

## THE TRAPDOOR SPIDER FAMILY CTENIZIDAE (ARACHNIDA: ARANEAE) FROM TAIWAN

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**ABSTRACT.** – In material obtained from pitfall traps in forest areas of central Taiwan mygalomorph spiders have been studied according to their distribution and phenology. *Ummidia taiwanensis*, new species, and *Latouchia formosensis smithi*, new subspecies, are described from both sexes. The receptaculum of the *Ummidia fragaria* type from Japan is depicted for the first time. A key of the known Taiwanese ctenizid spiders is given.

**KEY WORDS.** – *Ummidia taiwanensis*, new species, *Latouchia formosensis smithi*, new subspecies, Mygalomorpha, Taiwan.

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### INTRODUCTION

The ancient and primitive family Ctenizidae belongs to the suborder Opisthothelae, infraorder Mygalomorpha. Ctenizid spiders build underground burrows with a hinged door. They are unique as compared to other Mygalomorpha in exhibiting a rastellum on chelicera (a row of heavily-sclerotized stout spines). Rastella function to dig and gather soil while the spider builds the burrow (Comstock, 1912). After the burrow is dug out the spiders line the wall with silk and construct a hinged door composed of silk and soil at the entrance. In some cases the door is camouflaged with moss or plant detritus (Moggridge, 1873), and in some species the doors is lined with twigs (Main, 1957). Ctenizids will use its leg-like pedipalps and first legs to hold the door tightly closed when disturbed (Kayashima, 1943). Usually, there is only one door per burrow, but in some specimens which build branching tunnels multiple trapdoors can be found (Kayashima, 1943). Being ground-dwelling and nocturnal spiders, ctenizids are usually not easily detected and collected. Up to now, over 110 species belonging to 9 genera have been reported all over the world (Platnick, 2000). So far, only two species of Ctenizidae were reported from Taiwan (Chen, 1996), both by Japanese researchers during 1940s. Kayashima (1943) described *Latouchia formosensis* from northern Taiwan. Another species, *Bothriocyrtum tractabile* Saito, 1933, was also reported from northern Taiwan (Lee, 1964).

Recently, pitfall traps were established in several localities of central mountainous areas of Taiwan to systematically study the ground invertebrate fauna (Ou, 1999; Wang et al., 2001; Yu et al., 2001). From these pitfall collections and a few specimens from other localities of Taiwan we found trapdoor spiders of the genera *Latouchia* and *Ummidia*. These include a new species, *Ummidia taiwanensis*, and a new subspecies to Taiwan, *Latouchia formosensis smithi*. Besides taxonomic description and comparison to related species, the phenology of adult males and the distribution in different forest types are discussed. In addition to the aforementioned Taiwanese taxa, we also reported *U. fragaria* (Dönitz, 1887) from Japan. In this study the type of *U. fragaria* was used as a reference species for *U. taiwanensis*. Because *U. fragaria* was never fully described and illustrated, we also reported the female receptaculum and male palp of this Japanese species.

### MATERIALS AND METHODS

Part of the specimens examined in this study were obtained from Hui-Sun Experimental Forest Station situated in the mid-elevation mountainous area (1600 to 1800m) of Nantou County, Taiwan. Two systematic ground fauna investigations using pitfall traps were conducted during 1997 and 1999. One was part of a long term ecological research projects and

the collection sites were distributed between hard wood plantations and secondary broadleaf forests. The collection sites were sampled every two months for a year. Details about this collection site can be found in Wang et al. (2001). Another ground fauna investigation is part of a forest ecosystem management project conducted by the Department of Forestry, National Chung-Hsing University. The collection sites were established in two artificial Taiwanese red cypress stands and in a near-by secondary broadleaf forests. Samplings were conducted every three months between April 1998 and July 1999. Details about this project and collection sites can be found in Ou (1999). In addition, some of the specimens examined were collected from pitfall traps established at Fong-Huang Gu Bird Park, Nantou County. Compared with those two aforementioned sites, this site is lower in elevation (658 to 800m) and is dominated by evergreen broadleaf forests. Seven pitfall stations were established and the traps were retrieved once every month from August 1995 to May 1997. A detailed description regarding this site and collection methods is given in Yu et al. (2001).

Sorting and preliminary identification of pitfall collections were carried out in Department of Biology, Tunghai University. Further identification and illustration were conducted in the College of Life Sciences, Hebei University and the Institute of Ecology, Technical University of Berlin. The voucher specimens used in this study are mainly deposited in the National Museum of Natural Science, Taichung, Taiwan (NMNS-THU-Ar) and Museum of Natural Science, Humboldt University, Berlin (ZMB). Some non-type specimens are also deposited in the collection of Y. Nishikawa in Osaka (Osaka).

All measurements are given in millimeters (mm). The abbreviations used in this paper are as follows: AME-anterior median eyes, ALE-anterior lateral eyes, PME-posterior median eyes, PLE-posterior lateral eyes, MOA-median ocular area, PMS-posterior median spinneret, PLS-posterior lateral spinneret.

### Key To Taiwanese Genera Of Ctenizidae

1. Tibia III with a dorsally saddle-shaped depression (Fig. 31).....*Ummidia*  
– Tibia III without a dorsally saddle-shaped depression.....2
2. Rastellar process present; metatarsus I with a conspicuous bend near the middle; male with a retrodistal knob on palpal tibia, with scopulae on tarsi II–IV.....*Bothriocyrtum*  
– Rastellar process absent; metatarsus I without a conspicuous bend near the middle; male lacking retrodistal knob on palpal tibia, with scopulae on tarsi I–II.....*Latouchia*

## TAXONOMY

### *Bothriocyrtum* Simon, 1891

*Bothriocyrtum* Simon, 1891: 305; Gertsch & Wallace, 1936: 23; Raven, 1985: 143.

