

A REVIEW OF *SIMULIUM*
(*PTERNASPATHA*) ENDERLEIN
(SIMULIIDAE, DIPTERA)

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BULLETIN
OF THE
AMERICAN MUSEUM OF NATURAL HISTORY
VOLUME 136 : ARTICLE 2 NEW YORK : 1967

A REVIEW OF *SIMULIUM* (*PTERNASPATHA*)
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BULLETIN OF THE AMERICAN MUSEUM OF NATURAL HISTORY

Volume 136, article 2, pages 47–116, text
figures 1–41, plate 2, map 1

Issued June 8, 1967

Price: \$2.00 a copy

INTRODUCTION

THE BLACKFLY FAUNA of the cool and cold temperate areas of western and extreme southern South America is characterized by an array of peculiar genera and subgenera. These mostly Andean and sub-Andean forms belong to *Gigantodax* Enderlein, *Cnesia* Enderlein, *Austrosimulium* (*Paraustrosimulium*) Coscarón and Wygodzinsky, *Simulium* (*Hearlea*) Vargas, Martínez, and Díaz, and the subgenus treated in the present contribution, *Simulium* (*Pternaspatha*) Enderlein.

Stone (1963) included only five species in *Pternaspatha*. We here add 18 species, 10 of them formerly named, and eight described as new. The geographical range of the subgenus is now shown to extend from southern Argentina and Chile at least to central Peru (map 1).

Material for this study has been collected mainly by the authors. The first author's field work in Peru was supported in part through a grant awarded by the National Geographic Society, Washington, D. C., and in part by the Council Fund of the American Museum of Natural History. Collecting in Peru was greatly facilitated by the guidance of Dr. Aristides Herrero, of the Instituto Nacional de Salud, at Lima, and through the generous assistance of Dr. Julia Arrarte, of the Servicio Nacional de Erradicación de la Malaria, Lima; Dr. F. Blancas, Museo de Historia Natural "Javier Prado," Lima; Dr. M. del Río Cabrera, Servicio Nacional de la Erradicación de la Malaria, Cuzco; Ing. A. Paredes Cuffini, Estancia Naranjal, San Ramón; and Dr. H. Villegas de Olazábal, Servicio Nacional de la Erradicación de la Malaria, Tarma. The second author's field work in Argentina was materially assisted by Colonel Juan F. R. Bejarano (Ret.), and by Dr. Axel Bachmann, of the Instituto Nacional de Microbiología, Buenos Aires, who also contributed material collected by himself independently.

In addition, Dr. P. Arnaud has made it possible for us to study blackflies belonging to the California Academy of Sciences; Dr. J. Duret, Buenos Aires, has made specimens from his private collection available for study; Dr. G. Shewell has sent us material from the Canadian National Collection at Ottawa; and Dr. A. Stone allowed us to examine specimens

from the United States National Museum of the Smithsonian Institution. Our special thanks are due to Dr. H. Schumann, who generously transmitted for study several of Enderlein's type specimens kept at the Zoological Museum of the Humboldt University at Berlin. Prof. Dr. J. Illies, Hydrobiologische Anstalt der Max-Planck-Gesellschaft, Schlitz, Germany, allowed us to study blackfly specimens collected by him in western South America. Dr. G. Kuschel, formerly of Santiago, Chile, arranged for some of the types of Philippi's Chilean blackflies to be examined by us.

We are deeply grateful to all individuals and institutions that have supported our work.

The illustrations in this paper were prepared by the authors, unless otherwise noted.

BIOLOGY

Little is known about the biology of the species of *Pternaspatha*. The females of all species examined have fully developed mouth parts, with the mandibles and maxillae toothed on both edges, thus being equipped for taking blood meals. Coscarón and Wygodzinsky (1962) reported that females of *deagostinii* were taken from a horse, and we have now examined females of *annulatum* that had bitten a man, and of *nigristrigatum* that had bitten horses and cattle.

The aquatic instars of the species of *Pternaspatha* were found mostly in cool and clear mountain streams and irrigation ditches, where temperatures ranged from 10° C. to 15° C. *Pternaspatha* is a typical element of the rithron (for definition, see Illies, 1961) and is, as are most such elements, cold stenothermal, rheobiotic, and poloxybiotic. The altitudinal distribution of the species of *Pternaspatha* parallels the distribution of the rithron in South America: high (above 2000 meters) in the tropics, and extremely low in high latitudes where it may occupy the entire length of a river. In Peru, we found *Pternaspatha* thriving at 4000 meters, and in Tierra del Fuego the subgenus occurs virtually at sea level.

Larvae were found attached mostly to blades of grass trailing in the water. The surface of

other leaves of terrestrial or aquatic plants, exposed roots, twigs, rocks, and small stones also served as support for larvae, which were occasionally encountered in large concentrations. Pupae were found generally in identical situations, but in some cases also on the under sides of small rocks or fallen leaves resting on the bottom of watercourses. Pupae were generally attached singly, if situated on small leaves or blades of grass, but occasionally formed aggregations on the surfaces of larger rocks or large twigs.

As shown below, the pupae of most species of *Pternaspatha* are characterized by the large number of trichomes found on the exposed portion of the thorax. These trichomes act as a filter to retain small particles suspended in the water of the streams. The particles, matted together with the trichomes, often form a mat, effectively closing the aperture of the cocoon.

Occasionally we have found particles of silt embedded in the cocoon (fig. 5A), especially in pupae found on rocks in large streams.

SYSTEMATICS

SIMULIUM (PTERNASPATHA) ENDERLEIN

Pternaspatha ENDERLEIN, 1930, pp. 84 (key), 88 (description). EDWARDS, 1931, p. 151. ENDERLEIN, 1934, p. 274; 1936, p. 115. ORFILA, 1939, p. 1532. SMART, 1945, pp. 465, 488. VARGAS, 1945, p. 102. VARGAS AND DÍAZ, 1951, p. 143. STONE, 1962, pp. 206, 208; 1963, p. 17. Type: *Pternaspatha nigristrigata* Enderlein.

