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Delfinado, 1966 (Diptera : Culicidae) collected  
from Kuching, Sarawak, Malaysia

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## Redescription of *Armigeres (Armigeres) setifer* Delfinado, 1966 (Diptera: Culicidae) collected from Kuching, Sarawak, Malaysia

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**Abstract:** Redescriptions and illustrations are presented for larval, pupal and adult stages of *Armigeres (Armigeres) setifer* Delfinado, 1966 based on specimens collected in Kuching, East Malaysia. This species is recorded outside of the type locality, Palawan, Philippines, for the first time. The immatures of this species breed in coconut shells with high organic water.

**Key words:** mosquito, Culicidae, *Armigeres (Armigeres) setifer*, Sarawak, Malaysia

*Armigeres setifer* Delfinado, 1966, was originally described on the basis of a male collected from Palawan, Philippines (Delfinado, 1966), and the female adult and immature forms have remained unknown. During a mosquito survey in Sarawak, East Malaysia in September 2005 and August 2006, we collected many larvae and pupae of the genus *Armigeres* from coconut farms in Kuching. They were reared individually in the laboratory of the Sarawak Museum and a series of the adult male and female specimens were obtained with the associated larval and pupal exuviae. Among these specimens, an interesting pupa having very long and multi-branched paddle setae (Pa-1) was found. The morphological characteristic of the male genitalia associated with the pupal exuviae was identical to the holotype of *Ar. setifer* preserved in the National Museum of Natural History, Smithsonian Institution, Washington, DC. (USNM).

In the present paper, we describe and illustrate the female adult and immature forms of *Ar. setifer* for the first time. The ornamentation of the female abdomens was based on fresh specimens of the species. The terminology and abbreviations for general morphology used in this paper follow Harbach and Knight (1980, 1982).

### *Armigeres (Armigeres) setifer* Delfinado, 1966

(Figs. 1–3, Tables 1, 2)

*Armigeres (Armigeres) setifer* Delfinado, 1966,  
Mem. Am. Ent. Inst. 7: 87.

Holotype: male. Type locality: Pinigisan, Mantalingajan, Palawan, Philippines.

Male (Fig. 1A–E, I, J, L–N).

Wing 3.1–3.3 mm. Proboscis 2.0–2.7 mm.  
Forefemur 2.4–2.6 mm. Abdomen 3.5–4.0 mm.

*Head:* Vertex covered with broad dark scales and with broad white scales along ocular line, broadening ventrally at postgenal area. Occi-

put dark brown with erect forked scales. Ocular and interocular setae present. Clypeal integument dark brown. Proboscis long, uniformly covered with dark scales, slightly downcurved on apical 1/3. Maxillary palpus 2.5–2.8 mm, as long as or slightly longer than proboscis. Antenna about 1.8 mm. Pedicel with white broad scales on inner lateral sides.

**Thorax:** Integument brown to dark brown. Scutum densely covered with narrow curved black scales; posterior acrostichal area with a few narrow curved pale scales on prescutellar space. Paratergite with white scales. Acrostichal, dorsocentral and scutal fossal setae absent. Several well-developed antealar and supraalar setae present. Scutellum covered with several flat white scales on mid lobe and a few on lateral lobes; 6 lateral and 4 median scutellar setae present. Anteprenotal lobe with broad white scales uniformly, and with about 10 setae anteriorly. Proepisternum covered with large patch of broad white scales. Postpronotum with a patch of broad white scales and with a row of 8–10 setae on posterior margin. Anepisternal cleft with a line of white broad scales. Prespiracular setae absent. Postspiracular area with a patch of broad white scales and 2 pale setae. Mesokatepisternum with upper and lower large patches of white scales with 4–6 lower pale mesokatepisternal setae. Prealar knob with a patch of 8–10 setae, without white scales. Mesanepimeron with a large patch of white scales. Upper mesanepimeron with a patch of 10–15 pale setae. Mesomeron and metameron bare.

