New Species Records for the Blackfly (Diptera-Simuliidae) Fauna of Argentina with Description of Adults, Pupa and Larva of *Simulium oyapockense* s. l. and *S. seriatum*

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Two blackfly species Simulium (Cerqueirellum) oyapockense *Floch & Abonnenc* and S. (Hemicnetha) seriatum *Knab are recorded from Argentina, representing the most southern register for both species.* S. oyapockense *is a species epidemiologically very important, as a vector of onchocerciasis in the Amazonian focus. Both species are described and illustrated and their distribution are reported, in similarity to others like* S. roraimense *Nunes de Mello and* S. ganalesense *Vargas et al. in reference to* S. oyapockense *and* S. mexicanum *Bellardi similar to* S. seriatum *are discussed.*

Key words: Argentina blackflies - new records - *Simulium oyapockense* - *Simulium seriatum* - morphological description

In Argentina 68 blackfly species are recorded, occurring from the north of the country to Tierra del Fuego. Among them at least eight species are very well known because they are biting pests of man and some are vectors or potential vectors of human onchocerciasis as *Simulium exiguum*, *S. incrustatum* and *S. minusculum*. Two species are recorded as new to Argentina in this paper: *S. (Cerqueirellum) oyapockense* Floch & Abonnenc and *S. (Hemicnetha) seriatum* Knab. The first species is epidemiologically very important, as an *Onchocerca volvulus* vector in the Amazonian onchocerciasis focus (Shelley 1988, Py-Daniel 1997, Shelley et al. 1997).

S. oyapockense is a species with a large distribution, known from Guyana, Venezuela, Panama, Colombia, Ecuador and Brazil. It lives in a variety of environments and consequently has been described under several different names. Today it is considered as a species complex (Shelley et al. 1997). As there are extensive descriptions (Py-Daniel 1983, and especially Shelley et al. 1997) we will give only a diagnosis based on the Argentina specimens, in order to show the differences with the closest species. Also *S. (Hemicnetha) seriatum* Knab is another species with a distribution on the western border of the Neotropical region being found in Venezuela, Colombia, Ecuador, Peru and Bolivia (Coscarón 1987, Crosskey & Howard 1997). Here we add records of material from NW Argentina in the Yungas area.

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MATERIALS AND METHODS

The material was collected by the authors, from aquatic plants and submerged leaves and branches of trees and bushes and stones. Pupae were maintained individually in humid vials until emergence and then mounted or preserved in 80% ethanol. Larvae of *S. oyapockense* were either fixed in Carnoy for cytological studies or in ethanol for morphological studies. Studies were made by stereoscopic microscope; some material of different stages was dissected and mounted on slides for observation using the compound microscope. For the supraspecific denomination of taxa we use the system employed by Coscarón (1987). Specimens were deposited in the La Plata Museum (MLP), Argentina.

RESULTS

Simulium (Cerqueirellum) oyapockense
Floch & Abonnenc 1946: 4

The synonyms cited are *S. pseudosanguineum* Ramírez Pérez & Peterson, 1981: 154; *S. sanchezi* Ramírez Pérez, Yarzabal & Peterson, 1982: 71; *S. cuasisanguineum* Ramírez Pérez, Yarzabal & Peterson, 1982: 36 and more recently *S. pseudoamazonicum* Ramírez Pérez & Peterson 1981: 151, (synonymyzed by Shelley et al. 1997: 19). Several cytoforms and morphoforms are mentioned by Crosskey and Howard (1997).

DIAGNOSIS

Female: wing length 1.6-2.1 mm (n = 6, $\overline{x}$ = 1.7 mm). General coloration blackish, with silver

pruinosity. Frons silver iridescent, clypeus silver pruinose. Scutum with three black vittae bordered by silver pruinosity, the submedian silver stripes showing an elongated comma-shaped mark with an antero-lateral illumination (Fig. 1A), or observed laterally with antero-superior light position (Fig. 1C); with front superior illumination black median vittae narrower and more elongated posteriorly, submedian black vittae elongated anteriorly and comma-shaped marks shorter (Fig. 1B); with posterior illumination black vittae slightly shorter and silver area increased with submedian bands reaching anterior scutal margin and lacking anterior comma-shaped marks. Scutum pilosity golden, metanotum and scutellum black. Abdomen dark brown to black with 1+1 silver spot on T II; T III-V velvet black with narrow latero posterior area silver pruinose, T VI-VIII shiny and waxy. Frons with subparallel sides slowly convergent ventrally, frontocular triangle absent, basal portion of cibarium with 23-27 acuminate teeth on each side, extending from borders of deep central area to the cornua; sensorial organ of palp a half or nearly 1/3 length of basal article of palp, claws without subbasal teeth; paraproct short with rounded border, VIII sternite with 14-18 hairs and gonapophysis slowly divergent below with sclerotized borders.

