. Postpetiolar node strongly inclined forward, featuring a straight anterior face and lacking a clear and definite posterior face. In dorsal view, the petiolar node is significantly broader than long.

Distribution. China (Xizang).

Protanilla xui sp. nov.

Fig. 9

Material examined. Holotype worker: China, Sichuan Province, Jiangyan City, Shiqiao Town, Majiagou, nesting in the soil of primary broadleaf forests, using a small hoe to randomly dig the soil for collection, 2019.IV.12, Wei

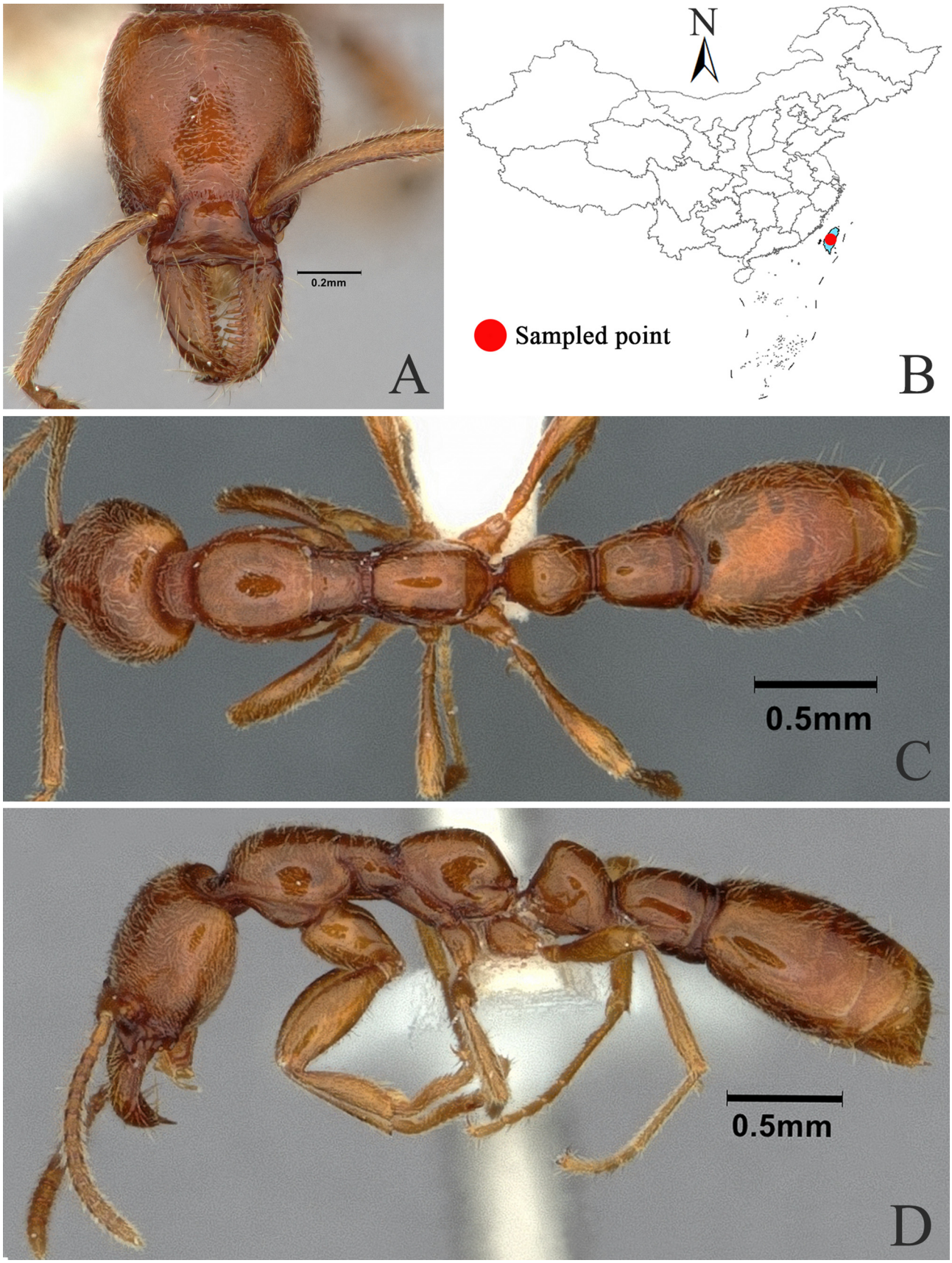

FIGURE 6. *Protanilla jongi*, paratype worker (From https://www.antweb.org, CASENT 0842693, imaged by Zachary Griebenow). Head in full-face view (A), distribution map (B), body in dorsal view (C), body in lateral view (D).