Type species. – *Bothriocyrtum californicum* (O. P. Cambridge, 1874), by original designation.

**Diagnosis.** – Tibia III lacking a dorsally saddle-shaped depression. Eye group at least twice as wide as long. Chelicera with rastellum on a process. Leg formula 4123. Tibia IV bowed prolaterally and spinose. Metatarsus I with a conspicuous bend near the middle. Tarsi II – IV of male with scopulae, palpal tibia with a retrolateral knob.

**Remarks.** – *Bothriocyrtum* is a small genus represented by only a few species (Gertsch & Wallace, 1936; Roewer, 1942). Almost all are found in North America, and only one species is found in Taiwan.

### *Bothriocyrtum tractabile* Saito, 1933

*Bothriocyrtum tractabile* Saito, 1933: 33, Figs. 2a-d; Lee, 1964: 10, pl. 1, Figs. b, c; Song, Zhu & Chen, 1999: 36.

**Remarks.** – Saito (1933) described this species from a single female collected from northern Taiwan, with only sketchy descriptions and illustrations of genitalia, spinnerets and tarsal claws. Subsequently, Kayashima (1943) and Lee (1964) both recorded this species but only supplemented additional dorsal body illustration and did not give sufficient description for taxonomic purposes. The type specimen might be lost, and nobody has collected it again up to now, so it has been listed as a species inquirenda in Song, Zhu & Chen (1999).

### *Ummidia* Thorell, 1875

*Ummidia* Thorell, 1875: 102; Raven, 1985: 141-142; Yaginuma, 1986: 4.

Type species. – *Ummidia aedification* (WestWood, 1840), by original designation.

**Diagnosis.** – This genus has been distinguished from *Bothriocyrtum* and *Latouchia* by a dorsal saddle-shaped depression of tibia III, and from *Conothele* by distinctly notched trochanters I and II.

**Remarks.** – Less than 10 species have been recorded world wide (Gertsch & Mulaik, 1940), of which six from North America and El Salvador, one from Tadzhikistan and one from Japan. This genus is reported from Taiwan for the first time. In this study, the new species *U. taiwanensis* is described as follows.

### *Ummidia fragaria* (Dönitz, 1887)

(Figs. 1-5)

**Material examined.** – Lectotype - adult female. Label: Zool. Mus. Berlin, F. Japan, S. Dönitz, I.N. 6398 E.K.N. (Kyushu is mentioned only on the glass in which the material is stored.)(ZMB).

Paralectotypes – 3 juveniles, same data as lectotype (ZMB).

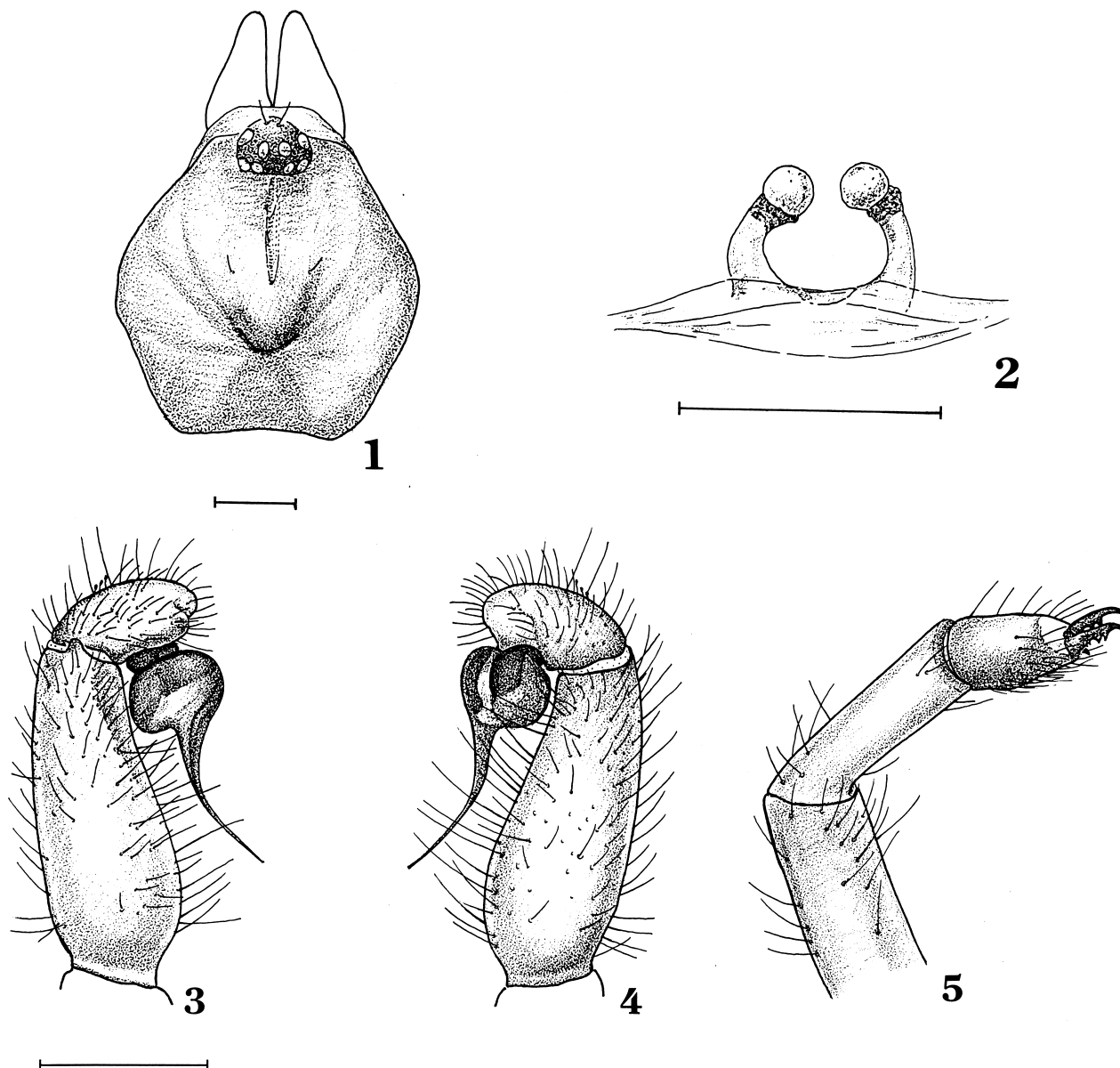
Others – 1 female, Oyabu, 110 m alt., Yabu-cho, yabu-gun, Hyogo pref., Japan, coll. Y. Nishikawa, 11 Apr.1973, det. K. Katsura (Osaka); 1 female, Nyugawa-kami, Jinya, 300 m alt, Shiraya, Kawakami-mura, Yoshino-gun, Nara pref. , Japan, coll. Y. Nishikawa, 21 Dec.1972, det. Y. Maikawa (Osaka); 1 male, Ponpon-yama NW, 400 m alt., Izuriha, Takatsuki-shi, Osaka pref. coll. Y. Nishikawa, 24 Apr.1988, det. K. Katsura (Osaka).

