



Redescription of two Ctenidae (Araneae) from Taiwan

YURI M. MARUSIK^{1,2,3} & MIKHAIL M. OMELKO^{4,5}¹Institute for Biological Problems of the North RAS, Portovaya Str. 18, Magadan, Russia. E-mail: yurmar@mail.ru²Zoological Museum, University of Turku, FI-20014 Turku, Finland³Department of Zoology & Entomology, University of the Free State, Bloemfontein 9300, South Africa⁴Gornotayozhnaya Station FEB RAS, Gornotayozhnoye Vil., Ussuriyski Dist., Primorski Krai, 692533 Russia.E-mail: omelkom@gmail.com⁵Far Eastern Federal University, Sukhanova 8, Vladivostok 690950, Russia

Abstract

Two ctenid species, *Anahita maolan* Zhu, Chen & Song, 1999 and *Ctenus yaeyamensis* Yoshida, 1998 from Taiwan are redescribed in detail based on both sexes. *Anahita maolan* is reported from Taiwan for the first time. For both species, Kenting National Park (southernmost Taiwan) is the southernmost known locality.

Key words: Aranei, *Anahita*, *Ctenus*, Asia, Kenting

Introduction

Anahita is a relatively small genus comprising 29 species (World Spider Catalog 2016). Half of the species are distributed in the African region (14 species), six species are known in East Asia, one species in South Asia (India), five species in South East Asia, one species in West Asia (Israel) and two species occur in the Nearctic. Thus, the Asian region has the second largest species diversity of the genus (13 species). Most Asian species (*A. denticulata* (Simon, 1884), *A. feai* (F.O. Pickard-Cambridge, 1902), *A. jianfengensis* Zhang, Hu & Han, 2011, *A. jinsi* Jäger, 2012, *A. jucunda* (Thorell, 1897), *A. punctata* (Thorell, 1890) and *A. smythiesi* (Simon, 1897)) have very restricted distributions and are known from type localities only. Eight species occur in the tropics of South and South East Asia exclusively. Only two species are known from the temperate zone of China, (*A. fauna* Karsch, 1879 and *A. samplexa* Yin, Tang & Gong, 2000), Japan, Russia and Far East (*A. fauna*).

Six species of East Asian *Anahita* have been recently revised and redescribed by Jäger (2012). The Chinese species are well illustrated in Song *et al.* (1999, 2001), Yin *et al.* (2012), Zhang *et al.* (2011) and Li *et al.* (2014). Despite these previous studies, the genus remains poorly studied in Asia. Four species are known from females only; some species were depicted only once and/or of insufficient quality.

Ctenus is a much larger genus containing 232 species to date (World Spider Catalog 2016). Most of the species inhabit the tropics of the New World and Africa (99 and 79 species, respectively). There are 50 species in Asia, distributed from India to Okinawa and the Philippines. The species from South East Asia were recently revised by Jäger (2012) and Jäger & Minn (2015).

While collecting spiders in the southernmost part of Taiwan, the senior author collected *Anahita*, previously known from mainland China and one *Ctenus* species described from Central-North Taiwan and the westernmost islands of Okinawa Prefecture. Both species are not very well known or properly illustrated. The main goal of this paper is to redescribe these two species.

Material and methods

Specimens were photographed using an Olympus E-520 camera attached to an Olympus SZX16 stereomicroscope

and with an SEM JEOL JSM-5200 scanning microscope at the Zoological Museum, University of Turku. Digital images were prepared using Zerene Stacker image stacking software. Macerated epigynes were temporarily coloured with Chlorazol Black to make some parts more visible. Photographs were taken with specimens in dishes with alcohol and paraffin on the bottom. Holes of different sizes were made in the paraffin to keep the specimens in the appropriate position. The epigynes were macerated with KOH solution. All measurements are in millimetres.

Our observations have shown that the spination of legs III and IV is of no value in distinguishing species in *Ctenus* occurring in East Asia, and therefore we have not included them.

Abbreviations

NSMT National Museum of Nature and Science, Tokyo
ZMMU Zoological Museum of the Moscow State University

Species survey

Anahita maolan Zhu, Chen & Song, 1999

Figs 1–13, 32–34

Anahita maolan Zhu *et al.* 1999: 210, figs 1–5 (♂♀); Yin *et al.* 2012: 936, figs 473a–e (♂♀).

