

A taxonomic study of five erigonine spiders (Araneae: Linyphiidae) from China

Таксономическое изучение пяти видов эригонин (Araneae: Linyphiidae) из Китая

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КЛЮЧЕВЫЕ СЛОВА: Erigoninae, систематика, новый вид, новая комбинация, новая находка.

ABSTRACT. Five erigonine spiders are described or redescribed and figured, i.e. *Gongylidioides diellipticus* sp.n., *Paikiniana biceps* sp.n., *Dicymbium sinofacetum* Tanasevitch, 2006, *Paikiniana lurida* (Seo, 1991) comb.n. and *Houshenzinus rimosus* Tanasevitch, 2006. The types of *Araeoncus stigmatosus* Xia et al., 2001 were re-examined and females of *A. stigmatosus* were referred to *D. sinofacetum*. The females are described for the first time for the species *P. lurida* (Seo, 1991) comb.n. (ex *Walckenaeria*) and *H. rimosus*. The species *P. lurida* (Seo, 1991) comb.n., is newly transferred from the genus *Walckenaeria*. This is the first record of the genus *Paikiniana* in China.

РЕЗЮМЕ. Приведено иллюстрированное описание либо переописание пяти видов эригонин *Gongylidioides diellipticus* sp.n., *Paikiniana biceps* sp.n., *Dicymbium sinofacetum* Tanasevitch, 2006, *Paikiniana lurida* (Seo, 1991) comb.n. и *Houshenzinus rimosus* Tanasevitch, 2006. Исследование типов *Araeoncus stigmatosus* Xia et al., 2001 показало, что самки этого вида относятся к *D. sinofacetum*. Впервые описаны самки *Paikiniana lurida* (Seo, 1991) comb.n. (ex *Walckenaeria*) и *H. rimosus*. Род *Paikiniana* впервые отмечается для Китая.

Introduction

Located in the east of the Asian continent, on the western shore of the Pacific Ocean, China has a land area of about 9.6 million sq km, and is one of the largest countries in the world. At present, a total of 125 species of subfamily Erigoninae, belonging to 69 genera, are known from China [Platnick, 2007]. There is no doubt that this figure represents but a small fraction of the true diversity of these spiders populating such a vast and physiographically heterogeneous country [Tanasevitch, 2006]

and that there are a tremendous number of new species waiting to be discovered from China in the near future.

In the present paper, detailed morphological descriptions and illustrations of two new species and three known species of erigonine spiders, as well as information about their habitats and distributions are provided. All the material examined is deposited in the Institute of Zoology, Chinese Academy of Sciences in Beijing (IZCAS), China.

Material and methods

Specimens were examined using an Olympus-SZ11 stereomicroscope and illustrated using an Olympus-BX41 compound microscope equipped with a drawing tube. Male left palps and female epigyna were illustrated after being separated from the body. Embolic divisions were dissected from the palpal bulb using sharp pins and forceps. Genital organs were immersed in 75% alcohol and examined under a compound microscope; embolic divisions and vulvae were mounted in Hoyer's Solution and examined by strong transmitted light against a white background. In addition, the cuticle of epigyna was removed by sharp pins and forceps when duct system of vulvae was observed.

Eye diameters were measured at the widest point. Leg measurements are shown as: total length (femur, patella, tibia, metatarsus, tarsus). All measurements are given in millimeters. Terminology for genitalic structures follows Hormiga [2000].

The following abbreviations are used in the text and figures:

Somatic morphology. ALE — anterior lateral eye; AME — anterior median eye; PLE — posterior lateral eye; PME — posterior median eye; Tm I — position of first metatarsal trichobothrium; Tm IV — fourth metatarsal trichobothrium.

Male palp. ARP — anterior radical process; C — column; BH — basal heamatodocha; DSA — distal suprategular apophysis; E — embolus; EBL — embolic basal lobe; EM — embolic membrane; F — a fissure in the center of ventral plate; MSA — marginal suprategular apophysis; PC — paracymbium; PT — protegulum; PTA — prolateral tibial apophysis; R — radix; RBP — cymbial retrobasal process; RMP — cymbial retromedian process; RTA — retrolateral tibial apophysis; SPT — suprategulum; ST — subtegulum; T — tegulum; TP — tailpiece of radix.

Epigynum. CD — copulatory duct; CO — copulatory opening; DP — dorsal plate; DPS — dorsal plate scape; FD — fertilization duct; FO — fertilization opening; S — spermatheca; VP — ventral plate.

Taxonomy

Family Linyphiidae Blackwall, 1859

Dicymbium sinofacetum Tanasevitch, 2006
Figs 1–13.

Araeoncus stigmatosus Xia *et al.*, 2001: 164, f. 14–17 (♀ only).

Dicymbium sinofacetum Tanasevitch, 2006: 289, Figs 39–44.

MATERIAL EXAMINED. 3 paratypes ♀♀ of *Araeoncus stigmatosus* Xia *et al.*, 2001, Mt. Xinglong (36.0°N, 103.7°E), Lanzhou City, Gansu Province, China, 15.VI.1991, leg. J. Gao; 8 ♂♂ and 3 ♀♀ (IZCAS), Rilong Town (31.92°N, 102.31°E), Xiaojin County, Sichuan Province, China, 31.VII.2004, leg. S. Li and L. Tu; 1 ♀ (IZCAS), Bitahai Nature Reserve (27.85°N, 100.02°E), Shangri-La County, Yunnan Province, 25.VII.2006, leg. Y. Song.

DIAGNOSIS. This species is closely related to the Siberian *Dicymbium facetum* (L. Koch, 1879) [Song, 2006, Figs 1–13] but differs by the non-expanded proximal part of paracymbium (Fig. 2); by the shape of embolus, which is gradually narrowed in *D. sinofacetum* (Figs 2, 8), expanded basally and abruptly narrowed distally in *D. facetum*; by the presence of one blunt apophysis at the base of embolus in *D. sinofacetum* (Fig. 9), absent in *D. facetum*; by the slender, narrow embolic membrane in *D. sinofacetum* (Fig. 9), wider and longer in *D. facetum*; by the prolateral tibial apophysis (Fig. 6), which has a row of highly sclerotized small teeth along the inner curvature of the prolateral tibial apophysis in *D. sinofacetum*, a patch of small teeth scattered randomly on the inner side of partly membranous prolateral tibial apophysis in *D. facetum*; by the shape of retrolateral tibial apophysis, which is irregular in *D. sinofacetum* (Fig. 6), triangular in *D. facetum*. Females further distinguished by the presence of a pair of coniform extensions, with two lateral sides free, in the middle of ventral plate in *D. facetum*, absent in *D. sinofacetum* (Fig. 12); by the shape of dorsal plate, which is small and tapered in *D. sinofacetum* (Fig. 10), large in *D. facetum* and by the shape of copulatory ducts, which are large and sac-shaped at their point of origin, and loop posteriorly before entering the spermathecae in *D. sinofacetum* (Figs 11, 13), small, with no posterior loop in *D. facetum*.

DESCRIPTION. Male. Total length 2.10. Cephalothorax 0.96 long, 0.76 wide, grayish brown, without any apophysis (Fig. 5). Abdomen light grey. Clypeus 0.22 high. AME diameter 0.041, ALE 0.069, PME 0.066, PLE 0.063, AME separation 0.31 times their diameter, AME-ALE separation

0.77 times one ALE diameter, PME separation 0.29 times their diameter, PME-PLE separation 1.00 times one PLE diameter. Sternum 0.55 long, 0.55 wide, dusky yellow. Coxa IV separation 0.88 times their width. Chelicerae grayish brown, with 6 promarginal teeth, 5 retromarginal teeth. Legs dusky yellow. Tibia I 6.59 times longer than wide. Tm I 0.50, Tm IV absent. Tibia dorsal spines: 2-2-1-1; patella dorsal spine: 1-1-1-1. Leg measurements: I: 2.99 (0.88, 0.28, 0.70, 0.63, 0.50); II: 2.74 (0.80, 0.26, 0.63, 0.61, 0.44); III: 2.65 (0.73, 0.23, 0.89, 0.69, 0.46); IV: 3.24 (0.97, 0.23, 0.89, 0.69, 0.46).

Male palp as illustrated, femur nearly twice as long as patella (Fig. 4). Tibia (Figs 6–7) narrowed distally; with vimineous bifurcate prolateral tibial apophysis strongly curved to retrolateral side, as well as a row of highly sclerotized small teeth arranged along the inner curvature; with complicated retrolateral tibial apophysis composed of triangular upper part and irregular nether part; with two retrolateral and one prolateral tibial trichobothria. Paracymbium straight hook (Fig. 2). Protegulum slightly swollen (Figs 2–3). Suprategulum armed with one strongly curved marginal suprategular apophysis (Figs 8–9) and one trifurcate distal suprategular apophysis (Figs 1, 9), the small branch of which is mostly covered by the outer two large branches. Anterior radical process (Figs 3, 9) long and narrow, with membranous lower surface. Tailpiece (Fig. 3) curved upwards, foot-shaped in prolateral view. Embolus (Figs 8–9) one loop, with a narrow membrane along the inner margin.

