

Revision of East Asian whip scorpions (Arachnida Uropygi Thelyphonida). I. China and Japan

Ревизия жгутоногих пауков Восточной Азии (Arachnida Uropygi Thelyphonida). I. Китай и Япония

Joachim Haupt* & Daxiang Song**

Й. Хаупт*, Дачжиан Сон**

* University of the Ryukyus, Tropical Biosphere Research Center (Iriomote Station), 870 Uehara, Taketomi-cho 907-15, Japan, and Institut für Biologie, Technische Universität Berlin, FR1-1, Franklinstr. 28/29, D-15087 Berlin.

** Department of Biology, Hebei Teachers' University, Yuhua Lu 1, Shijiazhuang, Hebei, 050016, China

* Университет островов Рюкю (Япония) и Институт биологии, Технический университет Берлина (ФРГ).

** Отдел биологии Хебейского педагогического университета (Китай).

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КЛЮЧЕВЫЕ СЛОВА: Arachnida, Uropygi, таксономия, ревизия, Восточная Азия, *Typopeltis*, *Teltus*.

ABSTRACT. A revision of whip scorpions from China and Japan (at least seven species from two genera) has led to the description of the female of *Typopeltis niger* (Tarnani, 1894), the identification of the male of *Typopeltis cantonensis* Speijer, 1936, and the description of *Typopeltis guangxiensis* sp.n. from Guangxi Prov., China. *Teltus vanoorti* (Speijer, 1936) has been redescribed from adult specimens of both sexes and placed in the genus *Typopeltis*, comb.n.

РЕЗЮМЕ. В результате ревизии фауны жгутоногих пауков Китая и Японии (по крайней мере семь видов из двух родов) описана самка *Typopeltis niger* (Tarnani, 1894), самец *Typopeltis cantonensis* Speijer, 1936, дано описание *Typopeltis guangxiensis* sp.n. из пров. Гуаньчжи (КНР). Вид *Teltus vanoorti* (Speijer, 1936) переописан по половозрелым экземплярам обоего пола и перемещен в род *Typopeltis* (comb.n.).

Introduction

Traditionally, the Uropygi is subdivided into Thelyphonida and the minute Schizomida [Weygoldt, 1979]. In the distribution of Asian whip scorpions, certain regions can be distinguished: The Indian subcontinent with the genera *Uroproctus* and *Labochirus* (reaching into Burma and northwestern Malaysia) and three species of *Hypoctonus* [see Gravely, 1916], Myanmar (= Burma) with 14 species of the genus *Hypoctonus* [Gravely, 1916, Rowland & Cooke, 1973]; excluding *Etiennius africanus* [Heurtault, 1974], Thailand and the countries of former Indochina with five *Typopeltis* species, one *Hypoctonus*, and *Ginosigma schimke-*

witschi which extends its distribution farther South East towards the Malay Peninsula and Indonesia. The fauna of China and Japan comprises only six species of the genus *Typopeltis*, and a single record of *Hypoctonus granosus* from Yunnan Province neighbouring Myanmar.

As the numerous species of *Hypoctonus* as well as the mainly Indonesian and Philippine insular species of the genus *Thelyphonus* (and several monotypic genera) can only be revised after new extensive field studies, and the investigation of their biology, the present revision had to be limited to material from China and Japan (Part I), and Thailand with some adjacent areas (Part II).

Material and methods

In order to avoid confusion with terminology in older publications, it has to be pointed out that segments are named according to Millot [1949], i.e. the genital segment is the 2nd opisthosomal segment, while articles of appendages according to Snodgrass [1948].

In the present study, body length is given as measured from the front margin of the carapace but excluding the whip.

The following abbreviations are accepted in the text of both parts: AMNH — American Museum of Natural History, New York, BMNH — The Natural History Museum, London, CAS — California Academy of Science, San Francisco, GAC — Guangxi College of Agriculture, Nanning, Guangxi, MCZ — Museum of Comparative Zoology, Harvard University, Cambridge, Mass., MNHN — Muséum National d'Histoire Naturelle, Paris, NHMG — Naturhistorisches Museum Genf, NHMW — Naturhistorisches

Museum Wien, PANW — Zoologyczny Muzei, Polska Akademia Nauk, Warszawa, SMF — Senckenberg Museum, Frankfurt/M., TNC — Thai National Collection, Bangkok, TUB — Institut für Biologie, Technische Universität Berlin, ZIAS — Zoological Institute, Academia Sinica, Beijing, ZIFU — Zoologisches Institut der Freien Universität Berlin, ZISP — Zoological Institute, Russian Academy of Sciences, St. Petersburg, ZMB — Zoologisches Museum der Humboldt Universität Berlin.

Taxonomic part

Whip scorpion species from China and Japan

Family Thelyphonidae Lucas, 1835

Subfamily Hypoconinae Pocock, 1899 (name corrected herein, pro Hypoconini Pocock, 1899)

Genus *Hypoconus* Thorell, 1889

Diagnosis: Keel between lateral and median eyes absent. Male patellar apophysis modified, tarsal articles of female tactile leg unmodified. Accessory tooth at inner margin of pedipalpal coxae absent.

Hypoconus granosus Pocock, 1900

Fig. 1.

Hypoconus granosus Pocock, 1900: 294, fig. 4.

Hypoconus granosus — Gravely, 1916: 69

Hypoconus granosus — Rowland & Cooke, 1973: 65

Material examined: *Hypoconus granosus*. Holotype. BMNH (♀). Type locality. Yunnan.

Diagnosis: Pedipalps with coarse granulation. Female genital plate on ventral side with a pair of deep, transversely oval pits (Fig. 1). Body length: 34 mm.

Note: The vial containing the holotype is supplied with the following labels: *Thelyphonus linganus* Koch. Yunan (142). / *Hypoconus granosus* Type. / *Hypoconus saxatilis* [Oates]. E.A.M. Speijer 1935. / 1893.10.29 17 *Hypoconus saxatilis*. (Oates) o Yunnan, China. J. Moore. (labelled *Thelyphonus linganus* Koch 142) [*Hypoconus granosus*, Pocock Type] revised E.A.M. Speijer 1935 ex dry coll. / Apparently, Speijer did not publish this revision.

Since new material of this species could not be obtained, a revision will have to be postponed, pending a thorough study of the genus *Hypoconus*.

Subfamily Typopeltinae Rowland & Cooke, 1973

Genus *Typopeltis* Pocock, 1894

= *Teltus* Speijer, 1936: 259. **syn.n.**

Diagnosis: Keel between lateral and anterior eyes present at least in part. Male patellar apophysis of tactile leg present. Opisthosomal sternites 2 and 3 modified. Posterior opisthosomal tergites undivided.