Material examined. 1♂ 2♀ (ZMMU), TAIWAN, Kenting National Park, 21°58'N 120°50'E, hand collected in grass, 26.06.2013 (Y.M. Marusik).

Diagnosis. This species is closely related to *A. jianfengensis* described from Hainan Island. *Anahita maolan* can be distinguished from this species by the long, crescent-like embolus, large conductor, shape of sperm duct loop and thick brush of hairs on the top of the tibia near the cymbium base. The species is also noticeably larger than *A. jianfengensis* (carapace length 4.7 and 3.21 for the holotypes, respectively). Females differ also by size (carapace length 4.9–6.4 and 3.52, respectively) and also by wider septum in *A. maolan* (cf. Figs 11–12 and fig. 5 in Zhang *et al.* 2011).

Description. Male. Total length 10.9. Carapace 5.65 long, 4.5 wide. Carapace brown with broad yellow median and lateral bands. Fovea thin, black. Chelicerae with two indistinct longitudinal bands; promarginal teeth absent, retromargin with 4 or 6 teeth (number differs on right and left chelicerae). Sternum, maxillae and labium yellow, without pattern. Dorsal part of abdomen gray with distinct yellowish band and 4 pairs of black spots. Spinnerets yellowish with gray on the external sides.

Legs yellowish brown with indistinct darker spots. Spination pattern same for both legs I and II. Femora 3d, 4p, 4r; patellae 1p, 1r; tibiae 2d, 2p, 2r, 4-4v and 2a, metatarsi 2p, 2r, 2-2v and 2a.

Palp as in Figs 5–10. Femur longer than other segments; tibia as long as cymbium; tibial apophysis absent. Intersegmental sclerite absent. Tegular apophysis (*Ta*) large with deep groove. Conductor absent. Embolus comparatively long, crescent-like, gradually tapering.

Leg measurements

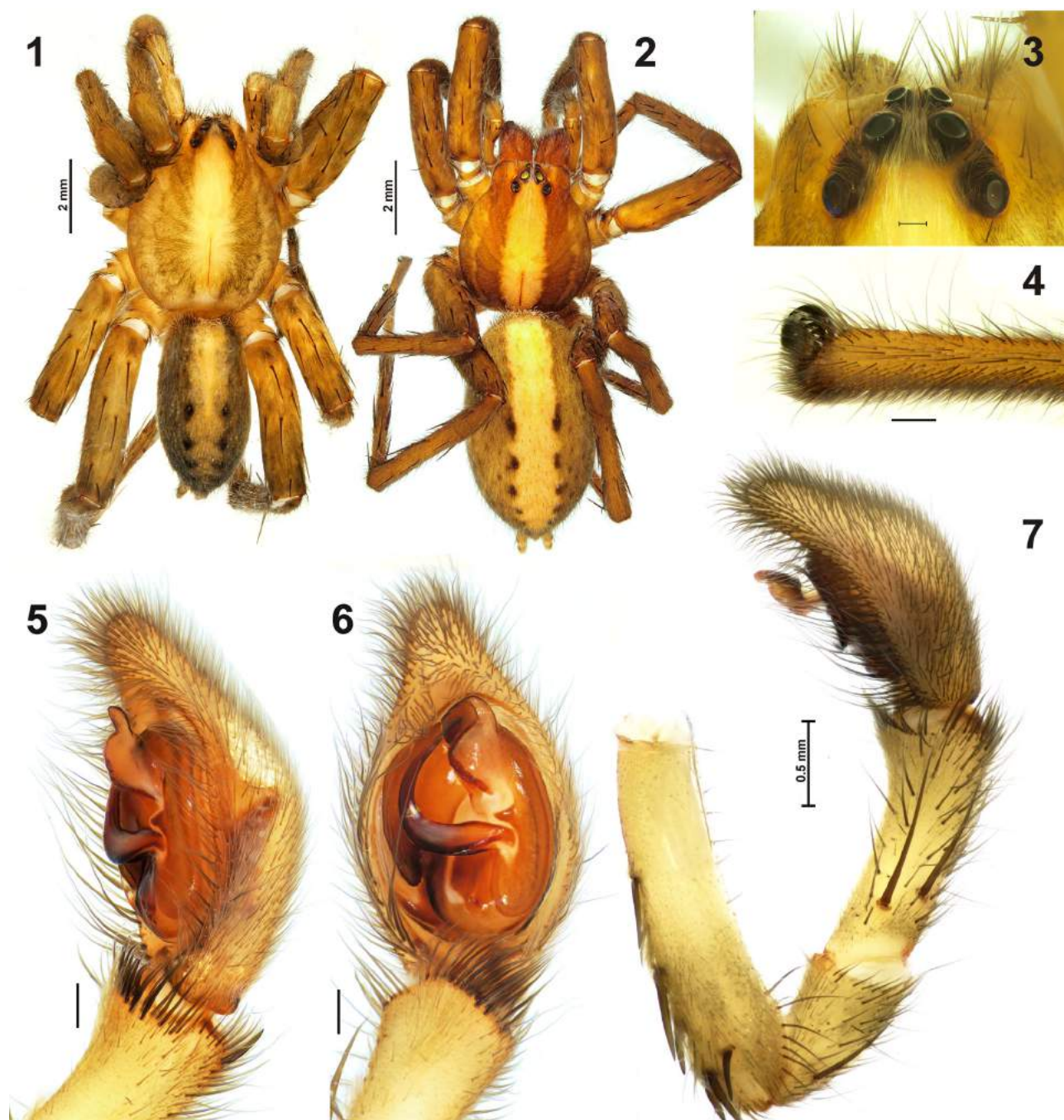
	Femur	Patella	Tibia	Metatarsus	Tarsus	Total
I	5.1	2.45	5.55	5.25	1.9	20.25
II	5.65	2.6	5.35	4.2	2.05	19.85
III	4.7	2.1	3.55	3.75	1.6	15.7
IV	6.1	2.3	5.35	6.25	2.2	22.2