Male: wing length 1.7-1.8 mm (n = 2). Coloration similar to female. Scutum with 1+1 black, submedian, silvery cunae extending for more than half of scutum length, but generally not joining with silvery posterior area (Fig. 1 D-E); length of cunae change with the light position. Genitalia in accordance with the morphology of this subgenus. Basistyle subquadrate about as long as high, dististyle subtriangular with strong club-shaped spine; ventral plate with short basal arms and rounded border.

Pupa: cocoon length (n = 12) on dorsum 2.1-2.6 mm ($\bar{x}$ = 2.3 mm) on base 2.5-3.2 mm ($\bar{x}$ = 2.7 mm), light yellowish brown coloration. Cocoon slipper shaped, sligtly protruding dorsally and basally, and covering the gill base (Fig. 1F). Cocoon made of soft and thick tissue with closely woven threads obscuring the pupa; gill length 1.2-1.4 mm (n = 5), ($\bar{x}$ = 1.3 mm). Frontoclypeus with moderately abundant rounded platelets; facial trichomes bifid with 1+1 or 2+2 single frontal trichomes (Fig. 1I). Respiratory gill with six filamentous branches subdivided near the base, showing a short basal trunk and three short primary branches (Fig. 1G). Disc of thorax with numerous rounded platelets, but with some pointed on posterior area and 5+5 bifid trichomes mainly bifid (Fig. 1H).

Larva: length (last instar) = 4.1-4.7 mm (n = 5) ($\bar{x}$ = 4.3 mm). Color (in alcohol) yellowish white with greenish spots (Fig. 1J) and a circular band around anterior third of abdomen; head yellowish gray; cephalic apotome scarcely light brownish at base, with pale median longitudinal stripe and 1+1 submedian spots, covered by abundant long and single to bifid trichomes leaving free only the pigmented area (Fig. 1K). Deep sub-circular gular cleft. Ratio hypostomium/hypostomial bridge = 2-2.7; hypostomium teeth at same level, with 4+4 to 5+5 lateral chaetae and 7-8 lateral serrations on each side. Antenna thin, with ratio of articles I-III being 1:0.9-1.1:1-1.2. Mandible with 5-6 internal teeth, 2 marginal teeth, (the second small and isolated from the anterior), fringe of supramarginal chaetae and presence of 2-3 mandible lateral process (Fig. 1L). Cephalic fan with 27-38 principal rays. Proleg comb with about 40 teeth in 7-8 groups. Body integument with abundant palmate trichomes 0.02 mm in length. Anal sclerite with few hairs. Anal ring with 57-63 rows with 12-15 hooks on each. Anal gill with 3 lobes each with 2-3 lobules.

Material examined: Argentina: (material collected by the first author and deposited in MLP collections) Tucumán Province, Lamadrid, river Marapa, on route 301, 21-VI-95: 1 female, 2 males, 13 pupae, 16 larvae; idem 16-IX-96, 12 reared females and 4 reared males, several pupae, 1 larva. Santiago del Estero Province, river Dulce over Santiago del Estero city, 19-VI-95: 13 pupae, 1 larva. Salta Province, Aguas Blancas, road to Yaculika farm collected on man and inside vehicle, 28-I-98: 11 females; river San Francisco on route 5, 28-VII-97: 3 pupae, 2 larvae; river del Valle on route 41, 30-I-98: 1 pupa, 5 larvae. Brazil: State of Amazonas, river Uatuma, 11-VIII-83, coll. U Barbosa, det. Py-Daniel: 1 reared male, 1 reared female and larvae.

Discussion: our material is in accordance with the descriptions of *S. oyapockense* of Py-Daniel (1983) and Shelley et al. (1997). Generally some of our specimens are a little longer than that recorded by those authors. One of the differences is the presence in the male of silver stripes on the scutum of different length, and in some specimens joining with the posterior silver area, indicating that this character used to differentiate *roraimense* is unreliable. Platelets on free portion of thorax of pupa are always rounded distally in Argentina material, but those more posteriorly positioned pointed apically, not so prominent as figured for *S. roraimense* by Shelley et al. (1997, fig. 212). In the pupa primary branch bifurcation from basal trunk at very similar distance, but if different, primary ventral branch always longest. Compared with other Argentina species of *S.* (*Cerqueirellum*) (= *amazonicum* group) the closest species is *S. minusculum* found in NE in Misiones and Corrientes provinces. It has six gill branches but the primary branch bifurcations are lower and ap-

