

## A Review of the Genus *Sinopoda* (Arachnida: Araneae: Sparassidae) in Korea

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**Abstract** – The giant crab spider genus *Sinopoda* in Korea is reviewed with detailed illustrations of male palpal organs. Three species, *S. forcipata*, *S. stellatops*, *S. koreana* are recognized with newly collected specimens. The first species is recorded newly in Korean spider fauna. A key to the species of the Korean *Sinopoda* spiders are also provided.

**Key words** : taxonomy, *Sinopoda*, *S. forcipata*, morphology, Korea

### INTRODUCTION

Sparassidae are large-sized spiders with long laterigrade legs and ground-living spiders, which in day hide in litter layers under stones or surface debris and in caves. Of these, the genus *Sinopoda* currently contains 38 species with two Korean species (*S. koreana*, *S. stellatops*) erected by Jäger (1999) for *S. forcipata* (Karsch 1881) and distinguished from related species by embolic apophysis, conductor arising from the distal part of the tegulum, bifurcated tibial apophysis with long dorsal branch in male palpal organs and uncoiled copulatory ducts fused along the median line of genital orifice, divided spermathecae into a basal part and a head in female genital organs (Jäger 1999; Platnick 2009). When Jäger (1999) described *Sinopoda* as a new genus, he newly combined Korean endemic species, *Heteropoda koreana* to *Sinopoda*. Also, Jäger and Ono (2002) revised the genus *Sinopoda* based on only Japanese materials they reported the male of *S. koreana* from Kyushu in Japan for the first time and described Korean *S. stellata* (*Heteropoda stellata*) as a misidentified species of *S. stellatops* new species with the same locality as holotype. Though the *okinawana* group is supposed to be monophyletic, some females of this

group can be hardly recognized as members without conspecific males (Jäger and Ono 2002).

During a survey of the spider fauna of Korea spiders in ground the family Sparassidae were collected by means of pitfall traps in natural forests. In this paper *Sinopoda forcipata* (Karsch 1881) is reported for the first time in Korea and recognized *S. stellatops* Jäger & Ono, 2002 based on Korean specimens. The main goal of this paper is to provide data for a future revisional study of the Korean sparassid spiders and relative taxa.

### MATERIALS AND METHODS

Twenty to twenty five pitfall traps with transparent acrylic cover (plastic cups, height 6.3 cm, diameter 8 cm) were set about 2 meters apart and filled with ethylene glycol (Greenlande and Greenlande 1971). Specimens examined in this paper will be deposited in the National Park Research Institute.

The descriptive terminology and spination of legs follow that of Kim and Lee (2008). Abbreviations used: a, apical; AER, anterior eye row; ALE, anterior lateral eye; AME, anterior median eye; CO, conductor; d, dorsal view; DTA, dorsal retrolateral tibial apophysis; EA, embolic apophysis; EM, embolus; Eye ratio, longest eye row/carapace width ×

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100; p, prolateral view; PER, posterior eye row; PLE, posterior lateral eye; PME, posterior median eye; r, retrolateral view; VTA, ventral tibial apophysis; ST, subtegulum; TE, tegulum.

## SYSTEMATIC ACCOUNTS

Order Araneae Clerck, 1757

Family Sparassidae Bertkau, 1872

A key to the species of genus *Sinopoda* from Korea

1. Male ..... 2
- Female ..... 4
2. Bifurcate tibial apophysis complete with a longest dorsal branch longest ..... 3
- Bifurcate tibial apophysis incompletely with a small ventral branch ..... *S. koreana*
3. Embolus distally with distal rounded tip ..... *S. forcipata*
- Embolus distally with distal triangular tip ..... *S. stellatops*
4. Epigynum with posterior lobes point towards the median line, trapezoid-shap ..... 5
- Epigynum without distinctly pointed posterior lobes ..... *S. koreana*
5. Both distal lobes of epigynum lie apart more than width size ..... *S. forcipata*
- Both distal lobes of epigynum lie adjacent less than width size ..... *S. stellatops*

### *Sinopoda forcipata* (Karsch, 1881)

화살거북이등거미 (신칭) (Figs. 1A-I, 3A-C)

*Sarotes forcipatus* Karsch, 1881, p. 38 (Description of male and female).