Acropogon ENDERLEIN, 1934, p. 276; 1936, p. 118. SMART, 1945, p. 489. VARGAS, 1945, p. 85. STONE, 1962, p. 206; 1963, p. 1. Type: *Acropogon barbatipes* Enderlein.

Dasytelmoza ENDERLEIN, 1934, p. 275. SMART, 1945, p. 488. VARGAS, 1945, p. 90. VARGAS AND DÍAZ, 1951, p. 146. STONE, 1962, p. 206; 1963, p. 5. New synonymy. Type: *Simulium varipes* Philippi.

ADULT: Antennae 11-segmented. Eyes of female with fronto-ocular triangle. Row of hairs between eyes of male. Hind border of cibarium of female unarmed. Mandibles and maxillae of female toothed on both sides.

Mesonotum of female gray, with 1+1 sub-lateral and one submedian, black, longitudinal stripes, median stripe divided longitudinally by fine grayish line. Mesonotum of male black, bordered with gray; anterior border with 1+1 small, white, submedian spots; a delicate, white, central, percurrent line often visible on anterior half of disc of mesonotum. Pleural tuft present; setae lacking from pleural membrane and sternopleurum.

Costa with both hairs and spinelike setae. Radial sector not branched. Basal portion of R bare, very rarely with hairs dorsally. R₁ with both hairs and spiniform setae.

Numerous long hairs on fore coxa, femur, and tibia of male. Fore tarsi narrow. Hind basitarsus of female narrow; of male, from narrow to conspicuously widened, spindle-shaped. Calcipala small to absent. Pedisulcus well developed. Claws of female with small subbasal tooth.

Basal fringe of abdomen of male exceptionally long. Last tergites of female dull.

MALE GENITALIA: Distimere subquadrate, shorter than basimere, with single apical spine; posterior surface glabrous or granulose. Ventral plate transverse, in many instances with 1+1 translucent areas; basal arms short. Median sclerite elongate, widened and deeply incised on distal half.

FEMALE GENITALIA: Spermatheca subglobular; outer surface not sculptured; inner surface with minute spicules arranged in groups of from one to five. Genital fork slender; stem strongly pigmented; arms not pigmented; apical expansions of arms partly translucent, partly pigmented. Paraprocts short, subrounded or subtriangular.

PUPA: Cocoon from slipper-shaped to shoe-shaped, with distinct anteroventral bridge; close-woven, threads not conspicuous. Rim of aperture slightly reinforced, not festooned.

Respiratory organs shorter than pupa, with six or eight slender filaments; their surface with granules forming a spiral pattern; apex of filaments rounded.

Exposed portion of thorax with numerous trichomes, from approximately 10+10 to more than 100+100. Cephalic and thoracic trichomes of greatly varied structure; hairlike, spatulate, ribbon-shaped, simple or branched. All trichomes either of single type or various types intermixed.

Abdominal tergite II with 3+3, rarely with 4+4, simple spines; tergites III-IV with 4+4 simple spines. Tergites VI-IX on anterior half with transverse rows of small, spinelike or scalelike tubercles. Sternites V-VII with 2+2 strong, simple or bifid spines. Sternites III-VIII on anterior portion of disc with 1+1 fields of minute scales. Apical hook of abdomen not developed.

LARVA: Thorax slightly swollen; abdomen gradually expanded, slightly clubbed posteriorly. No ventral tubercles at apex of abdomen. Body surface glabrous, or with only very sparse, simple setae; setae more numerous at base of anal sclerite.

Hypostomial setae arranged in two irregular series on each side, very rarely only in one series. Postgenal cleft subtriangular, narrowed apically; hypostomial bridge from well developed to extremely short, but postgenal cleft in no case completely attaining hypostomial groove.

Crochet ring with 80-90 rows composed of 13 to 20 hooklets each.

GEOGRAPHICAL DISTRIBUTION: Cool and cold temperate western and extreme southern South America, north as far as central Peru.



MAP 1: Distribution of the species groups of *Simulium* (*Pternaspatha*).

DISCUSSION: Some of the most striking characters of *Pternaspatha* are the multiplication of the thoracic, and in some cases also the cephalic, trichomes of the pupa, and the manifold variety of shapes of these setae, as shown in our illustrations. Thoracic trichomes that number much beyond the usual 5+5 are also found in the Mexican *Simulium lassmanni* Vargas, Martínez, and Díaz and the Brazilian *Simulium obesum* Vulcano, but both differ in so many essential characters from the species grouped under *Pternaspatha* that no thought of possible affinity need be entertained.

Stone (1962) indicated that the type species of *Pternaspatha*, that of *Acropogon*, and some other species all belong to one species group within *Simulium*. In 1963, Stone considered this group tentatively as a subgenus of *Simulium*, for which *Pternaspatha* was the first available name, and gave a short diagnosis based on adult characters. This diagnosis has here been amplified.

Another of Enderlein's names is herein synonymized with *Pternaspatha*. *Dasypelmoza* was erected for *Simulium varipes*, a species now found to be a synonym of *annulatum*. Although Edwards (1931) recognized the close affinity of *varipes* with *nemorale*, *nigristrigatum*, and *simile* (all of which we now recognize as typical species of *Pternaspatha*), Vargas and Díaz (1951) failed to associate *Dasypelmoza* with the other species mentioned. Stone (1962, 1963) even considered *varipes* as possibly related to *Simulium pertinax* and synonymized *Dasypelmoza* with *Simulium* (*Chirostilbia*), to which *pertinax* belongs. The failure to associate *Dasypelmoza* with the species of *Pternaspatha* has possibly been due to the fact that only adults were compared; in these, the base of the radial vein is setose in *annulatum* and bare in typical *Pternaspatha*. It is shown here that *annulatum* agrees in other adult characters, as well as in all aquatic instars, very closely with species of *Pternaspatha*. *Dasypelmoza* is consequently considered a synonym of *Pternaspatha*.

It may be mentioned that a difficulty in the correct interpretation of *Pternaspatha* arises if one accepts Enderlein's (1936) observation that R_1 bears spinelike setae in the type species *nigristrigata*, but only pubescence in the Peruvian *albilineata* and *prodexargenteum*. A re-examination of the types of the two latter

species has now shown that, in both, R_1 bears spinelike setae as do the type species and all other species of the subgenus.