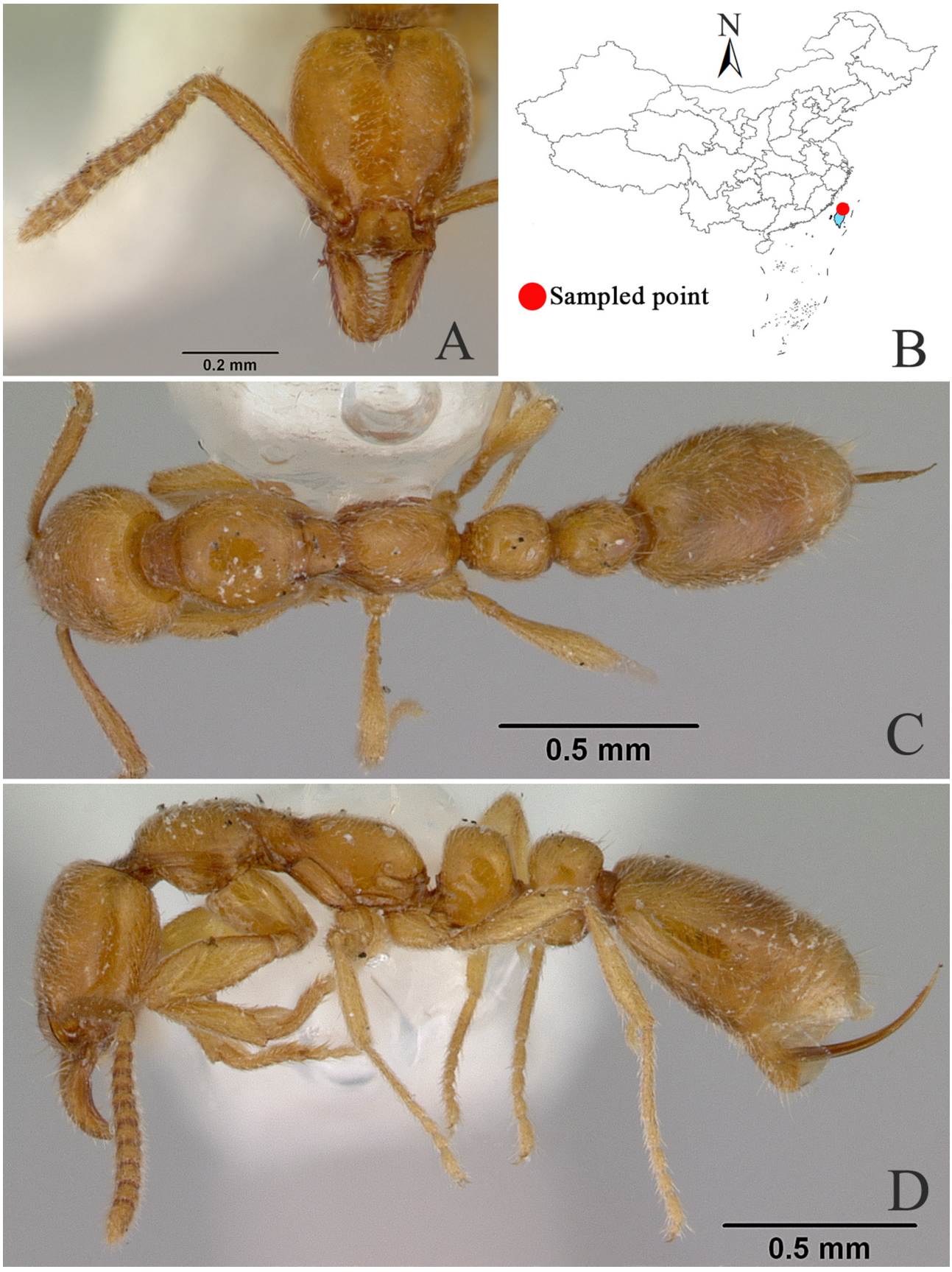

FIGURE 7. *Protanilla lini*, holotype worker (From https://www.antweb.org, CASENT 0172005, imaged by April Nobile). Head in full-face view (A), distribution map (B), body in dorsal view (C), body in lateral view (D).