Female. Both sexes similar in general appearance. Total length 1.80. Cephalothorax 0.98 long, 0.75 wide. Clypeus 0.31 high. AME diameter 0.047, ALE 0.078, PME 0.077, PLE 0.066, AME separation 0.27 times their diameter, AME-ALE separation 0.40 times one ALE diameter, PME separation 0.40 times their diameter, PME-PLE separation 0.62 times one PLE diameter. Sternum 0.57 long, 0.58 wide. Coxa IV separation 0.96 times their width. Chelicerae with 5 promarginal teeth, 5 retromarginal teeth. Tibia I 6.00 times longer than wide. Tm I 0.45, Tm IV absent. Tibia dorsal spines: 2-2-1-1; patella dorsal spines: 1-1-1-1. Leg measurements: I: 2.98 (0.85, 0.29, 0.75, 0.63, 0.46); II: 2.77 (0.83, 0.32, 0.64, 0.57, 0.41); III: 2.40 (0.71, 0.30, 0.51, 0.52, 0.36); IV: 3.20 (1.00, 0.30, 0.83, 0.64, 0.43).

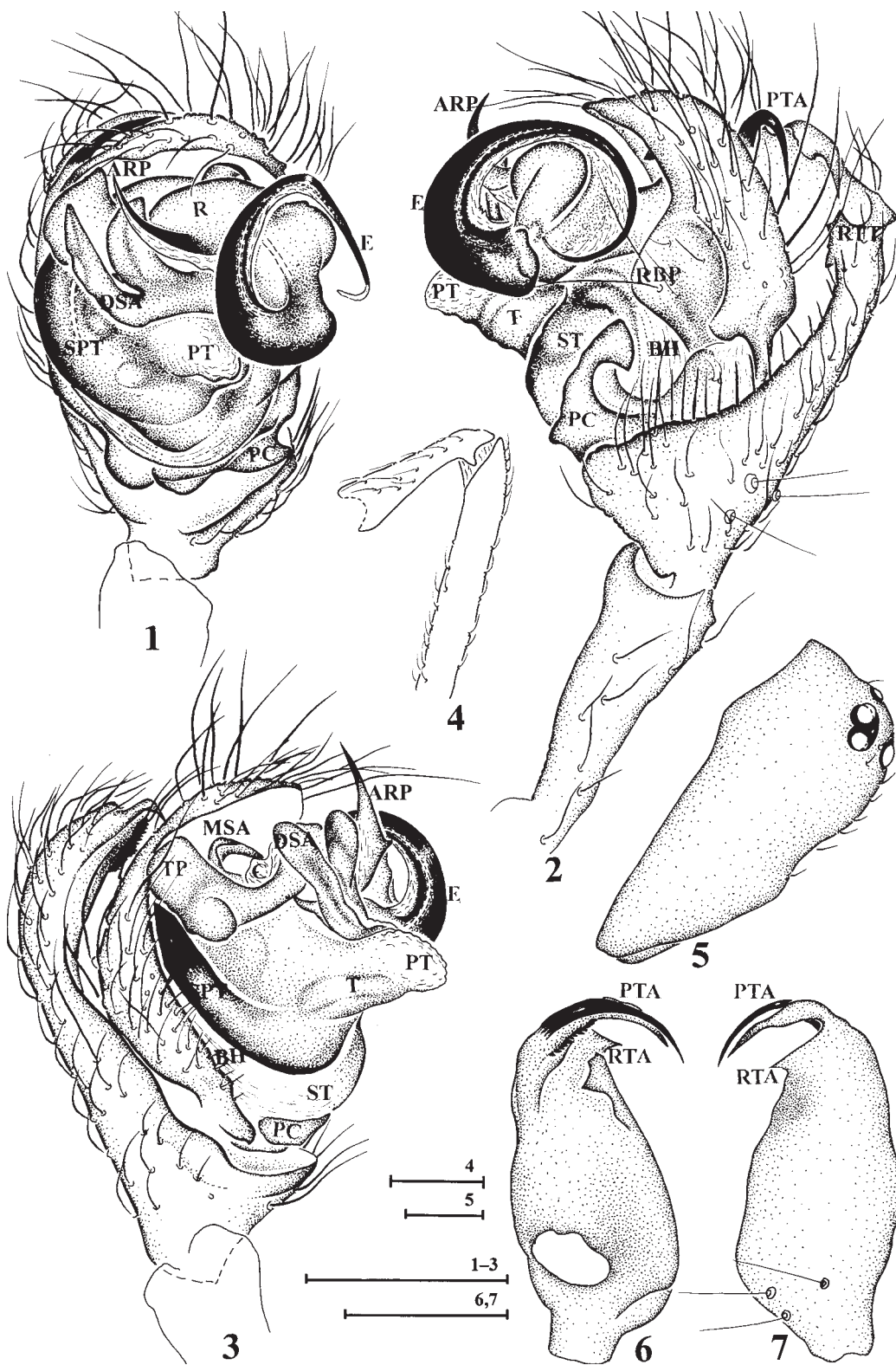
Epigynum elliptical, with a longitudinal fissure in the center (Fig. 12). Dorsal plate triangular, with posterior margins turned up (Fig. 10). A pair of semicircular depressions present along the posterior margins of epigynum (Fig. 12). Spermathecae long oblong and separated by about half their half length (Fig. 11). Copulatory ducts expanded at the beginning to be sac-shaped and looping posteriorly followed by a before entering into spermathecae (Figs 11, 13). Fertilization ducts posteriorly orientated and S-shaped in lateral view (Fig. 11).

VARIATION. Total length 1.56–2.17 in males (n=10), 1.66–2.14 in females (n=10). Cephalothorax length 0.95–0.97 in males (n=10), 0.96–0.98 in females (n=10); width 0.76–0.77 in males (n=10), 0.74–0.75 in females (n=10). Fissure length of female epigynum 0.20–0.23 (n=10).

DISTRIBUTION. China (Gansu, Sichuan, Yunnan).

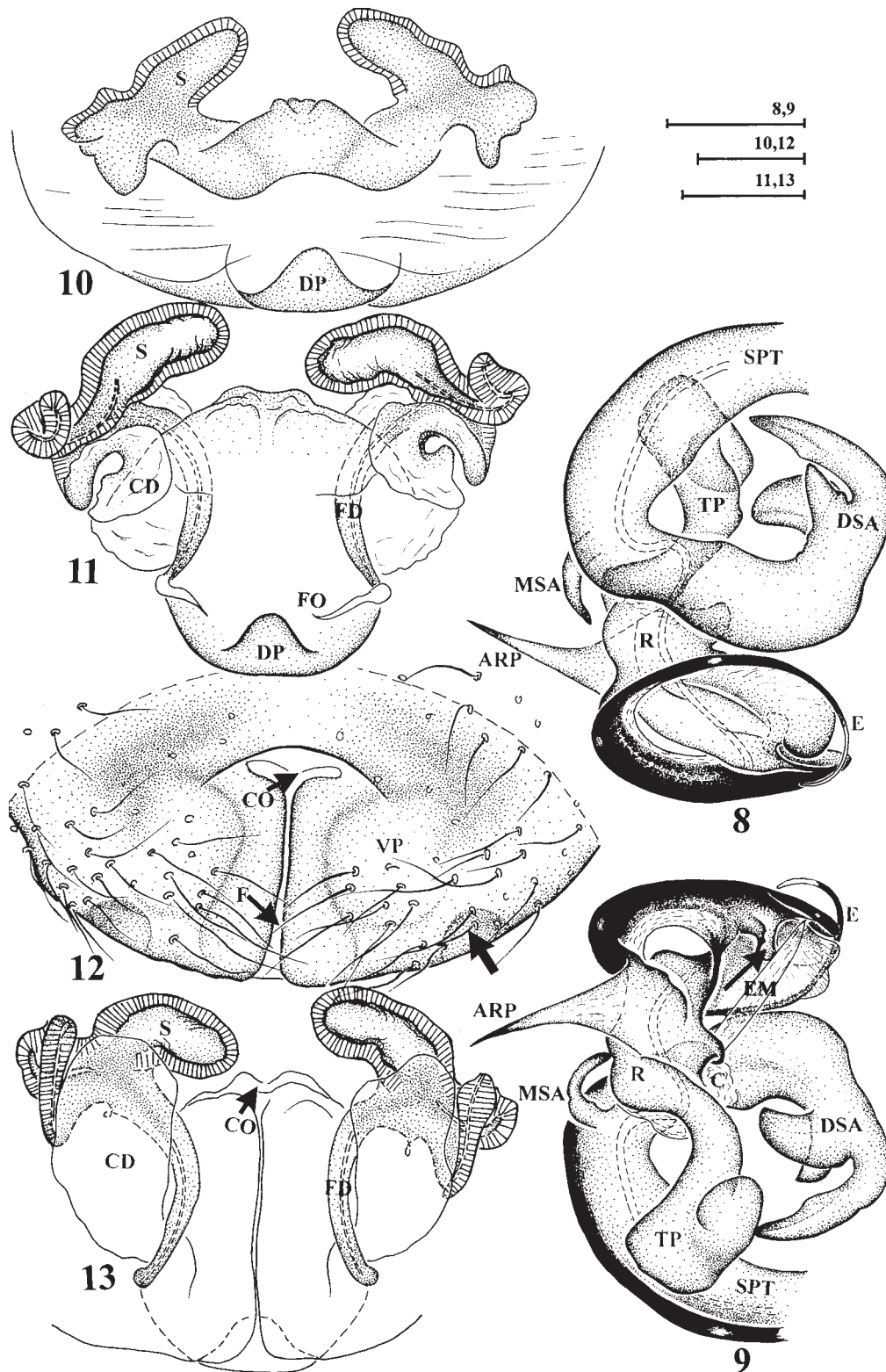
HABITAT. This species occurs in grass or under leaves on the ground in marshes, and becomes sexually mature in late July and early August.

