

# Six new cave-dwelling species of *Leptoneta* (Arachnida, Araneae, Leptonetidae) from Beijing and adjacent regions, China

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## ABSTRACT

Six new leptonetid spiders of the genus *Leptoneta* from caves of Beijing, Hebei, and Henan, China are diagnosed, described and illustrated. They are: *L. cornea* n. sp., *L. exilocula* n. sp., *L. foliiformis* n. sp., *L. setulifera* n. sp., *L. tianxinensis* n. sp. and *L. wangae* n. sp. All the new species described in this study can be distinguished from other congener species by the spines on male palpal femur and tibia, the number of cheliceral teeth and the details of genitalia of both sexes. An identification key to currently known 25 Chinese *Leptoneta* species, except for *L. arquata* Song & Kim, 1991, is provided.

## RÉSUMÉ

Six nouvelles espèces de *Leptoneta* (Arachnida, Araneae, Leptonetidae) de Pékin et ses environs, Chine.

Six espèces d'araignées Leptonetidae du *Leptoneta* sont nouvellement décrites et illustrées de grottes de Pékin, Hebei et Henan en Chine. Il s'agit de: *L. cornea* n. sp., *L. exilocula* n. sp., *L. foliiformis* n. sp., *L. setulifera* n. sp., *L. tianxinensis* n. sp. et *L. wangae* n. sp. Ces nouvelles espèces se distinguent de leurs congénères par les épines du fémur palpal et du tibia mâles, le nombre de dents des chélicères et des détails des genitalia des deux sexes. Une clé d'identification des 25 espèces de *Leptoneta* actuellement connue de Chine, excepté *L. arquata* Song & Kim, 1991, est incluse.

## KEY WORDS

Arachnida,  
Araneae,  
Leptonetidae,  
*Leptoneta*,  
caves,  
China,  
new species.

## MOTS CLÉS

Arachnida,  
Araneae,  
Leptonetidae,  
*Leptoneta*,  
grottes,  
Chine,  
espèces nouvelles.

## INTRODUCTION

Leptonetidae are small (1.0–3.0 mm), 3-clawed, haplogyne spiders, characterized by a distinctive 6-eyed pattern with the PME separated from the strongly recurved ALE and PLE; rarely with eyes continuous, or degenerate to four, two or even none (Song *et al.* 1999). They are cryptozoic spiders, construct irregular sheet webs in damp situations, under rocks, in leaf litter and may be common in caves (Yaginuma 1986). A total of 14 valid genera and 200 species have been recorded worldwide, of which 71 species belonging to the genus *Leptoneta* (Platnick 2007). To date, only the genus *Leptoneta* has been reported in China. Most of the recorded 19 Chinese species occur in caves or under leaf litter, showing a strong endemism (Chen *et al.* 1982, 1984, 1986, 2000; Xu & Song 1983; Yin *et al.* 1984; Song & Xu 1986; Song & Kim 1991; Chen & Zhang 1993; Zhu & Tso 2002). However, all the recorded species were from southern China, the most northern record was in Anhui Province (Xu & Song 1983; Song & Xu 1986).

This paper describes and illustrates six new leptonetids species from northern China, five of them (*Leptoneta cornea* n. sp., *L. exilocula* n. sp., *L. foliiformis* n. sp., *L. setulifera* n. sp. and *L. wangae* n. sp.) were collected from caves in Beijing, and one species, *L. tianxinensis* n. sp. was collected from cave in Henan Province. The lengthening of legs is usually considered as an adaptation to the cave environment, which is embodied in the present six species. *Leptoneta foliiformis* n. sp., which was collected from twilight zones of two different caves that are away from each other by more than 100 km, has the shortest legs, seems to be a troglophile, and may be also found in suitable habitats outside caves. Of the other five species, *L. exilocula* n. sp. and *L. wangae* n. sp., with longer legs and reduced eyes, are the most troglomorphic species.

## MATERIAL AND METHODS

Specimens were collected from caves of Beijing, Hebei and Henan. A total of 89 caves are known in Beijing, and the authors have studied 75 of them. *Leptoneta* spiders are found in six caves in Beijing, one in Hebei, and one in Henan.

Specimens were examined using an Olympus SZX12 stereomicroscope. Further details were studied under an Olympus BX51 compound microscope. All illustrations were made using a drawing tube and inked on ink jet plotter paper. Male palps and female genitalia were examined and illustrated after they were dissected from the spider's bodies. Vulvae of female were cleared in lactic acid.

All measurements were measured using an Olympus BX51 compound microscope and are given in mm. Leg measurements are shown as: total length (femur, patella, tibia, metatarsus, tarsus). Palp measurements are shown as: total length (femur, patella, tibia, —, tarsus). Legs segments were measured on their dorsal side.

The following abbreviations are used: ALE, PME, PLE for anterior lateral, posterior median and posterior lateral eyes; AER, PER for anterior and posterior eye rows (composed of ALE and PLE + PME, respectively); C, E, M for conductor, embolus and median apophysis of male palpal organ; IZCAS for Institute of Zoology, Chinese Academy of Sciences, Beijing; MNHN for Muséum national d'Histoire naturelle, Paris.

## SYSTEMATICS

### Family LEPTONETIDAE Simon, 1890

#### Genus *Leptoneta* Simon, 1872

*Leptoneta* Simon, 1872: 479.

TYPE SPECIES. — *Leptoneta convexa* Simon, 1872.

DIAGNOSIS. — Small sized species (body length 1.0–3.0 mm). Carapace usually with indistinct median groove. Six eyes with the PME separated from the strongly recurved ALE and PLE; rarely with eyes continuous, or degenerate to four, two or even none. Chelicerae with teeth on both promargin and retromargin. Legs slender, Leg formula usually I-IV-II-III. Male palp usually with strong spines on ventral surface of femur, and/or with strong spines or apophysis on tibia; bulb simple. Female with a pair of spermathecae; atrium oval to triangular in shape.

DISTRIBUTION. — Algeria, East Asia (China, Korea), North America (Mexico, USA), Western Europe (France, Italy, Portugal, Spain).

KEY TO CHINESE *LEPTONETA* SIMON, 1872(L. *arquata* Song & Kim, 1991, only known from female, is not included)

1. Male palpal femur with strong spines ventrally, at least on distal half ..... 2
- Male palpal femur without strong spines ventrally ..... 10
2. Male palpal tibia without distal special spines or apophysis ..... 3
- Male palpal tibia with distal special spines or apophysis ..... 5
3. Male palpal patella without short stout spines on retrolateral surface; median apophysis leaf-shaped ..... *L. foliiformis* n. sp.
- Male palpal patella with 3 short stout spines on retrolateral surface; median apophysis not leaf-shaped ..... 4
4. Chelicerae with 10 teeth on promargin; abdomen with brown patches dorsally ..... *L. maculosa*
- Chelicerae with 8 teeth on promargin; abdomen without patches dorsally ... *L. tunxiensis*
5. Male palpal tibia with row of long spines dorsally and ventrally, and 2 apophyses distally, one leaf-like, the other one hook-shaped ..... *L. changlini*
- Male palpal tibia without above mentioned characters ..... 6
6. Eyes absent; male palpal tibia with a short stick-shaped apophysis distally, with a hair on the tip of the apophysis ..... *L. anocellata*
- Eyes present; male palpal tibia without above mentioned apophysis ..... 7
7. Male palpal bulb with a horn-shaped projection ventrally ..... *L. cornea* n. sp.
- Male palpal bulb without horn-shaped projection ventrally ..... 8
8. Carapace with hairs on lateral margins ..... *L. setulifera* n. sp.
- Carapace without hairs on lateral margins ..... 9
9. Male palpal tibia with 1 strong short spine disto-laterally ..... *L. exilocula* n. sp.
- Male palpal tibia with 2 strong short spines disto-laterally ..... *L. wangae* n. sp.
10. Male palpal tibia with strong spines or apophysis distally ..... 11
- Male palpal tibia without strong spines or apophysis distally ..... 17
11. Male palpal tibia with 1 distally branched apophysis ..... 12
- Male palpal tibia if with 1 apophysis, then not branched ..... 13
12. The apophysis on male palpal tibia thick at base, just like prolongation of the tibia; with 2 long hairs and many short hairs on the apophysis; male chelicerae with 4 teeth on retromargin ..... *L. huanglongensis*
- The apophysis on male palpal tibia not thick at base; without hairs on the apophysis; male chelicerae with 6 teeth on retromargin ..... *L. lingqiensis*
13. Male palpal tibia with a single long straight apophysis distally ..... 14
- Male palpal tibia with a hook-shaped apophysis distally ..... 15
14. Apophysis on male palpal tibia spine-shaped; chelicerae with 8 teeth on promargin and 5 teeth on retromargin ..... *L. taiwanensis*
- Apophysis on male palpal tibia finger-shaped; chelicerae with 5 teeth on promargin and without retromarginal teeth ..... *L. monodactyla*

