Sabethes (*Peytonulus*) *luxodens*, a New Species of Sabethini (Diptera: Culicidae) from Ecuador

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The adult male, larva and pupa of Sabethes (Peytonulus) luxodens, *a new species from Ecuador, are described. The species is distinguished from* Sabethes aurescens *(Lutz), which it closely resembles in all life stages.*

Key words: *Sabethes* - *Peytonulus* - new species - mosquitoes - Culicidae - Ecuador

As noted by Harbach (1995a), the subgenus *Peytonulus* Harbach of the genus *Sabethes* Robineau-Desvoidy includes at least 15 species, a number of which are undescribed. When first proposed, the subgenus included seven recognised species, namely *aurescens* (Lutz), *fabricii* Lane & Cerqueira, *gorgasi* Duret, *identicus* Dyar & Knab, *soperi* Lane & Cerqueira, *undosus* (Coquillett) and *whitmani* Lane & Cerqueira. Three additional species, *hadrognathus* Harbach, *ignotus* Harbach and *xenismus* Harbach, were described later, bringing the total to 10 formally recognised species. With the addition of the new species described in this paper, the subgenus *Peytonulus* now includes 11 taxonomically valid species and at least four undescribed species.

The species described below, along with the previously described and yet-to-be-described species, illustrates both the array of diversity and the overall remarkable degree of morphological similarity within the subgenus *Peytonulus*. The new species very closely resembles *Sa. aurescens* in all life stages, which explains why Heinemann and Belkin (1979), who first recognised it was different, referred to it informally as *Sa*. sp. near *aurescens* (of subgenus *Sabethinus* Lutz). We have since confirmed that it is different and here describe and name it as *Sabethes* (*Peytonulus*) *luxodens*.

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MATERIALS AND METHODS

This study is based on specimens borrowed from the National Museum of Natural History, Smithsonian Institution, Washington, DC. Observations of the adults were made under simulated natural light. Larval and pupal chaetotaxy was studied using a combination of bright field, phase contrast and differential interference contrast microscopy. Measurements and counts were made from all available specimens whenever possible. Numbers in parentheses represent modes of the reported ranges unless indicated otherwise. The form of presentation, descriptive terminology and abbreviations used in the species description follow Harbach and Knight (1980, 1982) and recent papers published as part of an ongoing revision of the genus *Sabethes* (Harbach & Peyton 1990, 1991, 1992, Harbach 1991, 1992, 1994, 1995a,b, Harbach & Petersen 1992).

TAXONOMIC TREATMENT

Sabethes (*Peytonulus*) *luxodens* sp. n. (Figs 1-3)

Sabethes (*Sabethinus*) sp. near *aurescens* of Heinemann & Belkin 1979: 100, 101 (Ecuador; coll. rec., L bion.).

This species exhibits the diagnostic characteristics of the subgenus (Harbach 1991). The adult female is unknown. For the most part, the adult male bears the metallic coloration of scaling illustrated for the female of *Sa. aurescens* (Harbach 1991: 2) and described for other species of the subgenus (Harbach 1995a,b).

Male - *Head*: eyes joined above and below. Occiput with transverse row of short semi-erect scales at back of head. Ocular setae moderately long, dark, close to margin of eye; 2 long, bronzy, approximated interocular setae present. *Antenna*: dark; length 1.42-1.68 mm ($\bar{x}$ = 1.52 mm), slightly shorter than proboscis; pedicel large, surface pu-

bescent, with minute setae on mesal side; flagellum moderately verticillate, proximal whorls with 14 setae, longest setae about 0.33 length of antenna. Clypeus and frons without setae and scales, with dense covering of silvery pubescence. Proboscis short; distal 0.3 flattened and expanded laterally, about 2.5 times as broad as proximal part; ventral surface silvery-white scaled except at very base, white scaling gradually widened distally to cover most of ventral surface of expanded distal part; expanded part bent downward at angle of 30-40° from plane of proximal part; with 3,4 basal labial setae. Maxillary palpus short, 0.12-0.15 length of proboscis; dark-scaled, ventral surface without scales. *Thorax*: integument brown. Dorsum with dark setae on anterior promontory (5-7), antepronotum (8-12), supraalar area (about 12), scutellum (10,11 long setae) and mesopostnotum (3-5). Pleura with prespiracular (2), upper proepisternal (1,2), lower mesokatepisternal (2,3) and upper