**Legs:** Coxae covered with white scales and many well-developed setae. All femur dark dorsally with a line of white scales on ventral surface, the line extending from base to apex, apical 1/3 black in hind femur. Tarsi and tibiae dark without pale band. Ungues (Fig. 1L–N): Foreunguis much larger than mid- and hindungues, unequal in size, larger one about twice the size of smaller one, both with submedian tooth. Several minute setae on base of the smaller one. Midunguis equal with submedian tooth. Hindunguis small and simple.

**Wing:** Cell  $R_2$  about 1.33 of  $R_{2+3}$ . Alula with

a row of setae mingled with scales; upper calypter with a row of fine setae. Capitellum with brown scales, pedicel and scabellum light in color.

**Abdomen:** Terga I–VIII mostly black-scaled in dorsal view with lateral patch of small white scales on V–VII (Fig. 1I). Sterna I–VI white-scaled with dark scales anteriorly, VII and VIII black-scaled entirely in ventral view (Fig. 1J).

**Genitalia** (Fig. 1A): Tergum IX with shallow depression in center, 5–7 fine setae on each lobe (Fig. 1D). Gonocoxite about 2.87 times as long as its width at center. Basal dorsomesal lobe with a bundle of many setae (Fig. 1E). Gonostylus about 0.49 length of gonocoxite; comb of 17–20 spiniforms with a stout blunt tip, closely spaced, arranged in a row on apical 0.44 (Fig. 1B). Phallosome as in Fig. 1C.

Female (Fig. 1F–H, K, O–Q).

Wing 3.4–4.0 mm. Proboscis 2.2–2.4 mm. Forefemur 2.5–2.7 mm. Resembles male except in the following characters.

**Head:** Maxillary palpus 0.5–0.6 mm. Antenna 2.0–2.4 mm.

**Thorax:** Scutum without white scales on prescutellar area. Scutellum mostly black-scaled with few white scales on mid lobe (Fig. 1K).

**Legs:** All femora with a ventral line of white scales from base to apex. Fore- and midungues equal in size, each with a submedian tooth; hindunguis smaller than midunguis, without submedian tooth (Fig. 1O–Q).