The species of *Pternaspatha* can be arranged in several, probably natural, groups based on pupal and adult characters, as shown below. Species included in brackets are known from adults only and are listed in the respective groups because of the considerable general similarity between them and other species of the groups.

Nigristrigatum GROUP

Basal portion of R glabrous; calcipala relatively well developed to absent; abdomen of female spotted on tergites III–V; apex of distimere granulose; respiratory organ of pupa with eight filaments; trichomes of thorax of pupa with numerous branches.

Nigristrigatum SUBGROUP

Calcipala very small or absent; ratio, length/width of hind basitarsus of male, 3.2/1–4/1; trichomes of thorax of pupa slender, hairlike, numbering from 10+10 to 150+150: *bachmanni*, *deagostinii*, *dureti*, *huemul*, *limay*, [*nigristrigatum*], *pichi*, [*strigidorsum*], *walterwittmeri*.

Illiesi SUBGROUP

Calcipala distinct. Ratio, length/width of posterior basitarsus of male, 4.5/1; trichomes of thorax of pupa ribbon-like, numbering more than 100+100: *illiesi*, [*simile*].

The whole group is virtually limited to the southern portion of the area of the subgenus (Argentina and Chile; see map 1). Only *strigidorsum* is found in Peru.

Nemorale GROUP

Basal portion of R glabrous; calcipala relatively well developed; abdomen of female with either tergites III–V or IV–V uniformly dark; ratio, length/width of posterior basitarsus of male, 3.8/1–4.0/1; apex of distimere smooth; respiratory organ of pupa with eight filaments; trichomes of thorax of pupa hairlike, with a tendency toward loss of ramifications, number of trichomes from 60+60 to 100+100: *caprii*, *nemorale*, [*schoenemanni*].

This group is also restricted to Argentina and Chile (map 1).

Annulatum GROUP

Basal portion of R with hairs; calcipala relatively well developed; abdomen of female with tergites III–V uniformly dark; ratio, length/width of posterior basitarsus of male, 4.2/1; apex of distimere smooth; respiratory organ of pupa

with six filaments; trichomes of thorax of pupa hairlike, not branched, very numerous: *annulatum*.

This group is limited to southern Argentina and central and southern Chile (map 1).

Albilineatum GROUP

Basal portion of R glabrous; calcipala from relatively well developed to absent; abdomen of female with tergites III–V spotted; ratio, length/width of posterior basitarsus of male, 2.7/1–3.4/1, rarely 3.9/1; apex of distimere smooth; pupa with six respiratory filaments; trichomes of thorax of pupa from hairlike to spatulate, with strong tendency toward loss of ramifications; trichomes invariably very numerous: [*albicinctum*], *albilineatum*, *barbatipes*, *herrerri*, [*prodexargenteum*], *yacuchuspi*.

Most species of this group occur in Peru, but one extends southward to northern Argentina and central Chile (map 1).

Simulium pulchrum and *Simulium punctiventris* could not be assigned to any of the above groups because of insufficient data.

One may assume that the common ancestor of the species of the subgenus *Pternaspatha* agreed with the large majority of the species of *Simulium* in having a thoracic pattern roughly similar to the one shown by Recent *Pternaspatha*, as well as in having a well-developed calcipala, a relatively narrow hind basitarsus in the male (ratio, length/width, 4.0/1 or more), a short, apically smooth distimere, only 5+5 thoracic trichomes in the pupa, and six or eight filaments in the pupal respiratory organ.

Evolutionary divergence in Recent *Pternaspatha* is manifested by the presence of apomorphic characters, such as an increase in the number of thoracic, and in some cases also cephalic, trichomes in the pupa, and in the adults by a reduction in size or even occasional disappearance of the calcipala in both sexes, a frequent widening of the posterior basitarsus of the male, and the appearance of heavy granules on the apical surface of the distimere. As a survey of the characters of the several species groups of *Pternaspatha* shows, all share the multiplication of the thoracic trichomes of the pupae, but the characters of the adults exist in various combinations of apomorphic and plesiomorphic conditions. The foregoing indicates that evolutionary radiation has proceeded within the subgenus at different rates and in different directions. The difficult analy-

sis of the cladistic relationships of the species groups within *Pternaspatha* must await additional data. The geographically centrally situated *nemorale* and *annulatum* groups seem to be more plesiomorphic, whereas the geographically peripheral *nigristrigatum* and *albilineatum* groups possess a larger number of apomorphic characters and are thus probably more remote, not only geographically but also phylogenetically, from the hypothetical ancestor of Recent *Pternaspatha*.

KEY TO THE KNOWN LARVAE OF *Simulium*
(*Pternaspatha*)

1. Postgenal bridge extremely reduced, its length one-fifth or less of depth of postgenal cleft as measured from level of posterior tentorial pits to apex of postgenal cleft (figs. 2J; 3M; 15D) 2
Postgenal bridge much larger, at least one-half of depth of postgenal cleft (figs. 6G; 11K; 22G; 25I; 29E; 37G; 41T) 4
2. Maximum length of body, about 5 mm.; first two segments of antennae lacking distinct pigment (fig. 2I); hypostomial setae arranged in one, rarely in two, irregular series (fig. 2P); postgenal cleft very narrow (fig. 2J); anal gills at most with one secondary lobule each (fig. 2R) *bachmanni*
Maximum length, 8–9 mm.; first two segments of antenna distinctly pigmented (fig. 15C); hypostomial setae invariably in at least two irregular series (fig. 15E); postgenal cleft wider (figs. 3M; 15D) 3
3. Cephalic apotome with numerous faint pigment spots (fig. 3N); postgenal cleft as shown in figure 3M; anal gills with numerous secondary lobules (fig. 3 O) *deagostinii*
Cephalic apotome darkened only at hind border (fig. 15H); postgenal cleft as shown in figure 15D *illiesi*
4. Lobes of anal gills each with 16–20 very long and slender lobules (fig. 41U) *yacuchuspi*
Lobes of anal gills with fewer, or without secondary, lobules 5
5. Postgenal bridge approximately as long as postgenal cleft (fig. 37G); third antennal segment as long as, or slightly longer than, first (fig. 37H); lobes of anal gills with one or two secondary lobules each (fig. 37K) *herrerri*
Postgenal bridge much shorter, about half as long as postgenal cleft (figs. 6G; 11K; 22G; 25I; 29E; 33F); third antennal segment as long as, or shorter than, first (figs. 6D; 11J;

