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Contributions to the genus *Zodarium* Walckenaer, 1826 in Turkey, with the description of a new species (Araneae: Zodariidae)

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Abstract: In this paper, two species are newly recognized in Turkey. One is new to science, described as *Zodarium kunti* sp. n. (♂, ♀) from southeast Anatolian region. The other, *Zodarium christae* Bosmans, 2009 is found for the first time in Denizli, Antalya, and Muğla provinces.

Key words: Araneae, Zodariidae, *Zodarium*, new species, Turkey

1. Introduction

The spiders of the family Zodariidae are characterized by the absence of gnathocoxal serrula and by having long anterior spinnerets (Jocqué, 1991). This family includes more than 1165 species in 87 genera worldwide, but is most abundant in the tropical and subtropical regions (World Spider Catalog, 2020). The genus *Zodarium* Walckenaer, 1826 is the second largest genus in the Zodariidae family, with 168 previously described species from North Africa and Eurasia. It is the largest genus of the Zodariidae family in Europe, with 126 species (Nentwig et al. 2020). Zodariidae family is one of the families that contain a small number of species in Turkey and it has 22 species belonging to 4 genera. Among these 22 species, the genus *Zodarium* Walckenaer, 1826 contains 19 species (Danışman et al., 2019). This number has increased with the species presented in recent studies. The new species presented recently are: *Zodarium morosoides* Bosmans, 2009 (Danışman et al. 2017), *Zodarium robertbosmans* Wunderlich, 2017 (Wunderlich 2017), *Zodarium izmirensis* Danışman and Coşar, 2020 (Danışman and Coşar 2020) and *Zodarium imroz* Dimitrov, 2020 (Dimitrov, 2020). With these new species, the number of species increased to 23. The purpose of this study is to describe a new *Zodarium* species from the pusio species group on the basis of both sexual characters and provide new data on the spider fauna of Turkey.

2. Materials and methods

The spiders described in this study were collected by a pooter from under stones. Identification and measurements

of the examples were made with a Leica S8APO microscope (Leica Microsystems GmbH, Wetzlar, Germany). The photos were taken with the Canon EOS 250D (Canon Inc., Tokyo, Japan) that connected to the same microscope. Since the reproductive organs of the specimens are light color, a dark background was used when taking photos. In order to obtain a clear image, more than one photographs were obtained by focusing on different surfaces of the sample. Photos have been montaged by 'Combine ZM' image stacking software and 'Photoshop CC 2019' image editing software. SEM images were taken under high vacuum with a JEOL JSM-5600 (JEOL, Ltd., Tokyo, Japan). Spiders were preserved in the collection of Arachnological Museum of Kırıkkale University (KUAM) and Zoology Museum of Alaşehir Vocational School, Celal Bayar University (AZMM) in 70% ethyl alcohol. The map showing the distribution of the species in this study was generated with the SimpleMappr API. All measurements are expressed in millimeters. Leg measurements are shown as total length (femur + patella + tibia + metatarsus + tarsus) and the identification was made based on the descriptions and figures of Bosmans (1997; 2009), and Nentwig et al. 2020. Abbreviations used: AME: Anterior median eyes; ALE: Anterior lateral eyes; PME: Posterior median eyes; PLE: Posterior lateral eyes.

3. Results

Family Zodariidae Thorell, 1881

Genus *Zodarium* Walckenaer, 1826

Zodarium christae Bosmans, 2009

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Material examined: 1♂, 1♀, Tekke, Denizli, 37°43'47" N 29°10'15" E, 18.06.2012. alt. 261 m. leg. T. Danişman; 2♂, 1♀, Büyük çaltıcak, Konyaaltı, Antalya, 36°47'01" N 30°34'15" E, 15.03.2009. alt. 2 m. leg. T. Danişman; 1♂, 1♀, Yangı, Köyceğiz, Muğla, 36°57'43" N 28°43'19" E, 10.06.2017. alt. 20 m. leg. T. Danişman.

Distribution: Greece (World Spider Catalog, 2020).

Description

Male

Prosoma yellowish orange, cephalic part darker. Black colour around the AME. Walking legs pale yellowish, coxae whitish yellow; abdomen dark sepia, its ventral whitish brown (Figure 1). Palpal tibial apophysis elongated, with basal protrusion and terminal teeth. The linear embolus forms a semicircle and joins the hook-shaped distal end of the median apophysis (Figure 2). Total length: 4.85.

