

Guatemala 産 Simulium (Simulium) Latreille 属 の 1 新種の記載と S. (S.) metallicum Bellardi の再記載

著者	Okazawa Takao, Onishi Osamu
journal or publication title	衛生動物 = Medical entomology and zoology
volume	31
number	3
page range	167-179
year	1980-09-15
URL	http://hdl.handle.net/2297/11695

Description of a new species of *Simulium* (*Simulium*)
Latreille and redescription of *Simulium* (*Simulium*)
metallicum Bellardi from Guatemala
(Diptera : Simuliidae)*

Takao OKAZAWA** and Osamu ONISHI***

Laboratorio de Investigaciones Cientificas "Dr. Isao Tada" para Control de la
Onchocercosis, Servicio Nacional de Erradicación de la Malaria,
5a Avenida, 11-40, Zona 11, Ciudad de Guatemala, Guatemala

(Received: December 24, 1979)

Abstract: A new anthropophilic species of the genus *Simulium* (*Simulium*) Latreille is described from the endemic area of human onchocerciasis in Guatemala and also *S.* (*S.*) *metallicum* Bellardi is redescribed. The new species is very similar to *S.* (*S.*) *metallicum*, which is one of the vector of human onchocerciasis in tropical America, and separable by the features of genitalia at adult stage and by coloration at larval stage.

In the course of our survey on black-flies as a part of the onchocerciasis control project in the municipalities San Vicente Pacaya and Palín, Department Escuintla, Guatemala, we found a new species of the genus *Simulium* (*Simulium*) Latreille. This species closely resembles *S.* (*S.*) *metallicum* Bellardi at all stages. *S.* (*S.*) *metallicum* is one of the most common anthropophilic species and have been considered to be a vector of human onchocerciasis in Central America (Gibson and Dalmat, 1952) and in northern South America (Lewis and Ibáñez, 1962). The larvae of this new species are also commonly collected and adult females are often captured

from man mixed with *S.* (*S.*) *metallicum* at coffee plantation area in Guatemala. The so-called *S.* (*S.*) *metallicum* in Guatemala is thought to have been including this new species. In the present paper the new species is described at adult, pupal and larval stages, and also *S.* (*S.*) *metallicum* is redescribed for making a clear distinction since the previous descriptions are insufficient.

Simulium (*Simulium*) *horacioi*
new species

Simulium (*Simulium*) sp. Onishi, Okazawa
and Ochoa, 1977, *GJCRCP0-MENSAP*
Report, No. 2, pp. 1-8 (larva,
pupal respiratory organ)

Description

Female. General body color dark brown to black. Length: 2.3-2.6 mm, wing 2.5-2.8 mm.

Head brownish black covered with black hairs. Frons faintly greyish pollinose, with some black hairs along lateral margin, width at vertex and antennal base subequal, about 1/2 as wide as length, and 1/5 width of head. Clypeus greyish pollinose, longer than width, with sparse black hairs. Occiput covered with dense long black hairs dorsally. Anten-

* This study was supported by the Ministry of Public Health, Guatemala and the Japan International Cooperation Agency, Japan (GJCRCP0-MENSAP Series No. 2)

** Present address: Zoological Institute, Faculty of Science, Hokkaido University, Sapporo 060, Japan

*** Present address: Sanitary Pest Control Section, Center of Epidemic Prevent, Kyoto 604, Japan

** 岡沢孝雄: 北海道大学理学部動物学教室
(〒060 札幌市北区北10西8)

*** 大西修: 京都市防疫事務所 (〒604 京都市中
京区壬生東高田町1)

sclerotized, arms moderately broad, distally rather heavily sclerotized. Spermatheca ovoid, longer than wide, heavily pigmented, with a small clear circular area at junction with spermathecal duct.

Male. General body color brownish black to black. Length: body 2.6–3.0 mm, wing 2.2–2.4 mm.

Frons brownish black, greyish pollinose. Clypeus dark brown, slightly lighter than frons, with brownish black hairs. Posterior margin of eyes with a row of long, erect, black hairs. Upper eye facets in about 16 rows. Occiput with black hairs laterally. Antenna dark brown, scape and pedicel often yellowish brown, basal portion of first flagellomere usually yellowish brown, dorso-distal margin of scape and dorsal margin of pedicel with a row of black bristles; first flagellomere 1.3–1.5 times as long as pedicel; all segments covered with fine brown pubescences, interspersed with pale brown hairs except for scape and pedicel. Maxillary palpus brown with brownish black hairs; segment III shorter and slightly wider than segment IV, segment V about twice as long as segment III. Sensory vesicle about 1/3–1/4 length of its segment.

Pronotum dark brown, with dark brown hairs. Scutum dark purplish brown to velvety brownish black, covered with golden hairs; bands of whitish pollinosity extending mediodorsally from anterolateral margin of scutum, between bands V-shaped greyish pollinosity, as a whole appearing inverted W-shaped in front view; lateral margin with wide whitish pollinosity, which continues to broad, greyish pollinose prescutellar part; all pollinosities iridescent at some angle in light as those of female; prescutellum with rather long blackish brown hairs. Scutellum dark brown, anteriorly covered with hairs concolorous with those of prescutellum, posteriorly with a row of long, erect, black hairs. Postscutellum dark brown, greyish pollinose. Pleuron dark brown, lighter than scutum, densely greyish pollinose; mesepimeral tuft small and short, of black hairs. Wing membrane hyaline; veins yellowish brown; all hairs on veins dark brown; fringe of calypter and alar lobe pale yellow. Legs as in female except for

fore legs which are often wholly dark brown. Fore basitarsus about 5 times as long as broad. Hind basitarsus slender, about 5.0–5.5 times as long as broad.

Abdomen blackish brown. Basal fringe of long, dark brown hairs laterally, rather short black hairs dorsolaterally, extending to distal margin of abdominal segment III. Tergite II iridescent pollinose; tergites IV–IX concolorous pollinose anterolaterally, this pollinosity becomes more obscure and less in extent towards distal tergite; tergite X small, subrectangular. Sternite I trapezoidal to subtriangular; sternites III–VIII subrectangular with black hairs near posterior margin. Genitalia as in Fig. 3. Basimere subrectangular, longer than width in ventral view, inner surface and distal 1/3 of outer surface sparsely setose. Distimere subrectangular in ventral view, slightly longer than basimere, about 2/5 as wide as its long, inner margin concaved shallowly, its width reduced at basal 2/3 length and broadened distally; with a single terminal spine and a short, blunt, inner projection near base. Body of ventral plate broad, heavily sclerotized; in ventral view, apical margin slightly concave, with a short, haired, round ventral lip projecting posteroventrally; basal arms long, broad, extending anterolaterally, about as long as body; median sclerite long, broad, heavily sclerotized, distally expanding into round plate. Endoparameral organ heavily sclerotized, with 5 long and 5 short spines, basally expanding into subtriangular, wrinkled plate.