Note: Speijer [1936] placed his new genus in his family Mastigoproctidae (the type-species: *Mastigoproctus gi-*

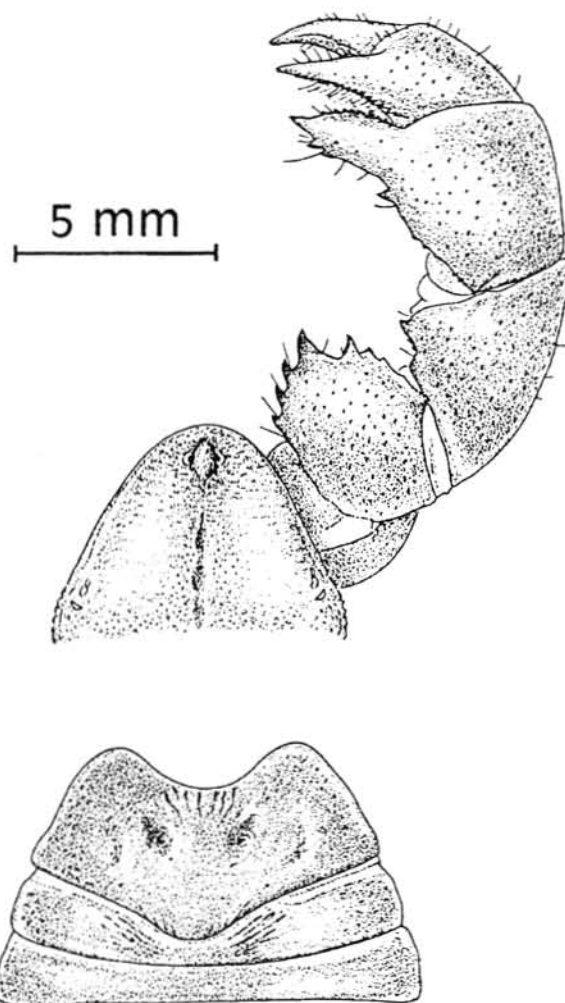


Fig. 1. *Hypoconus granosus* (holotype ♀): Anterior part of prosoma with right pedipalp and genital plate.

Рис. 1. *Hypoconus granosus* (голотип ♀): передняя часть просомы с правой педипальпой и генитальной пластинкой.

ganteus (Lucas, 1835)) on the grounds of its having eight tarsal articles in the tactile leg. When studying a larger number of specimens, one soon finds out that the number of tarsal articles varies from 8 to 10, and thus cannot be used for the distinction of different taxa.

Even though *T. vanoorti* is considerably smaller than the other members of the genus *Typopeltis*, the discovery of an adult male with a modified patellar apophysis and adult females with mating marks, very similar to those occurring in *Typopeltis crucifer* [Haupt, 1996], requires a new generic allocation of this species. We herewith place *Teltus vanoorti* into the genus *Typopeltis*, which is a senior subjective synonym of *Teltus* (new synonymy, new combination).

Typopeltis cantonensis Speijer, 1936

Figs 2d, 3c, 4e, 5e.

Typopeltis amurensis (non Tarnani) — Kraepelin, 1897: 25: 13, pl. I, fig. 11 (♂), Kraepelin, 1899: 208, fig. 68 (misidentification).

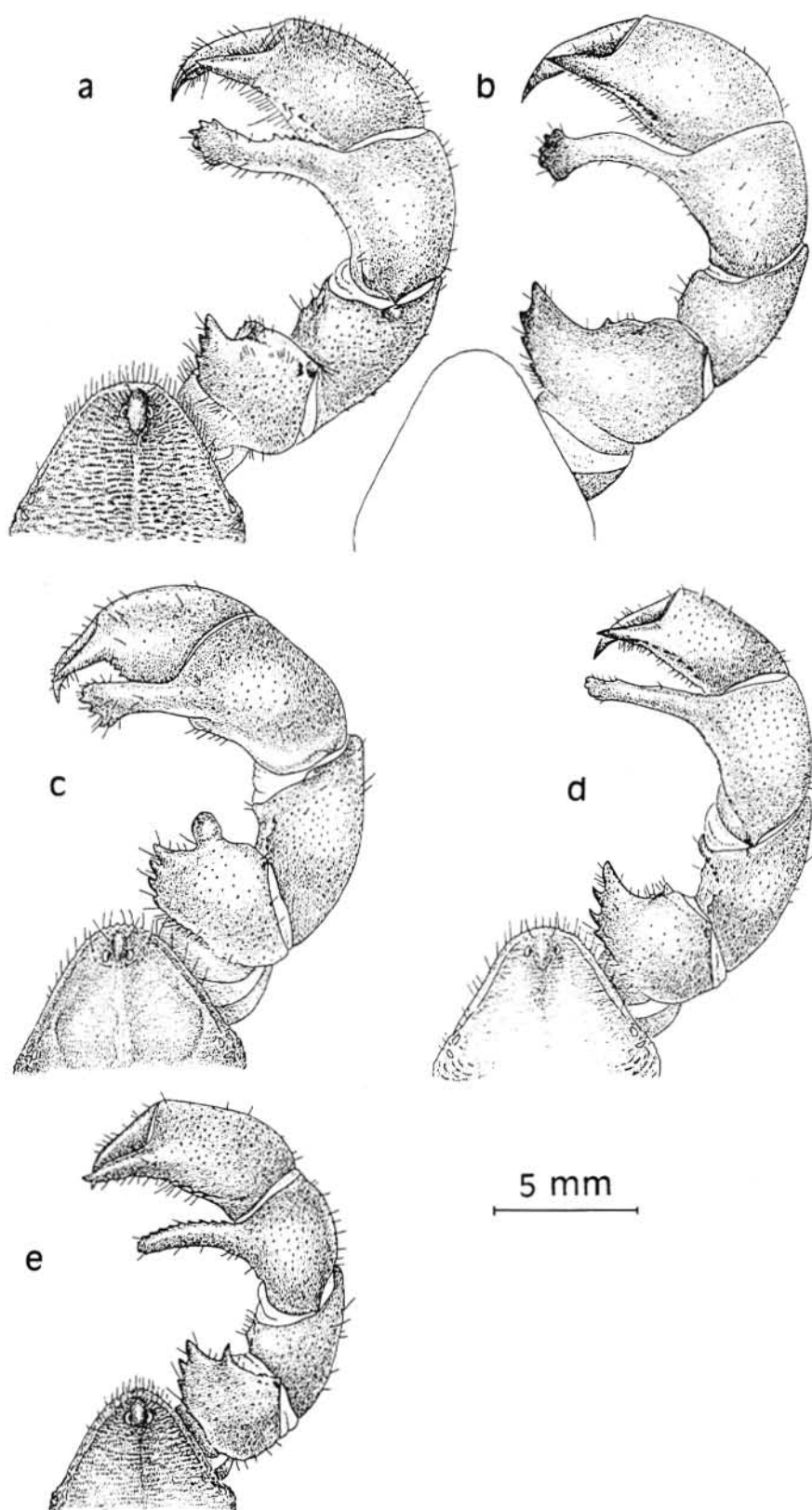


Fig. 2. Anterior part of prosoma with right ♂ pedipalp: a — *Typopeltis niger*, b — *T. stimpsonii*, c — *T. crucifer*, d — *T. cantonensis*, e — *T. vanoorti*.