**Remarks.** - It seems to be questionable whether this and the following new species are well placed in the genus *Ummidia*, as they have remarkable characters in common with *Conothele*.

**Description of female lectotype.** – Carapace (in ethanol) yellowish brown, 4.4 long, 3.95 broad, fovea procurved (Fig.

1), broadly rounded behind, anterior branches diverging almost rectangularly, 2 strong bristles behind eye tubercle, 1 bristle on each side 1.25 apart from median line (Fig. 1). AME:ALE:PME:PLE 0.2: 0.325: 0.175: 0.175. Sternum nonagonal, rounded, labium with two rows of cuspules, ventral side of pedipalpal coxae with numerous cuspules. Sigillum rounded, anteriorly acute, two marks in posterior region, posterior median region excavate.

Basal article of chelicera with seven teeth on ventrolateral side, 4 on ventromedian side. Rastellum present. Pedipalps and legs 1 and 2 from tibiae to tarsi with ventrolateral stout spines. Third leg : tibia basodorsally excavate, metatarsus with 4 terminal bristles on dorsal side. Opisthosoma wrinkled, violet (in ethanol), with light spots around the numerous hair bases. Receptacula semines globular in terminal part, which inserts to tubular part in obtuse angle through slightly darker intermediate part (Fig. 2).



Figs. 1-5. *Ummidia fragaria* (Dönitz, 1887). 1-2, female. 1. female carapace, dorsal view; 2. genitalia, dorsal view; 3-5, male. 3. left palp, lateral view; 4. left palp, retrolateral view; 5. anterolateral side of first leg. (Scale bars = 1mm).

**Description of male.** – Carapax dark brown, rounded, posterior part excavate, surface wrinkled, 3.75 long, 3.75 broad, AME:ALE:PME:PLE 0.25: 0.325: 0.075: 0.075, fovea as in female. Cuspules on labium in two rows, but posterior row with only few and small cuspule, those on the pedipalpal coxae scattered and small. Pedipalps and legs relatively much longer than in female, with numerous long hairs, especially numerous on ventral sides of tarsi of leg I (Fig. 5) and 2. 3<sup>rd</sup> leg with proximal excavation on dorsal side of tibia and four thick, stout bristles on dorsodistal side of metatarsus. Left palpal organ as depicted in figures 3 and 4. Opisthosoma as in female, sternum slightly more slender in anterior part.

**Distribution.** – Japan.

***Ummidia taiwanensis*, new species**  
(Figs. 25-42)

**Material examined.** – Holotype - male, Lugu Country, Nantou County, Taiwan, coll. Wen-Hao Chou, 29 Feb.1996 (NMNS-THU-Ar-01-0008).

Paratypes – 1 male, Lugu Country, Nantou County, Taiwan, coll. Wen-Hao Chou, 19 Aug.1997 (ZMB 34999); 1 male, Manzhou Country, Pingdong County, Taiwan, coll. Hsueh-Wen Chang, Dec.1996 (NMNS-THU-Ar-00-0009); 1 female, Renai Country, Nantou County, Taiwan, 25 Aug.2000, coll. I. M. Tso (NMNS-THU-Ar-00-0097).

**Diagnosis.** – Dark brown trap-door spider with round (male) or oval carapace (female) (Fig. 25) resembling *Ummidia fragaria* (Dönitz, 1887). In male specimens on anterolateral side of 1st leg towards ventral side there are numerous short, stout bristles, especially on tarsus, metatarsus and tibia (Fig. 6). In *U. fragaria* the first leg of males lacks short, thick bristles (Fig. 5). In the new species there are distal bristles on the cymbium (Figs. 13, 14) as compared to *U. fragaria*. In female specimens of the new species the globular reservoir of receptacles inserts at almost right angle at proximal tubular part (Fig. 24) as compared to an obtuse angle in *U. fragaria* (Fig. 2).