15. Eyes absent; male femur I incrassated on basal half part, distal half with dense long hairs ventrally ..... *L. taizhensis*
- Eyes present; male femur I normal ..... 16
16. Male palpal tibia with 1 single hook-shaped apophysis distally; cymbium distally branched ..... *L. huisunica*
- Male palpal tibia with 2 apophyses distally, one hook-shaped and the other one spine-shaped; cymbium not distally branched ..... *L. nigrabdomina*
17. Male palpal tibia with strong spines ventrally on basal half ..... 18
- Male palpal tibia without strong spines ventrally on basal half ..... 23
18. Male palpal tibia with 1 strong spine proximo-ventrally ..... 19
- Male palpal tibia with 3 strong spines on basal half ventrally ..... 21
19. Eyes reduced; chelicerae with 9 teeth on promargin, without teeth on retromargin ... *L. xui*
- Eyes present; chelicerae with 7 teeth on promargin and 3 or 4 teeth on retromargin ... 20
20. With a long slender spine near the strong spine on ventral surface of male palpal tibia; abdomen without distinct patches ..... *L. tianxinensis* n. sp.
- Only with a single strong spine on ventral surface of male palpal tibia; abdomen with some blackish-brown transverse stripes ..... *L. unispinosa*
21. Male palpal tibia with 1-3 long hairs proximo-ventrally and 2 long hairs disto-ventrally in addition to the 3 strong spines ..... 22
- Male palpal tibia without long hairs in addition to the 3 strong spines ..... *L. trispinosa*
22. Chelicerae with 9 teeth on promargin and 6 teeth on retromargin in male, but with 8 teeth on promargin and 4 teeth on retromargin in female; sperm duct of female not twisted ..... *L. hangzhouensis*
- Chelicerae with 8 teeth on promargin and 5 teeth on retromargin in both sexes; sperm duct of female twisted ..... *L. microdonta*
23. With 2 eyes; male palpal femur with spine-like hairs ventrally and dorsally, palpal tibia with 2 long hairs ventrally; male cymbium without strong spine on the tip; female with slightly twisted sperm duct ..... *L. miaoshiensis*
- With 6 eyes; male palpal femur and tibia without above mentioned hairs; male cymbium with a strong spine on the tip; female with strongly twisted sperm duct ..... *L. falcata*

#### TAXONOMIC DISCUSSION

*Leptoneta* is a genus described from Western Europe (France). It is mainly distributed in Mediterranean region, East Asia, and a few in North America. However, all species from outside the Mediterranean region are probably misplaced (Platnick 1986, 2007). The Chinese *Leptoneta* species should probably be included in one or more new genera in a future revisional work. In this paper, all the Chinese *Leptoneta* species except *L. arquata* Song & Kim, 1991, which is only known from female, are arranged into the

following four species groups mainly based on the characters of male palp.

1. *L. maculosa* group, including nine species: *L. maculosa*, *L. anocellata*, *L. changlini*, *L. cornea* n. sp., *L. exilocula* n. sp., *L. foliiformis* n. sp., *L. tunxiensis* n. sp., *L. setulifera* n. sp. and *L. wangae* n. sp. This group is characterized by the presence of strong spines at least on distal ventral half of male palpal femur, the distally situated apophysis on palpal tibia (missing in *L. foliiformis* n. sp., *L. maculosa* and *L. tunxiensis* n. sp.), and the absence of ventral spines on palpal tibia.

2. *L. huanglongensis* group, including seven species: *L. huanglongensis*, *L. huisunica*, *L. lingqiensis*, *L. monodactyla*, *L. nigrabdomina*, *L. taiwanensis* and *L. taizhensis*. This group is characterized by the absence of ventral strong spines on male palpal femur, the presence of apophyses on distal palpal tibia, and the absence of strong spines on ventral palpal tibia.

3. *L. microdonta* group, including six species: *L. microdonta*, *L. hangzhouensis*, *L. tianxinensis*, *L. trispinosa*, *L. unispinosa* and *L. xui*. This group is characterized by the presence of strong spines on ventral male palpal tibia.

4. *L. miaoshiensis* group, including two species: *L. miaoshiensis* and *L. falcata*. This group is characterized by the absence of any strong spines or apophysis on male palpal femur and tibia.

*Leptoneta cornea* n. sp.

(Fig. 1)

TYPE MATERIAL. — Holotype: China, Beijing City, Fangshan District, Shijiaying Town (39°52'N, 115°41'E), Shenxian Cave, 6.III.2005, leg. Q. Wang & Y. Bi, ♂ (MNHN).

Paratypes: same data as holotype, 1 ♂, 5 ♀♀ (IZCAS); 2 ♀♀ (MNHN). — Beijing City, Mentougou District (39°52'N, 116°04'E), Guanyin Cave (near Jietaishi Temple), 28.IV.2005, leg. H. Chen & X. Han, 1 ♂, 5 ♀♀ (IZCAS). — Beijing City, Mentougou District (39°52'N, 116°04'E), Guanyin Cave (near Jietaishi Temple), 28.IV.2005, leg. H. Chen & X. Han, 2 ♀♀ (MNHN).

ETYMOLOGY. — The specific name is from Greek, *corn*, horn-shaped, in reference to the horn-shaped projection presented on ventral surface of male palpal bulb.

DIAGNOSIS. — The new species can be distinguished from all the other congeners by the presence of a horn-shaped projection on ventral surface of male palpal bulb, the presence of two strong spines on apical part of male palpal tibia and the presence of many long spines on ventral surface of male palpal femur.

DESCRIPTION

*Male* ( $n = 3$ )

Body length 1.76–1.78 (average: 1.77). Carapace 0.79–0.81 (average: 0.80) long, 0.68–0.70 (average: 0.69) wide; abdomen 0.88–0.91 (average: 0.89)

long, 0.69–0.71 (average: 0.70) wide. Carapace yellow, with a pair of setae at lateral area of PME. Median groove dark brown, needle-shaped. Cervical grooves and radial furrows evident and light brown. Clypeus 0.16 high, slightly sloped anteriorly. Six eyes. Eye sizes: ALE 0.06, PLE 0.05, PME 0.04. Distance between eyes: ALE–PME 0.08, PLE–PLE 0.05, PLE–PME 0.04. AER 0.10, PER 0.14. Major axes of PLE convergent behind. PME continuous, axes parallel. Chelicera (Fig. 1F) light brown, with nine teeth on promargin of fang furrow and six small teeth on retromargin. Endites and labium light brown. Sternum (Fig. 1D) and legs yellow. Measurements of palp and legs: palp 2.08 (0.84, 0.44, 0.42, –, 0.38); I 6.80 (1.83, 0.29, 2.16, 1.63, 0.89); II 5.02 (1.44, 0.27, 1.48, 1.13, 0.70); III 4.05 (1.15, 0.24, 1.08, 1.00, 0.58); IV 5.79 (1.64, 0.26, 1.77, 1.40, 0.72). Leg formula: I–IV–II–III. Femur I with some relatively thicker setae on middle part of anterior surface. Tibia I with row of fine hairs ventrally (Fig. 1C). Metatarsus II and III (Fig. 4H, I) as *L. setulifera* n. sp., with a cluster of hairs on basal part of ventral surface, respectively. Abdomen haired, pale yellow, and oval in shape, no distinct pattern on the dorsum. Palpal femur with many spines ventrally. Palpal tibia with three long trichobothria on the dorsal surface and with two strong spines on disto-lateral and disto-dorsal surfaces (Fig. 1A, B). Cymbium distally branched.

