Taxonomy and Biology of *Culex* (*Culex*) *maxi* Dyar (Diptera: Culicidae) in South America

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Culex (Culex) maxi *Dyar is described in the adult, pupal and larval stages, and the male genitalia and parts of the fourth-instar larva are illustrated. The larva is described for the first time. The paper includes a summary of available information on the taxonomy, bionomics and distribution of the species. The taxonomy and identification of the species are reviewed in light of current knowledge of the subgenus* Culex *in the New World.*

Key words: *Culex* (*Culex*) *maxi* - adult - pupa - larva - description - bionomics - distribution

The subgenus *Culex* of *Culex* Linnaeus represents a highly successful group of mosquitoes which includes some 72 recognized species in the Neotropical Region (more than 200 species are known worldwide). At first glance the works and keys of Lane (1953), Forattini (1965), Cova García et al. (1966), Clark-Gil and Darsie (1983) and Darsie (1985) give the impression that the neotropical species are well studied and easy to identify, but this is far from true. Despite their importance as pests and vectors or potential vectors of arboviruses, these mosquitoes are poorly known and difficult to identify.

The subgenus *Culex* in the New World was last revised by Bram (1967), based primarily on structures of the male genitalia which provide the primary means of recognizing most species. Despite this revision, many species are still poorly known and difficult to identify. Few major nomenclatural acts have been published since 1967 (e.g., Harbach et al. 1984, 1986, Harbach & Peyton 1992), but these clearly indicate of how much taxonomic work remains to be done on this subgenus in the New World.

This paper is a contribution toward a better understanding of the *Culex* fauna of South America. Its purpose is to describe one species, *Cx. maxi* Dyar, in some detail, discuss the taxonomy and identification of this species in light of present knowledge and assemble the available information on its bionomics and distribution. The larva of this species is described here for the first time.

MATERIALS AND METHODS

The specimens examined during this study were collected as larvae from various locations in Córdoba Province, Argentina. Most larvae were individually reared to obtain adults with associated larval and pupal exuviae. Some larvae were killed and mounted on microscope slides. Specimens were identified initially to species as adults using published keys (Lane 1953, Forattini 1965, Darsie 1985). Species identification was confirmed on the basis of dissected male genitalia (Harbach et al. 1984) and subsequent association of immature stages with both males and females.

Measurements and counts are based on at least 10 specimens. Diagnostic and differential characters were confirmed in all of the specimens on hand. The morphological terminology is taken from Harbach and Knight (1980, 1982). The abbreviations and symbols used in the synonymy and literature summary are: coll. = collection, distr. = distribution, info. = information, lit. = literature, rec. = record(s), syn. = synonym(y), tax. = taxonomy, USNM = United States National Museum, A = adult, m = male, f = female, L = larva(l), P = pupa and G = genitalia. An asterisk (*) to the right of one of the symbols indicates that at least part of the life stage or genitalia was illustrated in the publication cited. The specimens examined are deposited in the Centro de Investigaciones Entomológicas, Universidad Nacional de Córdoba and The Natural History Museum, London.

The study of *Culex* mosquitoes in Argentina is supported by funds from the British Council, Buenos Aires, and the Consejo de Investigaciones Científicas y Tecnológicas de Córdoba, CONICOR.

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Received 2 January 1996
Accepted 6 May 1996

Culex (*Culex*) *maxi* Dyar

maxi Dyar 1928:386 (m). Holotype m: San Pedro, [Jujuy], Argentina (USNM); Stone & Knight 1957:53 (lectotype designation); Harbach et al. 1984:311 (invalidation of lectotype designation).

oswaldoi Forattini 1965:167 (m). Holotype m: Macaphyba [= Macaíba], Natal, Brazil (USNM); Harbach et al. 1984:312 (syn. with *maxi* Dyar).

Culex (*Culex*) *maxi* of Shannon 1930:496 (Argentina; coll. rec.); Duret 1950:305 (Argentina; coll. rec.); Duret 1951:65 (Argentina; coll. rec.); Duret 1953:274 (Argentina; coll. rec.); Lane 1953:318, 320, 337-338 (Argentina, Brazil; f, mG keys; f, m, mG*; distr.); Stone et al. 1959:251 (Argentina, Brazil; type info., lit.); Castro et al. 1960:553 (Argentina; coll. rec.); Bachmann & Casal 1963:41, 42 (Argentina; f*, m, mG*, P*); García & Casal 1965:6, 8 (Argentina; coll. rec., L bionomics); Forattini 1965:40, 166-169, 194, 201 (Argentina, Brazil; A, mG*, keys); Bianchini et al. 1967:192 (Argentina; coll. rec.); Bram 1967:13, 79-80, 117 (Argentina, Brazil; mG key; f, mG*); Belkin et al. 1968:15 (type info., L bionomics); Duret 1968a:57, 58 (tax.); Duret 1968b:4, 6 (Paraguay; coll. rec.); Knight & Stone 1977:212 (Argentina, Brazil, Paraguay; type info., lit.); Harbach et al. 1984:312, 315-317 (Argentina, Brazil; syn., mG*); Ward 1984:242 (tax.); Darsie 1985:159, 181, 203, 228, 245 (Argentina; A, L keys); Mitchell & Darsie 1985:284, 308 (Argentina; distr.); Brewer et al. 1991:241-245 (Argentina; coll. rec.); Ronderos et al. 1992:4, 7 (Argentina; A bionomics); Campos et al. 1993:55, 59, 62, 65 (Argentina; A, L bionomics); Rossi 1993:72 (Argentina; coll. rec., gynandromorph).