Prosoma length: 2.35, width: 1.85. Abdomen length: 2.50, width: 1.70. Ocular area length: 0.60. Palp length: 1.50. Sternum length: 1.30, width: 1.10. Eye diameter range and inter distances: AME: 0.15, ALE: 0.15, PME: 0.10, PLE: 0.10, AME-AME: 0.10, AME-ALE: 0.05, PME-PME: 0.30, PME-PLE: 0.10, PLE-ALE: 0.05. Lengths of legs: I. leg. 9.50 (2.20 + 0.85 + 2.30 + 2.60 + 1.55), II. leg. 8.50 (2.25 + 0.70 + 2.0 + 2.35 + 1.20), III. leg. 8.30 (2.20 + 0.70 + 1.90 + 2.50 + 1.0), IV. leg. 11.25 (3.0 + 0.85 + 2.80 + 3.40 + 1.20).

Female

Prosoma yellowish orange. Black colour around the AME. Walking legs pale yellowish, coxae whitish yellow; abdomen dark sepia, its ventral whitish brown (Figure 1). Anteromedian depression of epigyne with dome-shaped incision with posteriorly median cap. Spermathecae oval, in two pairs (Figure 3). Total length: 5.0. Prosoma length:

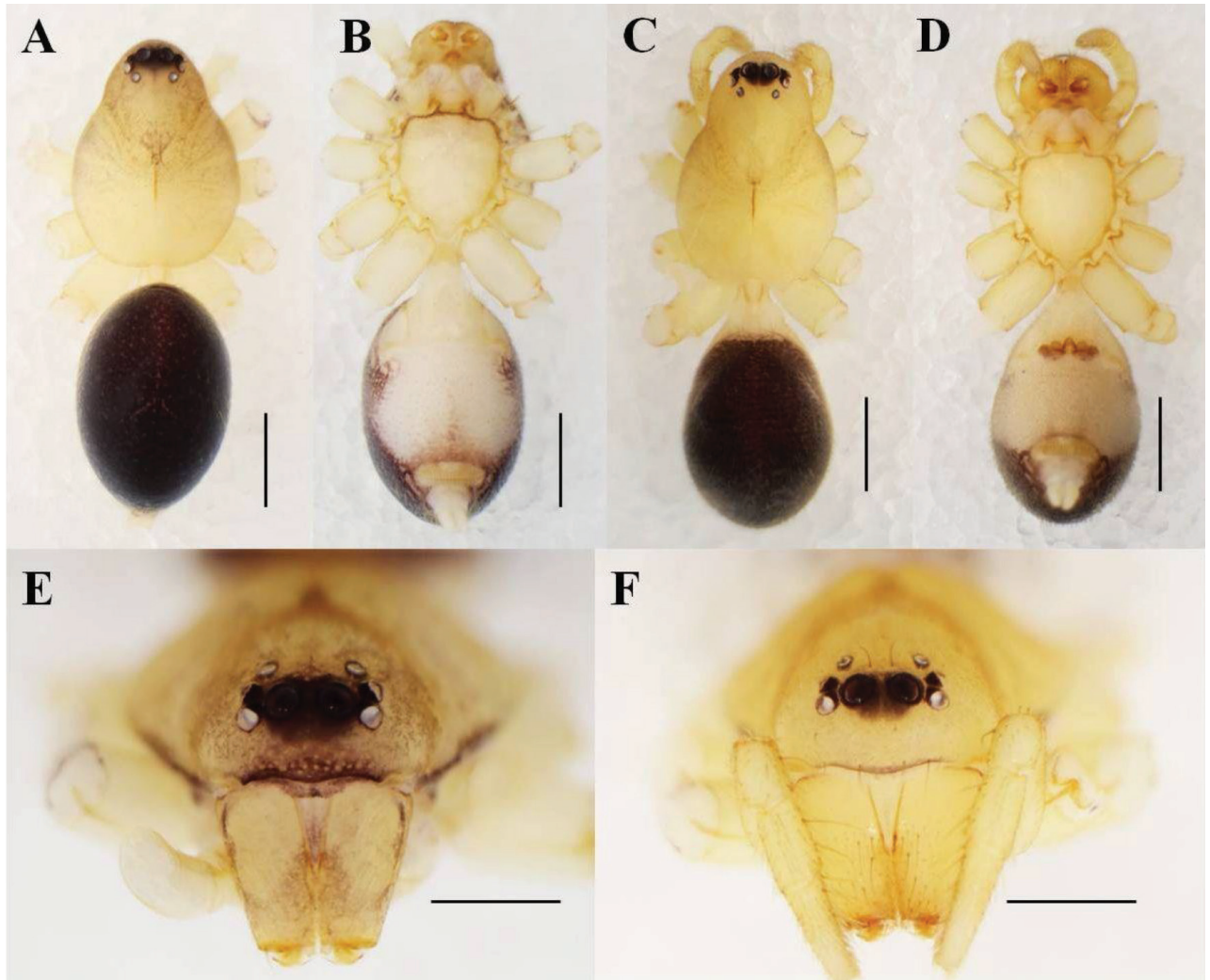


Figure 1. *Zodarion christae* Bosmans, 2009, habitus, ♂, A. Dorsal view; B. Ventral view; E. Ocular area frontal view; ♀, C. Dorsal view; D. Ventral view; F. Ocular area frontal view (Figures A–D Scale 1.0, Figures E–F Scale 0.5).