*Heteropoda forcipata*: Bösenberg & Strand, 1906, p. 276, plate 15, fig. 438 (male and female); Yaginuma, 1960, p. 118, fig. 98.2, 4 (male and female), 1971, p. 118, fig. 98.2, 4 (male and female), 1975, p. 190, figs. 7-8 (male and female), 1986, p. 199, fig. 111.2 (male and female); Chikuni, 1989, p. 130, fig. 2 (male and female).

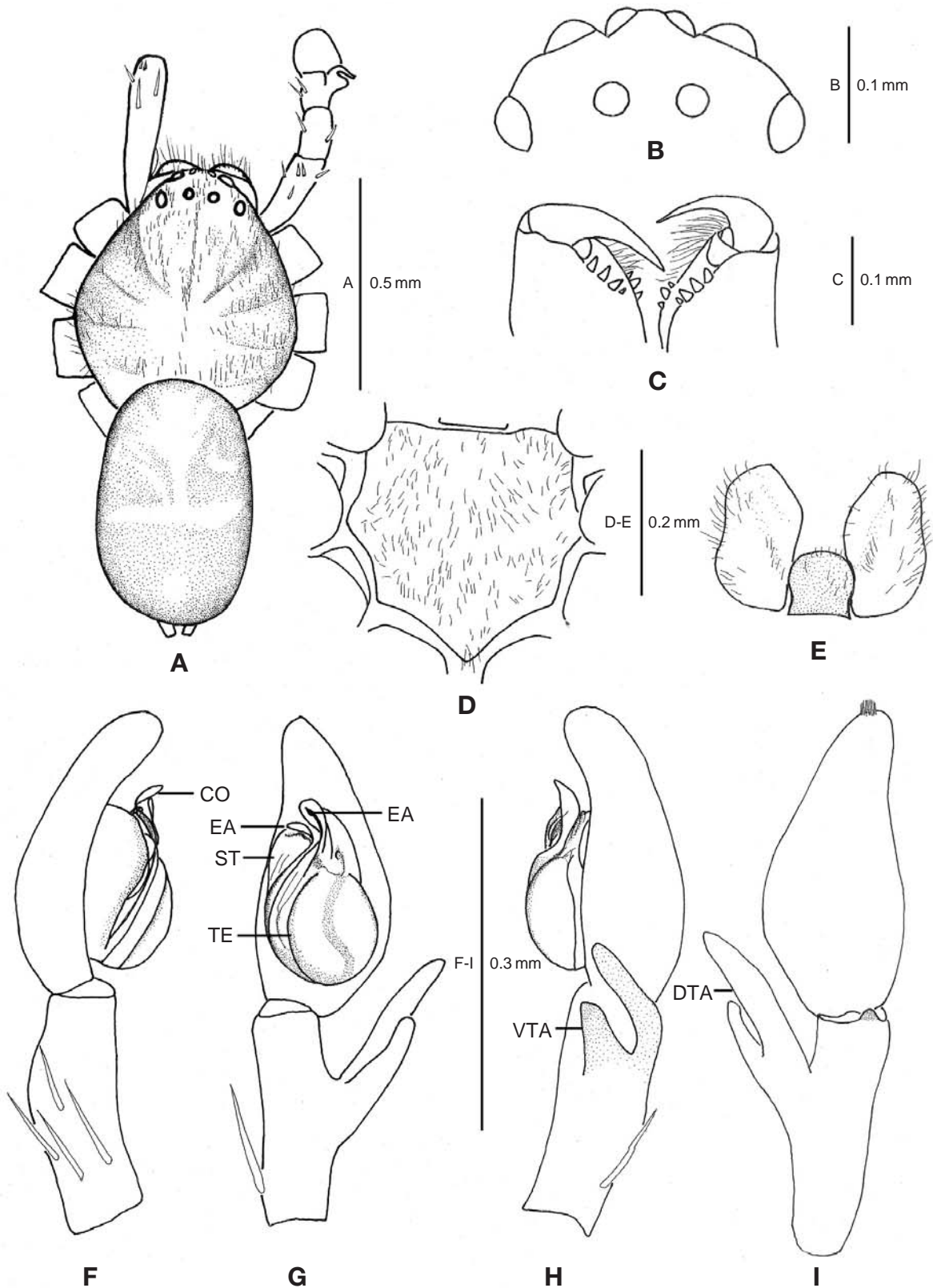
*Sinopoda forcipata*: Jäger, 1999, p. 21, figs. 1-8 (transferred from *Heteropoda*); Song *et al.*, 1999, p. 469, figs. 269P, 270B (male and female); Jäger & Ono, 2000, p. 51, figs. 27-34 (male and female); Jäger, 2001, p. 39, fig. 22n-o (male).