Pupa. Length: body 2.2–2.6 mm, respiratory organ 3.9–4.7 mm. Cephalic apotome of head and dorsum of thorax roughened with numerous, slightly raised, round granules. Antenna of female reaching to hind margin of head; antenna of male reaching about one half distance to hind margin of head. Cephalic apotome with 3 pale, long, two-branched trichomes at each side, two of them along antenna, rest one lateral to antennal base; thorax on each side with 5 pale, long two-branched dorsal trichomes and 2 rather long, simple, lateral trichomes; 5–7 pale setae near anterior margin of base of respiratory organ. Respiratory organ consisting of a short base, which giving rise

to a ventral pair of filaments with rather long petiole, and a short dorsal bough bearing two pairs of filaments; ventral pair splitting obliquely at an angle of 45° against perpendicular, not horizontally in front view; dorsalmost pair with short petiole, middle pair with rather long petiole; total number of filament six, all brown, long, slender, slightly tapering distally. Abdominal tergite II with 4 short setae near posterior margin on each half; tergites III-IV each with 4 large anteriorly directed hooks near posterior margin and a short seta anterior to the outermost hook on each side; tergites VII-VIII each with a row of short, irregular sized, posteriorly directed spines near anterior margin, row on tergite VII and on tergite VIII consisting of about 20 spines and about 13 spines respectively; tergite IX with some irregular numbered, posteriorly directed, small spines; anterolateral corner of tergites II-IX covered with fine granule-like, posteriorly directed spines, these are grouped and linked transversely, forming many spine-combs on tergites V-VIII, sometimes these are absent on tergite III-V. Sternite IV with an outer, simple, anteriorly directed hook and an inner seta toward each side; sternite V-VII each with an outer simple and an inner furcated, anteriorly directed hooks near hind margin on each side, outer hook on sternite V often furcated; sternites III-VIII with fine granule-like spines as on tergites. Caudal spines short, moderately sclerotized. Cocoon pocket-shaped, flattened, rounded in dorsal view, rather loosely woven; anterior margin slightly thickened.

Larva. Length: 4.8-5.5 mm. Head capsule (Fig. 7) yellow to pale yellowish brown, rather darker posteriorly; anterior margin brown; head spots positive but very obscure; eye spot of moderate size; eyebrow indistinct; cervical sclerites small, brown, isolated, moderately sclerotized. Antenna distinctly longer than stalk of cephalic fan; proportion of segments I-IV about 12:11:11:1; segment I brown, segment II pale brown with many transverse microstriations; segment III pale brown. Cephalic fan with 30-39 rays (av. 34). Hypostomium with 9 anterior teeth; median tooth slightly higher than corner teeth; intermedial teeth subequal in height; each lateral margin with 2

lateral teeth and 3-5 lateral serrations; 4-5 hypostomial setae slightly diverged posteriorly from lateral margin of hypostomium. Postgenal bridge slightly longer than depth of postgenal cleft and about 1.2 times as long as hypostomium. Postgenal cleft shaped as Fig. 7, slightly pointed apically. Mandibular serration of two distinct, triangular teeth; basal tooth always smaller than distal one. Maxillary palpus 2.1-2.6 times as long as width at base. Lateral plate of proleg subrectangular to subtriangular, moderately sclerotized, distal margin with a row of brown bristles. Abdominal segments I-IV each with a dark brown band; segments V-VI brown to purplish brown dorsally, segments VII-IX blackish brown to black dorsally. Rectal gill lobes compound; each lobe with 3-5 thumb-like secondary lobules. Rectal setulae compound in structure. Posteroventral arms of anal sclerite slender, slightly longer than anterodorsal arms which are broad basally. Accessory sclerites composed of small plaques linked, slightly divided into five groups, each of 4-5 plaques except 3 of central group. Posterior circlet consisting of 10-15 hooks in 72-78 rows.

Holotype

Female (reared), Quebrada Los Lavaderos, San Vicente Pacaya, Department Escuintla, February 1, 1978, T. Okazawa.

Allotype

Male (reared), same data as holotype.

Paratypes

Same data as holotype except for dates as follows: 4 ♂♂, 4 ♀♀ (reared) and 10 pupae (reared from larvae), February 1, 1978; 3 ♂♂, 4 ♀♀ (reared) and 3 pupae (reared from larvae), February 16, 1978; 20 larvae, December 29, 1977. The following paratypes were collected by T. Okazawa in small tributary stream of Riachuelo Guachipilín in Finca Peña Blanca, San Vicente Pacaya, Department Escuintla and dates as given: 15 larvae, March 7, 1977; 1 larva, April 26, 1977; 17 larvae, January 6, 1978; 10 larvae, January 16, 1978; 19 larvae, January 26, 1978.

Holotype, allotype and paratypes are kept in National Science Museum, Tokyo, Japan. Paratypes are also deposited in Laboratorio

de Investigaciones Científicas "Dr. Isao Tada," Servicio Nacional de Erradicación de la Malaria, Ciudad de Guatemala, Guatemala.