Рис. 2. Передняя часть просомы с правой педипальпой ♂: а — *Typopeltis niger*, б — *T. stimpsonii*, в — *T. crucifer*, д — *T. cantonensis*, е — *T. vanoorti*.

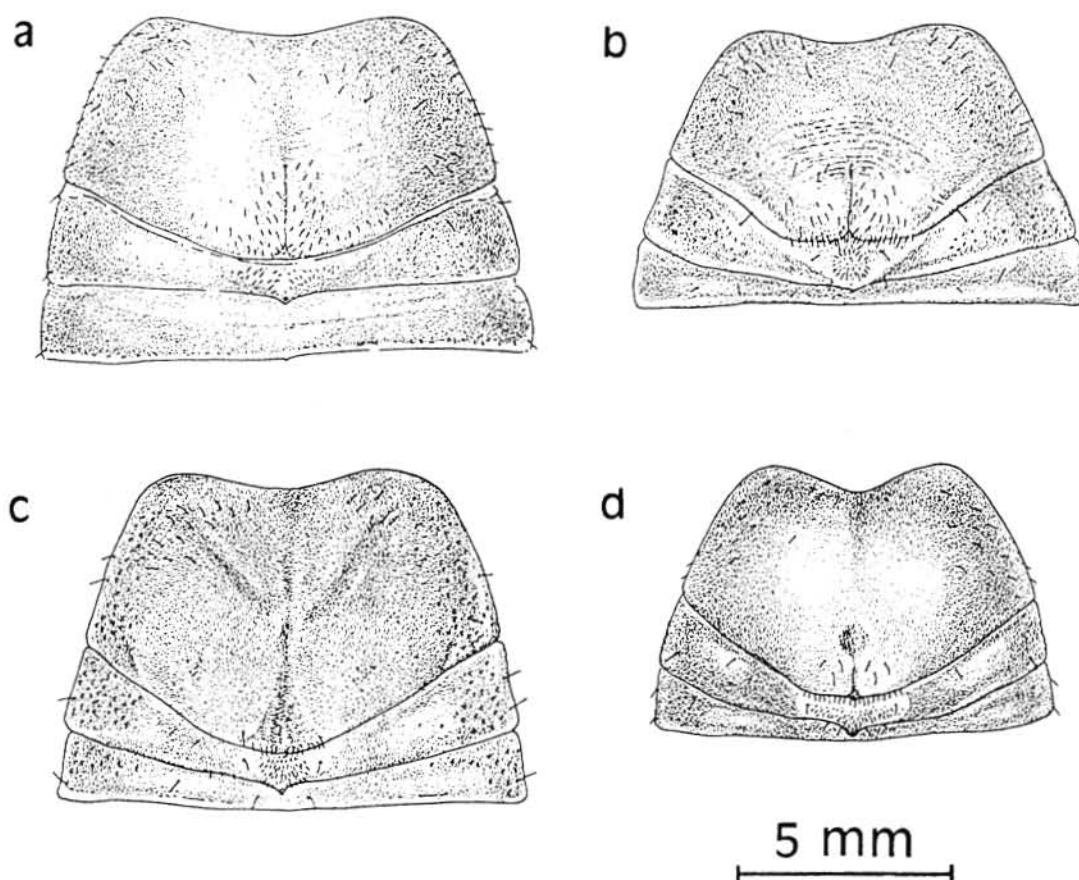


Fig. 3. Anterior ♂ opisthosomal sternites: a — *Typopeltis niger*, b — *T. crucifer*, c — *T. cantonensis*, d — *T. vanoorti*.

Рис. 3. Передние опистосомальные стерниты ♂: а — *Typopeltis niger*, б — *T. crucifer*, в — *T. cantonensis*, д — *T. vanoorti*.

Typopeltis cantonensis Speijer, 1936: 252-254, figs 2, 3.

Typopeltis cantonensis — Rowland & Cooke, 1973: 68.

Typopeltis cantonensis — Moritz & Fischer, 1980: 138.

Material examined: *Typopeltis cantonensis*: Holotype, ZMB No. 15 823: ♀ from Canton (= Guangzhou). Other material: ZISP No. 415a: ♂ from Guan-tung (Guangdong Prov.), South China, coll. Herz, det. Kraepelin. ZISP No. 415b: ♀ from Guan-tung, coll. Herz. BMNH BM1926.9.30.1: ♂ from Bao-Ha, Tonkin 1923-11-4 H. Stevens leg., Sladen-Godman-Trust Expedition.

Diagnosis: Female genital plate with two lateral, oblique grooves, with transverse wrinkles, and one longitudinal median groove. Pedipalps: Trochanter with five teeth. Tibial spurs on legs 2-4. Tarsal articles of tactile leg not modified. Ommatoids small, round. Body length: 32 mm, with pedipalps 48 mm.

Redescription of female holotype (Figs 4c, 5c): Eye tubercle short, globular, distinctly delimited also on anterior side. Keel after more than half the distance between lateral eyes and eye tubercle less prominent, but clearly reaching the front of the eye tubercle. Five teeth on trochanter (first reduced on right side), three on inner side, 4th at tip, 5th farther distant on anterior side. Patellar apophysis on inner side with a strong tooth before apex, outer side with eight regular teeth, distal ones smaller, facing teeth of tibial apophysis. Ommatoids small and round. Genital plate slightly excavated at hind margin, surface with a median longitudinal impression extending from anterior to posterior margin, lateral impressions with transverse wrinkles, situated at an acute

angle to posterior part of median impression, their impression less deep at about 2/3 of length (Fig. 5c). Tarsi of tactile leg (missing on right side) not modified. (Holotype with an irregular scar on the anterior right side of the carapace, caused by a previous wound.)

Description of male: Surface of patella with two distinct teeth on medioproximal side, patellar apophysis long, straight, with four basal teeth on front side, and two terminal teeth (Fig. 2d), tibial apophysis with four basal teeth. Surface of genital plate convex, with two small oblique impressions and an oval depression anterior to hind margin. Hind margin of 3rd sternite with a median posterior projection (Fig. 3c).

