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Three New Spiders of the Families Theridiidae and Anapidae (Araneae) from Southern Taiwan

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Abstract. Three new species of the spider families Theridiidae and Anapidae (Arachnida, Araneae) are described from the southern part of Taiwan under the names *Carniella tsurui* Ono, sp. nov. (Theridiidae), *Mysmena taiwanica* Ono, sp. nov. (Anapidae, Mysmeninae), and *Enielkenie acaroides* Ono, gen. et sp. nov. (Anapidae, Anapinae). The theridiid was found at Chipen Wenchuan in Taitung Hsien, while the anapids were obtained from Shanping above Liukuei, Kaohsiung Hsien. A new genus *Enielkenie* is established by monotypy, on the basis of the type species *E. acaroides.* The genera *Carniella* and *Mysmena* are new to the Taiwanese fauna.
Key words: Taxonomy, Araneae, Theridiidae, Anapidae, Taiwan.

Introduction

Under the long-term project "Natural History Researches of the Island Arc in the Western Pacific" conducted by the National Science Museum, Tokyo, various investigations were carried out for the fiscal years 2003–2005 in Taiwan and in the Philippines. As a part of the project, the first author of the present paper (H.Ono) made arachnological research-trips in Taiwan in October–November 2003 and in March 2005.

The study sites were selected mainly in Fushan Research Center in the mountains of 600–700 m alt. above Ilan City of northern Taiwan and Shanping Work Station of Liukuei (Liouquei) Research Center, 650–700 m alt., Kaohsiung Hsien of southern Taiwan, both Centers belonging to the Forestry Research Institute of the Council of Agriculture, Executive Yuan of Tawian, and in the mountainous areas near villages of Meifen, Tsuifeng, and Howang about 1500–2000 m alt. in Nantou Hsien, Central Taiwan. Field researches were fulfilled under practical supports of the National Taiwan University, Taipei, the National Chung Hsing University, the National Museum of Natural Science of Taiwan, and Tunghai University, Taichung, as well as the Forestry Research Institute of Taiwan.

Spider specimens of various families collected during the researches mainly by sweeping and beating vegetation, and sifting soil litter were studied in partnership between the present authors of the institutions in Tokyo and Taichung.

The present report deals with the result of a taxonomic study on three new species from southern Taiwan, based on a part of the above material and on the general collection of the National Science Museum, Tokyo. These are described herein under the names *Carniella tsurui* Ono, sp. nov. (Theridiidae; from Chihpen-Wenchuan, Taitung Hsien), *Mysmena taiwanica* Ono, sp. nov., and *Enielkenie acaroides* Ono, gen. et sp. nov. (both Anapidae; from Shanping, Kaohsiung Hsien).

The abbreviations used in this paper are as follows: ALE, anterior lateral eye; AME, anterior median eye; PLE, posterior lateral eye; PME, posterior median eye.

The holotypes of the new anapid species described herein are deposited in the collection of the Forestry Research Institute (FRIT), 53 Nanhai Road, Taipei, Taiwan, and their paratypes and the holotype of the theridiid species are preserved in the collection of the Department of Zoology, National Science Museum, Tokyo (NSMT).