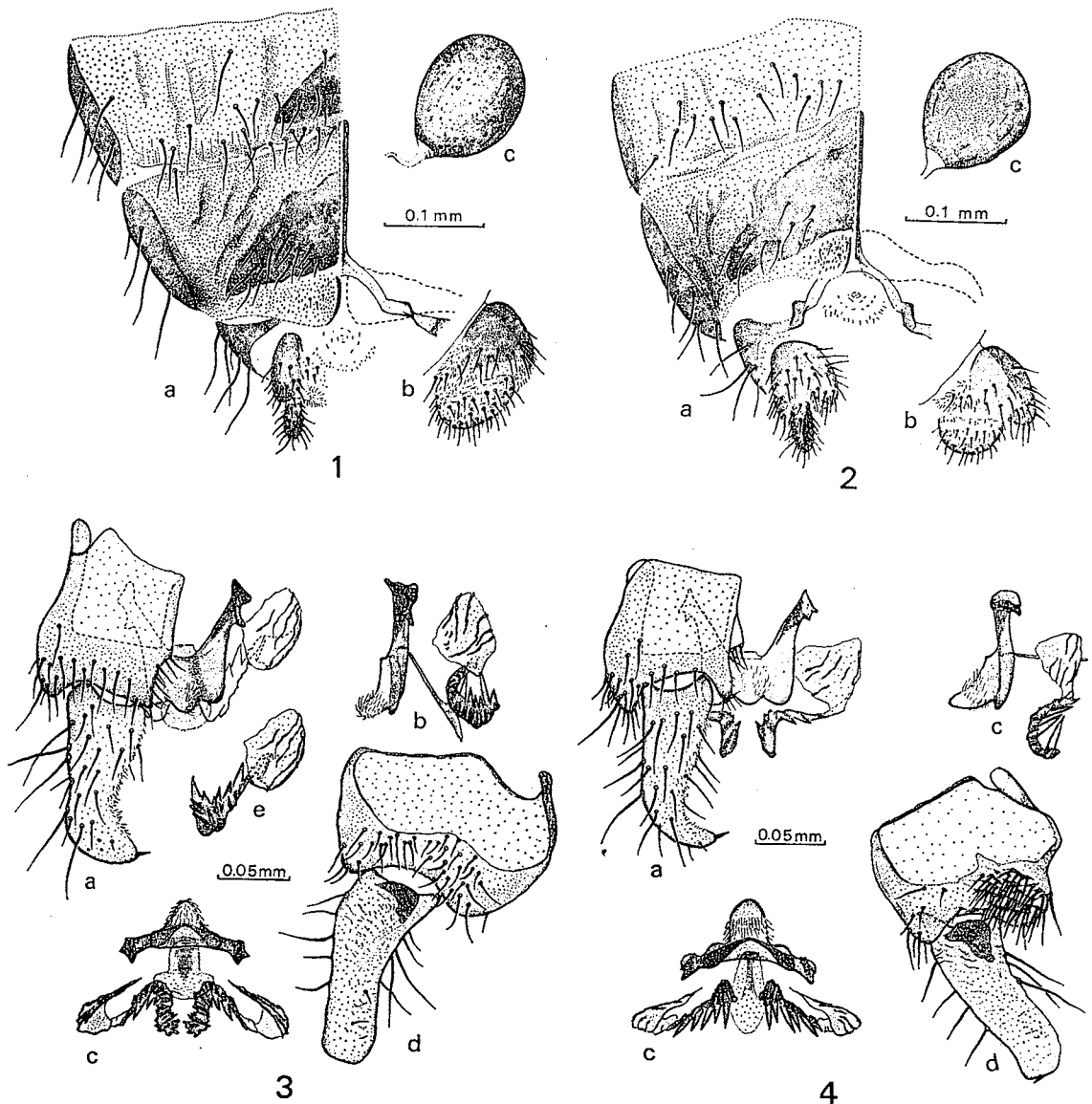
Records

Material examined. Department Escuintla: San Vicente Pacaya: Finca Peña Blanca, 11-IV-1978, S. Ito (2♀♀). Panruncito, Río Jazmines, 12-V-1978, S. Ito and T. Okazawa (6♀♀). El Injerto, 26-V-1978, S. Ito and Y. Yamagata (9♀♀). Finca Guachipilín, 19-VII-1978, T. Okazawa (1♀). Small tributary streams of upper Riachuelo Guachipilín, 17-II-1978, T. Okazawa and E. Gramajo M. (6 larvae); 13-VI-1978, O. O. Gudiel P. and R. Pichillá R. (10 larvae). Small tributary stream of Quebrada El Amate in Finca San Francisco El Amate, 29-VII-1976, T. Okazawa, K. Matsuo and O. Onishi (5 larvae). Small tributary streams of Río Jazmines, 13-IX-1977, T. Okazawa and E. L. Juárez O. (9 larvae); 21-IV-1978, T. Okazawa and E. Gramajo M. (122 larvae). Palín: All streams are located in Chilar. Small tributary streams of Quebrada El Rodeo, 19-IV-1978, T. Okazawa and E. Gramajo M. (10 larvae). Small tributary streams of upper Quebrada de Pajal, 4-V-1977, T. Okazawa, M. A. Gómez and O. O. Gudiel P. (146 larvae). Guanagazapa: Small tributary streams of Riachuelo El Silencio in Finca San Ramón, 24-I-1978, T. Okazawa and S. Ito (9 larvae). Department Guatemala: Small streams in Finca Rincón, Villa Canales, 23-V-1978, T. Okazawa, Y. Yamagata and I. Tanaka (147 larvae). Department Santa Rosa: Small tributary streams of Río Frío in Finca El Silencio Pueblo Nuevo Viñas, 21-XI-1977, T. Okazawa (21 larvae). Department Chimaltenango: Finca Buena Vista, Acatenango, 27-II-1980, T. Okazawa, E. Alvarad, (10 larvae). Department Suchitepéquez: Small tributary streams of Río Nica in Fincas La Conchita and Santa Monica Iboné, Chicacao, 8 and 9-IX-1976, O. Onishi, K. Matsuo and T. Okazawa (104 larvae). Department Sololá: Small tributary streams of Río Nica in Finca Monte Quina, Atitlan, 9-IX-1976, O. Onishi, K. Matsuo and T. Okazawa (56 larvae).

Remarks. This species closely resembles *S. (S.) metallicum*, and was firstly distinguished from *S. (S.) metallicum* at larval stage

by coloration and reported as *S. (S.)* sp. (Onishi *et al.*, 1977), that is, dorsal part of abdominal segments VII-IX is blackish brown to black and all head spots are indistinct and of positive pattern in *S. (S.) horacioi*, while in *S. (S.) metallicum* abdominal segments VII-IX are concolorous with segments V-VI, brown to purplish brown and head spots are generally distinct and postero-median and posterolateral ones of negative pattern (Fig. 8). At adult stage, in the female of *S. (S.) horacioi*, as in Fig. 1, small but well sclerotized stenite VII is present; length of anal lobe at ventral margin, in lateral view, is shorter than that at anterior margin, in ventral view inner margin of anal lobe is rather concaved and posteroinner angle is pointed and weakly sclerotized. In the female of *S. (S.) metallicum*, as in Fig. 2, sternite VII is not sclerotized; length of anal lobe at ventral margin, in lateral view, is subequal or longer than that at anterior margin, in ventral view inner margin is convexed, posteroinner angle is not pointed and well sclerotized. In the male of *S. (S.) horacioi*, as in Fig. 3, basimere is only sparsely setosed without patch of setae at innerdorsal surface, in ventral view distimere is reduced in its width at basal 2/3 length and distally broadened again; ventral lip of ventral plate, in terminal view, rounded and short. In the male of *S. (S.) metallicum*, as in Fig. 4, basimere has a patch of dense setae at innerdorsal surface; in ventral view distimere is curved inwards at basal 2/3 length and tapering distally to a slender apex; ventral lip of ventral plate, in terminal view, conical and strongly projecting ventrally. Pupa of *S. (S.) horacioi* differs from *S. (S.) metallicum* in absence of spines on anterior margin of tergite VI.