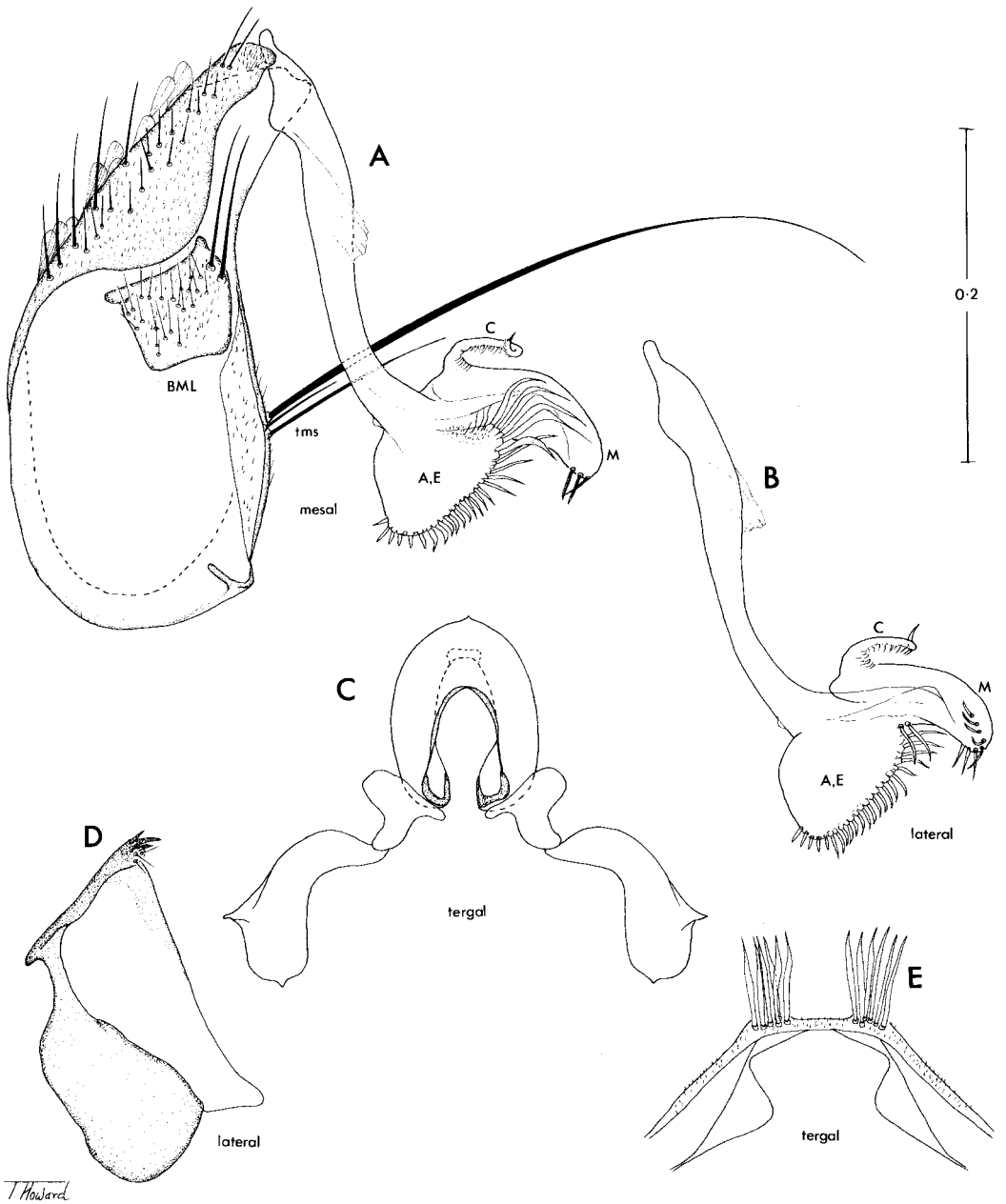

Fig. 1: male genitalia of *Sabethes* (*Peytonulus*) *luxodens* sp. n. Aspects as indicated for (A) gonocoxopodite; (B) gonostylus; (C) aedeagus, with parameres and basal pieces attached; (D) proctiger; (E) tergum IX. Bar in mm.

mesepimeral setae (9-12); prespiracular setae dark, others yellow or golden. Lower part of proepisternum without scales, scales on upper part contiguous with scales on anteprocoxal membrane; scales absent from postprocoxal membrane; mesopleuron with scales except on lower anterior margin of mesokatepisternum, upper posterior margin of mesepimeron and mesomeron; scales absent from metapleuron, metameron and postmetacoxal membrane. *Wing*: length 2.7 mm; scales on veins moderately broad and slightly asymmetrical, smaller on cubitus and anal vein; alula with fine piliform scales on margin distally; calypters without setae. *Halter*: scabellum without scales, integument pale; pedicel and capitellum dark-scaled. *Legs*: without paddles; coxae and trochanters with silvery-white scales, trochanters with some dark scales dorsally at apex; femora dark above and golden below; tibiae mainly dark with golden scaling proximally on ventral surface; tarsi entirely dark-scaled (hindtarsomere 5 without ventral white scaling); midtarsomeres 3 and 4, and distal part of midtarsomere 2, without projecting scales on dorsal surface, i.e. without expanded or slight paddle-like appearance in lateral view. Forefemur about 1.25 length of proboscis, essentially same length as midfemur, about 1.3 length of hindfemur; hindtibia about as long as hindfemur, hindtarsomere 1 longer than hindfemur. Ungues small, simple, black. *Abdomen*: coloration as noted above, lateral pale areas of terga rather large and rounded. *Genitalia* (Fig. 1 A-E; *cf. Sa. aurescens* in Fig. 2 A-E): tergum VIII (ventral in position; not figured) with posterolateral corners produced, bearing 4,5 rows of long close-set setae in patch extending mesad from lateral margin to point about half way to mid-line; posterior margin with broad, rather shallow V-shaped emargination with short scattered setae on either side extending to lateral patches of long setae. Tergum and sternum IX fused