REMARK. The female paratypes of *Araeoncus stigmatosus* Xia *et al.*, 2001 were examined and found to be *Dicymbium sinofacetum*.



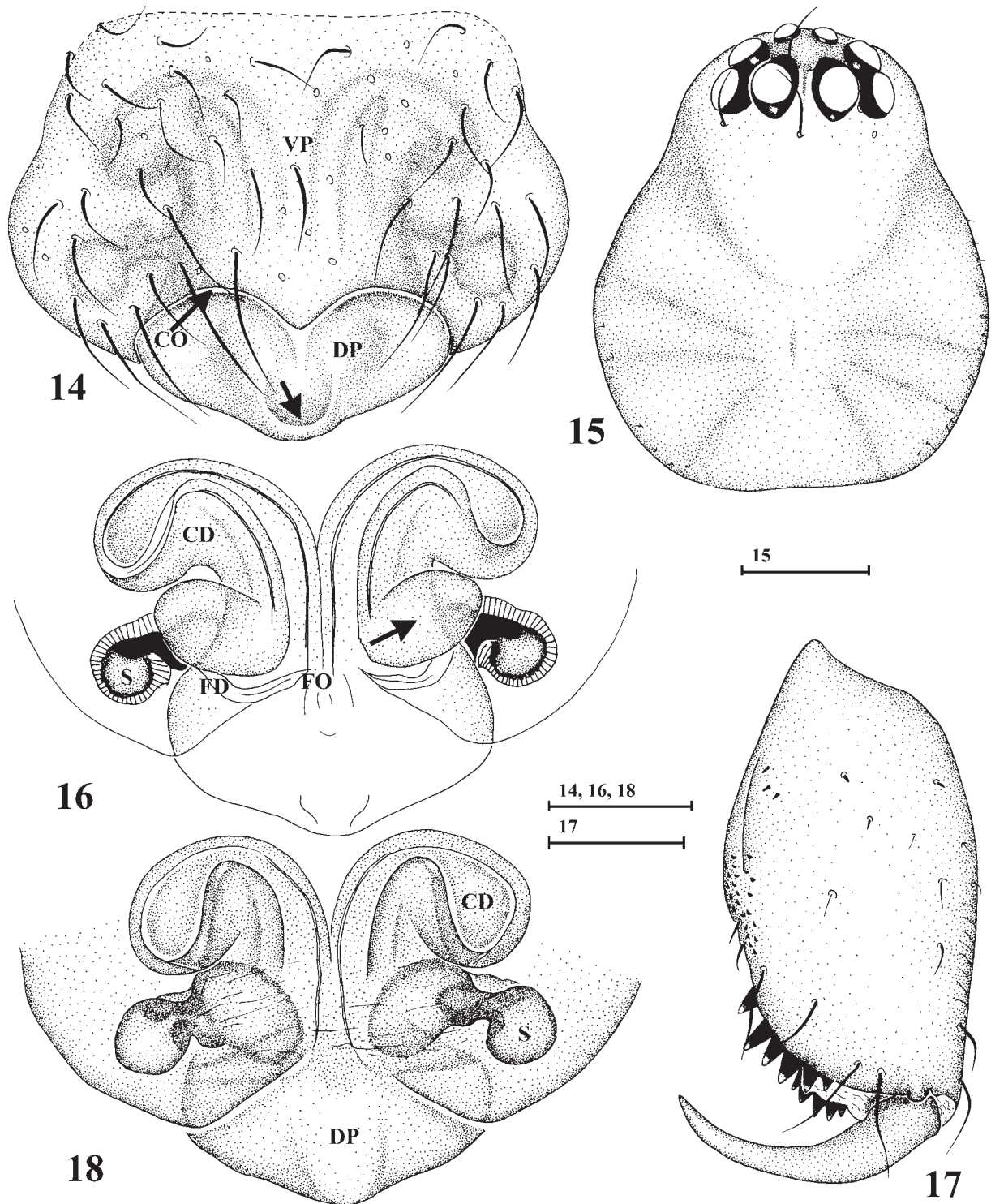
Figs 1-7. *Dicymbium sinofacetum*: 1 — left male palp, ventral view; 2 — same, retrolateral view; 3 — same, prolateral view; 4 — patella and femur of left male palp, retrolateral view; 5 — male cephalothorax, lateral view; 6 — male left tibia, ventral view; 7 — same, dorsal view. Scale bars: 0.2mm.

Рис. 1-7. *Dicymbium sinofacetum*: 1 — левая палпа самца, снизу; 2 — то же, ретролатерально; 3 — то же, пролатерально; 4 — колено и бедро левой палпы самца, ретролатерально; 5 — головогрудь самца, сбоку; 6 — голень левой палпы самца, снизу; 7 — то же, сверху. Масштаб: 0,2 мм.



Figs 8–13. *Dicymbium sinofacetum*: 8 — embolic division (with EM), dorsal view; 9 — same, ventral view (arrow refers to the blunt apophysis at the base of the embolus); 10 — epigynum, dorsal view; 11 — female vulva, dorsal view; 12 — epigynum, ventral view (arrow refers to the semicircular depression); 13 — vulva, ventral view. Scale bars: 0.1 mm.

Рис. 8–13. *Dicymbium sinofacetum*: 8 — эмболюсный отдел (с EM), сверху; 9 — то же, снизу (стрелка показывает тупой отросток в основании эмболюса); 10 — эпигина, сверху; 11 — вульва, сверху; 12 — эпигина, снизу (стрелка показывает полукруглое углубление); 13 — вульва, снизу. Масштаб: 0,1 мм.



Figs 14–18. *Gongylioides diellipticus* sp.n.: 14 — epigynum, ventral view (arrow refers to the shallow depression); 15 — female cephalothorax, dorsal view; 16 — female vulva, dorsal view; 17 — female chelicera, frontal view. Scale bars: 14, 16–18 — 0.1mm; 15 — 0.2 mm.

Рис. 14–18. *Gongylioides diellipticus* sp.n.: 14 — эпигина, снизу (стрелка показывает неглубокую ямку); 15 — головогрудь самки, сверху; 16 — вульва, сверху; 17 — хелицера самки, спереди. Масштаб: 14, 16–18 — 0,1 мм; 15 — 0,2 мм.

Gongyldioides diellipticus sp.n.

Figs 14–18.

TYPE MATERIAL. Holotype ♀ (IZCAS), Yangmingshan National Park (25.15°N, 121.55°E), Taipei City, Taiwan, China, X.2003, leg. I-M. Tso.

ETYMOLOGY. Specific name from Greece *ellipticus* = elliptical, combined with prefix *di*, in reference to the two extra elliptical extensions of copulatory ducts in female.

DIAGNOSIS. The female of this new species (male unknown) is similar to *Gongyldioides angustus* Tu & Li, 2006, but can be distinguished by the presence of two extra elliptical extensions of copulatory ducts and a shallow depression in the center of the dorsal plate.

DESCRIPTION. Male. Unknown.

Female (holotype). Total length 1.92. Cephalothorax (Fig. 15) 0.81 long, 0.61 wide, unmodified, lemon yellow. Abdomen light grey, with two black spots on both sides of epigynum and spinnerets. Clypeus 0.11 high. AME diameter 0.044, ALE 0.069, PME 0.069, PLE 0.078, AME separation 0.09 times their diameter, AME-ALE separation 0.18 times one ALE diameter, PME separation 0.23 times their diameter, PME-PLE separation 0.24 times one PLE diameter. Sternum 0.46 long, 0.45 wide. Coxa IV separation 1.45 times their width. Chelicerae (Fig. 17) with 6 promarginal and 5 retromarginal teeth. Tibia I 8.75 times longer than wide. Tm I 0.63, Tm IV present. Tibia dorsal spines: 2-2-1-1; patella dorsal spine: 1-1-1-1. Leg measurements: I: 4.20 (1.14, 0.33, 1.03, 1.06, 0.64); II: 3.85 (1.09, 0.34, 0.91, 0.92, 0.59); III: 3.33 (0.97, 0.31, 0.72, 0.83, 0.50); IV: 4.20 (1.14, 0.31, 1.09, 1.05, 0.61).

Surface of epigynum almost transparent. Ventral plate with margins extending anterolaterally and forming a pair of long, narrow and curved copulatory openings (Fig. 14). Dorsal plate (Fig. 14) exposed, somewhat cordate, with a shallow depression in the center when viewed ventrally. Copulatory ducts (Figs 16, 18) forming a pair of large round loops anteriorly and then extending to be a pair of ellipsoids before entering into rounded spermathecae. Fertilization ducts extremely short, mesally orientated (Fig. 16).

DISTRIBUTION. Known only from the type locality.

Houshenzinus rimosus Tanasevitch, 2006

Figs 19–32.

Houshenzinus rimosus Tanasevitch, 2006: 292, f. 45–50 (♂).