Note: Kraepelin studied the same material from the ZISP, but he overlooked the fact that the holotype of *T. amurensis* [Tarnani, 1890: fig. 3a] has an entirely different genital plate as compared to this material from Guangdong. We suppose that these male and female collected by Herz belong to the same species.

Typopeltis crucifer Pocock, 1894

Figs 2c, 3b, 4c, 5c.

Typopeltis crucifer Pocock, 1894: 128, pl. II, figs 4, 4a.

Typopeltis crucifer — Kraepelin, 1897: 15, fig. 19.

Typopeltis formosanus Kraepelin, 1897 sp.n.: 14, figs 13, 15, 16.

Typopeltis crucifer — Kraepelin, 1899: 209, fig. 69.

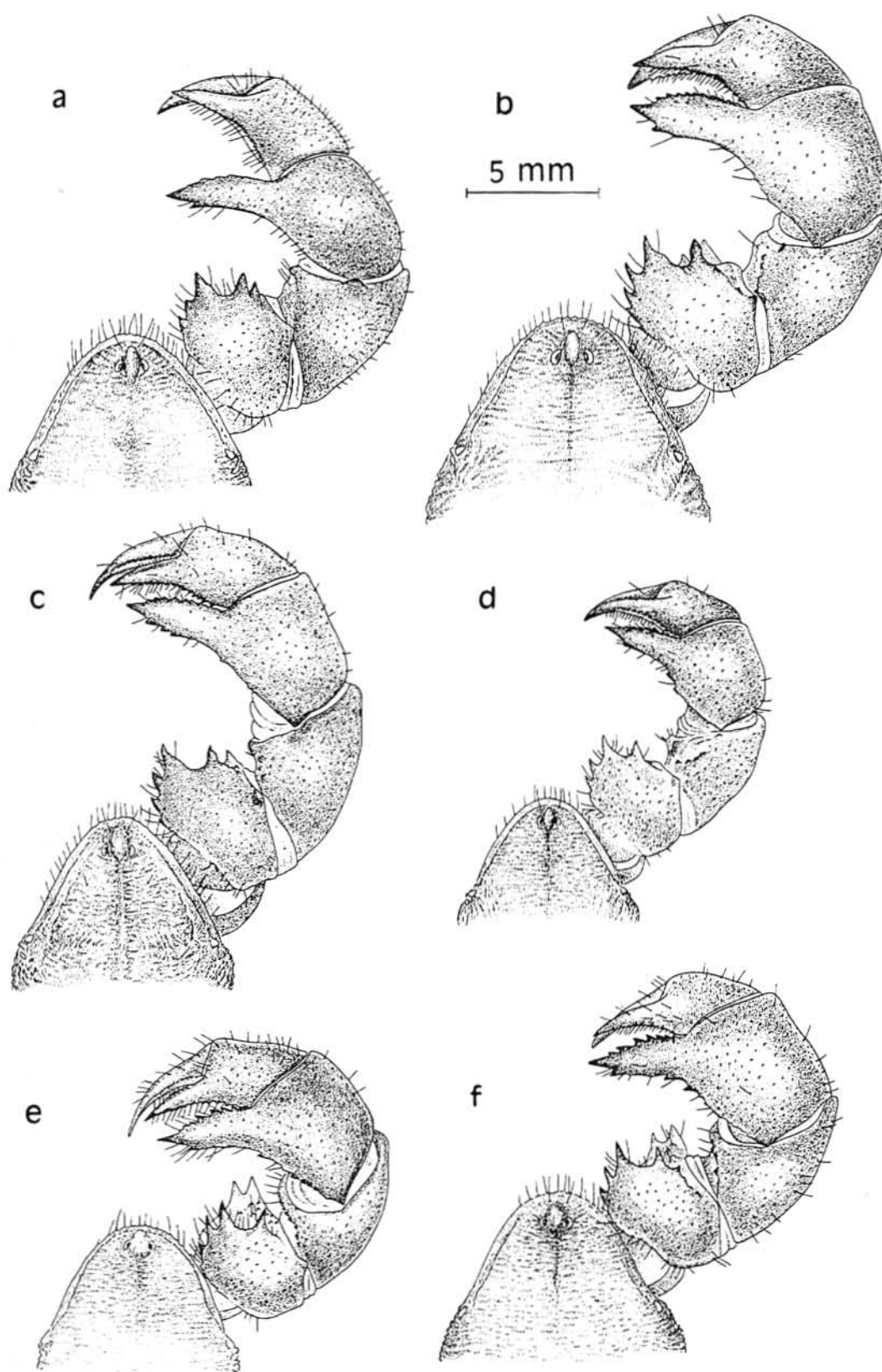


Fig. 4. Anterior part of prosoma with right ♀ pedipalp: a — *Typopeltis niger*, b — *T. stimpsonii*, c — *T. crucifer*, d — *T. vanoorti*, e — *T. cantonensis*, f — *T. guangxiensis* sp.n.

Рис. 4. Передняя часть просомы с правой педипальпой ♀: а — *Typopeltis niger*, б — *T. stimpsonii*, в — *T. crucifer*, д — *T. vanoorti*, е — *T. cantonensis*, ф — *T. guangxiensis* sp.n.

Typopeltis crucifer kochi, Schwangart, 1906: 336-337, fig. 3.
Typopeltis stimpsoni — Iwakawa, 1908: 287-291, pl. XI, figs 1-4.

Typopeltis stimpsoni — Speijer, 1936: 252.

Typopeltis crucifer — Rowland & Cooke, 1973: 69 (erroneously quoted from Thailand).

Typopeltis crucifer — Shimojana, 1974: 138-139, figs B, C.

Typopeltis crucifer — Yogi & Haupt, 1977: 53-56.

Typopeltis crucifer — Weygoldt, 1978: 151-156.

Material examined: Holotype. Apparently missing. Other material: MNHN 7 specimens from Takao (= Kaohsiung) and Central Taiwan, H. Sauter leg., NHMW No. B52/1353: 5 nymphs from Taiwan, ZMB Nos. 15829, 15830, 15832, 30662-30665: 6 ♂♂, 8 ♀♀ from Takao (= Kaohsiung, Taiwan), ZMB No. 15826, 15827: 3 ♂♂, 2 tetranymphs from Korotou, Central Taiwan, ZMB No. 15824: 1 ♂ from Kosampo village, 23°8'N 120°35'E, ZMB No. 30667: 2 ♂♂, 2 ♀♀ from Kashoto (= Lüdao, Green Island, East of Taiwan, TUB 1 ♂, 1 ♀ (from Ishigaki), TUB (in Haupt coll.) 5 ♂♂, 3 ♀♀, praenymphs grown up to adults in laboratory (from Ishigaki, Yaeyama Islands, Ryukyus), TUB (in Haupt coll.) 1 ♂, 5 ♀♀ from Iriomote, Yaeyama, Ryukyus, ZIFU 1 ♂, 1 ♀, nymphal stages (J. Haupt leg., Ishigaki, Ryukyus 1977-4), AMNH 1 ♂ (H.L. Keegon leg., Nagura, Ishigaki, Ryukyus 1955-10-26).