*Female* ( $n = 14$ )

Similar to male in coloration and general features, but body size larger and legs shorter. Body length 1.77–2.16 (average: 1.98). Carapace 0.76–0.80 (average: 0.79) long, 0.64–0.67 (average: 0.65) wide; abdomen 1.05–1.18 (average: 1.12) long, 0.91–1.18 (average: 0.99) wide. Clypeus 0.15 high. Eye sizes: ALE 0.05, PLE 0.04, PME 0.04. Distance between eyes: ALE–PME 0.08, PLE–PLE 0.06, PLE–PME 0.03. AER 0.09, PER 0.12. Measurements of palp and legs: palp 1.49 (0.50, 0.17, 0.36, –, 0.46); I 5.25 (1.40, 0.25, 1.61, 1.24, 0.75); II 4.10 (1.17, 0.24, 1.16, 0.92, 0.61); III 3.47 (0.98, 0.23, 0.89, 0.85, 0.52); IV 4.81 (1.36, 0.23, 1.46, 1.14, 0.62). Leg I without special hairs as in male. Internal genitalia with a pair of spermatheca and sperm duct, atrium visible (Fig. 1E, G).

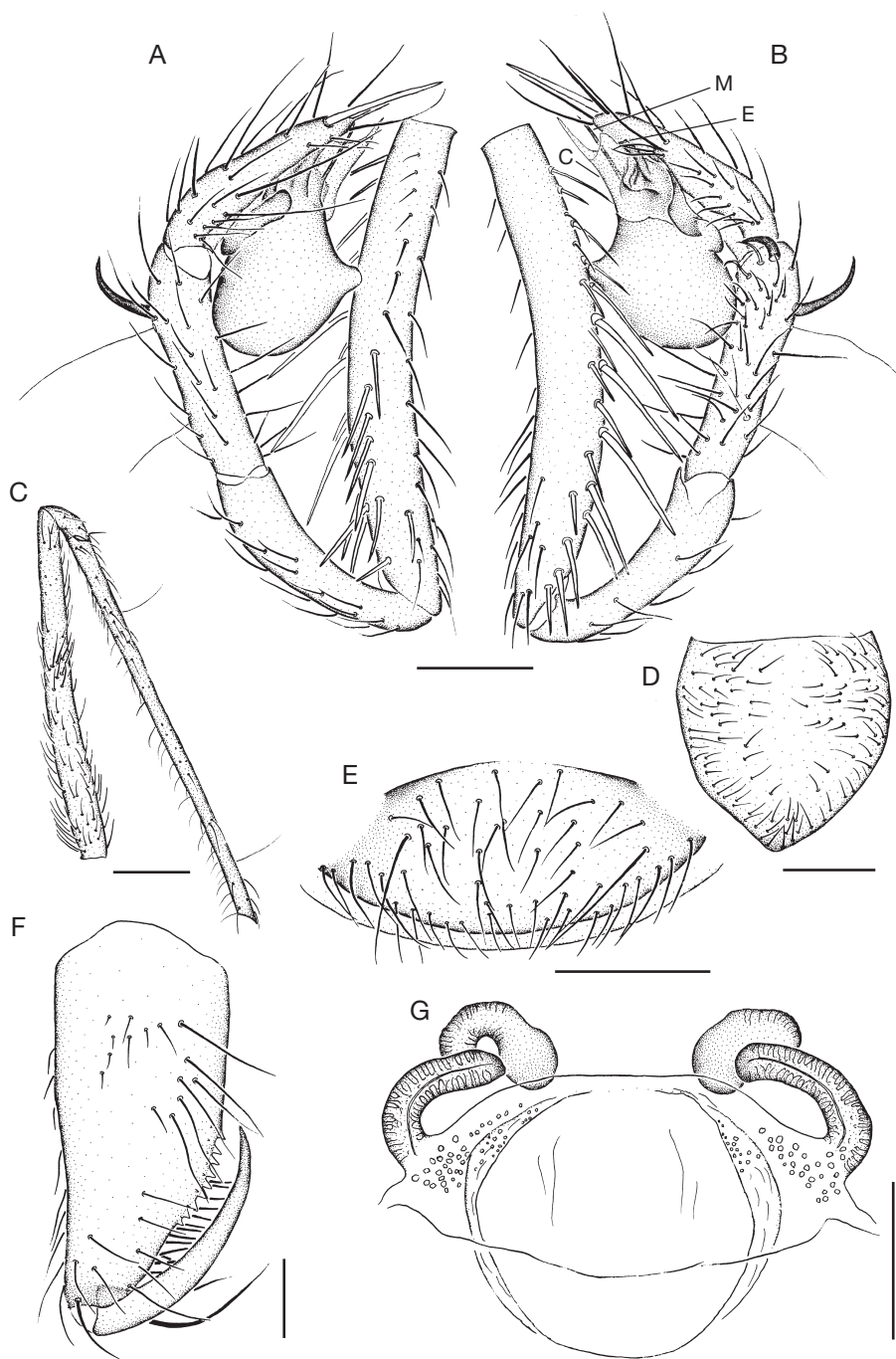


FIG. 1. — *Leptoneta cornea* n. sp.: **A**, male left palp in prolateral view; **B**, male left palp in retrolateral view; **C**, male left leg I in anterior view; **D**, female sternum in ventral view; **E**, female genitalia in ventral view; **F**, male chelicera in ventral view; **G**, female genitalia in dorsal view. Abbreviations: **C**, **E**, **M**, conductor, embolus and median apophysis of male palpal organ respectively. Scale bars: A, B, D, E, 0.2 mm; C, 0.4 mm; F, G, 0.1 mm.

