

**The genus *Hydraena* KUGELANN, 1794
(Insecta: Coleoptera: Hydraenidae)
in the Ryukyu Archipelago (Nansei-shoto), Japan**

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Abstract

Seven new species of *Hydraena* KUGELANN, 1794 are described from the Ryukyu Archipelago (Amami-Oshima, Iheya-jima, Iriomote-jima, Kuchino-shima, Okinawa-jima, Tokuno-shima): *Hydraena iheya* sp.n., *H. iriomotensis* sp.n., *H. okinawensis* sp.n., *H. satoi* sp.n., *H. sautakei* sp.n., *H. socius* sp.n., *H. victoriae* sp.n. All species belong to the subgenus *Hydraenopsis* JANSSENS, 1972.

Key words: Coleoptera, Hydraenidae, *Hydraena*, *Hydraenopsis*, taxonomy, new species, Japan, Ryukyu Archipelago.

Zusammenfassung

Sieben neue Arten von *Hydraena* KUGELANN, 1794 werden vom Ryukyu Archipel (Amami-Oshima, Iheya-jima, Iriomote-jima, Kuchino-shima, Okinawa-jima, Tokuno-shima) beschrieben: *Hydraena iheya* sp.n., *H. iriomotensis* sp.n., *H. okinawensis* sp.n., *H. satoi* sp.n., *H. sautakei* sp.n., *H. socius* sp.n., *H. victoriae* sp.n. Alle Arten gehören zur Untergattung *Hydraenopsis* JANSSENS, 1972.

Introduction

The Japanese species of the genus *Hydraena* KUGELANN were updated by JÄCH & SATÔ (1988) who recorded no species from the Ryukyu Islands (Nansei-shoto). However, numerous specimens have become available for study meanwhile. These specimens were found to represent seven species, all of them new to science.

Acronyms:

NMW Naturhistorisches Museum, Wien CSN Coll. Satô, Nagoya CYT Coll. Yoshitomi, Tokyo

***Hydraena (Hydraenopsis) iriomotensis* sp.n.**

Type locality: Small stream with residual small pools, in large streambed, ca. 20 m wide, with rocks and boulders, shaded by forest canopy, Nishifunatsuki-gawa, SE Iriomote-jima, Ryukyu Archipelago, Japan.

Type material: **Holotype** ♂ (NMW): "JAPAN: 18.7.1996 Iriomote Isl. Nishifunatsuki-gawa leg. M.L. Jeng". **Paratypes** (NMW, CSN, CYT): 2 ♂♂: same locality data as holotype; 1 ♂: "Nishifunatsuki-gawa

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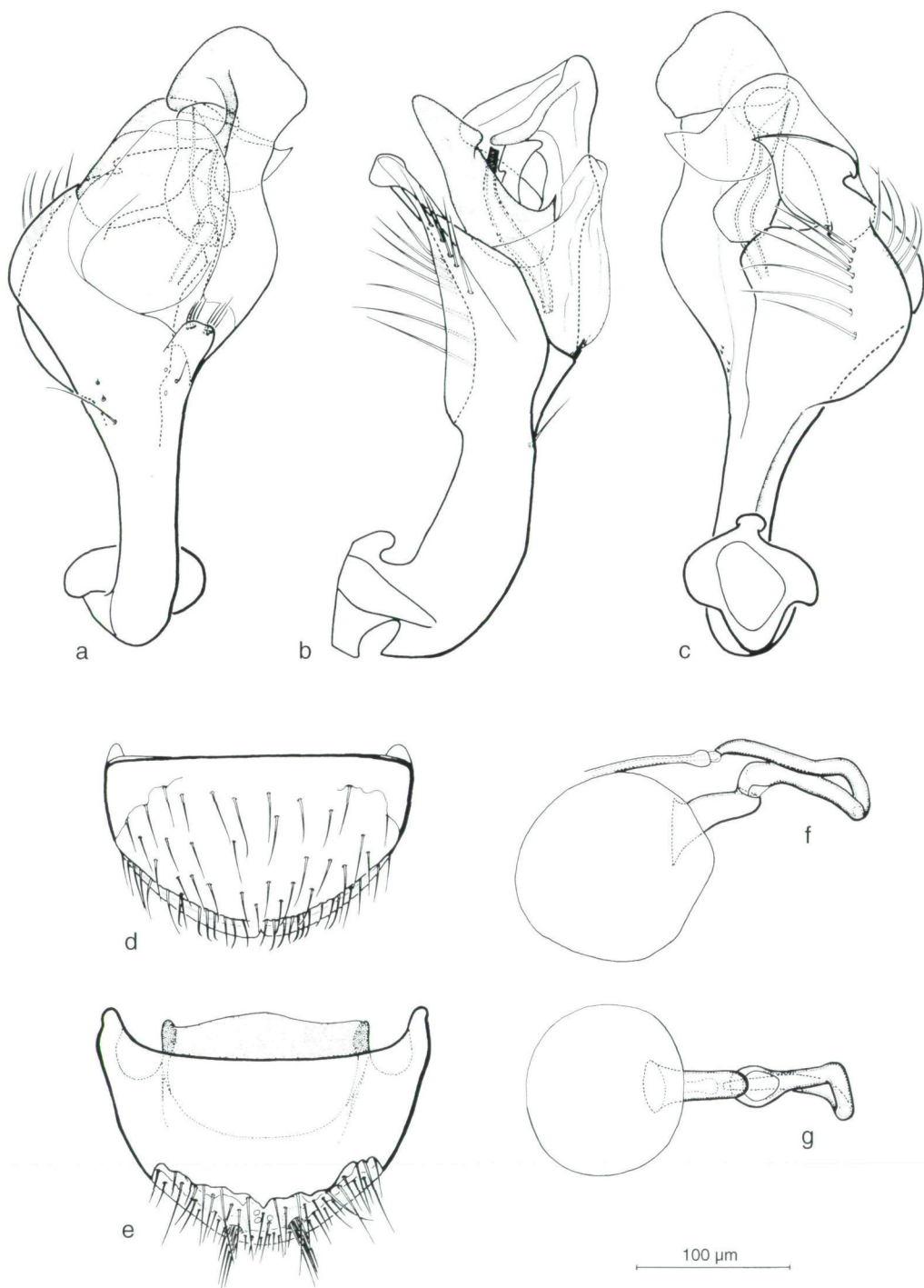


Fig. 1: *Hydraena iriomotensis* sp.n.: (a - c) aedeagus in dorsal, lateral and ventral view; (d) female tergite X; (e) gonocoxite; (f - g) spermatheca.

Iriomote-jima 18 - VII - 1996 M. Satô leg."; 1 ♂: "Nakamagawa Iriomote-jima Ryukyu Isl., Jpn 4. I. 1995 M. Nonaka leg.".