- 18C; 22C; 25A; 29B; 33E); lobes of anal gills either devoid of secondary lobules (fig. 11M) or secondary lobules present but more numerous than in *herrerri* (figs. 18H; 25J; 29F; 33I) 6
6. Lobes of anal gills without secondary lobules (fig. 11M) 7
Lobes of anal gills with numerous secondary lobules (fig. 18H; 25J; 29F; 33I) 9
7. Scales at base of anal sclerite present (fig. 22F) *nemorale*
Base of anal sclerite without scales (figs. 6E; 11P) 8
8. Pattern of cephalic apotome positive (fig. 11L); maximum size, 7 mm. *pichi*
Pattern of cephalic apotome negative (fig. 6B); maximum size, more than 8 mm. *dureti*
9. Base of anal sclerite lacking scales (fig. 25G) *annulatum*
Base of anal sclerite with scales (figs. 18G; 33G) 10
10. Crochet ring with not more than 70 rows of hooks; third antennal segment as long as first (fig. 29B); pattern of cephalic apotome as shown in figure 29A. *albilineatum*
Crochet ring with 80 rows of hooks or more; third antennal segment slightly but distinctly shorter than first (figs. 18C; 33E) 11
11. Pattern of cephalic apotome as shown in figure 33B *barbatipes*
Pattern of cephalic apotome difficult to perceive, approximately as shown in figure 18B *caprii*

KEY TO THE KNOWN PUPAE OF *Simulium*
(*Pternaspatha*)

1. Respiratory organs with eight filaments (figs. 2G, H, M, N; 3J; 5I–M; 7J, K; 8H; 11F–H; 14G, K, L, N; 17J; 21C; 36E, L) 2
Respiratory organs with six filaments (figs. 24H–K; 28F, G; 32L–N; 36N–P; 41C–H) 12
2. Trichomes of thorax elongate-lanceolate, simple (fig. 36D, M), numbering approximately 250+250; distinct areas of platelets at base of clypeus on each side (fig. 36G); both filaments of ventral primary branch of respiratory organ sharply diverging from remaining filaments, closely adhering to body of nymph (fig. 36E, L) [some] *herrerri*
Different combination of characters; trichomes of thorax in no case as above. 3
3. Trichomes of head and thorax very short, a few branched but most simple, hairy to spinelike, those of thorax concentrated in a transverse row at base of exposed portion

- (fig. 21G, K). *nemorale*
Trichomes of head and thorax much longer, mostly branched, and their arrangement not as above. 4
4. Trichomes of head and thorax very numerous, flattened, their branches ribbon-like (fig. 14E, H, J, M) *illiesi*
Trichomes of head and thorax hairlike, not as above 5
5. Disc of exposed portion of thorax virtually smooth 6
Disc of exposed portion of thorax with numerous platelets (fig. 11D, E) 8
6. Thorax with approximately 70+70 trichomes, latter either simple or frequently with two, very rarely with three, branches (fig. 17D, I) *caprii*
Thorax with not more than 20+20 trichomes, latter generally with four or more branches 7
7. Thorax with approximately 20+20 trichomes (fig. 8I); origin of filaments of ventral primary branch of respiratory organ generally situated below level of origin of upper filaments of dorsal primary branch (fig. 8H). *walterwittmeri*
Number of trichomes of thorax much fewer (fig. 2E); origin of filaments of ventral primary branch generally situated at or above level of origin of upper filaments of dorsal primary branch (fig. 2G, H). *bachmanni*
8. Trichomes of thorax lacking from anterior portion of sclerite (figs. 7M; 11D). 9
Trichomes of thorax covering all of exposed surface of sclerite (figs. 3K; 5H) 11
9. Clypeus with platelets on its basal portion only (fig. 7I); ventral filament of ventral primary branch bent downward, strongly diverging from remaining filaments (fig. 7J, K) *huemul*
Clypeus with platelets on entire surface (fig. 11C); ventral filament of ventral primary branch not diverging from remaining filaments (fig. 11F-H). 10
10. Thorax with approximately 20+20 trichomes (similar to fig. 8I) *limay*
Thorax with approximately 60+60 trichomes (fig. 11D). *pichi*
11. Frontal and facial trichomes forming a group of about five trichomes on each side (fig. 3I); second division of median primary branch of respiratory organ situated much apicad of level of second division of dorsal primary branch (fig. 3J). *deagostinii*
Frontal and facial trichomes forming a group of approximately 17 trichomes on each side (fig. 5F); second division of median primary branch generally not situated distinctly apicad of level of second division of dorsal primary branch (fig. 5I-M) *dureti*
12. One or both filaments of ventral primary branch of respiratory organ sharply diverging from remaining filaments, closely adhering to body of nymph (figs. 36N-P; 41C-H) 13
All filaments of respiratory organ approximately parallel (figs. 24H-K; 28F, G; 32L-N) 14
13. Both filaments of ventral primary branch of respiratory organ sharply diverging from remaining filaments (fig. 36N-P); conspicuous areas of platelets at base of clypeus on each side (fig. 36G); trichomes of thorax elongate-lanceolate, subequal (fig. 36M) *herrerri*
Generally only ventral filament of primary ventral branch of respiratory organ diverging from remaining filaments (fig. 41C-H); no platelets in regions mentioned; trichomes of thorax slender, hairlike, long and short (fig. 40) *yacuchuspi*
14. Thoracic trichomes both long hairlike and short spatulate (fig. 32K) *barbatipes*
Thorax lacking spatulate setae 15
15. Most of thoracic trichomes branched; their average length, 0.06 mm. (fig. 28A, E) *albilineatum*
Most thoracic trichomes simple, much longer; their average length, 0.15 mm. (fig. 24C, L) *annulatum*