Taxonomy

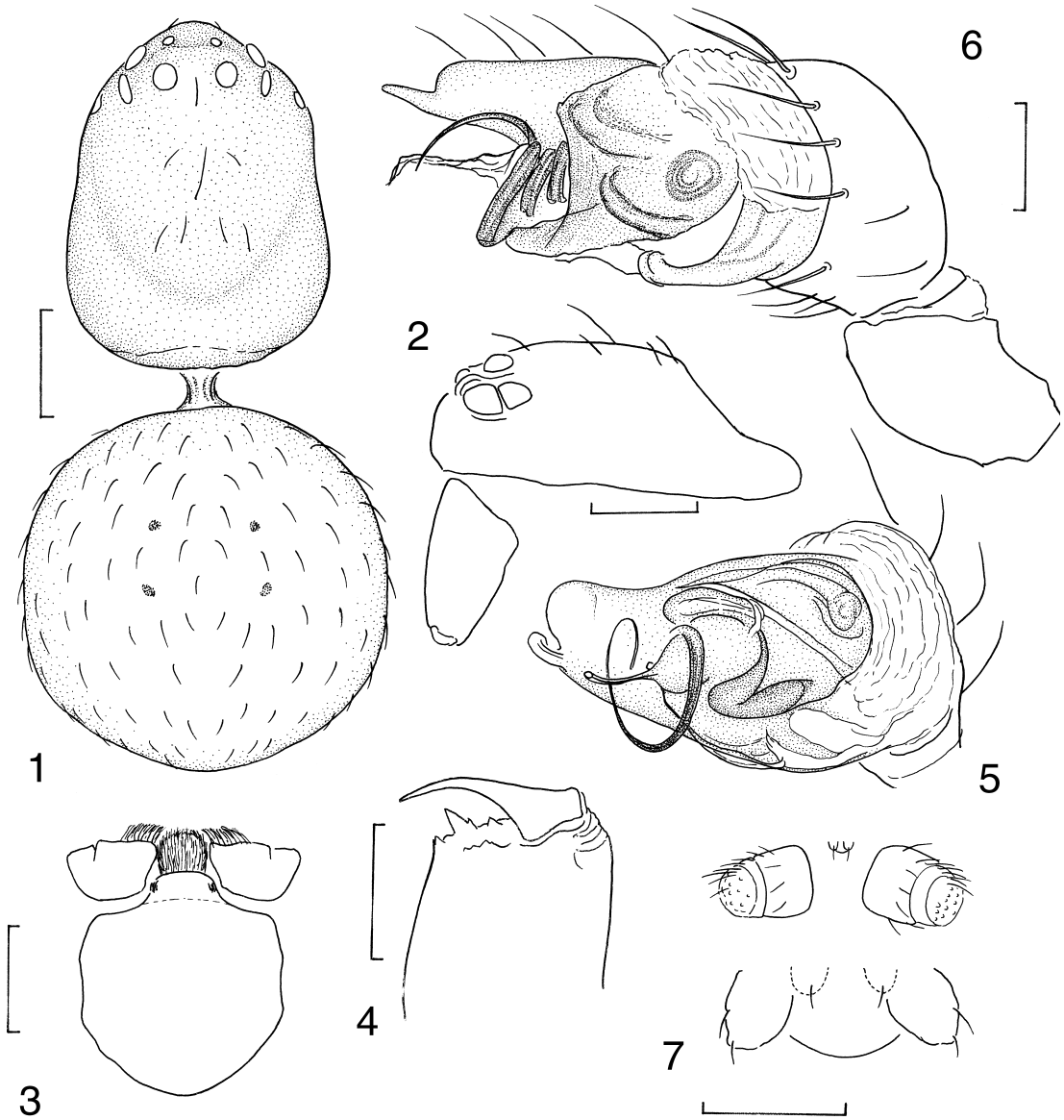
Family **Theridiidae**

Genus ***Carniella*** Thaler & Steinberger, 1988

Carniella tsurui Ono, sp. nov.

(Figs 1–7)

Diagnosis. This new species resembles



Figs 1–7. *Carniella tsurui* Ono, sp. nov., holotype, male (NSMT-Ar 5908). 1, Pro- and opisthosomata, appendages omitted, dorsal view; 2, carapace, lateral view; 3, maxillae, labium, and sternum, ventral view; 4, chelicera, ventral view; 5, palp, ventral view; 6, palp, retrolateral view; 7, spinnerets, ventral view. Scales: 0.15 mm for 1–3; 0.1 mm for 4 and 7; 0.05 mm for 5 and 6.

Carniella siam Knoflach, 1996 and *C. schwendingeri* Knoflach, 1996, both described from mountainous areas of Thailand, but can be distinguished from the species from Thailand by the shape of the male palpal organ. The embolus of male palp of this new species is relatively long, winding, and simple filiform, and without any projection, while those of both Thai species are short, curved, and with a spiniform projection, respectively (cf. Figs 5–6, and Knoflach, 1996: 573, figs 13–18).

Type material. Holotype: male, Chipen Wenchuan (Spa), 200 m alt., Peinan Hsiang, Taitung Hsien, Taiwan, by flight intercept trapping, 1–5-IV-2004, T. Tsuru leg. (NSMT-Ar 5908).

Description (holotype, female unknown)**.** Measurements (mm): Body length 1.16; prosoma length 0.52, width 0.37; opisthosoma length 0.59, width 0.55; lengths of legs [total length (femur+patella+tibia+metatarsus+tarsus)] I 0.96 (0.30+0.13+0.20+0.14+0.19), II 0.88 (0.27+0.11+0.18+0.13+0.19), III 0.74 (0.23+0.09+0.14+0.10+0.18), IV 1.07 (0.32+0.13+0.25+0.15+0.22).

Prosoma (Figs 1–4): Carapace longer than wide (length/width 1.41), flat, with several long setae at middle, median furrow absent (Figs 1–2). PME=PLE=ALE>AME in diameter (2 : 2 : 2 : 1), both eye rows recurved, lateral eyes close to each other, AME–AME<AME–ALE (2 : 3), PME–PME>PME–PLE (4 : 3), median ocular area wider than long (length/width 1.71), wider behind than in front (anterior width/posterior width 0.50), clypeus longer than AME–AME (3 : 1). Chelicerae (Fig. 4) with a large and two small teeth on promargin of fang furrow, labium fused with anterior margin of sternum, wider than long (length/width 0.50), and with hair tuft, maxillae short, with marginal hairs, sternum slightly longer than wide (length/width 1.09) (Fig. 3). Legs relatively short and thick, without spines; tarsi I–IV with serrated setae ventrally; claws with some minute teeth. Leg formula IV-I-II-III.

Male palp (Figs 5–6): Tibia simple and short, without long spines and trichobothria, cymbium slender, distally modified with a digitiform process, embolus filiform and winding, without any projection at base.

Opisthosoma (Fig. 1): Globular, slightly longer than wide (length/width 1.07), with many hairs. Colulus small with a pair of setae, anterior spinnerets largest, thick and short, posterior ones poorly developed, presumably no function.

Coloration and markings: Carapace yellow, ocular area blackish, chelicerae, maxillae, labium, sternum, and all other appendages pale yellow, opisthosoma white dorsally, relatively darker ventrally.

Distribution. Taiwan (at present known only from type locality).

Etymology. This species is dedicated to the collector of the type specimen.