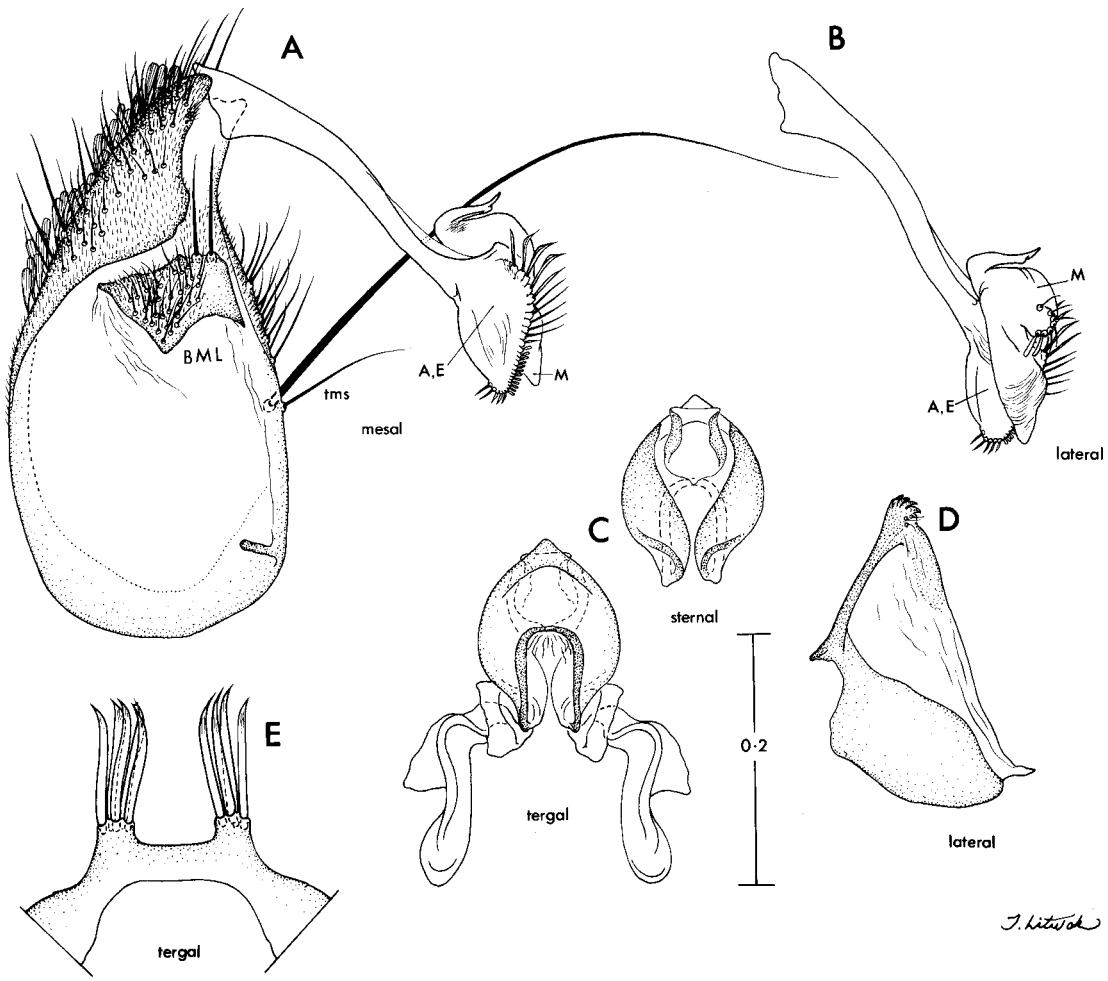

Fig. 2: male genitalia of *Sabethes* (*Peytonulus*) *aurescens* (Lutz). Aspects as indicated for (A) gonocoxopodite; (B) gonostylus; (C) aedeagus, with parameres and basal pieces attached; (D) proctiger; (E) tergum IX. Bar in mm.