KEY TO THE MALES OF *Simulium* (*Pternaspatha*)

1. Basal portion of R bare (figs. 19P; 35C) . . . 2
Basal portion of R hairy (fig. 23D) *annulatum*
2. Calcipala absent (figs. 1N, P; 3C; 8F, J; 38A, B) 3
Calcipala present, though in some cases very small (figs. 4W, X; 7C, F; 10T, U; 13P, Q; 16U, W; 20E, J; 23U, Z; 26C, E; 27N-P; 31C, J; 35G, I; 39G, H) 8
3. Hind tibiae conspicuously darkened at base (figs. 3C; 38A). 4
Hind tibiae not conspicuously darkened at base (fig. 1N) 5
4. Posterior basitarsus slightly less than three times as long as wide (fig. 38A); abdomen with paired silvery spots on tergites II-VII (fig. 38C); distimere with smooth apical surface *prodexargenteum*
Posterior basitarsus more than three times as long as wide (fig. 3C); abdomen with paired silvery spots only on segments II, VI, and VII; apical surface of distimere granulose (fig. 3E) *deagostinii*

5. Hind basitarsus less than four times as long as wide (fig. 1N) 6
Hind basitarsus at least four times as long as wide (fig. 8F, J) 7
6. Paired silvery white spots on abdominal tergites II and VI *nigristrigatum*
Paired silvery white spots on abdominal tergites II, VI, and VII (fig. 1I) . . . *bachmanni*
7. Wing length, 2.8 mm.; setae of mesonotum brass-colored; tergite VII with central black spot; color pattern of legs similar to that shown in figure 8C; posterior basitarsus five times as long as wide (fig. 8F) . . . *limay*
Wing length, 2.4 mm.; setae of mesonotum silvery; tergite VII almost completely black; color pattern of legs similar to that shown in figure 8D; hind basitarsus four times as long as wide (fig. 8J) *walterwittmeri*
8. Apical surface of distimere smooth (figs. 16X, Z; 20G, L, M; 27T; 35K, L) 9
Apical surface of distimere tuberculate (figs. 4Y, Z; 7E; 10V, W, X; 13U, V) 14
9. Base of hind tibia conspicuously darkened (figs. 16U; 20E; 26C; 27N; 35G) 10
Base of hind tibia not conspicuously darkened (fig. 31C, D) *barbatipes*
10. Hairs and spines on R_1 arranged in two irregular rows (fig. 19P); hind basitarsus about four times as long as wide (figs. 16U; 20E) 11
Hairs and spines on R_1 arranged in a single row (fig. 35C); hind basitarsus very wide, about 3 times as long as wide (figs. 26C; 27I; 35G; 39G) 12
11. Wing length, more than 3.5 mm. *nemorale*
Wing length, less than 3.5 mm. *caprii*; *schoenemanni*
12. Basal three-fifths of posterior femur whitish, strongly contrasting with dark apex (fig. 26C); posterior basitarsus very faintly darkened on apical third, distinctly less than three times as long as wide; second segment of hind tarsus pigmented only at extreme base and apex (fig. 26C); abdominal tergites III-V entirely black (fig. 26F) *albicinctum*
Basal three-fourths of posterior femur brown, though not so dark as apex of article (figs. 27I; 35G); hind basitarsus distinctly darkened on apical third, at least three times as long as wide (figs. 27I; 35G; 39G); second segment of hind tarsus pigmented at base and on apical half either tergite III or tergite V with one pair of small but distinct silvery white spots (figs. 27Q, R; 35H; 39I) 13
13. Hairs of abdomen silver-colored; tergite III uniformly dark (fig. 35H); spot at bases of fore and mid femora short (fig. 35D, F) *herrerri*
Hairs of abdomen light brass-colored; tergite III with 1+1 small but distinct silvery white spots at hind border (figs. 27Q, R; 39I); spot at bases of fore and mid femora narrowly elongate (fig. 27L, M) *albilineatum*; *yacuchuspi*
14. Calcipala very small (figs. 4X; 7F; 10U) . . . 15
Calcipala well developed (fig. 13Q) 17
15. Abdominal tergites III-V black (fig. 4Q); hind basitarsus less than four times as long as wide (figs. 4W; 10T) 16
Abdominal tergites III-V each with 1+1 silvery white spots, those on III and V large, those of VI minute (fig. 7D); hind basitarsus about five times as long as wide (fig. 7C) *huemul*
16. Wing length, 3 mm.; hind basitarsus wide, ratio, length/width, 3.2-3.4/1 (fig. 4W); under certain angles of illumination, almost all of anterior half of mesonotum grayish (fig. 4S; pl. 2, fig. 3) *dureti*
Wing length, 2.3-2.6 mm.; hind basitarsus narrower, ratio, length/width, 3.8/1 (fig. 10T); only a relatively narrow anterior portion of mesonotum gray (fig. 10N) *pichi*
17. Posterior tibia darkened only at apex (fig. 13P); abdomen with small but distinct light-colored spots on tergites II-V (fig. 13R) *illiesi*
Posterior tibia darkened on distal half; tergite IV and V lacking any trace of white spots *simile*

KEY TO THE FEMALES OF *Simulium* (*Pternaspatha*)

1. Basal portion of R bare (figs. 19P; 35C) . . . 2
Basal portion of R hairy (fig. 23D); abdominal tergites III-V black, only their hind margins narrowly white laterally (fig. 23 O) *annulatum*
2. Abdomen dull silver-gray, tergites II-V each with one relatively small, central, velvety black spot, lateral dark spots lacking (fig. 12K, O); calcipala very small (fig. 12J) *strigidorsum*
Abdominal tergites II-V with more extensive dark markings; calcipala absent or present 3
3. Calcipala absent (figs. 1D; 8C, D; 9G) . . . 4
Calcipala present although in some cases very small (figs. 4K; 10H; 13F; 16L; 19R; 26D; 27J; 30 O; 34I; 39L) 8
4. Paraprocts truncate on free extremity (figs. 1G; 8K) 5
Paraprocts with free extremity strongly