**Material examined.** 1♂, 31-VII-2008, Isl. Yeondo, Yeosu city, JN, leg. B.W. Kim; 1♂, 10-X-2008, Isl. Bogildo, Wando-gun, JN, leg. B.W. Kim; 1♂ 3♀, 12-X-2008, Mt. Gajisan, Cheongdo-gun, GN, leg. B.W. Kim.

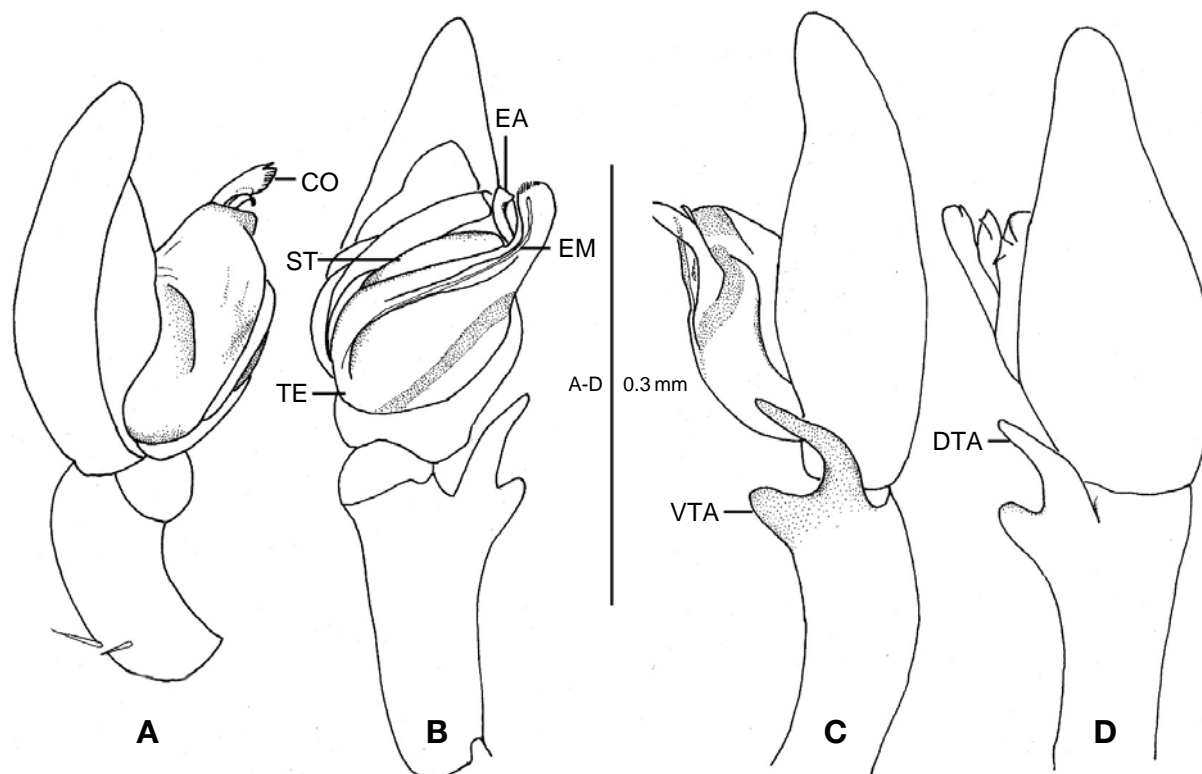
**Dimensions (mm).** Male: Habitus length 12.6; cheliceral length 2.8, cheliceral width 1.5, cheliceral fang length 1.6; carapace length 6.7, carapace width 6.0, carapace height 2.4; endite length 2.0, endite width 1.2; labium length 0.9, labium width 0.9; sternum length 3.2, sternum width 3.3; AER 1.8, PER 2.6, AME 0.3, ALE 0.5, PME 0.3, PLE 0.5. Eye formula ALE=PLE>PME=AME. Palp 11.0 (4.0, 2.0, 2.2, 2.8). First leg 29.6 (8.8, 3.5, 8.6, 8.4, 0.3), second leg 6.3 (1.0, 0.3, 0.9, 1.0, 3.1), third leg 27.5 (7.8, 3.2, 7.2, 7.2, 2.1), fourth leg 31.2 (8.7, 3.0, 7.7, 9.0, 2.8). Leg formula IV I III II. Abdomen length 0.8, abdomen width 4.8, abdomen height 3.5.

