

## New Species of the Family Linyphiidae (Arachnida, Araneae) from Japan

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**Abstract** Twenty new species of four genera of the spider family Linyphiidae (Arachnida, Araneae) are described from Japan under the names, *Hylyphantes tanikawai* sp. nov. (Yaeyama Islands), *Asperthorax borealis* sp. nov. (Hokkaido), *Nippononeta kantonis* sp. nov. (Miyagi, Ibaragi, Tochigi, Chiba, Tokyo and Yamanashi Prefs.), *N. kaiensis* sp. nov. (Tochigi, Gunma and Yamanashi Pref.), *N. masudai* sp. nov. (Yamanashi Pref.), *N. alpina* sp. nov. (Yamanashi Pref.), *N. ogatai* sp. nov. (Aichi Pref.), *N. xiphoides* sp. nov. (Aichi Pref.), *N. elongata* sp. nov. (Miyagi Pref.), *N. silvicola* sp. nov. (Gunma Pref.), *N. subnigra* sp. nov. (Yamanashi Pref.), *N. okamae* sp. nov. (Fukuoka Pref.), *N. masatakana* sp. nov. (Minami-iwojima Island), *Arcuphantes awanus* sp. nov. (Tokushima Pref.), *A. elephantis* sp. nov. (Tokushima Pref.), *A. concheus* sp. nov. (Yamaguchi Pref.), *A. rostratus* sp. nov. (Hiroshima Pref.), *A. hastatus* sp. nov. (Hyogo Pref.), *A. saragaminensis* sp. nov. (Ehime Pref.) and *A. tsushimaensis* sp. nov. (Tsushima Island).

**Key words** : Arachnida, Araneae, Linyphiidae, taxonomy, new species, Japan

### Introduction

The family Linyphiidae is the largest group in Japanese spiders, containing about 230 species of 98 genera at present (Ono, Kamura & Nishikawa, 1999; Saito & Ono, 2001). Although many species have been recorded under this family (one-sixth of all the known species from Japan), their taxonomic study is still far from complete. The proportion of linyphiids to all spider species should rise onto one-fourth.

This paper deals with descriptions of twenty new species of linyphiid spiders from Japan and performs the third part of taxonomic studies made by the same authors (Ono & Saito, 1989; Saito & Ono, 2001). Most of the new species to be described herein belong to two genera, *Nippononeta* Eskov, 1992 and *Arcuphantes* Chamberlin et Ivie, 1943. The former genus was established by Eskov based on about 10 species from Japan, Korea and Siberia, which were regarded as *Meioneta* Hull, 1920, or *Macrargus* Dahl, 1886, at that time (Oi, 1960; Saito, 1983; Yaginuma, 1986; Paik, 1991). Although spiders of the genus *Nippononeta* are very small with body length approximately 1.5 mm and hardly identifiable by beginners, they are frequently

collected from litter on the ground in various places of Japan and, in fact, many species of the genus are remaining undescribed.

On the other hand, *Arcuphantes* is at present the largest genus in linyphiid spiders of Japan. About 30 species were described mainly from western Honshu, Shikoku and Kyushu, and a few from Hokkaido and northern Honshu [Tikuni (=Chikuni), 1955; Oi, 1960, 1980; Saito, 1992; Ihara, 1995]. The spiders are relatively large as linyphiids with body length 2–4 mm and make webs between rocks, in cracks on the ground or in caves. In western Japan, spiders of the genus (species group of *Arcuphantes longiscapus*) show a remarkable geographic differentiation in details of the male palpal organ and epigynum (Ihara, 1995). Although materials of the present authors are not enough to recognize an outline of the genus in Japan, several new species are introduced to science.

Abbreviations of the terms of secondary genital organs in male palp are described in explanations of figures of some species, according to Merrett (1963), Saaristo (1973 a, b, 1977 & 1998) and Millidge (1977).

Type specimens of the new species to be described in this paper are deposited in the collection of the Department of Zoology, National Science Museum, Tokyo (NSMT).

Before going further, the authors wish to express their deep respects to the late Prof. Dr. Ryoji Oi (1904–1989) and the late Prof. Dr. Takeo Yaginuma (1916–1995) for contributions to the taxonomy of Japanese spiders. They also wish to express their sincere thanks to Dr. A. D. Blest, Mr. Shigeo Gonda, Mr. Yoh Ihara, Mr. Teruo Irie, Mr. Seiji Matsumoto, Mr. Mitsuru Nagashima, Dr. Keiko Niijima, Dr. Shûhei Nomura, Mr. Kiyoto Ogata, the late Dr. Chiyoko Okuma, Mr. Hiroshi Sakayori, Dr. Masataka Satô, Mr. Yôhei Suganami, Mr. Akio Tanikawa, Mr. Akira Tada, Dr. Nobuo Tsurusaki and Mr. Nobuki Yasuda for offering invaluable specimens used in the present paper. This study was partly supported (for H. Ono) by the Grant-in-aid No. 10640688 for Scientific Research, and in traveling expenses for overseas research (1999 in Europe) from the Ministry of Education, Science, Sports and Culture, Japan.

Subfamily Erigoninae, s. lat.

[Japanese name: Kosaragumo-aka]

Genus *Hylyphantes* Simon, 1884

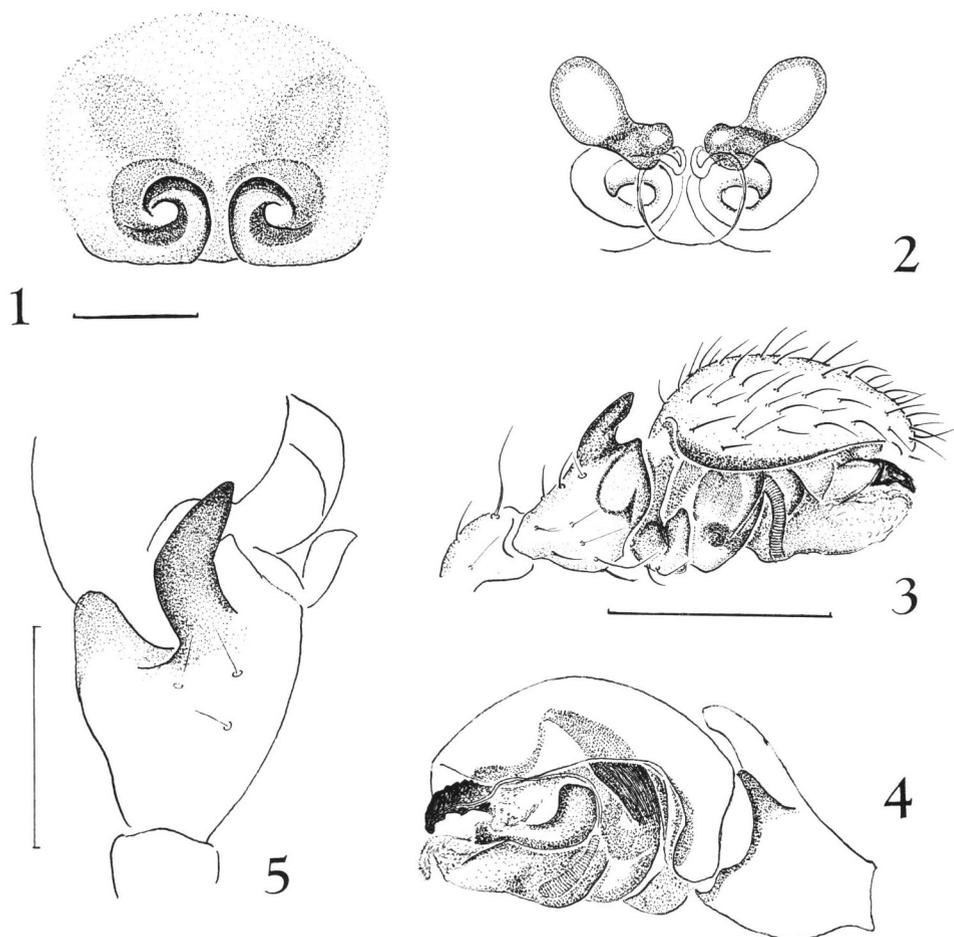
[Japanese name: Kuro-nankingumo-zoku]

***Hylyphantes tanikawai*** sp. nov.

[Japanese name: Iriomote-nankingumo]

(Figs. 1–5)

*Type specimens.* Holotype: ♀, Komi, Iriomotejima Island, Ryukyu Islands, Okinawa Pref., Southwest Japan, 29–III–1989, A. Tanikawa leg. (NSMT-Ar 5082);



Figs. 1-5. *Hylyphantes tanikawai* sp. nov., female holotype (NSMT-Ar 5082) and a male paratype (NSMT-Ar 5083) from Iriomotejima Island. — 1, Female genitalia (epigynum), ventral view; 2, female genitalia, cleared, dorsal view; 3, male palp, retrolateral view; 4, male palp, prolateral view; 5, tibia of male palp, dorsal view. [Scales: 1-2, 5, 0.1 mm; 3-4, 0.2 mm.]

paratypes: 1 ♀ 4 ♂, same locality and collector as for the holotype, 2-I-1986, 27-III, 10-VIII & 27-XII-1987, 3-I & 1-IV-1988 (NSMT-Ar 5083-5087), 1 ♀ 1 ♂, Iriomotejima Island, 30-III-1985 (NSMT-Ar 5088), 1 ♀, Tsukiga-hama Beach, Iriomotejima Island, 24-VIII-1987 (NSMT-Ar 5089), 1 ♂, Otomi, Iriomotejima Island, 29-XII-1987 (NSMT-Ar 5090), 1 ♀, Ohara, Iriomotejima Island, 2-I-1989 (NSMT-Ar 5091), all A. Tanikawa leg.

*Other specimens examined.* 1 ♀ 1 ♂, Mt. Omoto-dake, Ishigakijima Island, Ryukyu Islands, Okinawa Pref., Southwest Japan, 9-XII-1990, T. Irie leg. (NSMT-Ar

5092).

*Description.* Female (holotype): Body length 1.98 mm, prosoma length 0.93 mm, width 0.76 mm; lengths of palp and legs [total length (femur+patella and tibia+metatarsus+tarsus)]: palp 0.86 mm (0.32+0.27+--+0.27), leg I 2.71 mm (0.76+0.90+0.61+0.44), II 2.69 mm (0.76+0.85+0.63+0.45), III 2.22 mm (0.66+0.68+0.51+0.37), IV 2.88 mm (0.83+0.93+0.71+0.41).

Prosoma: Carapace reddish brown, median furrow and radiating lines darker and distinct, head relatively high and tinged with black; eyes with black ring (each eye annulated), anterior eye-row procurved, distance between anterior median eyes almost equal to the radius of anterior median eye, distance between anterior median eye and anterior lateral eye shorter than the radius of anterior median eye; posterior eye-row almost straight, distance between posterior median eyes slightly longer than the radius of posterior median eye, distance between posterior median eye and posterior lateral eye slightly shorter than the radius of posterior median eye, posterior eyes same in size, anterior median eye the largest, both the lateral eyes close to each other; clypeus almost vertical, shorter than the length of median ocular area. Sternum light reddish brown, as long as wide, round pentagonal (its shape like a home base), posteriorly truncated. Chelicera with two pairs of long setae on the dorsal (frontal) surface, stridulating files absent at the side, promargin of fang furrow with 6 teeth, retromargin with 5 denticles; legs yellowish brown, distance between coxae IV slightly longer than the diameter of coxa, the order of spines on the tibiae I–IV, 2211, Tm IV present, Tm I ca. 0.70.

Opisthosoma greyish black, dorsally with an indistinct, longitudinal band wide and white.

Female genitalia (Figs. 1–2): epigynum wider than long, openings visible in ventral view; spermathecae ovate.

Male (a topotypical paratype; NSMT-Ar 5083): Body length 1.95 mm, prosoma length 0.85 mm, width 0.71 mm; lengths of legs [total length (femur+patella and tibia+metatarsus+tarsus)]: I 2.60 mm (0.73+0.85+0.61+0.41), II 2.62 mm (0.73+0.85+0.61+0.43), III 2.15 mm (0.63+0.66+0.51+0.35), IV 2.67 mm (0.73+0.85+0.68+0.41).

Anterior eye-row relatively procurved, anterior eyes compactly set, distance between anterior median eyes slightly shorter than distance between anterior median eye and anterior lateral eye; posterior eye-row straight, distance between posterior median eyes equal to the radius of posterior median eye, distance between posterior median eye and posterior lateral eye shorter than the radius of posterior median eye; chelicera without stridulating files, promargin of fang furrow with 5 teeth, retromargin with 4 teeth (number of teeth variable: in another male paratype, promargin with 6 teeth and retromargin with 3 teeth); Tm I ca. 0.69; other characteristics in general appearance and coloration as same as those in the female.

Male palp (Figs. 3–5): Proportion of length of femur to that of patella 5 : 2, tibia

large, longer than patella, dorsal margin of the apical part with a digitiform apophysis strongly sclerotized.

*Etymology.* This new species is dedicated to Mr. Akio Tanikawa, Kanagawa, who collected many spiders from Iriomotejima Island and offered them to science.

*Distribution.* Japan (Iriomotejima and Ishigakijima Islands).

*Remarks.* Two species of the genus were known from Japan, that is, *Hylyphantes graminicola* (Sundevall, 1830) and *H. troquipalpis* (Oi, 1960). Of these, the latter species seems closer to *H. tanikawai* sp. nov. However, this new species is easily distinguished from the relative by the shape of female genitalia and the structure of male palpal organ.

Genus *Asperthorax* Oi, 1960

[Japanese name: Zara-akamunegumo-zoku]

*Asperthorax borealis* sp. nov.

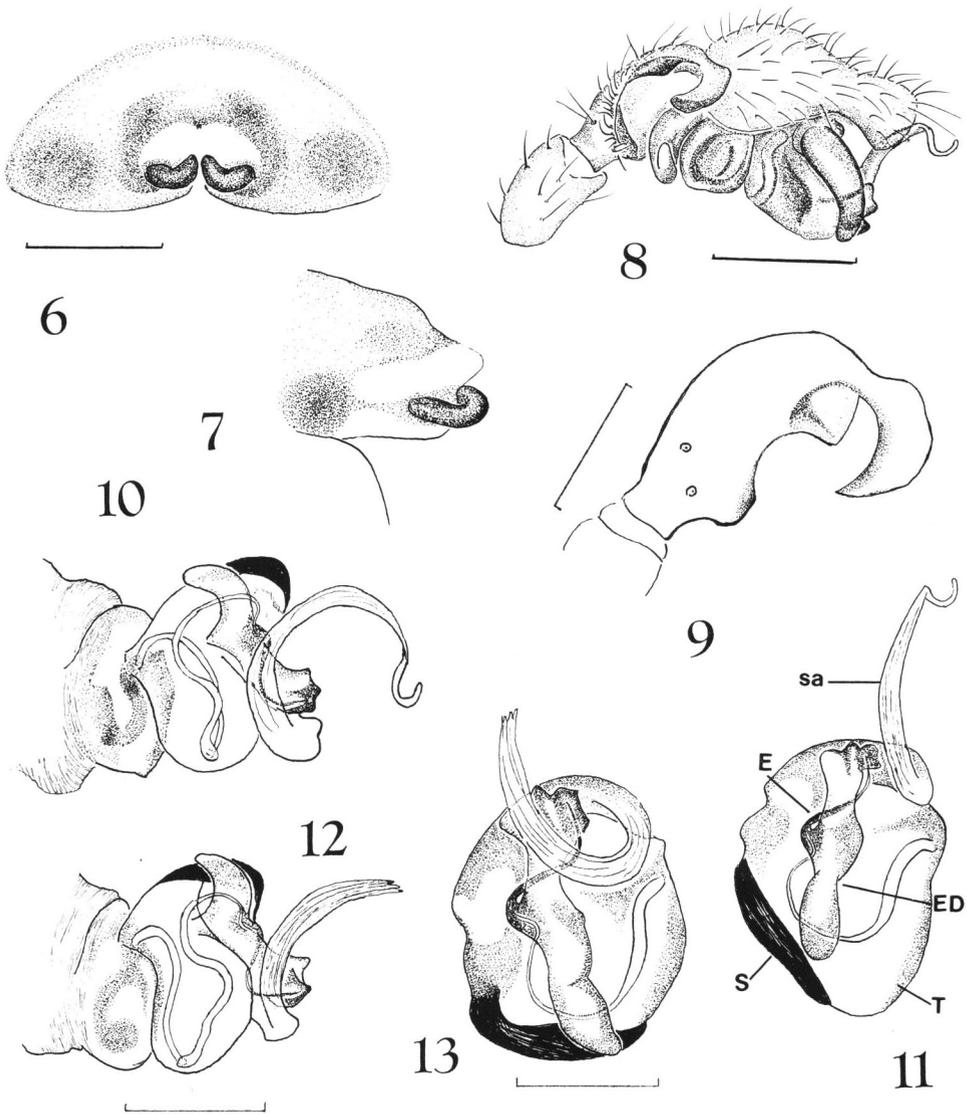
[Japanese name: Kita-zara-akamunegumo]

(Figs. 6–11)

*Type specimens.* Holotype: ♀, Sôunkyô, Kamikawa-chô, Kamikawa-gun, Hokkaido, Japan, 7–VI–1979, N. Yasuda leg. (NSMT-Ar 5093); paratypes: 1 ♂, same data as for the holotype (NSMT-Ar 5094), 1 ♂, same locality and same collector, 24–VI–1981 & 14–VI–1982 (NSMT-Ar 5095–5096), 2 ♀, Shirakawa, Kamikawa-chô, Kamikawa-gun, Hokkaido, 31–V–1983, N. Yasuda leg. (NSMT-Ar 5097–5098), 1 ♀ 1 ♂, Mt. Esaushi-yama, Kamikawa-chô, Kamikawa-gun, Hokkaido, 17–VI–1984 & 6–VI–1985, N. Yasuda leg. (NSMT-Ar 5099–5100).