laterally, forming a complete ring of sclerotization; tergum IX with distinct lobes rather widely separated by moderately broad bridge, each lobe with 5,6 flattened setae with apices slightly bent laterad. Gonocoxite elongate, tapered in distal half, tergomesal surface membranous, distosternal area covered with scales and short setae, bearing one very long and 2 unequal short tergomesal setae below level of basal mesal lobe; basal mesal lobe roughly quadrangular in ventral (tergal) view, covered with small slender setae and bearing 2 relatively large setae at caudolateral angle. Gonostylus as long as gonocoxite; stem narrow and slightly sigmoidally curved in lateral view, with a small translucent membranous flap borne ventromesally in basal half; head short and broad, about 0.3 total length of gonostylus, with 3 lobes developed as figured; lobe **A**,E large, laterally flattened and roughly cordate in lateral view, with fringe of specialised setae which begin as short stout setae at tergoapical angle and become progressively longer, flattened and expanded subapically on sternoapical edge at mesal side of lobe **M**, lateral side of sternoapical edge with 2 setae adjacent to base of lobe **M**; lobe **M** an apically directed, slightly bent thumb-like lobe with curved row of short stout setae borne tergolaterally at apex; lobe **C** a basally bent and apically directed slender process arising sternally from base of lobe **M**, with mesally twisted apex and tergal margin minutely spiculate. Aedeagus longer than wide, broadly oval in tergal view; with submedian tergal arms joined at midline to form narrow median tergal bridge; apical tergal arms broadly fused and bearing a minute median tubercle; median sternal plate membranous, apex flared and hood-like. Proctiger (lateral view) with very broad basal sclerotization (tergum X) narrowly fused with base of paraproct; paraproct narrow, only slightly enlarged apically, apex bearing several small teeth and 3 subapical cercal setae.

Egg - Unknown.

Larva, fourth instar (Fig. 3) - Similar to *Sa. aurescens* (*cf*. illustration in Harbach 1991: 3); character and placement of setae as figured, numbers of branches in Table I. *Head*: slightly wider than long, widest in posterior half; length 0.92-0.99 mm ($\bar{x}$ = 0.97 mm); width 1.00-1.11 mm ($\bar{x}$ = 1.05 mm). Occipital foramen widely V-shaped with arms extending dorsolaterally to point laterad of level of seta 9-C, margins heavily tanned, ventrocaudal margin with collar-like edge. Anterior margin of labiogula weakly denticulate; hypostomal suture complete, gently curved. Dorsomentum short, with 8-10(9) teeth on either side of median tooth, median tooth and most lateral tooth of either side larger than the others. Mandible (Fig. 4 E) without distinctive features. Maxilla (Fig. 4 C,D) relatively short, with 7-9(8) lateral teeth, first lateral tooth small, distinctly separated and removed far dorsad of other lateral teeth, second lateral tooth larger than the others which become progressively smaller and more dorsad; apical tooth not much longer than maxillary brush, curved mesad. Setae 4-6-C single, simple; 7-C double or triple; 9-C more or less directly mesad of 10-C; 11,14-C apparently shorter than in *Sa. aurescens*; 15-C inserted cephalad of 14-C near anterior margin of labiogula. *Antenna*: short, cylindrical; length 0.29-0.32 mm ($\bar{x}$ = 0.30 mm). Seta 1-A single, simple, borne dorsally about 0.8 from base, length about 3 times width of antenna at point of insertion; 5-A rather long with recumbent spine on mesal side about 0.3 from base. *Thorax*: integument hyaline, covered with minute villiform spicules. Setae 0,1,8,14-P, 1,13,14-M and 1,4,5,8-T multibranched and stellate; 11-P,M,T with stiff thickened branches, progressively longer and with fewer branches from pro- to metathorax, 11-T strong and spine-like; 13-T much longer than length of thorax, double; 10-M multiple, usually with 4 branches (3,4). *Abdomen*: integument hyaline, covered with minute villiform spicules. Setae 1-I-VI, 2,9-III-VII, 11-I and 13-I-VII well developed, stellate, with stiff aciculate branches; 2,9-I,II also stellate but smaller with weaker simple branches; 1-VII variable, more-or-less straight and simple to bent with minutely split or forked apex; 2-I,II both well laterad of 1-I,II respectively, 2-III-VI well mesad and anterior to seta 1; 6,7-I dissimilar, 6-I shorter with 5-8(6) branches, 7-I longer and single; 6,7-II similar but 6-II double or triple and 7-II single or double; 6-III-VI long, single; 7-III well developed but shorter than 7-I,II, with 2-4 branches; 3-VII longer than usual, about twice length of segment VIII; punctures absent from segments III-V. *Segment VIII*: comb a single row of 6-12(8) large spine-like scales with lateral fringes of minute spicules on proximal 0.5. *Siphon*: relatively long and slender, gradually tapered in proximal 0.5, more-or-less cylindrical in distal 0.5; moderately tanned; surface covered with short rows of minute spicules which become smaller distally; length 1.29-1.47 mm ($\bar{x}$ = 1.33 mm), width at mid-length 0.11-0.14 mm ($\bar{x}$ = 0.13 mm), index 9.21-12.09 ($\bar{x}$ = 10.20). Pecten of 11-17 filaments extending from below level of seta 1-S to point proximal to seta 1a-S. Seta 1-S inserted at mid-length of siphon; 2-S stout and claw-like with minute denticles ventrally on distal 0.5. *Segment X*: saddle covering dorsal 0.5 of segment, with rows of minute spicules that become larger dorsally; length 0.25-0.27 mm ($\bar{x}$ = 0.26 mm); siphon/saddle index 4.78-5.65 ($\bar{x}$ = 5.13). Setae 1-4-X well developed; 1,4-X single, 4-X shorter.