Diagnosis: Keel reaching the front of a steep eye tubercle, median eyes divided by a short broad ridge. Male with a thumb-like process on anterior side of trochanter. Genital plate of female with a Y-shaped median groove. Body length: 25-42 mm. Chemical composition of defense spray: acetic acid, caprylic acid and water [Yogi & Haupt, 1977; Itokawa et al. 1981].

Description: Male: Pedipalps: Dorsal side of trochanter with four teeth at inner edge, 4th tooth the largest, 5th tooth with broad, stout form situated separately on anterior side, opposite to a similar but bilobed ventral process. Patellar apophysis curved toward tibia, proximally almost circular in cross-section. Distal part broadened, with several terminal teeth (two on posterior side, one in median position, four in anterior position). Tibia with a stout proximal median process, followed by a row of teeth to tibial apophysis. Teeth on tibial apophysis reduced on both sides into narrow, curved stumps (Fig. 2c).

Genital plate: Hind margin trapezoidal, median part only slightly convex. Surface convex with posterior median impression. 3rd sternite with a median, less heavily sclerotized sensillar field and a very short median cuticular process at hind margin (Fig. 3b).

Female: Dorsal side of pedipalp trochanter with four teeth on inner side, increasing in size from proximal to distal tooth, 5th tooth at distance in anterior position, ventral side of trochanter with two teeth. Patellar apophysis at inner (posterior) border with three teeth before apex (Fig. 4c). Occasional notches on tarsal articles of tactile leg due to courtship behaviour [Haupt, 1996]. Genital plate at hind margin widely marginate in the middle, with a short, median, rounded prominence. Surface with a deep Y-shaped median groove and a pair of lateral, shallow, longitudinal impressions in parallel position, extending to the lateral posterior angles of the plate (Fig. 5c).

Note: Provenance of Pocock's type material is unknown, but Thailand has sometimes been erroneously quoted as the patria of this species [Rowland & Cooke, 1973], apparently due to the shape of the hind margin of the genital plate similar to that of *Typopeltis tarnanii*. Nevertheless, the typical cross-structure on the genital plate is lacking in the Thai species. All material observed here originates from Taiwan and the Ryukyu Islands,

where this species has been found as far north as Iheya, an island close to the northernmost extreme of Okinawa [Shimojana, 1974]. The nymphs have the following approximate sizes: protonymphs 11 mm, deutonymphs 15-16 mm, tritonymphs 19-24 mm, tetranymphs 30-32 mm, males 33-41 mm, females 40-43 mm. Adult specimens from Lüdao are considerably smaller (25-30 mm), which might justify the establishment of a separate (sub)species.

Typopeltis guangxiensis sp.n.

Figs 4f, 5f-g.

Typopeltis cantonensis (nec Speijer) — Haupt et al., 1988: 883-885 (misidentification).

Holotype: GAC: ♀ No. 1. Type-locality: Duxi Area of Gaofung Forest, Nanning, Guangxi Prov., broadleaved forest, under stones and in soil (J. Haupt leg. 1985-9-19). Paratype: ZMB No. 30668: ♀ No. 2 (J. Haupt leg., Duxi, Gaofung, Nanning 1985-9-19). ♂ unknown. Other material: Offspring from ♀ No. 2, bred in Berlin, ZMB No. 30672 and coll. Haupt. MCZ: 1 ♀ from collective vial (presumably collected in Kweiping, Kwangsi (= Guangxi), China by Gaines Liu 1932).

Name: The specific epithet is an adjective derived from the province name Guangxi.

Diagnosis: Similar to *T. cantonensis*, but the female genital plate on the ventral side with oblique, flat, oval grooves. Lateral keel petering halfway in the direction of the eye tubercle. Body length: ca. 40 mm. Composition of defence spray: acetic acid, 2-heptanone, 2-octanone and 2-nonanone [Haupt et al., 1988].

Description: Keel reaching forward from lateral eyes in the direction of the eye tubercle, but petering about halfway. Eye tubercle only slightly elevated, median ridge smooth and broad, not distinctly delimited on anterior side but gently fading towards anterior edge of carapace. Pedipalps: Trochanter with six teeth on dorsal side, 4th tooth at anteromedian edge the longest, tooth 5 distal in anterior position, joined by a much smaller 6th tooth on anterior side. Patellar apophysis with one small basal tooth on inner side, and a larger one in front of apex. Outer side with four teeth, decreasing in size distally. Both sides of tibial apophysis, and inner side of tarsal finger, with a dentate ridge (Fig. 4f). Tarsal articles of tactile leg unmodified. Genital plate with hind margin convex. Ventral surface with a longitudinal ridge, flanked by lateral oval areas, very slightly impressed, converging toward the posterior end of the median impression. Cuticle of oval areas with transverse wrinkles (Fig. 5f). On dorsal (inner) side of genital plate a pair of steep cuticular ridges (Fig. 5g). Ommatoids small and round. Male unknown.

Typopeltis niger (Tarnani, 1894)

Figs 2a, 3a, 4a, 5a.

Thelyphonus sinensis Butler, 1872: 205; Pl. XII, Fig. 7: **syn.n.!**

Thelyphonus stimpsonii — Butler, 1872: 204 (misidentification).

Thelyphonus niger Tarnani, 1894a: 17: 30-32.

Thelyphonus niger Tarnani, 1894b: 112-116; Pl. I, Figs 5, 6, 11.

Typopeltis sinensis — Pocock, 1894: 134.

Typopeltis niger — Kraepelin, 1897: 13-14; Pl. I, Figs 12, 14.

Typopeltis niger — Gravelly, 1916: 70.

Typopeltis niger — Speijer, 1936: 251-252.

Typopeltis niger — Rowland & Cooke, 1973: 69.