**Redescription of male.** Medium-sized spiders shorter than female, found under stones and fallen leaves on the ground of the forests. Carapace elongate, 1.1 times as long as wide, moderately narrowed in eye area, without distinctly longitudinal fovea at middle (Fig. 1A). Eyes: AER and PER slightly procurved in frontal view; AME and PME smaller than other eyes, eye ratio 43 (Fig. 1B). Chelicerae with numerous long setae, with three promarginal teeth, middle one largest; four retromarginal teeth, inner one smallest and others subequal in size (Fig. 1C). Endites reddish brown, widest at mid part; labium rectangular, as long as wide (Fig. 1D). Sternum shield-shaped, widest at second coxae, not produced between fourth coxae (Fig. 1E). Palp (Figs. 1F-I, 3A-C) without claw; tibia with 12 trichobothria in three rows (5d-4r-3r); femur with four spines on dorsal, tibia four (1d-3r) and tarsus without spine. Legs yellowish brown with small slender hairs on the ventral part of metatarsi and tarsi; length of leg I (patella+tibia) always longer than carapace length; tibiae with 10-11 trichobothria (4p-2d-4r on leg I, 4p-3d-4r on II, 5p-3d-2r on III, 1p-6d-3r on IV), metatarsi 12-17 in one row (17d on leg I, 16d on II, 12d on III, 15d on IV), tarsi 14-16 in three row (5d-4d-6d on leg I, 5d-4d-7d on II, 4d-5d-6d on III, 4d-5d-5d on IV); tarsi with two claws, upper claws with four to seven side teeth (seven on leg I and II, four on III, five on IV).

Leg spination: Leg I femur with seven spines, tibia 13 (three, 1-1-1 on dorsal; two, 0-1-0 on prolateral and retrolateral; eight, 2-2-2-2 on ventral), metatarsus seven (six, 1-2-0 on prolateral and retrolateral; two, 2-0-0 on ventral), tarsus



**Fig. 1.** A-I. *Sinopoda forcipata* (Karsch, 1881) from Korea, male. A. Habitus, dorsal view. B. Eye area and clypeus, front view. C. Chelicerae, posterior view. D. Endite and labium, ventral view. E. Sternum, ventral view. F-I. Palp, left part, prolateral view (F), ventral view (G), retrolateral view (H), dorsal view (I). Note: CO, conductor; DTA, dorsal tibial apophysis; EA, embolic apophysis; EM, embolus; VTA, ventral tibial apophysis; ST, subtegulum; TE, tegulum.



**Fig. 2.** A-D. *Sinopoda stellatops* Jäger & Ono, 2002 from Korea, male. A-D. Male palpal organs, left part, prolateral view (A), ventral view (B), retrolateral view (C), dorsal view (D). Note: CO, conductor; DTA, dorsal tibial apophysis; EA, embolic apophysis; EM, embolus; VTA, ventral tibial apophysis; ST, subtegulum; TE, tegulum.

without spine; leg II femur with seven spines, tibia 14 (four, 2-1-1 on dorsal; two, 0-1-0 on prolateral and retrolateral; eight, 2-2-2-2 on ventral), metatarsus eight (six, 1-2-0 on prolateral and retrolateral; two, 2-0-0 on ventral), tarsus without spine; leg III femur with seven spines, tibia 13 (three, 1-1-1 on dorsal; four, 1-1 on prolateral and retrolateral; six, 2-2-2 on ventral), metatarsus 16 (10, 1-2-2 on prolateral and retrolateral; six, 2-2-2 on ventral), tarsus 10 (three, 1-2-0 on prolateral; five, 1-2-2 on retrolateral; two, 2-0-0 on ventral); leg IV femur with seven spines, tibia 13 (three, 1-1-1 on dorsal; four, 1-1 on prolateral and retrolateral; six, 2-2-2 on ventral), metatarsus 12 (10, 1-2-2 on prolateral and retrolateral; two, 2-0-0 on ventral), tarsus without spines. Abdomen ovoid, with scattered brownish yellow spots, with indistinct chevrons on dorsal side (Fig. 1A). Cribellum absent.