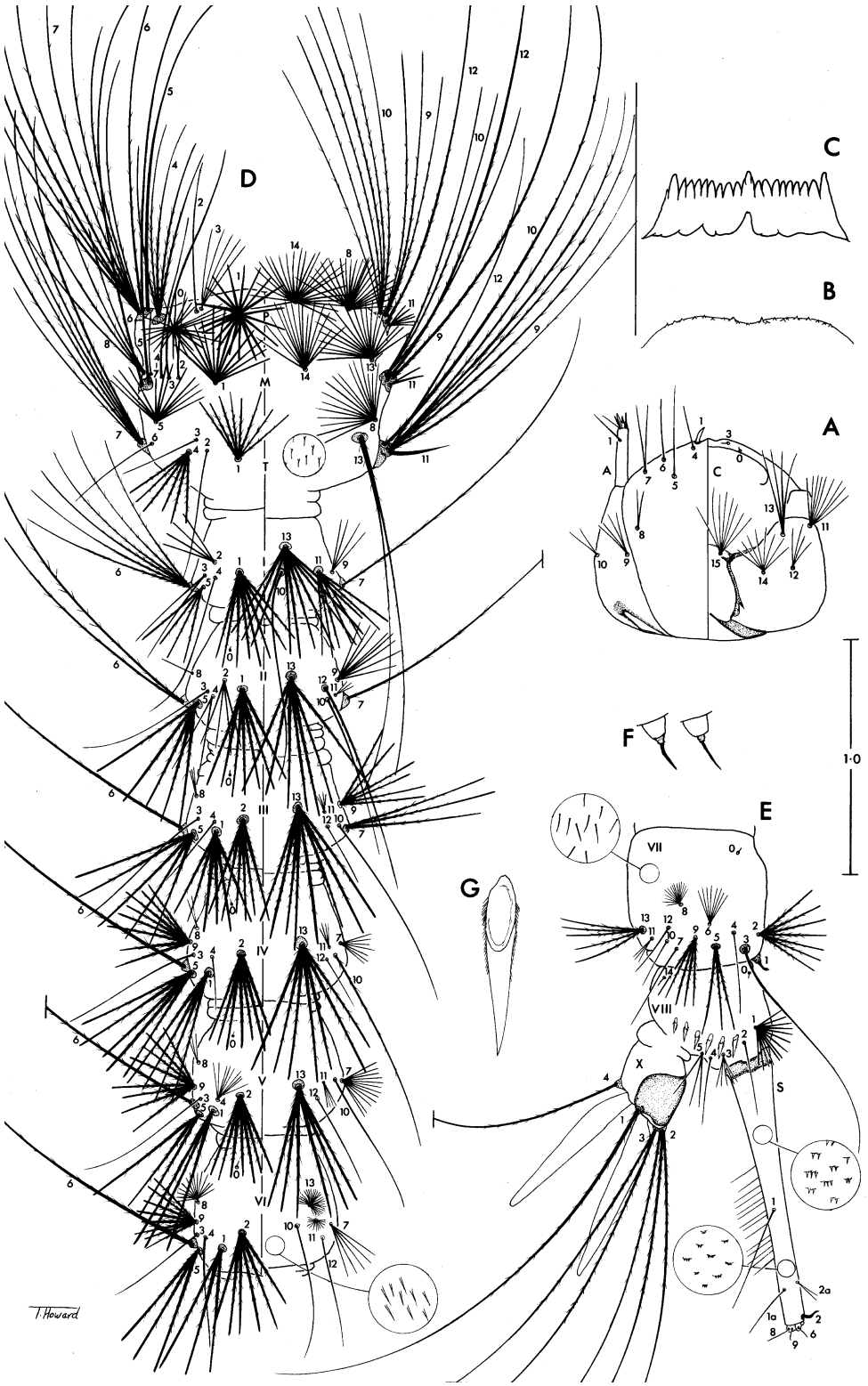

Fig. 3: fourth-instar larva of *Sabethes* (*Peytonulus*) *luxodens* sp. n. (A) Head, dorsal and ventral aspects of left side; (B) anterior margin of labiogula; (C) dorsomentum; (D) thorax and abdominal segments I-VI, dorsal and ventral aspects of left side; (E) abdominal segments VI-X, left side; (F) variation in development of seta 1-VII shown in E; (G) comb scales. Bar in mm.

TABLE I

Numbers of branches for setae of fourth-instar larvae of *Sabethes (Peytonulus) luxodens* sp. n.