**Etymology.** – Named after the type locality Taiwan.

**Description of male holotype.** – Total length, including chelicerae, 11.52; prosoma 6.48 long, 6.75 wide; opisthosoma 5.49 long, 4.68 wide. Carapace red brown or black purple, strongly sclerous, with numerous puncta and small ridges. Eight eyes in two rows, with the anterior eye row procurved and posterior row recurved from above, the former slightly wider than the latter; eye group 0.63 long, 1.39 wide; ALE-AME 0.18, AME-AME 0.10, PLE-PME 0.08, PME-PME 0.58; MOA 0.68 long, front width 0.68, back width 0.95; ALE: AME: PLE: PME (0.40: 0.33: 0.23: 0.18). Clypeus width 0.18.

Chelicerae with 8 teeth on inner margin and outer margin respectively (Fig. 9); rastellum conspicuous, consist of about 20 transverse-lined coniform spines, the first row with 9-10 spines (Fig. 8). rastellum is similar to that of female. Labium

0.85 long, 1.16 wide, cuspules reduced (Fig. 10). Coxae of palp (maxillae) 2.41 long, 1.39 wide; with about 20 cuspules ventrally; serrula absent (Fig. 10). Sternum yellowish brown, 3.42 long, 3.42 wide.

Coxae of legs yellowish brown ventrally. Legs with less and shorter thorn-like and normal spines. Trochanters I and II not notched. Tarsi I and II with narrower scopulae. Leg formula: 4123. Measurement of legs and palp:

	I	II	III	IV	Palp
Femur	4.14	3.78	3.24	4.32	3.51
Patella	2.61	2.52	2.25	2.52	2.16
Tibia	3.15	2.52	2.16	2.79	2.70
Metatarsus	2.74	2.16	1.84	3.42	—
Tarsus	<u>1.35</u>	<u>1.53</u>	<u>1.53</u>	<u>1.89</u>	<u>1.44</u>
Total	13.99	12.51	11.02	14.94	9.81

Opisthosoma gray-black, with lots of yellow small spots, dorsal setae shorter and more slender than in female. PMS slender, PMS-PMS 1.4 times as wide as diameter of PMS. Palpal bulb elliptic, embolus pointed and slender, cymbium with 4 dagger-shaped spines at its top (Figs. 12-14).

**Description of female.** – Total length, including chelicerae, 14.22: prosoma 6.75 long, 6.39 wide; opisthosoma 7.65 long, 6.30 wide. Carapace black brown, black on its margins; glabrous, only with a few slender setae on eye tubercle and its back. Caput arched. Eye tubercle black and low. Fovea deep, strongly procurved and “U”-shaped (Fig. 15). Eight eyes in two rows (Fig. 16), with the anterior eye row procurved and posterior row recurved from above, equal in width; eye group 0.80 long, 1.60 wide; ALE-AME 0.18, AME-AME 0.13, PLE-PME 0.13, PME-PME 0.68; MOA 0.68 long, front width 0.88, back width 1.08; ALE: AME: PLE: PME (0.48: 0.40: 0.33: 0.20). Clypeus width 0.25.

Chelicerae black; inner margin with 4 teeth, outer margin with 7 teeth (Fig. 18); rastellum is similar to that of male (Fig. 17). Labium, coxae of palp (maxillae) and sternum black brown. Labium 1.18 long, 1.33 wide, with 14 conspicuous cuspules (Fig. 19). Coxae of palp (maxillae) 1.08 long, 1.26 wide, with about 53 conspicuous cuspules ventrally (Fig. 19). Sternum 3.87 long, 4.05 wide, with a large lunular sigilla at the center (Fig. 19).

Legs black brown, light-colored ventrally, with long and short brown sparse setae, tadpole-shaped and willow-leaf-shaped trichobothrial hairs besides the normal ones. Tibia III with a saddle-like depression dorsally (Fig. 21). Trochanters I and II distinctly notched (Fig. 20). Tibia and tarsus of palp, distal three segments of leg I and II with bands of short thorn-like spines laterally; palpal patella with 2-3 short thorn-like prolateral spines; tibia III with 3 prolateral and 2 retrolateral short thorn-like spines distally; metatarsus IV with 2 prolateral spines; tarsus IV with 3 distal short thorn-like spines. Femur III thickest. Scopulae and claw tufts absent. Palpal claw with a single branched tooth; leg with 3 tarsal claws, paired claws with a row of teeth, occasionally with a denticle. Leg formula: 4123. Measurement of legs and palp:

	I	II	III	IV	Palp
Femur	4.14	3.60	2.25	4.23	3.60
Patella	2.61	2.52	2.16	2.61	2.25
Tibia	2.52	2.16	1.98	2.52	2.34
Metatarsus	1.62	1.44	1.53	2.25	—
Tarsus	<u>1.08</u>	<u>1.17</u>	<u>1.44</u>	<u>1.53</u>	<u>2.25</u>
Total	11.97	10.89	9.36	13.14	10.44

Opisthosoma black purple, scattered with thick and slender black setae. Spinnerets brownish. PMS one-segmented, 0.61

long, PMS-PMS 0.20; PLS three-segmented, 0.68 long, thicker and shorter. Genitalia with a pair of spermathecae, each with a right-angled curve, and apical globe (Fig. 24).