MATERIAL EXAMINED. 12 ♀♀ and 7 ♂♂ (IZCAS), Qisehai (30.05°N, 101.94°E), Kangding County, Sichuan Province, China, 14.VII.2004, leg. Y. Song, L. Tu and S. Li; 20 ♀♀ and 4 ♂♂ (IZCAS), Paoma Shan (30.05°N, 102.01°E), Kangding County, Sichuan Province, China, 17.VII.2004, leg. Z. Zhang.

DIAGNOSIS. See Tanasevitch [2006].

DESCRIPTION. Male. Total length 1.90. Cephalothorax 0.82 long, 0.65 wide, dark grey, highly modified as figures (Figs 25–26) shown. Abdomen pale grey. Clypeus 0.19 high. AME diameter 0.038, ALE 0.044, PME 0.044, PLE 0.050, AME separation 0.50 times their diameter, AME-ALE separation 0.86 times one ALE diameter, PME separation 1.71 times their diameter, PME-PLE separation 1.38 times one PLE diameter. Sternum 0.46 long, 0.48 wide. Coxa IV separation 1.09 times their width. Chelicerae (Fig. 22) with 6 promarginal teeth, 5 retromarginal teeth. Legs mostly pale grey-yellow, but dark grey at the proximal end of tibiae and distal end of femora and metatarsi. Tibia I 8.42 times longer than wide. Tm I 0.75, Tm IV present. Tibias and patellae of leg I and leg II with very short spines, one

third and one fifth of the width of patella and tibia respectively. Tibias and patellae of leg III and leg IV with long spines, once and twice the width of patella and tibia respectively. Tibia dorsal spines: 2-2-1-1; patella dorsal spines: 2-2-2-2. Leg measurements: I: 2.59 (0.73, 0.23, 0.63, 0.63, 0.38); II: 2.52 (0.68, 0.21, 0.61, 0.63, 0.39); III: 2.06 (0.56, 0.21, 0.43, 0.53, 0.33); IV: 2.59 (0.72, 0.21, 0.61, 0.67, 0.38).

Male palpal tibia (Fig. 23) armed with one prolateral and one retrolateral tibial apophysis, as well as one prolateral and one retrolateral trichobothria. Paracymbium (Fig. 21) L-shaped with the distal part extended to be a curved outgrowth and several hairs on the basal arm near its junction with the cymbium and four long hairs on the short arm. Tegulum distal to subtegulum in unexpanded palp (Fig. 24). Protegulum (Figs 20, 24) undeveloped and hid under super large distal suprategular apophysis, which covers the most of the embolic division. Column highly developed (Figs 19, 28). Distal suprategular apophysis (Figs 28–32) spiral, broad at the base, pointed in the distal end, with two concave slopes arranged in the opposite direction on the surface. Tailpiece (Fig. 28) short, with a deep hole at the bottom. Embolus (Figs 30, 32) long coiled, circling around the outer margin of distal suprategular apophysis. Radix (Figs 24, 32) rather simple, partly membranous and partly highly sclerotized in the shape of a black stripe.

Female (first description). Total length 2.15. Cephalothorax 0.81 long, 0.59 wide, dark grey, without any modifications as that of the male. Clypeus 0.17 high. AME diameter 0.047, ALE 0.053, PME 0.044, PLE 0.066, AME separation 0.53 times their diameter, AME-ALE separation 0.47 times one ALE diameter, PME separation 1.00 times their diameter, PME-PLE separation 0.43 times one PLE diameter. Sternum 0.47 long, 0.46 wide. Coxa IV separation 1.50 times their width. Chelicerae with 6 promarginal teeth, 5 retromarginal teeth. Tibia I 6.77 times longer than wide; Tm I 0.77, Tm IV present. Tibias and patellae of all four legs with very long spines, twice the width of tibia or patella. Tibia dorsal spines: 2-2-1-1; patella dorsal spines: 2-2-2-2. Leg measurements: I: 2.32 (0.64, 0.22, 0.55, 0.54, 0.36); II: 2.31 (0.65, 0.21, 0.56, 0.54, 0.36); III: 1.96 (0.54, 0.21, 0.39, 0.51, 0.31); IV: 2.38 (0.69, 0.19, 0.55, 0.60, 0.35).

Epigynum (Fig. 31) semicircular, with two highly sclerotized, long and narrow extensions anteriorly. Dorsal plate rectangular in ventral view. Copulatory ducts (Fig. 27) enclosed in a slightly sclerotized capsule, broad at first, then narrowed gradually to form two loops before reversing to the rounded spermathecae. Fertilization ducts simple (Fig. 27), short, mesally orientated.

VARIATION. Total length 1.88–1.91 in males (n=10), 2.06–2.17 in females (n=10). Cephalothorax length 0.80–0.84 in males (n=10), 0.78–0.83 in females (n=10); width 0.63–0.67 in males (n=10), 0.59–0.61 in females (n=10).

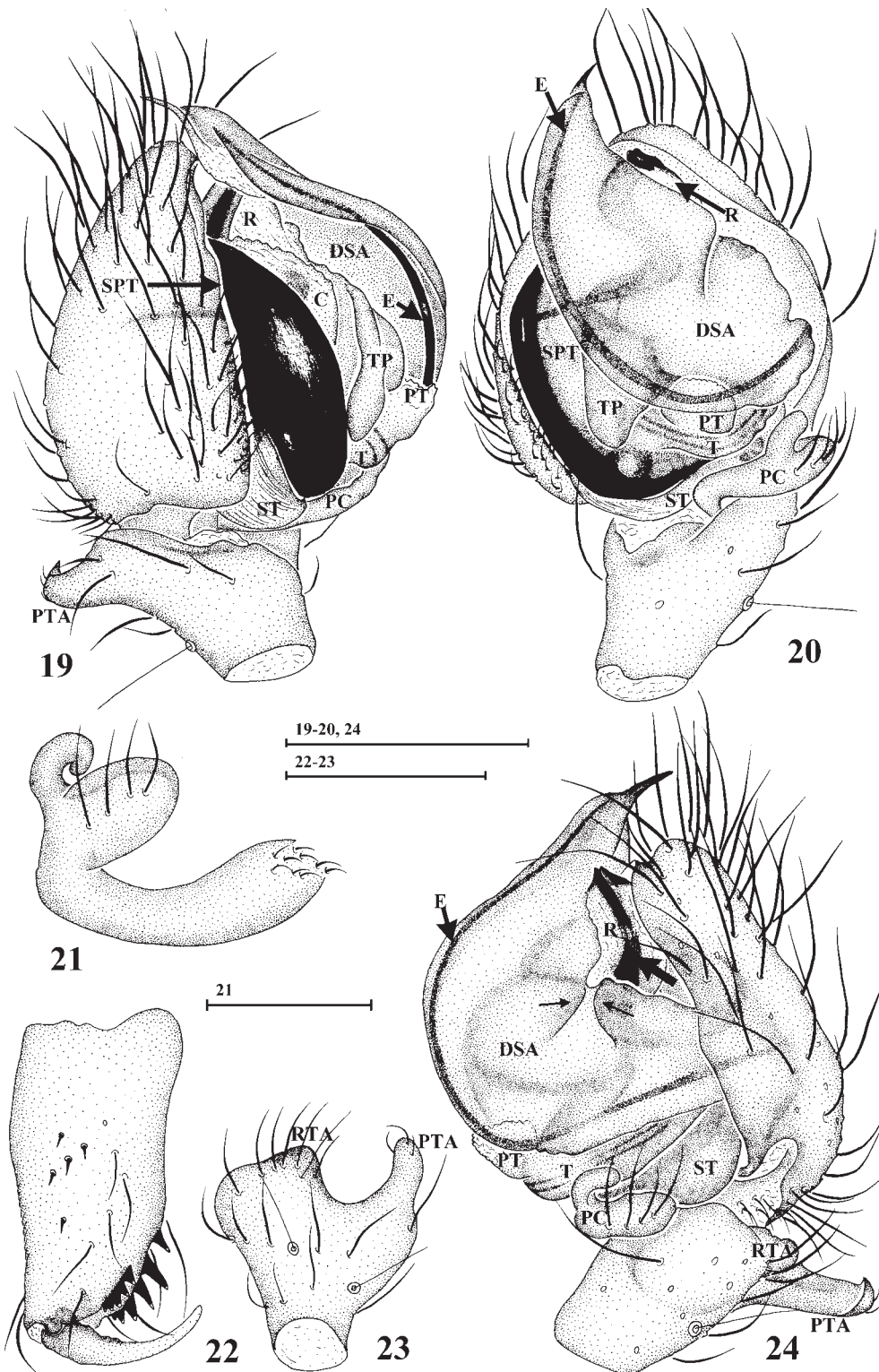
DISTRIBUTION. China (Shaanxi, Sichuan).

HABITAT. This species was found near roots of grass.

Paikiniana biceps sp.n.