	Head	Thorax			Abdominal segments								
Seta	C	P	M	T	I	II	III	IV	V	VI	VII	VIII	X
0	1	22-34(29)	—	—	—	1	1	1	1	1	1	1	—
1	1	15-19(18)	9-14(10,12)	5-11	6-10(9)	5-10(7)	5-7(5,6)	3,4	3-5(3)	3,4(3)	1	8-16(14)	1
2	—	1	1	1	3-5(4)	3,4(3)	5-8(7)	6-8(7)	5-8(6)	5-8(6)	6-10(8,9)	1	3
3	1	3-5(4)	1	1	1,2(1)	1	1	1	1	1	1	4-7(5)	2
4	1	3-6(4)	1	5-8(6)	1,2(1)	1,2(1)	1	1	5-10(6,7)	1	1	1	1
5	1	1	1	10-16	3-6(4)	4-6(5)	4-6(5)	3-5(4)	2,3(3)	3,4(3)	3-5(3)	3-5(4)	—
6	1	1	1	1	5-8(6)	2,3(2)	1	1	1	1	6-10(7)	—	—
7	2,3(3)	5-9(7)	1,2(1)	6-10(6)	1	1,2(2)	2-4(2,3)	4-10(8)	8-13(10)	3-6(5)	1	—	—
8	1-3(2)	15-39(24)	2-4(3)	12-18(14,16)	—	1,2(2)	2-5(3)	1-3(3)	2-6(3)	9-17	9-16(15)	1-S,	1,2(1)
9	3-5(4)	3	1	6-8(7)	2-4(3,4)	5-8(7,8)	6-9(6,7)	7-9(7,9)	5-9(7)	5-8(6)	4-7(5)	1a-S,	1
10	2,3(2)	4-8(5)	3,4(4)	1	1	1	1	1	1	1	1-3(2)	2a-S,	1-3(2)
11	8-10(9)	3-6(3,6)	2-4(2)	1,2(1)	5-9(7)	2,3(2)	2-5(2,3)	2-4(3)	2-5(3)	8-16(13)	1-4(1)	—	—
12	4-7(4)	1	1	1	—	1	1	1	1	1	1	—	—
13	2-6(3)	—	19-26(19)	2	7-11(10)	6-9(7,8)	6-9(7,8)	6-8(7)	5-7(6)	17-31(28)	4-7(6)	—	—
14	6-10(8,9)	23-33(29)	12-19	—	—	—	—	—	—	—	—	1	—
15	8-10(8,9)	—	—	—	—	—	—	—	—	—	—	—	—

C: cranium; P: prothorax; M: mesothorax; S: siphon; T: metathorax; I-X: abdominal segments.

Pupa (Fig. 4) - Similar to *Sa. aurescens* (*cf.* illustration in Harbach 1991: 4); character and positions of setae as illustrated, numbers of branches in Table II. *Cephalothorax*: lightly tanned. Seta 1-CT strongly developed, double, branches gently curved (not sigmoidally curved and without hooked tips); 5-CT also well developed, single or double, more often single; 7-CT rather longer than usual, nearly reaching base of trumpet. *Trumpet*: moderately tanned, broadest distally, slightly flattened but little if at all expanded laterally; length 0.36-0.41 ($\bar{x}$ = 0.39 mm), width at mid-length 0.08-0.09 mm, index 4.15-4.56 ($\bar{x}$ = 4.37); pinna short, length 0.06-0.09 mm ($\bar{x}$ = 0.07 mm). *Abdomen*: lightly tanned, terga and sterna darker anteriorly; length 3.41-3.85 mm ($\bar{x}$ = 3.60 mm). Seta 1-I well developed, with about 70 branches; 6,7-I long, 7-I significantly longer than 6-I; 2-II anterolateral to 1-II; 5-II,III much smaller than 5-IV-VI, 5-IV-VI very long, more than twice length of following tergum; 9-II,III slightly weaker than 9-IV-VI, 9-IV-VI equally developed (slightly thickened and same length); 10-II present; punctures absent from segments III-V. *Genital lobe*: lightly tanned, length (male only) about 0.40 mm. *Paddle*: lightly tanned, asymmetrical, broadest at base, tapered distally, inner part narrow, less than 0.5 width of outer part, minutely spiculate at apex; length 0.58-0.69 mm ($\bar{x}$ = 0.64 mm), width at widest point 0.33-0.38 mm ($\bar{x}$ = 0.36 mm), index 1.61-1.97 ($\bar{x}$ = 1.80).

Systematics - The male of *Sa. luxodens* sp. n., and probably the female, resembles *Sa. identicus*, *Sa. ignotus*, *Sa. whitmani* and *Sa. xenismus* in having hindtarsomere five entirely dark-scaled. These five species are easily distinguished from one another by differences in the male genitalia and other features denoted by Harbach (1995b). It is not possible to contrast the larval and pupal stages of *Sa. luxodens* sp. n. with those of the other four species because they are either unknown (*Sa. ignotus* and *Sa. xenismus*) or poorly described and illustrated (*Sa. identicus* and *Sa. whitmani*).

The new species most closely resembles *Sa. aurescens* in all life stages, and it is likely that these two species are sister taxa. The male differs from *Sa. aurescens* in the absence of projecting scales on the dorsal surface of midtarsomeres 2-4 (projecting scales give these tarsomeres an expanded appearance in lateral view in *Sa. aurescens*), the presence of pale scaling on hindtarsomere 5 and features of the gonocoxites illustrated in Figs 1 and 2, which include the presence of three tergomesal setae (only two in *Sa. aurescens*) and the different development of lobes of the gonostylus. The female is unknown, but it is probably very nearly identical to the female of *Sa. aurescens* (illustrated by Harbach 1991).