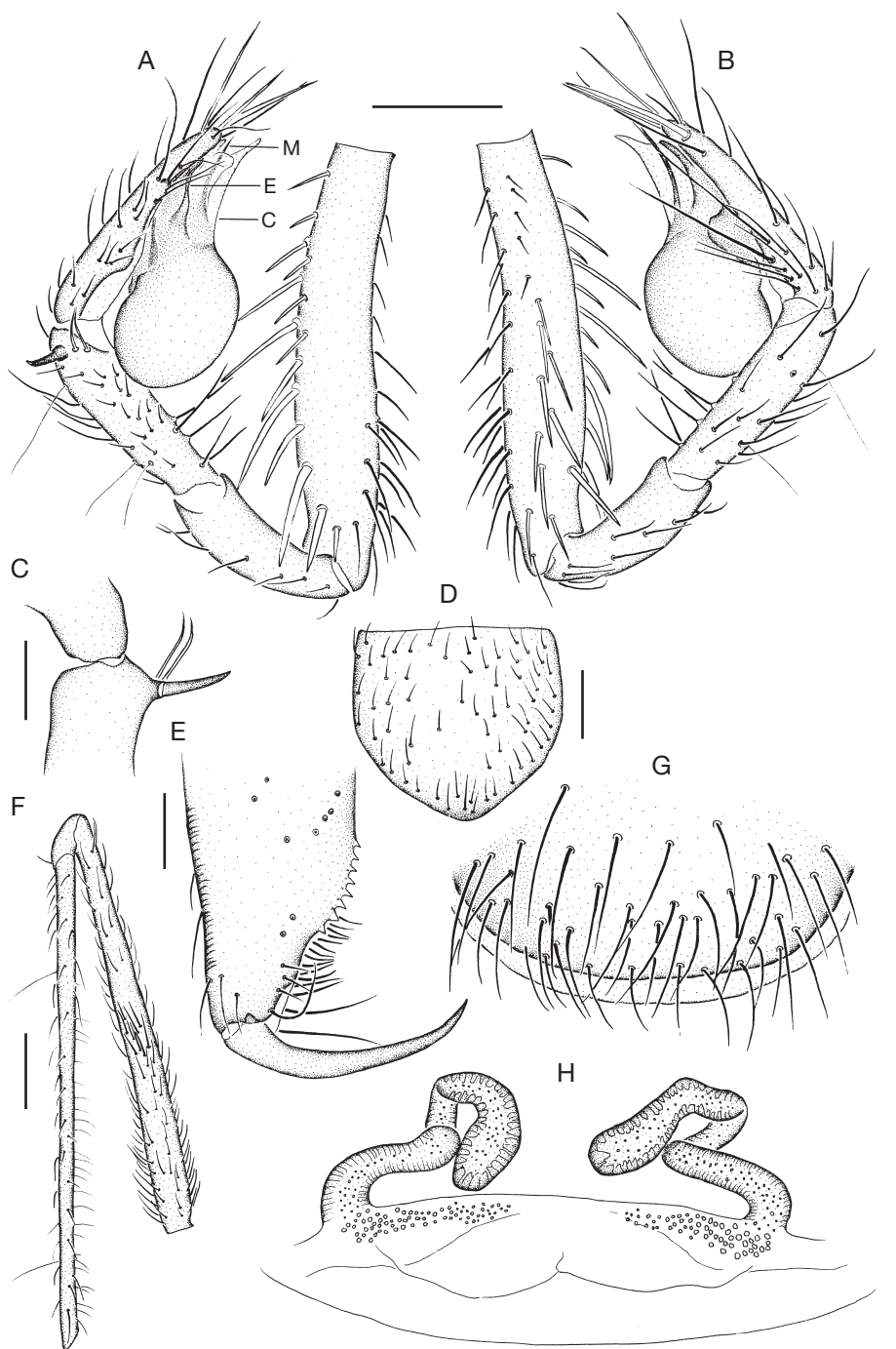


FIG. 2. — *Leptoneta exilocola* n. sp.: **A**, male right palp in retrolateral view; **B**, male right palp in prolateral view; **C**, tibial apophyses of male right palp, dorsal view; **D**, female sternum in ventral view; **E**, male chelicera in ventral view; **F**, male right leg I in anterior view; **G**, female genitalia in ventral view; **H**, female genitalia in dorsal view. Abbreviations: **C**, **E**, **M**, conductor, embolus and median apophysis of male palpal organ respectively. Scale bars: A, B, D, 0.2 mm; C, E, G, H, 0.1 mm; F, 0.4 mm.

*Leptoneta exilocula* n. sp.

(Fig. 2)

TYPE MATERIAL. — Holotype: China, Beijing City, Fangshan District, Hebeizhen Town (39°48'N, 115°54'E), Bianfu Cave, leg. H. Chen & Y. Tong, ♂ (MNHN). Paratypes: same data as holotype, 2 ♂♂, 2 ♀♀ (IZCAS); 2 ♀♀ (MNHN).

ETYMOLOGY. — The specific name is from Latin, *exil*, small and *ocul*, eyes, in reference to the relatively smaller sized eyes of this species.

DIAGNOSIS. — The new species is similar to *L. miaoshiensis* Chen & Zhang, 1993, but can be distinguished by having six eyes, instead of two eyes as in *L. miaoshiensis*; carapace hairless, instead of with rows of hairs from eyes to median furrow as in *L. miaoshiensis*; male palpal tibia with a strong short spine disto-laterally, but without the two long hairs presented on ventral surface as in *L. miaoshiensis*; abdomen without patterns; and also by the different shape of lamina of palpal bulb.

## DESCRIPTION

*Male (holotype)*

Body length 2.20. Carapace 0.92 long, 0.78 wide; abdomen 0.95 long, 0.89 wide. Carapace yellow, hairless. Cervical grooves and radial furrows evident and light brown. Median groove dark brown and needle-shaped. Clypeus 0.24 high. Eyes six. Eye sizes: ALE 0.03, PLE 0.03, PME 0.02. Distance between eyes: ALE-PME 0.08, PLE-PLE 0.05, PLE-PME 0.06. AER 0.07, PER 0.10. Major axes of PLE convergent behind. PME continuous, axes parallel. Chelicera (Fig. 2E) light brown, with eight teeth on promargin of fang furrow and five small teeth on retromargin. Endites and labium light brown. Sternum (Fig. 2D) and legs yellow. Measurements of palp and legs: palp 1.85 (0.72, 0.33, 0.37, —, 0.43); I 8.24 (2.28, 0.31, 2.51, 2.03, 1.11); II 6.13 (1.75, 0.30, 1.79, 1.40, 0.89); III 5.05 (1.43, 0.27, 1.38, 1.24, 0.73); IV 6.91 (2.03, 0.27, 2.10, 1.63, 0.88). Leg formula: I-IV-II-III. Femur I with some relatively thicker setae on middle part of anterior surface. Tibia I with rows of fine hairs on ventral surface (Fig. 2F). Abdomen haired, pale gray, and oval in shape, no distinct pattern on the dorsum. Palpal femur with many long spines. Palpal tibia with three long trichobothria on the dorsal surface and with a strong short spine disto-laterally (Fig. 2A-C). Cymbium distally branched.

*Female*

Similar to male in coloration and general features, but legs shorter. Body length 1.69. Carapace 0.75 long, 0.69 wide; abdomen 0.95 long, 0.74 wide. Clypeus 0.17 high. Eye sizes: ALE 0.04, PLE 0.04, PME 0.03. Distance between eyes: ALE-PME 0.07, PLE-PLE 0.05, PLE-PME 0.04. AER 0.06, PER 0.11. Measurements of palp and legs: palp 1.66 (0.58, 0.19, 0.39, —, 0.50); I 6.48 (1.77, 0.26, 1.97, 1.52, 0.96); II 4.98 (1.42, 0.25, 1.42, 1.11, 0.78); III 4.17 (1.19, 0.24, 1.08, 1.01, 0.65); IV 5.65 (1.62, 0.24, 1.68, 1.34, 0.77). Leg I without special hairs as in male. Internal genitalia with a pair of spermatheca and sperm duct, atrium visible (Fig. 2G, H).

*Leptoneta foliiformis* n. sp.

(Fig. 3)

TYPE MATERIAL. — Holotype: China, Beijing City, Fangshan District, Shangfangshan Mountain (39°39'N, 115°48'E), Yunshui Cave, 22.I.2005, leg. H. Chen & X. Han, ♂ (MNHN).

Paratypes: same data as holotype, 3 ♂♂, 4 ♀♀ (IZCAS); 2 ♂♂, 2 ♀♀ (MNHN). — Same locality as holotype, 1.IX.2005, Y. Tong & Q. Wang, 2 ♂♂, 1 ♀ (IZCAS). — Hebei Province, Mancheng County, Caojiayu Village, Caodian Cave (39°03'N, 115°10'E), 9.VI.2005, leg. Y. Tong & Q. Wang, 7 ♂♂, 12 ♀♀ (IZCAS). — Hebei Province, Mancheng County, Caojiayu Village, Caodian Cave (39°03'N, 115°10'E), 9.VI.2005, leg. Y. Tong & Q. Wang, 2 ♂♂, 2 ♀♀ (MNHN).

ETYMOLOGY. — The specific name comes from Latin, *foli*, leaf and *form*, shape, in reference to the leaf-shaped median apophysis of male palpal bulb.

DIAGNOSIS. — The new species is similar in female genitalia to *L. tunxiensis* Song & Xu, 1985, but can be distinguished by the presence of seven promarginal teeth on fang furrow, the absence of three short stout spines on retrolateral surface of male palpal patella, and the different shape of laminae of the palpal bulb.