Family **Anapidae**

Subfamily **Mysmeninae**

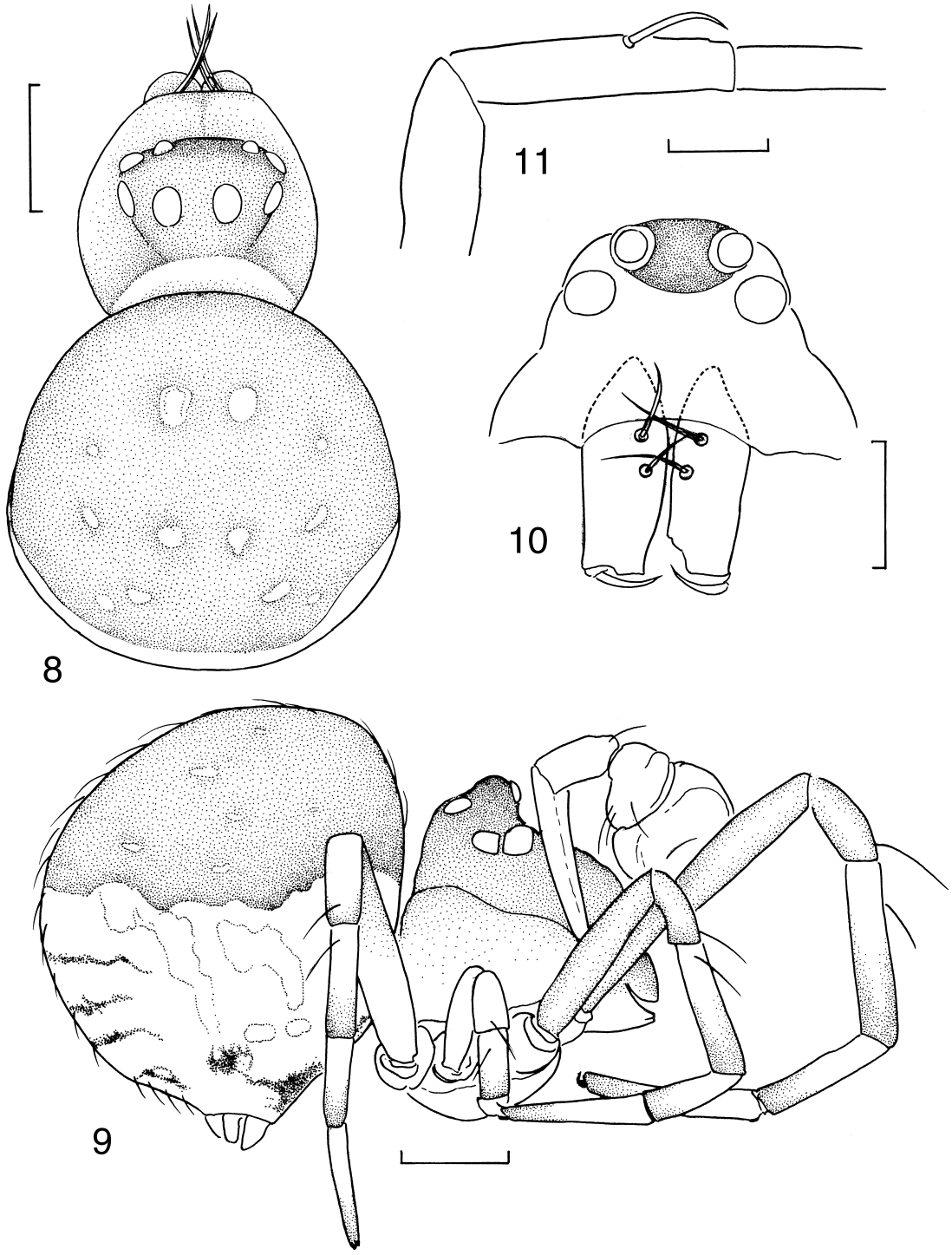
Genus ***Mysmena*** Simon, 1894

Mysmena taiwanica Ono, sp. nov.

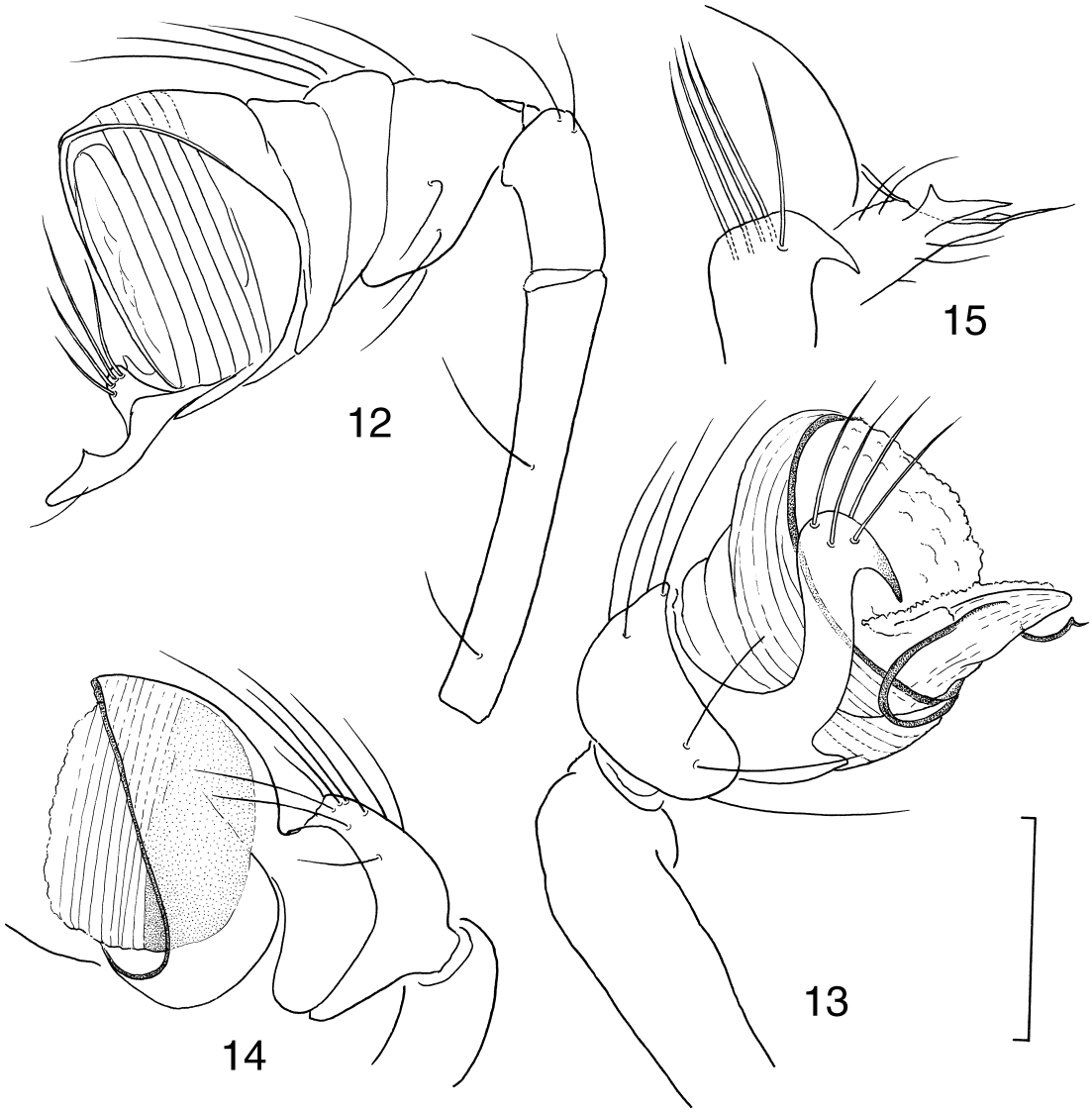
(Figs 8–19)