The pupae of the two species closely resemble one another, but *Sa. luxodens* sp. n. differs in having (1) setae 7-CT longer, nearly as long as 5-CT, (2) seta 10-II present, (3) seta 2-II-V more widely separated from seta 1 and (4) seta 9-IV-VI equally developed (9-V,VI are each progressively larger in *Sa. aurescens*).

The larvae of the two species appear to differ in a number of features that may prove to be unreliable distinctions once more material becomes available for study. These characters include (1) the apparent smaller size of setae 11,14-C, (2) the apparent larger size of seta 15-C and (3) the extensive covering of villiform spicules on the thorax and abdomen. Characters which are likely to prove reliable for distinguishing the larva of *Sa. luxodens* sp. n. from *Sa. aurescens* include: (1) first lateral tooth of maxilla displaced far dorsad of other lateral teeth, (2) seta 10-M multiple, (3) seta 11-P,M,T more strongly developed, each progressively larger with 11-T very large and spine-like, (4) seta 7-I-III differently developed, 7-I,II single, 7-III shorter and more branched, (5) seta 9-I-III larger with more branches, (6) seta 7-VII developed differently, never strongly hook-like and borne on smaller tubercles, (7) comb scales longer and without expanded basal plate, and (8) sculpturing of siphon a pattern of short rows of minute, sharp spicules (*Sa. aurescens* with pattern of individual, broad blunt spicules).

Etymology - The specific name is derived from the Latin words *luxus* (dislocated) and *dens* (tooth), in reference to the pronounced dorsal displacement of the first (distal) lateral tooth of the larval maxilla.

Bionomics - The type specimens were collected as larvae found in clear to brownish water contained in uncut bamboo internodes 0.5-2.5 m above ground; they were in association with larvae of *Haemagogus* (*Haemagogus*) *panarchys* Dyar and two undescribed species of *Sabethes*, one near *Sa.* (*Sab.*) *bipartipes* Dyar & Knab and the other near *Sa.* (*Pey.*) *undosus* (Coquillett).

Distribution - Known only from the type locality in Ecuador. This species presumably occurs throughout the western lowlands of Ecuador and neighbouring areas of Colombia and Peru. Reports of *Sa. aurescens* from Panama (e.g. Dyar 1923) and Venezuela (e.g. Anduze et al. 1947) may apply to *Sa. luxodens* sp. n.

Material examined - Fourteen specimens (3 males, 2 male genitalia, 1 larval exuviae, 3 pupal exuviae, 5 larvae), including 1 larval and 2 pupal rearings. ECUADOR: *Guayas*, Guyaquil, 12 km W of on Rt. 3 (17MPT1358), 5m; 11 Feb 1966, W Hjort & D Schroeder, 1 larva with mouthparts on separate microscope slide (ECU 142-3) (bamboo, uncut internode with 1 cm hole, in dense second