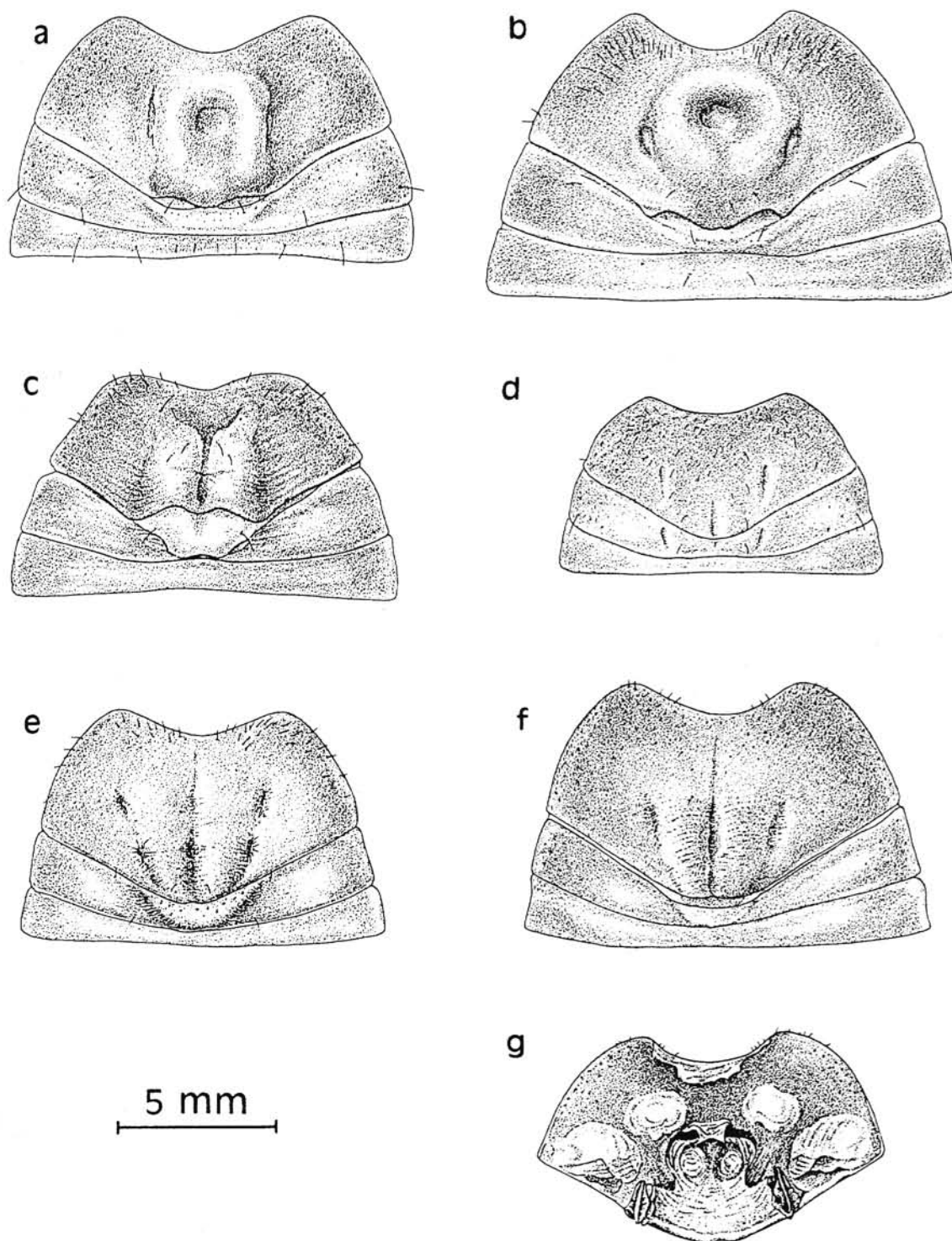


Fig. 5. Anterior ♀ opisthosomal sternites: a — *Typopeltis niger*, b — *T. stimpsonii*, c — *T. crucifer*, d — *T. vanoorti*, e — *T. cantonensis*, f — *T. guangxiensis* sp.n., g — dorsal view of genital plate of *T. guangxiensis* sp.n.

Рис. 5. Передние опистосомальные стерниты ♀: а — *Typopeltis niger*, б — *T. stimpsonii*, в — *T. crucifer*, д — *T. vanoorti*, е — *T. cantonensis*, ф — *T. guangxiensis* sp.n., г — дорсальный вид генитальной пластинки *T. guangxiensis* sp.n.

Material examined: *Typopeltis niger*: Holotype. ZISP, coll. Dr. Pjasecki 1876: China, Other material: ZMB No. 15835 1 ♂, coll. Mell 1914: China, ZMB No. 15836, 1 ♀ "*T. stimpsonii*", coll. Mell 1914: China, ZMB No. 30669, ♀ from Mt. West Tianmu, Zhejiang,

1987, ZMB 30670 1 ♂ Anhui Prov. Y.J. Xu. leg; MNHN No. 123, 1 ♂, 1 ♀ "*T. stimpsonii*" from Tchi-kiang (= Zhejiang), MNHN No. 889/72, 1 "*T. sinensis*" (David) from Tchi-kiang (=Zhejiang), MCZ 2 ♂♂ and 4 ♀♀ in collective vial from Taipingshien,

Anhui (=Anhui) and/or Kihuashan (Anhui), coll. Gaines Liu 1932, MCZ 5 ♀♀ from Liuchow (Maping, Kwangsi (= Guangxi) Prov.), AMNH 1 nymph from Ningkun, Anhui (=Anhui); 3rd Asiatic Expedition, 1921-9-15/10-15; ZIAS 1 ♂ from Hangzhou (Zhejiang), 1 ♀ from Ling-yin, Hangzhou, Zhejiang, coll. Haupt, 1 ♂ from Mt. Xitianmu, Zhejiang, 10. 1974, Z.D. Zhu leg., 1 ♀ from Nan-jing, Jiang-su Prov. 1983-10.

Diagnosis: Keel reaching from lateral eyes to front of eye tubercle. Ridge between median eyes pronounced, longer on anterior side. Ommatoids small and round, whip organs of long, oval shape. Patellar apophysis of male long, slender, bent ventrally, with four terminal teeth. Female genital plate with an almost quadrangular ventral impression. Body length: ca. 38-44 mm.

Description: Male: Pedipalps: Trochanter almost triangular on dorsal side, with a long apical tooth (No. 4) directed anteromediad. Teeth 1-3 on inner side, increasing in size. Tooth 5 small, far from tooth 4 on anterior side. Patellar apophysis long, slender, curved ventrally, with five small proximal teeth on anterior side. Terminal part of patellar apophysis broadened with a bulbous posterodistad part and four teeth on anterior side, like a paw. Tibia with a posterior row of small teeth. Tibial apophysis smooth on posterior side, dentate ridge on anterior side opposing a similar ridge on tarsal finger (Fig. 2a).