Female. Total length 12.75. Carapace 6.4 long, 5.45 wide. Carapace dark brown with broad yellow median band and irregular lateral bands. Fovea thin. Chelicerae, sternum, maxillae and labium dark brown, without pattern. Promargin with 2 teeth, retromargin with 7 teeth. Dorsal part of abdomen light brown with longitudinal yellow band. Spinnerets brown. Legs brown with indistinct spots.

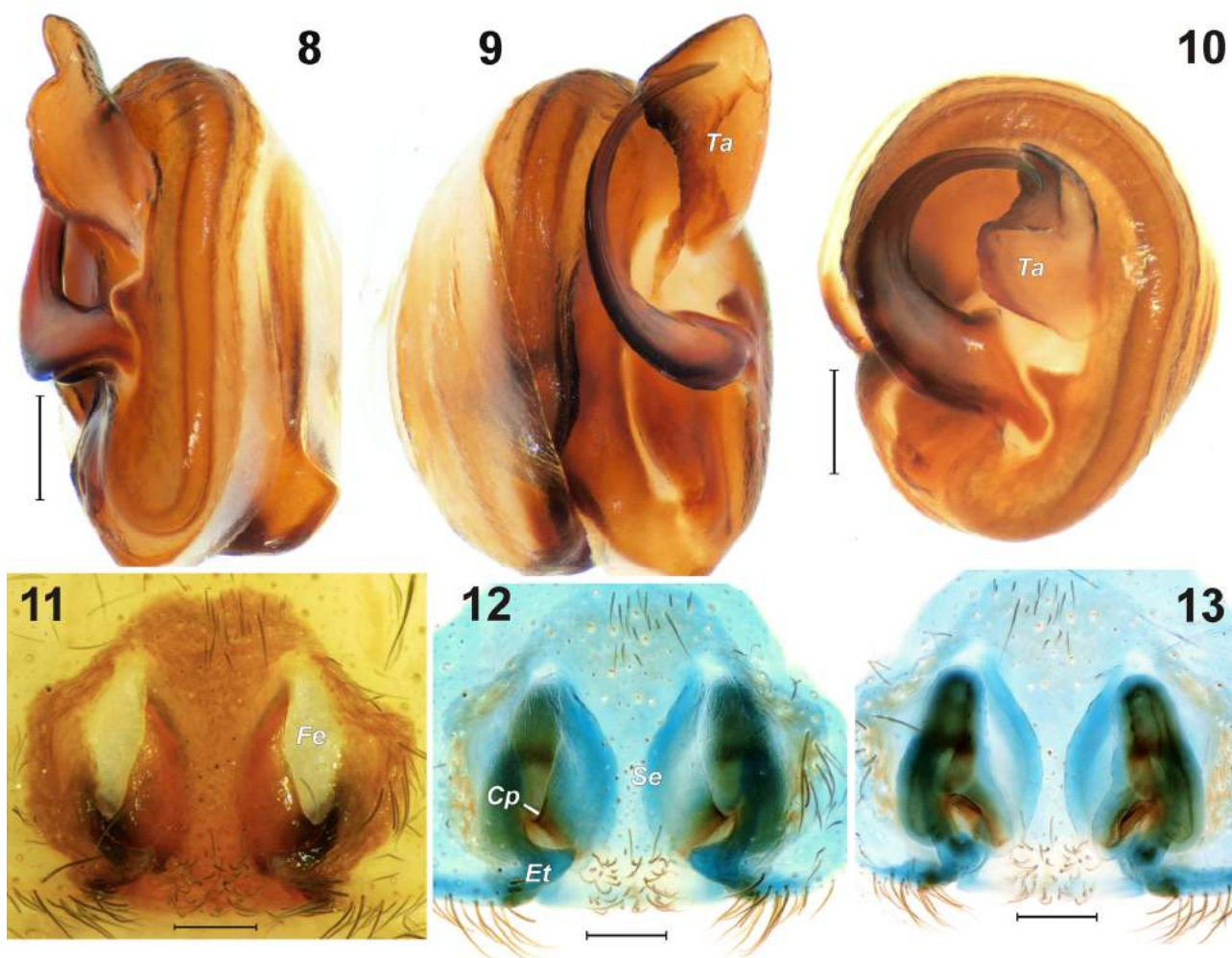
Metatarsi I and II with scopulae. Spination pattern same for both legs I and II, except for femur. Femora I 3d, 3p, 2r (femora II 3d, 4p, 4r); tibiae 4-4v and 2a; metatarsi 2-2v and 2a.