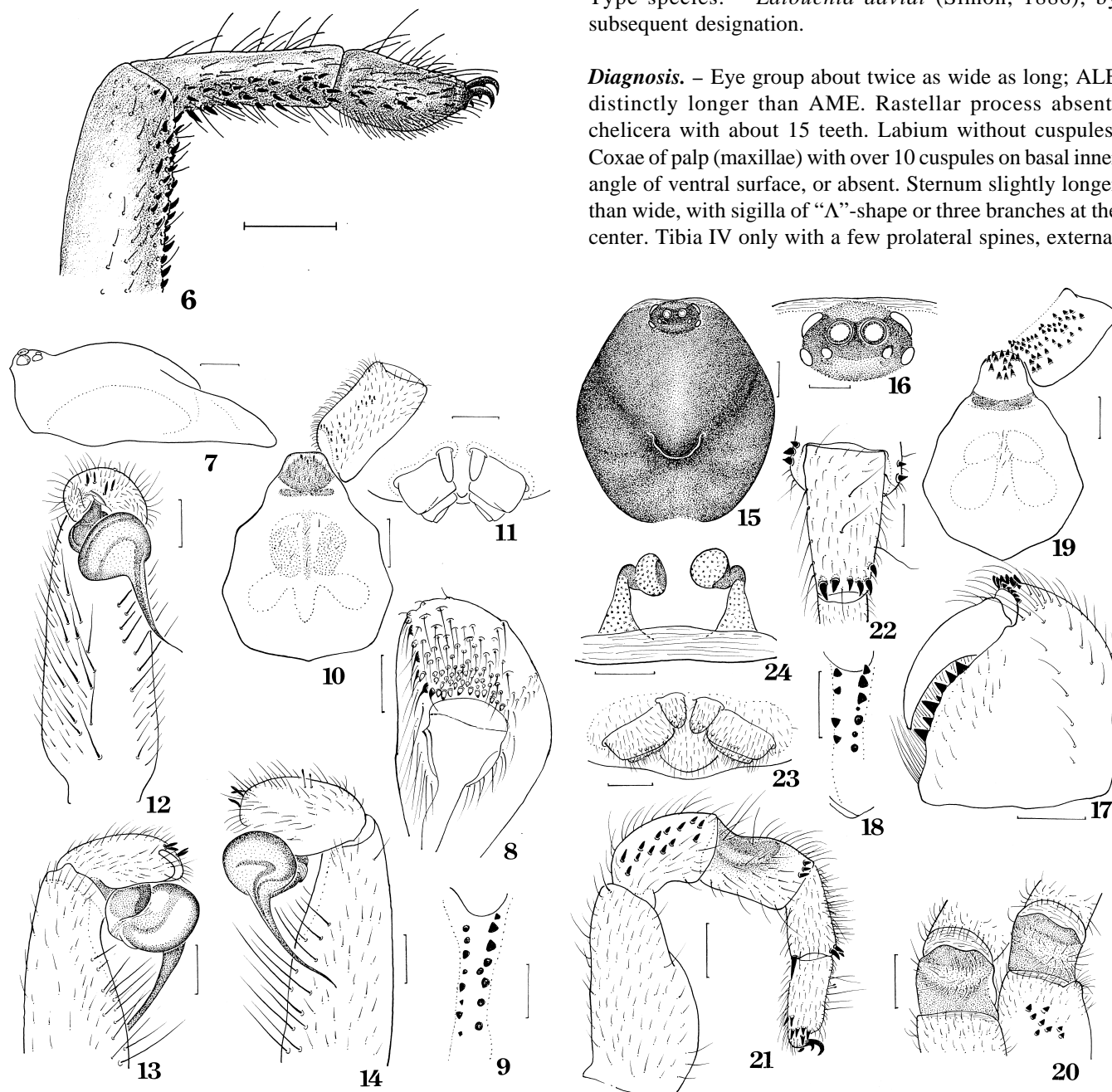
**Distribution.** – Taiwan (Nantou County, Pingdong County).

***Latouchia* Pocock, 1901**

*Latouchia* Pocock, 1901: 210; Raven, 1985: 140-143.

Type species. – *Latouchia davidi* (Simon, 1886), by subsequent designation.

**Diagnosis.** – Eye group about twice as wide as long; ALE distinctly longer than AME. Rastellar process absent; chelicera with about 15 teeth. Labium without cuspules. Coxae of palp (maxillae) with over 10 cuspules on basal inner angle of ventral surface, or absent. Sternum slightly longer than wide, with sigilla of “Λ”-shape or three branches at the center. Tibia IV only with a few prolateral spines, external



Figs. 6-24. *Ummidia taiwanensis*, new species. 6-14, male: 6. anterolateral side of first leg; 7. carapace, dorsal view; 8. left chelicera, ventral view; 9. teeth of both cheliceral margins, ventral view; 10. labium, coxa of left palp (maxilla) and sternum, ventral view; 11. spinnerets, ventral view; 12. left palp, ventral view; 13. do., prolateral view; 14. do., retrolateral view. 15-24, female: 15. carapace, dorsal view; 16. eyes and clypeus; 17. left chelicera, outer view; 18. teeth of both cheliceral margins, ventral view; 19. labium, coxa of left palp (maxilla) and sternum, ventral view; 20. right trochanters of palp and leg I, ventral view; 21. left leg III, prolateral view; 22. metatarsus III, dorsal view; 23. spinnerets, ventral view; 24. genitalia, dorsal view. (Scale bars: Figs. 6-7, 10-11, 15, 17-21, 23 = 1mm; Figs. 8-9, 12-14, 16, 22, 24 = 0.5mm).

spines absent. Scopulae present in male on tarsi I and II.