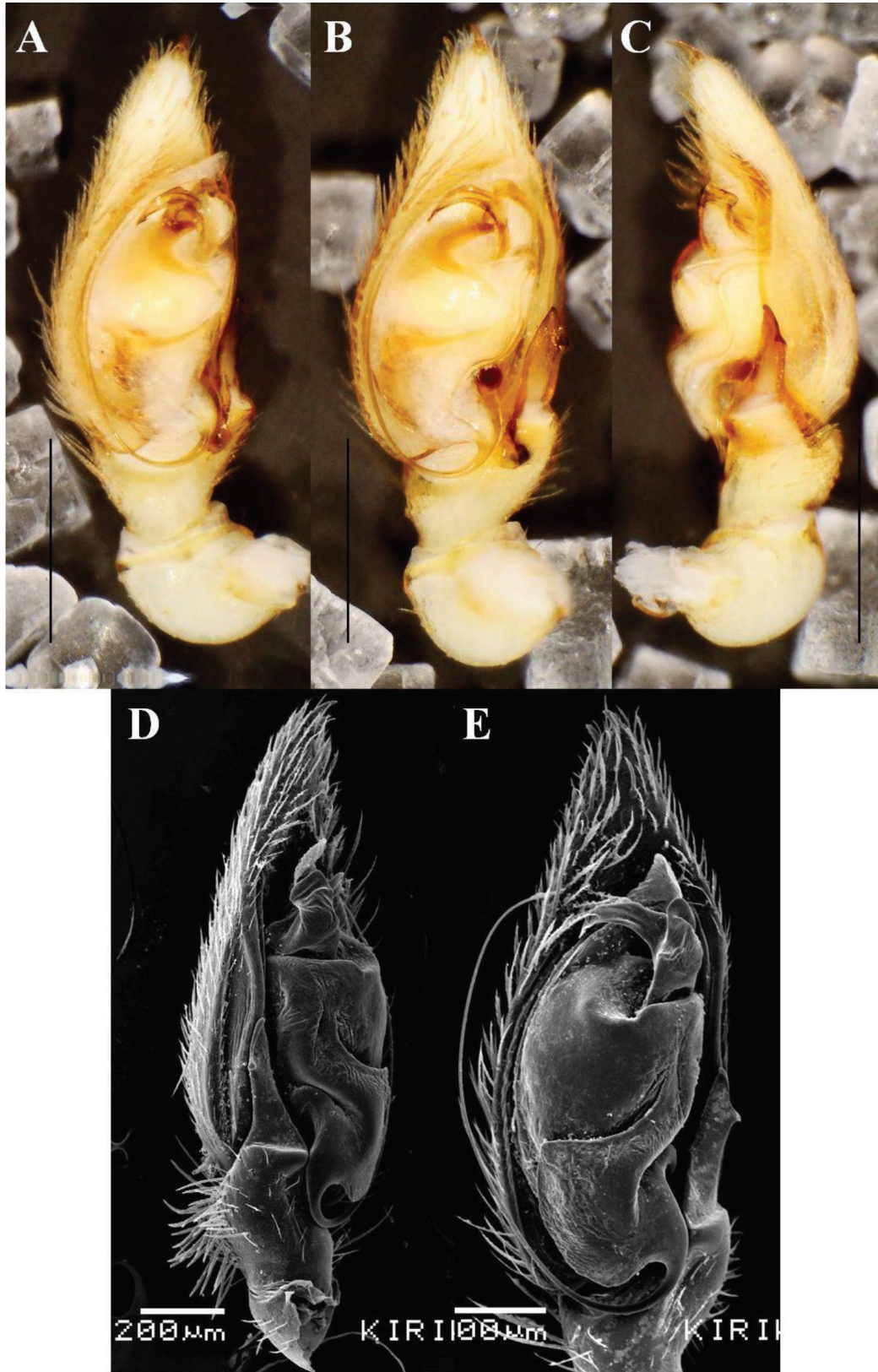


Figure 2. *Zodarion christae* Bosmans, 2009, ♂, pedipalp, A. Retrolateral view; B. Ventral view; C. Prolateral view, SEM microphotographs, D. Lateral view; E. Ventral view (Figures A–C Scale 0.5).

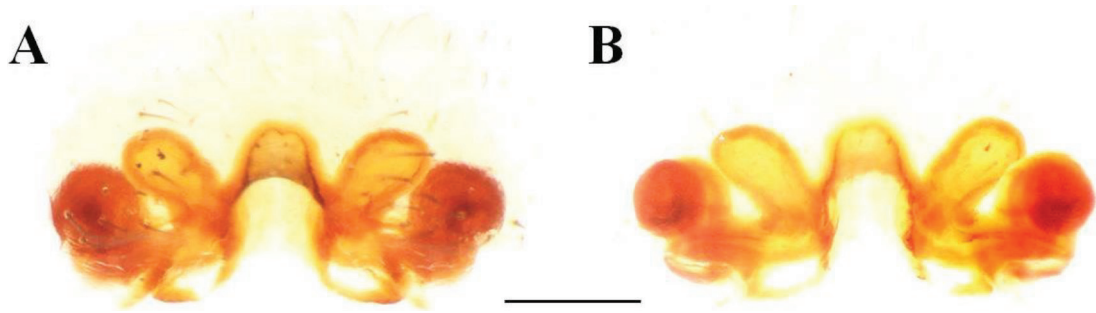


Figure 3. *Zodarion christae* Bosmans, 2009, ♀, A. Epigyne, ventral view; B. Vulva, dorsal view (Scale 0.2).



Figure 4. Distribution map.

2.55, width: 1.85. Abdomen length: 2.45, width: 1.65. Ocular area length: 0.70. Epigyne length: 0.70. Sternum length: 1.40, width: 1.10. Eye diameter range and inter distances: AME: 0.15, ALE: 0.15, PME: 0.10, PLE: 0.10, AME-AME: 0.10, AME-ALE: 0.05, PME-PME: 0.35, PME-PLE: 0.10, PLE-ALE: 0.05. Lengths of legs: I. leg. 8.05 (2.05 + 0.70 + 1.80 + 2.30 + 1.20), II. leg. 8.80 (2.20 + 0.70 + 2.0 + 2.40 + 1.50), III. leg. 7.95 (2.0 + 0.70 + 1.75 + 2.50 + 1.0), IV. leg. (2.75 + 0.85 + 2.65 + 3.30 + 1.10).

Zodarion kunti sp. n.

