Bull. Natl. Mus. Nat. Sci., Ser. A, 43(2), pp. 81–86, May 22, 2017

A new spider of the genus *Cicurina* from a limestone cave on Minami-daito-jima Island, Okinawa, Japan

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(Received 17 March 2017; accepted 22 March 2017)

Abstract A new species of the genus *Cicurina* Menge, 1871 (Araneae, Cicurininae) is described from Hoshino-do Cave on Minami-daito-jima Island, Okinawa Prefecture, Japan, under the name of *Cicurina hoshinonoana* sp. nov. The new species is closely related to *Cicurina maculifera* Yaginuma, 1979 known from Katano-do Cave, Shibushi-cho, Kagoshima Prefecture, southern Kyushu, but differs from the latter by the shape of the male palpal organ and the structure of female genitalia. Eyes of males of the new spider show degeneration.
Key words: Araneae, Cicurininae, new species, Hoshino-do Cave, Okinawa, Japan.

Minami-daito-jima is an oceanic island in the western Pacific 360 km east of Okinawajima Island, Japan. The island is small with an area of 30 square kilometers and very flat, with the highest point only 75 m above sea level. The Daito Islands, to which Minami-daito-jima belongs, are different from continental islands of the Ryukyu archipelago in their geological development, being on the Philippine Sea Plate and showing a natural wonder as a million-year-old elevated coral reef which has survived erosion by the sea (Shimizu, 2003). The unusual origins and the maritime climate yield a unique fauna on the Daito Islands, somewhat similar to the Ogasawara Islands (Ono, 2011) with endemic species or subspecies of birds and insects.

More than a hundred caves occur on Minami-daito-jima. Of these, Hoshino-do Cave (Hoshino-no-ana) is the largest limestone cave, being 375 m long from the opening and with a large domed space. The first author (Shimojana) found interesting spiders of a presumably unknown species of the genus *Cicurina* Menge, 1871 in the cave of Minami-daito-jima during repeated zoological investigations in caves of the Ryukyu Islands (Shimojana, 1977).

Cicurina spiders weave small sheet webs with a tubular retreat in fallen leaves or in crevices on the ground as well as in caves. The genus is composed of 129 species distributed in the Northern Hemisphere (WSC, 2017). Although most of these (about 90%) are described from North America (United States, Canada and Mexico), twelve species are known from Eurasia (Europe, Central Asia, China, Korea and Japan).

Five species were hitherto recorded from Japan: *Cicurina japonica* (Simon, 1886) distributed widely in Honshu, Shikoku and Kyushu (type locality: Yokohama), *C. maculifera* Yaginuma, 1979 known from southern Kyushu (type locality: Katano-do Cave, Shibushi-cho, Kagoshima), *C. troglodytes* Yaginuma, 1972 described from Koumori-ana Cave, Fujinomiya, Shizuoka, Honshu, *C. maculipes* Saito, 1934 described from Sapporo, Hokkaido, and the European *Cicurina cicur* (Fabricius, 1793) recorded by Saito (1934) from Hokkaido. Of these, however, *C. troglodytes* and *C. maculipes* could not be used for comparative study, because both have never been rediscovered since their

original description, and what is worse, the male of *C. troglodytes* is unknown and *C. maculipes* shows characteristics of other genera of Agelenidae. The record of *C. cicur* from Hokkaido is here regarded as an error based on misidentification.

After careful examination, the authors came to the conclusion that the cave spider from Okinawa was a new species closely related to *C. maculifera* Yaginuma, 1979. This new spider is reported here in the present paper.

Material

Type specimens. Holotype (NSMT-Ar 14716), male; allotype (NSMT-Ar 14717), female; one female and one male paratypes (NSMT-Ar 14718), all from Hoshino-do Cave (Hoshino-noana), Minami-daito-jima, Okinawa Prefecture, Japan, 31-VII-1977, collected by Matsuei Shimojana. All the type specimens designated herewith are deposited in the arachnid collection of the Department of Zoology at Tsukuba of the National Museum of Nature and Science, Japan.