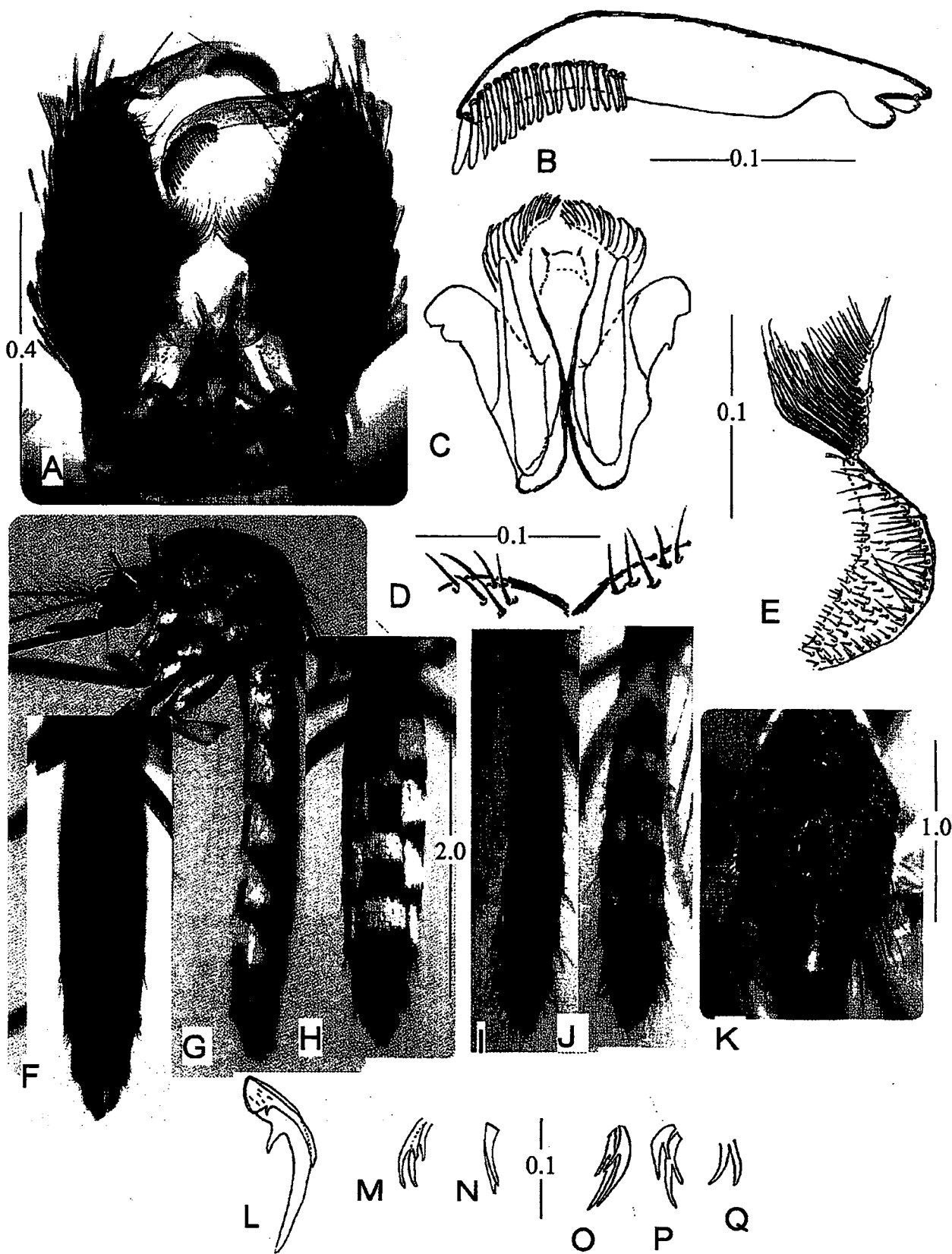
**Abdomen:** Dorsal, ventral and lateral views of tergal ornamentation as shown in Fig. 1F, G. Sterna I–VI entirely white-scaled, VII and VIII black-scaled entirely in ventral view (Fig. 1H).

Pupa (Fig. 2A–D).

Abdomen (segments I–VII) 4.4–6.0 mm in length (Fig. 2A). Trumpet short, 0.2–0.4 mm in length, index 0.82 (Fig. 2D). Paddle 0.7–1.1 mm in length, index 1.1–1.4. Chaetotaxy as in Fig. 2 and the range of branching of setae in Table 1.

**Cephalothorax:** Yellow to light brown; branches of main setae variable, 3–I 1, 2 branched, 3–III single, 6–IV, V 1, 2 branched, 6–VI 4–7 branched (Fig. 2C). Paddle lightly

Fig. 1. Male (A–E, I, J, L–N) and female (F–H, K, O–Q) of *Armigeres (Armigeres) setifer* Delfinado. A, male genitalia, ventral view; B, gonostylus; C, phallosome; D, tergum IX lobe; E, basal dorsomesal lobe; F, female abdomen, dorsal view; G, female abdomen, lateral view; H, female abdomen, ventral view; I, male abdomen, dorsal view; J, male abdomen, ventral view; K, female thorax, dorsal view; L, O, foreungues; M, P midungues; N, Q, hindungues. Scales: mm.