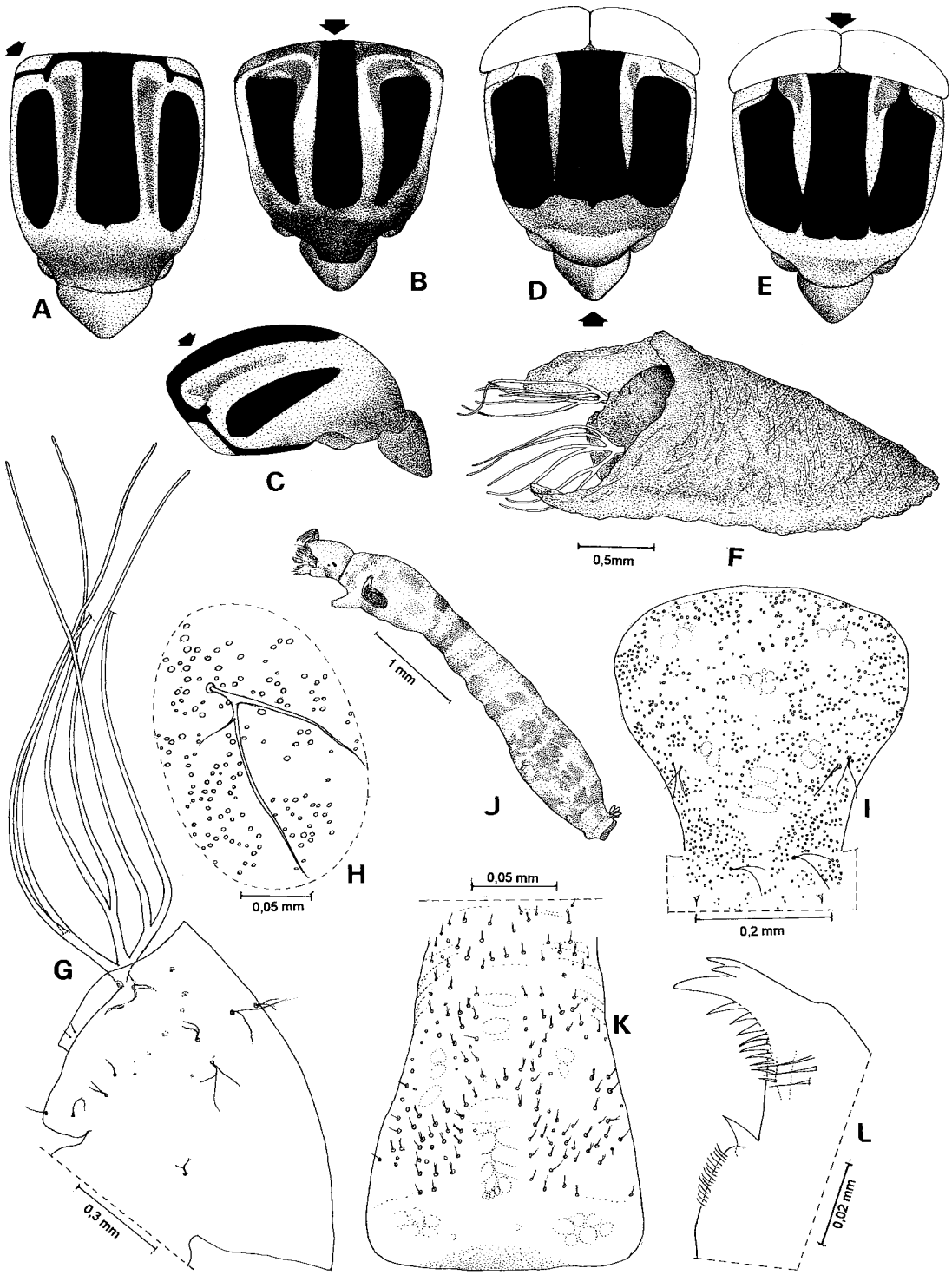

Fig. 1: *Simulium (Cerqueirellum) oyapockense*. A-C: female; A-B: scutum in dorsal view with different illumination; C: scutum in lateral view; D-E: male, scutum in dorsal view with different illumination; F-H: pupa, F: general aspect; G: disc of thorax and gills; H: trichome and platelets; I: frontoclypeus; J-L: larva, J: general aspect; K: cephalic apotome; L: anterior portion of mandible.

proximately at the same distance from the base, the terminal gill branches are proportionately longer, platelets are absent on the frontoclypeus as also on the area of the thorax disc which is smooth, and the presence of 2-4 branches in the thoracic trichomes. These characters help to separate the pupae of both species. Other important characters for separating both species are the absence of a fringe of supramarginal chaetae on the mandible border in the larva of *S. minusculum* and the subterminal dististyle spine is more central positioned and the anterior silver cunae on the scutum of *S. minusculum* are shorter.

S. chaquense with 8 and *S. cuneatum* with 10 gill branches in the pupa permit them to be easely distinguished from *S. oyapockense*. *Simulium delponteianum* has 6 gill branches, but is much larger and more grayish in color and the presence of several spines in the male dististyle, separates this species from *S. chaquense, cuneatum, oyapockense, minusculum*

Another species, *S. ganalesense* Vargas, Martinez Palacios and Díaz Nájera from Mexico, occurring in the northern limits of the Neotropical region is very similar (Coscarón & Ibañez Bernal 1994). Female ornamentation, gill branch distribution and platelets of pupae are similar; small differences are found in the male scutum where silvery longitudinal stripes join with the silver pruinose posterior band as is in *S. roraimense* (and one specimen of *S. oyapockense* from river Marapa), and the female shows less sclerotization of the dentate border of the cibarium. This is further evidence for the close phylogenetic relationship among distant populations of this species complex; possibly new evidence will be obtained from material from intermediate areas, or using other non morphologic characters to clarify the taxonomic status of *oyapockense – roraimense – ganalesense*.