S. (S.) horacioi is also allied to *S. (S.) jobbinsi* Vargas, Martínez and Díaz and *S. (S.) puigi* Vargas, Martínez and Díaz. The new species is separable from the former species by the features of genitalia in adult especially in male distimere with an apical spine and apicolateral corners are projecting posteriorly; in larva head capsule wholly light brown and abdominal segments VII-IX are blackish brown to black in contrast to anterior segments, and from the latter species by the



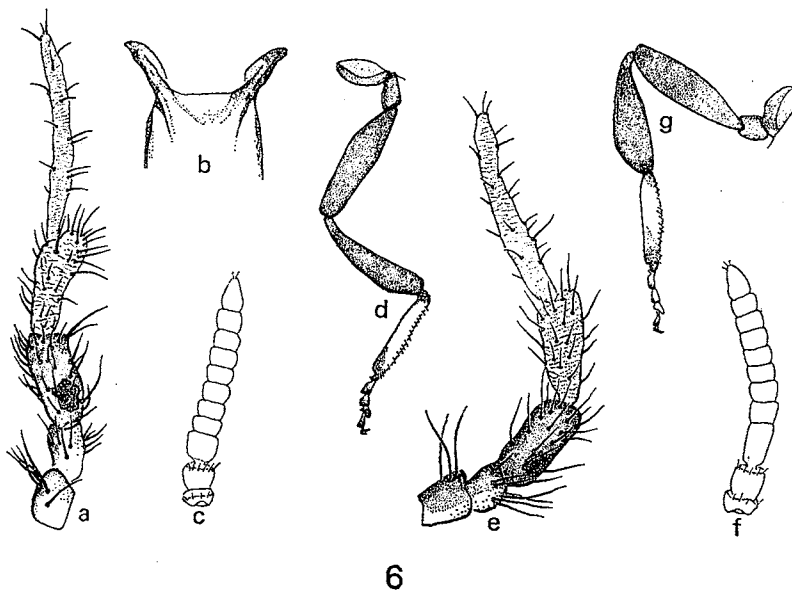
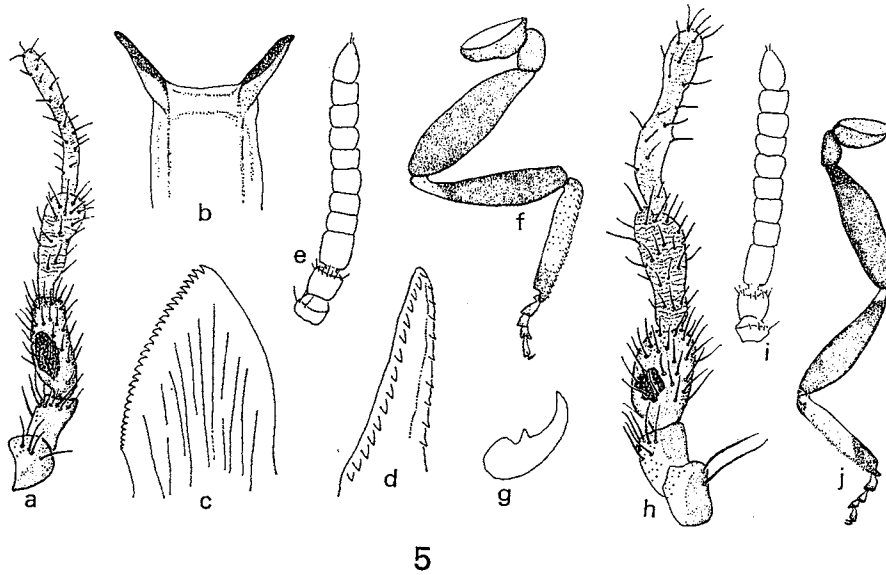
Figs. 1-4

1-2, female genitalia: 1, *Simulium (S.) horacioi*; 2, *S. (S.) metallicum*. (a) ventral view with left ovipositor lobe removed; (b) right lateral view of anal lobe and cercus; (c) spermatheca. 3-4, male genitalia: 3, *S. (S.) horacioi*; 4, *S. (S.) metallicum*. (a) ventral view with left basimere and distimere removed; (b) left lateral view of ventral plate, median sclerite and endoparameral organ; (c) terminal (end) view of same structures; (d) inner surface of basimere and distimere; (e) ventral view of left arm of endoparameral organ

features that basitarsus of hind leg is slender in adult male, cercus is about 1/2 as wide as long in female, cocoon flattened and rounded, while in *S. (S.) puigi* base tarsus of hind legs is of spindle form in male, cercus is about as wide as long, cocoon is conic.

This species is named for Dr. Horacio Figueroa M. who has been studying on human onchocerciasis in Guatemala.

Biological notes. The larvae of this species are found in very small streams in the mountainous area, which are called as "infant" or "young streams" by Dalmat (1955), and were collected throughout the year. The larvae attach themselves to submerged leaves and often to stone surface of the stream bottom. Adult female bites man. A single individual was also captured on cow mixed with numerous *S. (S.) metallicum*



Figs. 5-6 Adult

5, *Simulium* (*S.*) *horacioi*. (a)-(g) female, (a) maxillary palpus; (b) distal part of cibarium; (c) mandible; (d) maxilla; (e) antenna; (f) hind leg; (g) claw of hind leg. (h)-(j) male, (h) Maxillary palpus; (i) antenna; (j) hind leg. 6, *S.* (*S.*) *metallicum*. (a)-(d) female, (a) maxillary palpus; (b) distal part of cibarium; (c) antenna; (d) hind leg. (e)-(g) male, (e) maxillary palpus; (f) antenna; (g) hind leg