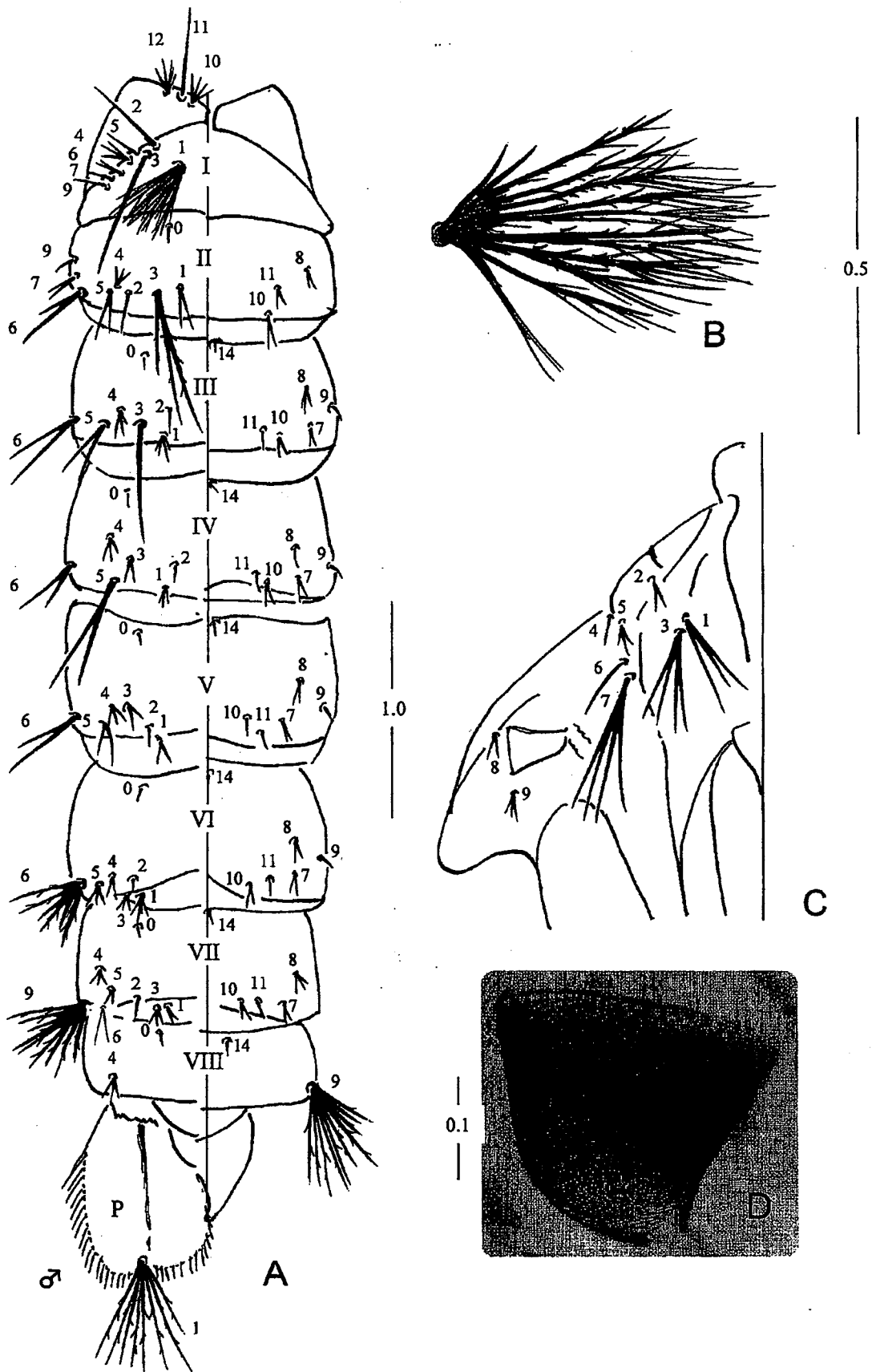


Fig. 2. Male pupa of *Armigeres (Armigeres) setifer* Delfinado. A, metanotum and abdomen; B, abdominal seta 1-I; C, cephalothorax; D, trumpet. Scales: mm.

Table 1. Chaetotaxy of the pupa of *Armigeres (Armigeres) setifer*.