Diagnosis. This new species is unique in having strong spines on the male chelicera, rostrated paracymbium, peculiar shape of the conductor, and wide scape of the epigynum, and can be distinguished from all the known species in the subfamily Mysmeninae. In the subfamily, about 90 species of more than 20 genera have been described in the world. Of these, 12 genera are monotypic, and eight are small with only a few species. Although characteristics to separate those genera from one another are not enough defined, the new species is put into *Mysmena* on the basis of some similarity with *Mysmena vitiensis* Forster, 1959 recorded from Fiji Island. Because spiders of this subfamily are quite unexplored in Asia, further species of this group should be found there in future.

Type material. Holotype: male, from Shanping Work Station of Liukuei Research Center, about 700 m alt., Kaohsiung Hsien, southern Tai-



Figs 8–11. *Mysmena taiwanica* Ono, sp. nov., holotype, male (FRIT). 8, Pro- and opisthosomata, appendages omitted, dorsal view; 9, pro- and opisthosomata, lateral view; 10, carapace and chelicerae, frontal view; 11, metatarsus of leg I, prolateral view. Scales: 0.15 mm for 8; 0.1 mm for 9 and 10; 0.05 mm for 11.

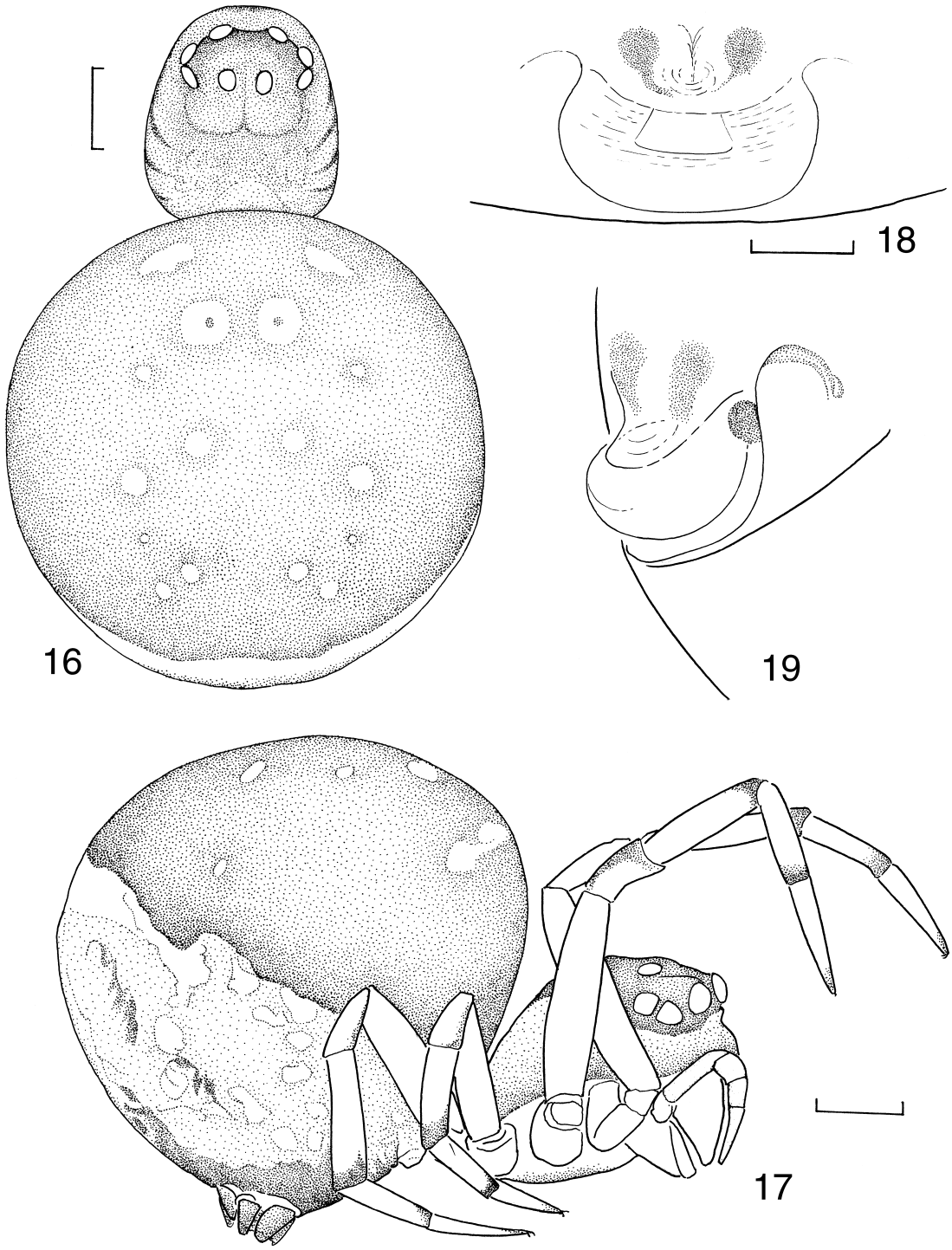


Figs 12–15. *Mysmena taiwanica* Ono, sp. nov., holotype, male (FRIT). 12, Palp, retrolateral view; 13, palp, ventral view; 14, tibia and cymbium of palp, dorsal view; 15, tip of palpal organ, ventral view from another angle. Scale: 0.1 mm.

wan, by sifting soil litter in a forest, 9-III-2005, H. Ono leg. (FRIT). Paratypes: two females, same data as for holotype (NSMT-Ar 5913–5914).

Description (holotype and a female paratype NSMT-Ar 5913)**.** Measurements (mm; female/male): Body length 0.82/0.60; prosoma length 0.28/0.27, width 0.26/0.27; opisthosoma length 0.58/0.38, width 0.58/0.38; lengths of legs [total length (femur+patella+tibia+metatarsus+tarsus)] I 0.92 (0.29+0.13+0.18+0.14+0.18), II 0.80 (0.27+0.09+0.17+0.12+0.15), III 0.60 (0.17+0.08+0.12+0.11+0.12), IV 0.73 (0.21+0.08+0.15+0.14+0.15) / I 0.97 (0.32+0.13+0.18+0.15+0.19), II 0.76 (0.23+0.10+0.16+0.15+0.12), III 0.60 (0.18+0.07+0.11+0.10+0.14), IV 0.72 (0.23+0.08+0.15+0.11+0.15).

Prosoma (Figs 8–10, 16–17): Carapace almost



Figs 16–19. *Mysmena taiwanica* Ono, sp. nov., female paratype (NSMT-Ar 5913). 16, Pro- and opisthosomata, appendages omitted, dorsal view; 17, pro- and opisthosomata, lateral view; 18, epigynum, ventral view; 19, epigynum, lateral view. Scales: 0.1 mm for 16 and 17; 0.05 mm for 18 and 19.