*Other specimens examined.* 1 ♂, Sarobetsu-genya, Teshio-gun, Hokkaido, Japan, N. Yasuda leg., 2 ♂, Mt. Kuro-dake, Daisetsuzan Mts., Kamikawa-gun, Hokkaido, 11 & 14–VI–1982, N. Yasuda leg., 1 ♀ 1 ♂, Daisetsu-genseirin, Kamikawa-gun, Hokkaido, 22–VI & 15–IX–1982, N. Yasuda leg., 3 ♀, Engaru-chô, Monbetsu-gun, Hokkaido, 30–VI–1985, N. Tsurusaki leg., 2 ♀ 1 ♂, Monbetsu-yama, Monbetsu-shi, Hokkaido, 16–V, 13–VI & 4–VII–1986, N. Tsurusaki leg., 1 ♂, Bankei, Hokkaido, 11–V–1984, N. Tsurusaki leg., 1 ♂, Mt. Poroshiri-dake, Hidaka Mts., Hokkaido, S. Nakano & N. Tsurusaki leg., 1 ♀, Experimental Forests of Hokkaido University, Tomakomai-shi, Hokkaido, 15–VII–1983, N. Tsurusaki leg.

*Specimens used for comparison.* *Asperthorax communis* Oi, 1960: ♂ holotype, ♀ allotype and 1 ♀ 1 ♂ paratypes, from Nagaoka, Santô-chô, Sakata-gun, Shiga Pref., Honshu, Japan, 11–XI–1957, R. Oi leg. (NSMT-Ar 2687–2689); 5 ♀ 3 ♂, Mt. Gyôdô-san, Tsukiya-chô, Ashikaga-shi, Tochigi Pref., 13–III–1975, H. Saito leg.; and many ♀♂ from Aomori, Tochigi, Gunma, Ibaragi, Tokyo, Yamanashi, Aichi, Kyoto, Mie, Osaka and Hiroshima Prefs., Honshu, Ehime Pref., Shikoku, and Oita Pref., Kyushu (NSMT; Coll. H. Saito).



Figs. 6–13. 6–11, *Asperthorax borealis* sp. nov., female holotype (NSMT-Ar 5093) and a male paratype (NSMT-Ar 5094) from Hokkaido; 12–13, *Asperthorax communis* Oi, 1960 from Ashikaga-shi, Tochigi Pref., Honshu. — 6, Female genitalia (epigynum), ventral view; 7, epigynum, lateral view; 8, male palpus, retrolateral view; 9, tibia of male palp, dorsal view; 10 & 12, male palpus, expanded, prolateral view; 11 & 13, male palpus, expanded, frontal view. Abbreviations: E, embolus; ED, embolic division; S, suprategulum; sa, suprategular apophysis; T, tegulum. [Scales: 6–7, 9, 10–13, 0.1 mm; 8, 0.2 mm.]

*Description.* Female (holotype): Body length 2.51 mm, prosoma length 1.10 mm, width 1.00 mm; lengths of palp and legs [total length (femur+patella and tibia+metatarsus+tarsus)]: palp 1.00 mm (0.32+0.34+—+0.34), leg I 3.60 mm (1.07+1.17+0.78+0.59), II 3.25 mm (1.00+1.07+0.67+0.51), III 2.61 mm (0.78+0.80+0.60+0.43), IV 3.34 mm (1.05+1.10+0.73+0.46).

Prosoma: Carapace round pyriform, reddish brown, median furrow and radiating lines darker; eyes with black ring, anterior eye-row straight, distance between anterior median eyes slightly shorter than the radius of anterior median eye, distance between anterior median eye and anterior lateral eye equal to the diameter of anterior median eye; posterior eye-row almost straight, distance between posterior median eyes equal to the radius of posterior median eye, distance between posterior median eye and posterior lateral eye equal to the diameter of posterior median eye; clypeus shorter than the length of median ocular area. Sternum reddish brown, tinged with black, darker marginated, wider than long, posteriorly truncated. Chelicera laterally with stridulating files very fine and hardly visible, promargin of fang furrow with 6 teeth, retromargin with 5 teeth, the last (apical) one of each margin very small; legs reddish brown, the distal parts of femora and whole segments from patellae to tarsi tinged with black, especially in legs I–II, distance between coxae IV slightly longer than the diameter of coxa, the order of spines on the tibiae I–IV, 1111, all these spines shorter than the diameter of tibia, Tm IV present, Tm I ca. 0.25.

Opisthosoma almost globular, black and without any marking, but with two pairs of sigilla.

Female genitalia (Figs. 6–7): epigynum much wider than long, relatively extending ventrad, opening part with a pair of sclerotized processes reniform.

Male (a topotypical paratype; NSMT-Ar 5094): Body length 2.27 mm, prosoma length 1.05 mm, width 0.98 mm; lengths of legs [total length (femur+patella and tibia+metatarsus+tarsus)]: I 3.60 mm (1.05+1.17+0.78+0.60), II 3.30 mm (0.98+1.05+0.71+0.56), III 2.50 mm (0.73+0.80+0.56+0.41), IV 3.27 mm (1.00+1.10+0.71+0.46).

Chelicera with stridulating files very fine and hardly visible, promargin of fang furrow with 5 teeth, retromargin with 4 denticles; Tm I ca. 0.28; other characteristics in general appearance and coloration as same as those in the female.

Male palp (Figs. 8–11): Length of femur to patella 2 : 1 in ratio, tibia longer than patella, dorsally with a rostriform apophysis and two trichobothria (Fig. 9), embolic division slender, twisted twice and forming three parts in same length, the distal part apically furnished with three small apophyses, the middle part with a whip-shaped embolus derived from retrolateral surface, extending under the base of distal part to the underside of one of the three apical apophyses of the distal part strongly sclerotized, the proximal part long oval, attached to suprategulum, suprategular apophysis a cingulum, apically constricted and curved like a fishhook.

*Etymology.* The specific name is Latin, meaning “northern,” derived from the

distribution.

*Distribution.* Japan (Hokkaido).

*Remarks.* This new species closely resembles *Asperthorax communis* Oi, 1960 (Figs. 12–13), widely distributed in Honshu, Shikoku and Kyushu, Japan, but can be separated from the latter by the shape of epigynum and the structure of male palp, especially of the embolic division and the suprategular apophysis (cf. Figs. 10–11 and Figs. 12–13). Both the species are closely related to each other and at present allopatric.

The junior author (H. Saito) provisionally recorded *Asperthorax communis* from Hokkaido on the basis of a male specimen collected at Sôunkyô (Saito, 1982 b). In the paper, he suggested that the shape of “embolus” of the specimen from Hokkaido had an apical part constricted and strongly curved like a fishhook and different from those with a wide and serrated apical part in the specimens from Honshu and Kyushu. The term “embolus” used was of course not a real embolus but a suprategular apophysis, and its shape was clearly different between spiders from Hokkaido (*borealis*) and southern species (*communis*) as was explained above. The description of the male of *Asperthorax borealis* sp. nov. was made on the same specimen regarded as *A. communis* in the previous paper (Saito, 1982 b).

Subfamily Linyphiinae, s. lat.

[Japanese name: Saragumo-aka]

Genus *Nippononeta* Eskov, 1992

[Japanese name: Nippon-keshigumo-zoku]

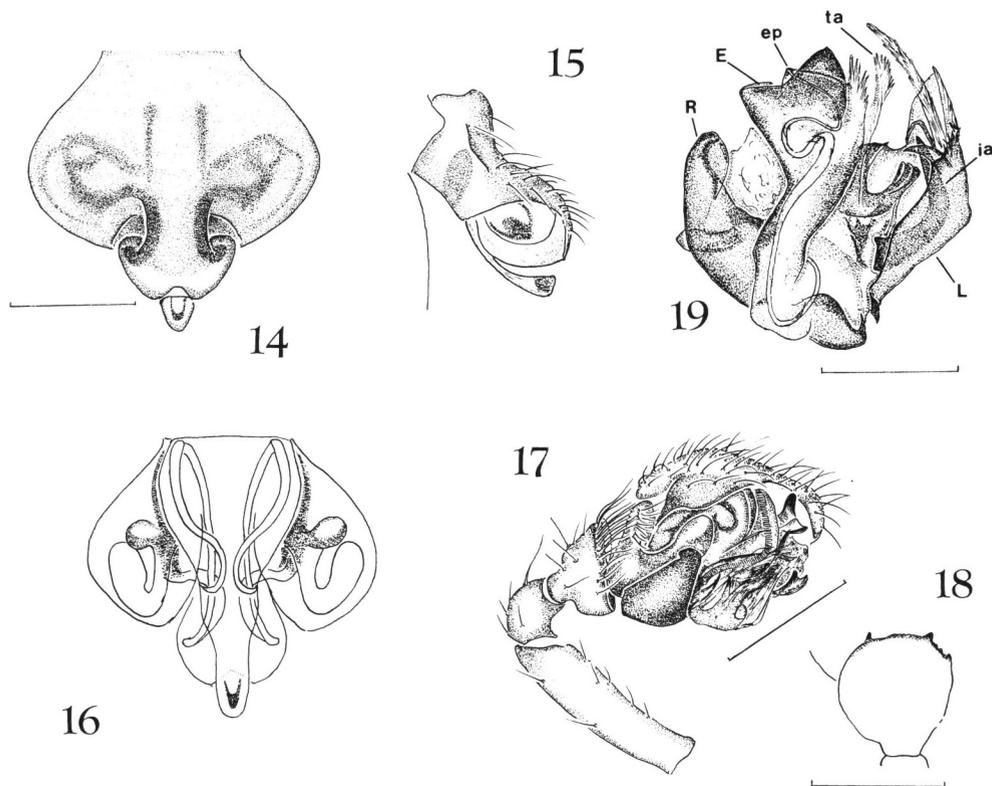
*Nippononeta kantonis* sp. nov.

[Japanese name: Kantou-keshigumo]

(Figs. 14–19)

*Type specimens.* Holotype: ♀, Node-hama, Nosaka-chô, Sôsa-gun, Chiba Pref., Honshu, Japan, 2–XI–1979, K. Niijima leg. (NSMT-Ar 5001); paratypes: 1 ♀ 1 ♂, same data as for the holotype (NSMT-Ar 5002–5003), 2 ♀ 2 ♂, Tsuchiuki, Sakura-shi, Chiba Pref., 9–III & 7–XI–1997, M. Nagashima leg. (NSMT-Ar 5004).

*Other specimens examined.* 10 ♀ 16 ♂, Shinrin-kôen Park, Sendai-shi, Miyagi Pref., Honshu, Japan, 5–VII–1982, K. Sasaki leg., 1 ♀ 1 ♂, Hasama-chô, Tome-gun, Miyagi Pref., 10–X–1986 & 22–III–1987, A. Tanikawa leg., 8 ♀ 4 ♂, Nikkô-shi, Tochigi Pref., 2–3–VII–1983, A. D. Blest leg., 2 ♀ 2 ♂, Nikkô-shi, Tochigi Pref., 11–V–1979, H. Saito leg., 1 ♀, Yumoto, Nikkô-shi, Tochigi Pref., 27–VIII–1974, H. Saito leg., 2 ♀ 1 ♂, Nagusa, Ashikaga-shi, Tochigi Pref., 26–IV–1976, H. Saito leg., 8 ♀ 4 ♂, Korofuji, Daigo-chô, Kuji-gun, Ibaragi Pref., 23–X–1993, H. Sakayori leg., 2 ♀ 1 ♂, Fukiage-gosho, Imperial Palace, Chiyoda-ku, Tokyo, 20–XI–1996, 23–VII–1998 & 2–III–2000, S. Nomura leg. (NSMT-Ar 5125–5127), 2 ♀, Yanagisawa-tôge,



Figs. 14–19. *Nippononeta kantonis* sp. nov., female holotype (NSMT-Ar 5001) and a male paratype (NSMT-Ar 5002) from Chiba Pref. — 14, Female genitalia (epigynum), ventral view; 15, epigynum, lateral view; 16, female genitalia, cleared, dorsal view; 17, male palp, retrolateral view; 18, tibia of male palp, dorsal view; 19, embolic division of male palp, dorsal view. Abbreviations: E, embolus; ep, embolus proper; ia, interior apophysis; L, lamella characteristic; R, radix; ta, terminal apophysis. [Scales: 14–16, 18–19, 0.1 mm; 17, 0.2 mm.]

Enzan-shi, Yamanashi Pref., 1–VIII–1981, S. Matsumoto leg., 1 ♂, Kawaguchiko-chô, Minamitsuru-gun, Yamanashi Pref., 12–VI–1983, A. D. Blest leg.

*Description.* Female (holotype): Body length 1.39 mm, prosoma length 0.66 mm, width 0.49 mm; lengths of palp and legs [total length (femur+patella and tibia+metatarsus+tarsus)]: palp 0.61 mm (0.20+0.20+–+0.21), leg I 2.17 mm (0.61+0.71+0.46+0.39), II 1.95 mm (0.56+0.66+0.39+0.34), III 1.74 mm (0.49+0.54+0.37+0.34), IV 2.15 mm (0.61+0.71+0.46+0.37).

Prosoma: Carapace dusky yellowish brown, finely margined with black; eyes with black ring, anterior eye-row straight, distance between anterior median eyes shorter than diameter of anterior median eye, distance between anterior median eye and anterior lateral eye almost equal to the radius of anterior median eye; posterior

eye-row almost straight, all the posterior eyes equidistant (radius of posterior median eye) from each other; clypeus much shorter than the length of median ocular area. Sternum dusky yellowish brown, as long as wide, cordate and rounded, convex, posteriorly pointed. Chelicera light yellowish brown, stridulating files present at the side, promargin of fang furrow with 5 teeth, retromargin with 4 teeth; legs dusky but light yellowish brown, distance between coxae IV as long as the diameter of coxa, the order of spines on the tibiae I–IV, 2222, Tm IV absent, Tm I ca. 0.26.

Female genitalia (Figs. 14–16): epigynum large and projecting posteriorly, ventral plate with a hollow at the middle, dorsal plate pyriform, long and slender.

Opisthosoma ovate, light yellowish brown, with indistinct black markings at the sides.

Male (a topotypical paratype; NSMT-Ar 5002): Body length 1.54 mm, prosoma length 0.78 mm, width 0.61 mm; lengths of legs [total length (femur+patella and tibia+metatarsus+tarsus)]: I 2.58 mm (0.73+0.83+0.56+0.46), II 2.26 mm (0.61+0.73+0.51+0.41), III 1.96 mm (0.54+0.61+0.48+0.33), IV 2.51 mm (0.71+0.83+0.58+0.39).

Anterior eye-row straight, distance between anterior median eyes as long as radius of anterior median eye, distance between anterior median eye and anterior lateral eye longer than radius of anterior median eye; posterior eye-row almost straight, distance between posterior median eyes equal to the radius of posterior median eye, distance between posterior median eye and posterior lateral eye slightly longer than the radius of posterior median eye; chelicera: promargin of fang furrow with 4 teeth, two of these situated near to fang very small and vestigial; Tm I ca. 0.26; other characteristics in general appearance and coloration as same as those in female.

Male palp (Figs. 17–19): Length of femur to patella 4:1 in ratio, tibia large, longer than patella, dorsal margin of the apical part strongly sclerotized and with several denticles (Fig. 18); paracymbium robust, strongly curved, proximally with many setae; embolic division as in Fig. 19, lamella (L) distally with various apophyses, anterior one (ia) horn-shaped, strong and curved.

*Etymology.* The specific name is derived from a Japanese word “Kanto” formerly meaning the eastern area of Honshu east of the Barriers of Suzuka, Fuwa and Arachi. This new species is distributed in the eastern Honshu between Miyagi and Yamanashi Prefectures.

*Distribution.* Japan (Honshu).

*Remarks.* This new species is closely related to *Nippononeta pentagona* (Oi, 1960), *N. projecta* (Oi, 1960) and the next new species but can be easily distinguished from these species by genital organs of both the sexes, especially by the peculiar shape of tibia and embolic division of palp in males and the shape of dorsal and ventral plates of genitalia in females.

*Nippononeta kaiensis* sp. nov.

[Japanese name: Kai-keshigumo]

(Figs. 20–25)

*Type specimens.* Holotype: ♀, Kawaguchiko-machi, Minami-tsuru-gun, Yamanashi Pref., Honshu, Japan, 12–VI–1983, A. D. Blest leg. (NSMT-Ar 5079); paratypes: 5 ♀ 3 ♂, same data as for the holotype (NSMT-Ar 5080–5081).

*Other specimens examined.* 4 ♀, Ido-Shitchi, Kanuma-shi, Tochigi Pref., 26–VI–1977, H. Saito leg.; 11 ♀ 2 ♂, Onuma, Mt. Akagi-san, Seta-gun, Gunma Pref., 16–VI–1979, H. Saito leg.; 1 ♀, foot of Yatsugatake Mts., Kitakoma-gun, Yamanashi Pref., 10–X–1970, S. Gonda leg.

*Description.* Female (holotype): Body length 1.56 mm, prosoma length 0.61 mm, width 0.49 mm; lengths of palp and legs [total length (femur+patella and tibia+metatarsus+tarsus)]: palp 0.52 mm (0.17+0.15+--+0.20), leg I 1.97 mm (0.54+0.65+0.41+0.37), II 1.83 mm (0.51+0.59+0.39+0.33), III 1.51 mm (0.44+0.46+0.34+0.27), IV 1.98 mm (0.56+0.66+0.43+0.33).