Seta no.	Cephalo-thorax	Abdominal segments							
		I	II	III	IV	V	VI	VII	VIII
0	—	—	1	1	1	1	1	1	1
1	2-5*	M*	2-5*	1-7	3-7	2-6	3, 4	1-4	—
2	2-4	1	1, 2	1	1	1	1, 2	1, 2	—
3	2-7*	1-4*	1-6*	1*	1-3	2-4	3-9	2-7	—
4	1-5	3-8	3-10	1-3	1-5	3-7	2-4	2-4	2-6
5	3-9	1-4	2-5	1, 2*	2-4*	2-4	2-4	2, 3	—
6	1	2-5	1-4*	1-3*	1-4*	1-4*	4-7*	2-4	—
7	2-9*	1-7	2-5	2-4	1, 2	2-6	1-6	2-7	—
8	1-3	—	2-4	3-5	1-4	2-4	2-4	2-8	—
9	4-6	1, 2	1	1	1	1	1	9-12*	9-17*
10	4-8	—	1, 2	2-4	1, 2	2-5	2-7	2-5	—
11	1-4	—	2-5	1	1	1	1, 2	1, 2	—
12	4-6	—	—	—	—	—	—	—	—
13	—	—	—	—	—	—	—	—	—
14	—	—	—	1	1	1	1	1	1

Specimens examined: 5 pupal exuviae from Sarawak, Malaysia.

M, multiple branched; \*prominent seta.

pigmented, with fine spicules and long marginal fringes, midrib present, seta Pa-1 very long, pectinated, 4-19 branched. Male genital lobe extending to 0.5-0.6 of paddle.

Forth-instar larva (Fig. 3A-G).

**Head** (Fig. 3E) 0.8-0.9 mm in length, 0.9-1.2 mm in width. Siphon about 0.69 mm in length, index 1.38. Chaetotaxy as in Fig. 3 and the range of branching of setae in Table 2. Dorsomentum dark brown, with strong median tooth and 6-8 teeth on each side (Fig. 3C).

**Antenna** (Fig. 3D): Length 0.19-0.21 mm; seta 1-A single, situated on about 0.4 from base.

**Thorax** (Fig. 3A): Setae 9, 5-M setellate with aciculate branches.

**Abdomen** (Fig. 3B, F): Comb with 5-7 scales in a row, each scale with a blunt tip without marginal fringe (Fig. 3G). Siphon, 1-S small with 3-7 branches, arising about 0.86 from base.

**Specimens examined.** Holotype ( $\sigma^7$ ), Philippines, Palawan, Mantalingajan, Pinigisan, 600 m, 7 Sept. 1961 (USNM).

The following specimens were collected as larval and pupal stages from coconut shells by I. Miyagi and T. Toma in September 2005 and August 2006 from Asajaya and Sampadi, Kuching, Sarawak, Malaysia. Some of the specimens were reared

individually and larval (L) and pupal (P) exuviae and genitalia (G) were mounted on slides.

3♀♀ (050915-2) on pins with L, P (3, 7, 27) on slides; 2♀♀, 2♂♂ (050915-2) on pins; 1♂ (050915-8) on pin with (G68) and L, P (45) on slides; 8♂♂G (050915-2) on slides; 2♂♂ (050920-11) with (G61, G62) and with L, P (50, 47); 3♀♀ (050920-11) with L, P (43, 48, 51); 9 whole larvae (050920-11); 5♂♂G (050920-15); 8 whole larvae (050920-15); 1♀ (060829-1) with P (130); 1♀ (060829-1) with L, P (111); 3♂♂G (060829-1); 1♂ (060829-3) with P (7). Most of the specimens examined will be deposited in the Sarawak Museum, Kuching, Malaysia and several male and female specimens with associated larval and pupal exuviae will be deposited in the USNM.

