A New Species of *Aedes (Stegomyia)* from Daito Islands, Ryukyu, Japan (Diptera: Culicidae)[1]

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ABSTRACT. Both sexes, egg, larva and pupa of *Aedes (Stegomyia) daitensis* n. sp., from Daito Islands, the Ryukyu Archipelago, Japan, are described, illustrated and compared to related species.

During the course of a faunatic survey on mosquitoes in Minami and Kita Daito Islands, offshore islands, about 400 km southeast of Okinawa Is., the authors found an interesting species belonging to the *Aedes (Stegomyia) scutellaris* subgroup (Toma and Miyagi 1980). As a result of morphological studies of this mosquito, the authors came to the conclusion that this species is new to science. It will be described as *Aedes daitensis*. The new mosquito species bites readily on man in forest. From the standpoint of transmission of pathogens, most members of the subgroup are important. However, the potentiality of this species as a vector of human pathogens is not known.

The method of presentation, terminology and abbreviation used in the description follow Belkin (1962) with modification by Huang (1979).

Aedes (Stegomyia) daitensis n. sp.

Aedes (stegomyia) sp. Toma and Miyagi 1980, Ryukyu Univ. J. Health Sci. Med. 3:15-20.

MALE (Figs. 1B, 2B). *Head.* Proboscis uniformly dark-scaled, longer than fore-femur; palpus dark, shorter than proboscis, with a white basal band on segments 2-5; those on segments 4, 5 incomplete dorsally; antenna plumose, shorter than proboscis; clypeus bare; torus covered with broad white scales except on dorsal side; decumbent scales of vertex all broad and flat; erect forked scales dark, not numerous; vertex with a median stripe of broad white scales, with broad dark ones on each side interrupted by a lateral stripe of broad white scales followed by a patch of white broad ones ventrally. *Thorax.* Lateral prescutal narrow white line not developed; scutem with narrow dark scales and a prominent

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median longitudinal stripe of similar yellowish-white ones, median stripe from anterior margin, narrows slightly posteriorly and forks at beginning of the prescutellar space; prescutellar yellowish-white line present; posterior dorsocentral yellowish-white line present; supraalar line of narrow yellowish-white scales inconspicuously present; acrostichal setae absent; dorsocentral setae present; scutellum (Fig. 1B) with broad black scales and with broad white ones at base of all lobes, sometimes lateral lobes with broad black scales only; anterior pronotum *(apn)* with broad white scales; posterior pronotum *(ppn)* with narrow dark scales on upper portion and with broad white scales on lower portion forming a white patch rather than a white stripe; paratergite with broad white scales; postspiracular area without scales; subspriacular area with several white scales; patches of broad white scales on propleuron *(ppl)*, and on the upper and lower portions of sternopleuron, upper sternopleural scale patch reaches to anterior corner of sternopleuron; upper and lower mesepimeral scale patches connected, forming a V-shaped white scale patch, the open side of the V being directed backwards; lower mesepimeron without setae; metameron bare. *Wing*. With dark scales on all veins; first forked cell about 1.5 (1.4-1.6) length of its stem. *Halter*. With dark and pale scales. *Legs*. Coxae with patches of white scales; knee spots present on all femora; fore- and midfemora dark anteriorly; anterior part of hindfemur with a broad white longitudinal stripe which widens at the base and is separated from apical knee spots; all tibiae dark anteriorly and fore- and midtibiae with pale scales posteriorly; fore- and midtarsi with a few white basal scales on tarsomeres 1, 2; hindtarsus with basal white bands on tarsomeres 1-5, that on 1 occupying 0.12 to 0.24 of the segment, on 2, 0.13 to 0.27, on 3, 0.20 to 0.36, on 4, 0.20 to 0.53, on 5, 0.33 to 0.56, the bands on tarsomeres 1-5 incomplete inner lateral part; fore- and midlegs with tarsal claws unequal, the larger one toothed, the smaller one simple; hindleg with tarsal claws equal, simple. *Abdomen*. Segment I with white scales on laterotergite and sometimes with median white spot on tergum; tergum II dark dorsally, with basal lateral white spots and with or without median white spot; terga III-VI usually with a complete sub-basal transverse white band which is connected to the lateral spots, sometimes terga III-VI interrupted mesally with several dark scales; tergum VII with lateral white spots only; sternum VIII with basal white band. *Terminalia* (Fig. 2B). Scales of basimere restricted to dorsolateral, lateral and ventral areas. A patch of setae on the basomesal area of dorsal basimere, mesal surface membranous; claspette with distal expanded part subtriangular in shape, sternal and tergal sides not parallel but tapering, with 5 or 6 modified setae in a row on center of sternal side and occupying about 0.33 of it; basosternal area of claspette with a shallow concave, apicotergal area with several distinctly long setae; distimere simple, elongate, as long as basimere, with a spiniform process and a few setae near apex; tergum IX with middle rounded and with a hairy lobe on each side.