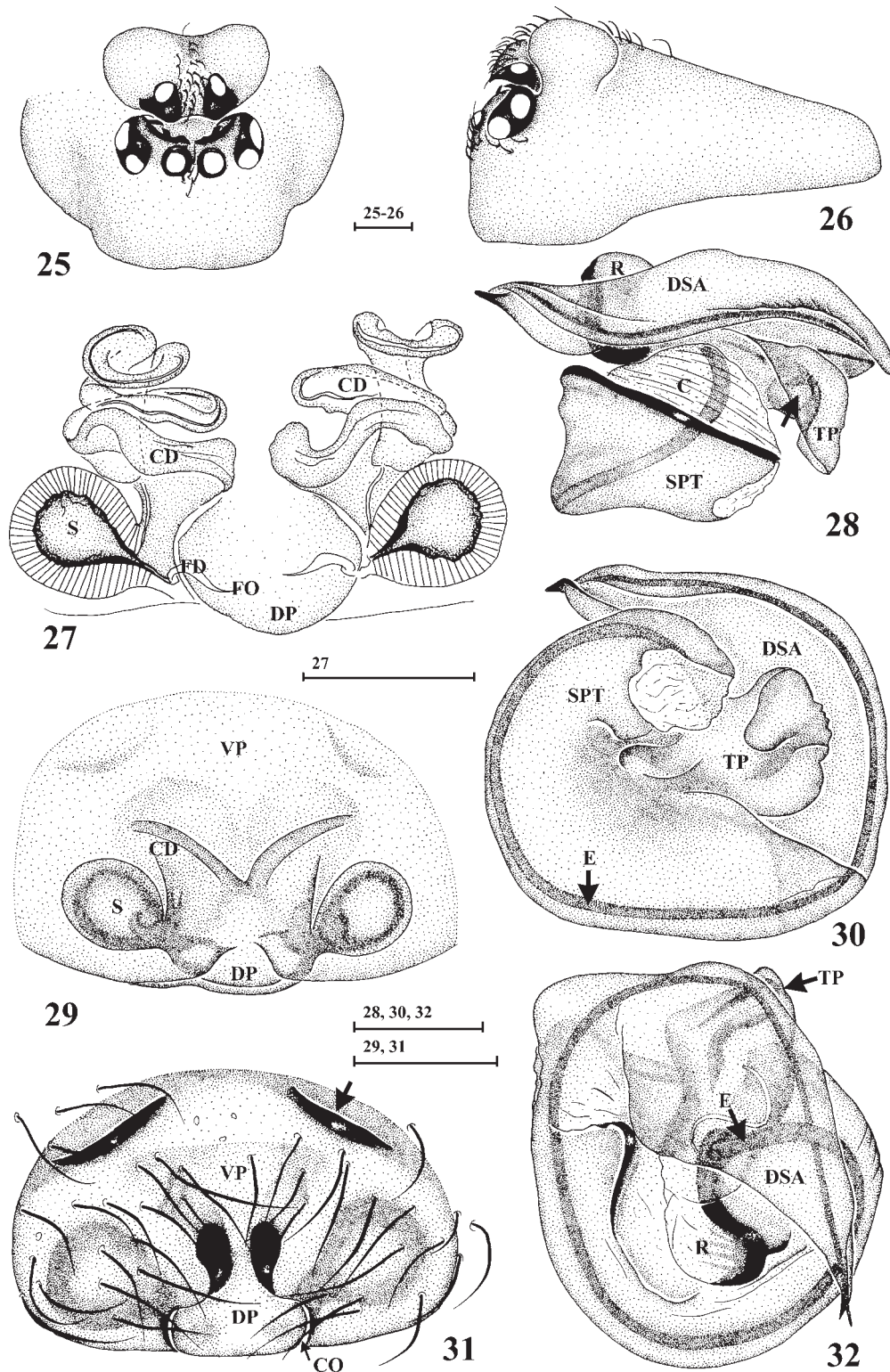
Figs 33–45.

TYPE MATERIAL. Holotype male (IZCAS), Wulingshan Nature Reserve (40.66°N, 117.41°E), Xinglong County, Hebei Province, China, 28.IV.1990. Paratypes: 1 ♀ and 1 ♂ (IZCAS), same data as for holotype. 2 ♂♂ (IZCAS), Xiaolongmen Forest Park (39.93° N, 116.07° E), Mentougou District, Beijing City, China, 21.III.1999, leg. X. Yu.



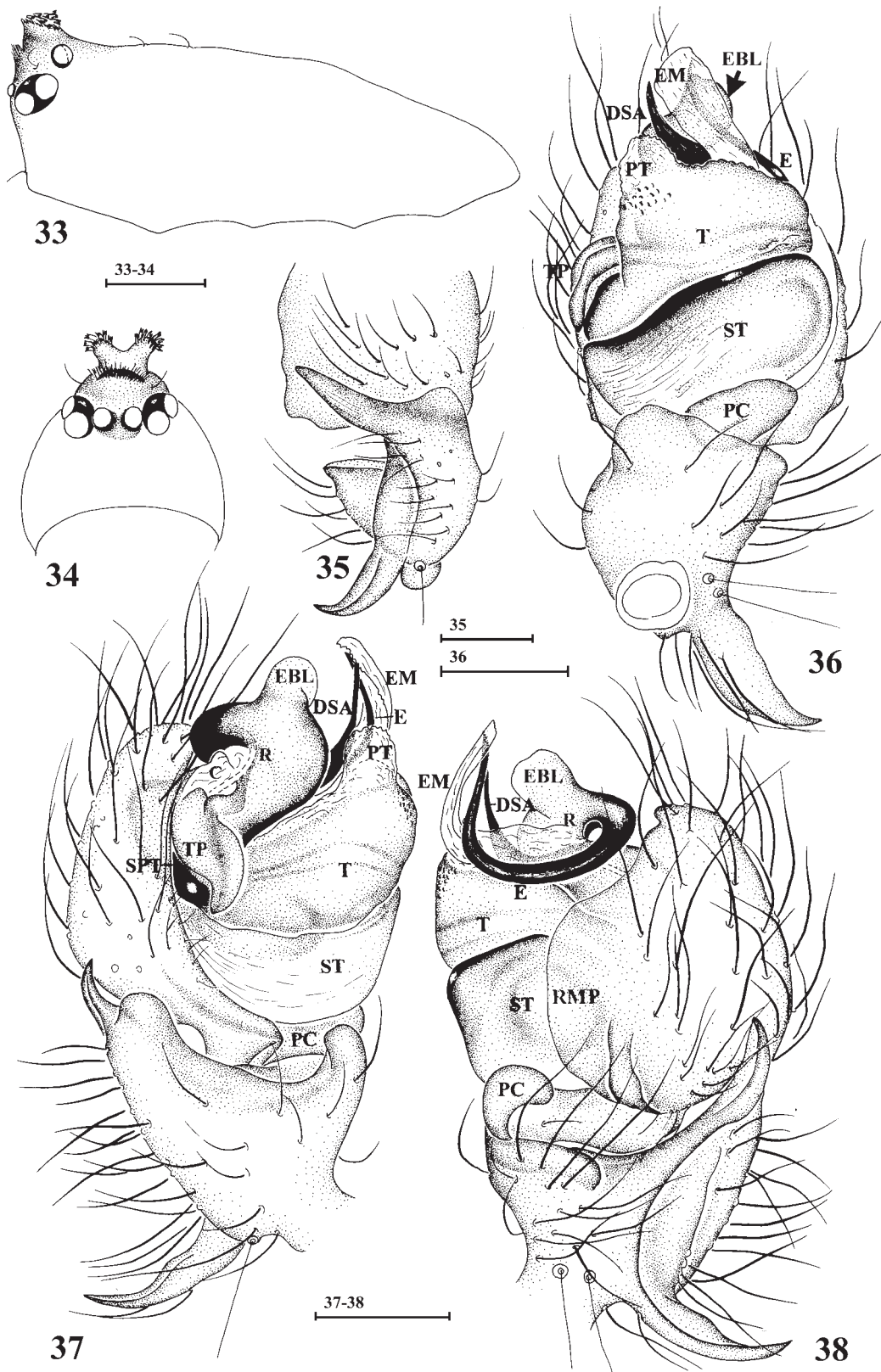
Figs 19–24. *Houshenzinus rimosus*: 19 — left male palp, prolateral view; 20 — same, ventral view; 21 — paracymbium, ventral view; 22 — male left chelicera, posterior view; 23 — male left tibia, dorsal view; 24 — left male palp, retrolateral view (regular arrows refer to the two concave slopes in the opposite direction; bold arrow refers to a black stripe on the radix). Scale bars: 21 — 0.1 mm; 19–20, 22–24 — 0.2 mm.

Рис. 19–24. *Houshenzinus rimosus*: 19 — левая пальпа самца, пролатерально; 20 — то же, снизу; 21 — парацимбиум, снизу; 22 — хелицера самца, сзади; 23 — левая голень пальпы самца, сверху; 24 — левая пальпа самца, ретролатерально. Масштаб: 21 — 0,1 мм; 19–20, 22–24 — 0,2 мм.



Figs 25–32. *Houshenzinus rimosus*: 25 — male cephalothorax, frontal view; 26 — same, lateral view; 27 — vulva, dorsal view; 28 — embolic division (with DSA, not in Hoyer's Solution, arrow refers to a deep hole at the bottom of tailpiece), dorsal view; 29 — epigynum, dorsal view; 30 — embolic division (with DSA, not in Hoyer's Solution), posterior view; 31 — epigynum (arrow refers to the highly sclerotized, long narrow extension anteriorly), ventral view; 32 — embolic division (with DSA), top view. Scale bars: 0.1 mm.