Material examined: Holotype, ♂ *Zodarion kunti* sp. n. was determined from Karkamış, Gaziantep, Turkey, (36°50'02" N 38°00'41" E), 04.05.2012, alt. 341 m. Paratypes: 1♂, 1♀, collected together with holotype (leg. T. Danişman); 2♂, 1♀, Gaziantep Province, Şahinbey District, Sarısalkım Neighborhood (37°04'05" N 37°18'14" E), 04.05.2012, alt. 909 m (leg. T. Danişman); 3♂, 2♀, Gaziantep Province, Şehitkamil District, (37°08'56" N

37°10'43" E), 15.09.2018, alt. 1235m (leg. E.A. Yağmur); 2♂, 1♀, Gaziantep Province, Araban District, (37°27'37" N 37°36'02" E), 05.05.2019, alt. 598 m (leg. İ. Coşar); 2♂, Şanlıurfa Province, Siverek District, (37°45'56" N 39°17'38" E), 12.04.2018, alt. 768 m (leg. T. Danişman); 1♂, Mardin Province, Derik District, (37°13'04" N 40°05'23" E), 09.05.2018, alt. 486 m (leg. T. Danişman); 1♂, 1♀, Mardin Province, Artuklu District, (37°10'39" N 40°56'53" E), 09.05.2018, alt. 565 m (leg. T. Danişman).