Additional material: 2 ♀♀: "Ohtomi - rindo Iriomote - jima 23 - VIII - 1994 M. Satô leg.".

Diagnosis (based on males): 1.40 - 1.45 mm long. Very closely related to *H. isolinae* JÄCH & DÍAZ, *H. inopinata* JÄCH & DÍAZ and *H. orchis* JÄCH & DÍAZ, all described from Taiwan (see JÄCH & DÍAZ 1998). The close relationship is indicated by the morphology of the aedeagus, by the presence of a conspicuous ledge on the profemur and by the presence of a brush of hairs on the male metatibia. In body shape, structure of metasternal disc, punctuation and coloration it is most similar to *H. orchis*, from which it can be distinguished by the pronotal disc being paler and by the male metatibia being less strongly dilated.

Metasternal plaques reduced to ridges as in *H. inopinata*, shorter than in *H. inopinata*.

Aedeagus (Fig. 1): Very similar to that of *H. orchis*. Main piece with one well developed dorsal seta, and with a few additional very short setae, and with one comparatively long seta near base of left paramere present only in one of the three specimens examined; phallobase asymmetrical, forming a closed ring. Distal lobe very intricately shaped, not clearly delimited from main piece. Left paramere short and inconspicuous, with a few apical setae; right paramere more or less completely fused to main piece, indicated by two rows of rather long setae.

The aedeagus of *H. iriomotensis* can be distinguished from that of *H. orchis* mainly by the outlines being more stout in lateral view, by the position of the dorsal seta, by various details of the distal lobe, and by the left paramere being slightly shorter.

The two females listed above under "additional material" might very well represent females of *H. iriomotensis*. They agree with the holotype in all general aspects, including such characteristic features as size and position of the metasternal plaques. However, it cannot completely be excluded that they represent an undescribed species. Their pygidial sclerites and spermatheca are described below:

Female tergite X (Fig. 1): Disc sparsely covered with trichoid setae (without squamose setae), anterior margin without setae; subapical setae trichoid, pointed; hyaline apical margin slightly excised medially.

Gonocoxite (Fig. 1): Subtriangular; inner plate medially surpassing outer plate; without distinct caveae.

Spermatheca (Fig. 1): Proximal portion tubular, very long; distal portion tubular. Spermathecal duct enlarged at apex.

Distribution: So far known only from Iriomote-jima.

Etymology: Named for the type locality.

Hydraena (Hydraenopsis) socius sp.n.

Type locality: Small stream with residual small pools, in large streambed, ca. 20 m wide, with rocks and boulders, shaded by forest canopy, Nishifunatsuki-gawa, SE Iriomote-jima, Ryukyu Archipelago, Japan.

Type material: **Holotype** ♂ (NMW): "JAPAN: 18.7.1996 Iriomote Isl. Nishifunatsuki-gawa leg. M.L. Jeng". **Paratypes** (NMW, CSN): 2 ♂♂, 1 ♀: "Nishifunatsuki-gawa Iriomote-jima 18 - VII - 1996 M. Satô leg.".

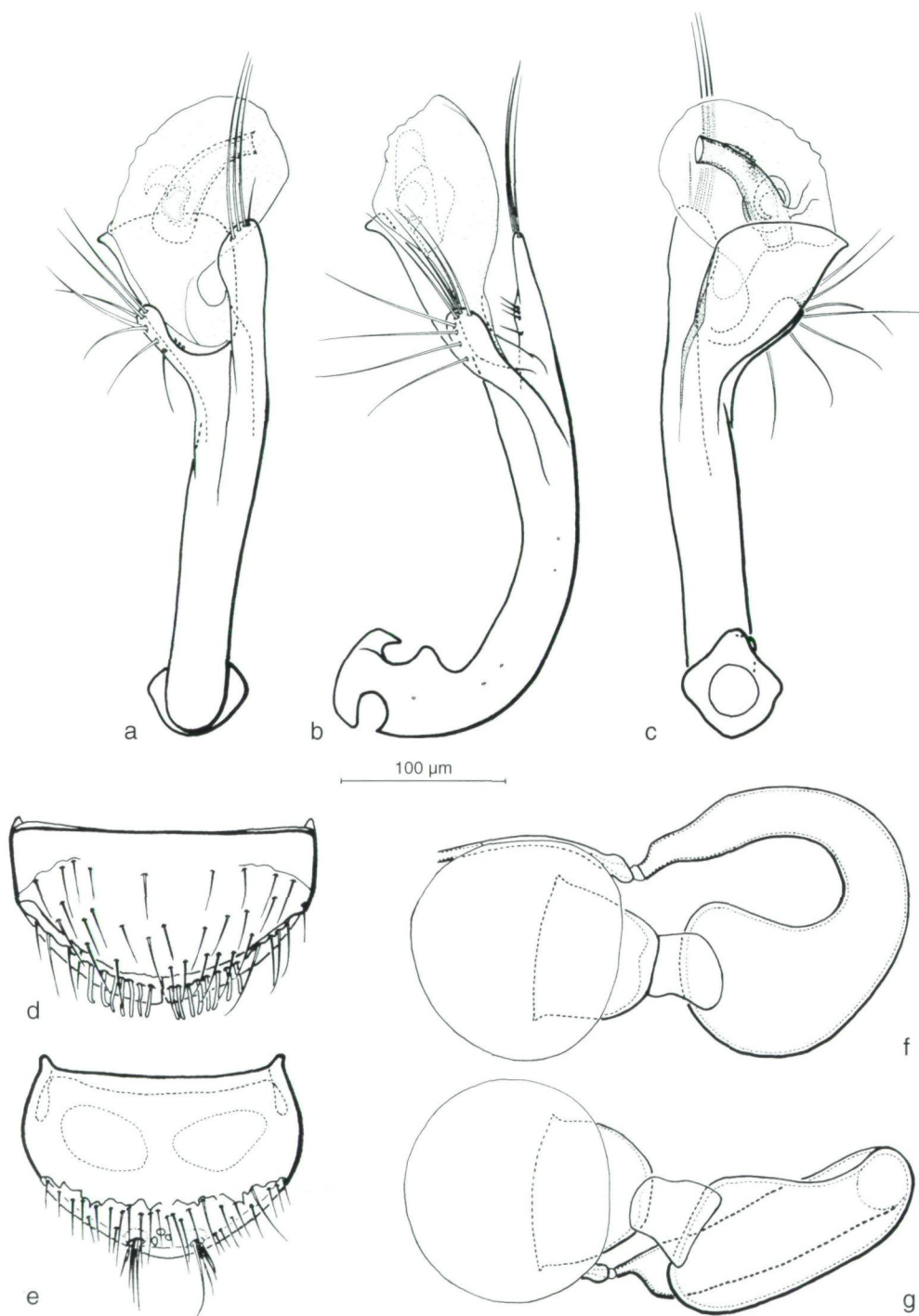


Fig. 2: *Hydraena socius* sp.n.: (a - c) aedeagus in dorsal, lateral and ventral view; (d) female tergite X; (e) gonocoxite; (f - g) spermatheca.