## DESCRIPTION

*Male (n = 17)*

Body length 1.42-1.99 (average: 1.79). Carapace 0.68-0.75 (average: 0.72) long, 0.66-0.71 (average: 0.69) wide; abdomen 0.84-1.15 (average: 1.03) long, 0.58-0.86 (average: 0.73) wide. Carapace

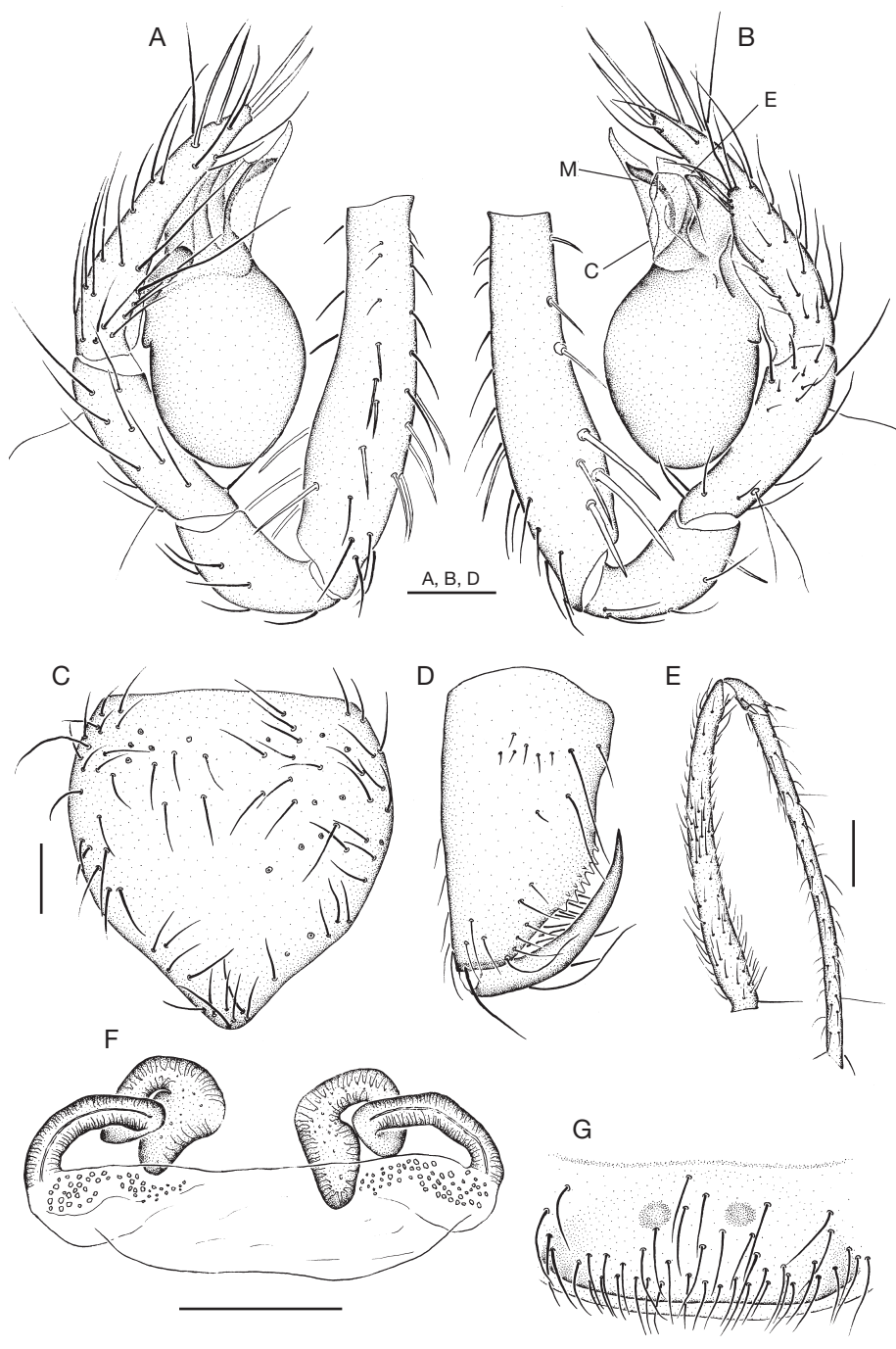


FIG. 3. — *Leptoneta foliiformis* n. sp.: **A**, male left palp in prolateral view; **B**, male left palp in retrolateral view; **C**, female sternum in ventral view; **D**, male chelicera in ventral view; **E**, male left leg I in anterior view; **F**, female genitalia in dorsal view; **G**, female genitalia in ventral view. Abbreviations: **C**, **E**, **M**, conductor, embolus and median apophysis of male palpal organ respectively. Scale bars: A-D, F, G, 0.1 mm; E, 0.3 mm.

yellow, with a small seta presented before middle of ALE, a pair of setae at antero-lateral area of PME, and with a long seta at the rear of median groove. Median groove dark brown, needle-shaped. Cervical grooves and radial furrows light brown. Clypeus 0.13–0.19 (average: 0.16) high. Six eyes. Eye sizes: ALE 0.05, PLE 0.04, PME 0.04. Distance between eyes: ALE-PME 0.08, PLE-PLP 0.06, PLE-PME 0.03. AER 0.11, PER 0.14. Major axes of PLE convergent behind. PME continuous, axes parallel. Chelicera (Fig. 3D) light brown, with seven teeth on promargin of fang furrow and four small teeth on retromargin. Endites and labium light brown. Sternum (Fig. 3C) and legs yellow. Measurements of palp and legs: palp 2.01 (0.76, 0.33, 0.36, –, 0.56); I 4.98 (1.45, 0.25, 1.56, 1.13, 0.59); II 4.13 (1.20, 0.26, 1.14, 0.92, 0.61); III 3.48 (0.97, 0.24, 0.92, 0.83, 0.52); IV 4.70 (1.35, 0.24, 1.42, 1.08, 0.61). Leg formula: I-IV-II-III. Femur I with some relatively thicker setae on middle part of anterior surface. Tibia I with row of finely hairs on distal half part of ventral surface (Fig. 3E). Metatarsus II and III (Fig. 4H, I) as *L. setulifera* n. sp., with a cluster of hairs on basal part of ventral surface, respectively. Abdomen haired, pale gray, and oval in shape, no distinct pattern on the dorsum. Palpal femur with some long spines ventrally. Palpal tibia with three long trichobothria on the dorsal surface and without special projection (Fig. 3A, B). Cymbium distally branched.

#### *Female* ( $n = 21$ )

Similar to male in coloration and general features, but legs shorter. Body length 1.65–1.95 (average: 1.76). Carapace 0.62–0.65 (average: 0.64) long, 0.61–0.63 (average: 0.62) wide; abdomen 1.00–1.37 (average: 1.19) long, 0.82–0.95 (average: 0.88) wide. Clypeus 0.13–0.15 (average: 0.14) high. Eye sizes: ALE 0.06, PLE 0.05, PME 0.04. Distance between eyes: ALE-PME 0.07, PLE-PLP 0.06, PLE-PME 0.03. AER 0.10, PER 0.13. Measurements of palp and legs: palp 1.27 (0.42, 0.15, 0.30, –, 0.40); I 4.53 (1.28, 0.23, 1.32, 1.02, 0.68); II 3.58 (1.02, 0.23, 1.00, 0.79, 0.54); III 3.06 (0.86, 0.22, 0.77, 0.72, 0.49); IV 4.24 (1.20, 0.22, 1.26, 0.97, 0.59). Leg I without special hairs as in male. Internal genitalia with a pair of spermatheca and sperm duct, atrium visible (Fig. 3F, G).

### *Leptoneta setulifera* n. sp. (Fig. 4)

TYPE MATERIAL. — Holotype: China, Beijing City, Fangshan District, Shidu Town (39°42'N, 115°37'E), Liuhe Village, Beipo Cave, 11.V.2005, leg. Q. Wang, ♂ (MNHN).

Paratypes: same locality as holotype, 5.IX.2006, leg. S. Li, Y. Lin & J. Liu, 6 ♂♂, 25 ♀♀ (IZCAS). — Same locality as holotype, 5.IX.2006, leg. S. Li, Y. Lin & J. Liu, 3 ♂♂, 3 ♀♀ (MNHN).

ETYMOLOGY. — The specific name comes from Latin, *set*, hairs, and combined with suffix *fera*, bearing, in reference to the hairs presented on carapace.

DIAGNOSIS. — The new species is similar to *L. handeulgulensis* Namkung, 2002 (Namkung 2003), but can be distinguished by the presence of many long spines on ventral surface of male palpal femur, and the presence of hook-like projection on male palpal tibia.