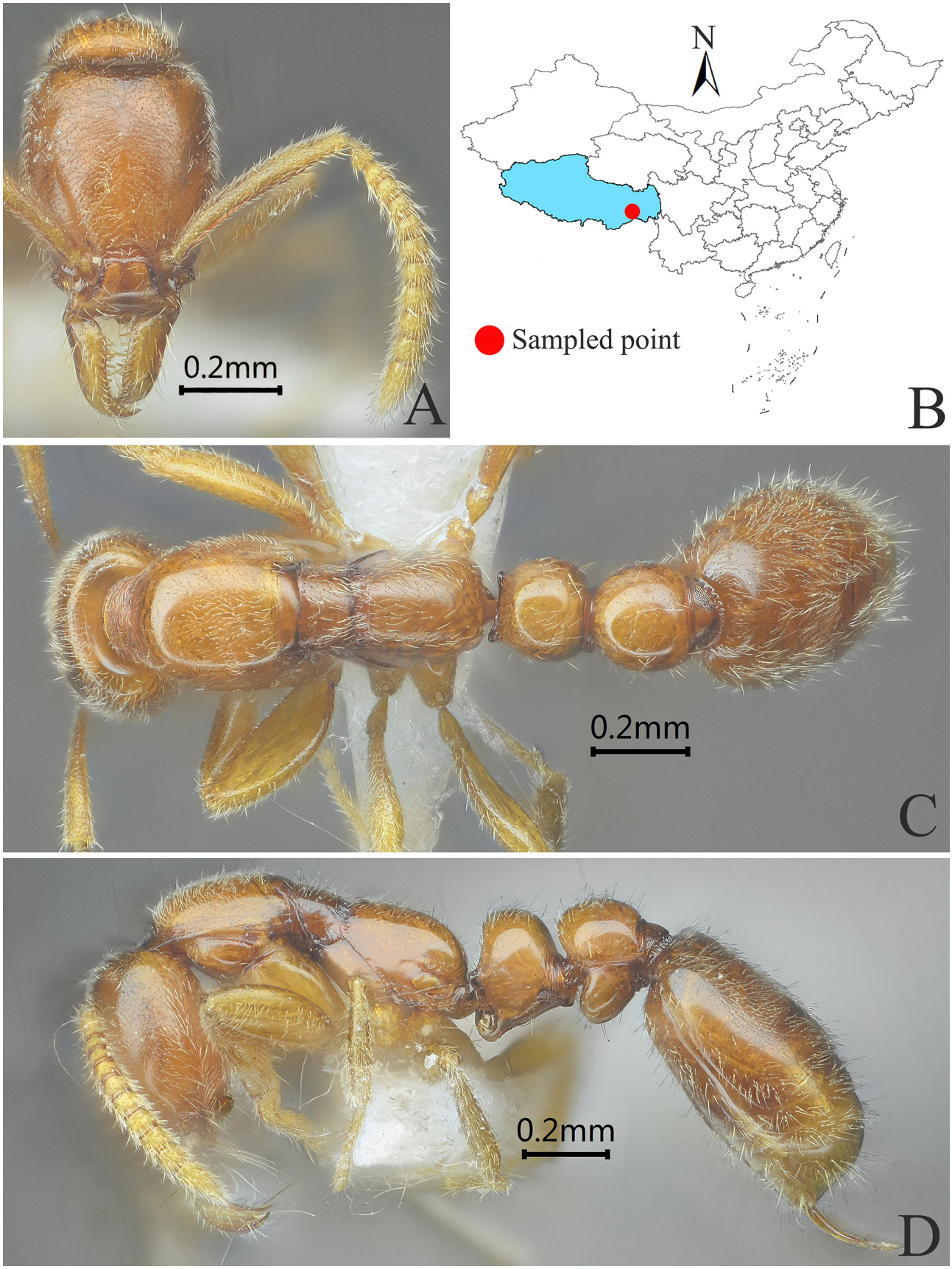

FIGURE 8. *Protanilla tibeta*, holotype worker (Imaged by Zhenghui Xu). Head in full-face view (A), distribution map (B), body in dorsal view (C), body in lateral view (D).