Leg measurements

	Femur	Patella	Tibia	Metatarsus	Tarsus	Total
I	5.4	2.85	5.25	3.95	1.6	19.05
II	5.1	2.5	4.65	3.7	1.5	17.45
III	4.4	2.25	3.55	3.5	1.5	15.2
IV	6.05	2.45	5.35	5.65	1.85	21.35



FIGURES 1–7. Somatic characters and male palp of *Anahita maolan*. 1–2 male and female habitus, dorsal; 3 eye pattern of male, dorsal; 4 tarsus III, retrolateral; 5–6 distal part of palp, retrolateral and ventral; 7 palp, retrolateral. Scale = 0.2 mm if not otherwise indicated.



FIGURES 8–13. Bulb (8–10) and epigyne (11–13) of *Anahita maolan*. 8–10 retrolateral, prolateral and distal; 11 intact, ventral; 12–13 macerated, ventral and dorsal. Abbreviations: *Cp*—copulatory openings; *Et*—epigynal teeth; *Fe*—fenestra; *Ta*—tegular apophysis; *Se*—septum.

Epigyne as in Figs 11–13, 32–34. Septum (*Se*) large, trapezoidal, slightly longer than wide; fenestra (*Fe* = weakly sclerotized part) wide; copulatory openings (*Cp*) located over epigynal teeth (*Et*). Copulatory duct (*Cd*) weakly sclerotized, almost as long as receptacle (*Re*); receptacle elongate, not well separated from copulatory duct.