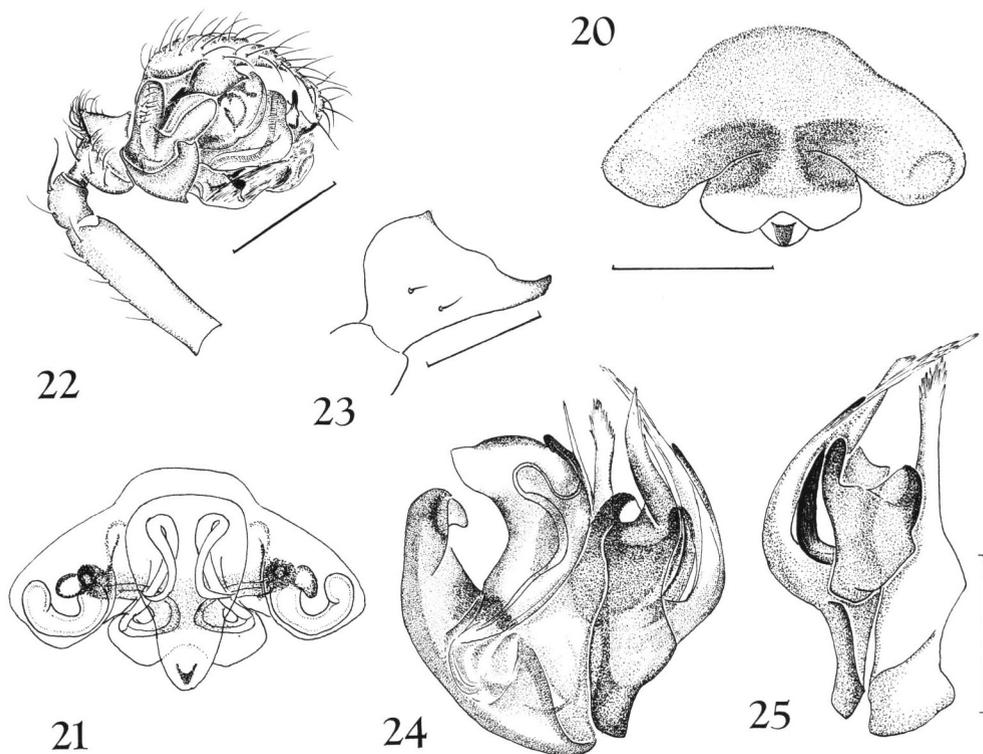
Prosoma: Carapace yellowish brown, tinged with black, median furrow and radiating lines distinct and blackish, the hexagonal, black marking behind head distinct; eyes with black ring, anterior eye-row slightly procurved, anterior eyes equidistant and distance between them equal to the radius of anterior median eye; posterior eye-row almost straight, posterior eyes equidistant, distance between them equal to the radius of posterior median eyes; clypeus shorter than the length of median ocular area. Sternum blackish brown, slightly longer than wide, posteriorly truncated. Chelicera light yellowish brown tinged with black, stridulating files present at the side, promargin of fang furrow with 5 teeth, retromargin with 4 denticles; legs light yellowish brown, distance between coxae IV longer than the diameter of coxa, the order of spines on the tibiae I–IV, 2222, Tm IV absent, Tm I ca. 0.26.

Opisthosoma ovate, greyish black.

Female genitalia (Figs. 20–21): epigynum wider than long, dorsal plate pyriform.

Male (a topotypical paratype; NSMT-Ar 5080): Body length 1.34 mm, prosoma length 0.68 mm, width 0.56 mm; lengths of legs [total length (femur+patella and tibia+metatarsus+tarsus)]: I 2.19 mm (0.59+0.71+0.49+0.40), II 2.05 mm (0.56+0.66+0.46+0.37), III 1.70 mm (0.49+0.54+0.37+0.30), IV 2.17 mm (0.61+0.73+0.49+0.34).

Anterior eye-row straight, distance between anterior median eyes shorter than the radius of anterior median eye, distance between anterior median eye and anterior lateral eye equal to the diameter of anterior median eye; posterior eye-row almost straight, distance between posterior median eyes equal to the radius of posterior median eye, distance between posterior median eye and posterior lateral eye slightly longer than the radius of posterior median eye; sternum as long as wide; chelicera



Figs. 20–25. *Nippononeta kaiensis* sp. nov., female holotype (NSMT-Ar 5079) and a male paratype (NSMT-Ar 5080) from Yamanashi Pref. — 20, Female genitalia (epigynum), ventral view; 21, female genitalia, cleared, dorsal view; 22, male palp, retrolateral view; 23, tibia of male palp, dorsal view; 24, embolic division of male palp, dorsal view; 25, lamella and interior apophysis of embolic division, ventral view. [Scales: 20–21, 23–25, 0.1 mm; 22, 0.2 mm.]

with stridulating files at the side, promargin of fang furrow with 4 teeth; distance between coxae IV equal to the diameter of the coxa,  $Tm\ I$  ca. 0.28; other characteristics in general appearance and coloration as same as those in the female.

Male palp (Figs. 22–25): Length of femur to patella 4 : 1 in ratio, tibia large and longer than patella, dorsal margin relatively simple with a digitiform apophysis a wide tooth (Fig. 23), paracymbium strongly curved, promargin at the middle furnished with a digitiform apophysis flat and semitransparent; embolic division as in Figs. 24–25, interior apophysis (ia) strongly curved at near the base, vertically extending and apically pointed.

*Etymology.* The specific name is derived from a Japanese word “Kai”, an old name of Yamanashi Prefecture.

*Distribution.* Japan (Honshu).

*Remarks.* This new species stands closest to *Nippononeta pentagona* (Oi, 1960), but can be distinguished from the latter by the details of male palpal organ and the structure of female genitalia.

*Nippononeta masudai* sp. nov.

[Japanese name: Daibosatsu-keshigumo]

(Figs. 26–31)

*Type specimens.* Holotype: ♀, Mt. Daibosatsu-rei, 2057 m alt., Enzan-shi, Yamanashi Pref., Honshu, Japan, 15–X–1999, H. Saito leg. (NSMT-Ar 5011); paratypes: 7 ♀ 14 ♂, same data as for the holotype (NSMT-Ar 5012–5013).

*Description.* Female (holotype): Body length 1.46 mm, prosoma length 0.68 mm, width 0.51 mm; lengths of palp and legs [total length (femur+patella and tibia+metatarsus+tarsus)]: palp 0.62 mm (0.20+0.20+–+0.22), leg I 2.31 mm (0.61+0.78+0.51+0.41), II 2.19 mm (0.61+0.71+0.49+0.38), III 1.79 mm (0.51+0.56+0.40+0.32), IV 2.27 mm (0.63+0.76+0.51+0.37).

Prosoma: Carapace yellowish brown, strongly tinged with black, margined with black, median furrow, radiating lines and hexagonal marking distinct and black; eyes with black ring, anterior eye-row straight, distance between anterior median eyes almost equal to the radius of anterior median eye, distance between anterior median eye and anterior lateral eye slightly shorter than the diameter of anterior median eye; posterior eye-row nearly straight, all the posterior eyes equidistant (radius of posterior median eye) from each other; clypeus slightly shorter than the length of median ocular area. Sternum blackish brown, almost as long as wide, convex and posteriorly truncated, sparsely covered by long hairs. Chelicera light yellowish brown, tinged with black, promargin of fang furrow with 5 teeth, retromargin also with 5 teeth, but distal two near fang touching basally; legs light yellowish brown, slightly tinged with black, distance between coxae IV slightly longer than the diameter of coxa, the order of spines on the tibiae I–IV, 2222, Tm IV absent, Tm I ca. 0.33.

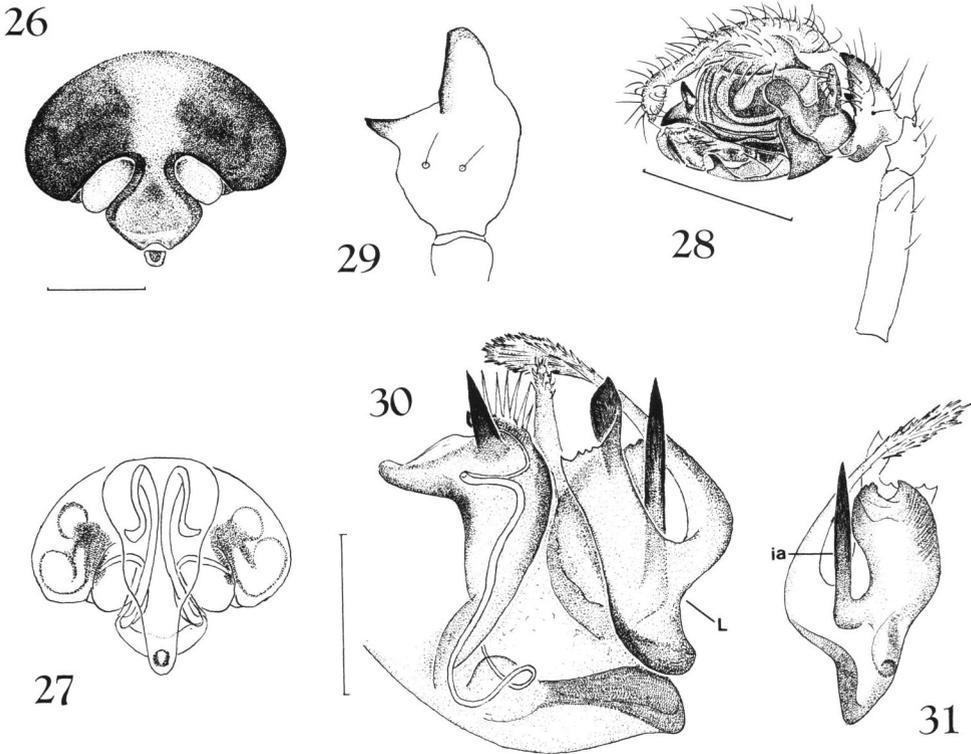
Female genitalia (Figs. 26–27): epigynum wider than long, black and very dark, dorsal plate pyriform and long.

Opisthosoma ovate, greyish black, without distinct marking.

Male (a topotypical paratype; NSMT-Ar 5012): Body length 1.34 mm, prosoma length 0.68 mm, width 0.56 mm; lengths of legs [total length (femur+patella and tibia+metatarsus+tarsus)]: I 2.29 mm (0.61+0.77+0.51+0.40), II 2.12 mm (0.59+0.68+0.46+0.39), III 1.80 mm (0.51+0.56+0.39+0.34), IV 2.30 mm (0.63+0.77+0.51+0.39).

Chelicera: promargin of fang furrow with 5 teeth, retromargin with 3 (left) or 4 (right) teeth; other characteristics in general appearance and coloration as same as those in the female.

Male palp (Figs. 28–31): Length of femur to patella 4:1 in ratio, tibia large,



Figs. 26–31. *Nippononeta masudai* sp. nov., female holotype (NSMT-Ar 5011) and a male paratype (NSMT-Ar 5012) from Yamanashi Pref. — 26, Female genitalia (epigynum), ventral view; 27, female genitalia, cleared, dorsal view; 28, male palp, retrolateral view; 29, tibia of male palp, dorsal view; 30, embolic division of male palp, dorsal view; 31, lamella and interior apophysis of embolic division, ventral view. Abbreviations: ia, interior apophysis; L, lamella characteristic. [Scales: 26–27, 29–31, 0.1 mm; 28, 0.2 mm.]

longer than patella, dorsal margin of the apical part with two apophyses (Fig. 29), the smaller one extending retrolaterad and apically pointed; paracymbium robust, basally with several setae, prolateral margin with a semitransparent apophysis round and digitiform, embolic division (Figs. 30–31) with interior apophysis (ia) spiniform and not curved, a spiniform (much pointed) apophysis present on the apical margin of embolus.

*Etymology.* This species is dedicated to Mr. Shigeru Masuda, owner and host of Kaizans, a mountain cottage standing near the top of Mt. Daibosatsu-rei (the type locality).

*Distribution.* Japan (known only from the type locality).

*Remarks.* This species is unique in the shape of tibia and embolic division of male palp and in the structure of female genitalia, and can be easily distinguishable

from all species of the genus.

*Nippononeta alpina* sp. nov.

[Japanese name: Miyama-nippon-keshigumo]  
(Figs. 32–37)

*Type specimens.* Holotype: ♀, Mt. Mitsutôge-yama on a border between Tsuru-shi and Minamitsuru-gun, 1780 m alt., Yamanashi Pref., Honshu, Japan, 22-X-2000, H. Saito leg. (NSMT-Ar 5008); paratypes: 10 ♀ 7 ♂, same data as for the holotype (NSMT-Ar 5009–5010).

*Description.* Female (holotype): Body length 1.71 mm, prosoma length 0.68 mm, width 0.54 mm; lengths of palp and legs [total length (femur+patella and tibia+metatarsus+tarsus)]: palp 0.66 mm (0.22+0.20+--+0.24), leg I 2.54 mm (0.66+0.83+0.59+0.46), II 2.30 mm (0.63+0.73+0.51+0.43), III 1.94 mm (0.56+0.61+0.43+0.34), IV 2.48 mm (0.68+0.80+0.59+0.41).

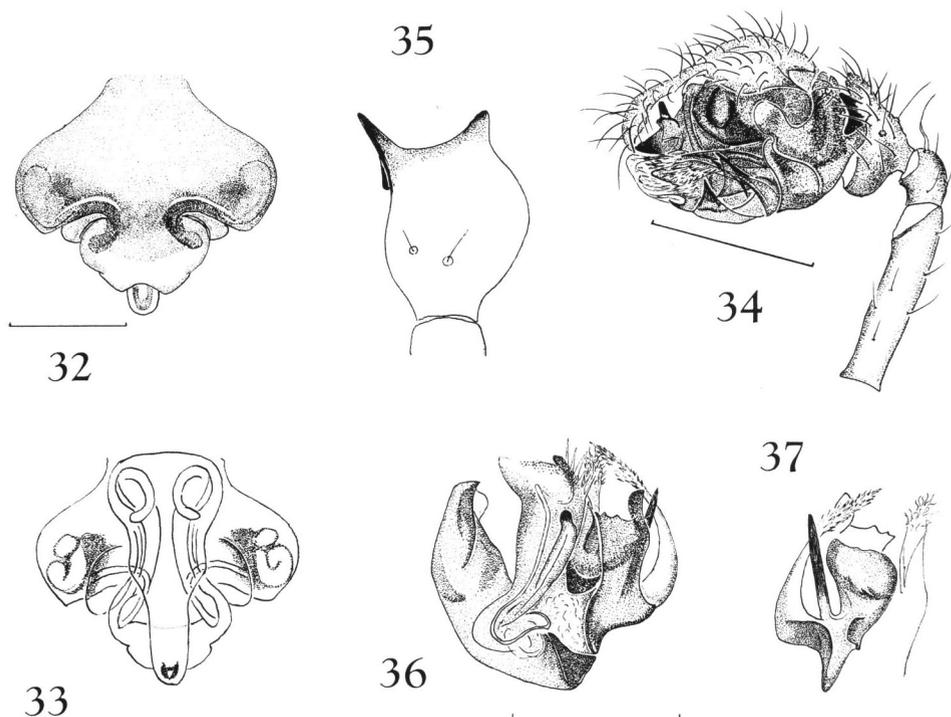
Prosoma: Carapace dusky yellowish brown, darker margined, median furrow and radiating lines distinct and black, the hexagonal black marking behind ocular area also distinct; eyes with black ring, anterior eye-row straight, distance between anterior median eyes equal to the radius of anterior median eye, distance between anterior median eye and anterior lateral eye equal to the diameter of anterior median eye; posterior eye-row slightly recurved, all the posterior eyes equidistant (radius of posterior median eye) from each other, both the lateral eyes close to each other; clypeus shorter than the length of median ocular area. Sternum blackish brown, almost as long as wide. Chelicera yellowish brown, stridulating files present at the side, pro- and retromargins of fang furrow with 5 teeth, respectively, in both the rows of teeth the distal two near fang touching basally; legs light yellowish brown, slightly tinged with black, distance between coxae IV equal to the diameter of coxa, the order of spines on the tibiae I–IV, 2222, Tm IV absent, Tm I ca. 0.27.

Female genitalia (Figs. 32–33): epigynum almost as long as wide, dorsal plate wide.

Opisthosoma ovate, greyish black, without markings.

Male (a topotypical paratype; NSMT-Ar 5009): Body length 1.46 mm, prosoma length 0.63 mm, width 0.49 mm; lengths of legs [total length (femur+patella and tibia+metatarsus+tarsus)]: I 2.27 mm (0.61+0.74+0.51+0.41), II 2.06 mm (0.56+0.66+0.46+0.38), III 1.75 mm (0.49+0.55+0.39+0.32), IV 2.17 mm (0.61+0.71+0.51+0.34).

Anterior eye-row straight, distance between anterior median eyes shorter than the radius of anterior median eye, distance between anterior median eye and anterior lateral eye almost equal to the diameter of anterior median eye; posterior eye-row slightly recurved, distance between posterior median eyes equal to the radius of posterior median eye, distance between posterior median eye and posterior lateral eye



Figs. 32–37. *Nippononeta alpina* sp. nov., female holotype (NSMT-Ar 5008) and a male paratype (NSMT-Ar 5009) from Yamanashi Pref. — 32, Female genitalia (epigynum), ventral view; 33, female genitalia, cleared, dorsal view; 34, male palp, retrolateral view; 35, tibia of male palp, dorsal view; 36, embolic division of male palp, dorsal view; 37, lamella and interior apophysis of embolic division, ventral view. [Scales: 32–33, 35–37, 0.1 mm; 34, 0.2 mm.]

slightly longer than the radius of posterior median eye; sternum blackish brown, convex, sparsely covered by long hairs, almost as long as wide, posteriorly truncated; chelicera yellowish brown, slightly tinged with red, stridulating files present at the side, promargin of fang furrow with 4 teeth, retromargin with 3 denticles; distance between coxae IV equal to the diameter of coxa, Tm I ca. 0.25; other characteristics in general appearance and coloration as same as those in the female.

Male palp (Figs. 34–37): Length of femur to patella 10:3 in ratio, tibia large, longer than patella, dorsal margin of the apical part with two apophyses (Fig. 35), the ectal one similar to the shape of caudal fin of a fish; embolic division (Figs. 36–37) without apophyses on its basal part and near embolic proper.

*Etymology.* The specific name is Latin, meaning “alpine.” Spiders of this species were collected from the mountainous area in Yamanashi Prefecture.

*Distribution.* Japan (known only from the type locality).

*Remarks.* The embolic division of male palp of this new species is closely re-

sembles that of *Nippononeta ogatai* sp. nov., however it lacks apophyses on the basal part and near the embolic proper, and the details of lamella and terminal apophysis are different from those of the latter species. *Nippononeta alpina* also resembles *N. pentagona* (Oi, 1960) and *N. projecta* (Oi, 1960), but is easily distinguished from these species by the shape of tibia and embolic division of male palp as well as the shape of epigynum.