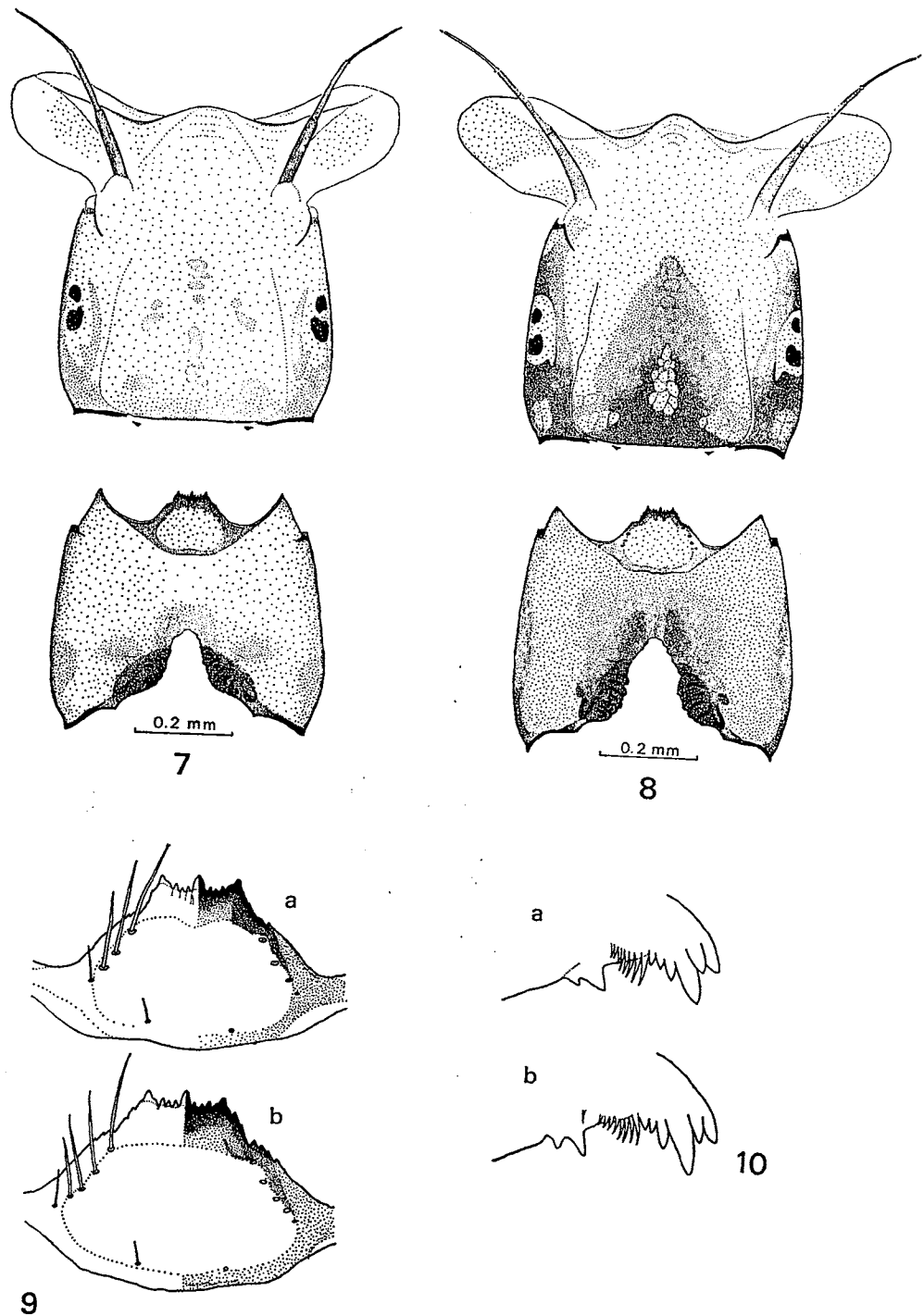
in Finca Guachipilín, San Vicente Pacaya, Department Escuintla, on July 19, 1978.

***Simulium* (*Simulium*) *metallicum*
Bellardi**

Simulium metallicum Bellardi, Saggio di Ditterologia Messicana, Vol. 1, p. 14, 1859 (original description, male). — Dyar and Shannon, *Proc. U. S. Nat. Mus.*,

Vol. 69, Art. 10, p. 41, 1927 (female). — Fairchild, *Ann. Entomol. Soc. Am.*, Vol. 33, No. 4, pp. 712-713, 1940 (female, male and pupa). — Vargas, *Rev. Inst. Salubr. Enferm. Trop.*, Vol. 3, No. 3, pp. 234-236, 1942 (male and female genitalia).

Simulium avidum Hoffmann, *An. Inst. Biol.*, Univ. México, Vol. 2, pp. 207-218, 1931

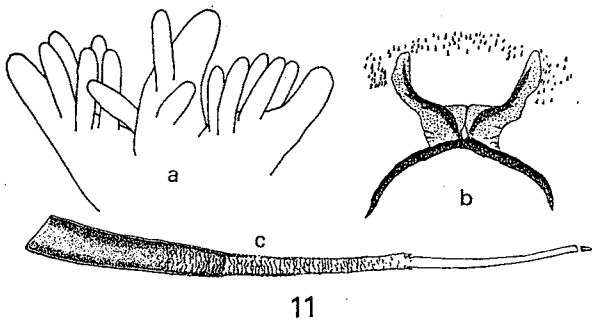


Figs. 7-10 Larva

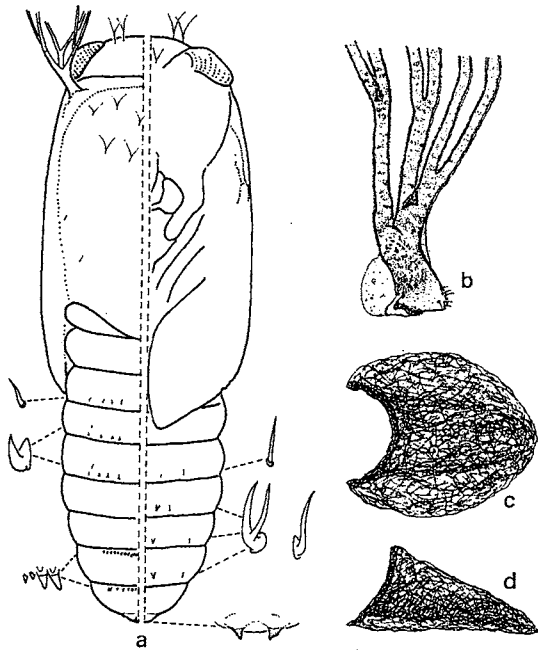
7-8, dorsal and ventral views of head capsule. 7, *Simulium* (*S.*) *horacioi*.
 8, *S.* (*S.*) *metallicum*. 9, hypostomial teeth: (a) *S.* (*S.*) *horacioi*; (b)
S. (*S.*) *metallicum*. 10, apex of mandible: (a) *S.* (*S.*) *horacioi*; (b) *S.*
 (*S.*) *metallicum*