Culex maxi of Ronderos et al. 1991:20, 22-25 (Argentina, Uruguay; A bionomics).

Culex (*Culex*) *oswaldoi* of Forattini 1965:40, 176-168, 180, 201 (Brazil; mG*, key); Bram 1967:13, 85-87 (Brazil; mG key; mG*); Knight & Stone 1977:215 (Brazil; type info., lit.); Ward 1984:242 (tax.).

Adult - A medium-sized brown mosquito without striking features and special ornamentation.

FEMALE - *Head*: erect scales of vertex brown; decumbent scales golden brown, sometimes paler medially and posteriorly; ocular scales narrow, whitish, continuous with broader whitish scales on lateral side of head; ocular and interocular setae dark brown. Antenna as long as proboscis, 1.61-2.16 mm ($\bar{x}$ = 1.85 mm); pedicel large, mesal surface dark (brown), lateral surface pale (yellowish), with minute inconspicuous setae on mesal surface, without scales; proximal part of flagellomere 1 pale (yellowish), remainder of flagellum dark, flagellomere 1 without scales. Proboscis 1.68-2.12 mm ($\bar{x}$ = 1.78 mm), 0.95-1.08 ($\bar{x}$ = 1.03) length of forefemur; entirely dark-scaled or with faint to distinct pale scaling on proximal 0.6-0.7 of ventral surface. Maxillary palpus entirely dark-scaled; length 0.25-0.37 mm ($\bar{x}$ = 0.3 mm), 0.15-0.19 ($\bar{x}$ = 0.16) length of proboscis. *Thorax*: pleural integument yellowish brown, postspiracular area and areas above and below upper mesokatepisternal and anterior mesepimeral scale patches usually noticeably darker; scutal integument brown. Scutal scales fine, golden brown, some inconspicuous pale scales usually present on anterior promontory, scutal angle, supraalar area and prescutellar area; scutal setae dark brown. Scutellum with fine pale scales confined to lobes (3 patches); 6-9(7) large and 4-8(7) small setae on median lobe, 4-7(5) large and 2-4(4) small setae on each lateral lobe. Antepronotum with fine pale scales mainly on lower part; upper part of postpronotum with fine golden-brown scales, with 4-7(5) dark brown setae in curved row on posterodorsal margin. Pleural setae yellow to gold: 4-8(5) upper proepisternal, 7-13(9) prealar, 4-6(5) upper mesokatepisternal, 6-10(6) lower mesokatepisternal, 5-9(8) upper mesepimeral and 1 lower mesepimeral. Pleura with white or nearly white spatulate scales as follows: small patch below upper proepisternal setae, patches on upper and lower areas of mesokatepisternum, anterior patch on mesepimeron about same level and size as upper mesokatepisternal patch and small patch mainly before upper mesepimeral setae. *Wing*: length 2.84-3.80 mm ($\bar{x}$ = 3.39 mm); length of cell R_2 3.36-5.24 ($\bar{x}$ = 4.63) length of vein R_{2+3}; subcosta intersects costa at or beyond furcation of vein R_{2+3}; length of cell M_1 0.71-0.79 ($\bar{x}$ = 0.75) length of cell R_2; entirely dark-scaled except for short, inconspicuous line of pale scales on posterior side of costa at humeral crossvein. *Halter*: scabellum and pedicel very pale (whitish), capitellum slightly darker (light brown or tan) with inconspicuous pale scales. *Legs*: integument of coxae very pale (yellowish white); anterior surface of forecoxa mainly dark-scaled, with small patch of pale scales at base; mid- and hindcoxae with longitudinal line of pale scales on anterior side of lateral midline. Ventral surface of foretrochanter with brown and whitish scales; ventral surfaces of mid- and hindtrochanters with whitish scales and transverse line of black integument at apex. Femora, tibiae and tarsi mainly dark-scaled; apices of femora with narrow knee spots dorsally; fore- and midfemora and -tibiae