Distribution: Known only from Turkey (Figure 4).

Etymology: The new species is devoted to Kadir Boğaç Kunt, who has a great contribution to the field of Arachnology in Turkey.

Diagnosis: This new species is included in the "*pusio*" species group (according to Bosmans 1997) and is closely related to *Zodarion emarginatum* (Simon, 1873), (Bosmans, 1997). The male of *Z. kunti* sp. n. varies in having a question mark-shaped median apophysis. Females distinct

from those of *Z. emarginatum* by the comparatively wider and V-shaped anteromedian depression, larger close-set spermathecae.

Description

Male

Cephalic part of prosoma light brown, thoracic part yellowish orange. AME encircled in black. Walking legs pale yellowish, coxae whitish yellow. Abdomen dark sepia, it's ventral whitish brown (Figures 5, 6). Palpal median apophysis question mark-shaped, with dorsal groove. Cymbium with basal hole. Tegulum flat, not protruding in lateral view. Tibial apophysis elongated, gradually narrowing and terminally pointed. The basal part of tibial apophysis with a distinctively second tooth (Figures 7–9). Total length: 3.20. Prosoma length: 1.55, width: 1.20. Abdomen length: 1.65, width: 1.10. Ocular area length: 0.50. Pedipalp length: 1.10. Sternum length: 1.0, width: 0.80. Eye diameter range and inter distances: AME: 0.15, ALE: 0.10, PME: 0.07, PLE: 0.07, AME-AME: 0.07, AME-ALE: 0.02, PME-PME: 0.20, PME-PLE: 0.07, PLE-ALE: 0.02. Legths of legs: I. Leg. 6.25 (1.60 + 0.55 + 1.45 + 1.55 + 1.10), II. Leg. 5.15 (1.35 + 0.45 + 1.15 + 1.35 + 0.85), III. Leg. 4.95 (1.30 + 0.45 + 1.05 + 1.50 + 0.65), IV. Leg. 7.65 (2.10 + 0.60 + 1.90 + 2.15 + 0.90).

Female

Cephalic part of prosoma brown, thoracic part yellowish orange. AME encircled in black. Walking legs pale yellowish, coxae whitish yellow. Abdomen dark sepia, it's ventral whitish brown (Figures 5,6). Anteromedian depression of epigyne with V-shaped incision. Spermathecae flat, oval shaped, in two pairs and adjoined (Figure 10). Total length: 4.10. Prosoma length: 1.70, width: 1.30. Abdomen length: 2.40, width: 1.50. Ocular area length: 0.55. Epigyne length: 0.50. Sternum length: 1.0, width: 0.90. Eye diameter range and inter distances: AME: 0.15, ALE: 0.10, PME: 0.07, PLE: 0.07, AME-AME: 0.07, AME-ALE: 0.02, PME-PME: 0.25, PME-PLE: 0.05, PLE-ALE: 0.02. Legths of legs: I. Leg. 7.0 (1.90 + 0.60 + 1.50 + 1.80 + 1.20), II. Leg. 6.40 (1.70 + 0.60 + 1.40 + 1.70 + 1.0), III. Leg. 6.20 (1.60 + 0.60 + 1.20 + 1.90 + 0.90), IV. Leg. 8.30 (2.30 + 0.60 + 2.10 + 2.40 + 0.90).