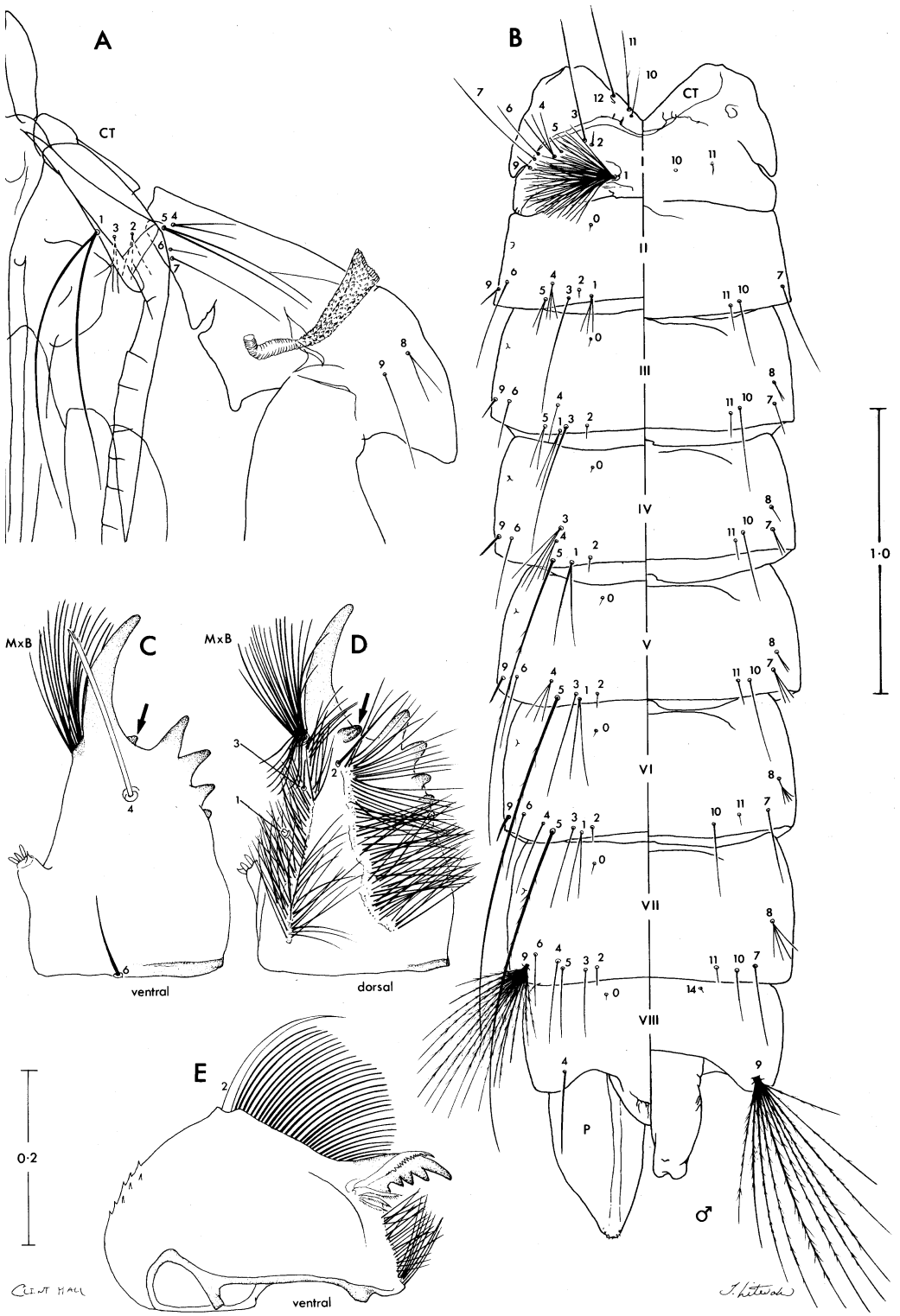

Fig. 4: pupa and larval mouthparts of *Sabethes* (*Peytonulus*) *luxodens* sp. n. (A,B) - Pupa - (A) dorsal aspect of cephalothorax, left side; (B) dorsal and ventral aspects of left side of metathorax and abdomen. (C-E) - Larval mouthparts, aspects as indicated: (C,D) maxilla, dorsally displaced first lateral tooth shown at arrow; (E) mandible. Bars in mm.

TABLE II

Numbers of branches for setae of pupae of *Sabethes (Peytonulus) luxodens* sp. n.

	Cephalo-thorax	Abdominal segments									Paddle
Seta	CT	I	II	III	IV	V	VI	VII	VIII	IX	P
0	—	—	1	1	1	1	1	1	1	—	—
1	2	5-7(6)[a]	2,3(3)	1-3	1-3(2)	2	1,2	—	—	—	—
2	2,3(3)	1	1	1	1	1	1	1	—	—	—
3	1,2(2)	1,2(1)	1	1-3(1)	2,3(2)	1	1	1	—	—	—
4	1,2(2)	3,4(4)	1-3(3)	1,2(1)	1,2(1)	2-4(2)	1	1	1	—	—
5	1,2(1)	1	1,2	1-3(1)	1	1	1	1	—	—	—
6	1	1	1	1	1	1	1	1,2(1)	—	—	—
7	1	1	1,2(1)	1	1,2(1)	1-3(3)	1	1	—	—	—
8	1-3(2)	—	—	1,2(2)	1	1,2(1)	3-5(4)	3-6(4)	—	—	—
9	1	1	1	1	1	1	1	10-16(10)	11,12	—	—
10	1-2(1)	0[b]	1	1	1	1	1	1	—	—	—
11	1-2(2)	1	1	1	1	1	1	1	—	—	—
12	1	—	—	—	—	—	—	—	—	—	—
13	—	—	—	—	—	—	—	—	—	—	—
14	—	—	—	—	—	—	—	—	1	—	—

a: primary branches; *b*: alveolus present or absent; CT: cephalothorax; P: paddle; I-IX: abdominal segments.

growth, 2.5 m above ground, water brownish, deep shade), 1 larva (ECU143-2) (same data but 0.5 m above ground); 10 km W of on Rt. 3 (17MPT1558), 5 m; 12 Feb 1966, J Belkin & E Gerberg, 1 male with larval and pupal exuviae and dissected genitalia (ECU160-20), 1 male with pupal exuviae and dissected genitalia (ECU160-100), 1 male (teneral, on microscope slide) with pupal exuviae (ECU160-104), 3 larvae (ECU 160-1, -2, -3) (bamboo, 6 uncut internodes, in domestic area, 0.5 m above ground, water brownish, deep-partial shade).

These specimens comprise the type series of *Sa. luxodens* sp. n. The holotype male (ECU 160-100), with associated pupal exuviae and dissected genitalia on separate slides, and the paratypes are deposited in the National Museum of Natural History, Smithsonian Institution.

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