Cicurina hoshinonoana sp. nov.

[Japanese name: Daito-kotanagumo]

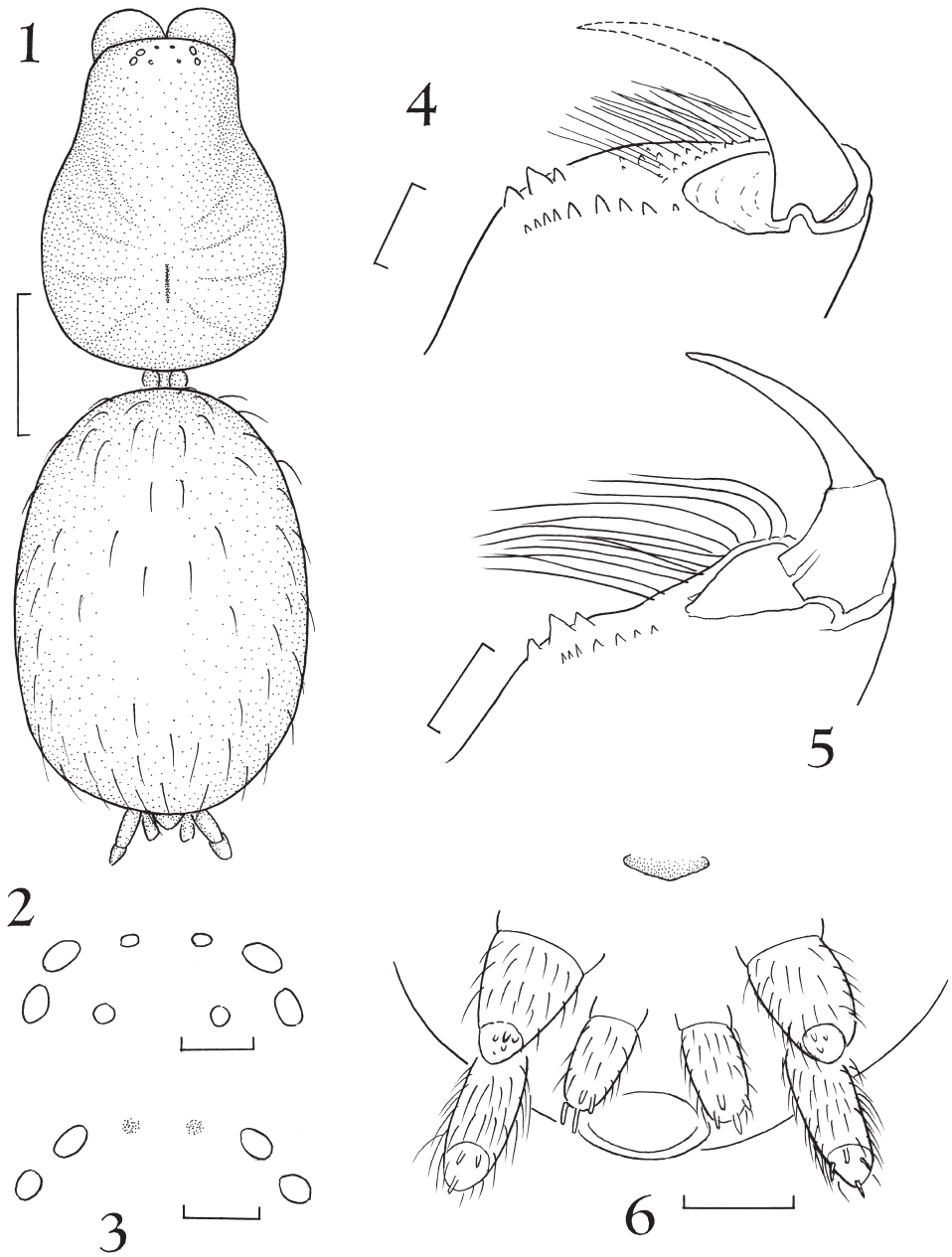
(Figs. 1–14)