Simulium (Hemicnetha) seriatum Knab

Simulium seriatum Knab, 1914: 81
Trichodagmia laticalx Enderlein, 1934: 291
Trichodagmia latidigitus Enderlein, 1936: 129

DIAGNOSIS

Female: wing length 3-3.3 mm (n = 4). General coloration dark brownish. Head dark brown, frons and clypeus brownish with grayish pollinosity; antennae and legs dark brown; scape and pedicel yellowish brown. Scutum reddish brown to blackish, pollinose with grouped hairs showing gray to golden iridescent scales depending on illumination. Scutellum and metanotum dark brown; pleura dark grayish brown, pollinose. Legs blackish on tarsites and brown on femora and tibiae (Fig. 2 F-G). Abdomen blackish with T II with 1+1 submedian silvery spots and posterior border dark brown; T VI-IX shiny and waxy. Frons convergent below, deep frontocular triangle (Fig. 2A). Smooth cibarium base, emarginated basally and laterally near the cornua with small spicules and more sclerotized (Fig. 2B). Mandibles with 35+13, maxillae with 12+13 teeth. Sensorial maxillary palp organ mostly enlarged (Fig. 2C), rarely small (Fig. 2D). Scutum with grouped hairs intercalated. Basal sector of R with hairs. Ratio length/width of posterior basitarsus = 5.6; claw with strong sub-basal teeth (Fig. 2H). Genitalia: paraproct robust, subrectangular with abundant microtrichiae, cercus rounded on external border (Fig. 3A); VIII sternite with a medium transversal sclerotized spot, gonapophysis about as long as wide, subovoidal with rounded apical border (Fig. 3B). Genital fork with robust branches and distal apodemes (Fig. 3C).

Male: wing length 2.7-2.9 mm (n = 3). Coloration similar to female but more dark; scutum blackish brown, pollinose, without special ornamentation. Abdomen brown with 1+1 silvery, pollinose, sublateral spots on T II, IV-VII. Basal sector of R without hairs. Ratio length/width of posterior basitarsus = 3.1-3.8. Basistyle subtrapezoidal, dististyle about two times the basistyle length, with soft rounded lateral projection and thin apical spur (Fig. 3D); endoparameres with strong hooks (Fig. 3E); basal plate, wider than high with median keel and abundant spines (Fig. 3F).

Pupa: cocoon shoe-shaped, projecting anteriorly with anterior border reinforced; thick tissue without visible threads (Fig. 4A). Length (n = 8) basally 3.5-3.9 mm (maximum 5 mm), on dorsum 2.6-3.4 mm, gill branches length 1.5-1.6 mm. Frontoclypeus with few platelets mostly on base border and laterally reinforced basally with some wrinkles (Fig. 4B); trichomes single with 1+1 facial and 2+2 frontal. Exposed thorax area, with external border granulose with big sub-globose platelets arranged in three longitudinal bands: one median narrow with platelets more darkened and two sub-lateral, the external diagonally placed and joined anteriorly with the sub-basal band (Fig. 4 C-D). Respiratory gills with 12 filamentous branches, emerging from 3 short primary branches that originate from short basal trunk (Fig. 4D).

Larva: length (last instar) 8.7-9.6 mm (n = 8). Coloration (in alcohol) light brown grayish, darkened on dorsum and lighter ventrally (Fig. 5A). Cephalic apotome light brown, slightly darkened at base, and on elongated medium longitudinal area plus 2+2 sublateral spots (Fig. 5B). Antennae longer than base of cephalic fans. Ratio of antennal articles I-III = 1:1.4 - 1.7:0.7 - 1; aspect in accordance with Fig. 5C. Mandible with pre-apical tooth and anterior internal teeth bigger than apical; 5-7 internal teeth ar-

ranged in two rows, only one marginal tooth elongated and pointed distally (Fig. 5D). Maxillary palp with 4-5 sensorial organs on apex. Hypostomium with short teeth, the angle teeth as high or lower than the median tooth, lateral setae in number of 7-10; deep postgenal cleft (Fig. 5E). Ratio hypostomium/hypostomial bridge = 1.3-1.5. Cephalic fan with about 55/60 rays. Proleg comb with 82-110 teeth arranged in two rows of 15-22 groups (Fig. 5F). Anal ring with 200-320 rows of 35-37 hooks