**Remarks.** – About 12 species have been reported world wide (Yaginuma, 1986; Murphy, 2000). Only one species *Latouchia formosensis* Kayashima, 1943, had been described from Taiwan. In this paper a new subspecies, *L. formosensis smithi* is described.

### *Latouchia formosensis* Kayashima, 1943

*Latouchia formosensis* Kayashima, 1943: 37, Table 3, figs. 1, 3.  
*Latouchia formosensis* - Lee, 1964: 10, pl. 1, fig. a; Song, Zhu & Chen, 1999: 36.

*Latouchia formosensis formosensis* - Haupt & Shimojana, 2001: 105, fig. 6a-b, 7a, 8.

**Remarks.** – Brignoli (1983) mentioned this species in his catalogue of spiders, and pointed to the fact that Kayashima (1943) has to be considered as author. Haupt & Shimojana (2001) redescribed it based on material from the surroundings of Taipei, as the type material is apparently lost. As *Latouchia formosensis* also occurs in the southern Ryukyu Islands, two different subspecies have been distinguished. In the following another subspecies from central Taiwan is described.

### *Latouchia formosensis smithi*, new subspecies (Figs. 25-40)

**Material examined.** – Holotype - male, Lugu Country, Nantou County, Taiwan, coll. Wen-Hao Chou, Feb.1997 (NMNS-THU-Ar-01-0006).

Paratypes – 2 males, Hui-Sun Experimental Forest Station, Nantou County, Taiwan, coll. Hai-Yin Wu, Apr.1998 (NMNS-THU-Ar-00-0027 and 0028); 1 male, Hui-Sun Experimental Forest Station, Nantou County, Taiwan, coll. Sheng-Hai Wu, Nov.1998 (NMNS-THU-Ar-00-0025); 1 female, Lugu Country, Nantou County, Taiwan, coll. Wen-Hao Chou, 29 Jan.1996 (NMNS-THU-Ar-01-0001); 1 female, Lugu Country, Nantou County, Taiwan, coll. Wen-Hao Chou, 27 Nov.1995 (NMNS-THU-Ar-01-0003); 1 female, the same data as in holotype (NMNS-THU-Ar-01-0004).

**Diagnosis.** – The new subspecies resembles *Latouchia formosensis formosensis* Kayashima, 1943, but differs from the latter in male palpal tibia without short and strong setae on retrolateral side, embolus with a small triangular apophysis in the middle and not bent at the tip (Figs. 27-30); terminal and tubular parts of spermatheca in a right angle in outer surface, base of tubular part thicker (Fig. 40).

**Etymology.** – The specific name is a patronym in honor of Dr. A. Smith.

**Description of male holotype.** – Total length, including chelicerae, 20.43; prosoma 5.94 long, 5.85 wide; opisthosoma 6.48 long, 5.13 wide. Carapace yellow brown, glabrous, only with a few setae at the edge, on eye tubercle and on its back. Caput low. Eye tubercle black and raised. Fovea strongly procurved and “U”-shaped. Eight eyes in two rows, with the anterior eye row procurved and posterior row

recurved from above, the latter slightly wider than the former; eye group 0.63 long, 1.18 wide; ALE-AME 0.10, AME-AME 0.05, PLE-PME 0.03, PME-PME 0.40; MOA 0.50 long, front width 0.55, back width 0.75; ALE: AME: PLE: PME (0.35: 0.25: 0.28: 0.18). Clypeus width 0.18.

Chelicerae red brown; 7 teeth on inner margin, which the distal three teeth smallest, 4 teeth on outer margin, with a denticle between the third and fourth teeth (Fig. 26); rastellum consists of seven coniform spines, of which four in the first row largest (Fig. 25). Labium, coxae of palp (maxillae) and sternum yellow brown. Labium 0.70 long, 1.10 wide. Coxae of palp (maxillae) 2.07 long, 1.35 wide; with 12-17 cuspsules on basal inner angle ventrally; serrula absent. Sternum 3.60 long, 3.24 wide, with a sigillum three branched at the center.

Legs red brown, longer than in female. Tarsal trichobothria similar to those of female. Tarsi I and II with relatively sparse scopulae. Leg I with strong spines on the end of prolateral femur, prolateral and ventral lateral patella and tibia; leg II with strong prolateral and ventral spines on patella, tibia (Fig. 31) and metatarsus; leg III, IV with a few relatively slender and longer spines on tibia, metatarsus and tarsus; tibia IV with 3-4 prolateral spines. Claw tufts absent. Legs with three tarsal claws; paired claws with one row of 3-4 small teeth. Leg formula: 4123. Measurement of legs and palp:

	I	II	III	IV	Palp
Femur	6.39	5.94	4.59	6.39	3.87
Patella	2.88	2.79	2.61	2.88	1.98
Tibia	4.95	3.96	2.97	4.95	3.15
Metatarsus	4.41	4.05	4.95	6.30	—
Tarsus	<u>2.25</u>	<u>2.25</u>	<u>2.79</u>	<u>3.24</u>	<u>1.20</u>
Total	20.88	18.99	17.91	23.76	10.20

PMS 0.54 long, PMS-PMS 0.17; PLS 1.29 long (basal 0.68, median 0.34, apical 0.27).