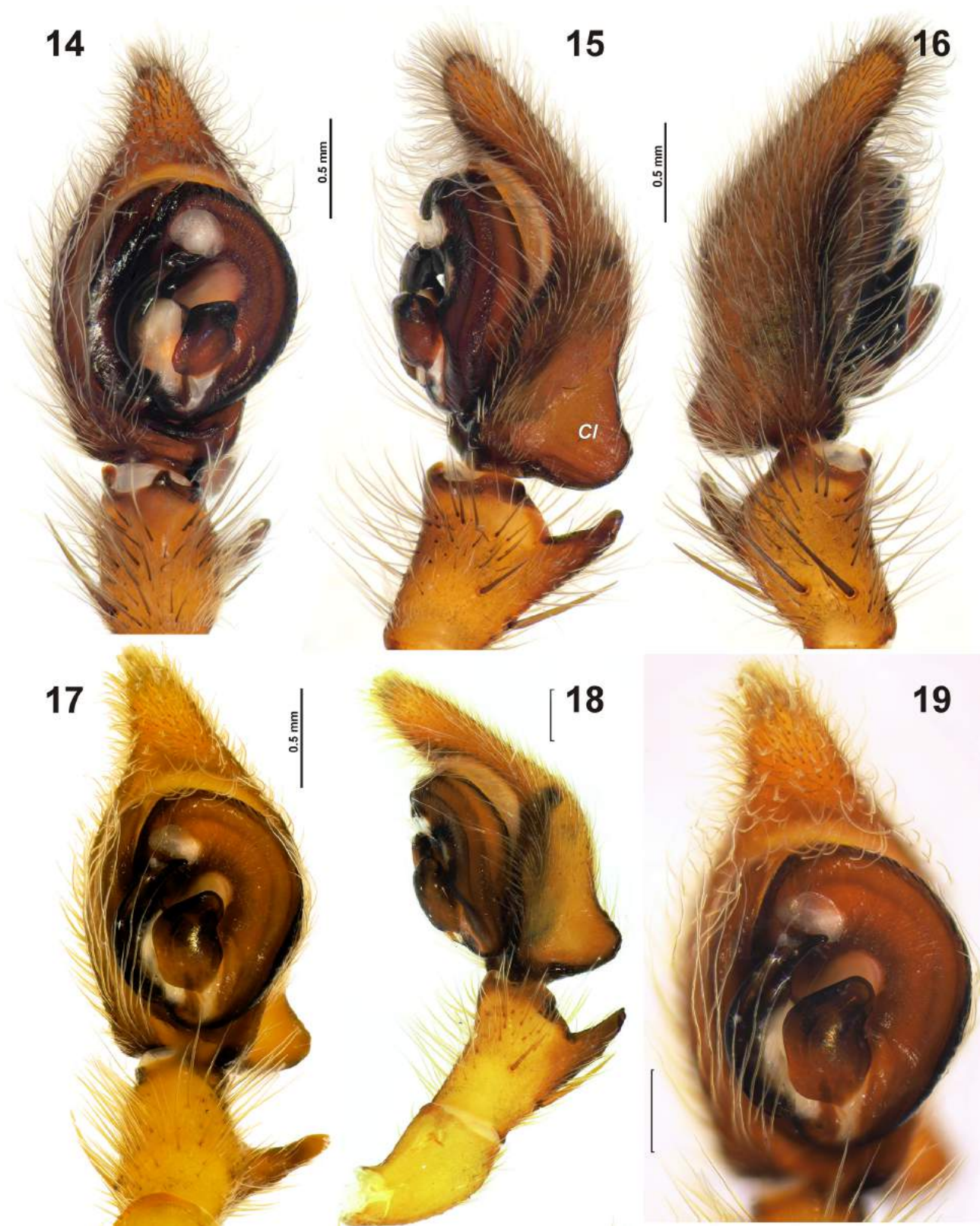
Remarks. Originally, this species was described from Guizhou Province, China based on both sexes. The description had five figures showing the abdominal coloration, the epigyne, the endogyne and the palp (lateral and ventral views). Later, the species was found in Hunan Province and was redescribed. The second taxonomic entry (Yin *et al.* 2012) also had five figures. The difference is that the entire body coloration is shown. It is worth mentioning that the epigynes in these two works are significantly different. The septum in the original description (Zhu *et al.* 1999: fig. 2) is widest in its median part. However, the same part of the septum is narrowest in the female from Hunan (Yin *et al.* 2012: fig. 473b). Another difference is the shape of the epigynal teeth. These teeth are wide and rounded in the female from Guizhou, whereas they are narrow and pointed in the Hunan females.

Distribution. This species is known from south China (Hunan and Guizhou Provinces) and Taiwan. It is likely that this species will be found in the countries adjacent to Southern China.