as long as wide (length/width 1.08 in female, 0.96 in male), high, without setae, median furrow absent, ocular area raised in male (Fig. 9). Anterior eye row recurved, posterior one procurved in dorsal view (Figs 8, 16), all eyes same in size in female, PLE larger than other eyes in male, lateral eyes close to each other, AME–AME> AME–ALE (8 : 3 in female, 16 : 3 in male), PME–PME>PME–PLE or PME–PME<PME–PLE (4 : 3 in female, 5 : 6 in male), median ocular area wider than long (length/width female 0.92, male 0.63), narrower behind than in front (anterior width/posterior width 1.09 in female, 1.33 in male), clypeus longer than AME–AME (7 : 4 in female, 9 : 4 in male), but shorter than width of ocular area. Chelicera with two strong spines on dorsal surface (Fig. 10), without teeth on margin of fang furrow, labium wider than long (length/width 0.63 in female, 0.67 in male), maxilla wide, sternum cordate and convex, slightly longer than wide (length/width 1.22 in female, 1.13 in male). Female palp present (Fig. 17). Legs relatively short and thick, patellae I–IV each with an apical spine dorsally, tibiae I–IV each with a long spine dorso-proximally, tibiae I–II each with two trichobothria retrolaterally; a huge spine present on prolateral side of male metatarsus I (Fig. 11); claws short and laking teeth. Leg formula I-II-IV-III.

Male palp (Figs 12–15): Femur much longer than patella, with two long spines retrolaterally, patella simple, with two long hairs apically, tibia very short, without apophysis, cymbium not developed and cup-shaped, with paracymbium developed with rostrated tip furnished with four spines (Fig. 12), bulb bare, embolus filiform and winding, with conductor (Fig. 15).

Opisthosoma (Figs 8–9, 16–17): Globular and expanded, as long as wide, less sclerotized dorsally. Colulus simple and small, without hairs, anterior lateral spinnerets largest, thick and short, much larger than posterior lateral spinnerets, posterior median spinnerets not developed, presumably no function.

Female genitalia (Figs 18–19): Epigynum small, scape wide, wider than long, with one hollow at middle. Small and globular spermathecae visible through integument.

Coloration and markings (Figs 8, 16): Carapace dark gray, ocular area blackish, posterior declivity white, chelicerae yellowish white proximally, black distally, maxillae, labium, and sternum dark gray, legs dull white, distal part of each segment blackish. Opisthosoma black dorsally with several pairs of white spots, gray laterally with white and black markings, relatively darker ventrally, spinnerets black.

Variation. Body length of another female paratype (NSMT-Ar 3914) 0.90 mm.

Distribution. Taiwan (at present known only from type locality).

Etymology. The specific epithet of this new spider is derived from the name of the country.

Subfamily **Anapinae**

Genus ***Enielkenie*** Ono, gen. nov.