#### DESCRIPTION

##### *Male* ( $n = 10$ )

Body length 1.62–1.96 (average: 1.83). Carapace 0.73–0.87 (average: 0.78) long, 0.66–0.71 (average: 0.69) wide; abdomen 0.88–1.08 (average: 0.98) long, 0.72–0.84 (average: 0.77) wide. Carapace yellow, with hairs on anterior margin of clypeus and lateral margins, with a pair of setae at lateral area of PME, and with two setae at median groove. Median groove dark brown, needle-shaped. Cervical grooves and radial furrows indistinct. Clypeus 0.13–0.16 (average: 0.15) high, slightly sloped anteriorly. Six eyes. Eye sizes: ALE 0.05, PLE 0.04, PME 0.04. Distance between eyes: ALE-PME 0.09, PLE-PLP 0.07, PLE-PME 0.04. AER 0.10, PER 0.13. Major axes of PLE convergent behind. PME also touching one another, axes parallel. Chelicera (Fig. 4F) light brown, with seven teeth on promargin of fang furrow and five small teeth on retromargin. Endites and labium light brown. Sternum (Fig. 4E) and legs yellow. Measurements of palp and legs: palp 2.31 (0.91, 0.45, 0.55, –, 0.40); I 6.10 (1.69, 0.25, 1.92, 1.47, 0.77); II 4.56 (1.31, 0.25, 1.29, 1.06, 0.65); III 3.85 (1.08, 0.24, 1.00, 0.95, 0.58); IV 5.32 (1.48, 0.25, 1.63, 1.28, 0.68). Leg formula: I-IV-II-III. Tibia I with row of finely hairs ventrally (Fig. 4D). Metatarsus II and III (Fig. 4H, I) with a cluster of hairs on

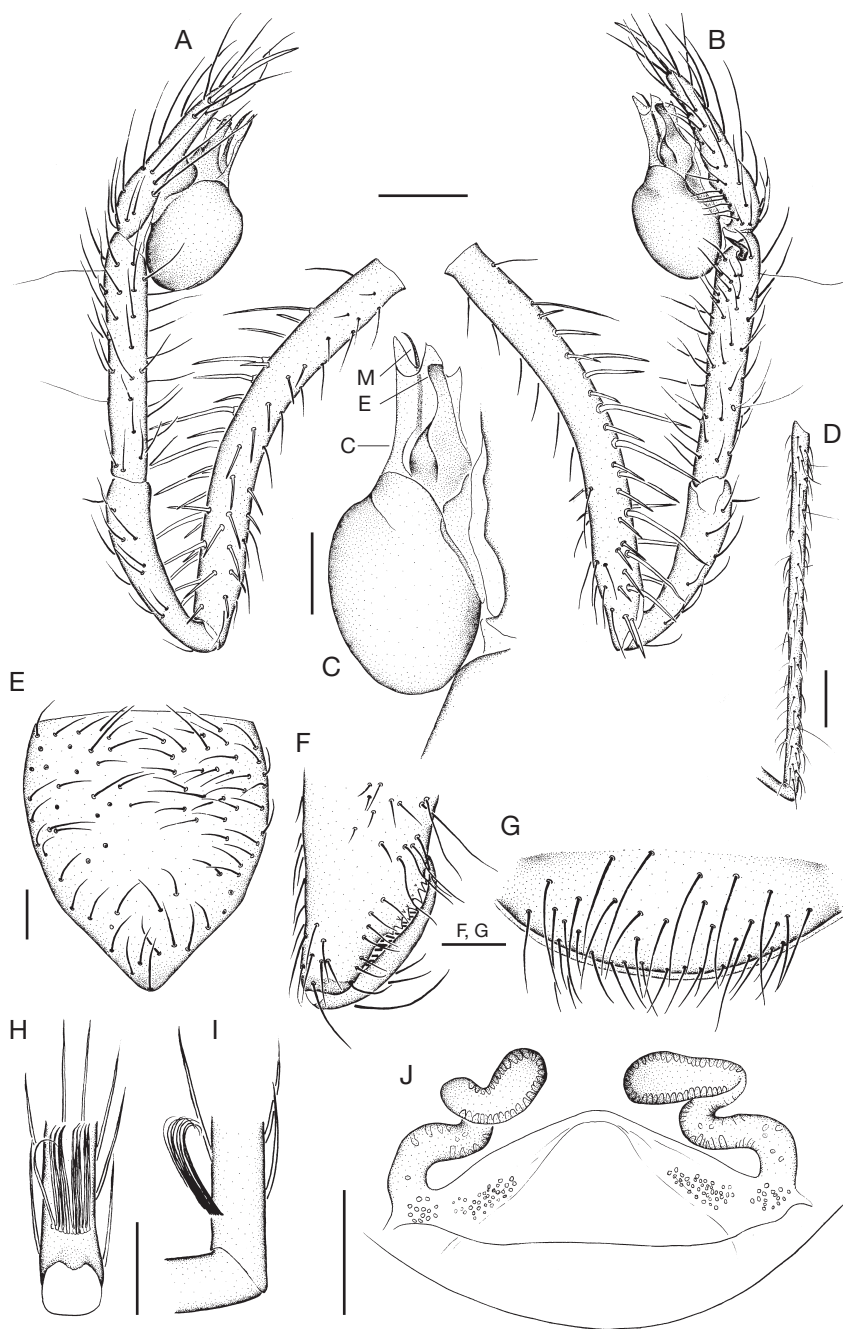


FIG. 4. — *Leptoneta setulifera* n. sp.: **A**, male left palp in prolateral view; **B**, male left palp in retrolateral view; **C**, male left palpal bulb in retrolateral view; **D**, tibia I of male left leg in anterior view; **E**, male sternum in ventral view; **F**, male chelicera in ventral view; **G**, female genitalia in ventral view; **H**, proximally of metatarsus of male leg III, ventral view; **I**, proximally of metatarsus of male leg III, lateral view; **J**, female genitalia in dorsal view. Abbreviations: **C**, **E**, **M**, conductor, embolus and median apophysis of male palpal organ respectively. Scale bars: **A**, **B**, 0.2 mm; **C**, **E**, **J**, 0.1 mm; **D**, 0.3 mm.

basal part of ventral surface. Abdomen haired, brown on dorsum and dark brown on lateral and ventral surfaces, and oval in shape, dorsum with black brown transverse stripes posteriorly, forming three to four folds. Palpal femur with many spines ventrally. Palpal tibia with three long trichobothria on the dorsal surface and with a single hook-like projection disto-laterally (Fig. 4A-C). Cymbium distally branched.

#### *Female (n = 28)*

Similar to male in coloration and general features, but legs shorter. Body length 1.55-2.16 (average: 1.97). Carapace 0.73-0.81 (average: 0.76) long, 0.63-0.70 (average: 0.67) wide; abdomen 0.86-1.24 (average: 1.09) long, 0.61-1.02 (average: 0.88) wide. Clypeus 0.13-0.14 (average: 0.14) high. Eye sizes: ALE 0.05, PLE 0.05, PME 0.04. Distance between eyes: ALE-PME 0.07, PLE-PLP 0.05, PLE-PME 0.03. AER 0.10, PER 0.14. Measurements of palp and legs: palp 1.57 (0.54, 0.19, 0.38, —, 0.46); I 5.03 (1.43, 0.25, 1.51, 1.18, 0.66); II 3.93 (1.13, 0.25, 1.09, 0.87, 0.59); III 3.36 (0.97, 0.24, 0.86, 0.78, 0.51); IV 4.69 (1.37, 0.24, 1.40, 1.07, 0.61). Leg I without special hairs as in male. Internal genitalia with a pair of spermatheca and sperm duct, atrium visible (Fig. 4G, J).

### *Leptoneta tianxinensis* n. sp. (Fig. 5)

TYPE MATERIAL. — Holotype: China, Henan Province, Neixiang County, Qiliping Town, Sandaohe Village, Tianxin Cave (33°21'N, 111°53'E), 24.VI.2005, leg. Q. Wang & Y. Tong, ♂ (MNHN). Paratypes: same data as holotype, 12 ♂♂, 6 ♀♀ (IZCAS); 2 ♂♂, 2 ♀♀ (MNHN).

ETYMOLOGY. — The specific name is derived from the type locality.

DIAGNOSIS. — The new species is similar to *L. xui* Chen, Gao & Zhu, 2000, distributed in Guizhou Province, but can be distinguished by having the chelicera with seven promarginal teeth, instead of nine as in *L. xui*; the eyes are normal-sized, but reduced in *L. xui*; the ventral long spines of male palpal tibia is two, one strong and one relatively slender; and also by the different shape of lamina of male palpal bulb.