**Taxonomic Discussion.** As indicated by Delfinado (1966), *Ar. setifer* is closely related to *Ar. confusus* Edwards from Malaysia. However, *Ar. setifer* is very distinctive in all stages and easily distinguished from the latter as follows. In the adult *Ar. setifer*, sterna II-V in both sexes have white scales basally and black scales apically, whereas the specimens of *Ar. con-*

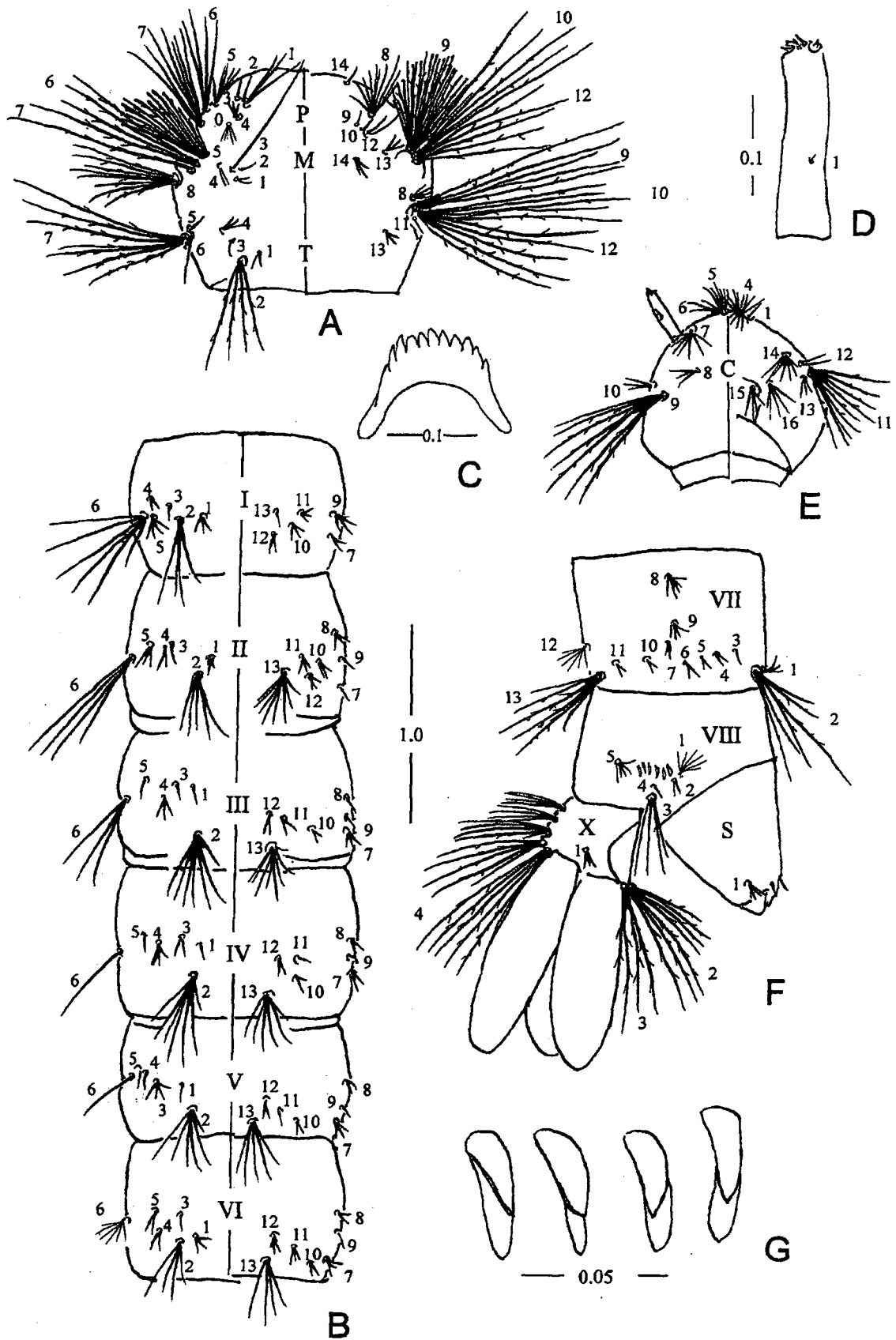


Fig. 3. Larva of *Armigeres (Armigeres) setifer* Delfinado. A, thorax; B, abdominal segments I-VI; C, dorsentum; D, antenna; E, head; F, terminal abdominal segments; G, comb scales. Scales: mm.