Diagnosis. This new species resembles *Cicurina maculifera* Yaginuma, 1979 described from Katano-do Cave, Shibushi-cho, Kagoshima Prefecture, not only in general features but also in the structure of genital organs, and is much closer to that species than to any other known species in Asia. However, *C. maculifera* is larger (body length: females, 5.5–6.0 mm, males 4.0–5.0 mm) and the males have complete eyes, and details of the male palpal organ and female genitalia are different from the new species in the following points. The tibial apophysis of the male palp is spatulate in *C. hoshinonoana*, while it is pointed in *C. maculifera*; the embolus arises at the posterior end (basal ridge) of the tegulum in *C. hoshinonoana*, while in a pro-lateral position in *C. maculifera*; visible canals on the tegulum draw different routes in both species; the tegular apophysis extends in an anterior direction in *C. hoshinonoana*, while in a posterior direction in *C. maculifera*; the copulatory duct of the female genitalia is much thicker in *C. hoshinonoana*; the spermathecae are situated laterally in *C. hoshinonoana*, while closer to the axis in *C. maculifera* (cf. Figs. 7–10, 12–14 of this paper and figs. 1–5 in Yaginuma, 1979, p. 24 and fig. 6 in Chikuni, 1989, p. 99).

Description (based on the holotype and allotype). Abbreviations used are as follows: ALE, anterior lateral eye; AME, anterior median eye; PLE, posterior lateral eye; PME, posterior median eye.

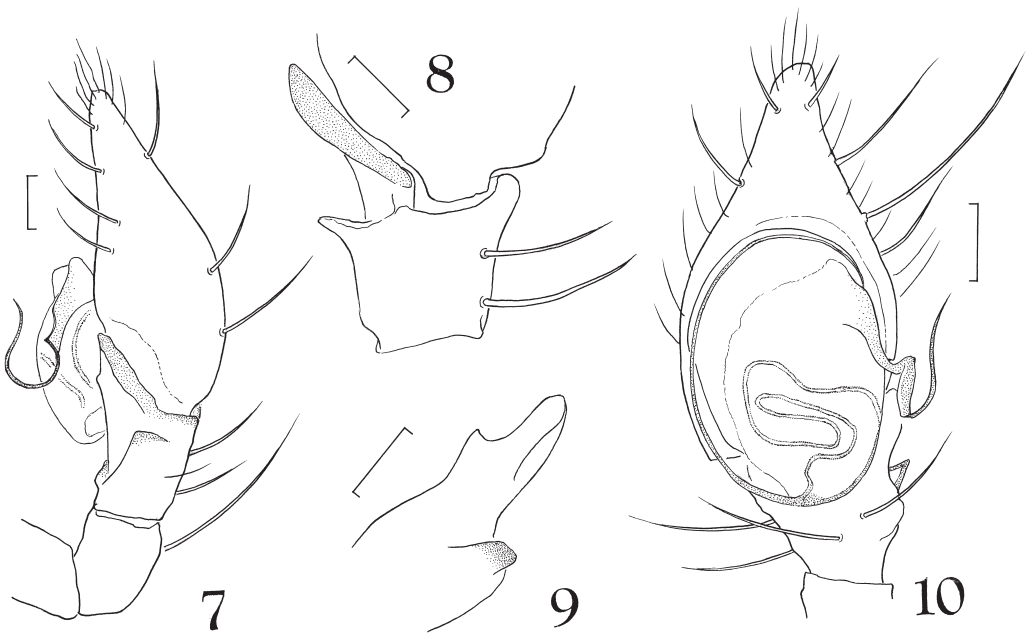
Measurements. Body length female 4.80 mm, male 3.04 mm; prosoma length female 2.12 mm, male 1.56 mm, width female 1.44 mm, male 1.13 mm; opisthosoma length female 2.44 mm, male 1.35 mm, width female 1.84 mm, male 0.92 mm; lengths of legs [total length (femur + patella + tibia + metatarsus + tarsus)]: female I 5.79 mm (1.65 + 0.67 + 1.46 + 1.26 + 0.75), II 5.36 mm (1.58 + 0.67 + 1.24 + 1.16 + 0.71), III 5.23 mm (1.56 + 0.67 + 1.13 + 1.16 + 0.71), IV 6.64 mm (1.73 + 0.67 + 1.69 + 1.73 + 0.82), male I 4.66 mm (1.35 + 0.48 + 1.16 + 1.03 + 0.64), II 4.53 mm (1.32 + 0.45 + 1.16 + 0.98 + 0.62), III 4.26 mm (1.22 + 0.45 + 1.05 + 0.93 + 0.61), IV 5.47 mm (1.50 + 0.53 + 1.38 + 1.38 + 0.68).