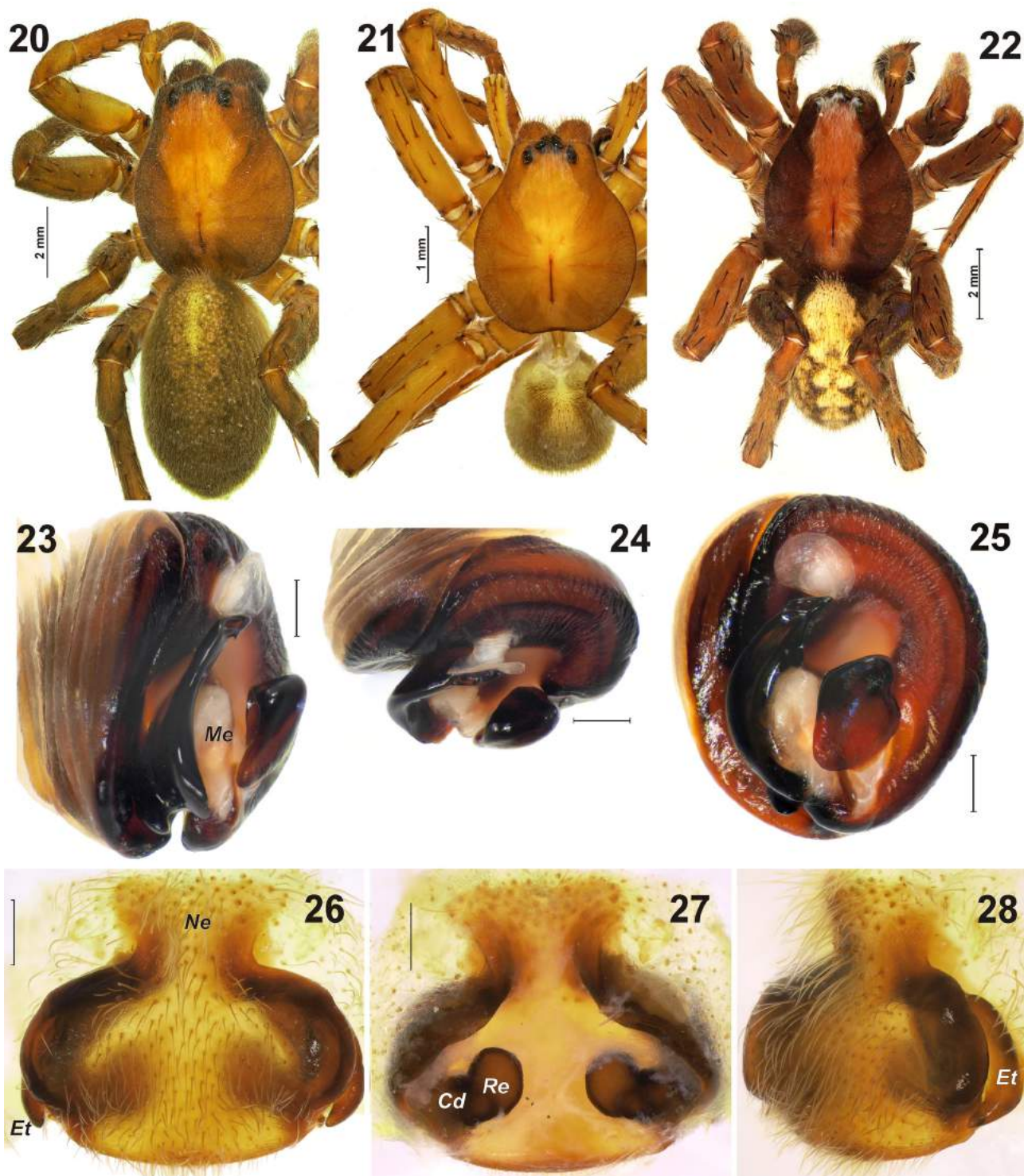
***Ctenus yaeyamensis* Yoshida, 1998**

Figs 14–31

Ctenus yaeyamensis Yoshida 1998: 117, figs 1–5 (♂♀); Yoshida 2009: 467, figs 1–5 (♂♀).



FIGURES 14–19. Male palp of *Ctenus yaeyamensis*. 14, 17, 19 ventral; 15, 18 retrolateral; 16 prolateral. 14–16 from Kenting, 17–19 holotype. Abbreviation: *CI*—lamella-shaped outgrowth.