Type species. *Enielkenie acaroides* sp. nov., by monotypy.

Diagnosis. More than 30 genera are described in the subfamily. Of these, the present new genus seems to stand close to the Australian genus *Risdonius* Hickman, 1939 in having retaining anterior booklungs (Platnick & Forster, 1989), but is distinguished from the latter by the extremely small body less than 1 mm, the arrangement of eyes, and the structure of male palpal organ. The patella of male palp of the type species of this new genus has a digitiform apophysis apico-dorsally (micropholcommatid character), and the tibia is simple and lacking any spiniform apophyses, which the *Risdonius* species possess. The tegular apophysis is a small plate, while that of the Australian species is well developed and forming a pointed tip. The eyes in this new genus are compactly set on an oval swelling situated in the middle of carapace.

According to the latest revision of the family Anapidae, including Mysmeninae and Symphytognathinae, made by Wunderlich (2004), this new genus also resembles the fossil genus *Fossilanapis* Wunderlich, 2004 known only from the

Baltic amber. Although inclusion of both recent and fossil species in one genus is not unusual in Anapidae, for instance in *Balticoroma* and *Mysmena*, the new genus is clearly separable from the fossil genus by peculiar feature of the male palp.

Etymology. The generic name is formed by an anagram of German "eine kleine (Spinne)" meaning a small spider derived from the size of this spider. The gender is feminine.

Enielkenie acaroides Ono, sp. nov.

(Figs 20–28)

Diagnosis. See the above generic diagnosis.

Type specimens. Holotype: male, from Shanping Work Station of Liouquei Research Center, about 700 m alt., Kaohsiung Hsien, southern Taiwan, sifting soil litter in a forest, 9-III-2005, H. Ono leg. (FRIT). Paratypes: one female and one male, same data as for the holotype (NSMT-Ar 5911–5912).

Description (holotype and a female paratype NSMT-Ar 5911). Measurements (mm; female/male): Body length 0.99/0.94; prosoma length 0.42/0.43, width 0.37/0.40; opisthosoma length 0.75/0.73, width 0.70/0.70; lengths of legs [total length (femur+patella+tibia+metatarsus+tarsus)] I 1.28 (0.39+0.13+0.31+0.15+0.30), II 1.21 (0.38+0.13+0.28+0.14+0.28), III 1.07 (0.31+0.11+0.25+0.13+0.27), IV 1.25 (0.38+0.12+0.32+0.15+0.28) / I 1.43 (0.45+0.15+0.35+0.16+0.32), II 1.29 (0.39+0.13+0.34+0.15+0.28), III 1.07 (0.30+0.11+0.26+0.14+0.26), IV 1.27 (0.39+0.11+0.34+0.16+0.27).

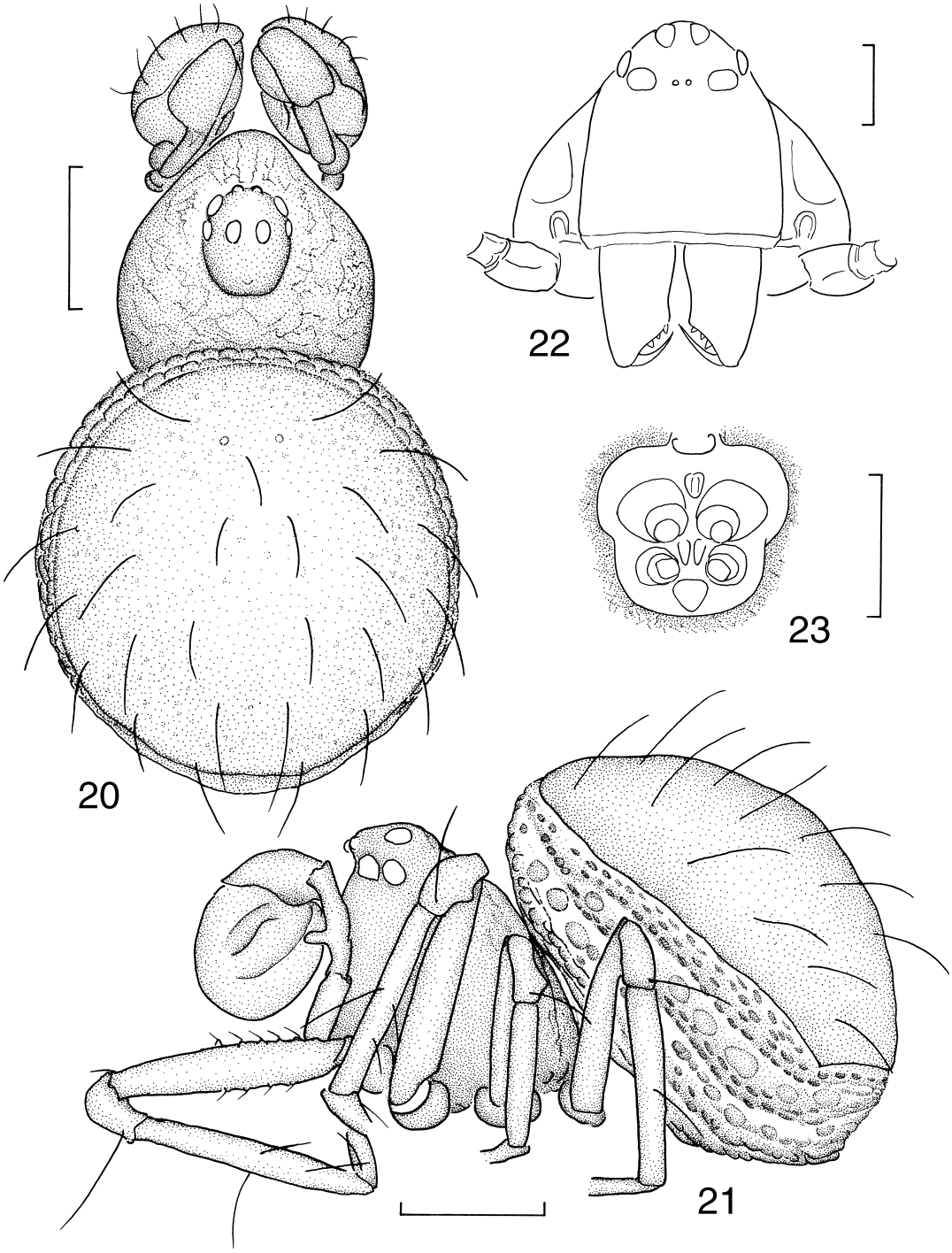
Prosoma (Figs 20–22): Carapace slightly longer than wide (length/width 1.14 in female, 1.08 in male), very high (height/width 1.00 in female, 1.03 in male), highest at ocular area, without setae. Median furrow absent, a pair of cervical bald spots present, surface of carapace strongly sclerotized with many folds forming reticulation, base of pedicel forming collar. Eyes compactly set (Fig. 20), anterior eye row recurved, posterior one procurved in dorsal view, ALE=PME=PLE>AME in diameter in female (5 : 5 : 5 : 1), ALE>PME=PLE>AME in diameter in male (5 : 4 : 4 : 1), AME–AME<AME–ALE (2 : 1 in female, 3 : 2 in male), PME–PME>PME–PLE (2 : 3 in female and male), median ocular area longer than wide (length/width 1.43 in female, 1.38 in male), wider behind than in front (anterior width/posterior width 0.43 in female, 0.38 in male), clypeus very long, longer than width of eye area (Fig. 22). Chelicerae with teeth on retromargin of fang furrow, labium fused with anterior margin of sternum, wider than long (length/width 0.62 in female, 0.50 in male), sternum strongly sclerotized and grained, longer than wide in female (length/width 1.03), as long as wide in male. Female palp absent (Fig. 22). Legs without spines on femora, but with rows of hairs, patellae I–IV each with a long, dorsal spine apically, tibiae I–IV each with a long spine dorsally at middle and two proximal trichobothria, tibia I with four pairs of long, lateral hairs distally, tarsus much longer than metatarsus in all legs, teeth on claws of legs indistinct. Leg formula I-IV-II-III in female, I-II-IV-III in male.