(larva, pupa and genital rod of female).
Simulium (*Simulium*) *metallicum* Bellardi;
 Vargas, Martínez and Díaz, *Rev. Inst.*
Salubr. Enferm. Trop., Vol. 7, No. 3,
 p. 175, 1946 (larva). —Dalmat, *Smith-*
sonian Misc. Coll., Vol. 125, pp. 220-

225, 1955 (larva, pupa, male and female).
 —Vargas and Díaz, *Rev. Inst. Salubr.*
Enferm. Trop., Vol. 17, p. 384, 1957
 (female and male genitalia, respiratory
 organ of pupa).
Description



11



12

Figs. 11-12 *Simulium (S.) horacioi*

11, larva: (a) rectal gill; (b) rectal sclerite; (c) antenna. 12, pupa: (a) dorsal and ventral views; (b) basal portion of respiratory organ; (c) cocoon, dorsal view; (d) cocoon, lateral view

Female. General body color dark brown to black. Length: body 1.9-2.6 mm, wing 1.9-2.3 mm.

Head almost black, covered with black hairs. Frons faintly greyish pollinose, with some black hairs along lateral margin, width at vertex and antennal base subequal, about $1/2$ as wide as length, and $2/9$ width of head. Clypeus greyish pollinose, longer than width, covered with sparse black hairs. Occiput with dense long black hairs dorsally. Antenna 11-segmented; scape, pedicel and basal half of first flagellomere light brown, with a row of black bristles at dorsodistal margin of scape and distal margin of pedicel;

remainder of segments dark brown; all segments covered with dense fine pale brown pubescences, interspersed with pale brown hairs except for scape and pedicel. Mandible with 24-27 serrations, confined to inner apical margin. Blade of maxilla with 19-22 retrorse teeth. Maxillary palpus brown to greyish brown; segment III shorter than segment IV, subequal in width; segment V about twice as long as segment III. Sensory vesicle about $1/3$ or less as long as its segment, width/length of vesicle $1/2-2/3$, proximally situated, with round mouth. Cibarium without armatures, median proximal space somewhat squared, dorsolateral arms heavily sclerotized.

Pronotum brownish black posteriorly, with whitish pollinosity which shines iridescently at some angle in light, covered with black hairs. Scutum black, covered with short, recumbent, black hairs; medially three longitudinal, velvety black stripes on greyish pollinose ground in anterodorsal view, but in posterodorsal view greyish pollinose stripes on velvety black ground, these stripes extending from anterior margin to prescutellar part; anterior and lateral margin with broad iridescent pollinosity at some angle, lateral pollinosity continues to prescutellar part; prescutellum greyish pollinose, shines in same color as lateral margin, covered with sparse, rather long, black hairs. Scutellum blackish brown, faintly greyish pollinose, with a row of long black hairs. Postscutellum concolorous with scutellum, lighter than scutum, greyish pollinose. Pleuron brownish black to black, greyish pollinose; pleural membrane greyish brown, naked. Mesepimeral tuft small, of rather long black hairs. Katepisternum concolorous with pleuron, bare. Wing membrane hyaline; veins brown to pale brown, stem vein and base of costa with rather long black hairs; base of radius bare; R_1 with a row of black spinules, R_s with a row of short black hairs; fringe of clyptor and alar lobe pale brown. Basal stem of halter dark brown, rest of halter yellowish white. Precoxal bridge absent. Coxa, trochanter and femur of fore leg brown, of mid and hind legs dark brown; fore tibia brown with basal and apical $1/4$ dark brown, mid and hind

tibiae dark brown with basal apex often brown; fore tarsus wholly brownish black, mid and hind tarsi yellowish brown basally and dark brown distally, fore basitarsus about 5 times as long as broad, hind basitarsus parallel-sided, about 6 times as long as broad; calcipala and pedisculus well developed; claw slender with a small tooth near base.

Abdominal segments II, VI-IX brown to bark brown dorsally, segments III-V velvety brownish black dorsally, all segments greyish pollinose ventrally; basal fringe yellowish brown; tergite II iridescent pollinose, about 3 times as wide as tergite III; tergites III-IV reduced, with sparse black hairs; tergites V-IX lustrous with brownish black hairs; tergite X small, subsquare. Sternite I weakly sclerotized laterally; sternite VIII wide, heavily sclerotized. Genitalia as in Fig. 2. Anal lobe, in lateral view, subtriangular, length at ventral margin subequal or longer than that at anterodorsal margin which is somewhat concaved, posteroventrally rounded, projecting below level of cercus, dorsally tapering, reaching to dorsal margin of cercus; in ventral view subtriangular, inner margin rather convex, posteroinner angle well sclerotized but not pointed, space between lobes narrow. Cercus subtriangular, densely covered with light fine setae, inner margin weakly and narrowly sclerotized. Stem of genital fork long and slender, heavily sclerotized, arms moderately broad, distally heavily sclerotized. Spermatheca ovoid to subspherical, slightly longer than width, heavily pigmented, with a small clear circular area at junction with spermathecal duct.

Male. General body color dark brown to black. Length: body 1.9-2.4 mm, wing 2.0-2.2 mm.

Frons brownish black, greyish pollinose. Clypeus blackish brown, slightly lighter than frons, greyish pollinose, covered with blackish brown hairs. Posterior margin of eyes with a row of long, erect, black hairs. Upper eye facets in about 16 rows. Occiput covered with black hairs laterally. Antenna dark brown, scape, pedicel and basal portion of first flagellomere yellowish brown, dorso-distal margin of scape and distal margin of pedicel with a row of black bristles, first

flagellomere 1.5-2.0 as long as pedicel; all segments covered with fine, brown pubescences, interspersed with pale yellowish brown hairs except scape and pedicel. Maxillary palpus brown with brownish black hairs; segment III shorter and slightly wider than segment IV; segment V about twice as long as segment III. Sensory vesicle about $1/3-1/5$ length of its segment.

Pronotum blackish brown, with dark brown hairs, which are yellow in light. Scutum velvety brownish black, covered with short hairs concolorous with those on pronotum; whitish pollinose bands extending dorsomedially from anterolateral margin, between bands V-shaped greyish pollinosity, as a whole appearing inverted W-shaped in front view; lateral margin with wide, whitish pollinosity, which continues to broad, greyish pollinose prescutellar part; all pollinosities iridescent at some angle in light; prescutellum with rather long, black hairs. Scutellum dark brown, with a row of long, erect, blackish brown hairs. Postscutellum dark brown, greyish pollinose. Pleuron dark brown, lighter than scutum, densely yellowish grey pollinose; mesepimeral tuft small and short, of black hairs. Wing membrane hyaline; veins brown to pale yellowish brown, all hairs on veins dark brown; fringe of calypter and alar lobe pale brown. Legs as in female. Fore basitarsus about 5 times as long as broad. Hind basitarsus slender, about 4.8-5.4 times as long as width.