Рис. 25–32. *Houshenzinus rimosus*: 25 — головогрудь самца, спереди; 26 — то же, сбоку; 27 — вульва, сверху; 28 — эмболюсный отдел (с DSA, стрелка показывает глубокую ямку в хвостовой части эмболюсного отдела), сверху; 29 — эпигина, сверху; 30 — эмболюсный отдел (с DSA), сзади; 31 — эпигина, снизу; 32 — эмболюсный отдел (с DSA), сверху. Масштаб: 0,1 мм.



Figs 33–38. *Paikiniana biceps* sp.n.: 33 — male cephalothorax, lateral view; 34 — same, frontal view; 35 — male left tibia, dorsal view; 36 — left male palp, ventral view; 37 — same, prolateral view; 38 — same, retrolateral view. Scale bars: 0.1 mm.

Рис. 33–38. *Paikiniana biceps* sp.n.: 33 — головогрудь самца, сбоку; 34 — то же, спереди; 35 — левая пальпа самца, сверху; 36 — левая пальпа самца, снизу; 37 — то же, пролатерально; 38 — то же, ретролатерально. Масштаб: 0,1 мм.

ETYMOLOGY. The specific name comes from Latin *biceps* = bifurcate, and refers to the shape of the horn projecting from the center of ocular area.

DIAGNOSIS. Male is easily distinguished from all other *Paikiniana* species by the bifurcate horn, projecting from the center of ocular area. The epigynum is similar to that of *P. lurida*, but has a shorter dorsal plate scape.

DESCRIPTION. Male (holotype). Total length 1.73. Cephalothorax (Figs 33–34) 0.88 long, 0.59 wide, beautiful reddish-orange, with a bifurcate horn projecting above and forward from the center of ocular area, as well as one small crescent-shaped plate at the base of the horn (Fig. 34); the top of the bifurcate horn furnished with two crests of stout bristles directed up and backward; the top of crescent-shaped plate covered with short pubescence. Abdomen yellowish-gray. Clypeus 0.14 high. AME diameter 0.031, ALE 0.066, PME 0.063, PLE 0.051, AME separation 0.80 times their diameter, AME-ALE separation 0.29 times one ALE diameter, PME separation 0.50 times their diameter, PME-PLE separation 0.69 times one PLE diameter. Sternum 0.48 long, 0.46 wide, reddish-yellow. Coxa IV separation 1.09 times their width. Chelicerae reddish-orange, with 4 promarginal teeth, 4 retromarginal teeth. Legs reddish-yellow. Tibia I 5.42 times longer than wide. Tm I 0.37, Tm IV present. Tibia with very thin spines. Tibia dorsal spines: 2-2-1-1; patella dorsal spine: 1-1-1-1. Leg measurements: I: 2.01 (0.57, 0.21, 0.51, 0.41, 0.31); II: 1.81 (0.50, 0.21, 0.44, 0.37, 0.29); III: 1.63 (0.45, 0.19, 0.36, 0.36, 0.27); IV: 2.14 (0.59, 0.19, 0.56, 0.47, 0.33).

Male palpal tibia (Fig. 38) greatly broadened distally, funnel-shaped, armed with two large tibial apophyses whose axes present an initial semi-elliptical surface notch; the upper one (Fig. 38) spoon shaped distally, directed forward and lying close to the cymbium; the lower one tapering (Figs 35, 38) and lying close to the patella. Paracymbium spiral (Fig. 38). Tegulum distal to subtegulum in unexpanded palp, with a small patch of inconspicuous papillae (Figs 36, 38). Protegulum semicircular, without any papillae (Figs 36–37). Apically the suprattegulum (Figs 36–38) produced into a spiny distal suprattegular apophysis, accompanied with embolic membrane and spiral embolus, and provided with a retrolateral groove (Fig. 41) which is as long as the distal suprattegular apophysis. Tailpiece (Fig. 37) of radix large, spiral, leaf-shaped when viewed prolaterally. Embolic membrane (Fig. 41) rectangular, accompanying with distal suprattegular apophysis and disal half of embolus. Embolus (Figs 39–40) broad at the base, forming a wide coil of more or less one turn, about 5 times longer than the height of embolic basal lobe.

Female. Cephalothorax unmodified. Total length 1.84. Cephalothorax 0.78 long, 0.59 wide, beautiful reddish-orange. Clypeus 0.13 high. AME diameter 0.034, ALE 0.063, PME 0.059, PLE 0.056, AME separation 0.36 times their diameter, AME-ALE separation 0.25 times one ALE diameter, PME separation 0.74 times their diameter, PME-PLE separation 0.39 times one PLE diameter. Sternum 0.48 long, 0.43 wide. Coxa IV separation 1.05 times their width. Chelicerae with 4 promarginal teeth, 2 retromarginal teeth. Tibia I 3.88 times longer than wide; Tm I 0.33, Tm IV present. Tibia with very thin spines. Tibia dorsal spines: 2-2-1-1; patella dorsal spine: 1-1-1-1. Leg measurements: I: 1.76 (0.54, 0.21, 0.39, 0.34, 0.28); II: 1.66 (0.49, 0.20, 0.38, 0.33, 0.26); III: 1.48 (0.41, 0.19, 0.31, 0.31, 0.26); IV: 1.95 (0.56, 0.19, 0.50, 0.41, 0.29).

Epigynum (Fig. 42) has an obtuse dorsal plate scape, which is a bit shorter than the diameter of the spermathecae.

Spermathecae (Figs 42, 44–45) almost round, visible through the tegument and separated by about their diameter. Copulatory ducts (Figs 44–45) very simple, fused at the base, separated and parallel from the middle, then making a reverse to the dorsal side. Fertilization ducts (Fig. 45) short, slim, mesally orientated.

VARIATION. Total length 1.69–1.83 in males (n=4). Cephalothorax length 0.86–0.94 in males (n=4); width 0.56–0.63 in males (n=4).

DISTRIBUTION. Only known from the type locality.

HABITAT. This species was found under leaf litter in the forest, near roots of grass.

REMARK. The genital structures of *P. biceps* sp.n. and *P. lurida* share many common characteristics, in male: 1) funnel-shaped tibia with two retrolateral and one prolateral trichobothria (Figs 38, 51); 2) obvious cymbial retro-median process (Figs 38, 51); 3) paracymbium spiral, with three to four hairs at the basal arm (Figs 38, 51); 4) tegulum distal to subtegulum in unexpanded palp, with a small patch of inconspicuous papillae (Figs 36, 38, 49, 51); 5) leaf-shaped tailpiece of radix when viewed prolaterally (Figs 37, 50); 6) similar shape of suprattegulum and embolic membrane as described above (Figs 41, 52, 53); 7) spiral embolus, with a little more than one turn, but without membrane along the inner margin present (Figs 40, 53); in female: 8) rectangular dorsal plate with a short scape (Figs 42, 55); 9) simple copulatory ducts pathway as described above (Figs 45, 57); 10) fertilization ducts short, slim, mesally orientated (Figs 45, 57). But they differ in: 1) the axes of the two palpal tibial apophyses present a semi elliptical surface notch in *P. biceps* sp.n. (Fig. 38), vertical in *P. lurida* (Fig. 51); 2) the upper tibial apophysis expanded distally to be spoon-shaped in *P. biceps* sp.n. (Fig. 38), gradually narrowed in *P. lurida* (Fig. 51); 3) the lower tibial apophysis long tapering in *P. biceps* sp.n. (Fig. 38), but thin broad in *P. lurida* (Fig. 51); 4) embolus (Figs 51, 38) is much longer and wider in *P. lurida* than in *P. biceps* sp.n. In female: 1) dorsal plate scape (Figs 42, 55) is broader and shorter in *P. biceps* sp.n. than in *P. lurida*; 2) copulatory ducts (Figs 44–45, 56–57) are much shorter and narrower in *P. biceps* sp.n. than in *P. lurida*.