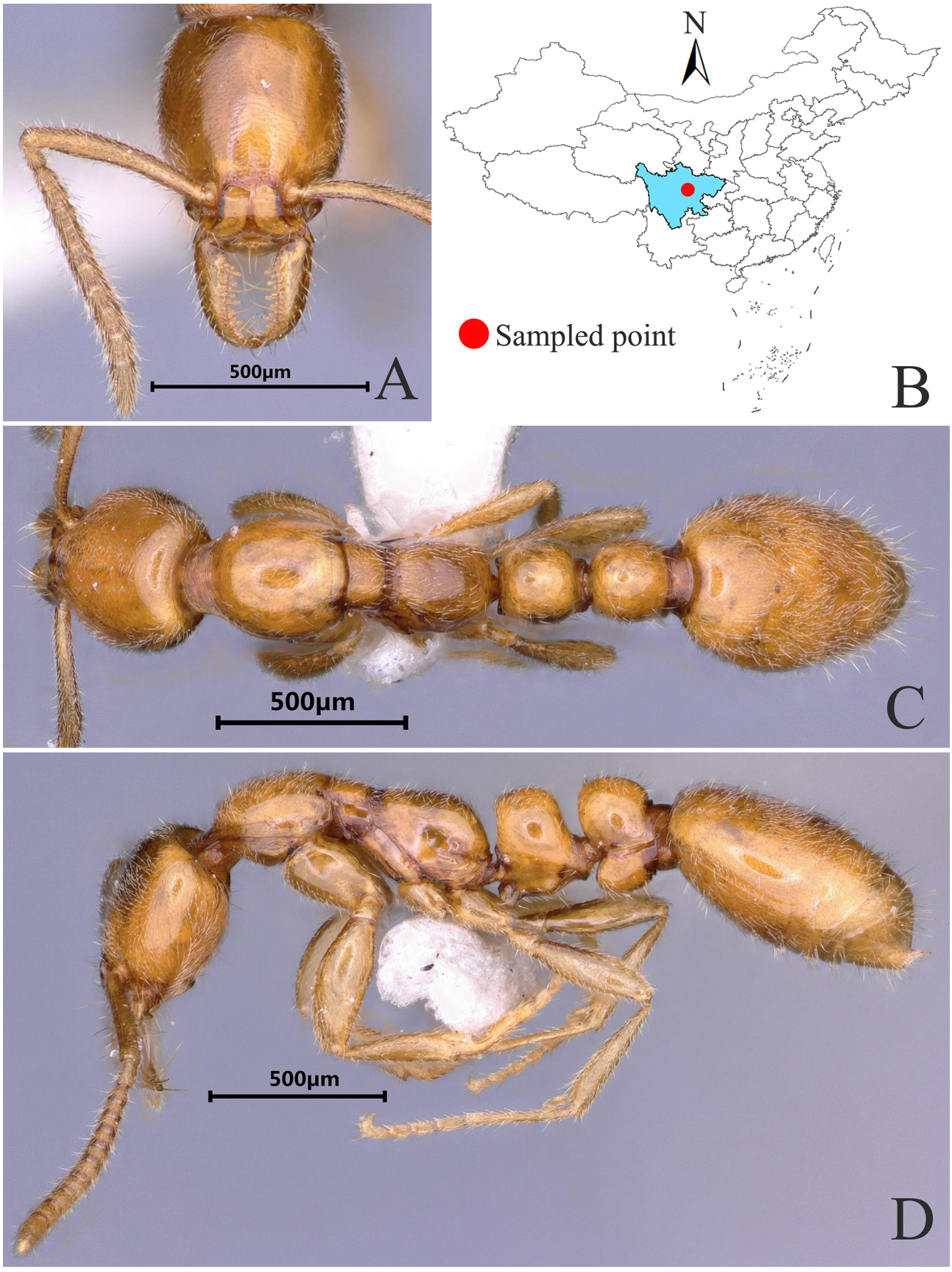

FIGURE 9. *Protanilla xui* **sp. nov.**, holotype worker (Imaged by Zhilin Chen). Head in full-face view (A), distribution map (B), body in dorsal view (C), body in lateral view (D).

Tang leg., No. GXNU 1940096 [GXNU]; **Paratypes**: same data as holotype [5 worker, GXNU; 1 worker, SWFU, 1 worker, IZCAS].

Diagnosis (worker). Concolorous species, whole body reddish brown. Dorsum of propodeum straight, posterodorsal corner about 120°. In lateral view, postpetiolar node inclining anteriorly, dorsal margin strongly convex and sloping down posteriorly, anterior margin convex, posterodorsal corner broadly rounded.