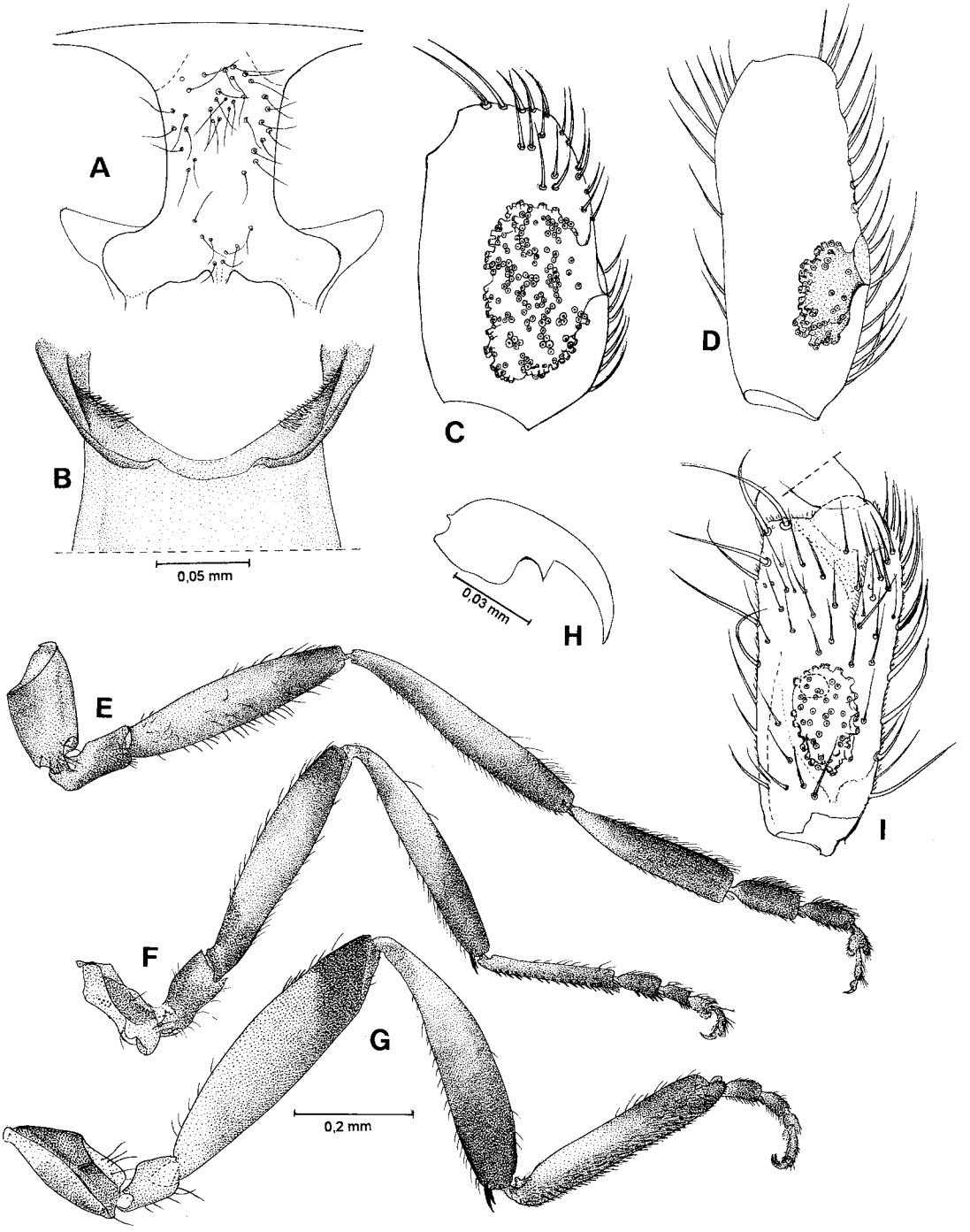

Fig. 2: *Simulium (Hemicnetha) seriatum*. A-H: female. A: frons; B: basal portion of cibarium; C-D: sensorial organ of maxillary palp (both from Marapa river); E-G: first, second and third pair of legs; H: claw. *S. (Hem.) mexicanum*. I: sensorial organ of maxillary palp (from Kikuya river, Acatenango, Guatemala).

each; anal sclerite as Fig. 5G. Anal gill with three lobes each with 9-14 lobules (Fig. 5H).

Material examined: Argentina: Jujuy Province, Caimancito river, on 34 road, 12-III-92, coll. Coscarón: pupae, (MLP); Capilla river, 20 km E of Normenta, 25-VIII-97, coll. Coscarón: pharates female and male, pupae, larvae (mounted in slides) (MLP). Bolivia: Beni Departament, S. of Inicua, Riv. Alto Beni, 15/18-I-76, 1100 m, coll. Peña: 1 female (MLP). Perú: Lima Departament, Rimac valley, 1200 m, 7-VIII-65, coll. P. & B. Wygodzinsky: pharate female and male, pupae and larvae (AMNH); Verrugas Canyon, 1929, coll. Shannon: 1 female (USNM); Cuzco Departament, Quincemil, 27/31-