FEMALE (Fig. 1A, C, D, G, H). Essentially as in the male, differing in the following respects: *Head*. Palpus about 0.2 length of proboscis, with white scales on apicodorsal half, 4-segmented, or sometimes 5-segmented, when present segment 5 minute. *Thorax* (Fig. 1A). Supraalar line of narrow yellowish-white scales present; scutellum with broad black scales on all lobes and with broad white ones at base of midlobe, sometimes lateral lobes with basal spot of white

scales or all lobes with black scales only. *Wing.* With first forked cell about 1.7 (1.6-1.8) length of its stem. *Legs* (Fig. 1G, H). Hindtarsus with basal white bands on tarsomeres 1-5, that on 1 occupying 0.17 to 0.26 of the segment, on 2, 0.22 to 0.32, on 3, 0.32 to 0.48, on 4, 0.44 to 0.63, on 5, 0.50 to 0.78, the bands on tarsomeres 1-5 incomplete on inner lateral part; fore- and midlegs with tarsal claws equal, simple. *Abdomen* (Fig. 1C, D). Tergum II usually without median white spot, sometimes with median spot, terga III-VII usually with a complete sub-basal transverse white band which is connected to the lateral spots, sometimes terga III-VII interrupted with several dark median scales; segment VIII entirely retracted. *Terminalia.* Sternum VIII with a deep U-shaped notch at middle and with conspicuous rounded lateral lobes; tergum IX with well developed lateral lobes, each with 3 or 4 setae; postgenital plate with a shallow concave; cerci short and broad; 3 spermathecae, one larger than the other 2.

PUPA (Fig. 2A, C). Chaetotaxy as figured in Fig. 2A, C and recorded in Table 1. Mental plate, area between respiratory trumpets and terga I-VII on median area moderately to heavily pigmented. Trumpet about 3.9 (3.5-4.2) as long as wide at the middle, paddle ovoid with marginal fringe on apical 0.80; seta 1-P single; midrib reaches apex; index 1.18 (1.12-1.24).

LARVA (Fig. 3). Chaetotaxy as figured in Fig. 3 and recorded in Table 2. *Head.* Antenna 0.5 length of head, without spicules; seta 1-A inserted near middle of shaft; seta 4-C well developed, branched, closer to 6-C than 5-C, cephalad and mesad of 6-C; 5-C single, long; 6-C usually single, rarely double, stout; 8-10, 13-C single; 7-C usually double (2-3); 11-C usually 3-branched (2-4); 12-C usually double (1-3); 14-C usually double (2-3); 15-C with 2-branched (1-3); mentum (MP) with 10-13 teeth on each side. *Abdomen.* Comb scales (CS) 8-11, in a single row, each scale with fine denticles or fringes at the base of the apical spine; siphon about 2.5 as long as wide, acus absent; pecten teeth (PT) 3-10 in number, evenly spaced, and in a straight row, each tooth with 1-3 basal denticles; 1-S with 2-4 branches, inserted beyond last tooth at basal 0.53 of siphon; 1-X usually 2-branched (2-3); 2-X 2-branched; 3-X usually single, rarely 2; ventral brush with 4 pairs of seta on grid, each seta single except 4d-X usually double (1-2), sometimes 4c-X double; no precratal tufts; anal papillae unequal, sausage-like about 1.8-2.2 length of saddle.

EGG (Fig. 1E, F). Shape. Diamond-shaped, anterior and posterior ends with sharp taper. Size. Length about 0.5 mm, width about 0.2 mm. Color. Dark brown.

HOLOTYPE

Male (791006-1), with larval and pupal skins on slides, found as 4th stage larva in a tree hole at Zaisho, Minami Daito Island, the Ryukyus, Japan, on October 6, 1979, by I. Miyagi and T. Toma. Holotype will be deposited in the National Sciences Museum, Tokyo, Japan.