Holotype worker. HL 0.55, HW 0.44, CI 80, SL 44, SI 100, ML 0.27, PW 0.33, MSL 0.83, PNL 0.22, PNH 0.34, PNW 0.22, PI 100, PPNL 0.19, PPNH 0.34, PPNW 0.22, PPI 116.

Paratype workers. TL 2.81–2.11, HL 0.43–0.45, HW 0.42–0.46, CI 78–91, SL 0.44–0.49, SI 100–112, ML 0.26–0.28, PW 0.32–0.34, PNL 0.21–0.22, PNH 0.33–0.34, PNW 0.22–0.23, PI 100–102, PPNL 0.18–0.19, PPNH 0.33–0.34, PPNW 0.22–0.23, PPI 115–123 (n=5).

Head. In full-face view, head trapezoidal, longer than broad, narrowed forward, with a nearly straight posterior margin and rounded posterolateral corners. The anteromedial portion of clypeus nearly straight. Mandibles long triangular and curved ventrally at apex, laterodorsal face without a longitudinal groove, masticatory margin with about 14 alternately arranged long and short peg-like teeth. Antenna 12-segmented, scape surpassing posterior corner of head by about 1/10 of its length. **Mesosoma.** In lateral view, promesonotum convex and higher than propodeum. Promesonotal suture distinct, and metanotal groove shallowly depressed. Propodeal dorsum straight, declivity weakly convex and shorter than dorsum, posterodorsal corner broadly rounded. In dorsal view, mesothorax constricted. Pronotum broadest, sides moderately convex. Propodeum narrower than pronotum, sides weakly convex. **Metasoma**. In lateral view, petiolar node nearly trapezoidal and narrowing dorsally, anterior face vertical, posterior face steeply sloping, dorsal face weakly convex; anterodorsal corner nearly rightly angled, slightly higher than posterodorsal corner, the latter narrowly rounded. Ventral margin moderately convex, anteroventral corner with bluntly extruding subpetiolar process which with a circular subtransparent fovea. In dorsal view, petiole as broad as long, the node broader than long, sides strongly convex. In lateral view, postpetiolar node inclined forward, anterior face moderately convex, dorsal face strongly convex and sloping down posteriorly, anterodorsal corner narrowly rounded, posterodorsal corner broadly rounded. Sternite strongly inclined anteriorly, ventral face strongly convex, anteroventral corner narrowly rounded. Gaster nearly elliptical, sting extruding. In dorsal view, postpetiole as broad as long, and as broad and as long as petiole, weakly widening posteriorly, sides weakly convex. Gaster elongate oval. **Sculpture**. Mandibles smooth, with a row of punctures along masticatory margin. Body smooth and shiny. **Pilosity**. Body dorsum with sparse suberect hairs and abundant subdecumbent pubescence, pubescence on head and gaster dense. Scapes and tibiae with sparse suberect hairs and dense subdecumbent pubescence. **Color**. Body brown yellow. Mandibles, antennae and legs light yellowish brown.

Notes. This new species is most similar to *Protanilla lini* Terayama, 2009, but can be distinguished by the following characters: in *P. lini*, postpetiolar node erect in lateral view, dorsum weakly convex and gently sloping down posteriorly, anterodorsal corner broadly rounded, posterodorsal corner narrowly rounded. In *P. xui*, postpetiolar node inclining anteriorly, dorsum strongly convex and steeply sloping down posteriorly, anterodorsal corner narrowly rounded, posterodorsal corner broadly rounded.

Distribution. China (Sichuan).

Etymology. The new species is named in honor of Dr. Zhenghui Xu from Southwest Forestry University, China, recognizing his exceptional contributions to the study of the ant fauna in China.

Protanilla shanyii sp. nov.

Fig. 10

Material examined. Holotype worker: China, Chongqing City, Wuxi County, Yintiaoling National Nature Reserve, Guanshan Linchang, N 31.5352°, E109.7034°, 2153 m, inhabiting the decayed wood under the mixed coniferous and broadleaf forest, using a small hoe to randomly dig the decayed wood for collection, 2022.VI.24, Defu Chen leg., No. GXNU220683. [worker, GXNU]. **Paratypes**: same data as holotype [20 workers, GXNU; 1 worker, SWFU; 1 worker, IZCAS].

Diagnosis (worker). The surface of head with dense rough punctures.

Description

Holotype worker., HL 0.66, HW 0.62, CI 94, SL 0.55, SI 89, ML 0.28, PW 0.45, PNL 0.24, PNH 0.39, PNW 0.30, PI 125, PPNL 0.20, PPNH 0.36, PPNW 0.32, PPI 160.