Male palpal organ with middle hematodocha, embolus extended triangularly in the middle, cymbium with more than 10 thick setae at the top, and 8 tadpole-shaped, 1 willow-leaf-shaped and 3 normal trichobothria on the dorsal surface (Figs. 27-30).

**Description of female.** – Total length, including chelicerae, 16.92; prosoma 7.83 long, 6.03 wide; opisthosoma 8.28 long, 5.85 wide. Carapace yellow brown, glabrous, only with sparse slender setae at the edge, and a few thick and slender setae on posterior eye tubercle (Fig. 32). Caput low. Eye tubercle black, distinctly raised. Cervicle groove and radial furrows red brown. Fovea strongly procurved and “U”-shaped (Fig. 32). Eight eyes in two rows (Fig. 34), with the anterior row procurved and posterior row recurved from dorsal view, the latter slightly wider than the former; eye group 0.70 long, 1.45 wide; ALE-AME 0.10, AME-AME 0.08, PLE-PME 0.08, PME-PME 0.38; MOA 0.53 long, front width 0.63, back width 0.73; ALE: AME: PLE: PME (0.35: 0.25: 0.38: 0.20). Clypeus width 0.15. Chelicerae red brown; inner margin with 6 teeth, outer margin with 5 teeth and 3

denticles (Fig. 36); rastellum conspicuous, consists of some coniform spines, of which four in the first row largest (Fig. 35).

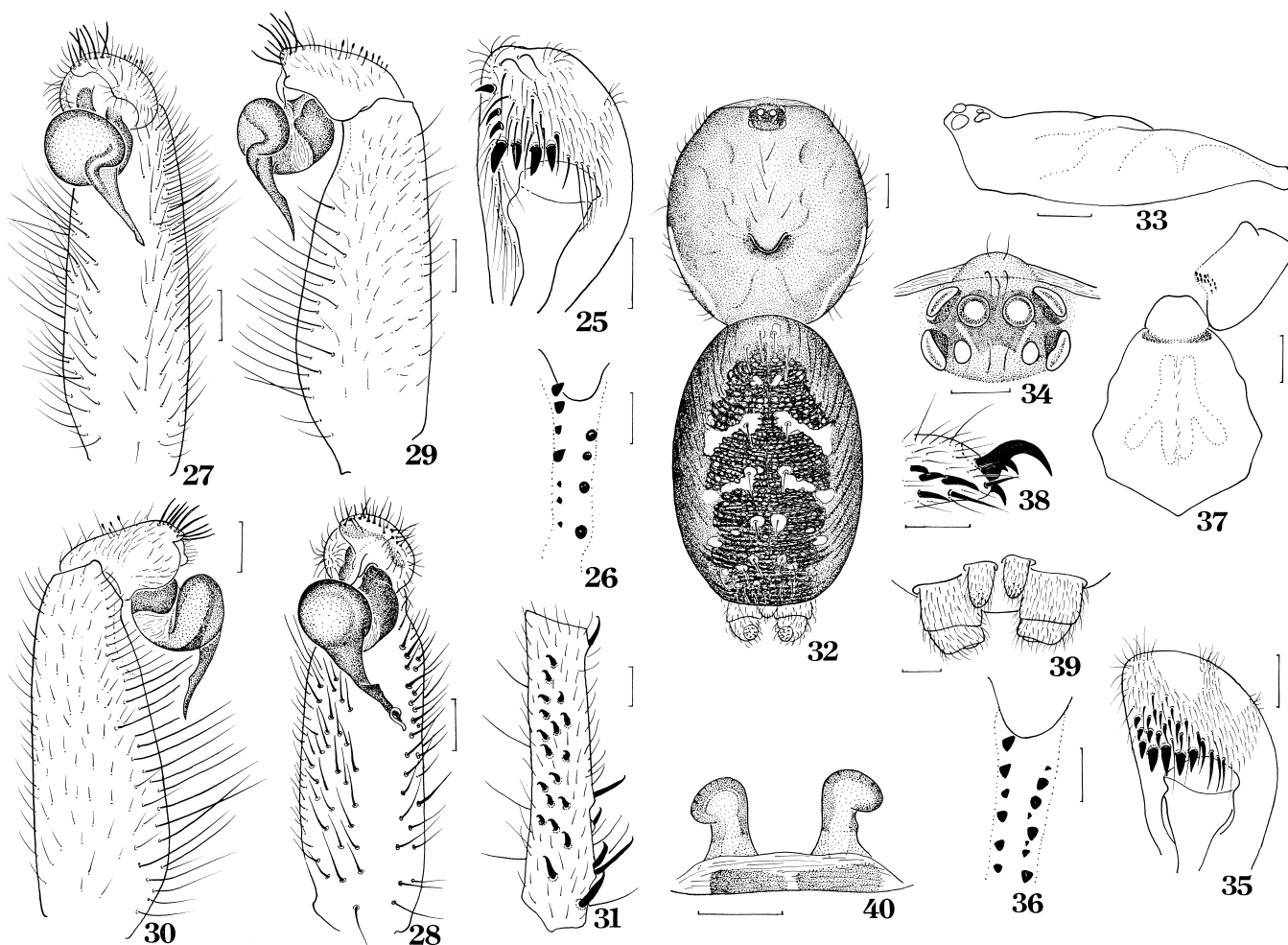
Labium red brown, 1.02 long, 1.36 wide, cuspules absent (Fig. 37). Coxae of palp (maxillae) yellow brown, 2.61 long, 1.35 wide, with 18-19 cuspules on basal inner angle ventrally; serrula absent (Fig. 37). Sternum yellowish brown, 3.78 long, 3.78 wide, with a large sigillum three branched at the center (Fig. 37).