Prosoma. Carapace longer than wide (length/width female 1.47, male 1.38), covered with sparse hairs, median and radial furrows distinct (Fig. 1). Eyes of female: small but present, ocular area wider than long (Fig. 2), AME＜PME＜PLE＜ALE (1 : 2 : 3 : 4), anterior eye row recurved, posterior one procurved, AME-AME = AME-ALE, PME-PME＞PME-PLE (2 : 1), ALE and PLE apart from each other, median ocular area wider than long (length/width 0.5), wider behind than in front (anterior width/posterior width 0.67), clypeus almost same as the length of the ocular area; eyes of male degenerated and almost eyeless. Chelicera with three teeth on promargin of fang furrow, nine (female)



Figs. 1–6. *Cicurina hoshinonoana* Shimojana et Ono, sp. nov., 1, 2, 4, 6, allotype, female, 3, paratype, male, 5, holotype, male (NSMT-Ar 14714–14717).—1, Pro- and opisthosoma, dorsal view; 2, 3, eyes, dorsal view; 4, 5, chelicerae, ventral view; 6, spinnerets, ventral view. [Scales: 1, 1 mm; 2, 3, 5, 6, 0.1 mm; 4, 0.2 mm.]

or seven (male) small teeth on retromargin (Figs. 4–5). Maxillae distally wider and truncated, labium wider than long (length/width 0.71–0.75). Sternum longer than wide (length/width 1.13–1.14), covered with strong hairs, female palp with a claw. Legs with spines in the following formation. Femur: I and II dorsally 1-1-1, pro-laterally 0-0-1, III dorsally 1-1-1 (female) or 1-1-1-1 (male), pro- and retro-laterally each 0-0-1, IV dorsally 1-1-1 (female) or 1-1-1-1 (male), pro-



Figs. 7–10. *Cicurina hoshinonoana* Shimojana et Ono, sp. nov., holotype, male (NSMT-Ar 14714).—7, palp, retro-lateral view; 8, tibia, dorsal view; 9, retro-lateral tibial apophysis, ventro-lateral view; 10, palpal organ, ventral view. [Scales: 0.1 mm.]

and retro-laterally none (female) or 0-0-1 (male); patella: I-IV dorsally 1-0-1; tibia: I pro-laterally 1-1-1, ventrally 2-2, II pro-laterally 0-1-1, ventrally 2-2, III and IV pro- and retro-laterally each 1-1, ventrally 1-2-2; metatarsus: I and II ventrally 2-2-2, III and IV pro- and retro-laterally each 1-1-1, ventrally 2-2-2. Leg formula: IV-I-II-III, claws of legs with 8–10 teeth respectively.