Diagnosis: 1.20 - 1.25 mm long. Externally (general appearance, absence of secondary sexual characters on legs), this species resembles *H. jengi* JÄCH & DÍAZ from Taiwan. It can be distinguished from the latter by the elytral punctation being slightly less regular, by the elytra being slightly less parallel-sided (more strongly attenuate apically), and by the mesosternal process being more slender and by the metasternal plaques being well developed and wide.

Aedeagus (Fig. 2): Main piece without dorsal seta (at least three micropores present), with a subbasal acute tooth (lateral view); phallobase slightly asymmetrical, forming a closed ring. Distal lobe intricately shaped, not clearly delimited from main piece; with a conspicuous, tube-like structure, which is provided with a row of spines. Left paramere elongate, moderately wide, slightly dilated apically (dorsal view), inserted near middle of aedeagus, not articulately connected with main piece, with ca. 4 moderately long apical and a few shorter, lateral setae; right paramere shorter than left one, not articulately connected with main piece, with ca. 8 moderately long setae.

Gonocoxite (Fig. 2): Subpentagonal, widest near middle; inner plate not surpassing outer plate; with one pair of caveae.

Spermatheca (Fig. 22): Proximal portion very large, bluntly tubular, tapering anteriorly; intermediate portion very large; distal portion cup-shaped.

Secondary sexual characters: Mesosternal process more slender in male. Abdominal sternite VIII of male much larger. Female tergite X (Fig. 2): Transverse; disc sparsely covered with trichoid setae (without squamose setae), anterior margin without setae; subapical setae vermiform; hyaline apical margin very slightly excised medially. Spermathecal duct enlarged at apex.

Distribution: So far known only from Iriomote-jima.

Etymology: *Socius*, m. (Latin: comrade, fellow, companion), noun in apposition; referring to the fact that this species lives on the small island of Iriomote-jima - together with *H. iriomotensis* and *H. satoi*, obviously sharing the same habitat.

Hydraena (Hydraenopsis) okinawensis sp.n.

Type locality: Stream, ca. 3 - 4 m wide, Genka-gawa, Okinawa-jima, Ryukyu Archipelago, Japan.

Type material: **Holotype** ♂ (NMW): "JAPAN: Okinawa Isl. Genka-gawa 22.7.1996 leg. C.F. Lee" (NMW). **Paratypes** (NMW, CSN): 1 ♂, 1 ♀: same locality data as holotype; 4 exs.: "Haneji - Ohkawa Is. Okinawa 26 - III - 1997 M. Satô leg."; 4 exs.: "Henan - gawa Is. Okinawa 22 - III 1994 M. Satô leg."; 2 exs.: "Taiho - gawa Is. Okinawa 22 - III - 1994 M. Satô leg."; 7 exs.: "(RYUKYUS) Yona Okinawa 12 VIII, 1969 Y. Hori leg.".

Diagnosis: 1.15 - 1.35 mm long. Very closely related to *Hydraena porcula* JÄCH & DÍAZ from Taiwan (see JÄCH & DÍAZ 1998). Externally, the new species can be distinguished by the shorter, more ovoid elytra, by the elytral and pronotal punctures being more deeply impressed, and especially by the male metatibia being strongly dilated in apical half. Characters of underside as in *H. porcula*.

Aedeagus (Fig. 3): Main piece with one long dorsal seta; phallobase slightly asymmetrical, forming a closed ring. Distal lobe intricately shaped, not clearly delimited from main piece, with numerous conspicuous spinules, with a conspicuous flagellum with a