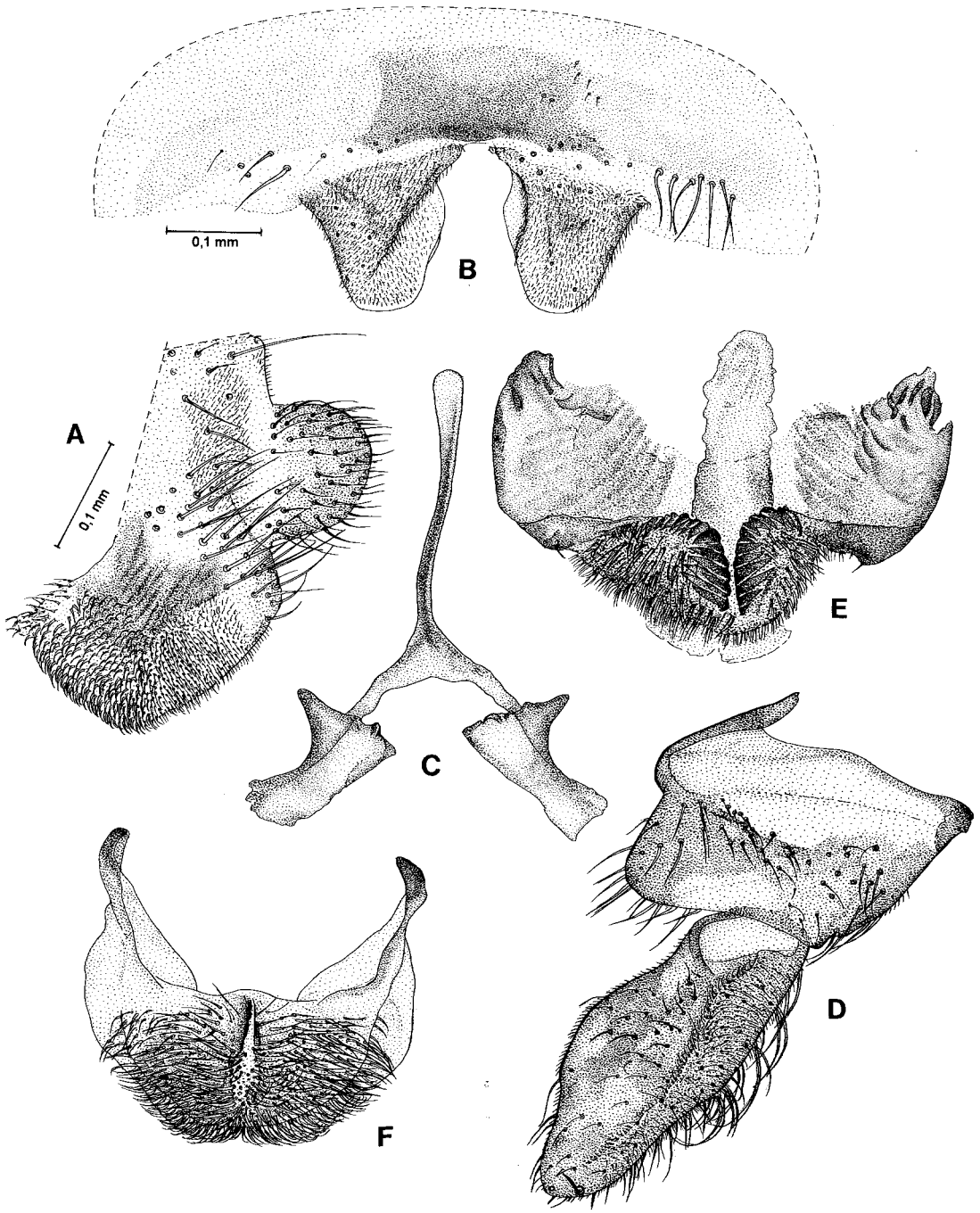

Fig. 3: *Simulium (Hemicnetha) seriatum*. A-C: female. A: paraproct and cercus; B: eighth sternite and gonapophysis; C: genital fork; D-F: male. D: basistyle and dististyle; E: endoparameres and median sclerite; F: ventral plate. (Figs. A, C, D similar scale).