pale-scaled posteriorly, dark scaling of midfemur expanded onto posterior surface at apex; hindfemur largely pale-scaled, with rather narrow stripe of dark scaling beginning near base and widening onto anterior and posterior surfaces toward apex, more or less abruptly expanded to cover apical 0.06-0.14 of anterior surface, expanded over distal 0.5 or less of posterior surface; anteroventral surface of hindtibia pale-scaled, appearing as lower longitudinal stripe from anterior aspect; tibio-tarsal joints and joints between tarsomeres with narrow pale bands, bands may be indistinct or absent, particularly on fore- and midlegs. Pulvilli pale; ungues small, dark, simple. *Abdomen*: tergum I with median posterior patch of dark scales; terga II-VIII variable, with basal pale bands complete, reduced to basomedian lunular spots or absent on some or all terga, usually present at least as small median spots on terga III-V and concave band on tergum VIII, bands as much as 0.3 tergum width when fully developed; all terga with large basolateral pale spots which cover entire lateral surface of terga VII and VIII. Sterna II-VII mainly or entirely pale-scaled, anterior sterna often entirely pale, remainder normally with median longitudinal stripe of dark scales, stripes become broader on succeeding posterior sterna; sternum VIII with lateral pale patches, median area without scales.

MALE - Smaller than female, otherwise like female except as follows. *Head*: antenna strongly verticillate, pale between flagellar whorls, length 1.52-1.68 mm ($\bar{x}$ = 1.60 mm). Proboscis with narrow pale ring mainly on distal side of false joint. Length of maxillary palpus 2.36-2.64 mm ($\bar{x}$ = 2.46 mm), extending beyond tip of proboscis by more than length of palpomere 5; mainly dark-scaled, integument between palpomeres 2 and 3 pale; palpomere 3 pale-scaled in middle, pale scaling sometimes indistinct dorsally, with ventrolateral row of 8-14 dark setae distad of pale scaling; palpomeres 4 and 5 with small dorsal and ventral patches of pale scales at base, ventral surface of palpomere 4 with median line of pale scales extending variable distance from basal pale patch; lateral and mesal surfaces of palpomeres 4 and 5 densely setose. *Thorax*: upper proepisternal setae usually more numerous, 5-11(9); upper mesepimeral setae usually fewer, 3-5(4). *Wing*: length 2.48-3.08 mm ($\bar{x}$ = 2.78 mm); length of cell R_2/length of vein R_{2+3} 2.29-2.78 ($\bar{x}$ = 2.52); subcosta intersects costa at or usually before furcation of vein R_{2+3}; length of cell M_1/length of cell R_2 about 0.8; pale scaling at base of costa often apparently absent. *Legs*: ungues black; anterior unguis of fore- and midlegs larger than posterior unguis, with small ventral tooth near midlength, posterior unguis of both legs with small ventral tooth near base; hindungues much smaller than fore- and midungues, simple. *Abdomen*: terga without basolateral spots. *Genitalia* (Fig. 1): ninth tergal lobe small, with single or partially double row of 4-20 unevenly spaced setae. Gonocoxite not enlarged, apex with conspicuous cluster of long setae on dorsolateral margin; subapical lobe prominent, distinctly rounded, usually with 6(4-8) long, stout, tapered setae, 3 usually stouter than the others. Gonostylus stout, curved and narrowed distally, with 2 small slender setae on distal 0.5 of concave dorsal surface; gonostylar claw short, troughlike. Phallosome longer than broad, with lateral plates and aedeagal sclerites of nearly equal length; lateral plate with 2-5 large teeth, 0-4 small teeth and a flat lateral lobe (or ridge), base of lobe (or ridge) continuous with base of thumblike dorsal process; ventral arm curved dorsomesad, ventral surface bluntly dentiform, dorsal surface somewhat concave, slightly longer than teeth; dorsal arm flattened, slightly sinuous, tapered distally and with indistinct ridge along dorsomesal margin. Proctiger without distinctive features; paraproct with long, curved basal lateral arm and prominent ventral acetabulum which appears as a lobe at base of dorsal process of lateral plate when intact genitalia are viewed from dorsal aspect; crown dark, with numerous short needlelike spicules. Cercal sclerite elongate, broadest anteriorly; 1-5 cercal setae. Tergum X straplike, joining base of paraproct ventrally.