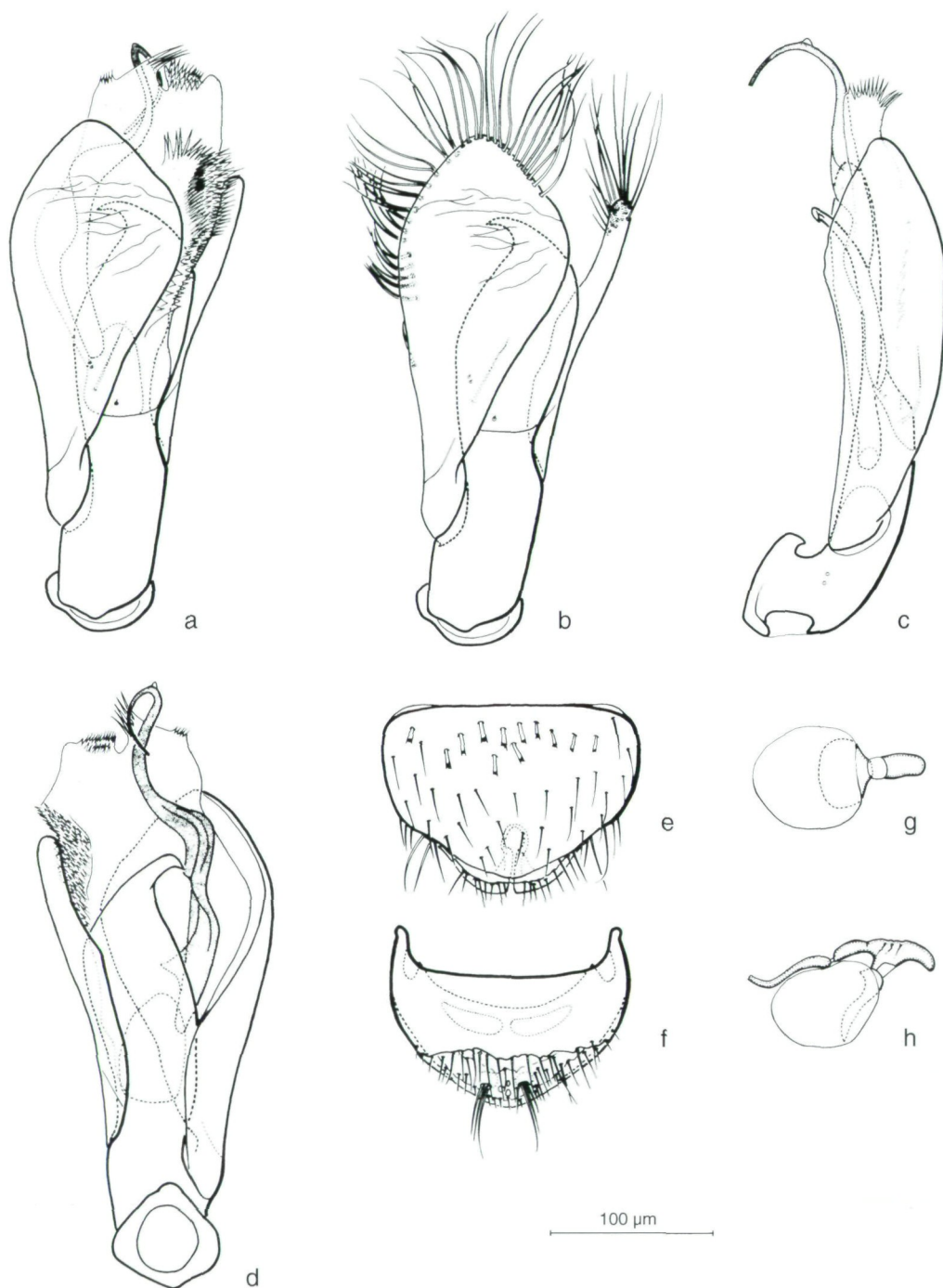


Fig. 3: *Hydraena okinawensis* sp.n.: aedeagus; (a) dorsal view (parameral setae omitted); (b) dorsal view (distal lobe omitted); (c) lateral view (parameral setae omitted); (d) ventral view (parameral setae omitted); (e) female tergite X; (f) gonocoxite; (g - h) spermatheca.

small subapical protuberance. Parameres articulately connected with main piece, inserted in basal half of aedeagus. Left paramere elongate, slender, with a group of apical setae; right paramere longer than left one, oval, with a row of conspicuous, rather long setae, some of which are furcate basally.

Gonocoxite (Fig. 3): Subtriangular; inner plate with a pair of slender transverse caveae.

Spermatheca (Fig. 3): Proximal portion saccoid; distal portion discoidal. Spermathecal duct enlarged at apex.

Secondary sexual characters: Male mesosternal process slightly narrower and slightly impressed medially. Abdominal sternite VIII of male much larger. Female tergite X (Fig. 3): Disc sparsely covered with trichoid setae and with few squamose setae near base; subapical setae trichoid; posterior margin bisinuous; hyaline apical margin excised medially. Male metatibia dilated in apical half.

Distribution: So far known only from Okinawa-jima.

Etymology: Named in reference to the type locality.

Hydraena (Hydraenopsis) victoriae sp.n.

Type locality: Small stream, with little flowing water, abundant plant debris, shaded by very dense forest, Amami-Oshima, Ryukyu Archipelago, Japan.

Type material: **Holotype** ♂ (NMW): "JAPAN: Amami-Oshima [= Oshima] Isl. Kinsakubaru, 24.7.1996 virgin forest leg. M. L. Jeng". **Paratypes** (NMW, CSN): 2 exs.: "Kinsakubaru Amami-ôshima 24 - VII - 1996 M. Satô leg."; 1 ex.: "Kinsakubaru Amami-Oshima 23 - III - 1997 M. Satô leg."; 3 exs.: "Ohganeku Is. Amami 26.VII.1961 K. Yamada"; 4 exs.: "Nishiagina Is. Tokuno-shima 25.July, 1963 M. Satô et N. Ohbayashi"; 2 exs.: "Kuchino-shima Tokara Is. May 22, 1962 M. Satô leg."; 2 exs.: "[Tokara] Kuchino-shima 21.V.1962 M. Satô".

Diagnosis: 1.15 - 1.25 mm long. Very closely related to *Hydraena porcula* and *H. okinawensis*. In body form and punctuation intermediate between these two species. However, externally it can be readily distinguished from both species by the male metatibia being not (or hardly noticeably) dilated in posterior half.

Aedeagus (Fig. 4): Very similar to that of *H. okinawensis*. However, it can be distinguished from the latter by a number of subtle differences: shape of apex of main piece (ventral view); shape of distal lobe; position of spines on distal lobe; left paramere more slender; position of furcation of parameral setae further distal.

Gonocoxite (Fig. 4): Subtriangular, laterally rounded; inner plate not surpassing outer plate, anterior margin strongly concave medially, strongly excised laterally; with one pair of oval, slanting caveae, which seem to be connected medially.

Spermatheca (Fig. 4): Proximal portion saccoid; distal portion discoidal. Spermathecal duct very slightly enlarged at apex.

Secondary sexual characters: Male metasternum slightly more impressed between metasternal plaques. Abdominal sternite VIII of male much larger. Female tergite X (Fig. 4): Subpentagonal, widest near base; disc moderately densely covered with trichoid setae, with few squamose setae near base; subapical setae trichoid; hyaline apical margin narrow, excised medially. Male metafemur more distinctly arched; posterior margin more strongly concave in basal half. Male metatibia hardly noticeably dilated in posterior half.