Table 2. Chaetotaxy of the larva of *Armigeres (Armigeres) setifer*.

Seta no.	Head	Thorax			Abdominal segments								
		P	M	T	I	II	III	IV	V	VI	VII	VIII	
0	—	4-7	—	—	—	—	—	—	—	—	—	—	—
1	1	3-5	1-4	1-3	1-6	1-4	1	1	1	3-6	3-5	5-12	
2	—	1, 2	1-2	3-5*	4-6*	4, 5	6, 7*	5-9*	5-7*	4-6*	4-6*	1-3	
3	—	1-4	1-3	1-3	1, 2	1	1, 2	1, 2	3-6	1	1	4-8*	
4	9-16	3-7	2-6	3-7	2-4	2-6	2-5	1-4	1-4	2-6	2, 3	1-3	
5	5-13	2-5*	12-21*	1	4-7	3-5	1-4	1-3	1-3	1-3	2-4	5-9	
6	2, 3	3-7*	4-7*	1, 2	3-8*	2-5*	1-3*	1, 2	1, 2*	5-11	6-8	—	
7	5-8	7-11*	1, 2*	7-11*	1, 2	1, 2	3-5	3-6	2, 4	1-3	2-5	1-X=2-6	
8	1-5	8-15*	7-10*	5-7	—	2-4	2, 3	1, 2	1, 2	1, 2	5-10	2-X=7-11*	
9	5-10*	1-5*	23-31*	5-10*	1-3	1	1	1	1, 2	1	4, 5	3-X=4, 5*	
10	1-4	1*	5-7*	5-7*	3, 4	1-4	2-4	2	2, 3	2	2-5	4-X=4-10*	
11	7-18*	?	?	1	2-7	1-4	1, 2	1, 2	1, 2	3-6	1-5	—	
12	2-4	2*	5-7*	5-7*	1	1-3	2	2	2	3-6	4-8	—	
13	4-10	—	3-10	5-7	1, 2	8-14*	8-11*	6-9*	5-9*	4-6*	5-8*	—	
14	8-15	1	3-10	—	—	—	—	—	—	—	—	—	
15	4-9	—	—	—	—	—	—	—	—	—	—	—	
16	5-10	—	—	—	—	—	—	—	—	—	—	—	

Specimens examined: 5 larvae from Sarawak, Malaysia.  
 \*Prominent seta.

*fuscus* collected from Sarawak, Malaysia, have sterna II-VI entirely white (Bonne-Wepster and Brug, 1937; Edwards, 1915). In the male genitalia, *Ar. setifer* is characterized by a basal dorsomesal lobe with many curved setae (Delfinado, 1966) and gonostylus with a comb of 17-20 spiniforms on apical 0.44, whereas the latter has a lobe with several strong upright setae and comb of 20-25 teeth on apical 0.71. In the larva of *Ar. setifer*, head seta 9-C is long with 5-10 branches and 11-C is long with 7-18 branches, whereas, in the latter, 9-C is long with 2, 3 branches and 11-C is small with 4-7 branches. In the pupa of *Ar. setifer*, paddle seta 1 (Pa-1) is very strong with 4-19 branches, whereas, in the latter, Pa-1 is weak and usually single.

**Bionomical Notes.** Immatures of *Ar. setifer* were found commonly in a coconut shell on the ground, associated with *Ar. malayi* (Theobald), *Ar. moultoni* Edwards, *Ar. confusus* and *Ar. jugraensis* (Leicester). Generally, water in the shell is either very foul or has a high organic content. The

females of *Ar. setifer* are attracted to humans and bite during the daytime in the shade.

**Distribution.** Palawan, Philippines and Kuching, Sarawak, East Malaysia.

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