PUPA - Exhibiting the subgeneric characters noted by Harbach and Peyton (1992); range and modal number of setal branches in Table I. *Cephalothorax*: lightly and unevenly tanned, antenna, dorsum, mesothoracic wing and legs darker; all setae branched as indicated in the Table I. *Trumpet*: moderately tanned, tracheoid area darker; cylindrical, length 0.65-0.85 mm ($\bar{x}$ = 0.72 mm), width 0.09-0.11 mm ($\bar{x}$ = 0.10 mm), index 6.23-8.45 ($\bar{x}$ = 7.26). *Abdomen*: length 2.21-3.12 mm ($\bar{x}$ = 2.66 mm); lightly tanned, posteromedian area of tergum I darkly tanned, anterior margins of other terga darker, particularly terga II-VII; integument of segments I-VI with tiny spicules. Seta 6-I,II single and distinctly longer than 7-I,II which is usually double; 1-II-VII multiple, number of branches progressively fewer on each succeeding posterior segment, 1-II with 14 or more branches (14-22), 1-VI,VII often triple (2-4); 5-IV usually with 4 branches (2-5), 5-V,VI double, both distinctly longer than 5-IV, about 1.5 length of following tergum, 5-VII small, double; 2-VII mesad of 1-VII. *Genital lobe*: lightly tanned, darker in male; length about 0.35 mm in male, about 0.28