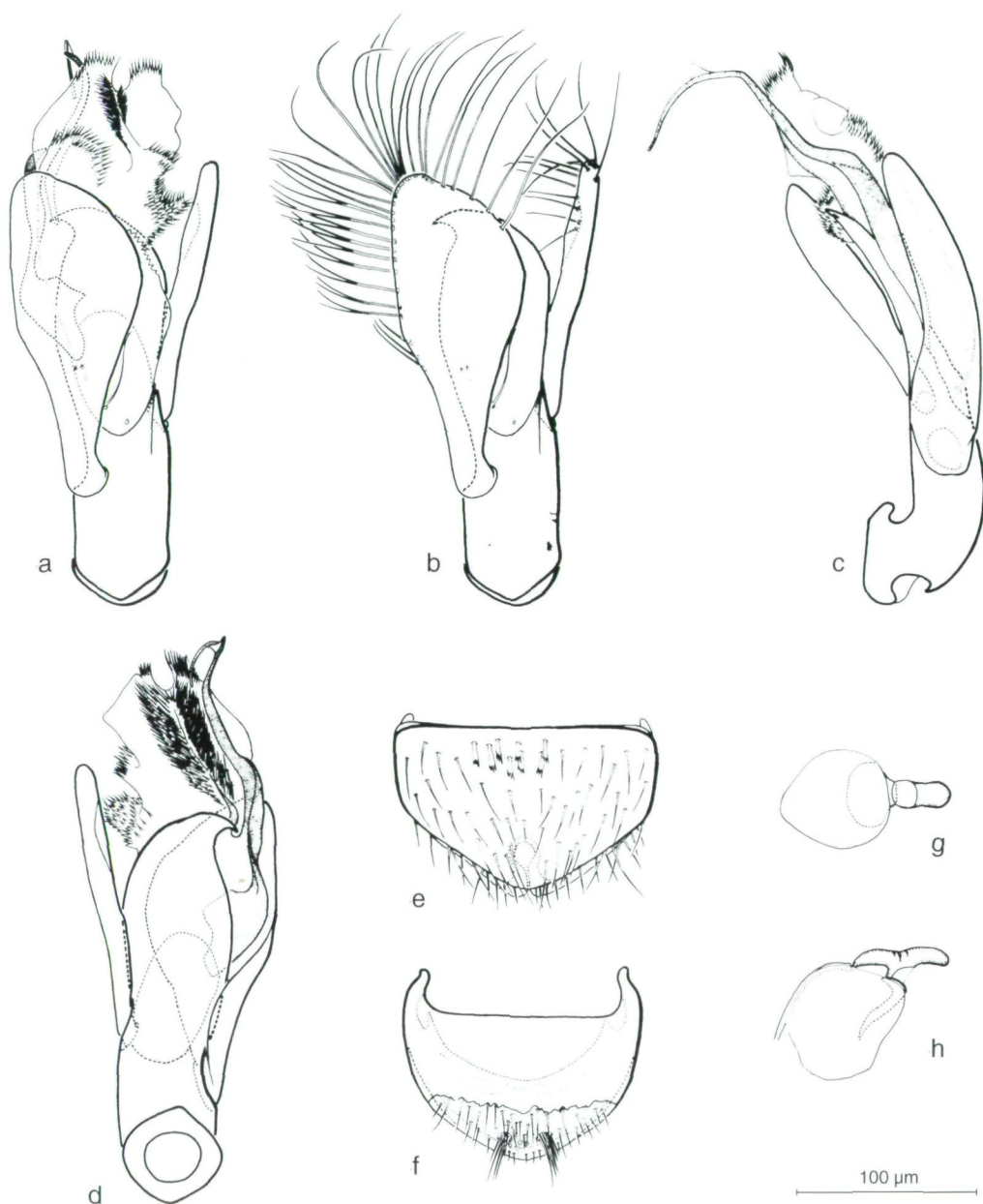


Fig. 4: *Hydraena victoriae* sp.n.: aedeagus; (a) dorsal view (parameral setae omitted); (b) dorsal view (distal lobe omitted); (c) lateral view (parameral setae omitted); (d) ventral view (parameral setae omitted); (e) female tergite X; (f) gonocoxite; (g - h) spermatheca.

Distribution: So far known from Tokuno-shima, Amami Oshima and Kuchino-shima.

Etymology: Dedicated to Victoria, wife of the junior author.

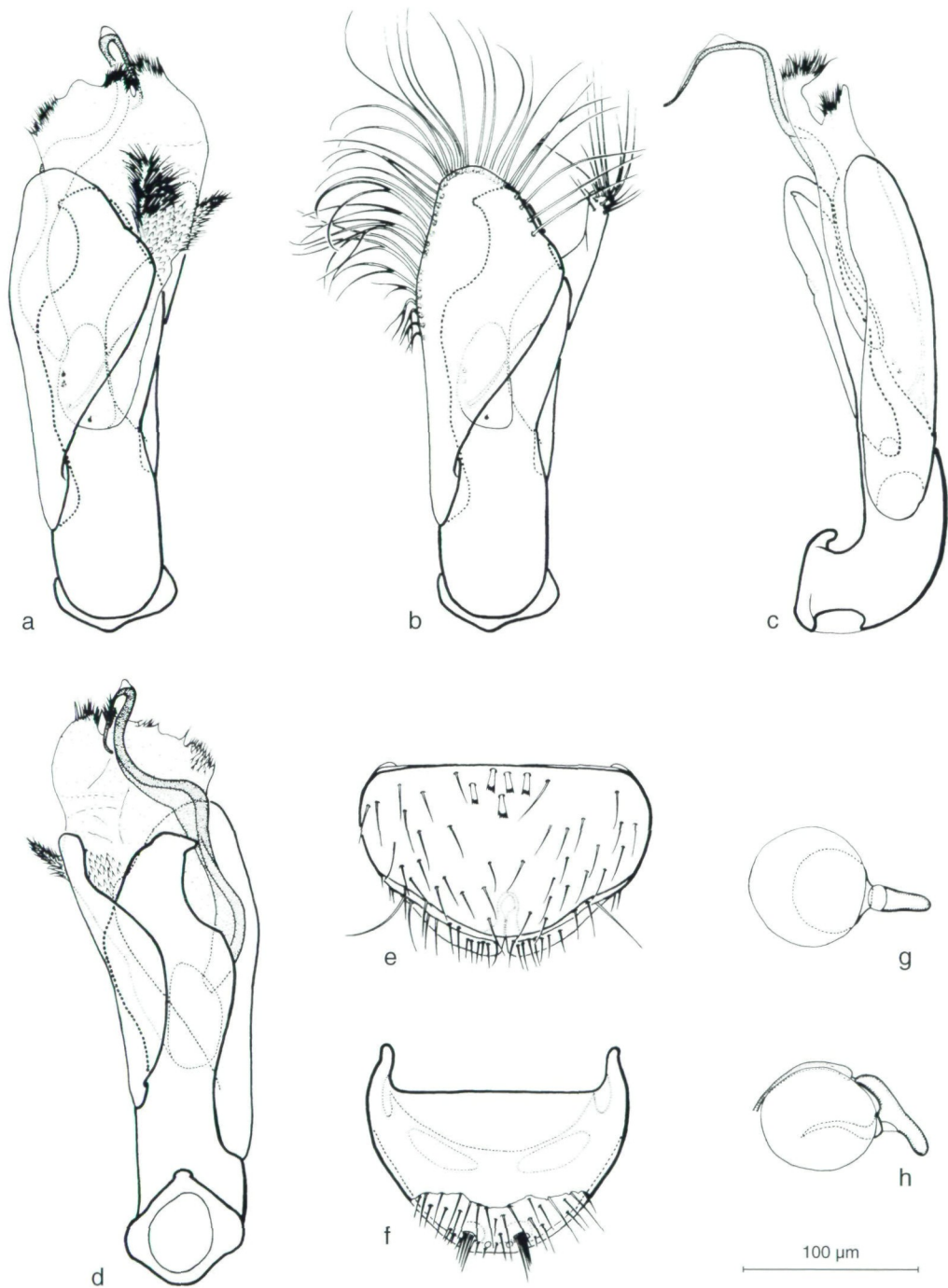


Fig. 5: *Hydraena iheya* sp.n.: aedeagus; (a) dorsal view (parameral setae omitted); (b) dorsal view (distal lobe omitted); (c) lateral view (parameral setae omitted); (d) ventral view (parameral setae omitted); (e) female tergite X; (f) gonocoxite; (g - h) spermatheca.

Hydraena (Hydraenopsis) iheya sp.n.

Type locality: Dana, Iheya-jima [north of Okinawa-jima], Ryukyu Archipelago, Japan.

Type material: **Holotype** ♂ (CSN): "Dana, Ryukyus Iheya - jima 29 - III - 1996 M. Kimura leg.". **Paratype** (NMW): 1 ♀: same locality data as holotype.

Diagnosis: 1.25 - 1.30 mm long. Very closely related with *H. victoriae*, with which it agrees in all general characters (colouration, punctuation, size, secondary sexual characters).