Male palp (Figs. 1F-I, 3A-C): patellar apophysis absent; RTA bifurcated tibial apophysis with long dorsal branch; cymbial furrow absent; embolic apophysis bent clockwise direction (right part); thin conductor wound, arising from the upper part of the tegulum; embolus long slender, origi-

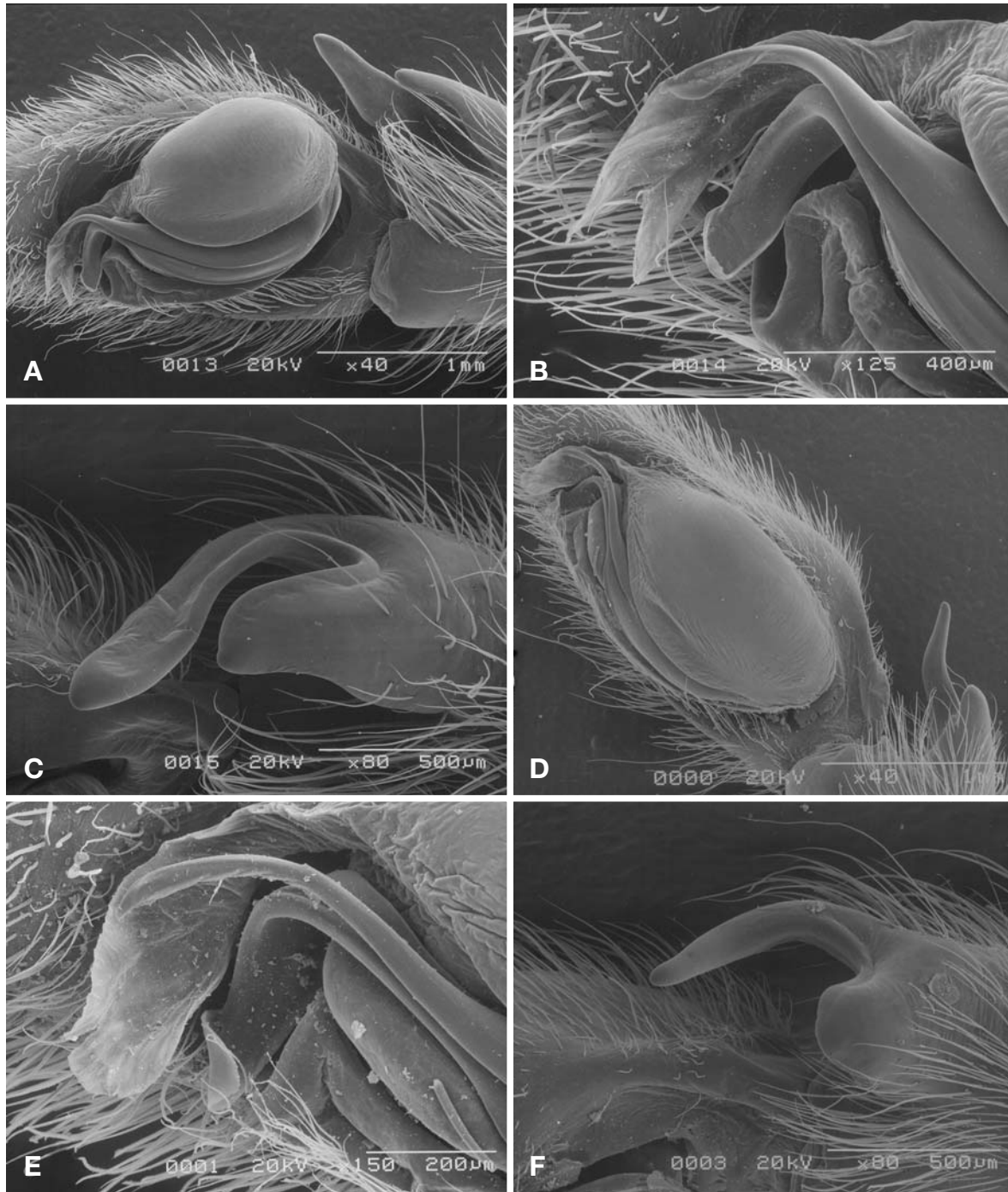
nating laterally expanded curvedly to upper of cymbium;