***Nippononeta ogatai* sp. nov.**

[Japanese name: Ogata-nippon-keshigumo]

(Figs. 38–43)

*Type specimens.* Holotype: ♀, Mt. Rokushozan, Sakaué-chô, Toyota-shi, Aichi Pref., Honshu, Japan, 5–V–1988, K. Ogata leg. (NSMT-Ar 5017); paratypes: 19 ♀ 12 ♂, same data as for the holotype (NSMT-Ar 5018–5019), 2 ♀ 1 ♂, same locality and collector as for the holotype, 16–V–1987 (NSMT-Ar 5020).

*Description.* Female (holotype): Body length 1.80 mm, prosoma length 0.68 mm, width 0.53 mm; lengths of palp and legs [total length (femur+patella and tibia+metatarsus+tarsus)]: palp 0.64 mm (0.20+0.22+–+0.22), leg I 2.38 mm (0.68+0.78+0.51+0.41), II 2.15 mm (0.61+0.68+0.49+0.37), III 1.82 mm (0.51+0.59+0.40+0.32), IV 2.37 mm (0.68+0.78+0.54+0.37).

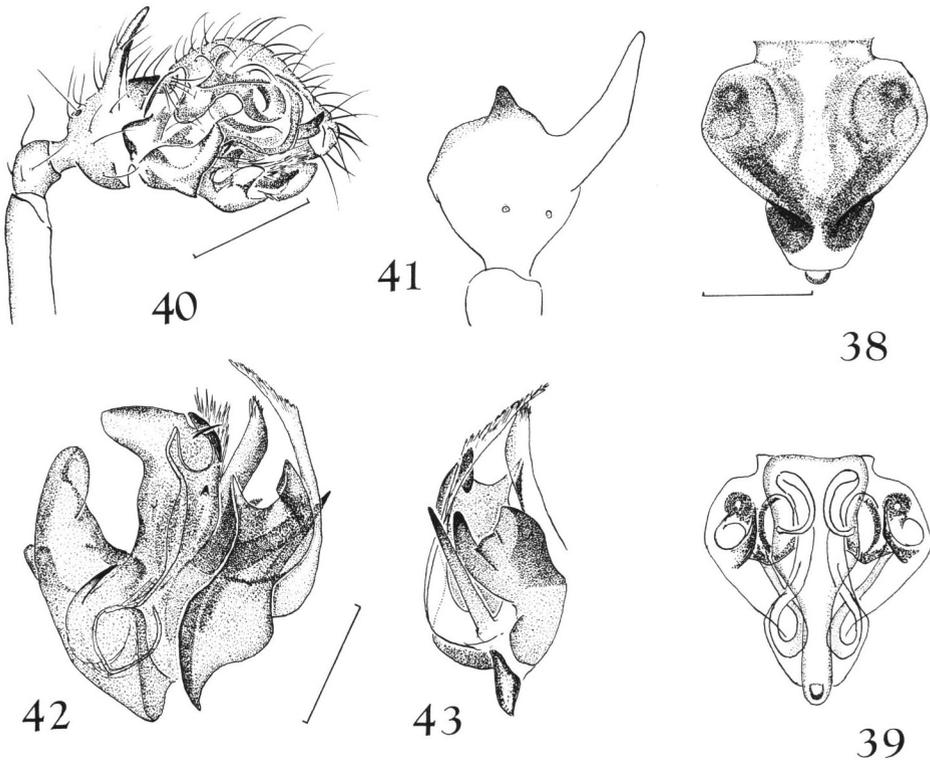
Prosoma: Carapace dusky yellowish brown, darker marginated; eyes with black ring, anterior eye-row slightly procurved, anterior eyes equidistant (relatively shorter than the radius of anterior median eye) from each other; posterior eye-row slightly recurved, posterior eyes equidistant (radius of posterior median eye) from each other; clypeus shorter than the length of median ocular area. Sternum blackish brown, slightly longer than wide. Chelicera light yellowish brown, slightly tinged with red, stridulating files present at the side, promargin of fang furrow with 6 teeth, retromargin with 5 denticles; legs slender and long, distance between coxae IV slightly longer than the diameter of coxa, the order of spines on the tibiae I–IV, 2222, Tm IV absent, Tm I ca. 0.26.

Female genitalia (Figs. 38–39): epigynum longer than wide, triangle, dorsal plate long, pyriform.

Opisthosoma ovate, yellowish brown, without markings.

Male (a topotypical paratype; NSMT-Ar 5018): Body length 1.51 mm, prosoma length 0.73 mm, width 0.59 mm; lengths of legs [total length (femur+patella and tibia+metatarsus+tarsus)]: I 2.40 mm (0.68+0.78+0.54+0.40), II 2.26 mm (0.63+0.73+0.51+0.39), III 1.86 mm (0.54+0.59+0.41+0.32), IV 2.37 mm (0.68+0.78+0.54+0.37).

Anterior eye-row straight, distance between anterior median eyes shorter than the diameter of anterior median eye, distance between anterior median eye and anterior lateral eye almost equal to the diameter of anterior median eye; posterior eye-row



Figs. 38–43. *Nippononeta ogatai* sp. nov., female holotype (NSMT-Ar 5017) and a male paratype (NSMT-Ar 5018) from Aichi Pref. — 38, Female genitalia (epigynum), ventral view; 39, female genitalia, cleared, dorsal view; 40, male palp, retrolateral view; 41, tibia of male palp, dorsal view; 42, embolic division of male palp, dorsal view; 43, lamella and interior apophysis of embolic division, ventral view. [Scales: 38–39, 41–43, 0.1 mm; 40, 0.2 mm.]

slightly recurved, distance between posterior median eyes shorter than the radius of posterior median eye, distance between posterior median eye and posterior lateral eye longer than the radius of posterior median eye, clypeus shorter than the length of median ocular area; chelicera yellowish brown, tinged with red, stridulating files present at the side, promargin of fang furrow with 4 teeth, retromargin with 3 vestigial denticles; Tm I ca. 0.26; other characteristics in general appearance and coloration as same as those in the female.

Male palp (Figs. 40–43): Length of femur to patella 3 : 1 in ratio, tibia large, longer than patella, dorsal margin of the apical part furnished with two apophyses, the median one strongly sclerotized and the retrolateral one large, digitiform and curved inward at the middle (Fig. 41), paracymbium robust, retromargin with a triangle apophysis near the base and several setae at the base; embolic division (Figs. 42–43) with interior apophysis (ia) straight, spiniform, not curved (Fig. 43), embolus

with a retrolateral hook at the middle, and a thin apophysis at the inner part of the base, the latter one slightly curved and apically pointed, near embolus proper a short spiniform apophysis present.

*Etymology.* The species is dedicated to Mr. Kiyoto Ogata, Aichi, the collector of the type material.

*Distribution.* Japan (known only from the type locality).

*Remarks.* Females of this new species resemble those of the next new species, *Nippononeta xiphoidea* sp. nov., but distinguished from the latter by the shape of dorsal plate of epigynum. Males are easily separated from other congeners by the structure of the embolic division of their palp.

*Nippononeta xiphoidea* sp. nov.

[Japanese name: Hourai-keshigumo]

(Figs. 44–49)

*Type specimens.* Holotype: ♀, Mt. Hōrai-jisan, Hōrai-chō, Minami-shitara-gun, Aichi Pref., Honshu, Japan, 6–XI–1992, K. Ogata leg. (NSMT-Ar 5021); paratypes: 3 ♀ 2 ♂, same data as for the holotype (NSMT-Ar 5022–5023), 3 ♀ 1 ♂, same locality and collector as for the holotype, 18–VII–1993 (NSMT-Ar 5024).

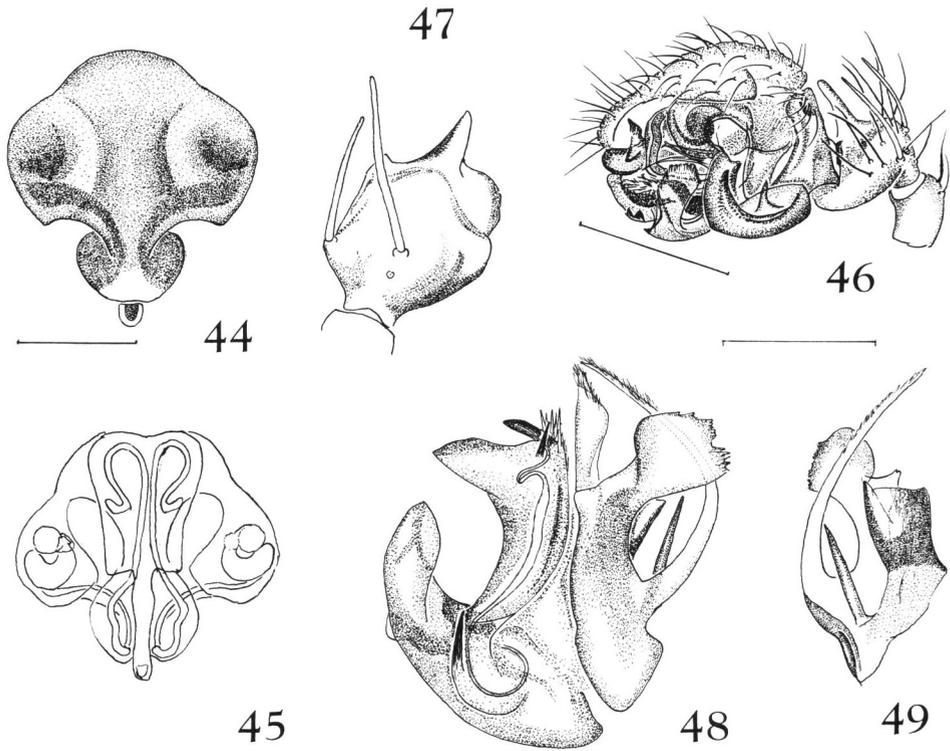
*Description.* Female (holotype): Body length 1.71 mm, prosoma length 0.61 mm, width 0.49 mm; lengths of palp and legs [total length (femur+patella and tibia+metatarsus+tarsus)]: palp 0.60 mm (0.20+0.20+–+0.20), leg I 2.26 mm (0.61+0.71+0.54+0.40), II 2.00 mm (0.54+0.63+0.46+0.37), III 1.69 mm (0.49+0.54+0.37+0.29), IV 2.18 mm (0.63+0.71+0.49+0.35).

*Prosoma:* Carapace yellowish brown, darker marginated, radiating lines distinct and black; eyes with black ring, anterior eye-row straight, distance between anterior median eyes almost equal to the radius of anterior median eye, distance between anterior median eye and anterior lateral eye equal to the diameter of anterior median eye; posterior eye-row almost straight, posterior eyes equidistant (radius of posterior median eye) from each other, posterior lateral eyes smaller than the posterior medians; clypeus shorter than the length of median ocular area. Sternum blackish brown, almost as long as wide, posterior margin projecting but blunt. Chelicera yellowish brown, stridulating files present at the side, promargin of fang furrow with 5 teeth, retromargin with 4 teeth; legs yellowish brown, slender and long, distance between coxae IV slightly shorter than the diameter of coxa, the order of spines on the tibiae I–IV, 2222, Tm IV absent, Tm I ca. 0.26.

*Female genitalia* (Figs. 44–45): epigynum longer than wide, dorsal plate long, spade-shaped, distal part strongly narrowed.

*Opisthosoma* ovate, yellowish brown, without markings.

*Male* (a topotypical paratype; NSMT-Ar 5022): Body length 1.59 mm, prosoma length 0.73 mm, width 0.59 mm; lengths of legs [total length (femur+patella and



Figs. 44–49. *Nippononeta xiphoidea* sp. nov., female holotype (NSMT-Ar 5021) and a male paratype (NSMT-Ar 5022) from Aichi Pref. — 44, Female genitalia (epigynum), ventral view; 45, female genitalia, cleared, dorsal view; 46, male palp, retrolateral view; 47, tibia of male palp, dorsal view; 48, embolic division of male palp, dorsal view; 49, lamella and interior apophysis of embolic division, ventral view. [Scales: 44–45, 47–49, 0.1 mm; 46, 0.2 mm.]

tibia+metatarsus+tarsus): I 2.54 mm (0.68+0.83+0.59+0.44), II 2.26 mm (0.63+0.73+0.51+0.39), III 1.91 mm (0.54+0.61+0.44+0.32), IV 2.39 mm (0.66+0.76+0.59+0.39).

Anterior eye-row straight, distance between anterior median eyes equal to the radius of anterior median eye, distance between anterior median eye and anterior lateral eye equal to the diameter of anterior median eye; posterior eye-row almost straight, distance between posterior median eyes equal to the radius of posterior median eye, distance between posterior median eye and posterior lateral eye slightly longer than the radius of posterior median eye, clypeus as long as the length of median ocular area; chelicera with stridulating files at the side, promargin of fang furrow with 4 teeth, retromargin with 3 small denticles; Tm I ca. 0.29; other characteristics in general appearance and coloration as same as those in the female.

Male palp (Figs. 46–49): Length of femur to patella ca. 8 : 3 in ratio, tibia large,

longer than patella, dorsal margin of the apical part furnished with a long conical apophysis apically pointed and two thick and gladiate spines (Fig. 47), paracymbium strongly curved in U-shape, with a spiniform apophysis on the bottom, promargin with a digitiform swelling flat and semitransparent; embolic division (Figs. 48-49) with interior apophysis (ia) straight and not curved (Fig. 49).

*Etymology.* The specific name is Latin, meaning "sword-shaped," derived from the shape of spines on the male palpal tibia.

*Distribution.* Japan (known only from the type locality).

*Remarks.* This new species seems closest to *Nippononeta ogatai* sp. nov., especially in the structure of embolic division of male palp, but is distinguished from the latter by the shape of embolus and lamella in details of male palpal organ and the structure of female genitalia.

*Nippononeta elongata* sp. nov.

[Japanese name: Michinoku-keshigumo]

(Figs. 50-57)

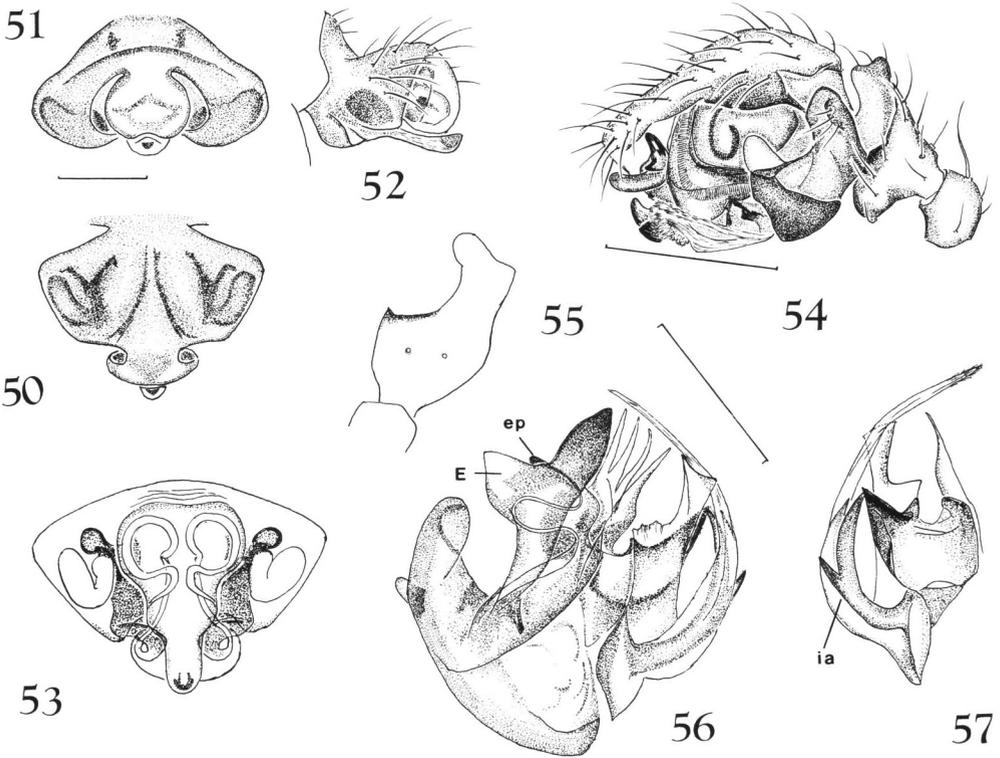
*Type specimens.* Holotype: ♀, Sendai-shi, Miyagi Pref., Honshu, Japan, 20-V-1983, A. D. Blest leg. (NSMT-Ar 5014); paratypes: 19 ♀15 ♂, same data as for the holotype (NSMT-Ar 5015-5016).

*Description.* Female (holotype): Body length 1.56 mm, prosoma length 0.71 mm, width 0.51 mm; lengths of palp and legs [total length (femur+patella and tibia+metatarsus+tarsus)]: palp 0.57 mm (0.20+0.17+–+0.20), leg I 2.08 mm (0.56+0.71+0.44+0.37), II 1.90 mm (0.56+0.63+0.39+0.32), III 1.58 mm (0.46+0.51+0.34+0.27), IV 2.13 mm (0.61+0.73+0.46+0.33).

Prosoma: Carapace dusky yellowish brown, finely margined with black, radiating lines distinct and black, a hexagonal black marking present behind ocular area; eyes with black ring, anterior eye-row slightly recurved, distance between anterior median eyes equal to the radius of anterior median eye, distance between anterior median eye and anterior lateral eye longer than the radius of anterior median eye; posterior eye-row almost straight, all the posterior eyes equidistant (radius of posterior median eye) from each other, posterior median eye slightly larger than posterior lateral eye; clypeus longer than the length of median ocular area. Sternum yellowish brown, tinged with black, darker margined, almost as long as wide. Chelicera light yellowish brown, stridulating files present at the side, promargin of fang furrow with 5 teeth, retromargin with 4 teeth; legs slender and long, distance between coxae IV slightly longer than the diameter of coxa, the order of spines on the tibiae I-IV, 2222, Tm IV absent, Tm I ca. 0.26.

Female genitalia (Figs. 50-53): epigynum almost as long as wide, dorsal plate pyriform.

Opisthosoma ovate, greyish black, without markings.