Aedeagus (Fig. 5): Very similar to that of *H. okinawensis* and *H. victoriae*. It can be distinguished from these species by the shape of the apex of the main piece (ventral and dorsal view), which is distinctly wider; left paramere widened near middle.

Gonocoxite (Fig. 5): Subpentagonal, widest near anterior third; inner plate not surpassing outer plate, anterior margin strongly concave medially, strongly excised laterally; with one pair of oval, slanting caveae.

Spermatheca (Fig. 5): Proximal portion saccoid; distal portion discoidal. Spermathecal duct very slightly enlarged at apex.

Female tergite X (Fig. 5): Transverse; disc moderately densely covered with trichoid setae, with few squamose setae near base; subapical setae trichoid; anterior margin slightly bisinuous; hyaline apical margin excised medially.

Distribution: So far known only from Iheya-jima [north of Okinawa-jima].

Etymology: Named in reference to the type locality.

Hydraena (Hydraenopsis) satoi sp.n.

Type locality: Small creeks, almost lentic, with boulders and mud, flowing through forest, near Nishifunatsuki-gawa, SE Iriomote-jima, Ryukyu Archipelago, Japan.

Type material: **Holotype** ♂ (NMW): "JAPAN: 18.7.1996 Iriomote Isl. Taisho-ike leg. M.L. Jeng". **Paratypes** (NMW, CSN): 11 exs.: "Shirahama-rindo Iriomote - jima 25 - III - 1995 M. Satô leg."; 3 exs.: "Nishifunatsuki-gawa Iriomote-jima 18 - VII - 1996 M. Satô leg."; 4 exs.: "Taisho - ike Iriomote - jima 25 - VIII - 1994 M. Satô leg."; 4 exs.: "(IRIOMOTE IS.) Kanpiree 1988-7-26 T.Ueno"; 4 exs.: "[RYUKYUS] Is.Iriomote Inaba 9.VIII,1962 M.Sato et Y.Arita".

Diagnosis: 1.15 - 1.30 mm long. Very closely related to *Hydraena porcula*, *H. okinawensis* and *H. victoriae*. Body form and punctuation as in *H. okinawensis*. Protibia of male with conspicuous denticle in middle of under side; metatibia as in *H. porcula*.

Aedeagus (Fig. 6): The aedeagus of *H. satoi* can be distinguished from *Hydraena porcula*, *H. okinawensis* and *H. victoriae* mainly by the shape of the apex of the main piece (ventral view). Main piece with one long dorsal seta. Flagellum without protuberance. Phallosome forming a closed ring.

Gonocoxite (Fig. 6): Subtriangular, laterally slightly rounded; inner plate slightly surpassing outer plate sublaterally, anterior margin bisinuous (at least in some of the specimens), concave medially, strongly excised laterally; with one pair of oval, slanting caveae.

Spermatheca (Fig. 6): Proximal portion saccoid; distal portion discoidal. Spermathecal duct very slightly enlarged at apex.

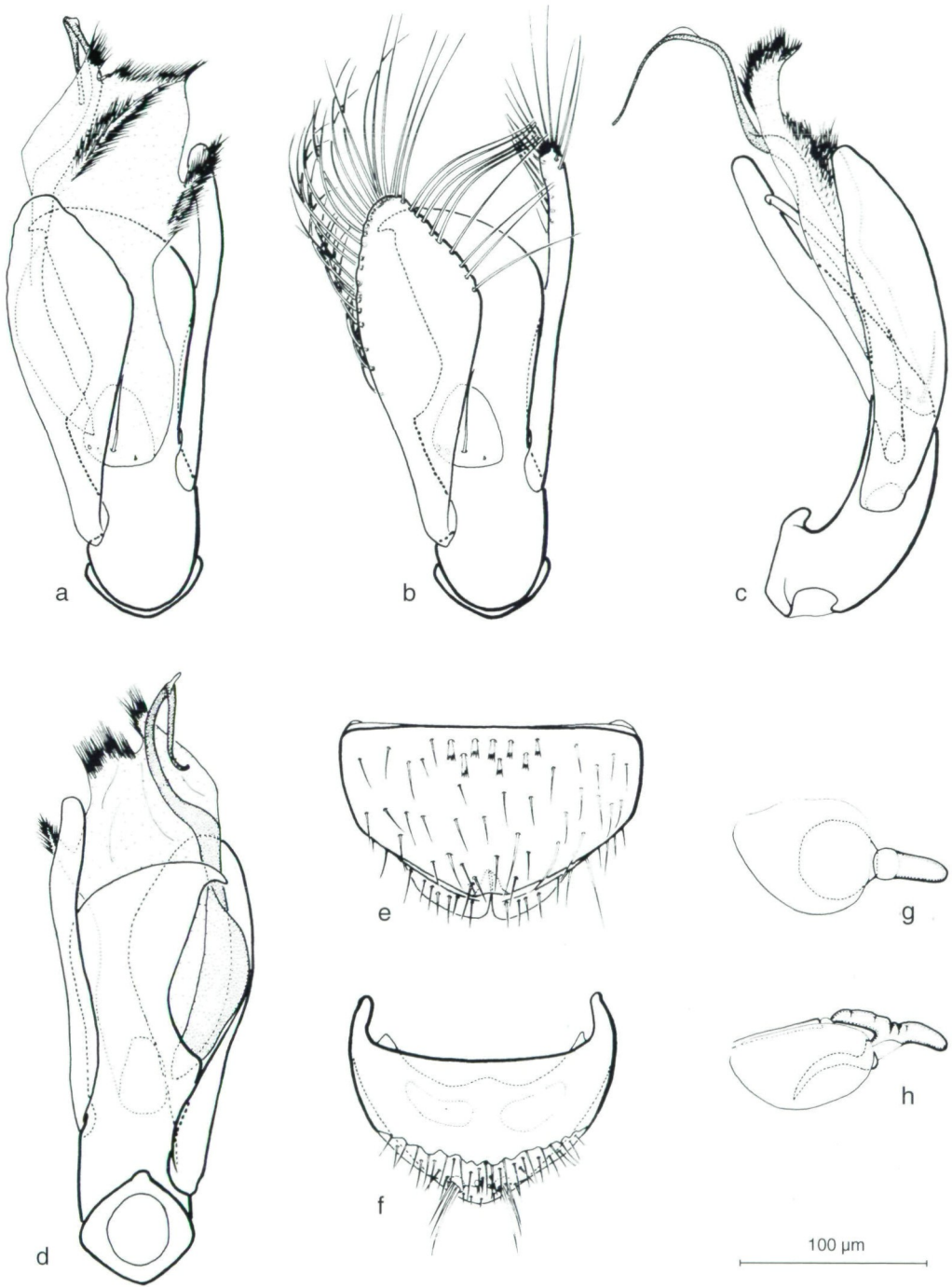


Fig. 6: *Hydraena satoi* sp.n.: aedeagus; (a) dorsal view (parameral setae omitted); (b) dorsal view (distal lobe omitted); (c) lateral view (parameral setae omitted); (d) ventral view (parameral setae omitted); (e) female tergite X; (f) gonocoxite; (g - h) spermatheca.