PARATYPES

Eight males and 15 females with associated larval and pupal skins on slides and 11 males, 18 females, 3 larvae and 3 pupal skins. Collections were made in tree holes and artificial containers at the same locality as holotype in October 1979, by I. Miyagi and T. Toma. Paratypes (2 females and 2 males with associated larval and pupal skins on slides) will be deposited in the National Science Museum, Tokyo, and one male and female with larval and pupal skins on slides which will be presented to the U. S. National Museum, Washington, D. C.

DISTRIBUTION

Minami and Kita Daito Islands, the Ryukyus, Japan.

BIOLOGY

The immature stages of *Aedes daitensis* have been collected mainly in tree holes. They have also been found in artificial containers near forest. *Aedes daitensis* appears to be a forest species and the adults bite readily on man in the vicinity of its breeding places. They were sometimes associated with *Aedes albopictus* in the containers.

TAXONOMIC DISCUSSION

The *Aedes scutellaris* group of species is the most dominant and complex in the subgenus *Stegomyia* as shown by the number of species and subspecies (Knight and Stone 1977). Knight and Hurlbut (1949) studied on the group of eastern Carolines and subdivided Edward's (1932) group C, which was modified by Knight and Rozeboom (1946), into 3 subgroups, subgroup I (*Aedes scutellaris s. str.)*, II *(Aedes albopictus)* and III *(Aedes mediopunctatus)*. They characterized the subgroup I by having the abdominal tergum with subbasal markings. In addition, post spiracular scales are lacking, and the pleural scale patches are arranged in 2 rather well-defined longitudinal bands (not true of *Aedes gurneyi* Stone and Bohart). Bohart (1956) divided the Micronesian *Aedes scutellaris* group by the definition of Knight and Hurlbut (1949). Huang (1972, 1979) reviewed the Southeast Asian *Aedes scutellaris* group, which comprised both Knight and Hurlbut's subgroup I and II, and divided it into 2 subgroups, the *Aedes albopictus* subgroup and the *Aedes scutellaris* subgroup. The *Aedes albopictus* subgroup is characterized by having the supraalar white line not clearly defined and with only narrow scales over the wing root. The *Aedes scutellaris* subgroup is characterized by having the supraalar white line complete and well developed, with broad flat scales over the wing root and toward scutellum. The new species, *Aedes daitensis*, is apparently a member of the Western Pacific *scutellaris* subgroup. The authors should use Bohart's (1956) definition of the subgroup to discuss their new species and also should compare their new species with other members of the Western Pacific *scutellaris* subgroup (Micronesian *scutellaris* subgroup) in all stages. According to the

literatures, *Aedes daitensis* is very similar to *Aedes hakanssoni* Knight and Hurlbut, *Aedes hensilli* Farner and *Aedes guamensis* Farner and Bohart described from Micronesian Islands. After comparing the present species with the paratypes of these Micronesian species (male, female, pupa and larva of *Aedes hakanssoni*, male and female of *Aedes guamensis)* afforded from U. S. National Museum and with descriptions of Bohart and Ingram (1946), Knight and Hurlbut (1949) and Bohart (1956), the authors have concluded that the new species is apparently different from these species by the following points.

The adult of *Aedes daitensis* is very similar to *Aedes hakanssoni* in having narrow curved scales above the wing root, a patch of broad scales on subspiracular area, so that pleural marking not obviously linear, hindtarsus with basal white bands and markings on tarsomeres 1-5. It can be easily distinguished from *Aedes hakanssoni* by the absence of a thin line of pale scales along the anterior scutal marking and inward along the scutal angle, and from other Micronesian species, *Aedes guamensis, Aedes hensilli, Aedes scutoscriptus* Bohart and Ingram and *Aedes scutellaris* (Walker), in having yellowish-white narrow scales over the wing root.

The male terminalia of *Aedes daitensis* is very similar to *Aedes hensilli, Aedes hakanssoni* and *Aedes guamensis* but it can be separated from these species by having claspette with a shallow concave at basosternal 0.33 of claspette.

The pupa of *Aedes daitensis* distinguishable from the paratype of *Aedes hakanssoni* (no. 58806) in having setae 6-III-V about as long as 9-III-V, paddle ovoid with marginal fringe on about apical 0.80. While in the latter species, setae 6-III-V longer than 9-III-V and paddle ovoid with middle area of outer margin slightly depressed and with fringe on both outer and inner subbasal margins and distal margins.

The larva of *Aedes daitensis* can be distinguished from *Aedes scutellaris* and *Aedes hensilli* in having abdominal seta 5-VIII usually double, sometimes single, pecten teeth 3-10 (except *Aedes hensilli*) and from *Aedes hakanssoni* and *Aedes guamensis* in having anal papillae sausage-like, length of seta 1-X shorter than anal papillae and pecten teeth in a straight row.