Abdomen blackish brown. Basal fringe of long brown hairs laterally, extending to distal margin of abdominal segment III, of rather short black hairs dorsolaterally. Tergite II iridescent pollinose; tergites IV-IX laterally concolorous with tergite II, pollinosity less extent toward distal segment; tergite X subrectangular. Sternite I trapezoidal; sternites III-VIII subrectangular with black hairs near posterior margin. Genitalia as in Fig. 4. Basimere subequal in width and length, with an innerdorsal patch of dense setae, remainder part of inner surface and distal $1/2$ of outer surface sparsely setose. Distimere curved inwards at basal $2/3$ length, tapering distally to a slender apex, longer than basimere, about $2/5$ wide

as its long; with a single terminal spine and a short blunt inner projection near base. Body of ventral plate broad, heavily sclerotized; in ventral view, apical margin concave, conical ventral lip haired except for apex, strongly projecting ventrally; basal arms broad, long, extending anteriorly, slightly longer than body; median sclerite long, elliptic, moderately sclerotized medio-longitudinally. Endoparameral organ sclerotized, with 5-6 long spines; basally expanding into subtriangular wrinkled plate.

Pupa. Length: body 2.1-2.3 mm, respiratory organ 3.4-4.5 mm. Cephalic apotome of head and dorsum of thorax roughened with numerous, slightly raised, round granules. Antenna of female reaching to hind margin of head; antenna of male reaching about one half distance to hind margin of head. Cephalic apotome with 3 pale, long, two-branched trichomes at each side, two of them along antenna and rest one lateral to antennal base; thorax with 5 pale, long, two-branched of sometimes three-branched dorsal trichomes and 2 rather long, simple lateral trichomes; 3-5 pale setae near anterior margin of base of respiratory organ. Respiratory organ consisting of short base which giving rise to a ventral pair of filaments with rather long petiole and short dorsal bough bearing two pairs of filaments; ventral pair splitting almost horizontally; dorsalmost pair with short petiole; middle pair with rather long petiole; all six filaments brown, long, slender, slightly tapering distally. Abdominal tergite I with a long seta laterally on each side; tergite II with 6 short setae on each side, 4 of them near posterior margin, 2 anterior to outer one of 4; tergites III-IV each with 4 large anteriorly directed hooks near posterior margin and a short seta anterior to outer hook on each side; tergite VI with 3 short posteriorly directed spines near anterior margin on each side; tergites VII-VIII each with a row of short irregularly sized, posteriorly directed spines near anterior margin, row on tergite VII consisting of about 22 spines, on tergite VIII of about 15 spines; tergite IX with about 7 anteriorly directed, irregularly sized, short spines; tergites III-VIII with fine, granule-like spines laterally, these are grouped and linked, forming many

spine-combs, sometimes absent on tergites III-V. Sternite IV with an outer simple anteriorly directed hook and an inner seta toward each side; Sternite V with 2 furcated, anteriorly directed hooks near hind margin on each side, often outer one simple; sternites V-VII each with an outer simple and an inner fructed, anteriorly directed hooks near hind margin on each side; sternites III-VIII with fine granule-like spines as on tergites. Caudal spines short, moderately sclerotized. Cocoon pocket-shaped, flattened, rounded in dorsal view, rather loosely woven; anterior margin slightly thickened.

Larva. Length 4.8-5.6 mm. Head capsule (Fig. 8) yellowish brown to pale brown; cephalic apotome ovally dark brown medially, this pigmentation continues to dark brown posterior margin; anterior margin dark brown; posteromedian and posterolateral spots of negative pattern, brown to pale brown; lateral side of head dark brown with posterior spots of negative pattern, anteriorly yellowish brown, eye spot moderate size, surrounded by clear area; ventral side of head capsule yellowish brown, area along postgenal cleft dark brown. Cervical sclerites small, brown, isolated, moderately sclerotized. Antenna distinctly longer than stalk of cephalic fan; proportion of segments I-IV 13:12:11:1; segment I brown, segment II pale brown with many transverse microstriations; segment III pale brown. Cephalic fan with 35-40 rays (av. 36). Hypostomium with 9 anterior teeth; median and corner teeth subequal in height; intermedial teeth subequal in height; each lateral margin with two lateral teeth and 3-6 lateral serrations; 4-5 hypostomial setae subparallel to lateral margin of hypostomium. Postgenal bridge $\frac{2}{3}$ long as depth of postgenal cleft and as long as hypostomium. Postgenal cleft rather long, slightly pointed apically. Mandibular serration of two distinct, triangular teeth, basal tooth always smaller than distal one. Maxillary palpus 2.2-2.5 times as long as width at base. Lateral plate of proleg subrectangular; distal margin with a row of brown bristles, 3-4 bristles are grouped and attached basally. Abdominal segments I-IV each with brown to dark brown band, segments V-IX brown to

purplish brown dorsally. Rectal gill lobes compound; each lobe with 3-4 thumb-like secondary lobules. Rectal setulae compound in structure. Posteroventral arms of anal sclerite slender, subequal or slightly longer than anterodorsal arms which is broad basally. Accessory sclerites composed of 23-27 small plaques linked or slightly separated. Posterior circlet consisting of 12-15 hooks in 67-77 rows.