**Distribution.** Korea (Isl. Yeondo, Isl. Bogildo, Mt. Gajisan), China, Japan

**Remarks.** This species can be distinguished from Korean giant crab spiders by the males with embolic apophysis distally with rounded part (triangular in *S. stellatops*), embolus with broad and shallow tip and bifurcate tibial apophysis bent with ventral branch more half as long as dorsal (less half in *S. stellatops*, a small projection in *S. koreana*); and females with both distal lobes of epigynum lie apart more than width (adjacent in *S. stellatops*), posterior lobes of epigynum point allow-shaped, point toward the median line, head of spermathecae two times as long as broad (equal in *S. stellatops*) and both basal part of spermatheca close on the axis of epigynum.

***Sinopoda koreana* (Paik, 1968)**

*Heteropoda koreana* Paik, 1968, p. 168, figs. 1-2, 7-21, 41 (Description of male and female), 1978, p. 394, fig. 177.1-8 (male and female).



**Fig. 3.** A-F. SEM photographs of *Sinopoda* spp. from Korea, male. A-C. *Sinopoda forcipata* (Karsch, 1881), male palp, left part, ventral view (A); conductor, embolic apophysis and embolus, anterior view (B); tibial apophysis, retrolateral view (C). D-F. *Sinopoda stellatops* Jäger & Ono, 2002 male palp, left part, ventral view (D); conductor, embolic apophysis and embolus, anterior view (E); tibial apophysis, retrolateral view (F).

*Sinopoda koreana*: Jäger, 1999, p. 21 (Transferred from *Heteropoda*); Namkung, 2002, p. 497, fig. 40.1a-b (male and female); Jäger & Ono, 2002, p. 115, figs. 15-18 (male); Namkung, 2003, p. 500, fig. 40.1a-b (male and female).

Previous records in Korea: Paik, 1968 (5y ♀♀, 5-VIII-1958, 1♀, 28-VI-1964, Geaneumsa temple, JJ, leg. K.Y. Paik; 7y ♀♀, 10-VIII-1958, Geumyeongsagul cave, JJ, leg. H.J. Lee & T.K. Park; 1y♀, 20-VII-1960, Mt. Harasan, JJ.

leg. S.M. Lee, 1y ♀, 22-VII-1960, leg. H.J. Lee; 2♂♂, 28-VI-1964, Samseonghyeol, JJ, leg. K.Y. Paik; 1♀, 17-VIII-2004, Hannam Experimental Forests, JJ, leg. B.W. Kim.

**Distribution.** Korea (Mt. Harasan, Geumyeongsagul cave), Japan

**Remarks.** The species can be distinguished from Korean giant crab spiders by the males with bifurcate tibial apophysis bent with long curved dorsal branch and small projectable ventral (ventral branch more half as long as dorsal in *S. forcipata*, less half in *S. stellatops*); and females with epigynum without distinctly pointed posterior lobes (trapezoid-shap in *S. stellatops* and *S. forcipata*), both distal lobes of epigynum lie apart more than width (adjacent in *S. stellatops*), posterior lobes of epigynum point toward the lateral part with tapering part (cylindrical in *S. forcipata* and *S. stellatops*).

#### *Sinopoda stellatops* Jäger & Ono, 2002

(Figs. 2A-D, 3D-F)

*Heteropoda stellata*: Paik, 1968, p. 171, figs. 3-4, 22-29 (female, misidentified); Yaginuma, 1975, p. 190, figs. 5-6 (male and female, misidentified), 1986, p. 199, fig. 111.3 (male and female, misidentified); Chikuni, 1989, p. 131, fig. 3 (male and female, misidentified).

*Sinopoda stellata*: Jäger & Ono, 2000, p. 56, figs. 46-52 (male and female, misidentified).

*Sinopoda stellata*: Namkung, 2003, p. 501, fig. 40.2a-b (male and female, misidentified); Yoo & Kim, 2002, p. 27, fig. 43 (male, misidentified).