Genital plate: Hind margin convex, ventral surface with a posterior lateral prominence and a posterior median impression carrying many hair sensilla. 3rd sternite with a median, less heavily sclerotized, sensillar field, and a small, median, cuticular process at hind margin (Fig. 3a).

Female: Pedipalps: Trochanter as in male, tooth 6 sometimes lacking. Patellar apophysis with tooth on inner (posterior) side close to apex, 6-7 teeth on outer (anterior) side opposing tibia, on which a regular row of small teeth covering the inner side up to 2/3 of the tibial apophysis. Regular sawtoothed ridge of outer tibial apophysis opposing the ridge of tarsal finger (Fig. 4a). Genital plate with one median and a pair of lateral angles at posterior margin. Ventral surface with an almost quadrangular median impression, which is surrounded by a prominent, almost quadrangular, wall (Fig. 5a).

Note: Butler described his n.sp. on the basis of a nymphal stage from Hongkong. As the name '*sinensis*' has not been used, since Pocock [1894] placed this species in his new genus *Typopeltis*, it is proposed to suppress this name in favour of *Typopeltis niger*, which has been applied since Tarnani [1894].

As all males from the provinces of Zhejiang and Anhui belong to *Typopeltis niger*, and all females from this region have so far been determined as *Typopeltis stimpsonii*, we consequently have to attribute these females to *T. niger*. They can be distinguished from females of *T. stimpsonii*, a species which lives in Japan, by the almost quadrangular pit in the genital plate (Fig. 5a). The close resemblance of both species certainly dates back to the Pleistocene era, when the Japanese archipelago was connected to the Asian continent.

Typopeltis stimpsonii (Wood, 1862)

Figs 2b, 4b, 5b.

Thelyphonus stimpsonii Wood, 1862: 312.

Typopeltis stimpsonii — Pocock, 1894: 126, Pl. II, figs 3, 3a.

Typopeltis stimpsonii — Kraepelin, 1897: 15, fig. 18.

Typopeltis stimpsoni — Kraepelin, 1899: 209-210.

Typopeltis stimpsoni — Pocock, 1900: 296-297, fig. 2, 2a.

Typopeltis stimpsoni — Gravely, 1916: 71 (incl. *T. crucifer*).

Typopeltis stimpsoni — Rowland & Cooke, 1973: 69.

Typopeltis stimpsoni — Shimojana, 1974: 136, 138-139, figs D, E.

Material examined: Holotype missing. Other material: MCZ 1 ♀ from Amami-o-shima, ZISP Nos. 414, 115-927 2 nymphs from Amami-o-shima.

Diagnosis: Keel reaching from lateral eyes to front of eye tubercle. Ommatoids slightly oval. Male patellar apophysis slender, bent ventrally, with a distinct terminal broadening. Female genital plate trilobed at hind margin, with an oval ventral impression. Body length: ca. 42 mm. Composition of defence spray: acetic acid, caprylic acid, water [Itokawa et al., 1985].

Description: Male: Pedipalp: Trochanter with an acute tip, three teeth on median side, anterior side concave with a single small tooth. Patellar apophysis long, slender, curved in ventral direction, terminal part distinctly broadened with five short projections (Fig. 2b).

Female: Pedipalp: Trochanter with 5 teeth, 5th one apart at anterior edge. Patellar apophysis on inner (posterior) side with one tooth close to apex, anterior side with a basal sawtoothed ridge and six distal teeth opposing a denticulated row of tibia and tibial apophysis. Tibial apophysis on anterior side with a sawtoothed ridge opposing the corresponding ridge of tarsal finger (Fig. 4b). Genital plate: distinctly trilobed at hind margin, ventral surface with a deep oval impression situated transversely to median axis; impression slightly broader at anterior side, its walls marked at posterior lateral side by a pair of oblique longitudinal impressions (Fig. 5b).

Note: As Wood's type material originated from Japan, and only females have been reported from China, the latter must be attributed to *Typopeltis niger* (see comments under this species). All material studied from China has distinctly different characters which allow it to be identified as *T. niger*, thus the records of *T. stimpsonii* in China must be considered as erroneous. *T. stimpsonii* (Fig. 6) is distributed from Kyushu in the north to Izena (close to the northernmost extreme of Okinawa) in the south [Shimojana, 1974].

Typopeltis vanoorti (Speijer, 1936), **comb.n.**

Figs 2e, 3d, 4d, 5d.

Teltus vanoorti Speijer, 1936: 259-260.

Teltus vanoorti — Rowland & Cooke, 1973: 68.

Material examined: *Typopeltis vanoorti*. Holotype: ZMB ♂, from Hainan, body length 22 mm, with pedipalps 24 mm, missing [Moritz and Fischer, 1980]. Neotype (designated herein). ZIAS, ♀ from Mt. Bawangling, Hainan 1989-12-18. Other material: CAS, 1 ♂, 1 ♀, 1 nymph from Tai pin (Dwa Bi, Hainan: 1935-7-22), 1 ♀, 1 nymph from Tai Pin (Dwa, Bi, Hainan: 1935-7-23), ZIAS 5 nymphs from Mt. Bawangling, Hainan, 1989-12-18, ZMB No. 30671, 6 specimens of two different nymphal stages from Mt. Jianfenglou, Hainan (600-800 m), 1992-5-20.

Note: The specimens studied can be placed in the following size categories:

- 1 Protonymph 11 mm,
- 4 Deutonymphs about 16 mm,
- 3 Tritonymphs 20 — 23 mm,
- 1 Tetranymp 27 mm,
- 1 female 29 mm, 1 male 28 mm.

Comparison of the sizes makes it very likely that Speijer based the description of his new species on a nymphal specimen. As this specimen is lost, we designate