Records

Material examined. Department Escuintla. San Vicente Pacaya: Quebrada Los Lavaderos and its small tributary streams, 21-II-1977, 1-II-1978, T. Okazawa (5 pupae and 3 ♂ ♂, 4 ♀ ♀). Small tributary streams of Quebrada El Barretal, 28-VII-1976, T. Okazawa, O. Onishi and K. Matsuo (7 larvae). Upper Río Jazmines and its small tributary streams, 28-VII-1976, O. Onishi, T. Okazawa and K. Matsuo (141 larvae, 8 pupae and 2 ♂ ♂, 1 ♀). Panrúncito, Río Jazmines, 12-V-1978, S. Ito and T. Okazawa (7 ♀ ♀). Riachuelo Guachipilín and its small tributary streams in Finca Peña Blanca and Finca Guachipilín, 30-IX-1976, T. Okazawa, O. Onishi and K. Matsuo (22 larvae). Finca Guachipilín, 19-VII-1978, T. Okazawa (10 ♀ ♀). Río El Chupadero in Finca Jutal, 29-VII-1976, O. Onishi, T. Okazawa and K. Matsuo (14 larvae, 1 pupae and 1 ♂). Quebrada Las Chilcas and its small tributary streams, 22-II-1977, T. Okazawa and E. Gramajo M. (40 larvae). Río Metapa and its small tributary streams in Finca Berlín, 21-VII-1976, O. Onishi, T. Okazawa and K. Matsuo (56 larvae, 7 pupae and 1 ♂ 1 ♀). Outlet stream of Laguneta Las Tortugas in Finca Terranova, 16-V-1977, T. Okazawa (larvae). Quebrada Guineo and Quebrada La Campana in Finca Suiza, 25-VIII, 22-IX-1976, T. Okazawa, O. Onishi and K. Matsuo (175 larvae, 3 pupae and 2 ♂ ♂ 1 ♀). Quebrada Hamburgo and its tributary streams in Finca Hamburgo, 29-VII-1976, O. Onishi, T. Okazawa and K. Matsuo (62 larvae, 3 pupae and 4 ♂ ♂ 7 ♀ ♀). Río San Nicolas and irrigation ditch in Finca San Nicolas, 22-VIII-1976, T. Okazawa, O. Onishi and K. Matsuo (143 larvae and 3 ♂ ♂ 6 ♀ ♀). Department Guatemala. Villa Canales: Río El Chupadero in Finca El Chupadero, 25-VIII-

1976, O. Onishi, T. Okazawa and K. Matsuo (38 larvae). Department Santa Rosa. Pueblo Nuevo Viñas: Río Frío in Finca El Silencio, 21-XI-1977, T. Okazawa (36 larvae). Department Suchitepéques: Small tributary streams of Río Nica in Finca La Conchita and Finca Santa Monica Iboné, Chicacao, 8-IX-1976, O. Onishi, T. Okazawa and K. Matsuo (79 larvae). Department Sololá: Small tributary streams of Río Nica in Finca Monte Quina, Atitlán, 9-IX-1976, O. Onishi, T. Okazawa and K. Matsuo (94 larvae). Department Quiché: Río Sepelá, Chichicastenango, 28-XI-1976, T. Okazawa (5 larvae). Río El Naranjo on the way from Santa Cruz del Quiché to Sacapulas, 26-XI-1977, T. Okazawa and M. Watanabe (7 larvae). Department Baja Verapaz: Río El Chol, El Chol, 10-XII-1977, T. Okazawa (2 larvae).

ACKNOWLEDGMENTS

We wish to express the sincere thanks to Dr. J. J. Castillo O., director of the National Department for Malaria Eradication, Ministry of Public Health, Guatemala, Dr. H. A. Godoy B., subdirector of the same department, for giving supports to our work, to Dr. H. Takahasi, Leader of Japanese Medical Cooperation Team, Dr. H. Takaoka, Kagoshima University, Dr. K. Matsuo, Kyoto Prefectural University of Medicine, Mr. J. O. Ochoa A., Departamento de Oncocercosis, Servicio Nacional de Erradicación de la Malaria, Guatemala, for kind advice and encouragement, and to all Japanese and Guatemalan members of the Laboratory "Dr. Isao Tada" for collecting the materials. Also we are grateful to Dr. K. Uemoto, Shiga University of Medical Science, and Prof. M. Yamada, Hokkaido University, for reading through the manuscript.

REFERENCES

- Bellardi, L. (1859): *Saggio di Ditterologia Messicana*, 1: 13-14 (Torino).
 Dalmat, H. T. (1955): The blackflies (Diptera, Simuliidae) of Guatemala and their role as vectors of onchocerciasis. *Smithsonian Misc. Collect.*, 125: vii+417.
 Dyar, H. G. and R. C. Shannon (1927): The North American two-winged flies of the family Simuliidae. *Proc. U.S. Nat. Mus.*, 69: 1-54.
 Fairchild, G. B. (1940): Notes on the Simuliidae of Panama (Dipt., Nematocera). *Ann. Entomol. Soc. Am.*, 33: 701-719.
 Gibson, C. L. and H. T. Dalmat (1952): Three

- new potential intermediate hosts of human onchocerciasis in Guatemala. *Am. J. Trop. Med. Hyg.*, 1(5) : 848-851.
- Hoffman, C. C. (1931) : Los simúlidos de la región onchocercosa de Chiapas. Segunda parte. Los estados larvales. *An. Inst. Biol., Univ. Méx.*, 2 : 207-218.
- Lewis, D. J. and R. Ibáñez de Aldecoa (1962) : Simuliidae and their relation to human onchocerciasis in northern Venezuela. *Bull. Wld Hlth Org.*, 27 : 449-464.
- Onishi, O., T. Okazawa and J. O. Ochoa A. (1977) : *GJCRPO-MENSAP Report*, No. 2, pp. 1-8, Guatemala-Japan Cooperation Research and Control Program of Onchocerciasis, Malaria Eradication National Service and Adjointed Programs, Guatemala.
- Vargas, L. (1942) : Notas sobre la terminalia de algunos simúlidos de México. *Rev. Inst. Salubr. Enferm. Trop. Mexico.*, 3(3) : 229-249.
- Vargas, L. and A. Díaz Nájera (1957) : Simúlidos mexicanos. *Rev. Inst. Salubr. Enferm. Trop. Mexico.*, 17 : 143-339.
- Vargas, L., A. Martínez and A. Díaz Nájera (1946) : Simúlidos de México. *Rev. Inst. Salubr. Enferm. Trop. Mexico.*, 7 : 101-192.

摘 要

Guatemala 産 *Simulium* (*Simulium*)
Latreille 属の 1 新種の記載と
S. (S.) metallicum Bellardi
の再記載

中米グアテマラ共和国のオンコセルカ症流行地 Escuintla 県 San Vicente Pacaya 郡および Palín 郡から, *Simulium* (*Simulium*) Latreille 属のブユ, 1 新種を記載した。この種は人吸血種であり, 中南米でオンコセルカ症媒介種の一つと考えられている, *S. (S.) metallicum* Bellardi に類似する。しかし雌の第 7 腹板がキチン化する, 雄の把握器はほぼ長方形で先端は細まらない, 幼虫頭部は黄褐色で額斑はきわめて薄い等の点で, *S. (S.) metallicum* から区別できる。明確な同定ができるよう, あわせて *S. (S.) metallicum* の再記載も行った。