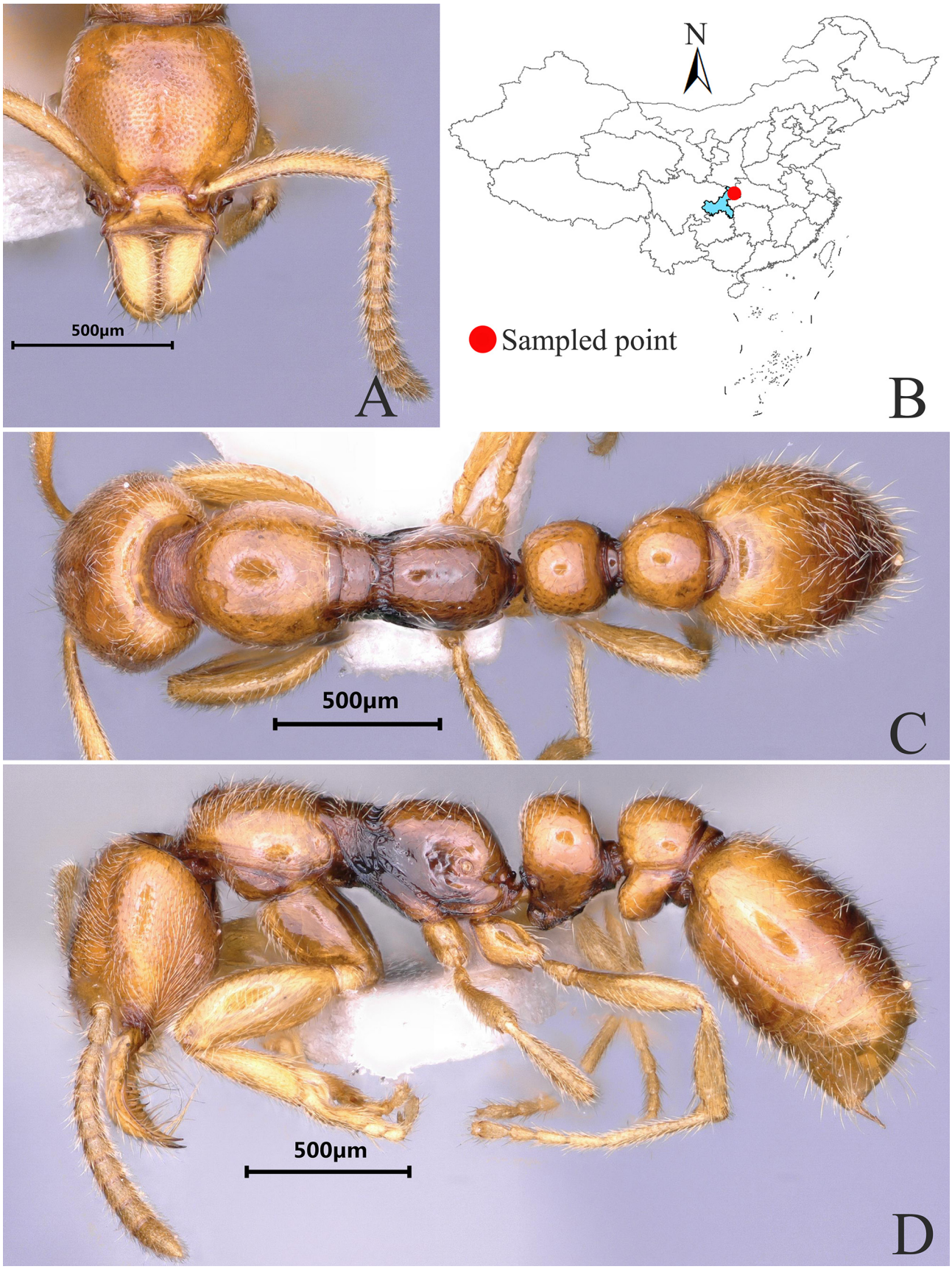

FIGURE 10. *Protanilla shanyii* **sp. nov.**, holotype worker (Imaged by Zhilin Chen). Head in full-face view (A), distribution map (B), body in dorsal view (C), body in lateral view (D).