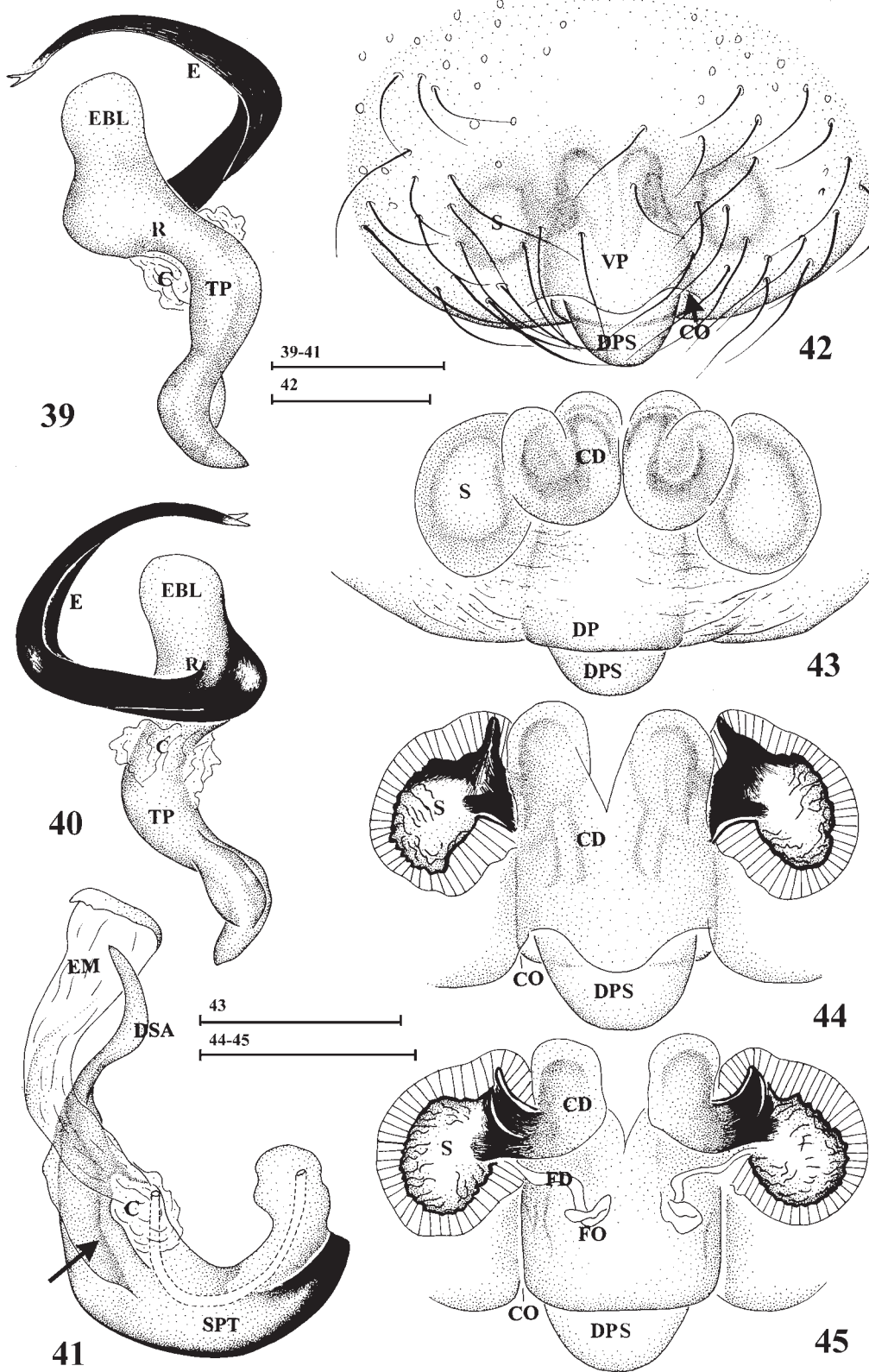
Paikiniana lurida (Seo, 1991) **comb.n.**
Figs 46–57.

Walckenaeria lurida Seo, 1991: 37, f. 7–13; Namkung, 2002: 211, f. 17.63a–b; Namkung, 2003: 213, f. 17.63a–b; Lee *et al.*, 2004: 100, f.

MATERIAL EXAMINED. 2 ♂♂ and 2 ♀♀ (IZCAS), Zhangjiajie National Forest Park (29.32° N, 110.45° E), Hunan Province, China, 29.X.2005, leg. S. Li; 4 ♀♀ (IZCAS), Erlangshan Nature Reserve (30.07°N, 102.78°E), Tianquan County, Sichuan Province, China, 7.VII.2004, leg. Y. Song, L. Tu and S. Li.

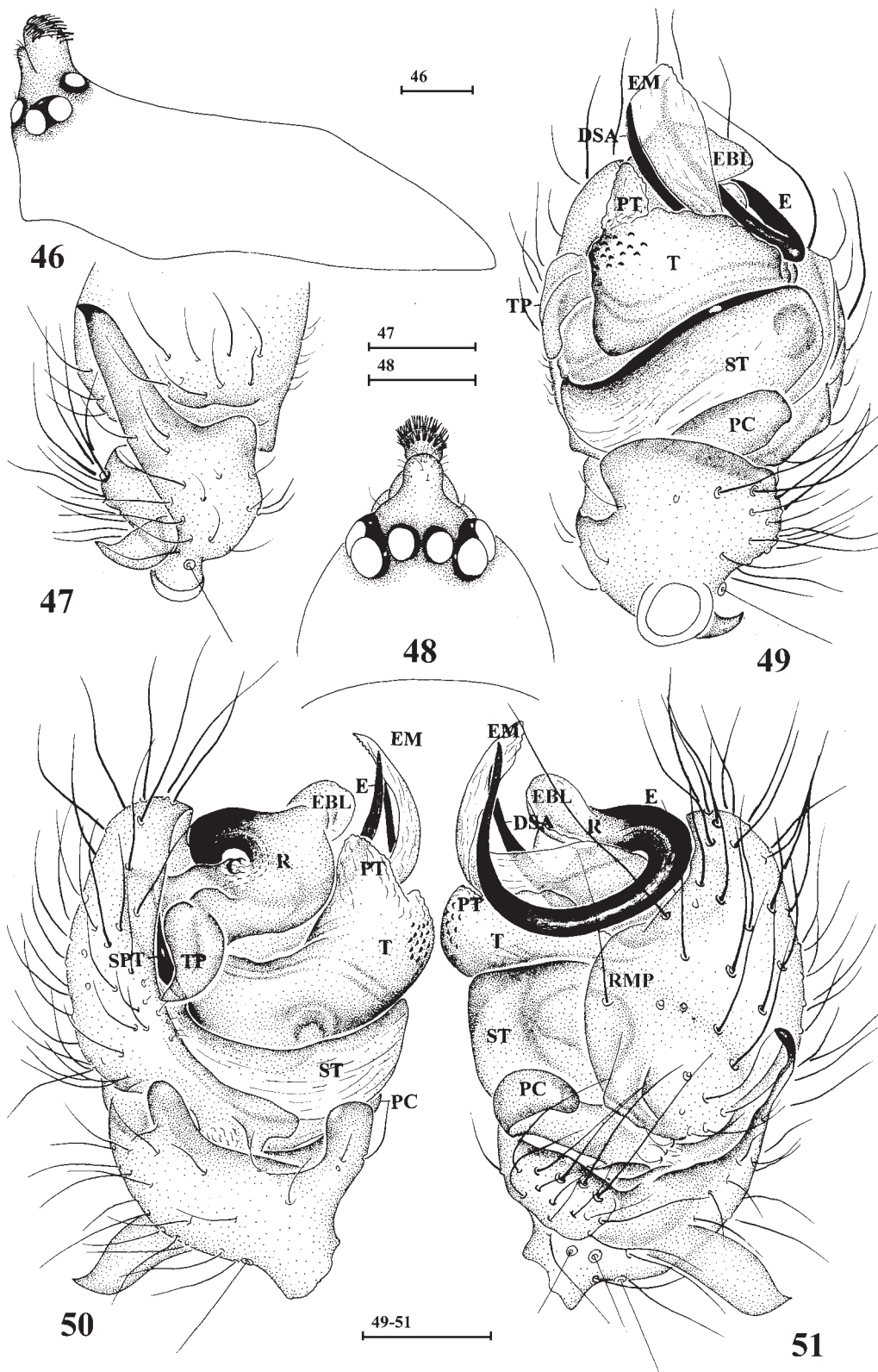
DIAGNOSIS. See remarks under *P. biceps* sp.n.

DESCRIPTION. Male. Total length 1.69. Cephalothorax 0.86 long, 0.55 wide, beautiful reddish-orange, with similar horn as *P. mira* (Oi 1960, Figs 7, 10), but only half long as the latter. Abdomen yellowish-gray. Clypeus 0.16 high. AME diameter 0.044, ALE 0.059, PME 0.044, PLE 0.059, AME separation 0.36 times their diameter, AME-ALE separation 0.32 times one ALE diameter, PME separation 0.64 times their diameter, PME-PLE separation 0.47 times one PLE diameter. Sternum 0.46 long, 0.41 wide, reddish-yellow. Coxa IV separation 1.00 times their width. Chelicerae reddish-orange, with 5 promarginal teeth, 3 retromarginal teeth. Legs reddish-yellow. Tibia I 5.79 times