FIGURES 20–28. Somatic characters and copulatory organs of *Ctenus yaeyamensis*. 20 female habitus, dorsal; 21–22 male habitus, dorsal; 23–25 bulb, anterior-prolateral, anterior and ventral; 26–28 epigyne, ventral, dorsal and ventro-lateral. 20, 26–28 allotype female; 21 holotype male; 22–25 specimens from Kenting. Abbreviations: *Me*—membranous extension; *Ne*—neck of epigynal plate; *Et*—epigynal tooth; *Re*—receptacles; *Cd*—copulatory duct.

Material examined. Holotype ♂ (NSMT-Ar 4150), Taiwan, Nantow County, Chitow, 20.7.1977 (H. Yoshida). Allotype ♀ (NSMT-Ar 4151), same locality and collector as for the holotype, 21.07.1977; 1♂, 4 juv. (ZMMU), TAIWAN Pingtung County, Kenting National Park, 21°58'N 120°50'E, hand collected among grass, 26.06.2013 (Y.M. Marusik).

Diagnosis. Males of *C. yaeyamensis* can be distinguished from other species found in the region by the

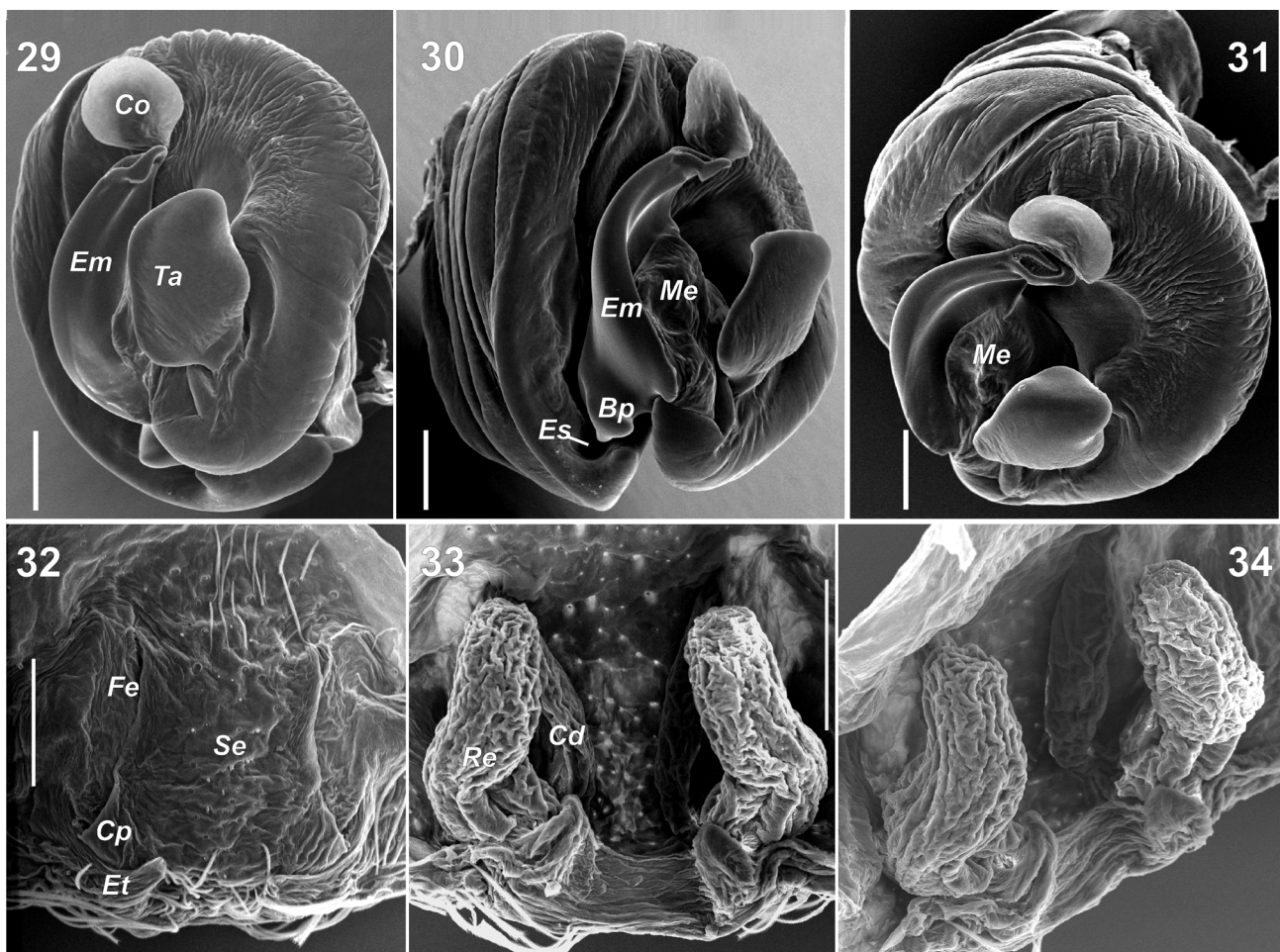
following combination of characters: 1) with a well-developed, dorsally located and dorsally directed, gradually tapering tibial apophysis (absent, or retrolaterally located and directed, and/or complex in other species); 2) presence of a rounded cymbial outgrowth (*CI*); and 3) with a wide embolus with a complex base and complex tip. The female of *C. yaeyamensis* differs from other congeners known in South East Asia by the width to length ratio of epigynal plate (1.7 times wider than high).