Figs. 50–57. *Nippononeta elongata* sp. nov., female holotype (NSMT-Ar 5014) and a male paratype (NSMT-Ar 5015) from Miyagi Pref. — 50, Female genitalia (epigynum), ventral view; 51, epigynum, caudal view; 52, epigynum, lateral view; 53, female genitalia, cleared, dorsal view; 54, male palp, retrolateral view; 55, tibia of male palp, dorsal view; 56, embolic division of male palp, dorsal view; 57, lamella and interior apophysis of embolic division, ventral view. Abbreviations: E, embolus; ep, embolus proper; ia, interior apophysis. [Scales: 50–53, 55–57, 0.1 mm; 54, 0.2 mm.]

Male (a topotypical paratype; NSMT-Ar 5015): Body length 1.58 mm, prosoma length 0.73 mm, width 0.59 mm; lengths of legs [total length (femur+patella and tibia+metatarsus+tarsus)]: I 2.36 mm (0.66+0.78+0.51+0.41), II 2.14 mm (0.59+0.71+0.46+0.38), III 1.83 mm (0.51+0.56+0.44+0.32), IV 2.41 mm (0.68+0.73+0.56+0.44).

Carapace light brown, finely margined with black; anterior eye-row slightly recurved, distance between anterior median eyes equal to the radius of anterior median eye, distance between anterior median eye and anterior lateral eye nearly same as the diameter of anterior median eye; posterior eye-row slightly procurved, distance between posterior median eyes equal to the radius of posterior median eye, distance between posterior median eye and posterior lateral eye longer than the radius of posteri-

or median eye; stridulating files present at the side of chelicera, promargin of fang furrow with 3 teeth, retromargin with 2 vestigial denticles; Tm I ca. 0.24; other characteristics in general appearance and coloration as same as those in the female.

Male palp (Figs. 54–57): Length of femur to patella 4:1 in ratio, tibia large, longer than patella, with two trichobothria, dorsal margin of the apical part digitiform and expanded retrolaterad (Fig. 55), paracymbium robust, basally with several setae; embolic division (Figs. 56–57) with interior apophysis (ia) bifid (Fig. 57).

*Etymology.* The specific name is Latin, meaning “lengthend,” derived from the shape of the apical part of male palpal tibia.

*Distribution.* Japan (known only from the type locality).

*Remarks.* The embolic division of male palp of this new species is closely resembles that of *Nippononeta kantonis* sp. nov., however, the shape of embolus, lamella and internal apophysis are different from those of the latter species. Interior apophysis of this new species is bifid as in *Nippononeta subnigra* sp. nov., but in *N. elongata* sp. nov. both the branches are much different in size.

***Nippononeta silvicola* sp. nov.**

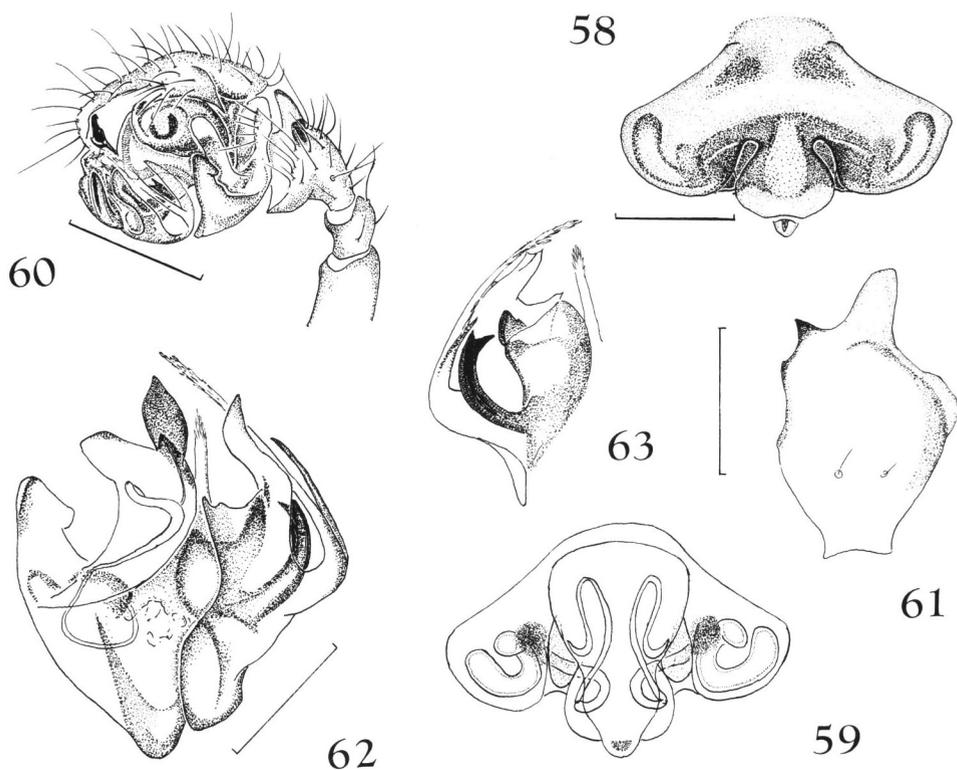
[Japanese name: Mori-nippon-keshigumo]

(Figs. 58–63)

*Type specimens.* Holotype: ♀, Dôiwana National Forest, Naganohara-machi, Agatsuma-gun, Gunma Pref., Honshu, Japan, 18–XI–1990, Y. Suganami leg. (NSMT-Ar 5069); paratypes: 1 ♂, same data as for the holotype (NSMT-Ar 5070), 2 ♀, same locality and collector as for the holotype, 16–VI & 23–XI–1991 (NSMT-Ar 5071–5072).

*Description.* Female (holotype): Body length 1.46 mm, prosoma length 0.63 mm, width 0.49 mm; lengths of palp and legs [total length (femur+patella and tibia+metatarsus+tarsus)]: palp 0.64 mm (0.22+0.20+--+0.22), leg I 2.09 mm (0.61+0.68+0.46+0.34), II 1.96 mm (0.56+0.63+0.43+0.34), III 1.66 mm (0.49+0.51+0.37+0.29), IV 2.17 mm (0.63+0.71+0.49+0.34).

Prosoma: Carapace yellowish brown, tinged with black, median furrow and radiating lines distinct and dark blackish brown, hexagonal black marking present behind head; each eye with black ring, anterior eye-row slightly procurved, distance between anterior median eyes shorter than the radius of anterior median eye, distance between anterior median eye and anterior lateral eye equal to the diameter of anterior median eye; posterior eye-row almost straight, distance between posterior median eyes equal to the radius of posterior median eye, distance between posterior median eye and posterior lateral eye slightly longer than the radius of posterior median eye, posterior median eye larger than posterior lateral eye; clypeus shorter than the length of median ocular area. Sternum blackish-yellowish brown, almost as long as wide. Chelicera light yellowish brown, tinged with black, stridulating files present at the side, promar-



Figs. 58–63. *Nippononeta silvicola* sp. nov., female holotype (NSMT-Ar 5069) and a male paratype (NSMT-Ar 5070) from Gunma Pref. — 58, Female genitalia (epigynum), ventral view; 59, female genitalia, cleared, dorsal view; 60, male palp, retrolateral view; 61, tibia of male palp, dorsal view; 62, embolic division of male palp, dorsal view; 63, lamella and interior apophysis of embolic division, ventral view. [Scales: 58–59, 61–63, 0.1 mm; 60, 0.2 mm.]

gin of fang furrow with 5 teeth, retromargin also with 5 teeth, but the distal one very small; legs light yellowish brown, distance between coxae IV equal to the diameter of coxa, the order of spines on the tibiae I–IV, 2222, Tm IV absent, Tm I ca. 0.27.

Opisthosoma ovate, greyish black, dorsally without markings.

Female genitalia (Figs. 58–59): epigynum much wider than long, dorsal plate short and round.

Male (a toptypical paratype; NSMT-Ar 5070): Body length 1.54 mm, prosoma length 0.73 mm, width 0.59 mm; lengths of legs [total length (femur+patella and tibia+metatarsus+tarsus)]: I 2.11 mm (0.56+0.71+0.46+0.38), II 1.92 mm (0.54+0.63+0.41+0.34), III 1.57 mm (0.44+0.51+0.34+0.28), IV 2.08 mm (0.61+0.68+0.46+0.33).

Anterior eye-row straight, distance between anterior median eyes equal to the radius of anterior median eye, distance between anterior median eye and anterior lateral

eye almost equal to the diameter of anterior median eye; posterior eye-row nearly straight, distance between posterior median eyes almost equal to the diameter of posterior median eye, distance between posterior median eye and posterior lateral eye slightly shorter than the distance between posterior median eyes; chelicera: promargin of fang furrow with 5 teeth, retromargin with 4 very small denticles hardly visible;  $Tm\ I\ ca.\ 0.24$ ; other characteristics in general appearance and coloration as same as those in the female.

Male palp (Figs. 60–63): Length of femur to patella 4:1 in ratio, dorsal margin of the apical part of tibia furnished with a digitiform apophysis and two teeth (Fig. 61), paracymbium strongly curved in U-shape, promargin with a digitiform apophysis flat and semitransparent at the middle, and with several setae at the base; embolic division as in Figs. 62–63, with embolic proper situated inside of an oval apophysis strongly sclerotized and pointed apically, interior apophysis (ia) strongly curved and apically bifid (Fig. 63).

*Etymology.* The specific name is Latin, meaning “dweller of forests,” because the specimens were collected in a forest.

*Distribution.* Japan (known only from the type locality).

*Remarks.* This new species resembles *Nippononeta elongata* sp. nov. and *N. kantonis* sp. nov., but can be distinguished from these species by the peculiar shape of epigynum and the structure of male palpal organ.

### *Nippononeta subnigra* sp. nov.

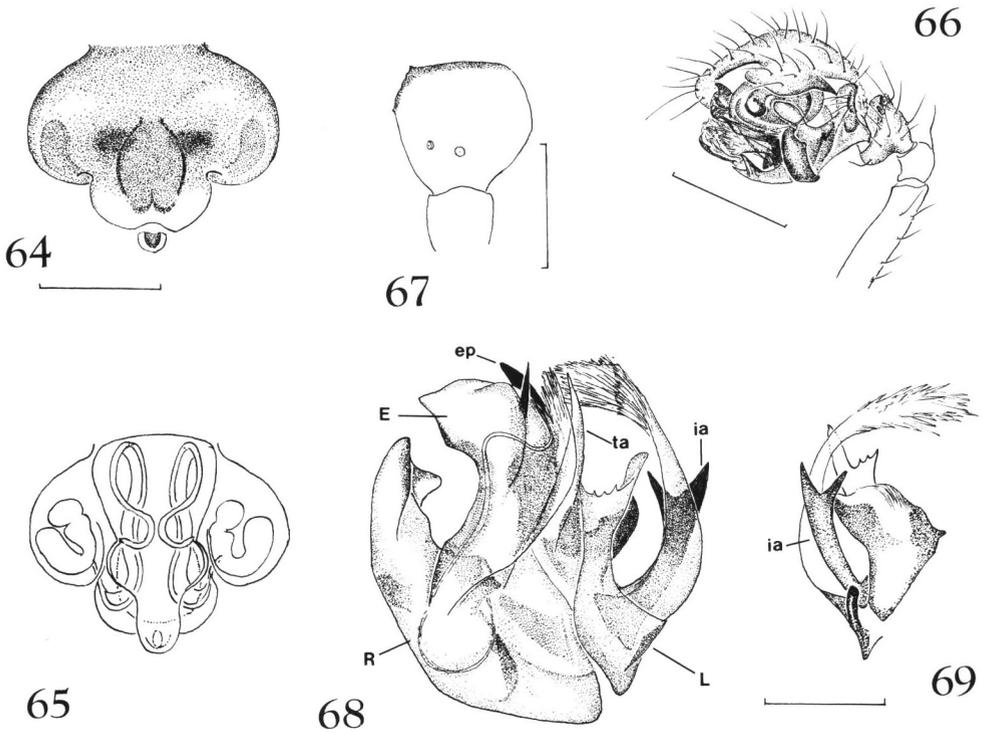
[Japanese name: Amari-keshigumo]

(Figs. 64–69)

*Type specimens.* Holotype: ♀, Mt. Amari-yama, Nirasaki-shi, Yamanashi Pref., Honshu, Japan, 29–IV–1998, H. Saito leg. (NSMT-Ar 5005); paratypes: 1 ♀ 4 ♂, same data as for the holotype (NSMT-Ar 5006–5007).

*Description.* Female (holotype): Body length 1.51 mm, prosoma length 0.63 mm, width 0.49 mm; lengths of palp and legs [total length (femur+patella and tibia+metatarsus+tarsus)]: palp 0.60 mm (0.20+0.18+--+0.22), leg I 2.15 mm (0.59+0.71+0.48+0.37), II 1.92 mm (0.54+0.63+0.41+0.34), III 1.66 mm (0.49+0.51+0.37+0.29), IV 2.15 mm (0.61+0.71+0.49+0.34).

Prosoma: Carapace yellowish brown, strongly tinged with black, darker margined, a distinct, hexagonal marking present behind ocular area; eyes with black ring, anterior eye-row straight, distance between anterior median eyes shorter than the radius of anterior median eye, distance between anterior median eye and anterior lateral eye almost equal to the diameter of anterior median eye; posterior eye-row slightly recurved, all the posterior eyes equidistant (radius of posterior median eye) from each other; clypeus shorter than the length of median ocular area. Sternum blackish brown, almost as long as wide, sparsely covered by long hairs. Chelicera light yellow-



Figs. 64–69. *Nippononeta subnigra* sp. nov., female holotype (NSMT-Ar 5005) and a male paratype (NSMT-Ar 5006) from Yamanashi Pref. — 64, Female genitalia (epigynum), ventral view; 65, female genitalia, cleared, dorsal view; 66, male palp, retrolateral view; 67, tibia of male palp, dorsal view; 68, embolic division of male palp, dorsal view; 69, lamella and interior apophysis of embolic division, ventral view. Abbreviations: E, embolus; ep, embolus proper; ia, interior apophysis; L, lamella characteristic; R, radix; ta, terminal apophysis. [Scales: 64–65, 67–69, 0.1 mm; 66, 0.2 mm.]

ish brown, tinged with black, stridulating files present at the side, promargin of fang furrow with 5 teeth, retromargin with 4 teeth; legs light yellowish brown, tinged with black, distance between coxae IV almost equal to the diameter of coxa, the order of spines on the tibiae I–IV, 2222, Tm IV absent, Tm I ca. 0.28.

Female genitalia (Figs. 64–65): epigynum wider than long, dorsal plate pyriform, wide and rounded.

Opisthosoma ovate, greyish black, without any marking.

Male (a topotypical paratype; NSMT-Ar 5006): Body length 1.54 mm, prosoma length 0.66 mm, width 0.54 mm; lengths of legs [total length (femur+patella and tibia+metatarsus+tarsus)]: I 2.15 mm (0.59+0.71+0.46+0.39), II 1.93 mm (0.54+0.63+0.41+0.35), III 1.67 mm (0.46+0.52+0.37+0.32), IV 2.12 mm (0.59+0.68+0.48+0.37).

Anterior eye-row straight, distance between anterior median eyes as long as the radius of anterior median eye, distance between anterior median eye and anterior lateral eye equal to the diameter of anterior median eye; posterior eye-row slightly recurved, distance between posterior median eyes and distance between posterior median eye and posterior lateral eye equal to the diameter of posterior median eye, respectively; sternum as long as wide; chelicera with stridulating files at the side, promargin of fang furrow with 5 teeth, of these one tooth situated near of fang very small, retro-margin with 4 teeth; Tm I ca. 0.26; other characteristics in general appearance and coloration as same as those in the female.

Male palp (Figs. 66–69): Length of femur to patella 10:3 in ratio, tibia longer than patella, with two trichobothria, dorsal margin of the apical part truncated and with several denticles sclerotized but very small (Fig. 67); embolic division as in Fig. 68, with interior apophysis (ia) bifurcated (Fig. 69).

*Etymology.* The specific name is Latin, meaning “blackish,” derived from coloration of the body.

*Distribution.* Japan (known only from the type locality).

*Remarks.* This new species resembles *Nippononeta kantonis* sp. nov., especially in the shape of male palpal tibia, but can be distinguished from the latter by the shape of embolic division of male palp and the structure of female genitalia.

*Nippononeta okumae* sp. nov.

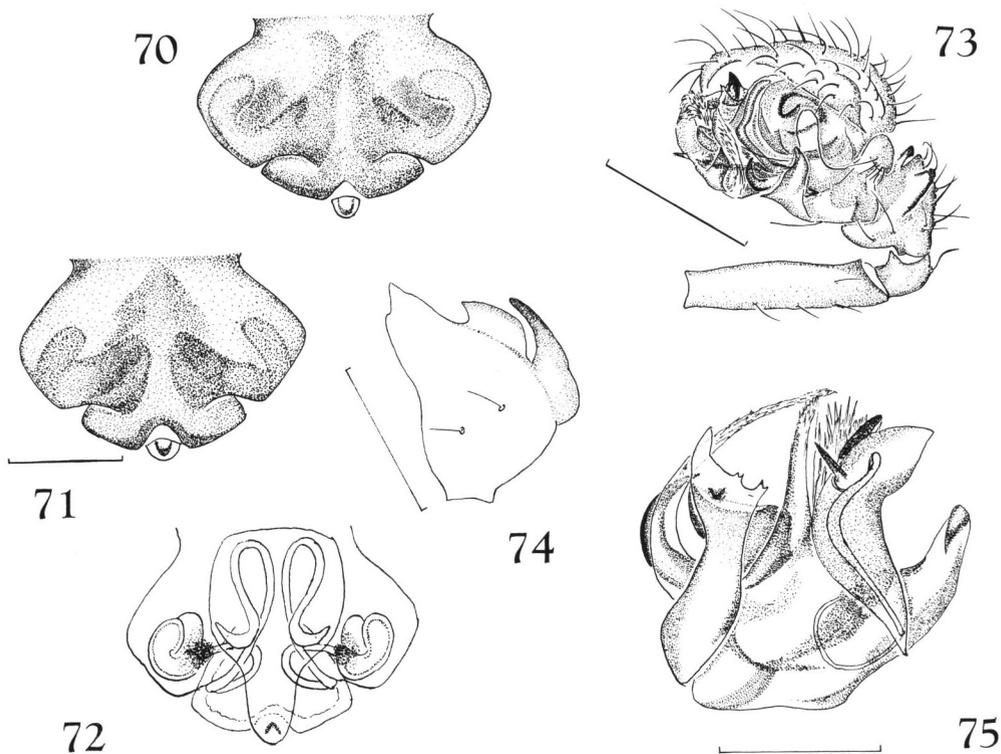
[Japanese name: Ookuma-nippon-keshigumo]

(Figs. 70–75)

*Type specimens.* Holotype: ♀, Mt. Hikosan, Fukuoka-shi, Fukuoka Pref., Kyushu, Japan, 27–31–V–1959, C. Okuma leg. (NSMT-Ar 5073); paratypes: 41 ♀ 5 ♂, same data as for the holotype (NSMT-Ar 5074–5075), 5 ♀ 3 ♂, same locality and collector as for the holotype, 4–9–VIII–1959 (NSMT-Ar 5076), 26 ♀ 3 ♂, same, 27–VII–2–VIII–1959 (NSMT-Ar 5077), 6 ♀, same (NSMT-Ar 5078).