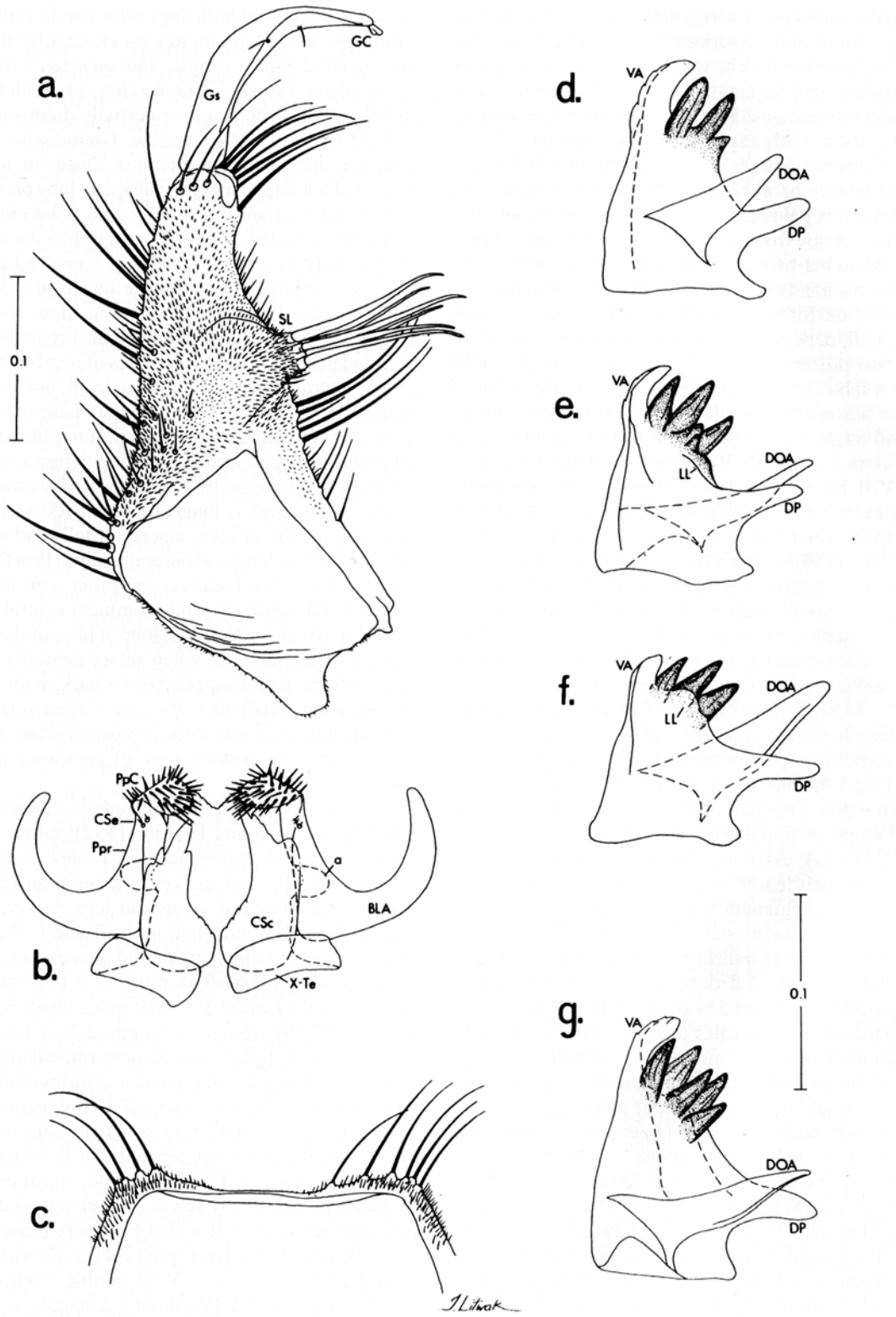

Fig. 1: male genitalia structures of *Culex* (*Culex*) *maxi* Dyar: a, gonocoxopodite (lateral); b, proctiger (dorsal); c, tergum IX (dorsal); d-g, lateral plates (d, g, mesal; e, f, lateral). Abbreviations: a = acetabulum; BLA = basal lateral arm; CSs = cercal sclerite; DOA = dorsal arm; DP = dorsal process; GC = gonostylar claw; Gs = gonostylus; LL = lateral lobe; PpC = paraproct crown; Ppr = paraproct; SL = subapical lobe; VA = ventral arm; X-Te = tergum X. Scales in mm. Modified from Harbach et al. (1984).

TABLE I

Number of branches for pupal setae of *Culex (Culex) maxi* (10 specimens, 20 setae; modes in parentheses)

Seta N	Cephalo-thorax CT	Abdominal segments I	II	III	IV	V	VI	VII	VIII	XI	Paddle P
0	-	-	1	1	1	1	1	1	1	-	-
1	2-5(3)	6-9(8)	14-22(16)	6-12(9)	5-8(6)	3-5(4)	2-4(3)	2-4(3)	-	1	1-4(2)
2	3-5(4)	1-3(1)	1,2(1)	1	1	1,2(1)	1	1	-	-	1
3	2,3(2)	1,2(2)	2	2	6-8(7)	1,2(2)	1-3(2)	1,2(2)	-	-	-
4	2-4(4)	2-4(2)	4-6(6)	4-8(6)	2-5(2)	3-7(5)	2-5(4)	2-4(2)	2,3(2)	-	-
5	3-6(4)	6-12(6)	4-6(4)	4-8	2-5(4)	2	2	1,2(2)	-	-	-
6	2-5(2)	1	1	2-4(3)	2-4(4)	2-4(3)	2-5(3)	5-10(7)	-	-	-
7	2,3(2)	1-3(2)	1,2(2)	3-7(6)	3,4(4)	4-8(6)	1	1	-	-	-
8	3-6(4)	-	-	2-6(4)	2-5(2)	2-5(3)	2-5(4)	3-5(3)	-	-	-
9	2,3(2)	1,2(1)	1	1	1	1	1	3-6(3)	7-10(9)	-	-
10	4-7(5)	a*	-	2,3(2)	2	1	1	1	-	-	-
11	2,3(2)	2,3	-	1,2(1)	1	1	1,2(1)	1-3(2)	-	-	-
12	3-5(4)	-	-	-	-	-	-	-	-	-	-
13	-	-	-	-	-	-	-	-	-	-	-
14	-	-	-	1	1	1	1	1	1	-	-

*alveolus only

mm in female. *Paddle*: length 0.70-0.86 mm ($\bar{x}$ = 0.79 mm), width 0.46-0.65 mm ($\bar{x}$ = 0.56 mm), index 1.25-1.60 ($\bar{x}$ = 1.42). Seta 2-P present, about 0.6 length of 1-P.