Paratype workers. TL 3.40–3.96, HL 0.50–0.68, HW 0.55–0.62, CI 92–96, SL 0.50–0.57, SI 87–94, ML 0.24–0.28, PW 0.42–0.46, PNL 0.23–0.24, PNH 0.38–0.39, PNW 0.29–0.30, PI 124–127, PPNL 0.19–0.20, PPNH 0.34–0.36, PPNW 0.30–0.32, PPI 155–163 (n=5).

Head. In full-face view, head roughly trapezoidal and narrowing anteriorly, longer than broad, strongly constricted at the antennal socket position and with a prominent tooth at the side concavity; posterior margin slightly concave, posterior corners broadly rounded, sides moderately convex. Anterior margin of clypeus slightly concave. Mandibles long triangular and robust, curved ventrally at apex, laterodorsal surface with a longitudinal groove, masticatory margin with about 13 peg-like teeth. Antenna 12-segmented, scape surpassing posterior head corner by about 1/12 of its length, flagellum incrassate toward apex. **Mesosoma.** In lateral view, promesonotum weakly convex and higher than propodeum, promesonotal suture distinct, metanotal groove weakly depressed. Dorsum of propodeum slightly convex, posterodorsal corner broadly rounded; declivity slightly convex, as long as dorsum. In dorsal view, mesothorax strongly constricted, pronotum broadest, sides moderately convex; propodeum narrower than pronotum, widening posteriorly, sides weakly convex. **Metasoma**. In lateral view, petiolar node nearly trapezoidal and narrowing dorsally, anterior face vertical, dorsal face strongly convex and sloping down posteriorly, posterior face weakly convex, anterodorsal corner narrowly rounded, posterodorsal corner broadly rounded. Tergite and sternite completely fused. Sternite strong inclining anteriorly and roughly triangular, anteroventral corner rounded, with an elliptical subtransparent fovea. Postpetiole erect, dorsum strongly convex, anterodorsal corner broadly rounded; sternite strongly inclining anteriorly, apex narrowly rounded. Gaster roughly elliptical, sting extruding. In dorsal view, petiolar node roughly rectangular, broader than long, sides moderately convex; postpetiole roughly trapezoidal and widening posteriorly, broader than long, sides moderately convex, longer and broader than petiole. **Sculpture**. Mandibles finely reticulate. Head abundantly punctate, the rest of body smooth and shining. **Pilosity**. Body dorsum with sparse subdecumbent hairs and abundant decumbent pubescence, pubescence on head and pronotum dense; scapes and tibiae with sparse subdecumbent hairs and dense decumbent pubescence. **Color**. Body color brownish yellow, mesothorax, metathorax and propodeum blackish brow.

Notes. This new species is most similar to *Protanilla beijingensis* Man *et al*., 2017, but can be distinguished by the following characters: in *P. beijingensis*, mandibles relatively slender, propodeal dorsum longer than declivity, both anterior and posterior faces of petiolar node steeply sloping, postpetiolar node strongly inclining anteriorly, head dorsum smooth, body color reddish brown; in *P. shanyii*, mandibles robust, propodeal dorsum as long as declivity, petiolar node with vertical anterior face and steeply sloping posterior face, postpetiolar node erect and not inclining anteriorly, head dorsum punctate, body color brownish yellow.

Distribution. China (Chongqing).

Etymology. The specific epithet honors Dr. Shanyi Zhou (Guangxi Normal University, China) for his outstanding contributions to the study of the ant fauna in China.

Discussion

The groundbreaking taxonomic revision of Leptanillinae by Griebenow (2024) represents a pivotal advancement in our understanding of this enigmatic ant subfamily, establishing a robust systematic framework for both generic and specific-level classifications. Notably, China emerges as the global biodiversity hotspot for the genus *Protanilla*, harboring ten documented species that collectively constitute the majority of known diversity within this taxon. While most *Protanilla* species exhibit a preference for warm temperate and tropical ecosystems, the remarkable case of *P. beijingensis* demonstrates exceptional ecological plasticity, having successfully colonized the cold temperate zones of Beijing (39°54’N, 116°24’E). This species’ disjunct distributional pattern—spanning from its type locality in northern China to recently discovered populations in Pakistan’s Khyber Pakhtunkhwa province (34°08’N, 72°22’E; Griebenow 2024)—not only challenges previous biogeographic assumptions but also highlights the genus’ underestimated dispersal capabilities across climatic gradients.