- salient (figs. 3D; 8G; 9I) 6
5. Wing length, approximately 3 mm.; fore and mid femora light brown, not conspicuously darkened apically; tergites VIII and IX almost entirely black *limay*
Wing length, approximately 2.5 mm.; fore and mid femora conspicuously darkened at apex (fig. 1A, B); tergites VIII and IX silver-colored, VIII faintly darkened at center (fig. 1E) *bachmanni*
6. Femora dark brown (fig. 9D-F); dark portion of hind tibia occupying at least apical half of article (fig. 9F); light-colored spots of abdominal tergites III-V not attaining anterior border of tergites (fig. 9H) *nigristrigatum*
Not all femora uniformly dark brown; dark region of hind tibia occupying less than apical fourth of article; light-colored spots of abdominal tergites III-V attaining anterior portion of tergites. 7
7. Wing length, 3.4 mm.; femora and tibiae of mid and hind legs distinctly darkened at base and apex (as shown in fig. 3A-C) *deagostinii*
Wing length, 2.6 mm.; femora and tibiae of mid and hind legs darkened at apex but not on base (fig. 8D) *walterwittmeri*
8. Tergite III lacking paired white spots, thus tergites III-V (fig. 16J) entirely dark except in some cases with narrow white line on each side of hind margin; central light-colored line of mesonotum invisible or only faintly perceptible 9
Tergite III with paired gray or white spots, in some cases small but in every case perceptible (figs. 10J; 13K; 19U; 26H; 27F; 30I; 34P; 39 O); central light-colored line of mesonotum invariably clearly visible (figs. 10I; 19H; pl. 2, figs. 1, 2, 5) 10
9. Bases of tibia conspicuously pigmented, but apex of hind basitarsus lacking conspicuous pigment (fig. 16G-I); lateral portions of eighth sternite lighter than central pigmented area (fig. 16 O); paraprocts roundly salient, cerci relatively high (fig. 16K) *caprii*
Bases of tibiae lacking distinct pigment, hind basitarsus conspicuously pigmented on apical third; lateral portions of eighth sternite darker than central portion; paraprocts very short and truncate, cerci relatively low (fig. 16N) *schoenemanni*
10. Tergites IV and V lacking paired gray or white spots, in only some cases their hind margins narrowly white laterally (figs. 19U; 26H); tibiae with distinct dark basal or subbasal annulus (figs. 19 O; 26A) 11
Tergites IV and V, in some cases only tergite V, with paired gray or white spots of various sizes (figs. 10J; 13K; 27F; 30I; 34P; 39 O); tibiae with or without dark subbasal or basal annulus 12
11. Setae and spines on R_1 and setae on R_s arranged in several irregular rows (fig. 19P); dark area separating white spots on tergite II wide (fig. 19T, U) *nemorale*
Setae and spines on R_1 and setae on R_s arranged in a single row; dark area separating white spots on abdominal segment II very narrow (fig. 26H) *albicinctum*
12. Tibiae not conspicuously darkened at base . 13
Tibiae conspicuously darkened at base (figs. 19M-O; 27B-D; 34F-H; 39F) 17
13. Basal articles of antennae distinctly orange-colored; wing length, 3.1-3.9 mm.; paired, light-colored spots on tergite III distinct, on IV and V very small, in some cases difficult to perceive (fig. 34P) *barbatipes*
Basal articles of antennae grayish; wing length, 2.5-3.6 mm.; paired, light-colored spots on tergites III-V large, as large as black spots (figs. 4L; 10J; 13K) 14
14. Calcipala well developed (fig. 13F) 15
Calcipala minute (figs. 4K; 10H) 16
15. Posterior tibia with pigment only at its extreme apex (as shown in fig. 13P) . . . *illiesi*
Pigment of hind tibia more widely extended, on apical two-fifths of article *simile*
16. Fronto-ocular triangle longer than wide (fig. 4B); wing length, more than 3 mm.; Sc with approximately 10 hairs *dureti*
Fronto-ocular triangle not longer than wide (fig. 10A); wing length, 3 mm. or less; Sc without or with at most one or two setae *pichi*
17. Setae and spines on R_1 and setae on R_s arranged in several irregular rows (fig. 19P); white spots on tergites IV and V faint, narrowly elongate (fig. 19T) *nemorale*
Setae and spines on R_1 and setae on R_s arranged in a single row (fig. 35C); white spots on tergites IV and V generally distinct, rounded or rectangular (figs. 27F; 34P; 39 O) 18
18. Tooth of claws exceptionally small (figs. 27E; 39M, N); tergite VI almost entirely white, darkened only at lateral extremities (figs. 27F; 39 O); central portion of eighth sternite lighter than lateral portions (fig. 27G); paraprocts not broadly rounded (figs. 27K; 39P) 19
Tooth of claws well developed (fig. 34J); tergite VI white at center, extensively darkened laterally (fig. 34P); central portion of eighth sternite darker than lateral portions

- (fig. 34K); paraprocts broadly rounded (fig. 34N) *herrerri*
19. Paired white spots of tergite V as large as those of tergite III (fig. 27F); paraprocts large (fig. 27K) *albilineatum*
- Paired white spots of tergite V much smaller than those of tergite III (fig. 39 O); paraprocts small (fig. 39P) . . . *yacuchuspi*

Nigristrigatum GROUP

Nigristrigatum SUBGROUP

***Simulium (Pternaspatha) bachmanni*,**
new species

Figures 1, 2

FEMALE: Length of wing, 2.5–2.6 mm.

Head black; antennae, palpi, and labrum dark gray; occiput, frons, and clypeus dark gray pollinose. Pilosity of antennae very short, that of palpi, clypeus, frons, and occiput somewhat longer, silver-gray. First and second antennal segments much lighter than the remaining segments, brownish.