LARVA (Fig. 2) - Exhibiting the subgeneric characters noted by Harbach and Peyton (1992); range and modal number of setal branches in Table II. *Head*: wider than long, lateralia rather strongly produced or bulging laterally, length about 0.7 mm, width about 1.1 mm; lightly but unevenly tanned, usually with dark spots on posterior part of dorsal apotome and on lateralia. Dorsomentum with 5-7(6) teeth on either side of median tooth. Antenna length 0.55-0.62 mm ($\bar{x}$ = 0.57 mm); lightly tanned, darker at base and distal to seta 1-A; proximal part aciculate, distal part with few aciculae laterally near seta 1-A; seta 1-A 0.62-0.71 ($\bar{x}$ = 0.67) from base, with 25-31(29) aciculate branches. Seta 1-C slender, not tanned; 2-C absent; 16,17-C present. *Thorax*: integument hyaline, minutely spiculate. Setae 1-3-P and 9-12-P,M,T on common tubercles, tubercle of setae 9-12-M,T with small spine; 1-P single; 4,8-P usually double, 7-P triple. *Abdomen*: integument hyaline, minutely spiculate, spicules more evident on segment VIII. Setae 1-III-VII and 13-III-V developed as usual, all similar in size and form, shorter than length of segment; 6-I-II normally triple, 6-IV-VI double or triple, more often double; 7-I developed like 6-I but single or double, 7-II much smaller than 7-I, with 5-8(5) branches. *Segment VIII*: comb with 26-34(30) scales; scales short, normally fringed on sides and apex; scales arranged in 3-4 irregular rows. *Siphon*: length 1.69-1.93 mm ($\bar{x}$ = 1.82 mm), width (measured at base) 0.24-0.31 mm ($\bar{x}$ = 0.28 mm), index 5.45-7.96 ($\bar{x}$ = 6.47); lightly tanned, base and apex darker; with 0-4 subapical spines on anterior surface. Pecten with 12-15(13) spines. Seta 1-S usually in 4 pairs, rarely with a fifth seta. *Segment X*: saddle complete, lateroposterior margins with distinct spicules; length 0.31-0.39 mm ($\bar{x}$ = 0.36 mm), siphon/saddle index 5.0-6.66 ($\bar{x}$ = 5.35). Seta 1-X usually double, sometimes triple; 2-X usually triple, occasionally with 4 branches; 4-X in 6 pairs, all setae borne on grid. Anal papillae long, slender, dorsal and ventral papillae about 1.2 and 1.1 saddle length respectively.