*Description.* Female (holotype): Body length 1.59 mm, prosoma length 0.73 mm, width 0.56 mm; lengths of palp and legs [total length (femur+patella and tibia+metatarsus+tarsus)]: palp 0.65 mm (0.21+0.21+–+0.23), leg I 2.51 mm (0.68+0.83+0.56+0.44), II 2.37 mm (0.68+0.80+0.50+0.39), III 2.29 mm (0.66+0.73+0.51+0.39), IV 2.49 mm (0.73+0.83+0.54+0.39).

Prosoma: Carapace light yellowish brown, median furrow and radiating lines darker and blackish, a hexagonal black marking present behind head; each eye with black ring, anterior eye-row procurved, distance between anterior median eyes equal the radius of anterior median eye, distance between anterior median eye and anterior lateral eye equal to the diameter of anterior median eye; posterior eye-row almost straight, posterior eyes equidistant, distance between them slightly shorter than the diameter of posterior median eyes, posterior lateral eye slightly smaller than posterior



Figs. 70–75. *Nippononeta okumae* sp. nov., female holotype (NSMT-Ar 5073) and a female and male paratypes (NSMT-Ar 5074–5075) from Fukuoka Pref. — 70, Female genitalia (epigynum) of holotype, ventral view; 71, epigynum of a paratype, ventral view; 72, female genitalia of holotype, cleared, dorsal view; 73, male palp, retrolateral view; 74, tibia of male palp, dorsal view; 75, embolic division of male palp, dorsal view. [Scales: 70–72, 74–75, 0.1 mm; 73, 0.2 mm.]

median eye in size; clypeus shorter than the length of median ocular area. Sternum yellowish brown, strongly tinged with black, cordate and convex, almost as long as wide. Chelicera light yellowish brown, stridulating files present at the side, promargin of fang furrow with 4 teeth, retromargin with 4 denticles; legs light yellowish brown, distance between coxae IV equal to the diameter of coxa, the order of spines on the tibiae I–IV, 2222, Tm IV absent, Tm I ca. 0.30.

Opisthosoma ovate, greyish black, dorsally with a wide band light-colored and indistinct.

Female genitalia (Figs. 70–72): epigynum wider than long, dorsal plate variable.

Male (a topotypical paratype; NSMT-Ar 5074): Body length 1.39 mm, prosoma length 0.63 mm, width 0.51 mm; lengths of legs [total length (femur+patella and tibia+metatarsus+tarsus)]: I 2.36 mm (0.63+0.78+0.54+0.41), II 2.22 mm (0.61+

0.71+0.49+0.41), III 1.73 mm (0.49+0.51+0.41+0.32), IV 2.26 mm (0.61+0.73+0.54+0.38).

Anterior eye-row procurved, distance between anterior median eyes equal to the radius of anterior median eye, distance between anterior median eye and anterior lateral eye relatively longer than the radius of anterior median eye; posterior eye-row slightly procurved, posterior eyes equidistant, distance between them slightly shorter than the radius of posterior median eye; sternum slightly longer than wide; chelicera with stridulating files at the side, both the margins of fang furrow with 4 teeth, respectively; Tm I ca. 0.26; other characteristics in general appearance and coloration as same as those in the female.

Male palp (Figs. 73–75): Length of femur to patella 4:1 in ratio, tibia large and longer than patella, dorsal margin with a digitiform apophysis curved and a wide tooth with sharp edge (Fig. 74), paracymbium strongly curved in U-shape, promargin with a digitiform apophysis flat and semitransparent at the middle, and with several setae at the base; embolic division as in Figs. 75, interior apophysis (ia) strongly curved, embolus with a spiniform apophysis strongly sclerotized.

*Etymology.* This species is dedicated to the late Dr. Chiyoko Okuma, in honor of her contribution to the arachnology.

*Distribution.* Japan (known only from the type locality).

*Remarks.* This new species resembles *Nippononeta subnigra* sp. nov., but can be distinguished from the latter by the details of male palpal organ and the structure of female genitalia.

***Nippononeta masatakana* sp. nov.**

[Japanese name: Ioujima-keshigumo]

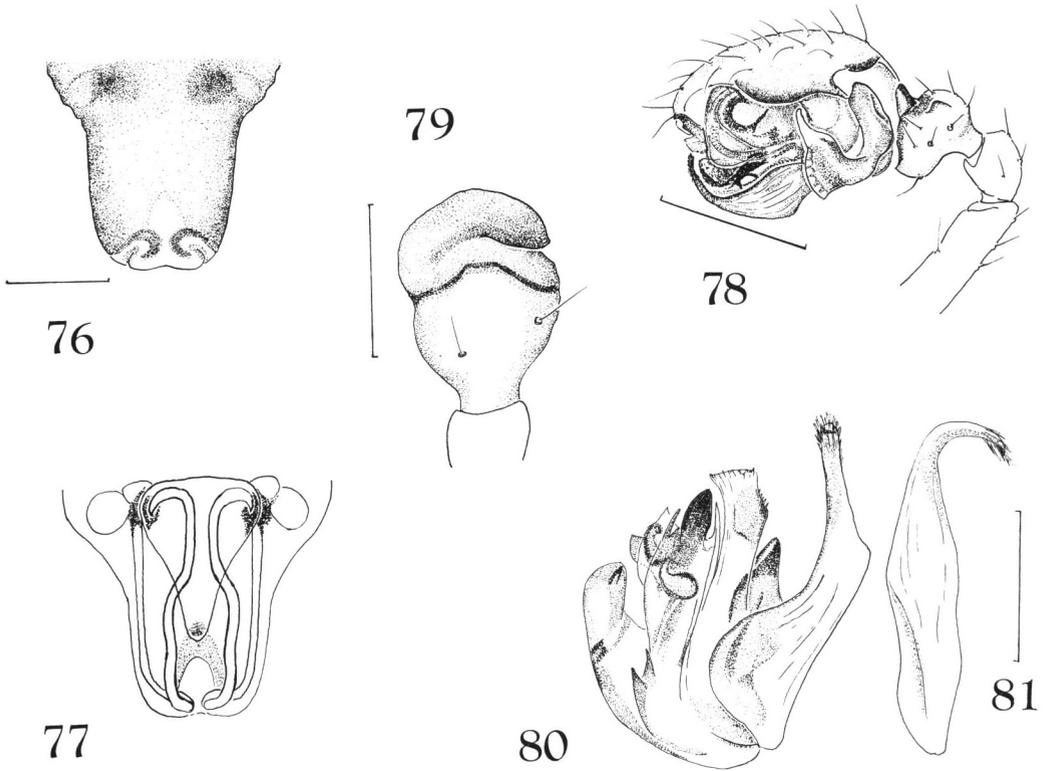
(Figs. 76–81)

*Type specimens.* Holotype: ♀, Minami-Iwojima, Ogasawara-mura, ca. 1200 km south of Tokyo, Japan, 18–VI–1982, M. Satō leg. (NSMT-Ar 5101); paratypes: 2♂, same data as for the holotype (NSMT-Ar 5102–5103).

*Other specimens examined.* 2 juv. ♀ 2 juv. ♂, same data as for the holotype (NSMT-Ar 5104).

*Description.* Female (holotype): Body length 1.61 mm, prosoma length 0.73 mm, width 0.54 mm; lengths of palp and legs [total length (femur+patella and tibia+metatarsus+tarsus)]: palp 0.70 mm (0.22+0.22+–+0.26), leg I 3.03 mm (0.80+0.98+0.71+0.54), II 2.81 mm (0.77+0.90+0.65+0.49), III 2.16 mm (0.62+0.66+0.51+0.37), IV 2.77 mm (0.80+0.90+0.66+0.41).

Prosoma: Carapace yellowish brown, finely marginated with black; eyes with black ring, anterior eye-row straight, distance between anterior median eyes shorter than the radius of anterior median eye, distance between anterior median eye and anterior lateral eye equal to the radius of anterior median eye, posterior eye-row slightly



Figs. 76–81. *Nippononeta masatakana* sp. nov., female holotype (NSMT-Ar 5101) and a male paratype (NSMT-Ar 5102) from Minami-iwojima Island. — 76, Female genitalia (epigynum), ventral view; 77, female genitalia, cleared, dorsal view; 78, male palp, retrolateral view; 79, tibia of male palp, dorsal view; 80, embolic division of male palp, dorsal view; 81, lamella of embolic division, prolateral view. [Scales: 76–77, 79–81, 0.1 mm; 78, 0.2 mm.]

recurved, distance between posterior median eyes a half the radius of posterior median eye, distance between posterior median eye and posterior lateral eye slightly shorter than the radius of posterior median eye; clypeus depressed just below anterior median eyes, obliquely extending forward, shorter than the length of median ocular area. Sternum blackish brown, cordate and convex, longer than wide, sparsely covered with long hairs. Chelicera yellowish brown tinged with black, stridulating files present at the side, promargin of fang furrow with 4 teeth, retromargin with 5 teeth; legs long and slender, light yellowish brown, distance between coxae IV equal to the diameter of coxa, the order of spines on the tibiae I–IV, 2222, Tm IV absent, Tm I ca. 0.31.

Opisthosoma ovate, yellowish brown.

Female genitalia (Figs. 76–77): epigynum much longer than wide, strongly ex-

tending, dorsal plate long triangle.

Male (a topotypical paratype; NSMT-Ar 5102): Body length 1.34 mm, prosoma length 0.63 mm, width 0.51 mm; lengths of legs [total length (femur+patella and tibia+metatarsus+tarsus)]: I 2.91 mm (0.80+0.95+0.68+0.48), II 2.60 mm (0.71+0.83+0.61+0.45), III 1.97 mm (0.54+0.59+0.49+0.35), IV 2.60 mm (0.73+0.83+0.63+0.41).

Chelicera light yellowish brown, with stridulating files at the side, promargin of fang furrow with 4 teeth; sternum blackish brown, slightly longer than wide, posterior end narrowed and blunt; Tm I ca. 0.25; other characteristics in general appearance and coloration as same as those in the female.

Male palp (Figs. 78–81): Length of femur to patella 5 : 1 in ratio, tibia large and longer than patella, dorso-apical margin with a furrow extending from prolateral side to another side and a peculiar apophysis present and semi-globular in shape (Fig. 79), embolic division as in Fig. 80, with two hook-shaped apophyses near the joining part between radix and embolus, anterior terminal apophysis a membranous plate, posterior terminal apophysis thick, sclerotized and conical, lamella large, distally strongly curved (Fig. 81).

*Etymology.* This new species is dedicated to Prof. Dr. Masataka Sato, Nagoya, an excellent entomologist who collected this interesting spider on the uninhabited island.

*Distribution.* Japan (known only from type locality).

*Remarks.* This new species independently stands in the genus, and is readily recognizable from other congeners by the structure of male and female genitalia, especially by the peculiar shape of tibia and embolic division of male palp and the shape of epigynum.

Saito (1982a) described two species of the genus *Meioneta* from Ogasawara (Bonin) Islands, namely *Meioneta boninensis* H. Saito, 1982, and *M. ignorata* H. Saito, 1982. These species should be re-examined especially on their generic status. The shape of epigynum of this new species somewhat resembles that of *Meioneta boninensis* and the male palp seems similar to that of *M. ignorata*.

#### Genus *Arcuphantes* Chamberlin et Ivie, 1943

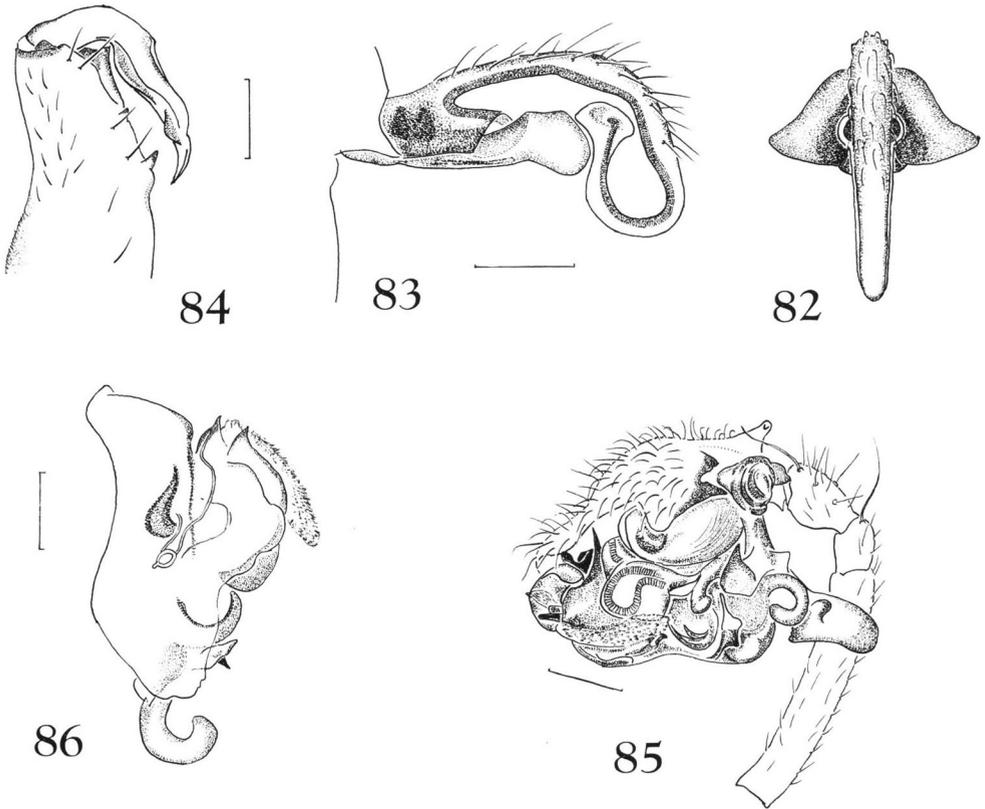
[Japanese name: Yami-saragumo-zoku]

#### *Arcuphantes awanus* sp. nov.

[Japanese name: Awa-yami-saragumo]

(Figs. 82–86)

*Type specimens.* Holotype: ♀, Tsuya, Yamashiro-chô, Miyoshi-gun, Tokushima Pref., Shikoku, Japan, 2–V–1990, Y. Ihara leg. (NSMT-Ar 5122); paratypes: 2 ♀ 4 ♂, same data as for the holotype (NSMT-Ar 5123–5124).



Figs. 82–86. *Arcuphantes awanus* sp. nov., female holotype (NSMT-Ar 5122) and a male paratype (NSMT-Ar 5123) from Tokushima Pref. — 82, Female genitalia (epigynum), ventral view; 83, epigynum, lateral view; 84, male chelicera, frontal view; 85, male palp, retrolateral view; 86, embolic division of male palp, dorsal view. [Scales: 82–85, 0.2 mm; 86, 0.1 mm.]

*Description.* Female (holotype): Body length 2.56 mm, prosoma length 1.02 mm, width 0.85 mm; lengths of legs [total length (femur+patella and tibia+metatarsus+tarsus)]: leg I 6.76 mm (1.83+2.20+1.73+1.00), II 5.77 mm (1.61+1.90+1.46+0.80), III 4.43 mm (1.32+1.41+1.09+0.61), IV 5.73 mm (1.71+1.83+1.46+0.73).

Prosoma: Carapace yellowish brown, tinged with black, margined with black, median furrow and radiating lines black and distinct; eyes with black ring, anterior eye-row almost straight, distance between anterior median eyes shorter than the radius of anterior median eye, distance between anterior median eye and anterior lateral eye slightly longer than the diameter of anterior median eye, posterior eye-row re-curved, posterior eyes same in size, standing equidistant, both the lateral eyes close to each other; clypeus equal to the length of median ocular area. Sternum black, as wide

as long, sparsely covered with long hairs. Chelicera light yellowish brown, frontal surface covered with several long setae, stridulating files present at the side, promargin of fang furrow with 3 large teeth, retromargin with 5 small teeth; legs annulated, especially remarkable in femora and tibiae, distance between coxae IV almost equal to the diameter of coxa IV, femur I with a prolateral spine, the order of spines on the tibiae I–IV, 2222, other than dorsal spines, tibia I with a spine on pro- and retrolateral surfaces and two spines on ventral surface, tibia II with a spine on retrolateral and ventral surfaces, respectively, metatarsi I–III with a dorsal spine, Tm IV absent, Tm I ca. 0.18.

Opisthosoma oval and with markings.

Female genitalia (Figs. 82–83): epigynum long and projecting ventrad, scape slender, distally strongly curved.

Male (a topotypical paratype; NSMT-Ar 5123): Body length 2.80 mm, prosoma length 1.22 mm, width 1.07 mm; lengths of legs [total length (femur+patella and tibia+metatarsus+tarsus)]: I 8.63 mm (2.23+2.88+2.32+1.20), II 7.05 mm (1.90+2.32+1.85+0.98), III 5.36 mm (1.56+1.71+1.39+0.70), IV 7.12 mm (2.07+2.27+1.90+0.88).

Anterior eye-row straight, distance between anterior median eyes equal to the radius of anterior median eye, distance between anterior median eye and anterior lateral eye slightly longer than the diameter of anterior median eye, posterior eye-row slightly recurved, posterior eyes same in size and equidistant from each other, the distance slightly shorter than diameter of posterior median eye; sternum black, convex, wider than long; chelicera with stridulating files at the sides, frontal surface covered by many short setae, promargin of fang furrow with two teeth, fang modified (Fig. 84); tibiae I–II without ventral spines, Tm I ca. 0.17; other characteristics in general appearance and coloration as same as those in the female.