Nomenclatural acts

This study and the nomenclatural acts it contains have been registered in ZooBank. The ZooBank Life Science Identifier (LSID) for this publication is urn:lsid:zoobank.org:pub:0B21B0E5-A187-4213-9D8E-6A94F229CEA6

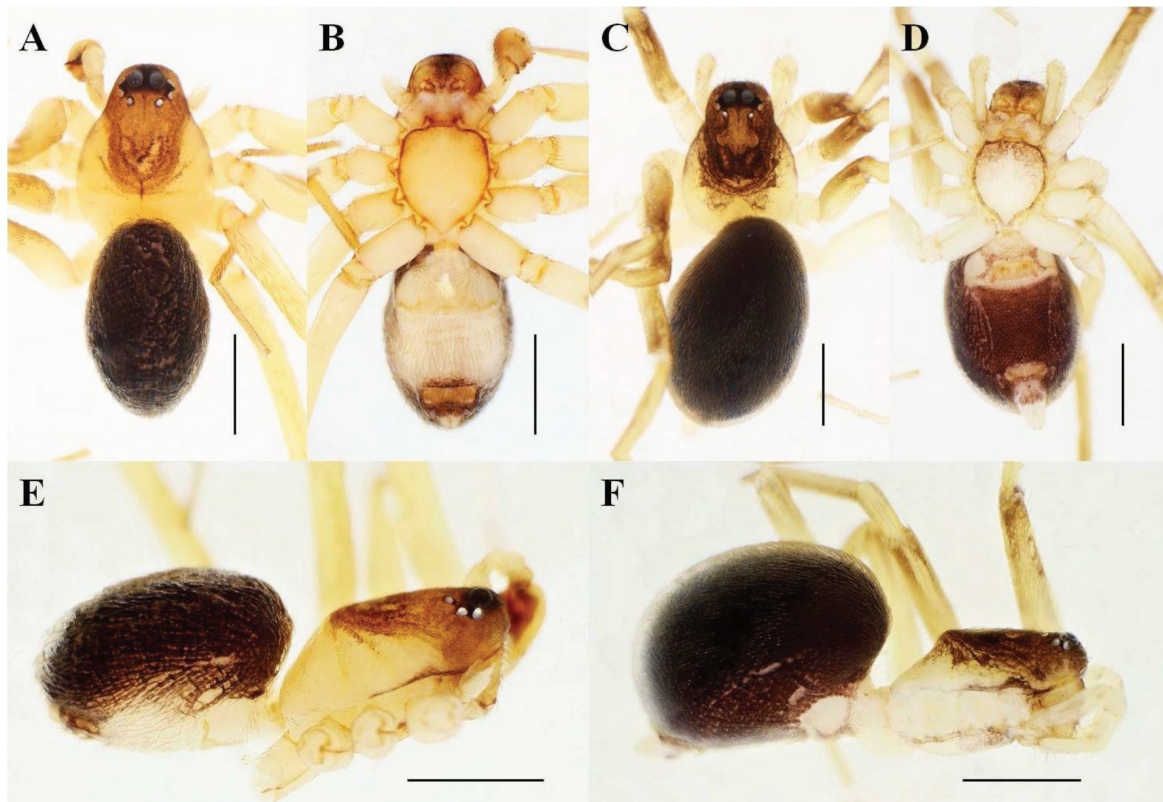


Figure 5. *Zodarion kunti* sp.n., ♂, habitus, A. Dorsal view; B. Ventral view; E. Lateral view; ♀, C. Dorsal view; D. Ventral view; F. Lateral view (Scale: 1.0).



Figure 6. *Zodarion kunti* sp.n., ocular area, frontal view, **A.** Male; **B.** Female; idem dorsal view, **C.** Male; **D.** Female (Scale: 0.5).