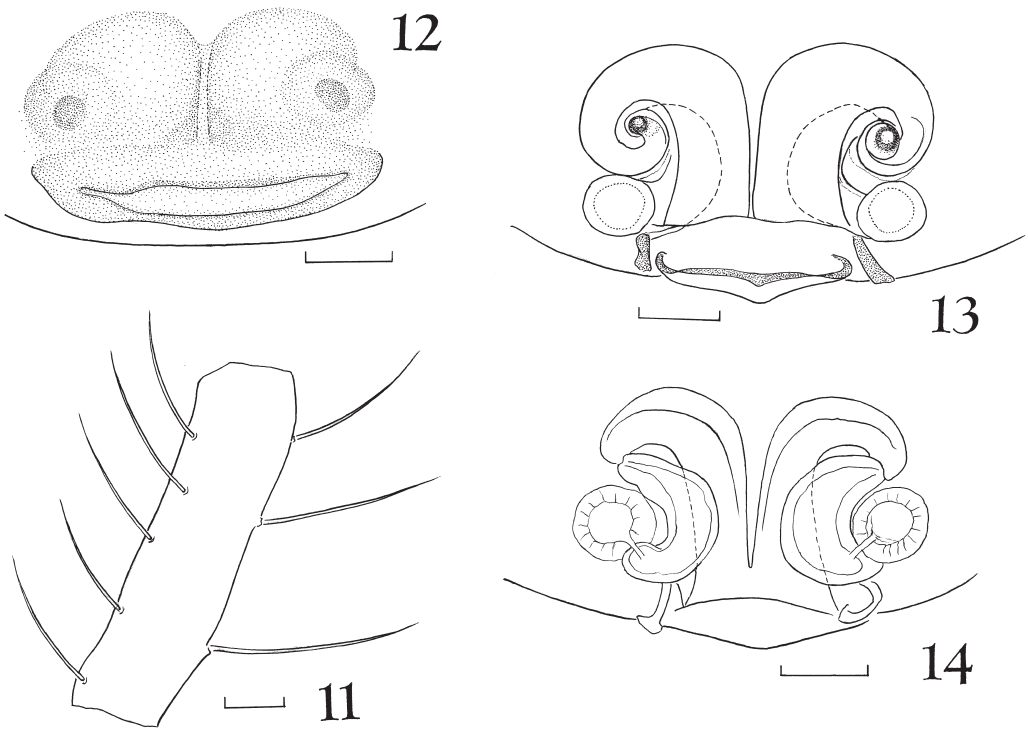
Male palp (Figs. 7–11). Femur short, almost as long as the length of patella + tibia, with long bristles (Fig. 11), patella short and unmodified, tibia shorter than tarsus, unique with several long bristles and a large, spatulate retro-lateral apophysis extending forward along the side of cymbium, distal margin of tibia sclerotized with pro- and retro-lateral projections (Figs. 8–9). Cymbium longer than wide with some long bristles, palpal organ simple with a tegular apophysis located retro-laterally, its distal part curved and forming a hook, embolus long and filiform, arising from posterior part of tegulum (Figs. 7, 10).

Opisthosoma. Oval, longer than wide (length/width 1.32 in female, 1.46 in male), densely covered with strong hairs (Fig. 1). Colulus absent, no vestige nor hairs, anterior-lateral spinnerets conical and thicker than others, median and posterior ones cylindrical with same thickness, all these spinnerets with some large spigots (Fig. 6).

Female genitalia (Figs. 8–9). Epigynum wider than long, with a single transverse opening (atrium), spermathecae and the canals visible through the cuticle. Inner organ: wide and horn-like tube (copulatory duct) from opening curved laterally and narrows anteriorly into a connecting tube (spermathecal stalk) present between copulatory duct and globular spermathecum.

Coloration and markings. Female carapace yellowish brown without markings, chelicerae, maxillae, labium and sternum light yellowish brown, palps and legs light yellow, opisthosoma dorsum grey without markings, spinnerets light yellow. The color of male is much lighter than that of the female and the whole body tends towards yellowish white.