Male palp (Figs. 85–86): Length of femur to patella 6:1 in ratio, tibia longer than patella, with 3 trichobothria; the proximal part of cymbium with a reniform apophysis; paracymbium large and developed, its distal part digitiform with a small apophysis at the middle; embolic division as in Fig. 86, radix wide, with a hook-shaped apophysis strongly curved and a rostriform apophysis in the posterior part, a membranous bushy tail present near embolus.

*Etymology.* The specific name is derived from a Japanese word “Awa,” an old name of Tokushima Prefecture.

*Distribution.* Japan (known only from type locality).

*Remarks.* Having a membranous process like a bushy tail on embolic division of male palp, this new species resembles species of the *longiscapus* group, for instance, *Arcuphantes longiscapus* (Oi, 1960), *A. hibanus* H. Saito, 1992, *A. iharai* H. Saito, 1992, etc., and may belong to the same species group. However, *A. awanus* stands far from other species in the relationship.

*Arcuphantes elephantis* sp. nov.

[Japanese name: Tokushima-yamisaragumo]

(Figs. 87–91)

*Type specimens.* Holotype: ♀, Noma-dani, Kamiyama-chô, Myôzai-gun, Tokushima Pref., Shikoku, Japan, 30–IV–1990, Y. Ihara leg. (NSMT-Ar 5107); paratype: 1 ♂, same data as for the holotype (NSMT-Ar 5108).

*Description.* Female (holotype): Body length 2.17 mm, prosoma length 0.93 mm, width 0.77 mm; lengths of legs [total length (femur+patella and tibia+metatarsus+tarsus)]: leg I 5.41 mm (1.46+1.73+1.34+0.88), II 4.62 mm (1.27+1.46+1.17+0.72), III 3.54 mm (1.02+1.10+0.88+0.54), IV 4.65 mm (1.34+1.44+1.17+0.70).

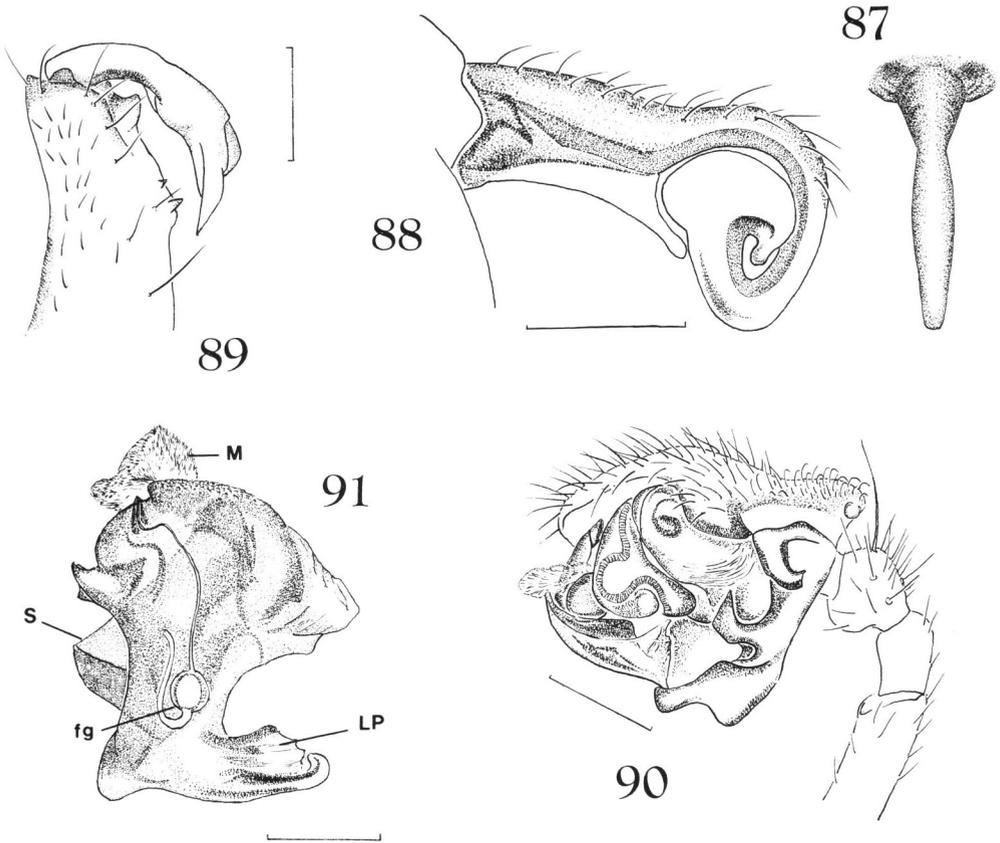
Prosoma: Carapace yellowish brown, tinged with black, marginated with black, median furrow and radiating lines distinct and black; eyes with black ring, anterior eye-row straight, distance between anterior median eyes longer than the radius of anterior median eye, distance between anterior median eye and anterior lateral eye almost equal to the diameter of anterior median eye, posterior eye-row recurved, distance between posterior median eyes almost equal to the radius of posterior median eye, distance between posterior median eye and posterior lateral eye shorter than the radius of posterior median eye; clypeus shorter than the length of median ocular area. Sternum black, wider than long, sparsely covered with long hairs. Chelicera light yellowish brown, with two pairs of long setae on the dorsal (frontal) surface, stridulating files present at the side, promargin of fang furrow with 3 large teeth, retromargin with 5 small teeth; legs with rings, especially remarkable in femora and tibiae, distance between coxae IV almost equal to the diameter of coxa, femur with a prolateral spine, the order of spines on the tibiae I–IV, 2222, other than dorsal spines, tibia I with a spine on pro- and retrolateral surfaces and two ventral spines, tibia II with a retrolateral spine and a ventral spine, metatarsi I–III with a dorsal spine, respectively, Tm IV absent, Tm I ca. 0.19.

Opisthosoma oval, dorsally with markings.

Female genitalia (Figs. 87–88): epigynum much longer than wide, scape simple and slender, apex large.

Male (a topotypical paratype; NSMT-Ar 5108): Body length 2.41 mm, prosoma length 1.20 mm, width 1.00 mm; lengths of legs [total length (femur+patella and tibia+metatarsus+tarsus)]: I 7.14 mm (1.90+2.34+1.88+1.02), II 6.17 mm (1.68+1.98+1.63+0.88), III 4.53 mm (1.32+1.41+1.17+0.63), IV 6.16 mm (1.78+1.90+1.66+0.82).

Eyes with black ring, anterior eye-row straight, distance between anterior eyes equal to the radius of anterior median eye, distance between anterior median eye and anterior lateral eye almost equal to the diameter of anterior median eye; posterior eye-row recurved, posterior eyes same in size, standing equidistant, their distance



Figs. 87–91. *Arcuphantes elephantis* sp. nov., female holotype (NSMT-Ar 5107) and a male paratype (NSMT-Ar 5108) from Tokushima Pref. — 87, Female genitalia (epigynum), ventral view; 88, epigynum, lateral view; 89, male chelicera, frontal view; 90, male palp, retrolateral view; 91, embolic division of male palp, dorsal view. Abbreviations: fg, Fickert's gland; LP, lamellate part; M, median membrane; S, supratégulum. [Scales: 87–90, 0.2 mm; 91, 0.1 mm.]

slightly shorter than the radius of posterior median eye; both the lateral eyes adjacent to each other; clypeus strongly depressed just below the anterior median eyes, equal to the length of median ocular area. Sternum blackish brown, wider than long. Chelicera light yellowish brown, weakly tinged with red, with many setae on frontal surface, stridulating files present at the side, promargin of fang furrow with 2 small teeth, fang strongly modified (Fig. 89); legs long, with remarkable annulation, tibiae I–II without ventral spines, Tm I ca. 0.19; other characteristics in general appearance and coloration as same as those in the female.

Male palp (Figs. 90–91): Length of femur to patella 5:1 in ratio, tibia slightly longer than patella, with 3 trichobothria, the basal part of cymbium densely covered

with short hairs, with a small hump-like apophysis extending retrolaterad, paracymbium long and developed, similar to that of *Arcuphantes concheus* sp. nov. in shape, but without apophysis on posterior margin; embolic division large, deeply furrowed at the posterior part near the center, radial part (see remarks!) L-shaped (Fig. 91).

*Etymology.* The specific name is Latin, meaning “elephant;” the shape of epigynum of the new species reminds the authors the head of an elephant.

*Distribution.* Japan (known only from type locality).

*Remarks.* In the structure of male palp, this new spider resembles *Arcuphantes yamakawai* (Oi, 1960), *A. orbiculatus* H. Saito, 1992 and *A. concheus* sp. nov. However, these species are different from one another in details, especially in embolic division, and in the shape of epigynum. Having resemblance in the shape of epigynum to these species, *Arcuphantes saragaminensis* sp. nov. also seems to be near of them, but the male is unknown at the present.

Merrett (1963) divided the structure of embolic division in the family Linyphiidae into two types as the simple type in the subfamily Erigoninae and the complex type in Linyphiinae, and defined that the simple type of embolic division was composed simply of the embolic part and the radial part, while the complex one was made up with radix, embolus, terminal apophysis and lamella. The present authors used in the above description the word “radial part” not in the sense of Merrett. Because the posterior part of embolic division from the central furrow is regarded as a secondary process, it should be called “lamellate part” from the condition better than radial part from the placement.

***Arcuphantes concheus* sp. nov.**

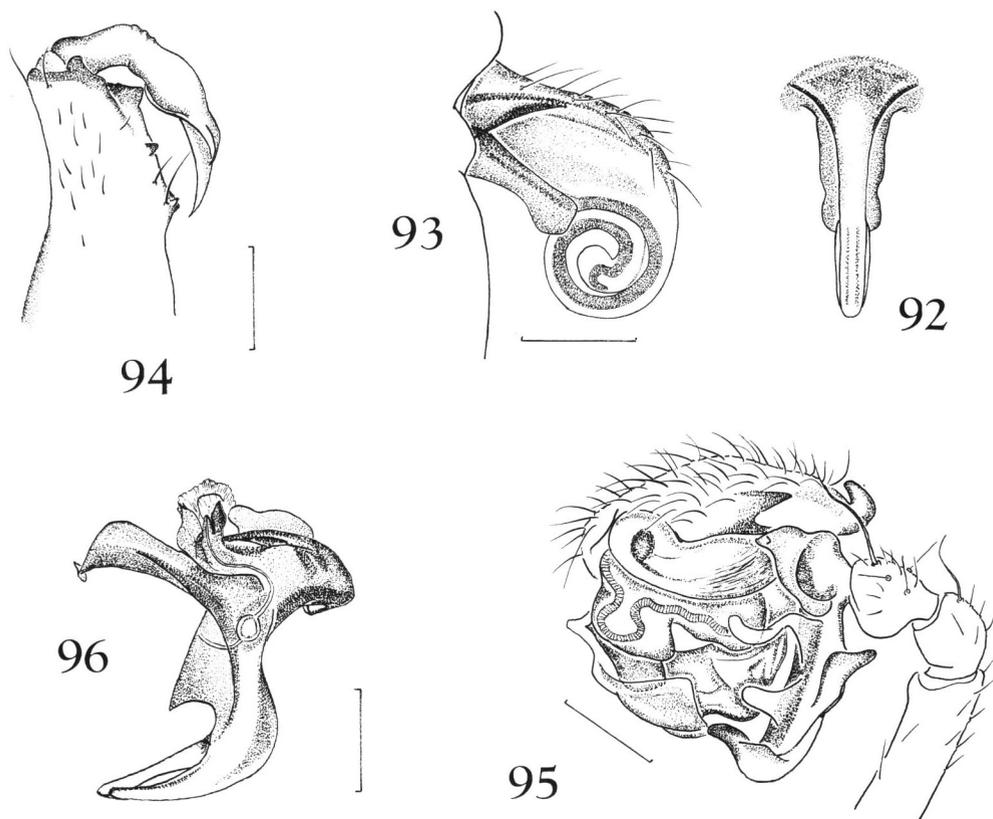
[Japanese name: Nagato-yami-saragumo]

(Figs. 92–96)

*Type specimens.* Holotype: ♀, Nanami, Kikugawa-chô, Toyoura-gun, Yamaguchi Pref., Honshu, Japan, 22–V–1990, Y. Ihara leg. (NSMT-Ar 5109); paratype: 2 ♀ 2 ♂, same data as for the holotype (NSMT-Ar 5110–5111), 1 ♀, same locality and collector, 29–XI–1989 (NSMT-Ar 5112), 2 ♀ 1 ♂, Shimo-hoki, Kikugawa-chô, Yamaguchi Pref., 21–V–1990, Y. Ihara leg. (NSMT-Ar 5113).

*Description.* Female (holotype): Body length 2.20 mm, prosoma length 1.01 mm, width 0.80 mm; lengths of legs [total length (femur+patella and tibia+metatarsus+tarsus)]: leg I 5.49 mm (1.49+1.83+1.34+0.83), II 4.86 mm (1.37+1.59+1.22+0.68), III 3.76 mm (1.10+1.22+0.93+0.51), IV 4.90 mm (1.46+1.56+1.22+0.66).

Prosoma: Carapace yellowish brown, tinged with black, darker marginated, median furrow and radiating lines distinct and black; eyes with black ring, anterior eye-row slightly procurved, distance between anterior median eyes shorter than the radius of anterior median eye, distance between anterior median eye and anterior lateral eye



Figs. 92–96. *Arcuphantes concheus* sp. nov., female holotype (NSMT-Ar 5109) and a male paratype (NSMT-Ar 5110) from Yamaguchi Pref. — 92, Female genitalia (epigynum), ventral view; 93, epigynum, lateral view; 94, male chelicera, frontal view; 95, male palp, retrolateral view; 96, embolic division of male palp, dorsal view. [Scales: 92–95, 0.2 mm; 96, 0.1 mm.]

almost equal to the diameter of anterior median eye, posterior eye-row recurved, posterior eyes same in size, standing equidistant, the distance of eyes almost equal to the diameter of posterior median eye; posterior eyes adjacent; clypeus slightly shorter than the length of median ocular area. Sternum blackish brown, wider than long, convex, sparsely covered with long hairs. Chelicera light yellowish brown, with a pair of long setae on the dorsal (frontal) surface, stridulating files present at the side, promargin of fang furrow with 3 teeth, retromargin with 5 teeth, fang simple and not modified; legs indistinctly annulated, distance between coxae IV slightly shorter than the diameter of coxa, femur I with a prolateral spine, the order of spines on the tibiae I–IV, 2222, tibia I with a spine on pro- and retrolateral and ventral surfaces, respectively, tibia II with a retrolateral spine, metatarsi I–III with a dorsal spine, Tm IV ab-

sent, Tm I ca. 0.18.

Opisthosoma oval, black with markings.

Female genitalia (Figs. 92–93): epigynum much longer than wide, scape slender in ventral view but thick and shell-like in lateral view, apex winding twice.

Male (a topotypical paratype; NSMT-Ar 5110): Body length 2.15 mm, prosoma length 1.15 mm, width 0.98 mm; lengths of legs [total length (femur+patella and tibia+metatarsus+tarsus)]: I 6.39 mm (1.61+2.12+1.71+0.95), II 5.41 mm (1.46+1.78+1.41+0.76), III 4.20 mm (1.17+1.34+1.10+0.59), IV 5.58 mm (1.56+1.80+1.49+0.73).

Anterior eye-row straight, distance between anterior median eyes almost equal to the radius of anterior median eye, distance between anterior median eye and anterior lateral eye equal to the diameter of anterior median eye; posterior eye-row re-curved, posterior eyes same in size, standing equidistant and the distance equal to the radius of posterior median eye, both the lateral eyes adjacent; chelicera vertical, curved retrolaterad at the distal part, fang strongly modified (Fig. 94); Tm I ca. 0.19; other characteristics in general appearance and coloration as same as those in the female.

Male palp (Figs. 95–96): Length of femur to patella 4:1 in ratio, tibia longer than patella, with 3 trichobothria; the proximal part of cymbium with a small conical apophysis extending retrolaterad; paracymbium long, extending in J-shape, the anterior margin with two apophyses and the posterior margin with one apophysis; embolic division T-shaped, the anterior part of radix slender and projecting (Fig. 96).

*Etymology.* The specific name is Latin, meaning “shell proper,” derived from the shell-like shape of epigynum in lateral view.

*Distribution.* Japan (known only from type area).

*Remarks.* This new species resembles *Arcuphantes yamakawai* (Oi, 1960) and *A. elephantis* sp. nov., but can be distinguishable from these species by the shape of epigynum and the structure of embolic division of male palp.