Female tergite X (Fig. 6): Subpentagonal, widest near base; disc moderately densely covered with trichoid setae, with few squamose setae near base; subapical setae trichoid; hyaline apical margin rather short, not reaching lateral margin of tergite, deeply excised medially.

Distribution: So far known only from Iriomote-jima.

Etymology: Named for Prof. Masataka Satô.

Hydraena (Hydraenopsis) sautakei sp.n.

Type locality: Gaji-rindô, NE of Mt. Terukubi, 340 m a.s.l., Okinawa-jima, Ryukyu Archipelago, Japan.

Type material: **Holotype** ♂ (CSN): "[Okinawa:RYUKYU] Gaji-rindô 340m NE of Mt. Terukubi 21. X. 1987 \ Y. Nishikawa leg. (in leaf litter)". **Paratype** (NMW, CSN): 7 exs.: same locality data as holotype; 5 ♀♀: "IE-RINDOH KUNIGAMI <OKINAWA> 16 - iii. 1985 S.NOMURA".

Diagnosis: 1.3 - 1.4 mm long. Very closely related with *Hydraena miyatakei* SATÔ and *H. sauteri* d'ORCHYMONT.

Aedeagus (Fig. 7): Conspicuously Y-shaped (ventral and lateral view). Main piece rather straight and slender; with one long seta on left side near base of distal lobe; apex very long, thin, slightly curved; phallobase asymmetrical. Distal lobe rather amorphic, not clearly delimited from main piece, emerging from a lateral (left hand side) projection of the main piece. Left paramere rather short, curved, inserted near base of distal lobe, with a few long apical setae and one or two subbasal setae on left side; right paramere more or less completely fused to main piece, mainly indicated by the long apical setae.

Gonocoxite (Fig. 7): Subquadrate, lateral sides subparallel; inner plate distinctly outer plate medially, anterior margin concave; without cavea.

Spermatheca (Fig. 7): Proximal portion crescentic; distal portion more or less cup-shaped. Spermathecal duct very slightly enlarged at apex.

Secondary sexual characters: Mesosternal process more slender in male. Metasternal plaques of male very narrow and (especially posteriorly) ridge-like. Abdominal sternite VIII of male much larger. Female sternite VIII (Fig. 7): conspicuously produced, setose and rugulosely sculptured apically. Female tergite X (Fig. 7): Transverse, widest near base; disc sparsely covered with trichoid setae, without squamose setae; subapical setae vermiform (except for a few lateral, trichoid ones); hyaline apical margin rather entire.

Differential diagnosis: Externally, *Hydraena sautakei* can be distinguished from *Hydraena miyatakei* and *H. sauteri* by the colouration (more unicoloured brown, pronotum not distinctly bicoloured, although lateral margin slightly paler) and by the slightly wider pronotum (lateral margin rather convex than concave anterior of posterior angles). Apart from these characters it can be distinguished from *H. miyatakei* (Fig. 8) by the following characters: Ventral margin of aedeagal main piece (lateral view) more straight (not produced anterior of distal lobe and paramere insertions); left paramere slightly wider and slightly shorter. Posterior margin of female sternite VIII even more strongly produced. Vermiform setae of female tergite X less densely arranged. Gonocoxite not distinctly retracted towards base; anterior margin of inner plate convex. Distal portion of spermatheca more distinctly cup-shaped. From *H. sauteri* (see JÄCH & DÍAZ 1998: Fig. 21) it can be distinguished

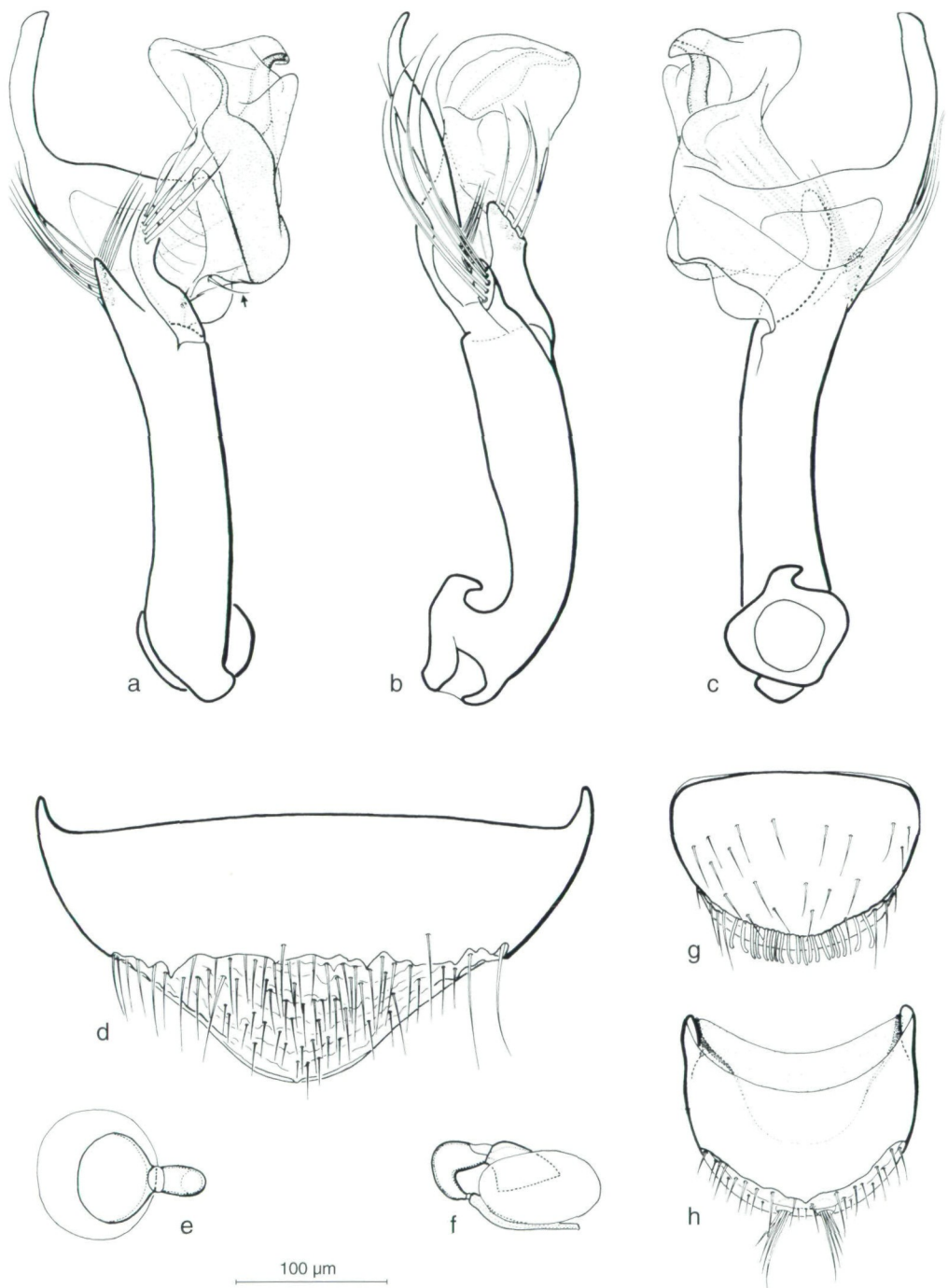


Fig. 7: *Hydraena sautakei* sp.n.: (a - c) aedeagus in dorsal, lateral and ventral view (arrow indicates seta of main piece); (d) female sternite VIII; (e - f) spermatheca; (g) female tergite X; (h) gonocoxite.