Taxonomy - The subgenus *Culex* is divided into two main lines, the Pipiens and Sitiens Groups (Edwards 1932), and two secondary or annectent lines, the Atriceps and Duttoni Groups (Belkin 1962 and Harbach 1988, respectively). As far as known, all New World species of the subgenus belong to the Pipiens Group. Whereas Old World species of this group are classified into a number of subgroups (Mattingly & Rageau 1958, Sirivanakarn 1976, Harbach 1988), no infrasubgeneric groups are currently recognized for New World species. Lane (1953) divided the New World species into Groups A and B based on the absence or presence, respectively, of a foliform seta on the gonocoxite of male genitalia, but these

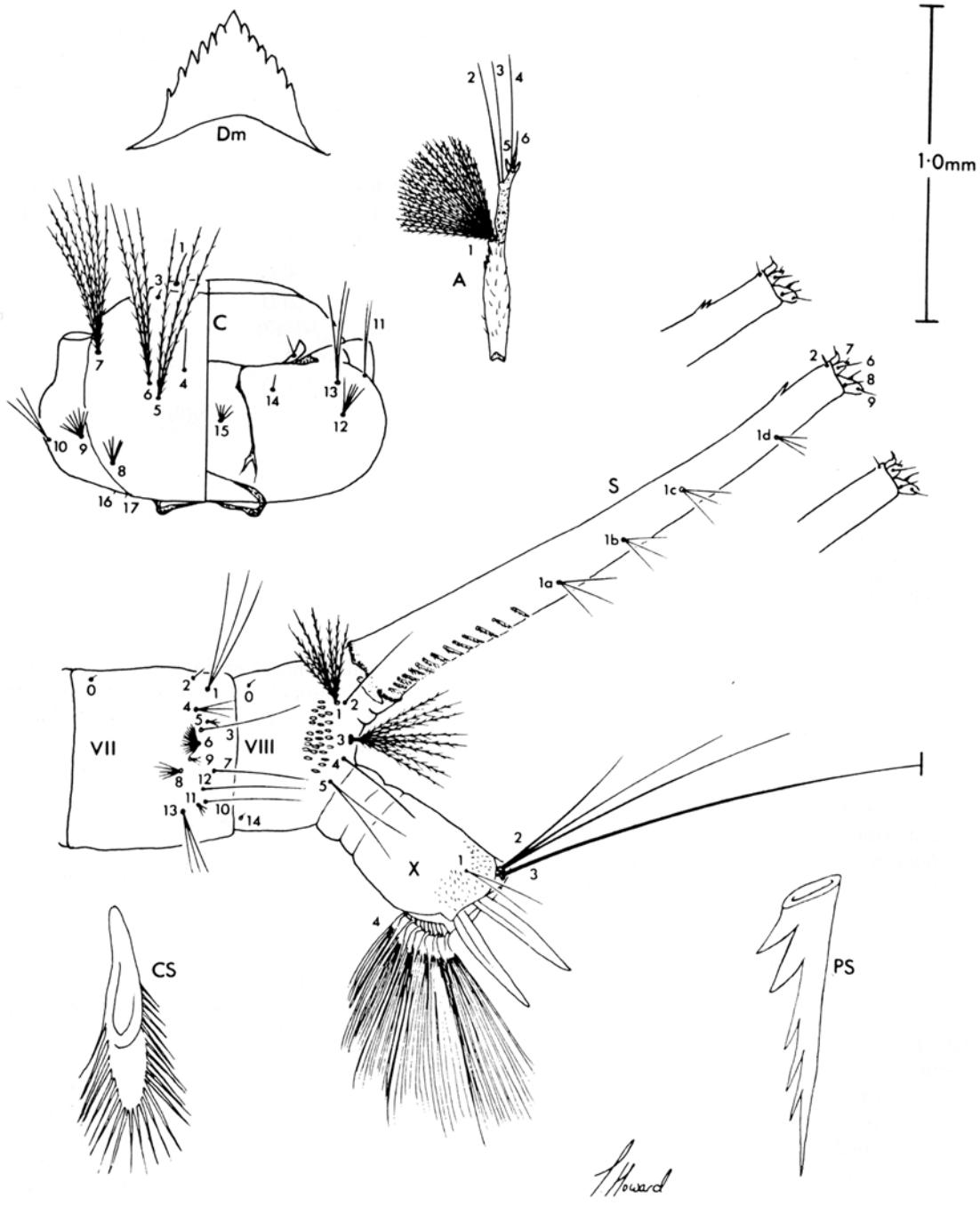

Fig. 2: elements of larval anatomy of *Culex* (*Culex*) *maxi* Dyar. A = antenna; C = cranium; CS = comb scales; Dm = dorsomentum; PS = pecten spine; S = siphon; VII, VIII, X = abdominal segments. Numbers indicate individual elements of chaetotaxy (Table II).

groups were not recognized in the subgeneric revision of Bram (1967). At the present time most species are superficially and inadequately described and many are known only as adults. This is a clear indication that morphological relationships among New World species are poorly known. The affinities of *Cx. maxi* are not clear, but there appear to be some similarities with *Cx. paramaxi* Duret, *Cx. brevispinosus* Bonne-Wepster & Bonne, *Cx. surinamensis* Dyar, and members of the *Cx. coronator* complex, particularly *Cx. coronator* Dyar & Knab and *Cx. usquatus* Dyar, based on

TABLE II

Number of branches for fourth-instar larval setae of *Culex (Culex) maxi* (10 specimens, 20 setae; modes in parentheses)

Seta	Head	Thorax			Abdominal segments								
N	C	P	M	T	I	II	III	IV	V	VI	VII	VIII	X
0	-	16-29	-	-	-	1	1	1	1	1	1	1	-
1	1	1	1-5(2)	1-5(2)	3-8(5)	1-3(2)	2-4(3)	2-4(3)	2-4(3)	2,3(2)	2-4(3)	5-8(7)	2,3(2)
2	-	1	2-4(4)	1-3(2)	1,2(1)	1	1	1	1	1	1	1	3,4(3)
3	1	1	1	2-7(4)	2,3(2)	2,3(2)	2,3(2)	2,3(3)	1	1,2(1)	1-3(2)	7-11(8)	1
4	1	1,2(2)	2,3(2)	3-5	12-17	5-8	2-10(2)	1-3(2)	4-10(6)	2-4(3)	1	1	5-12(10)
5	3,4(3)	1	1	1,2(1)	4-8(5)	2-5(3)	2-6(4)	3-5(3)	1-4(4)	2-5(4)	2-4(3)	2,3(3)	-
6	2-4(3)	1	1	1	3	3,4(3)	3	2,3(3)	2,3(2)	2,3(2)	12-17(15)	-	-
7	5-8(8)	3	1	5-8	1-2(2)	5-8(5)	7-12(9)	7-11(10)	7-12(8)	1	1	1a-S,	3,4(3)
8	3-7(5)	2,3(2)	4-7(5)	5-8(6)	-	1,2(1)	1,2	2,3(2)	2	2-4(3)	4-7	1b-S,	3-5(3)
9	6-10(8)	1	4-7	5-7(6)	1-4	1	1	1	1	1	1-4(3)	1c-S,	3,4(3)
10	2-4(3)	1	1	1	1	1	1	1	1	1	1	1d-S,	3,4(3)
11	2.3(2)	3-5(4)	2,3(3)	2-4(3)	4-6	2-4(3)	2,3(2)	1-3(2)	2,3	2,3(2)	2,3(2)	2-S,	1
12	4-6(5)	1	1	1-3(2)	2-4(2)	2,3(2)	1-3(2)	1,2(1)	1,2(1)	1,2(1)	1	-	-
13	3-5(3)	-	20-41	5-9(7)	2,3(2)	>20	3-5(4)	2-4(4)	3,4	>30	3-5(3)	-	-
14	1-3(1)	1	16-30	-	-	-	1	1	1	1	1	1	-
15	4-6(5)	-	-	-	-	-	-	-	-	-	-	-	-
16	1.2(1)	-	-	-	-	-	-	-	-	-	-	-	-
17	1.2(1)	-	-	-	-	-	-	-	-	-	-	-	-

certain features of the adults and male genitalia. The immature stages of these species are not sufficiently known to support or clarify any affinities with these species.