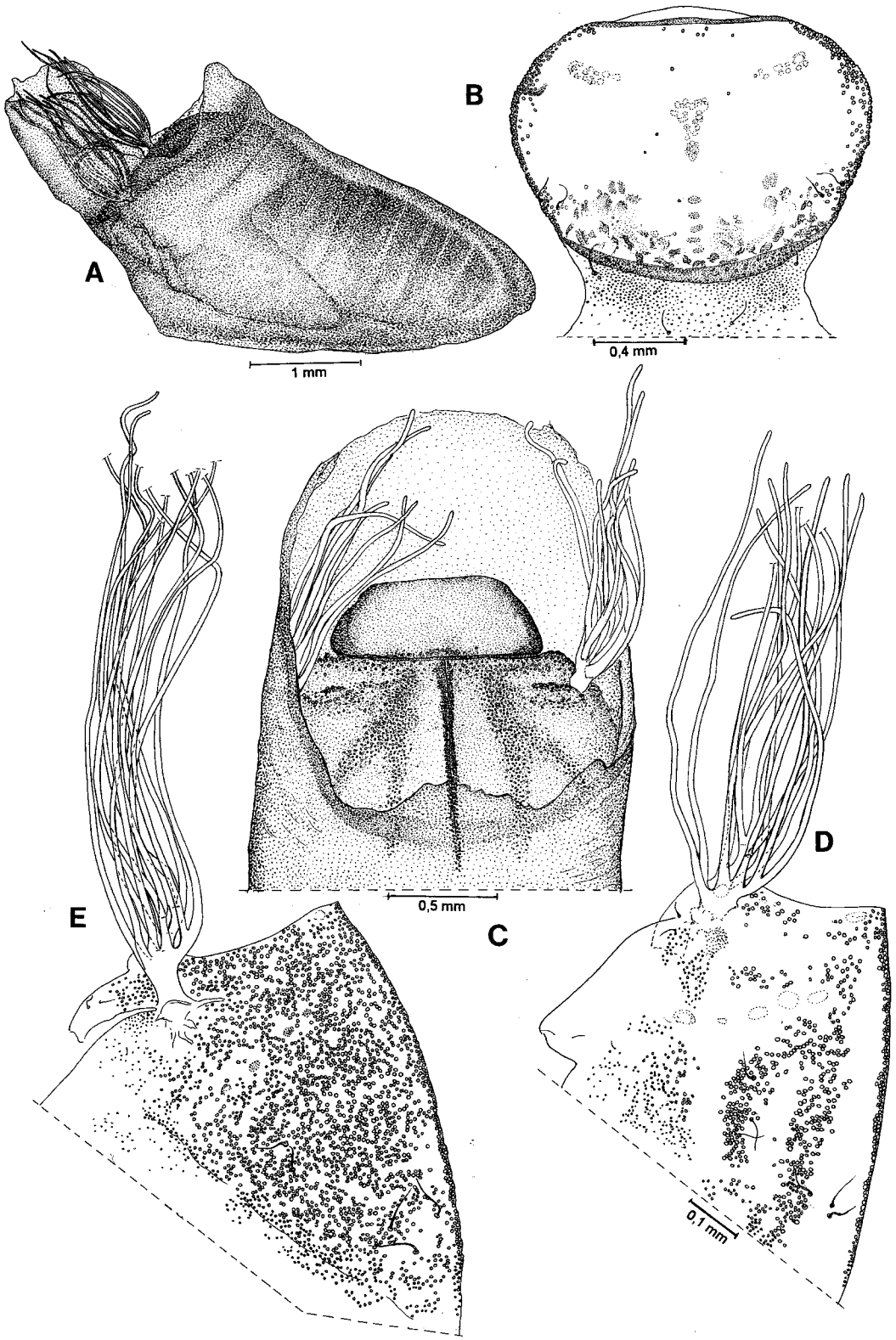

Fig. 4: *Simulium (Hemicnetha) seriatum*. A-D: pupa. A: general aspect; B: frontoclypeus; C: dorsal view of thorax disc, showing disposition of platelets; D: disc of thorax in lateral view. *S. (Hem.) mexicanum.* E: disc of thorax in lateral view showing platelet arrangement.

VIII-62, 740 m, coll. Peña: 2 females (MLP). Ecuador: Pichincha State, on road to Santo Domingo lake, 7-VIII-69, coll. P. & B. Wygodzinsky: pharate female and pupae, (AMNH); Chimborazo State, Multitud, Citado river, 1030 m, 7-XI-86, coll. Coscarón: reared male, pupae and larvae, (MLP); Cañar State, Sacramento, 550 m, 3-XI-86, coll. Coscarón: 4 reared female, pupae and larvae, (MLP); Chimbo river, 3-XI-86, coll. Coscarón: pupae and larvae, (MLP); Calhuayacu, 400 m, 4-XI-86, coll. Coscarón: pupae and larvae, (MLP). Colombia: Valle Departament, river Pance, 1600 m, 22-VIII-67, coll. P. & B. Wygodzinsky: 1 female and 1 male, pupae and larvae (AMNH); Anchicaya, 1000 m, 24-