The striking ecological versatility exhibited by *Protanilla*, coupled with its apparent range expansion, underscores the urgent need for comprehensive systematic surveys across China’s understudied regions. Future investigations should prioritize: (1) extensive sampling campaigns targeting ecotonal zones and elevational gradients; (2) implementation of standardized collection protocols as demonstrated by Man *et al.* (2017), including subterranean traps and leaf litter extraction; and (3) integrative taxonomic approaches combining traditional morphology with cutting-edge molecular techniques to uncover potential cryptic diversity. Such multidimensional research efforts

will be crucial for elucidating the true species richness and distributional dynamics of this fascinating ant lineage in East Asia.

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References

Baidya, P. & Bagchi, S. (2020) A new species of *Protanilla* Taylor 1990 (Hymenoptera: Formicidae: Leptanillinae) from India. *Halteres*, 11, 19–24.
https://doi.org/10.5281/zenodo.3941686

Baroni Urbani, C. & De Andrade, M.L. (2006) A new *Protanilla* Taylor, 1990 (Hymenoptera: Formicidae: Leptanillinae) from Sri Lanka. *Myrmecologische Nachrichten*, 8, 45–47.

Bharti, H. & Akbar, S.A. (2015) First record of genus *Protanilla* (Hymenoptera: Formicidae: Leptanillinae) from India with description of a new species. *Journal of Asia-Pacific Entomology*, 18, 573–576.
https://doi.org/10.1016/j.aspen.2015.04.008

Bolton, B. (1990) The higher classification of the ant subfamily Leptanillinae (Hymenoptera: Formicidae). *Systematic Entomology*, 15, 267–282.
https://doi.org/10.1111/j.1365-3113.1990.tb00063.x

Borowiec, M.L., Rabeling, C., Brady, S.G., Fisher, B.L., Schultz, T.R. & Ward, P.S. (2019) Compositional heterogeneity and outgroup choice influence the internal phylogeny of the ants. *Molecular Phylogenetics and Evolution*, 134, 111–121.
https://doi.org/10.1016/j.ympev.2019.01.024

Griebenow, Z.H. (2021) Synonymisation of the male-based ant genus *Phaulomyrma* (Hymenoptera: Formicidae) with *Leptanilla* based upon Bayesian total-evidence phylogenetic inference. *Invertebrate Systematics*, 35, 603–636.
https://doi.org/10.1071/is20059

Hsu, P.W., Hsu, F.C., Hsiao, Y. & Lin, C.C. (2017) Taxonomic notes on the genus *Protanilla* (Hymenoptera: Formicidae: Leptanillinae) from Taiwan. *Zootaxa*, 4268 (1), 117–130.
https://doi.org/10.11646/zootaxa.4268.1.7

Man, P., Ran, H., Chen, Z.L. & Xu, Z.H. (2017) The northern-most record of *Leptanillinae* in China with description of *Protanilla beijingensis* sp. nov. (Hymenoptera: Formicidae). *Asian Myrmecology*, 9, 12 e009008.
https://doi.org/10.20362/am.009008

Taylor, R.W. (1990) [Untitled. Anomalomyrmini Taylor tribe n., *Anomalomyrma* Taylor gen. n., *Protanilla* Taylor gen. n.]. *In*: Bolton, B. (Ed.), *The higher classification of the ant subfamily Leptanillinae (Hymenoptera: Formicidae)*. *Systematic Entomology*, 15, pp. 278–279.
https://doi.org/10.1111/j.1365-3113.1990.tb00063.x

Terayama, M. (2009) A synopsis of the family Formicidae of Taiwan (Insecta: Hymenoptera). Research Bulletin of Kanto Gakuen University. *Liberal Arts*, 17, 81–266.

Terayama, M. (2013) Additions to knowledge of the ant fauna of Japan (Hymenoptera; Formicidae). *Memoirs of the Myrmecological Society of Japan*, 3, 1–24.

Xu, Z.H. (2002) A systematic study on the ant subfamily Leptanillinae of China (Hymenoptera: Formicidae). *Acta Entomologica Sinica*, 45, 115–120.

Xu, Z.H. (2012) *Furcotanilla*, a new genus of the ant subfamily Leptanillinae from China with descriptions of two new species of *Protanilla* and *P. rafflesi* Taylor (Hymenoptera: Formicidae). *Sociobiology*, 59, 477–491.
https://doi.org/10.13102/sociobiology.v59i2.612

Xu, Z.H. & Zhang, J.L. (2002) Two new species of the ant subfamily Leptanillinae from Yunnan, China (Hymenoptera: Formicidae). *Acta Zootaxonomica Sinica*, 27 (1), 139–144.