#### DESCRIPTION

##### *Male (n = 15)*

Body length 1.83-1.87 (average: 1.85). Carapace 0.85-0.90 (average: 0.87) long, 0.74-0.76 (average: 0.75) wide; abdomen 0.92-0.98 (average: 0.96) long, 0.71-0.75 (average: 0.73) wide. Carapace yellow, with pair of hairs at antero-lateral area of PME. Median groove dark brown, needle-shaped. Cervical grooves and radial furrows evident and light brown. Clypeus 0.09-0.12 (average: 0.11) high. Six eyes. Eye sizes: ALE 0.06, PLE 0.06, PME 0.06. Distance between eyes: ALE-PME 0.10, PLE-PLP 0.08, PLE-PME 0.06. AER 0.11, PER 0.14. Major axes of PLE convergent behind. PME continuous, axes parallel. Chelicera (Fig. 5C) light brown, with seven teeth on promargin of fang furrow and four small teeth on retromargin. Endites and labium light brown. Sternum (Fig. 5E) and legs yellow. Measurements of palp and legs: palp 2.12 (0.82, 0.31, 0.39, —, 0.60); I 6.71 (1.85, 0.31, 1.96, 1.60, 0.99); II 5.52 (1.57, 0.30, 1.53, 1.29, 0.83); III 4.44 (1.29, 0.27, 1.16, 1.05, 0.67); IV 5.96 (1.72, 0.29, 1.67, 1.45, 0.83). Leg formula: I-IV-II-III. Legs with several long and thin spines. Femur I with some stout setae at basal 1/3 of anterior surface. Tibia I with rows of finely hairs ventrally (Fig. 5F). Metatarsus II and III (Fig. 4H, I) as *L. setulifera* n. sp., with a cluster of hairs on basal part of ventral surface, respectively. Abdomen haired, light gray, and oval in shape, no distinct pattern on the dorsum. Palpal femur without thick long spines ventrally. Palpal tibia with three long trichobothria on the dorsal surface and with two long spines ventrally, one is very thick and inserted a finely hair on apical part, the other one relatively slender (Fig. 5A, B). Cymbium distally branched.

##### *Female (n = 8)*

Similar to male in coloration and general features, but legs shorter. Body length 1.88. Carapace 0.70-0.79 (average: 0.76) long, 0.59-0.69 (average: 0.64) wide; abdomen 1.08 long, 0.98 wide. Clypeus 0.10-0.12 (average: 0.11) high. Eye sizes: ALE 0.06, PLE 0.06, PME 0.05. Distance between eyes: ALE-PME 0.08, PLE-PLP 0.07, PLE-PME 0.03. AER 0.10, PER 0.13. Measurements of palp and legs: palp 1.17 (0.38, 0.14, 0.24, —, 0.41); I 4.91

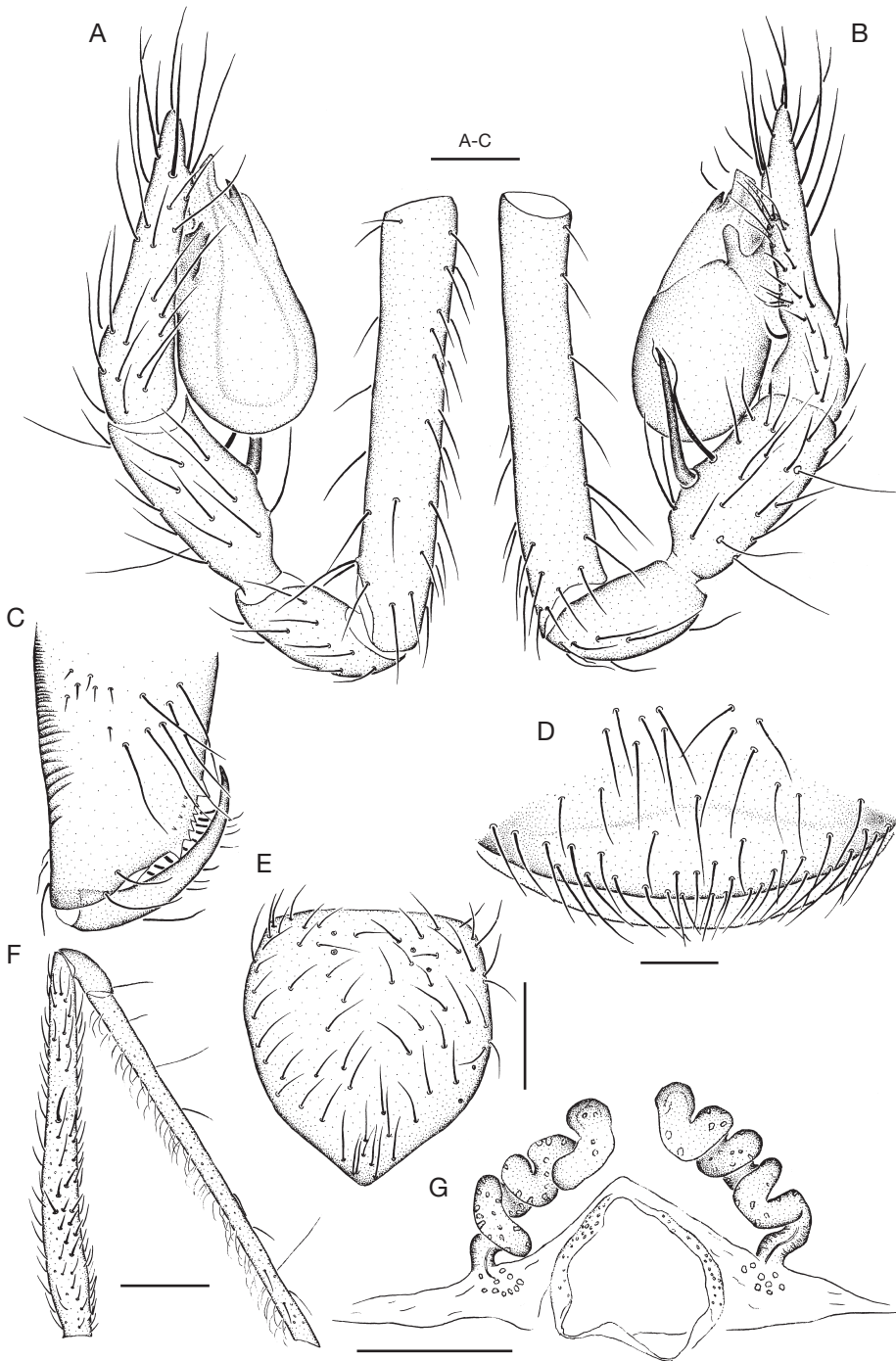


FIG. 5. — *Leptoneta tianxinensis* n. sp.: **A**, male left palp in prolateral view; **B**, male left palp in retrolateral view; **C**, male chelicera in ventral view; **D**, female genitalia in ventral view; **E**, female sternum in ventral view; **F**, male left leg I in anterior view; **G**, female genitalia in dorsal view. Scale bars: A-D, G, 0.1 mm; E, 0.2 mm; F, 0.4 mm.