The presence of pale scales at the base of the costa in adults of *Cx. maxi* is of interest because this character has been considered to be characteristic of only a few species in South America, including *Cx. apicinus* Philippi, *Cx. fernandezi* Casal, García & Cavalieri, *Cx. lahillei* Bachmann & Casal and *Cx. paramaxi*. Unfortunately, this is not an unambiguous character for *Cx. maxi*. When these scales are distinct, specimens of *Cx. maxi* are easily and correctly identified in the keys of Darsie (1985). When the scales are indistinct or apparently absent, specimens of *Cx. maxi* are misidentified as *Cx. coronator* or *Cx. usquatus*. No characters are presently known that reliably distinguish all specimens of *Cx. maxi* from these species. *Culex paramaxi* is known only from the holotype male collected in Brazil. As far as known, this species can only be distinguished from *Cx. maxi* by the presence of two groups of setae on the gonocoxite of the male genitalia (Duret 1968a).

Darsie (1985) used the presence of subapical spines on the siphon to identify and distinguish larvae of *Cx. maxi* from those of *Cx. coronator* and *Cx. usquatus*. These spines were absent in approximately 70% of the larvae examined in this study, hence this character is hardly diagnostic for the species. Larvae of *Cx. maxi* without spines on the siphon key to couplet 18 in Darsie (1985:229), which uses the total number of branches of setae 5,6-C (presumably on one side of the head) to distinguish the larvae of *Cx. fernandezi* and *Cx. dolosus* (Lynch Arribalzaga). Larvae with 9 or more branches are identified as *Cx. fernandezi* while those with 4-6 branches are identified as *Cx. dolosus*. Since these setae have 5-8 branches in *Cx. maxi*, it is obvious that some larvae of this species without spines would be identified incorrectly as *Cx. dolosus* while others could not be assigned to species on the basis of this character. The larva of *Cx. maxi* is easily distinguished from *Cx. fernandezi* by the absence of stellate setae on the thoracic and abdominal segments. The latter species also inhabits the axils of bromeliads where *Cx. maxi* does not occur. *Culex maxi* differs from *Cx. dolosus* in having seta 3-P triple and seta 7-P single. Seta 3-P is usually double, sometimes single, while seta 7-P is normally double, rarely triple, in *Cx. dolosus*. The combination of these characters should effectively distinguish the larvae of these species.

The pupae of most species of the subgenus *Culex* are extremely similar. This coupled with the fact that the pupal stage of many species is either poorly described or unknown makes it impossible to provide a diagnosis for the pupa of *Cx. maxi*. The pupa is fully described in this paper to enhance the superficial description and partial illustration provided previously by Bachmann and Casal (1963).

Bionomics - The immature stages of *Cx. maxi* are found in a variety of water bodies, including temporary and permanent ground pools, irrigation channels, stream margins, swamps and swimming pools. The habitats are either shaded or in open sunlight, the water ranges from clear to turbid and vegetation is usually present. Larvae are usually found in stagnant water, but they also occur in slowly moving water in the presence of aquatic plants (García & Casal 1965, Campos et al. 1993, Almirón & Brewer 1996). Associated species include *Anopheles albitarsis* Lynch Arribalzaga, *Aedes albifasciatus* (Macquart), *Cx. acharistus* Root, *Cx. apicinus*, *Cx. bidens* Dyar, *Cx. brethesi* Dyar, *Cx. dolosus*, *Cx. mollis* Dyar & Knab, *Cx. pipiens* Linnaeus and *Cx. saltanensis* Dyar (Campos et al. 1993, Almirón & Brewer 1996).

Ronderos et al. (1991) collected adult females of this species in the area of Salto Grande reservoir (Argentina-Uruguay) during the spring, summer and autumn, while Ronderos et al. (1992) captured adult females at Punta Lara in Buenos Aires Province throughout the year except February. In La Plata City, Buenos Aires Province, Campos et al. (1993) collected larvae and pupae between November and May, and females during November, December, February and April. Almirón and Brewer (1995a) collected adult females and larvae of this species on the outskirts of Córdoba City, Argentina during spring, summer and fall. Thus it appears that *Cx. maxi* may be collected as immatures or adults at any time of the year.

Using can traps baited with rabbit, chicken, turtle or frog, Almirón and Brewer (1995b) found that females only fed on chicken. *Culex maxi* is probably not a medically important species.

Rossi (1993) found a single gynandromorph of *Cx. maxi* among 127 adults of this species collected with a CDC light trap at Punta Lara. Nothing is known about the genetics of this species.

Distribution - *Culex maxi* is recorded from localities in Brazil, Paraguay, Uruguay and northern Argentina (see literature summary above). The species is probably broadly distributed east of the Andes, south of the Amazon basin and north of about 38-40°S latitude in south-central Argentina.

ACKNOWLEDGMENT

To Theresa Howard for preparing the drawings in Fig. 2.

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