Description. Male (Kenting National Park). Total length 10.65. Carapace 5.8 long, 4.4 wide.

Carapace dark brown with broad yellow median band, lateral bands absent. Median band covered by white hairs, especially thick near ocular area. Fovea thin. Chelicerae, sternum, maxillae and labium dark brown, without pattern. Chelicera with 3 promarginal teeth, and retromargin with 4 teeth.

Dorsal part of abdomen yellowish with two black spots latero-anteriorly. Ventral part of abdomen black with small brown spots. Anterior spinnerets black, posterior yellow. Legs brown without pattern. Legs I and II somewhat lighter than III and IV. Leg III unmodified (lacking ventral humps on femur, tibia and metatarsus), venter of femur with stronger setae than all other legs. Spination pattern same for both legs I and II, except for femur. Femora I 3d, 3p, 4r (femora II 3d, 4p, 4r); patellae 1p, 1r; tibiae 3d, 1p, 2r, 4-4v and 2 apical; metatarsi 2p, 2r, 2-2v and 4 apical.

Palp as in Figs 14–19, 23–25, 29–31. Patella almost as long as tibia; retrolateral tibial apophysis nearly dorsal on tibia, its length subequal to the width of the tibia; cymbium with basal lamellar outgrowth (*CI*). Tegular apophysis (*Ta*) more or less trapezoidal in shape. Conductor (*Co*) rounded, lamellar, weakly sclerotized. Embolus (*Em*) thick, with large membranous extension (*Me*); base of embolus with basal process (*Bp*) corresponding to excavation in the subtegulum (*Es*), tip of embolus complex (Figs 29–31).



FIGURES 29–34. SEM micrographs of the bulb of *Ctenus yaeyamensis* (29–31) and epigyne of *Anahita maolan* (32–34). 29–31 bulb, ventral, prolateral and ventrodistal; 32–34 epigyne, ventral, dorsal and antero-lateral. Scale = 0.2 mm. Abbreviations: *Bp*—basal process; *Cd*—copulatory duct; *Co*—conductor; *Cp*—copulatory opening; *Em*—embolus; *Es*—excavation in subtegulum; *Et*—epigynal tooth; *Fe*—fenestra; *Me*—membranous extension; *Re*—receptacle; *Se*—septum; *Ta*—tegular apophysis.

Leg measurements

	Femur	Patella	Tibia	Metatarsus	Tarsus	Total
I	4.8	2.3	4.95	4.45	1.45	17.95
II	4.7	2.4	4.3	4.0	1.25	16.65
III	4.0	1.8	3.15	3.5	1.15	13.6
IV	5.25	2.0	4.95	5.95	1.55	19.7

Female. Described in detail by Yoshida (1998).

Epigyne as in Figs 26–28. Neck of epigynal plate (*Ne*) well-developed, about 3 times thinner than plate width; plate 1.7 times wider than high, lateral sides of plate rounded; epigynal teeth long, almost as long as height of the plate; copulatory ducts (*Cd*) short; receptacles (*Re*) ovoid, spaced by one length.

Distribution. This species is known from Taiwan and the two nearby islands (Ishigaki jima and Iriomote jima) belonging to the Okinawa Prefecture of Japan. Previously, it was known from northern (Taipei Co.) and central (Nantow Co.) Taiwan. The record from Kenting is the southernmost in the whole range. It is the northernmost species of the genus in South East Asia.

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