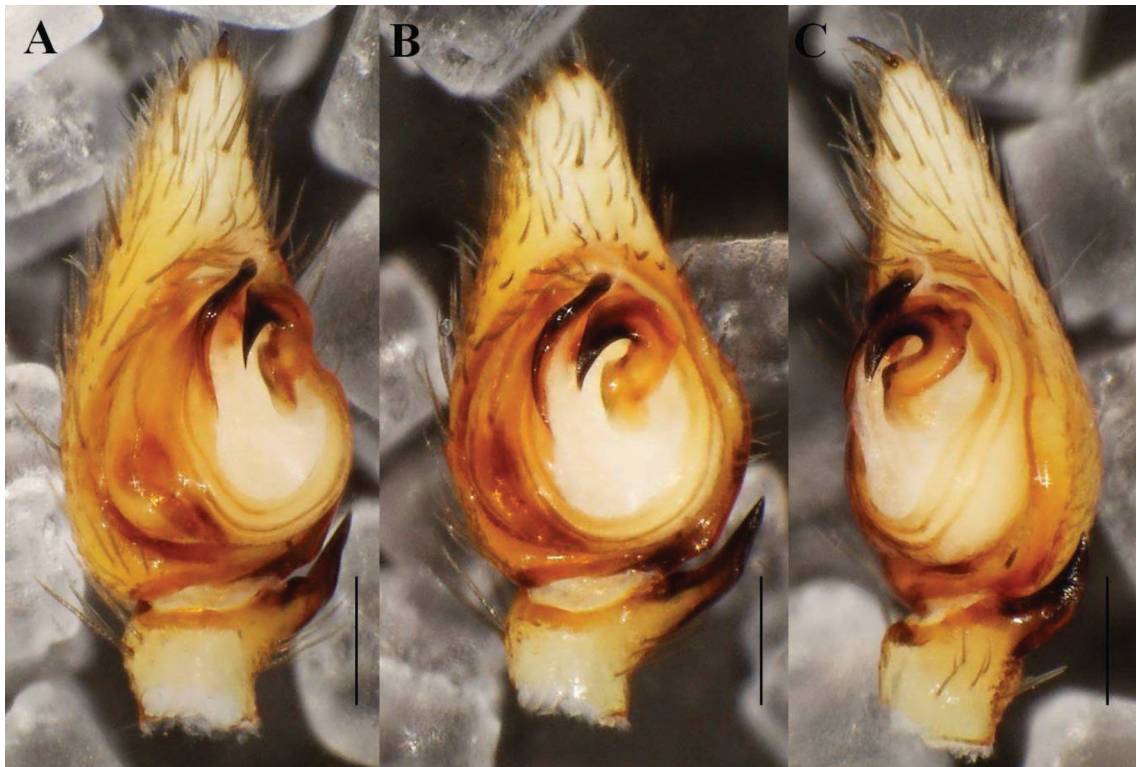


Figure 7. *Zodarion kunti* sp.n., ♂, pedipalp, **A.** Prolateral view; **B.** Ventral view; **C.** Retrolateral view (Scale 0.2).

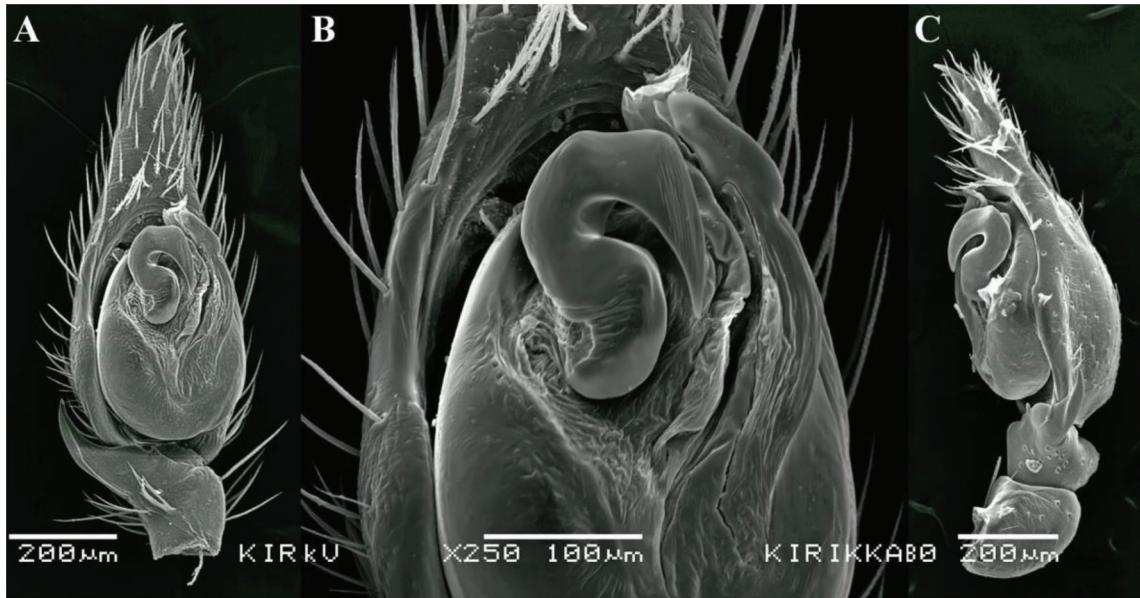


Figure 8. *Zodarion kunti* sp.n., SEM microphotographs, pedipalp, A. Ventral view; B. Median apophysis ventral view; C. Retrolateral view.