Male palp (Figs 24–27). Femur simple, without apophysis, slightly longer than patella; patella modified (Fig. 26), with a large, ventral apophysis and a dorso-apical tooth, tibia short and pointed. Cymbium simple, palpal organ fitted in cymbium with exception of embolus extending beyond tip (Fig. 27), a tegular plate present.

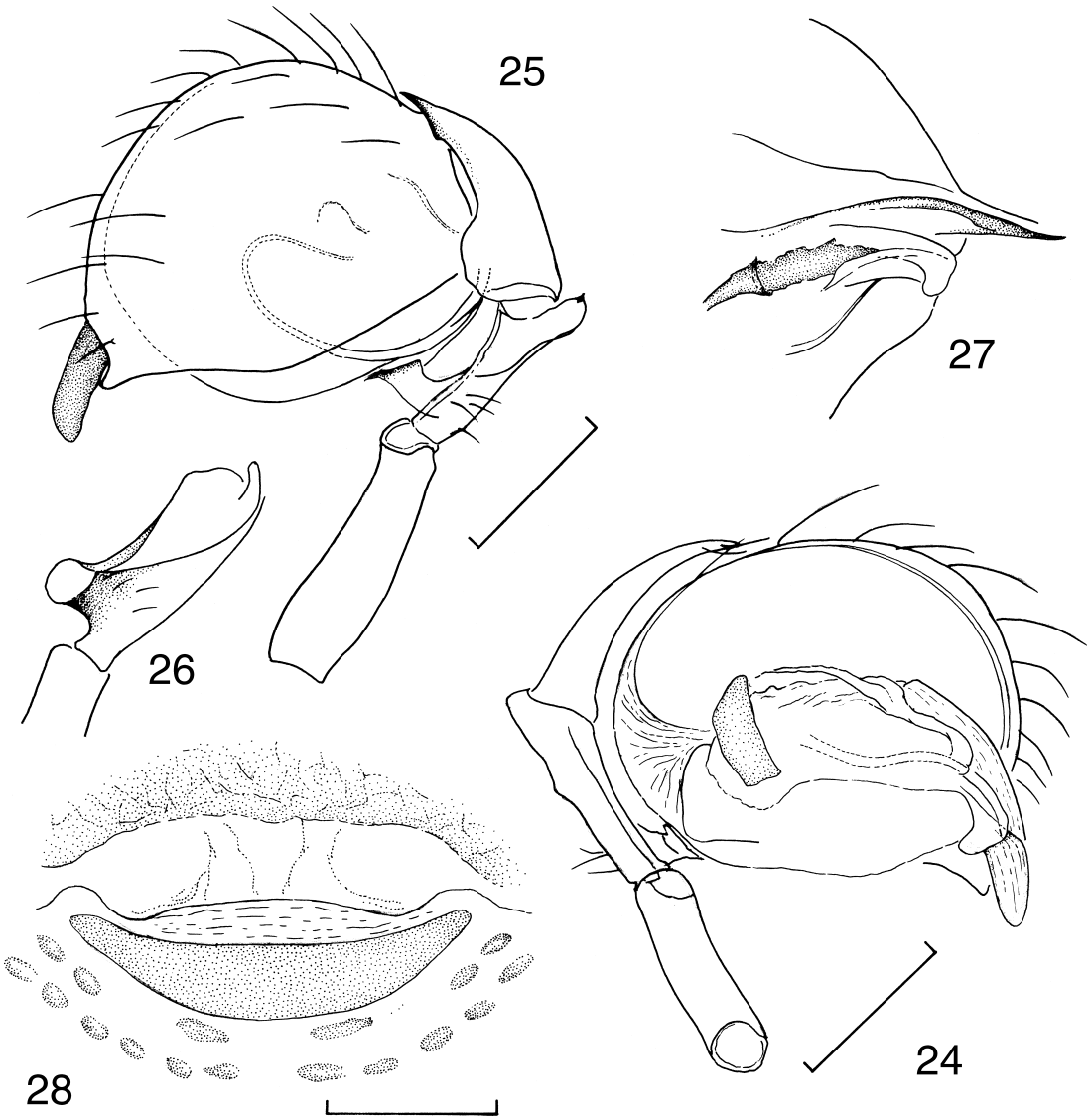
Opisthosoma (Figs 20–21): Globular, slightly longer than wide (length/width 1.07 in female, 1.04 in male), its dorsum wholly covered with a round plate strongly sclerotized, and with many long hairs, surface of this plate relatively smooth. Anterior spinnerets and posterior lateral spinnerets thick and conical, posterior median spinnerets small but visible, colulus distinct with a pair of hairs (Fig. 23). Booklung present.