Mesonotum with usual color pattern, central dark band divided by distinct, longitudinal, gray line. Hairs of thorax silver-gray; adpressed setae of mesonotum very dense, somewhat obliterating pattern. Scutellum, metanotum, pleura, and sterna dark gray. Wings hyaline, veins light gray, hairs and spines blackish, tufts at base of wing silver-gray. Stem of halteres tinged with brown; knob white. Legs light yellow; hairs silvery gray to black; following regions darkened: all coxae, those of fore legs as intensely as others; trochantera; femora, their apices very strongly so on all pairs; apical three-fifths of mid and hind tibiae, fore tibiae almost entirely; entire fore tarsi; apical third of basal, and apical half of second, segment of mid and hind tarsi, and their entire third to fifth segments. Exact proportions and relative intensity of pigmented areas as shown in figure 1A–C.

Abdomen (fig. 1E) matte silver-gray. First tergite darkened. Tergites II–V each with one large central and 1+1 lateral black spots connected by black line along anterior border of tergites; these spots narrowed posteriorly; distance between central and lateral spots about as large as width of central spot. Tergite VI only very slightly darkened at middle anteriorly. Tergite VII with one very large, black, central spot. Tergites VIII and IX gray, VIII

faintly darkened anteriorly at center. Hairs of abdomen from black to silver-gray.

Head not examined in detail.

Wing: Sc with two or three hairs on its basal and three or four hairs on its central portion. Basal portion of R glabrous. R₁ with hairs and setae arranged in one row, but occasional setae or spines out of line. R₄ with one somewhat irregular row of setae, in some specimens a few out of line.

Shape and proportion of segments of legs as shown in figure 1A–C. Calcipala not developed (fig. 1D); claws with well-developed tooth (fig. 1H).

Eighth abdominal sternite as shown in figure 1L; rather faintly pigmented, its central portion lighter than lateral areas; posterior border of central portion slightly sclerotized. Gonapophyses not examined. Cerci and paraprocts as illustrated in figure 1G. Cerci much higher than wide. Paraprocts short, their free extremity truncate. Genital fork as shown in figure 1F; median process distinctly sclerotized, including its terminal knob. Spermatheca ovate, its inner surface with minute spiculae, either single or arranged in groups of two.

MALE: Length of wing, 2.5 mm.

Head black. Eyes deep purple. Antennae and palpi piceous; clypeus gray pollinose. Antennae with short pubescence only; setae of basal segments not distinctly longer than remainder. Occiput, clypeus, and basal segments of maxillary palpi with some long hairs; isolated and rather short setae between eyes.

Mesonotum with usual color pattern; basic color from dark matte gray to velvety black, depending on the angle of view; adpressed setae very light brass-colored. Scutellum blackish, silvery gray pollinose. Metanotum blackish. Pleura blackish, silvery gray pollinose. Pleural tuft silvery white. Color of wings and halteres as in female. Legs pale yellow to whitish, their hairs from silvery white to black; following regions dark: all coxae and trochantera; base and apex of fore and mid femora, and apex of hind femur strongly, rest of femora slightly, pigmented; fore and mid tibiae as shown in figure 1M, viz., apical fourth intensely pigmented, with a dark stripe running toward base, becoming evanescent in basal third; hind tibia intensely on apical third, faintly more basad, very faintly near

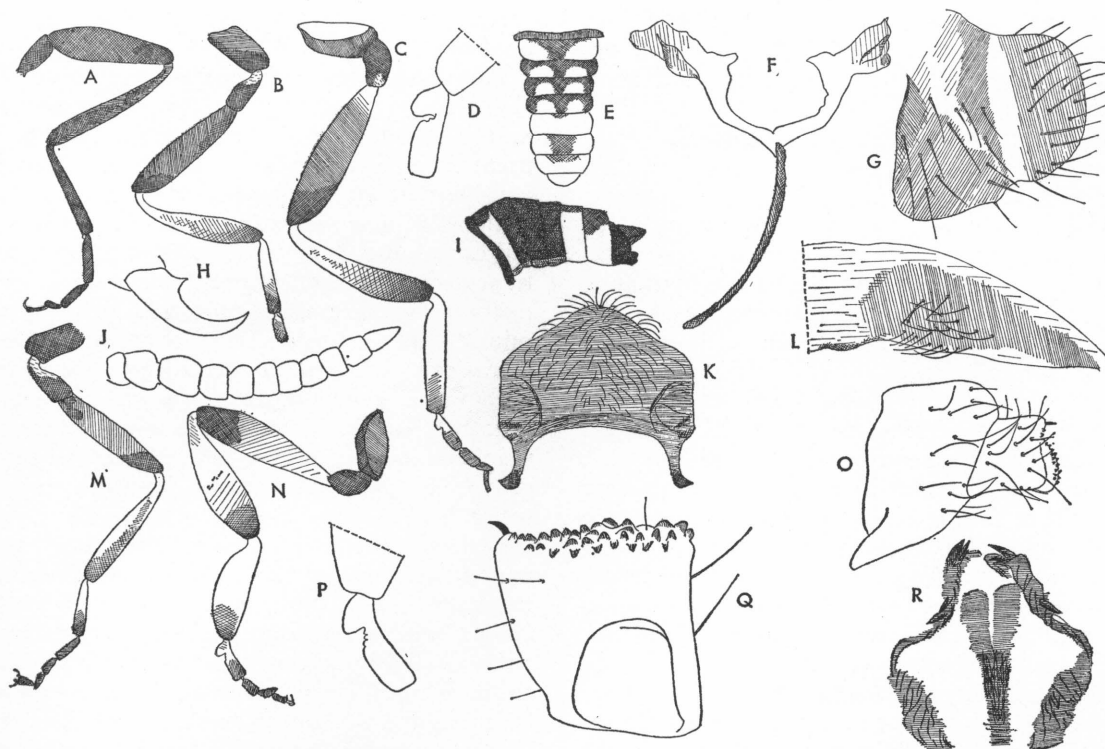


FIG. 1. *Simulium bachmanni*. A-H. Female. A. Foreleg. B. Mid leg, tarsus incomplete. C. Hind leg. D. Apex of hind basitarsus, with second tarsal segment. E. Color pattern of abdomen, dorsal view. F. Genital fork. G. Paraproct and cercus. H. Claw of hind leg. I-K. Male. I. Color pattern of abdomen, side view. J. Antenna. K. Ventral plate. L. Portion of eighth sternite of female. M-R. Male. M. Fore leg. N. Hind leg. O. Paramere. P. Apex of hind basitarsus, with second tarsal segment. Q. Distimere. R. Aedeagus with median sclerite.

base; entire fore tarsus, mid tarsus on apical half of basitarsus, and entire second through fifth segments; hind tarsus on apical third of basitarsus, apical half of second, and entire third through fifth segments.