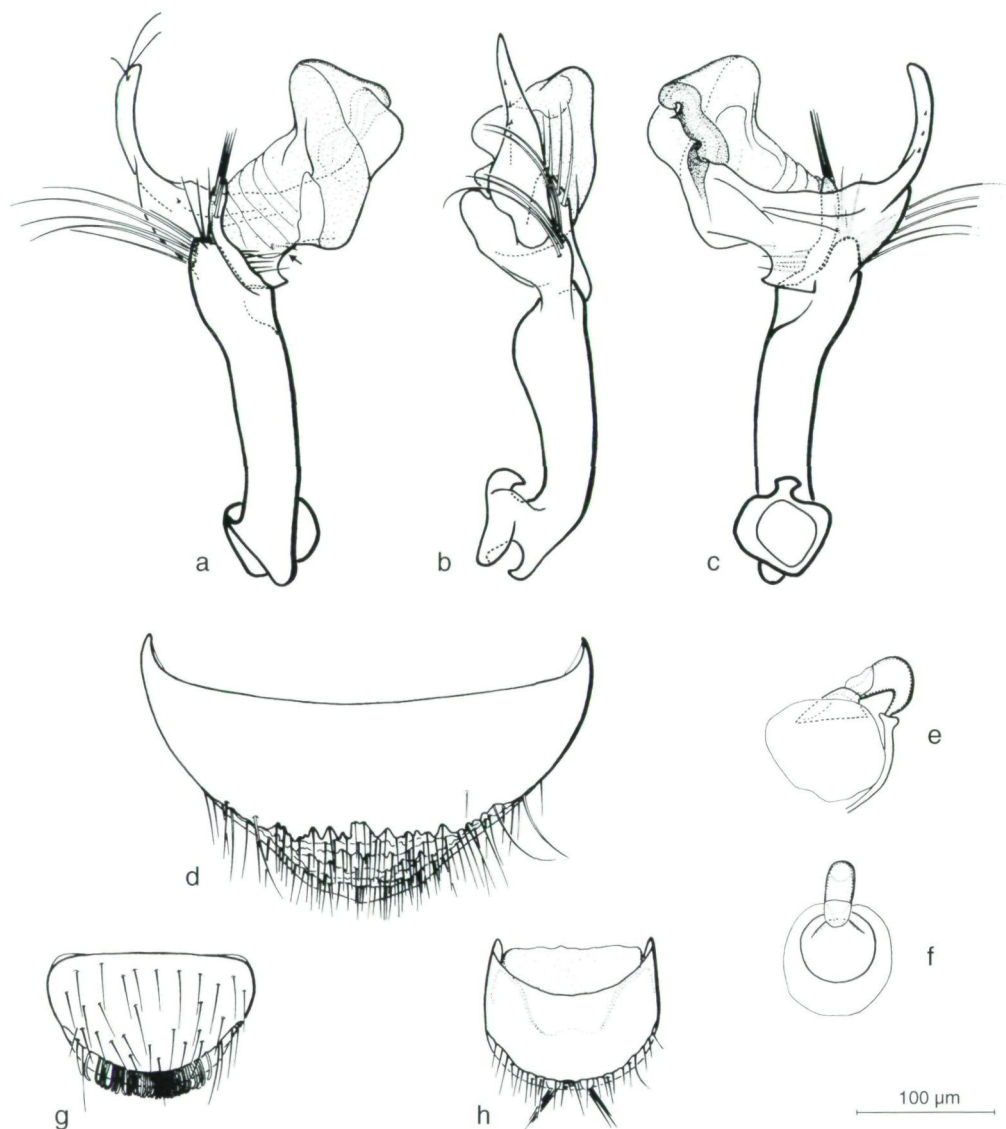


Fig. 8: *Hydraena miyatakei*: (a - c) aedeagus (specimen from China, Liaoning) in dorsal, lateral and ventral view (arrow indicates seta of main piece); (d) female sternite VIII; (e - f) spermatheca; (g) female tergite X; (h) gonocoxite.

also by the following characters: Produced portion of posterior margin of female sternite VIII widely rounded. Anterior margin of gonocoxite (including anterior margin of inner plate) distinctly convex. Distal portion of spermatheca more distinctly cup-shaped.

Distribution: So far known only from Okinawa-jima.

Etymology: The name *sautakei* is composed of the names *sauteri* and *miyatakei*, referring to the fact that this species is closely related with *Hydraena sauteri* and *H. miyatakei*.

Discussion

The Ryukyu Archipelago is comprised of numerous islands, six of which are now known to host one or more species of *Hydraena*: Iriomote-jima (*Hydraena iriomotensis*, *H. satoi*, *H. socius*), Okinawa-jima (*H. okinawensis*, *H. sautakei*), Iheya-jima (*H. iheya*), Tokunoshima (*H. victoriae*), Amami Oshima (*H. victoriae*), Kuchino-shima (*H. victoriae*).

The greatest diversity is found in the southern part of the Ryukyus. All species belong to the subgenus *Hydraenopsis* JANSSENS, and all species are more or less closely related with Taiwanese species. The subgenus *Hydraena* s.str., which is so common in the Japanese main islands, is obviously absent from the Ryukyus. Thus we can assume that the Ryukyu Archipelago was invaded by *Hydraena* from the south (through Taiwan) and not from the north (Japanese main islands).

Five of the six species are obviously strictly endemic (confined to single islands in their distribution). Only one, *H. victoriae*, is more widely distributed (known from three islands).

Hydraena iriomotensis and *H. socius* belong to the *H. isolinae* lineage (see JÄCH & DÍAZ 1998). Four species, *H. okinawensis*, *H. satoi*, *H. iheya*, and *H. victoriae* belong to the *H. porcula* lineage (see JÄCH & DÍAZ 1998). And *H. sautakei* belongs to the *H. miyatakei* lineage (defined by the typical shape of the aedeagus and by the strongly produced female sternite VIII).

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