As far as the authors are aware, one species of the subgroup, *Aedes riversi* Bohart and Ingram, has been known to occur in the southern part of Japan (Mogi 1976). The adult of *Aedes daitensis* is easily distinguished from *Aedes riversi* in having yellowish-white narrow scales over wing root and markings on tarsomeres 1-5 and on scutellum. The eggs of *Aedes daitensis* are similar to those of *Aedes riversi* but can be distinguished from the latter by diamond-shape.

In the review of Micronesian species of the *scutellaris* subgroup, Bohart (1956) demonstrated that "The subgroup is remarkably homogenous except for *scutoscriptus, hakanssoni,* and *gurneyi* in which the pleural pattern is scarcely linear. Possibly *gurneyi* should have a subgroup of its own, and the other two might be placed in still another subgroup." Marks (1954) in her extensive review of the subgroup, also stated that *Aedes gurneyi* is often placed with

Aedes albopictus subgroup and *Aedes scutoscriptus* is also somewhat aberrant from the subgroup. *Aedes daitensis* is very similar to *Aedes hakanssoni* and their pleural markings can hardly be called linear. The Micronesian *scutellaris* subgroup is complicated and will undoubtedly be split into a few other subgroups in the future.

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Table 1. Chaetotaxy of the pupa of *Aedes daitensis*

Seta No.	Cephalo-thorax	Abdomen								Paddle
		I	II	III	IV	V	VI	VII	VIII	
0	-	-	1	1	1	1	1	1	1	-
1	1	10-20	2-4	2-4	2-4	1-3	1-2	1-3	-	1
2	1	1-2	1	1	1	1	1	1	-	-
3	1	1	1	1	1-4	1-2	1	1-2	-	-
4	1-2	1-4	2-5	1-4	1-2	2-3	1-2	1-2	1	-
5	2-4	2-5	2-4	1-4	1	1-2	1	1-2	-	-
6	1-3	1-2	1	1-2	1	1-2	1-2	1-2	-	-
7	1-2	1-2	1-3	1-3	1-2	2-4	1-2	1-2	-	-
8	2-5	-	-	1-3	2-3	2-3	2-5	1-3	-	-
9	1	1-2	1	1	1	1	1-2	1	1-2	-
10	1-5	-	1	1	1	1	1	1	-	-
11	1	-	1-2	1	1	1	1	1	-	-
12	1-2	-	-	-	-	-	-	-	-	-
14	-	-	-	1	1	1	1	1	-	-

Chaetotaxy based on 15 pupal skins which have associated adult specimens.

Table 2. Chaetotaxy of the 4th instar larva of *Aedes daitensis*

Seta No.	Head	Thorax			Abdomen							
		Pro-	Meso-	Meta-	I	II	III	IV	V	VI	VII	VIII
0	-	-	-	-	-	1	1	1	1	1	1	1
1	1	3	1-3	2-4	2-4	2-4	2-3	1-3	2-3	2-4	2-3	2-3
2	-	1	1	1	1-2	1-2	1	1	1	1	1	1
3	1	2	1	1-3	1	1	1	1	1	1	1	2-5
4	7-11	1-2	1	2-4	2-4	2-4	1-2	1-2	1-2	1	1	1
5	1	1-2	1	2-3	3-4	3-4	3-4	2-3	3-4	2-3	3-4	1-2
6	1-2	1	3-4	1	3-4	2-3	2	2	2	1	2-4	-
7	2-3	2-3	1	4-7	1-2	1-3	2-4	1-4	1-4	1	1	1-S=2-4
8	1	3-4	4-5	2-3	-	1-2	1-2	1-3	1	1-3	2-4	1-X=2-3
9	1	1	3	1-2	1-2	1-2	1-2	1-2	1-2	1-2	2-3	2-X=2
10	1	1	1	1	1	1	1	1	1	1	1	3-X=1-2
11	2-4	1-3	1	1	1-3	1	1	1	1	1	1	Antenna 1-A=1
12	1-3	1	1	1	-	1	1	1	1	1	1	
13	1	-	2-4	1-3	1-3	1-3	1-3	1-3	2-3	1-3	1-2	-
14	2-3	2-3	1-2	-	-	1	1	1	1-2	1	1	1
15	1-3	-	-	-	-	-	-	-	-	-	-	-

Chaetotaxy based on 15 whole larvae and 15 larval skins which have associated adult specimens.