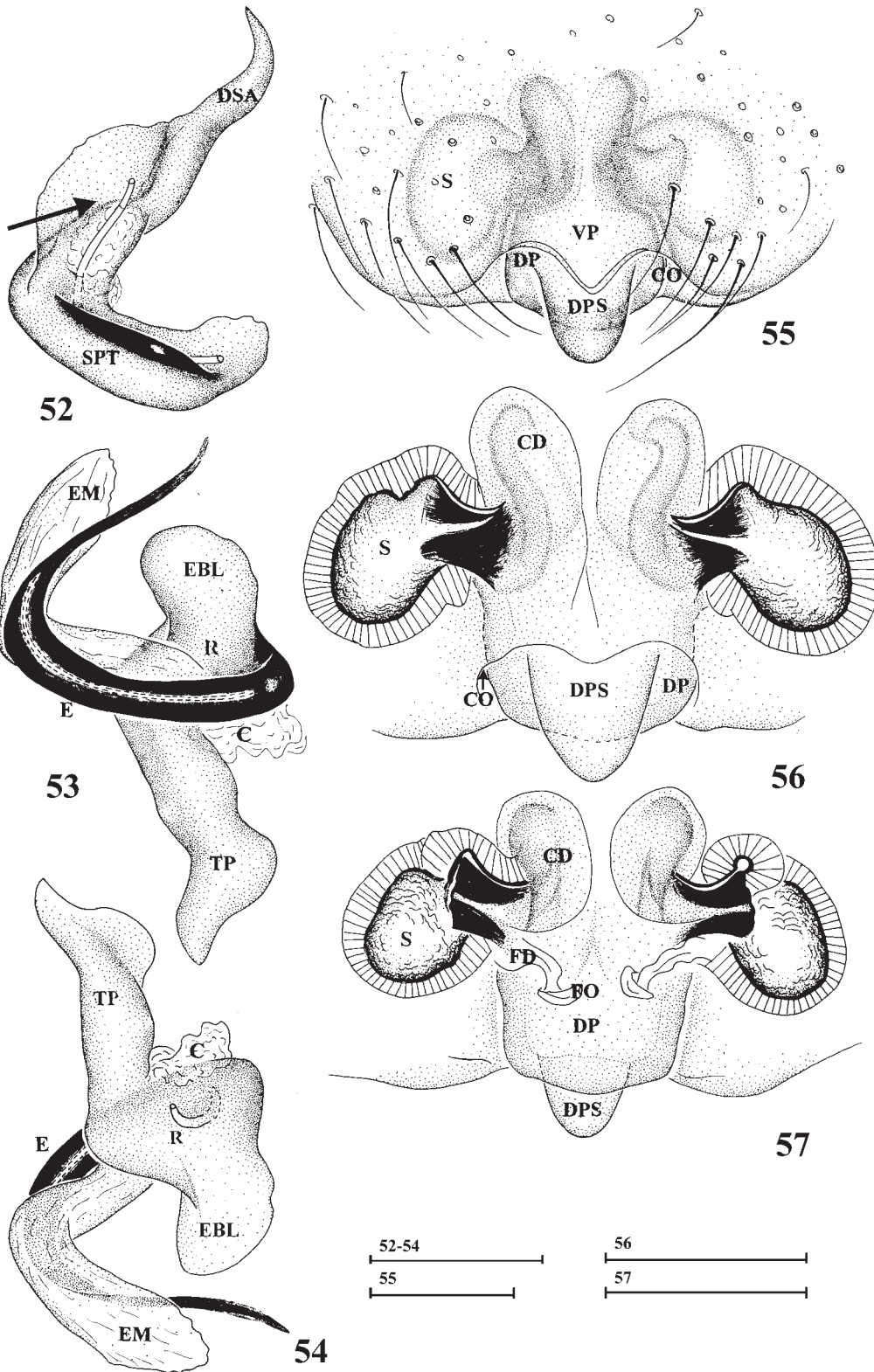
Figs 39–45. *Paikiniana biceps* sp.n.: 39 — embolic division (without DSA), dorsal view; 40 — same, ventral view; 41 — embolic membrane and suprategulum, ventral view (arrow refers to the retrolateral groove); 42 — epigynum, ventral view; 43 — same, dorsal view; 44 — female vulva, ventral view; 45 — same, dorsal view. Scale bars: 0.1 mm.

Рис. 39–45. *Paikiniana biceps* sp.n.: 39 — эмболюсный отдел (с DSA), сверху; 40 — то же, снизу; 41 — эмболюсная мембрана и супратегулюм, снизу; 42 — эпигина, снизу; 43 — то же, сверху; 44 — вульва, снизу; 45 — то же, сверху. Масштаб: 0,1 мм.



Figs 46–51. *Paikiniana lurida*: 46 — male cephalothorax, lateral view; 47 — male left tibia, dorsal view; 48 — male cephalothorax, frontal view; 49 — left male palp, ventral view; 50 — same, prolateral view; 51 — same, retrolateral view. Scale bars: 46 — 0.2 mm; 47–51 — 0.1 mm.

Рис. 46–51. *Paikiniana lurida*: 46 — головогрудь самца, сбоку; 47 — male left tibia, сверху; 48 — головогрудь самца, спереди; 49 — левая пальпа самца, снизу; 50 — то же, пролатерально; 51 — то же, ретролатерально. Масштаб: 46 — 0,2 мм; 47–51 — 0,1 мм.



Figs 52–57. *Paikiniana lurida*: 52 — suprategulum (arrow refers to the retrolateral groove), ventral view; 53 — embolic division (without DSA), ventral view; 54 — same, dorsal view; 55 — epigynum, ventral view; 56 — vulva, ventral view; 57 — same, dorsal view. Scale bars: 0.1 mm.

Рис. 52–57. *Paikiniana lurida*: 52 — супратегулюм, снизу; 53 — эмболюсный отдел (без DSA), снизу; 54 — то же, сверху; 55 — эпигина, снизу; 56 — вульва, снизу; 57 — то же, сверху. Масштаб: 0,1 мм.

longer than wide. Tm I 0.37, Tm IV present. Tibia with very thin spines. Tibia dorsal spines: 2-2-1-1; patella dorsal spine: 1-1-1-1. Leg measurements: I: 2.01 (0.61, 0.20, 0.51, 0.41, 0.28); II: 1.88 (0.58, 0.20, 0.44, 0.38, 0.28); III: 1.58 (0.46, 0.19, 0.35, 0.34, 0.24); IV: 2.10 (0.60, 0.19, 0.56, 0.44, 0.31).

Male palp. See remarks under *P. biceps* sp.n.

Female. Cephalothorax unmodified. Total length 1.96. Cephalothorax 0.92 long, 0.69 wide, beautiful reddish-orange. Clypeus 0.13 high. AME diameter 0.044, ALE 0.059, PME 0.066, PLE 0.056, AME separation 0.43 times their diameter, AME-ALE separation 0.37 times one ALE diameter, PME separation 0.43 times their diameter, PME-PLE separation 0.50 times one PLE diameter. Sternum 0.50 long, 0.43 wide. Coxa IV separation 1.04 times their width. Chelicerae with 4 promarginal teeth, 3 retromarginal teeth. Tibia I 4.35 times longer than wide; Tm I 0.39, Tm IV present. Tibia with very thin spines. Tibia dorsal spines: 2-2-1-1; patella dorsal spine: 1-1-1-1. Leg measurements: I: 1.91 (0.59, 0.21, 0.46, 0.37, 0.28); II: 1.78 (0.54, 0.19, 0.44, 0.35, 0.26); III: 1.57 (0.45, 0.19, 0.34, 0.34, 0.25); IV: 2.07 (0.59, 0.21, 0.54, 0.44, 0.29).

Epigynum. See remarks under *P. biceps* sp.n.

VARIATION. Total length 1.69–1.91 in males (n=2), 1.86–2.00 in females (n=4). Cephalothorax length 0.86–0.91 in males (n=2), 0.89–0.95 in females (n=4); width 0.55–0.63 in males (n=2), 0.66–0.70 in females (n=4).

DISTRIBUTION. China (Hunan, Sichuan) and Korea.

REMARKS. A study by Seo [1991, Figs 8–9, 10–12] showed that the male of this species belongs to the genus *Paikiniana* Eskov, 1992 according to the shape of male cephalic horn, funnel-shaped palpal tibia, medium-sized, simple, hook-like paracymbium, simple embolic division with a moderately long and strong curved embolus. Eskov [1992] also mentioned that the Korean species *W. lurida* should be incorporated into this genus. In an expedition to Hunan Province in May 2005, the female of *P. lurida* was first discovered to science. Judging from the shape of female epigynum, the female of this species also clearly belongs to the genus *Paikiniana* by the presence of dorsal plate scape (coded as protruding epigyne by Eskov), medium-sized copulatory ducts (coded as receptacula by Eskov) and short, almost straight fertilization ducts (coded as entrance ducts by Eskov).

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References

- Eskov K.Yu. 1994. Catalogue of the linyphiid spiders of northern Asia (Arachnida, Araneae, Linyphiidae). Sofia-Moscow: PEN-SOFT Publ. 144 pp.
- Hormiga G. 2000. Higher level phylogenetics of erigonine spiders (Araneae, Linyphiidae, Erigoninae) // Smithsonian Contributions to Zoology. No.609. 160 p.
- Lee Y.B., Yoo J.S., Lee D.J., Kim J.P. 2004. Ground dwelling spiders // Korean Arachnology. Vol.7. P.115.
- Namkung J. 2002. The spiders of Korea. Kyo-Hak Publishing Company, Seoul. 648 pp.
- Namkung J. 2003. The Spiders of Korea, second edition. Seoul: Kyo-Hak Publishing Company. 648 pp.
- Oi R. 1960. Linyphiid spiders of Japan // Journal of the Institute of Polytechnics Osaka City University. Vol.11(D). P.137–244.
- Platnick N.I. 2007. The world spider catalog, version 7.5. American Museum of Natural History. Available from: <http://research.amnh.org/entomology/spiders/catalog/index.html> (accessed: 10 May 2007)
- Seo B.K. 1991. Description of two new species of family Linyphiidae (Araneae) from Korea // Korean Arachnology. Vol.7. P.35–41.
- Song Y., Li S., Marusik Y.M. 2006. Redescription on *Dicymbium facetum* (L. Koch) (Araneae, Linyphiidae) with first report on its male // Acta zootaxonomica Sinica. Vol.31. P.330–334.
- Tanasevitch A.V. 2006. On some Linyphiidae of China, mainly from Taibai Shan, Qinling Mountains, Shaanxi Province (Arachnida: Araneae) // Zootaxa. No.1325. P.277–311.
- Xia Q., Zhang G.R., Gao J.C., Fei R., Kim J.P. 2001. Three new species of spiders of Erigoninae (Araneae: Linyphiidae) from China // Korean Arachnol. Vol.17. P.161–168.