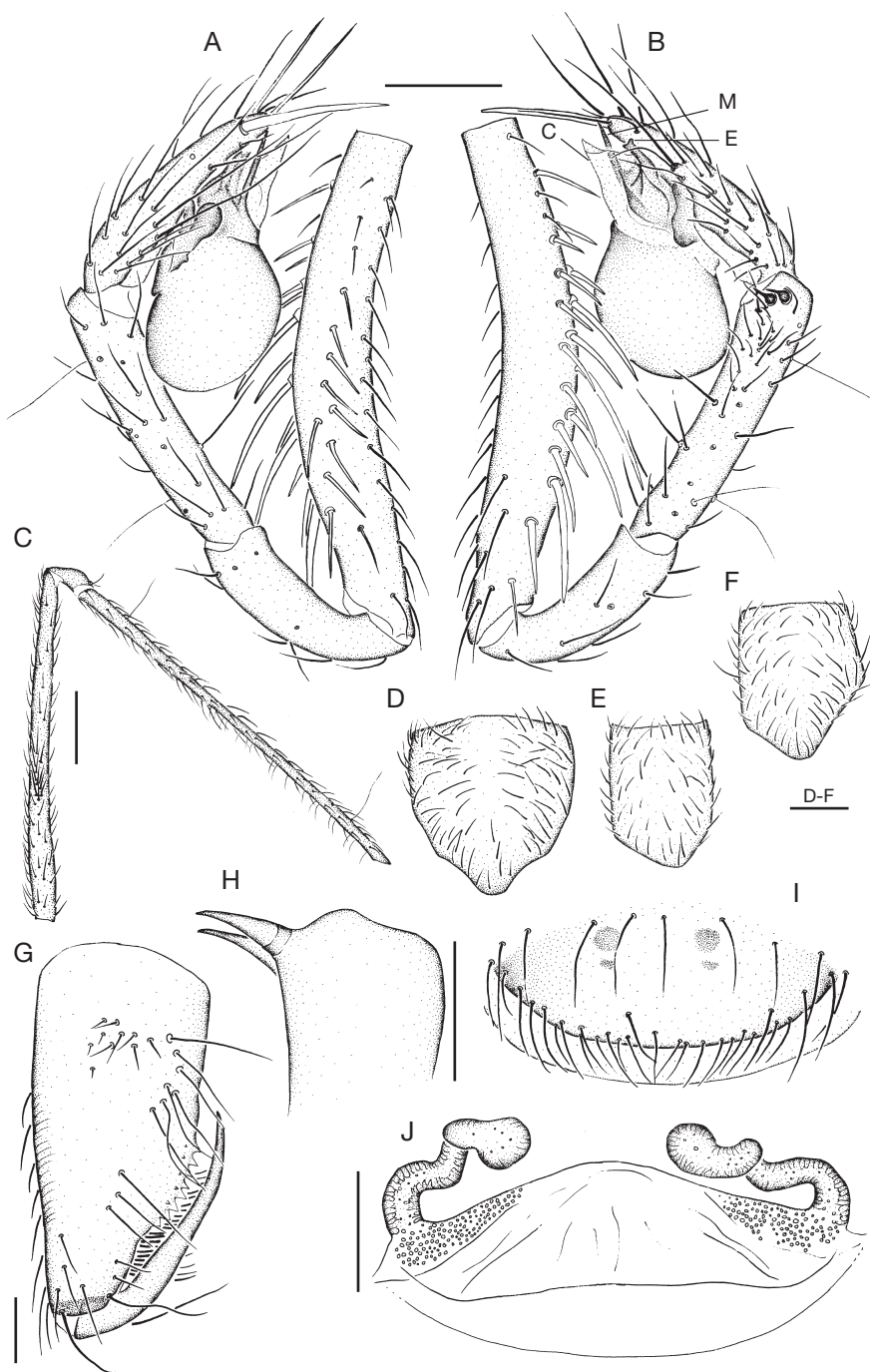


FIG. 6. — *Leptoneta wangae* n. sp.: **A**, male left palp in prolateral view; **B**, male left palp in retrolateral view; **C**, male left leg I in anterior view; **D-F**, female sternum in ventral view; **G**, male chelicera in ventral view; **H**, tibial apophyses of male left palp, dorsal view; **I**, female genitalia in ventral view; **J**, female genitalia in dorsal view. Abbreviations: **C**, **E**, **M**, conductor, embolus and median apophysis of male palpal organ respectively. Scale bars: **A**, **B**, **D-F**, 0.2 mm; **C**, 0.5 mm; **G-J**, 0.1 mm.

(1.37, 0.26, 1.36, 1.11, 0.81); II 4.07 (1.16, 0.24, 1.06, 0.91, 0.70); III 3.47 (1.00, 0.23, 0.87, 0.79, 0.58); IV 4.64 (1.33, 0.23, 1.26, 1.09, 0.73). Leg I without special hairs as in male. Internal genitalia with a pair of spermatheca and sperm duct, atrium visible (Fig. 5D, G).

*Leptoneta wangae* n. sp.  
(Fig. 6)

TYPE MATERIAL. — Holotype: China, Beijing City, Fangshan District, Xiayunling Town (39°42'N, 115°44'E), Beizhihe Village, Zhizhu Cave, 8.III.2005, leg. Q. Wang & Y. Tong, ♂ (MNHN).

Paratypes: same data as holotype, 10 ♂♂, 8 ♀♀ (IZCAS); 2 ♂♂, 2 ♀♀ (MNHN).

ETYMOLOGY. — The species is named after the collector Dr Qian Wang (Shanghai Institute for Biological Sciences, Chinese Academy of Sciences).

DIAGNOSIS. — The new species is similar to *L. yongdamgulensis* Paik & Namkung, 1969 (Paik *et al.* 1969), but can be easily distinguished by the presence of eight teeth on promargin of fang furrow and five small denticles on retromargin, the presence of many long spines on ventral surface of male palpal femur, and the presence of two small strong spines on disto-lateral surface of male palpal tibia, instead of a single long spine on middle part of retrolateral surface as in *L. yongdamgulensis*.

DESCRIPTION

*Male* (*n* = 13)

Body length 1.76–1.99 (average: 1.87). Carapace 0.81–0.87 (average: 0.84) long, 0.70–0.76 (average: 0.73) wide; abdomen 0.95–1.16 (average: 1.04) long, 0.70–0.79 (average: 0.75) wide. Carapace yellow, with a pair of setae at lateral area of PME. Median groove dark brown, needle-shaped. Cervical grooves and radial furrows evident and light brown. Clypeus 0.20 high. Eyes six, but the PME strongly reduced or only one of the PME can be discernable or both absent. Eye sizes: ALE 0.04, PLE 0.04, PME 0–0.03. Distance between eyes: ALE–PME 0.08, PLE–PLE 0.04, PLE–PME 0.04. AER 0.08, PER 0.10. Major axes of PLE convergent behind. PME, if both present, separated from each other by one time of their diameter. Chelicera (Fig. 6G) light brown, with eight teeth on promargin of fang furrow and five small teeth on retromargin. Endites

and labium light brown. Sternum (Fig. 6D–F) usually shield-shaped, but varying greatly, some narrowed and lateral margins parallel and some asymmetrical at outer margins, especially in the part along the coxae III and IV. Legs yellow. Measurements of palp and legs: palp 2.24 (0.90, 0.39, 0.50, –, 0.45); I 8.93 (2.47, 0.30, 2.73, 2.22, 1.21); II 6.52 (1.87, 0.28, 1.90, 1.48, 0.99); III 5.21 (1.51, 0.21, 1.45, 1.28, 0.76); IV 7.27 (2.08, 0.28, 2.24, 1.75, 0.92). Leg formula: I–IV–II–III. Femur I with some relatively thicker setae on middle part of anterior surface. Tibia I with row of fine hairs on distal half of ventral surface (Fig. 6C). Abdomen haired, pale yellow, venter brownish, and oval in shape, no distinct pattern on the dorsum. Palpal femur with many long spines ventrally. Palpal tibia with three long trichobothria on the dorsal surface and with two strong short spines disto-laterally (Fig. 6A, B, H). Cymbium distally branched.

*Female* (*n* = 10)

Similar to male in coloration and general features, but legs shorter. Body length 1.65–2.01 (average: 1.89). Carapace 0.75–0.81 (average: 0.78) long, 0.69–0.73 (average: 0.71) wide; abdomen 0.90–1.21 (average: 1.12) long, 0.62–0.91 (average: 0.79) wide. Clypeus 0.19–0.20 (average: 0.19) high. Eyes usually four, PME more strongly reduced than in male, in a few specimens, the PLE even slightly reduced. Eye sizes: ALE 0.04, PLE 0.04. Distance between eyes: ALE–PME 0.10, PLE–PLE 0.05, PLE–PME 0.07. AER 0.08, PER 0.12. PME, if both discernable, separated from each other by at least one time of their diameter. Measurements of palp and legs: palp 1.80 (0.62, 0.21, 0.45, –, 0.52); I 7.35 (1.95, 0.30, 2.19, 1.75, 1.16); II 5.58 (1.57, 0.26, 1.60, 1.27, 0.88); III 4.62 (1.30, 0.25, 1.23, 1.12, 0.72); IV 6.39 (1.85, 0.26, 1.91, 1.51, 0.86). Leg I without special hairs as in male. Internal genitalia with a pair of spermathecae and sperm duct, atrium visible (Fig. 6I, J).

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