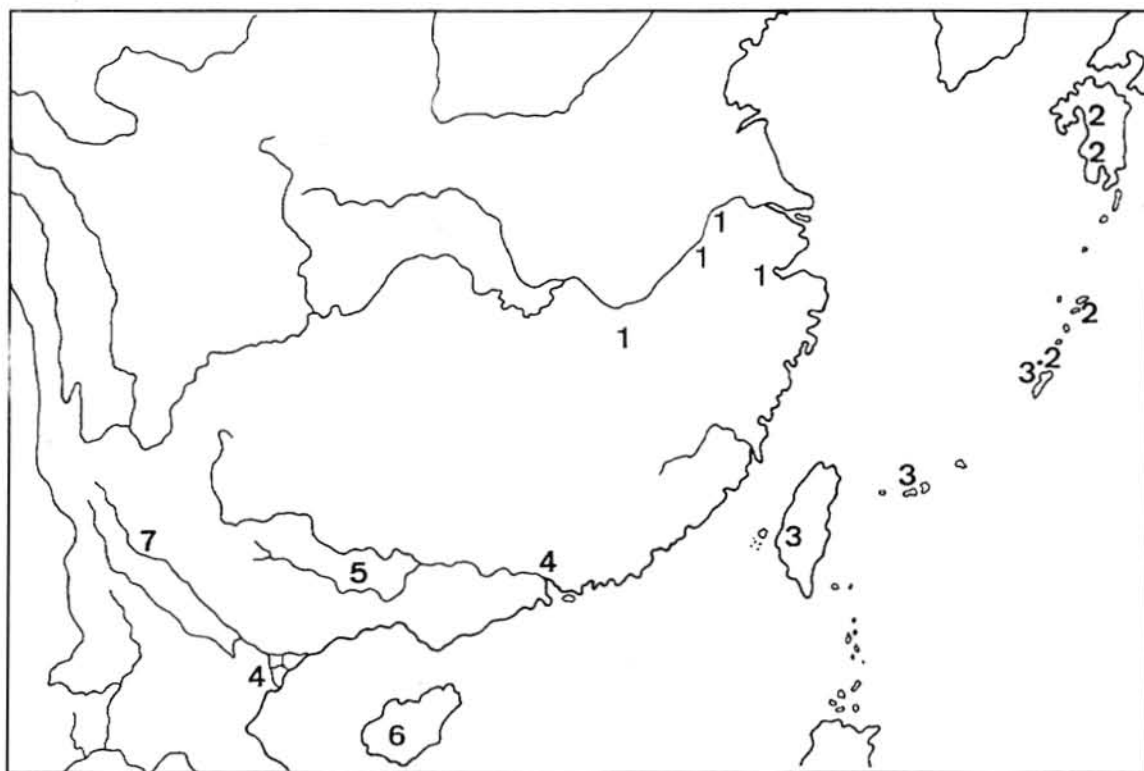


Fig. 6. Geographic records of whip scorpions in East Asia: 1 — *Typopeltis niger*, 2 — *Typopeltis stimpsonii*, 3 — *Typopeltis crucifer*, 4 — *Typopeltis cantonensis*, 5 — *Typopeltis guangxiensis* sp.n., 6 — *Typopeltis vanoorti*, 7 — *Hypoctonus granosus*.

Рис. 6. География находок жгутоногих пауков в Восточной Азии: 1 — *Typopeltis niger*, 2 — *Typopeltis stimpsonii*, 3 — *Typopeltis crucifer*, 4 — *Typopeltis cantonensis*, 5 — *Typopeltis guangxiensis* sp.n., 6 — *Typopeltis vanoorti*, 7 — *Hypoctonus granosus*.

as neotype the female from Mt. Bawangling. This specimen had apparently already mated: this can be concluded from the typical mating marks comparable to those of *Typopeltis crucifer* [see Haupt, 1996]. Moreover, another female of the same species from Hainan (CAS) could be studied, which also has a mating mark as well as the residues of a spermatophore hanging from under the genital plate, together with a male in the same vial. As described by Speijer [1936], the ommatoids are relatively large and round. Rowland & Cooke [1973] erroneously state that ommatoids are absent.

New diagnosis: Keel present, but not reaching the area of eye tubercle, eye tubercle with a broad ridge separating median eyes, ommatoids relatively large and round. Female genital plate with long lateral impressions and a median posterior impression. Male genital plate with a triangular posteromedian impression. Patellar apophysis very long and slender, tip curved ventrally. Body length: ca. 29 mm.

Redescription: Female neotype: Body length: 29 mm, colour reddish-brown, legs slightly lighter. Keel reaching from lateral eyes to about half the way to the front area of the median eye tubercle, which is short and stout. Median eyes divided by a short ridge. Pedipalps: Dorsal side of trochanter with four spines, anterior of which separated from the other three. Patellar apophysis with one large spine on inner side, outer side with seven regular spines. Tibial apophysis with small, regular spines on inner side, outer side with an undulating ridge similar to that of opposing tarsal finger (Fig. 4d).

Tactile leg with eight tarsal articles, basal one very

short, articles 6-8 on the left tarsal leg showing black mating marks, with a distinct cut on article 8. Genital plate: Slightly convex at hind margin, ventral surface with a pair of long lateral impressions and a median posterior impression (Fig. 5d). Whip: Ommatoids at 3rd basal article, round, as described by Speijer [1936], whip organs of very long, oval shape.

Male: Body length: 28 mm. Pedipalps: Dorsal side of trochanter with two smaller median teeth, one large tooth at apex, and a 4th one long but slender, at some distance on anterior side. Patellar apophysis very long and slender, slightly curved. Tip curved towards ventral side, nine regularly spaced teeth on anterior side, facing the row of spaced teeth on tibia and tibial apophysis (Fig. 2c). Anterior side of tibial apophysis with a row of teeth facing the corresponding row on tarsal finger. Genital plate convex at hind margin, surface convex with a triangular posteromedian impression, covered by hair sensilla. Anterior part of plate with slight, transverse, cuticular wrinkles. 3rd sternite with a posterior median projection at hind margin: elevated, broad, median sensilla field less heavily sclerotized, with a median impression (Fig. 3d).

Doubtful species

Typopeltis amurensis (Tarnani, 1889)

Thelyphonus amurensis Tarnani, 1889: 19-120.

Thelyphonus amurensis — Tarnani, 1890: 24. 519-523, pl. III, figs 3a, 3b.

Typopeltis amurensis — Pocock, 1894: 126.

Typopeltis amurensis — Gravely, 1916: 70, 80 (partim).

Typopeltis amurensis — Rowland & Cooke, 1973: 68.

Material examined: *Typopeltis amurensis*. Holotype ♀ from Olga Bay, Primorie; apparently missing. Other material: The specimens kept in ZISP under this name differ from Tarnani's [1890] drawing; they originate from Guangdong Province, and the ♂ which was erroneously attributed to *T. amurensis* [see Kraepelin, 1897], is now attributed to *T. cantonensis*.

Note: This species has been reported only once, from Olga Bay, Maritime Province (Primorie), Russia, and has never been found since north of the Chang-jiang area (Yang-tse-kiang) (Fig. 6). Tarnani [1889, 1890] gave no information about the sex of his adult specimen, but from his figure one can conclude that it was

a female. It is reminiscent of a female of *Typopeltis niger*. It cannot be entirely excluded that a region as warm and humid during the summer as Primorie may be the home of whip scorpions. On the other hand, it is possible that the type specimen got there by accident: Olga Bay has long been a locally important harbour [Arseniev, 1921]. As the type material could not be located, we can only leave *Typopeltis amurensis* as a doubtful species.

For further Discussion, Acknowledgements and References see Part II.