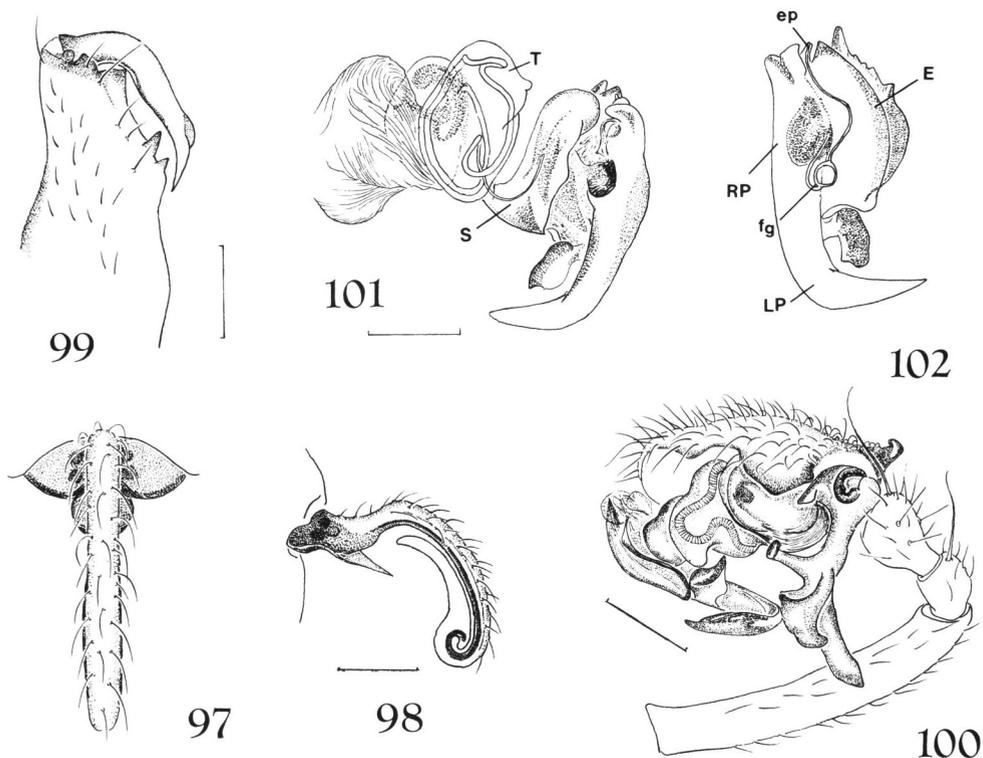
***Arcuphantes rostratus* sp. nov.**

[Japanese name: Togouchi-yami-saragumo]

(Figs. 97–102)

*Type specimens.* Holotype: ♀, Koumori-ana Cave, Togouchi-chô, Yamagata-gun, Hiroshima Pref., Honshu, Japan, 25–IX–1988, Y. Ihara leg. (NSMT-Ar 5116); paratypes: 2 ♀, same locality and collector as for the holotype (NSMT-Ar 5117), 2 ♀ 2 ♂, Sakaibara, Ana, Kake-chô, Yamagata-gun, Hiroshima Pref., 18–III–1990, Y. Ihara leg. (NSMT-Ar 5118–5119), 5 ♀ 1 ♂, Sakane, Ana, Kake-chô, Yamagata-gun, Hiroshima Pref., 28–X–1989 & 17–VI–1990, Y. Ihara leg. (NSMT-Ar 5120–5121).

*Description.* Female (holotype): Body length 3.00 mm, prosoma length 1.29 mm, width 1.05 mm; lengths of legs [total length (femur+patella and tibia+metatar-



Figs. 97–102. *Arcuphantes rostratus* sp. nov., female holotype (NSMT-Ar 5116) and a male paratype (NSMT-Ar 5118) from Hiroshima Pref. — 97, Female genitalia (epigynum), ventral view; 98, epigynum, lateral view; 99, male chelicera, frontal view; 100, male palp, retro-lateral view; 101, male palp, expanded; 102, embolic division of male palp, dorsal view. Abbreviations: E, embolus; ep, embolus proper; fg, Fickert's gland; LP, lamellate part; RP, radical part; S, supratégulum; T, tegulum. [Scales: 97–100, 0.2 mm; 101–102, 0.1mm.]

sus+tarsus): leg I 9.29 mm (2.56+3.05+2.34+1.34), II 8.35 mm (2.32+2.76+2.12+1.15), III 6.28 mm (1.90+1.98+1.59+0.81), IV 8.00 mm (2.44+2.51+2.07+0.98).

Prosoma: Carapace yellowish brown, tinged with black, finely margined with black, head in the front of cervical grooves tinged with red, median furrow relatively indistinct, radiating lines dark and distinct; eyes relatively large and with black ring, anterior eye-row straight, distance between anterior median eyes shorter than the radius of anterior median eye, distance between anterior median eye and anterior lateral eye relatively longer than the diameter of anterior median eye, posterior eye-row recurved, posterior eyes same in size, standing equidistant, the distance of eyes almost equal to the radius of posterior median eye; clypeus depressed just below anterior median eyes, slightly shorter than the length of median ocular area. Sternum blackish

brown, as wide as long, convex, sparsely covered with long hairs. Chelicera yellowish brown, tinged with red, frontal surface sparsely covered with short hairs, stridulating files present at the side, promargin of fang furrow with 3–4 teeth (different in right and left chelicerae), retromargin with 5 denticles; legs long, light yellowish brown, tinged with black, without distinct annulation, femur I with a prolateral spine, the order of spines on the tibiae I–IV, 2222, tibia I with a spine on pro- and retrolateral surfaces and two spines on ventral surface, tibia II with a retrolateral spine and two ventral spines, all metatarsi with a dorsal spine, Tm IV absent, Tm I ca. 0.18.

Opisthosoma oval and with markings.

Female genitalia (Figs. 97–98): epigynum long, scape slender, distally folded, apex rostriform and extending along the scape.

Male (a topotypical paratype; NSMT-Ar 5118): Body length 2.56 mm, prosoma length 1.15 mm, width 1.02 mm; lengths of legs [total length (femur+patella and tibia+metatarsus+tarsus)]: I 9.23 mm (2.49+3.05+2.32+1.37), II 7.69 mm (2.20+2.51+1.88+1.10), III 5.86 mm (1.73+1.90+1.46+0.77), IV 7.64 mm (2.27+2.44+1.95+0.98).

Chelicera with two promarginal teeth, fang distally modified (Fig. 99); legs long, tibiae I–II without ventral spines as present in females, Tm I ca. 0.20; other characteristics in general appearance and coloration as same as those in the female.

Male palp (Figs. 100–102): Length of femur to patella ca. 30 : 7 in ratio, tibia longer than patella, with 3 trichobothria; the proximal part of cymbium with a small hook-like apophysis; paracymbium long and projecting, with much complicated shape; embolic division as in Fig. 102, the posterior part of radix extended and slender, strongly curved in ectal direction, the apical part sharply pointed.

In the embolic division of male palp of *Lepthyphantes* species, a globular and expanded part of sperm duct is present, which is called the Fickert's gland (Merrett, 1963). The same gland exists also in males of *Arcuphantes* species (Figs. 86, 91, 96, 102). In some species of *Arcuphantes*, one or two further expansions are examined in the duct running in embolic division. Besides, lamella, embolus and terminal apophysis are fused on the radix of embolic division and no clear distinctions between these parts are visible in *Arcuphantes* species, while there are clear boundary lines between parts of embolic division in *Lepthyphantes*, *Meioneta* and *Nippononeta* species.

*Etymology.* The specific name is Latin, meaning “beaked,” derived from the shape of epigynum in lateral view.

*Distribution.* Japan (known only from type area).

*Remarks.* This new species stands in a group with *Arcuphantes yamakawai* (Oi, 1960), *A. orbiculatus* H. Saito, 1992, *A. concheus* sp. nov., *A. elephantis* and others. It can be distinguished from these species by the unique shape of epigynum and the structure of embolic division of male palp.

*Arcuphantes hastatus* sp. nov.

[Japanese name: Itoi-yami-saragumo]

(Figs. 103–104)

*Type specimens.* Holotype: ♀, Itoi-keikoku Valley, Wadayama-chô, Asakogun, Hyogo Pref., Honshu, Japan, 6–IX–1987, N. Tsurusaki leg. (NSMT-Ar 5114); paratype: 1 ♀, same data as for the holotype (NSMT-Ar 5115).

*Description.* Female (holotype): Body length 2.44 mm, prosoma length 0.95 mm, width 0.81 mm; lengths of legs [total length (femur+patella and tibia+metatarsus+tarsus)]: leg I 6.32 mm (1.68+2.07+1.63+0.94), II 5.39 mm (1.46+1.76+1.39+0.78), III & IV lost.

Prosoma: Carapace yellowish brown, strongly tinged with black, median furrow and radiating lines distinct and black; eyes with black ring, anterior eye-row straight, distance between anterior median eyes equal to the radius of anterior median eye, distance between anterior median eye and anterior lateral eye almost equal to the diameter of anterior median eye, posterior eye-row recurved, distance between posterior median eyes equal to the radius of posterior median eye, distance between posterior median eye and posterior lateral eye slightly shorter than the radius of posterior median eye; clypeus deeply depressed below anterior median eyes, shorter than the length of median ocular area. Sternum as long as wide, cordate and convex. Chelicera with stridulating files at the side, promargin of fang furrow with 3 teeth, retromargin with 5 teeth; legs indistinctly annulated, distance between coxae IV almost equal to the diameter of coxa, femur I with a prolateral spine, the order of spines on the tibiae I–IV, probably 2222, tibia I with a spine on pro- and retrolateral surfaces and two spines on ventral surface, tibia II with a retrolateral spine and a ventral spine, respectively, metatarsi I–II with a dorsal spine, metatarsus III probably with the spine, Tm IV absent, Tm I ca. 0.16.

Opisthosoma oval, black with markings (Fig. 103).

Female genitalia (Fig. 104): epigynum very large, its length almost equal to a half the length of opisthosoma, scape strongly constricted at the middle in ventral view, distally rhombic.

Male unknown.

*Etymology.* The specific name is Latin, meaning “armed with a spear,” derived from the shape of epigynum in ventral view.

*Distribution.* Japan (known only from type area).

*Remarks.* This new species resembles *Arcuphantes saragaminensis* sp. nov. and *A. elephantis* sp. nov., but can be easily distinguished from these species by the peculiar shape of epigynum.

*Arcuphantes saragaminensis* sp. nov.

[Japanese name: Saragamine-yamisaragumo]

(Figs. 105–106)

*Type specimen.* Holotype: ♀, Kaza-ana, Saragamine, Matsuyama-shi, Ehime-ken, Shikoku, Japan, 25–VI–1972, N. Tsurusaki leg. (NSMT-Ar 5106).

*Description.* Female (holotype): Body length 2.51 mm, prosoma length 1.17 mm, width 1.02 mm; lengths of palp and legs [total length (femur+patella and tibia+metatarsus+tarsus)]: palp 1.76 mm (0.54+0.54+—+0.68), leg I 7.56 mm (2.07+2.51+1.88+1.10), II 6.67 mm (1.85+2.20+1.68+0.94), III 5.06 mm (1.51+1.61+1.26+0.68), IV femur 1.95 mm, other segments lost.

Prosoma: Carapace yellowish brown, tinged with red, finely margined with black, median furrow and radiating lines distinct and darker, cervical grooves brown, wide and deeply depressed; each eye with black ring, anterior eye-row almost straight, distance between anterior median eyes shorter than the radius of anterior median eye, distance between anterior median eye and anterior lateral eye slightly shorter than the diameter of anterior median eye, posterior eye-row recurved, all the posterior eyes equidistant and the distance between them almost equal to the radius of posterior median eye; clypeus depressed just below anterior median eyes, equal to the length of median ocular area. Sternum yellowish brown, tinged with black, convex, as long as wide. Chelicera light yellowish brown tinged with red, stridulating files present at the side, promargin of fang furrow with 3 teeth, retromargin with 5 teeth; legs with indistinct rings, distance between coxae IV equal to the diameter of coxa, femur I with a prolateral spine, the order of spines on the tibiae I–IV, 222(2?), tibia I with a spine on pro- and retrolateral sides and two spines on ventral side, tibia II with a spine on retrolateral and ventral sides, respectively, metatarsi I–III with a dorsal spine, Tm IV absent, Tm I ca. 0.18.

Opisthosoma black with irregular markings (Fig. 105).

Female genitalia (Fig. 106): epigynum relatively large, with a long and thick scape.

Male unknown.

*Etymology.* The specific name is derived from the type locality.

*Distribution.* Japan (known only from type locality).

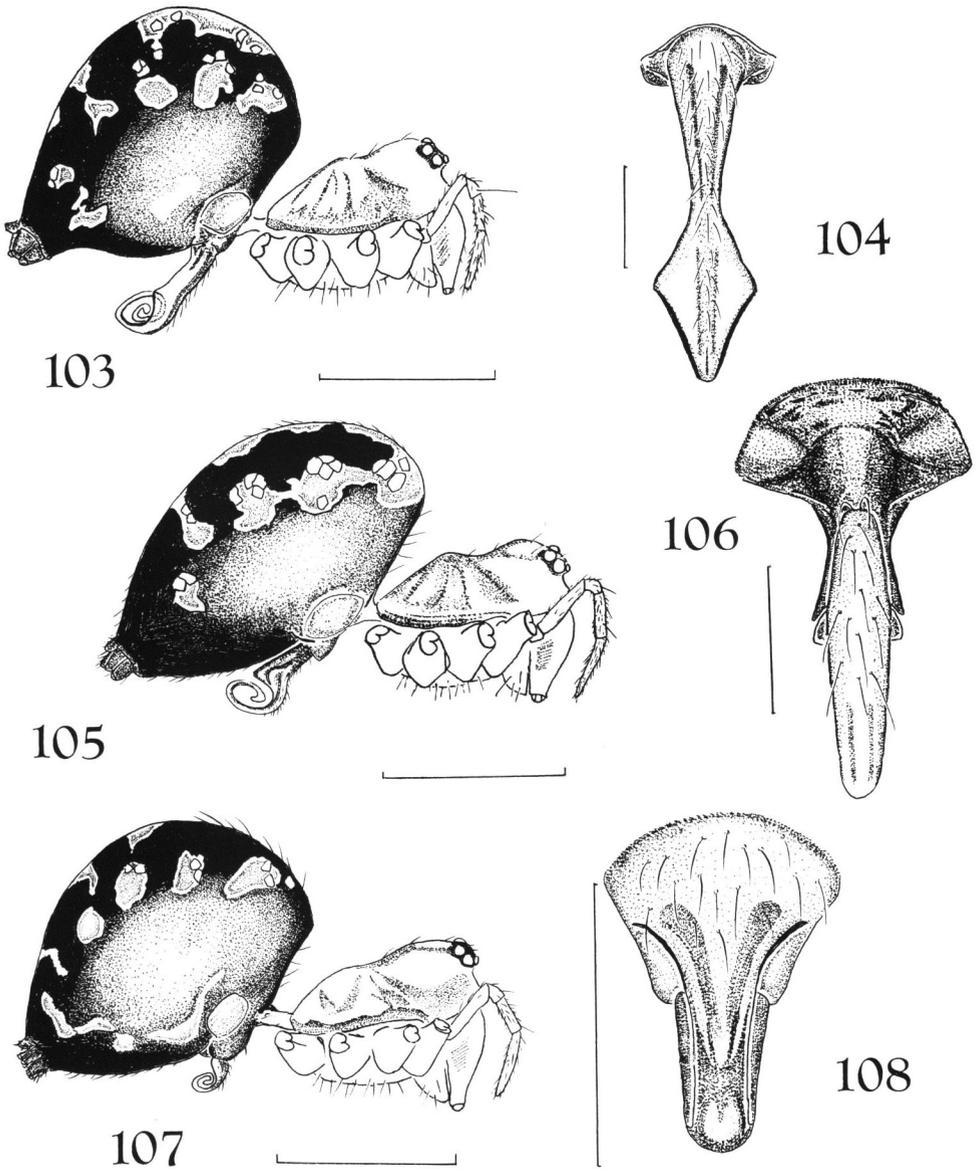
*Remarks.* This new species resembles *Arcuphantes elephantis* sp. nov. but is distinguished from the latter by details in shape of epigynum.

*Arcuphantes tsushmanus* sp. nov.

[Japanese name: Tsushima-yamisaragumo]

(Figs. 107–108)

*Type specimen.* Holotype: ♀, Konpira-gû, Izuhara-chô, Shimoagata-gun, Tsushima Island, Nagasaki Pref., Kyushu, Japan, 24–VII–1967, A. Tada leg. (NSMT-



Figs. 103–108. 103–104, *Arcuphantes hastatus* sp. nov., female holotype (NSMT-Ar 5114) from Hyogo Pref.; 105–106, *Arcuphantes saragaminensis* sp. nov., female holotype (NSMT-Ar 5106) from Ehime Pref.; 107–108, *Arcuphantes tsushmanus* sp. nov., female holotype (NSMT-Ar 5105) from Tsushima Island, Nagasaki Pref. — 103, 105, 107, Female body, lateral view; 104, 106, 108, female genitalia (epigynum), ventral view. [Scales: 103, 105, 107, 1 mm; 104, 106, 108, 0.2 mm.]

Ar 5105).

*Description.* Female (holotype): Body length 2.56 mm, prosoma length 0.93 mm, width 0.78 mm; lengths of palp and legs [total length (femur+patella and tibia+metatarsus+tarsus)]: palp 1.23 mm (0.39+0.35+—+0.49), leg I 5.99 mm (1.59+1.93+1.49+0.98), II 5.22 mm (1.42+1.66+1.29+0.85), III 3.93 mm (1.10+1.20+0.95+0.68), IV 4.98 mm (1.49+1.54+1.22+0.73).

Prosoma: Carapace yellowish brown, weakly tinged with red, its margin tinged with black, median furrow and radiating lines distinct and black; eyes with black ring, anterior eye-row slightly recurved, distance between anterior median eyes shorter than the radius of anterior median eye, distance between anterior median eye and anterior lateral eye slightly shorter than the diameter of anterior median eye, posterior eye-row recurved, distance between posterior median eyes shorter than the radius of posterior median eye, distance between posterior median eye and posterior lateral eye slightly shorter than the distance between posterior median eyes; clypeus depressed just below anterior median eyes, equal to the length of median ocular area. Sternum blackish brown, cordate and convex, as long as wide. Chelicera yellowish brown tinged with red, stridulating files present at the side, promargin of fang furrow with 3 teeth, retromargin with 5 teeth; legs with indistinct rings, distance between coxae IV equal to the diameter of coxa, femur I with a prolateral spine, tibia I with a spine on pro- and retrolateral and ventral surfaces, respectively, tibia II with a retrolateral spine, the order of spines on the tibiae I–IV, 2222, metatarsi I–III with a dorsal spine, respectively, Tm IV absent, Tm I ca. 0.18.

Opisthosoma black with irregular white markings on dorsal and lateral sides (Fig. 107).

Female genitalia (Fig. 108): epigynum very small, short and wide, with a short scape.

Male unknown.

*Etymology.* The specific name is derived from the name of Island, Tsushima, where the new spider was found.

*Distribution.* Japan (known only from type locality).

*Remarks.* This new species seems to be related to *Arcuphantes tamaensis* (Oi, 1960) and *A. uenoi* H. Saito, 1992, both known from Kanto District, Honshu, but can be distinguished from these species by the shape of epigynum considerably smaller than those of the two species.

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- [Further literature on Japanese linyphiids see Saito & Ono (2001).]