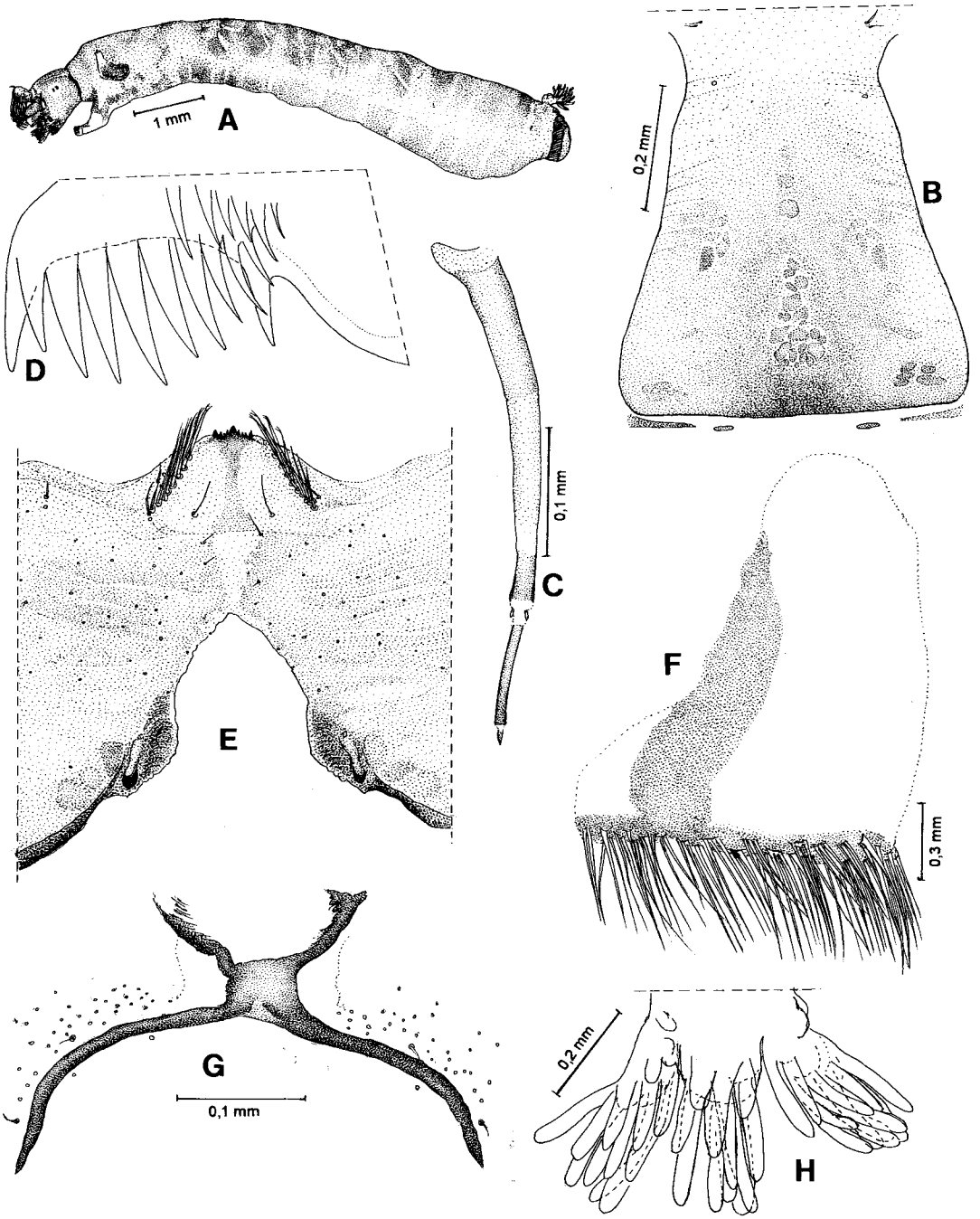

Fig. 5: *Simulium (Hemicnetha) seriatum*. A-H: larva. A: general aspect; B: cephalic apotome; C: antenna; D: mandible; E: hypostomium and gular cleft; F: proleg sclerite; G: anal sclerite; H: anal gills. (Figs B, E similar scale).

VII-70, coll. Howden: 1 female (AMNH); Venezuela: Yaracuy State, Dto. Bolivar, Beroes, Minas Aroa, Tupe river, 450 m, 1 reared female; Táchira State, Dto. San Cristobal, El Carozo, 1 reared male, both determinated by Ramírez Pérez as *S. mexicanum.*

Distribution: Argentina: Jujuy; Bolivia: Beni; Peru: Lima and Cuzco; Ecuador: Pichincha, Chimborazo, Cañar; Colombia: Valle and Venezuela: Distrito Federal, Yaracuy, Táchira.

Discussion: our material is in accordance with the type and author's description. Also adults are similar to *S. mexicanum* Bellardi, but show small differences in the preimaginal stage morphology.

In the pupa the thoracic platelets in *S. mexicanum* are very abundant and cover homogeneously the exposed area (Fig. 4F), the platelets are strongly sclerotized and more spiculate distally, also the frontoclypeus platelets are abundant. In *S. seriatum* the thoracic platelets are more scarce and leave smooth areas (Fig. 4 C-D); in dorsal view it is possible to see three stripes; the frontoclypeus is practically smooth.

Another difference is the sensorial organ of the maxillary palp which in *S. mexicanum* is proportionally smaller with ratio = 2.9-3.3, ($\bar{x}$ = 3.1 mm, n = 6) (Fig. 2 E), and in *S. seriatum* is = 1.6-2.9, ($\bar{x}$ = 2.1 mm, n = 10). Also in *S. mexicanum* the cocoon is thicker, thereby obscuring the pupa and is more reinforced on the anterior border.

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