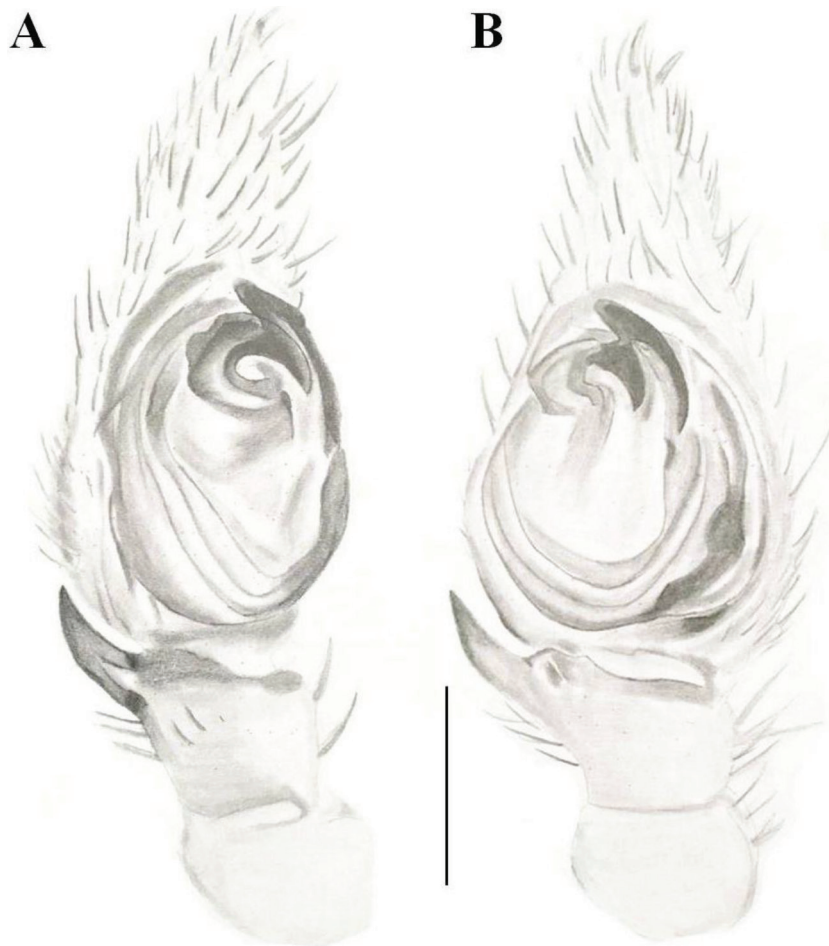


Figure 9. *Zodarion kunti* sp.n., drawings of male palp, A. Retrolateral view; B. Ventral view (Scale: 0.2).

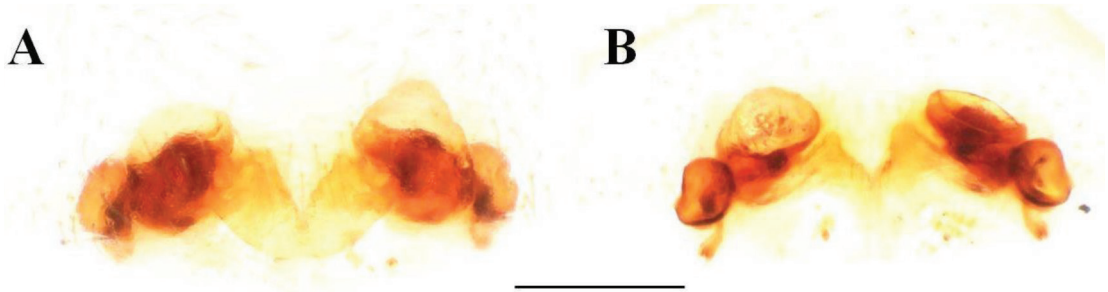


Figure 10. *Zodarion kunti* sp.n., ♀, **A.** Epigyne dorsal view; **B.** Vulva, ventral view (Scale: 0.2).

and for the new species is urn:lsid:zoobank.org:act:C3C9C41B-3D05-4843-B9D4-7121B284B027.

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