Female genitalia (Fig. 28): Genital field situated on a wide, sclerotized plate, and internal structure visible through this plate. Paired genital openings situated at posterior margin of epigynum, internal organs not visible through integument.

Coloration and markings (female and male):



Figs 20–23. *Enielkenie acaroides* Ono, gen. et sp. nov. 20, 21, Holotype, male (FRIT); 22, 23, female paratype (NSMT-Ar 5911). 20, Pro- and opisthosomata, appendages omitted, dorsal view; 21, pro- and opisthosomata, lateral view; 22, carapace and chelicerae, frontal view; 23, spinnerets, ventral view. Scales: 0.2 mm for 20 and 21; 0.1 mm for 22 and 23.



Figs 24–28. *Enielkenie acaroides* Ono, gen. et sp. nov. 24–27, Holotype, male (FRIT); 28, female paratype (NSMT-Ar 5911). 24, Palp, ventral view; 25, palp, retrolateral view; 26, patella of palp, ventral view; 27, tip of palpal organ, prolateral view; 28, epigynum, ventral view. Scales: 0.1 mm.

Carapace shiny amber, chelicerae light yellowish brown, maxillae, labium, and sternum reddish brown, legs yellowish brown. Opisthosoma reddish brown dorsally, relatively lighter in female, ventrally yellow with many reddish brown patches.

Variation. Body length of single male paratype (NSMT-Ar 5912) 0.92 mm.

Distribution. Taiwan (at present known only from type locality).

Etymology. The specific epithet is formed by a combination of the Latin *acarus* and a suffix *-oides* meaning a mite-like creature, and is derived from the appearance of the spider, which strikingly resembles those of some species of the oribatid mites.

Discussion

At present, 275 species of spiders are known from Taiwan (Chu & Okuma, 1975, 1976; Chu, 2003). However, the number does not reflect the actual conditions of the Taiwanese spider fauna, especially, the ground spiders have been poorly studied.

Hsieh, Lin, and Tso (2003) published a list of ground spiders in Kenting National Park, southern Taiwan, and enumerated 213 species of spiders, but more than 80% of them were not able to determine in the species level.

All the new spiders described in the present paper were found in leaf-litters and cavities on the ground, and are very small in size (0.6–1.2 mm).

The strange genus *Carniella* (Theridiidae) was first established for a single European spider, *Carniella brignolii* Thaler & Steinberger, 1988, but has been known to include many species distributed in Southeast Asia (Knoflach, 1996) A male specimen in the present material was considered to belong to this genus in resemblance to some species recorded from the mountainous areas of central and northern Thailand.

The family Anapidae, apparently unrecorded from Taiwan, is newly registered to the fauna of this country with this report. The present anapids are both peculiar not only in general appearance but also in the genital morphology and readily distinguished from other species of the family as recorded from the region around Taiwan by Yaginuma (1986) and Song, Zhu, and Chen (1999). The peculiarly interesting species, *Enielkenie acaroides*, shows some characteristics common with those of *Risdonius* Hickman, 1939 known from Australia. It also resembles some species of *Fossilanapis* Wunderlich, 2004 known only from the Baltic amber.

Acknowledgement

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台湾南部のヒメグモ科およびヨリメグモ科（クモ目）の3新種

小野展嗣・張　永浩・卓　逸民

台湾南部からヒメグモ科およびヨリメグモ科（クモ綱，クモ目）の3新種を以下のように命名して記載した：*Carniella tsurui* Ono, sp. nov.（ヒメグモ科），*Mysmena taiwanica* Ono, sp. nov.（ヨリメグモ科，コツブグモ亜科），*Enielkenie acaroides* Ono, sp. nov.（ヨリメグモ科，ヨリメグモ亜科）．ヒメグモ科の新種は台東県の知本温泉から得られたものであり，ヨリメグモ科の2新種は高雄県の六龜の奥の扇平から得られたものである．最後の1種*E. acaroides*に基づいて単型の1新属*Enielkenie*を立てた．*Carniella*属および*Mysmena*属を台湾の動物相にはじめて記録した．