Palps and legs reddish brown. Leg III and IV distinctly thicker than leg I and II. All tarsi with tadpole-shaped and willow-leaf-shaped trichobothria besides the normal trichobothrial hair shafts. Tibia and tarsus of palp, distal three segments of leg I and II with bands of short thorn-like spines laterally; patella III with two rows of prolateral spines; tibia III with irregular prolateral spines; metatarsus III with a row of prolateral spines; tarsus III and distal three segments of leg IV with a few ventral spines. Scopulae and claw tufts absent. Palpal claw with a large basal tooth; tarsi with 3

claws, paired claws with four teeth in two rows, unpaired tarsal claw without teeth. Leg formula: 4132. Measurement of legs and palp:

	I	II	III	IV	Palp
Femur	4.32	3.60	3.60	4.68	3.87
Patella	2.88	2.61	2.79	2.97	2.43
Tibia	2.61	2.25	1.60	3.15	2.61
Metatarsus	1.98	2.07	2.34	3.42	—
Tarsus	<u>1.26</u>	<u>1.35</u>	<u>1.80</u>	<u>1.98</u>	<u>2.61</u>
Total	13.05	11.88	12.13	16.20	11.52

Opisthosoma with numerous fine black hairs and a few thick setae, dorsum black brown, with 5 pairs of yellow-green spots at posterior part, and many transverse-lined yellow-green small spots in black brown areas; laterally with lots of longitudinal black stripes (Fig. 32); ventrally yellow-green. Spinnerets yellowish brown; PMS one-segmented, 0.68 long, PMS-PMS 0.10; PLS three-segmented, 1.70 long (basal 0.68, median 0.61, apical 0.41), shorter and thicker. Genitalia with two boot-shaped spermathecae (Fig. 40).



Figs. 25-40. *Latouchia formosensis smithi*, new subspecies. 25-31, Male: 25. left chelicera, ventral view; 26. teeth of both cheliceral margins, ventral view; 27. left palp, ventral view; 28. left palp with embolus cap; 29. do., retrolateral view; 30. do., prolateral view; 31. left tibia II, prolateral view. 32-40, Female: 32. body, dorsal view; 33. carapace, lateral view; 34. eyes and clypeus; 35. left chelicera, ventral view; 36. teeth of both cheliceral margins, ventral view; 37. labium, coxa of left palp (maxilla) and sternum, ventral view; 38. distal end of tarsus I, prolateral view; 39. spinnerets, ventral view; 40. genitalia, dorsal view. (Scale bars: Figs. 32-33, 37 = 1mm; all the others = 0.5mm).

**Distribution.** – Taiwan (Nantou County).

#### NOTES ON THE NATURAL HISTORY OF TAIWANESE CTENIZIDAE

*Latouchia formosensis smithi*, new subspecies, seems to be quite abundant in both low and mid-elevation areas of central Taiwan. Temporal abundance patterns from pitfall collections of Fong-Huang-Gu Bird Park showed that a large number of mature males were found from December to February, and the number peaked in January. However, in Hui-Sun Experimental Forest Station which elevation is 1000m higher, mature male *L. smithi* were only present in April. Trapdoor spiders usually are quite sedentary and seldom leave their web sites. The presence of a large number of male specimens in pitfall traps is usually regarded as coinciding with the time when males emerge from their burrows searching for females (Uetz & Unzicker, 1976). Therefore, the aforementioned patterns indicate that *L. formosensis smithi* in low elevation areas reproduce during the winter, and individuals in the mid-elevation areas reproduce in Spring.

Spatial pattern of pitfall collections indicated that while the distribution of *L. formosensis smithi* in Fong-Huang-Gu Bird Park is more or less even, but that in Hui-Sun Experimental Forest Station is very uneven. In Hui-Sun, pitfall traps were established in both secondary broadleaf forests and plantations of Taiwanese red cypress. Mature male specimens were obtained from four out of six stations established in secondary broadleaf forests. To the contrary, for the whole year not single one specimen was found from the four sites established in Taiwanese red cypress plantations. This distinct difference in distribution indicates that *L. formosensis smithi* exhibits a very strong habitat-preference, especially to the structurally more heterogenous secondary broadleaf forests. The strong habitat-preference derived from *L. formosensis smithi*'s unique distribution pattern justifies the necessity of long-term and systematic fauna survey when conducting forest ecosystem management. Inappropriate habitat management, such as the large scale removal of secondary growth for hardwood plantation, will cause extinction of species with special environmental needs, such as trapdoor spiders.

Judged from the available distribution data, *Ummidia taiwanensis*, new species, seems to be more widely distributed than *Latouchia formosensis smithi*. *Ummidia taiwanensis* is present in both central subtropical and southern tropical areas of Taiwan. According to current data *L. formosensis smithi* could only be found in central mountainous areas. However, at least in central Taiwan, *L. formosensis smithi* seems to be the dominant trapdoor spider species. It can be found in both mid and low elevation areas, but *U. taiwanensis* seems to exist only in lower elevation areas. Moreover, the abundance of *U. taiwanensis* is much lower than that of *L. formosensis smithi*. According to the

occurrence of males obtained from Fong-Huang-Gu Bird Park the reproduction time seems to be during winter.

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