*Sinopoda stellatops* Jäger & Ono, 2002, p. 119, figs. 42-82 (description of male and female).

**Specimens examined.** 1♂, 30-IV-2005, Mt. Odaesan, Pyeongchang-gun, GW, leg. B.W. Kim; 1♀, 1-V-2005, Mt. Odaesan, Pyeongchang-gun, GW, leg. B.W. Kim; 1♀, 21-VII-2005, Nodongdonggul cave, Danyang-gun, CB, leg. B.W. Kim; 1♀, 5-I-2007, Jaegunggolgul, Gangreung-si, GW, leg. B.W. Kim; 1♀, 1-XII-2007, Mungyeongsaejae, CB, leg. B.W. Kim; 2♂♂ 1♀, 18-IX-2008, Mt. Sopaiksan, Danyang-gun, CB, leg. B.W. Kim.

**Distribution.** Korea (Mt. Odaesan, Mt. Sopaiksan, Nodongdonggul cave, Jaegunggolgul cave, Mungyeongsaejae), Japan

**Remarks.** This species can be distinguished from Korean giant crab spiders by the males with embolic apophysis with

triangular distal part (rounded in *S. forcipata*), embolus with tapering tip and bifurcate tibial apophysis bent with ventral branch less half as long as dorsal (more half in *S. forcipata*, a small projection in *S. koreana*); and females with both distal lobes of epigynum lie adjacent to median part (apart more than width in *S. forcipata*), posterior lobes of epigynum point toward the lateral part with cylindrical tip (tapering in *S. koreana*) and head of spermathcae as long as broad (two times in *S. forcipata*).

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### REFERENCES

- Bösenberg W and E Strand. 1906. Japanische Spinnen. Abh. Senck. Naturf. Ges. 30:93-422.
- Chikuni Y. 1989. Pictorial Encyclopedia of Spiders in Japan. Kaisei-sha Publ. Co., Tokyo, pp.1-310.
- Greenslade P and PJM Greenslade. 1971. The use of baits and preservatives in pitfall traps. J. Aust. Entomol. Soc. 10: 253-260.
- Jäger P. 1999. *Sinopoda*, a new genus of Heteropodinae (Araneae, Sparassidae) from Asia. J. Arachnol. 27:19-24.
- Jäger P and H Ono. 2002. Sparassidae from Japan. II. First *Pseudopoda* species and new *Sinopoda* species (Araneae: Sparassidae). Acta Arachnol. Tokyo 51:109-124.
- Karsch F. 1881. Diagnoses Arachnoidarum Japoniae. Berl. Ent. Zeitschr. 25:35-40.
- Kim BW and W Lee. 2008. Notes on four corinnid species from Korea, with the description of *Trachelas joopili* new species (Arachnida: Araneae: Corinnidae). J. Nat. Hist. 42:1867-1884.
- Namkung J. 2003. The Spiders of Korea, 2nd. ed. Kyo-Hak Publ. Co., Seoul. pp.1-648.
- Paik KY. 1968. The Heteropodidae (Araneae) of Korea. Thes. Coll. Kyungpook Univ. 12:167-185.

- Paik KY. 1978. Araneae. Illustr. Fauna Flora Korea 21:1-548.
- Platnick NI. 2009. The world spider catalog, version 9.5. American Museum of Natural History, online at <http://research.amnh.org/entomology/spiders/catalog/index.html> (accessed 4 March 2009).
- Song DX, MS Zhu and J Chen. 1999. The Spiders of China. Hebei Sci. Technol. Publ. House, Shijiazhuang, pp.1-640.
- Yaginuma T. 1960. Spiders of Japan in colour. Hoikusha, Osaka. pp.1-186.
- Yaginuma T. 1971. Spiders of Japan in Colour (enlarged and revised edition). Hoikusha, Osaka. pp.1-197.
- Yaginuma T. 1975. The spider fauna of Japan (V). Fac. Let. Rev. Otemon Gakuin Univ. 9:187-195.
- Yaginuma T. 1986. Spiders of Japan in Color (new ed.). Hoikusha Publ. Co., Osaka. pp.1-305.
- Yoo JC and JP Kim. 2002. Studies on basic pattern and evolution of male palpal organ (Arachnida: Araneae). Korean Arachnol. 18:13-31.

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