Variation. Body length of the female para-



Figs. 11–14. *Cicurina hoshinonoana* Shimojana et Ono, sp. nov., 11, holotype, male, 12–14, allotype, female (NSMT-Ar 14714–14716).—11, Femur of palp, dorsal view; 12, epigynum, ventral view; 13, inner organ of female genitalia, ventral view; 14, same, dorsal view. [Scales: 0.1 mm.]

type: 4.12 mm, that of the male paratype: 3.38 mm. Four eyes (both lateral eyes) present on the head of male paratype (Fig. 3).

Distribution. Known only from the type locality and at present endemic to Minami-daito-jima Island.

Remarks. The specific name is derived from the local name of Hoshino-do Cave, the type locality of the new species. The taxonomic position of *Cicurina* lacks stability. Although the present authors (as in Ono, 2009) included the genus in the family Agelenidae as the classical view after Chamberlin and Ivie (1940), Murphy and Roberts (2015) proposed an independent family Cicurinidae on the basis of spinneret morphology, in contrast to hypothese which treat spinnerets lightly as a less fundamental character as per Lehtinen (1967) and Cokendolpher (2004). The World Spider Catalog accepted the latter opinion and placed *Cicurina* in Dictynidae. Because the present authors have no further material for a family level discussion, we recognize a certain group around *Cicurina* as a subfamily under the family Agelenidae.

Acknowledgements

Many thanks are due to Dr. Jason Dunlop, Museum für Naturkunde and Leibniz Institute for Evolution and Biodiversity Science, Berlin, Germany, for his kind advice and reading through the manuscript of this paper.

References

Chamberlin, R. V. and W. Ivie 1940. Agelenid spiders of the genus *Cicurina*. Bulletin of the University of Utah, 30: 1–108.

Cokendolpher, J. C. 2004. *Cicurina* spiders from caves in Bexar County, Texas (Araneae: Dictynidae). Texas Memorial Museum, Speleological Monographs, 6: 13–58.

Chikuni, Y. 1989. Pictorial Encyclopedia of Spiders of

Japan. 309 pp. Kaiseisha, Tokyo.

Irie, T. 1977. Ecological studies of the cave spiders I. Studies on the natural environment and seasonal fluctuation of *Cicurina* sp. in Katano-do Cave. Acta arachnologica, 27 (special number): 221–227.

Lehtinen, P. 1967. Classification of the cribellate spiders and some allied families, with notes on the evolution of the suborder Araneomorpha. Annales Zoologici Fennici, 4: 199–468.

Murphy, J. A. and M. J. Roberts, 2015. Spider Families of the World and their Spinnerets. Part 1 (pp. i–xi, 1–190) and Part 2 (pp. i–xvi, 191–553). British Arachnological Society, Dorset Press, Dolchester.

Ono, H. 2009. The spiders of Japan with keys to the families and genera and illustrations of the species. Tokai University Press, Kanagawa. xvi + 739 pp.

Ono, H. 2011. Spiders (Arachnida, Araneae) of the Ogasawara Islands. Memoirs of the National Museum of Nature and Science, Tokyo, 47: 435–470.

Saito, S., 1934. Spiders from Hokkaido. Journal of the Faculty of Agriculture, Hokkaido Imperial University, Sapporo, Japan, 33: 267–362.

Shimizu, Y. 2003. Nature of Minami-daito-jima, from the point of view of another oceanic island in Japan. Studies in Regional Sciences, 16: 9–32.

Shimojana, M. 1977. Preliminary report on the cave spider fauna of the Ryukyu Archipelago. Acta arachnologica, 27 (special number): 337–365.

World Spider Catalogue, 2017. Natural History Museum Ber, online at http://www.wsc.nmbe.ch, version 18.0, accessed on 28 February, 2017.

Yaginuma, T. 1972. The fauna of the lava caves around Mt. Fuji-san, IX. Araneae (Arachnida). Bulletin of the National Sicence Museum, Tokyo, 15: 267–334.

Yaginuma, T. 1979. Spiders from tuff and wave-cut caves of southern Kyushu, Japan, II. Journal of the Speleological Society of Jana, 4: 23–26.