EXPLANATION OF FIGURES

Fig. 1. Adult of *Aedes daitensis* (A, B, C, D, G, H) and egg (E, F)

A. Thorax of female

B. Scutellum of male

C. Abdomen of female, lateral aspect

D. Abdomen of female, dorsal aspect

E. Egg, lateral aspect

F. Egg, ventral aspect

G. Hindtarsus of female, outer aspect

H. Hindtarsus of female, inner aspect

Fig. 2. Pupa of *Aedes daitensis* (A, C) and male genitalia (B)

A. Cephalothorax (C)

B. Male genitalia and claspette (CL)

C. Metanotum (C) and abdominal segments (I-VIII) and paddle (P)

Fig. 3. Fourth stage larva of *Aedes daitensis*

A. Thorax and abdominal segment (I-VI)

B. Head

C. Abdominal segment (VII, VIII, X) and siphon (S)

Fig. 1

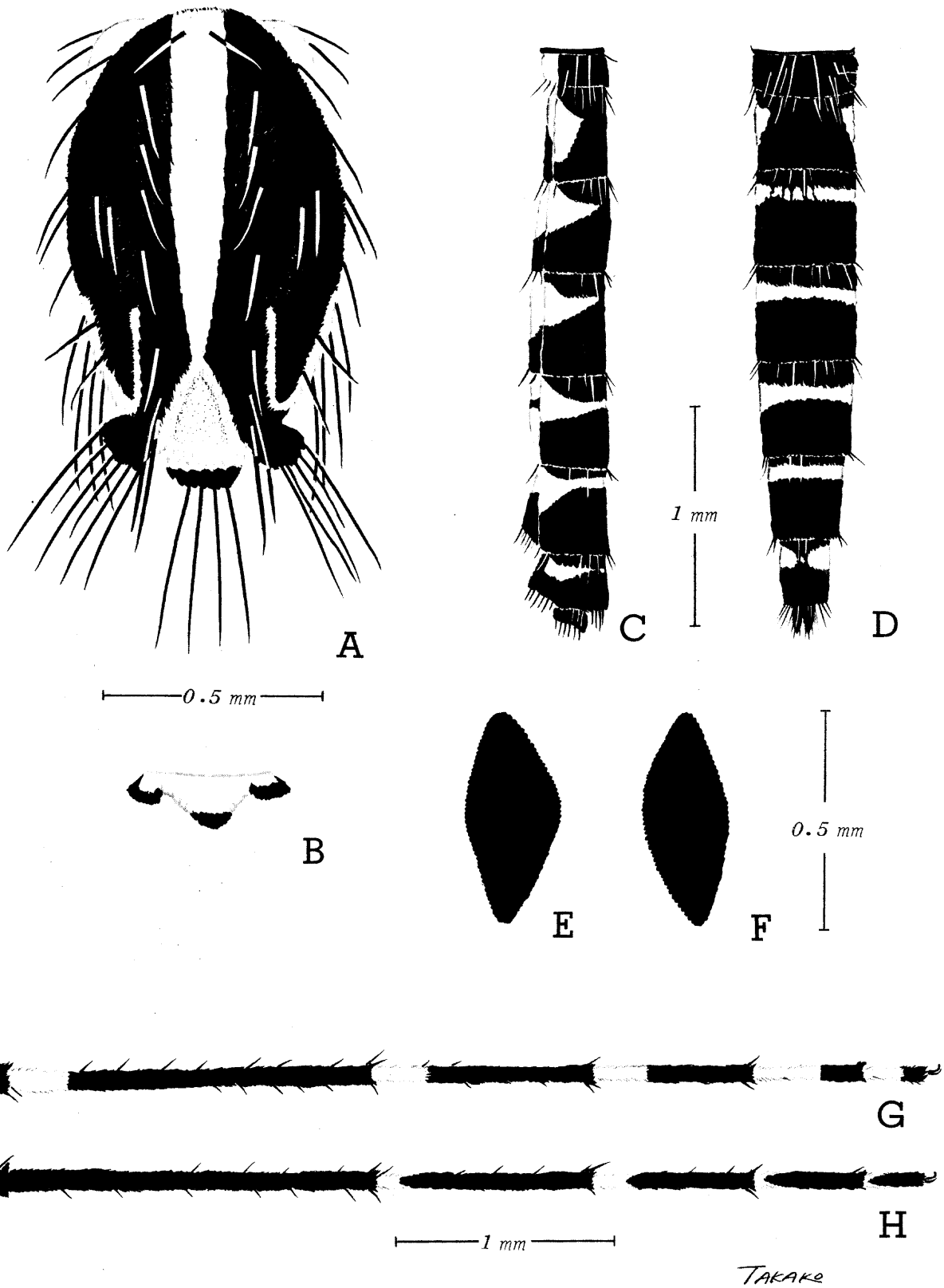

Fig. 2

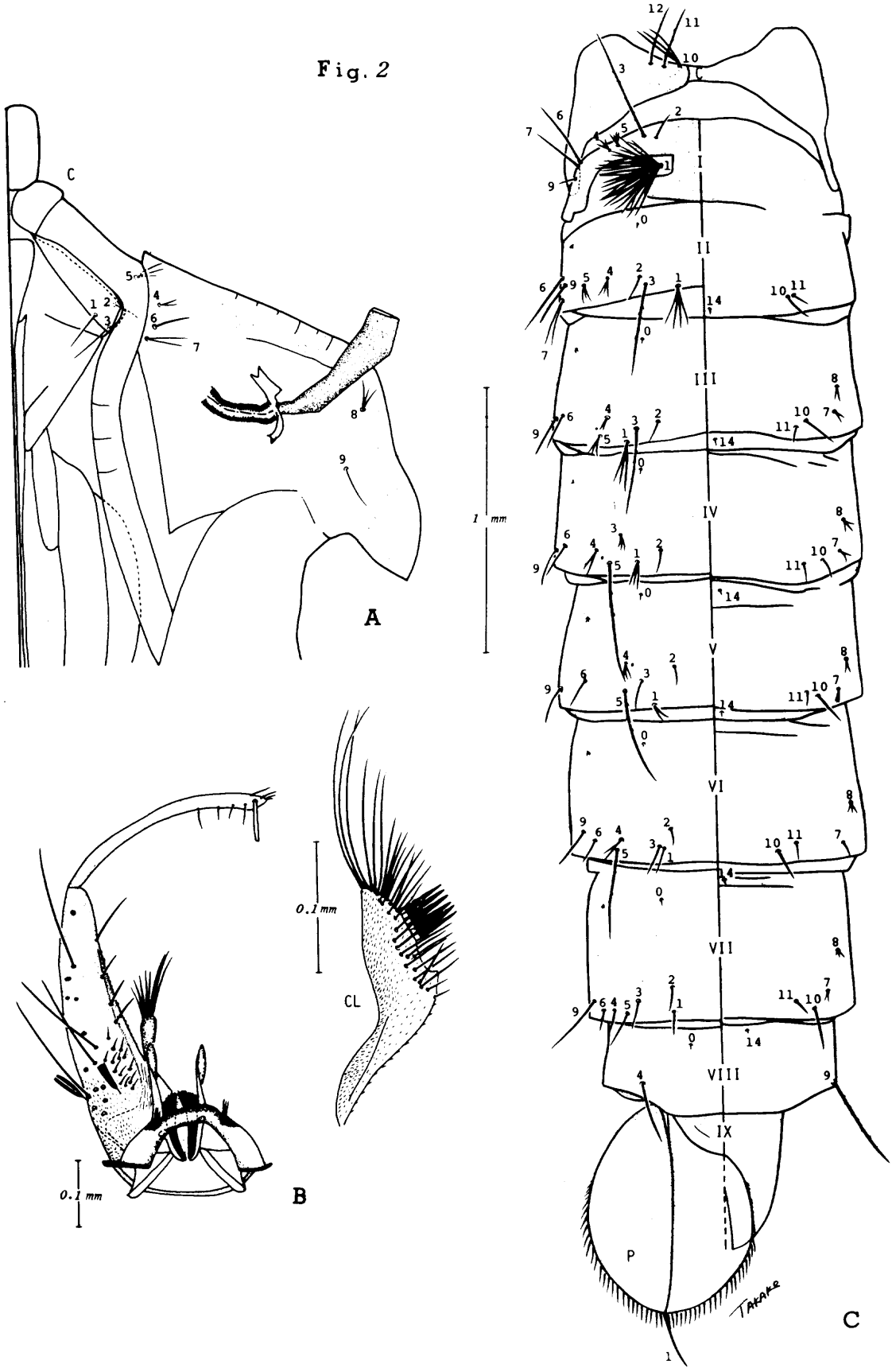

Fig. 3