Abdomen velvety black, its hairs silvery white, including those of basal fringe. Tergites II, VI, and VII with 1+1 silvery gray spots, those of segments II and VI very large, separated dorsally only by a small black area on II, virtually confluent on VI; those of segment VII much smaller (fig. 1I).

Shape and proportion of antennal segments as shown in figure 1J. Last segment of maxillary palp more than twice as long as penultimate; diameter of sensory vesicle smaller than half of diameter of third segment.

Chaetotaxy of wings like that of female.

Shape and proportions of segments of legs as shown in figure 1M, N. Femur of forelegs

with a large number of long hairs. Hind basitarsus 3.3-3.4 times as long as wide. Calcipala not developed (fig. 1P).

Genitalia as shown in figure 1K, O, Q, R. Basimere wider than long; distimere subquadrate, distal surface heavily granulose. Central portion of ventral plate somewhat salient; lateral projection and basal margin distinctly sclerotized; disc of ventral plate uniformly pigmented. Aedeagus with spines in small number; bifid portion of median sclerite narrow.

PUPA: Cocoon (fig. 2A, B) slipper-shaped, its anteroventral bridge very short. Color stramineous, surface smooth, closely woven, threads not distinct under medium magnification ($\times 60$). Rim of aperture not perceptibly reinforced. Length of cocoon at dorsum along middle, 2.3-2.7 mm.; maximum length along base, 3.8 mm.

Length of pupa, 2.8–3.0 mm.; length of respiratory organs, approximately 1.5 mm., viz., less than half as long as cocoon, and about half as long as pupa.

Respiratory organs with eight filaments, forming a compact group (fig. 2G, H, M, N). Three primary branches arising from a short, basal trunk. Dorsal and median primary branches sharing a short, common trunk. Dorsal primary branch short, with three filaments, ventralmost arising from a short, basal trunk, frequently appearing to arise from extreme base of median primary branch. Median primary branch with three filaments, dividing shortly beyond its base, resulting dorsal branch dividing again much beyond first point of division. Ventral primary branch with two filaments arising at a considerable distance from base of branch, this point of division situated at or beyond level of origin of upper filaments or dorsal primary branch. Filaments gradually tapering toward their rounded tips. Surface of filaments delicately granulose, granules arranged in spirals.

Head and thorax of pupa light brown.

Head with 2+2 frontal and 1+1 facial trichomes (fig. 2C, D); trichomes simple or with two or three branches.

Thorax as shown in figure 2E; exposed portion not more strongly sclerotized than rest; region adjacent to aperture of cocoon with platelets only near dorsal midline. Disc of thorax lacking platelets, with about 10+10 long, simple or branched, hairlike trichomes, latter with not more than four branches; length of trichomes, 0.1–0.16 mm.

Abdomen much like that of *S. nemorale* (see fig. 21A), but spines on tergite II extremely small; spiniform tubercles on tergite VI very weak, those of VIII forming one continuous row, those of IX small but distinct.

LARVA: Maximum length, 5.2 mm.; maximum width of head, 0.5 mm. General shape of body as shown in figure 2K.

General color whitish, with transverse bands of hypodermal pigment on first three or four abdominal segments dorsally; entire posterior portion of body pigmented; ventral surface pigmented only on anterior portion of body. Head ivory-colored. Cephalic apotome without perceptible pattern elements, only slightly darkened at posterior margin. Body integu-

ment glabrous; a few short hairs at base of anal sclerite.

Antennae very pale, only third segment slightly pigmented (fig. 2I). Ratio of length of antennal segments I–III, 1/1.3/0.9; third segment slender, shorter than first. Mouth brushes with 30–35 rays in large fan. Toothing of mandibles as shown in figure 2L. Maxillary palp as shown in figure 2Q. Pigmentation of hypostomium like that of related species, but not very intense. Median tooth of hypostomium about as prominent as lateral ones; serrations of lateral border of hypostomium exceptionally prominent. Hypostomial setae (fig. 2P) arranged in one, rarely in two, irregular series, numbering about six in each group, in addition to two to four short, posterior setae. Disc of hypostomium with one or two short, single, bifid hairs. Postgenal cleft narrow and exceptionally deep, its apex almost attaining hypostomial groove (fig. 2J).

Anal sclerite as shown in figure 2O, its base with numerous minute scales with from one to four rays. Crochet ring with approximately 80 rows of 15–17 hooks each. Anal gills consisting of three primary lobes; two lateral ones close to their base, each with one secondary lobule (fig. 2R).

MATERIAL EXAMINED: Argentina: Río Negro: General Roca, December 4–7, 1964 (A. Bachmann; Museo de La Plata) one male, holotype, one female, allotype, both reared; *idem* (A. Bachmann; the American Museum of Natural History), one male, one female, paratypes, both reared; General Roca, in the Río Negro, 300 meters above ferry of Paso Córdoba, October 4, 1964 (A. Bachmann; the American Museum of Natural History), several larvae and pupae, and one male and one female, paratypes, reared; *idem* (A. Bachmann; Instituto Nacional de Microbiología), several larvae and pupae, one male and one female, paratypes, reared.

DISCUSSION: This species is named for its collector, Dr. Axel Bachmann, in recognition of his valuable contributions to hydrobiological work in Argentina.

Simulium bachmanni is closely related to *limay*, *nigristrigatum*, and *walterwittmeri*. The male of *bachmanni* differs from that of *limay* and *walterwittmeri* by its much wider basitarsus (at least four times as long as wide in the

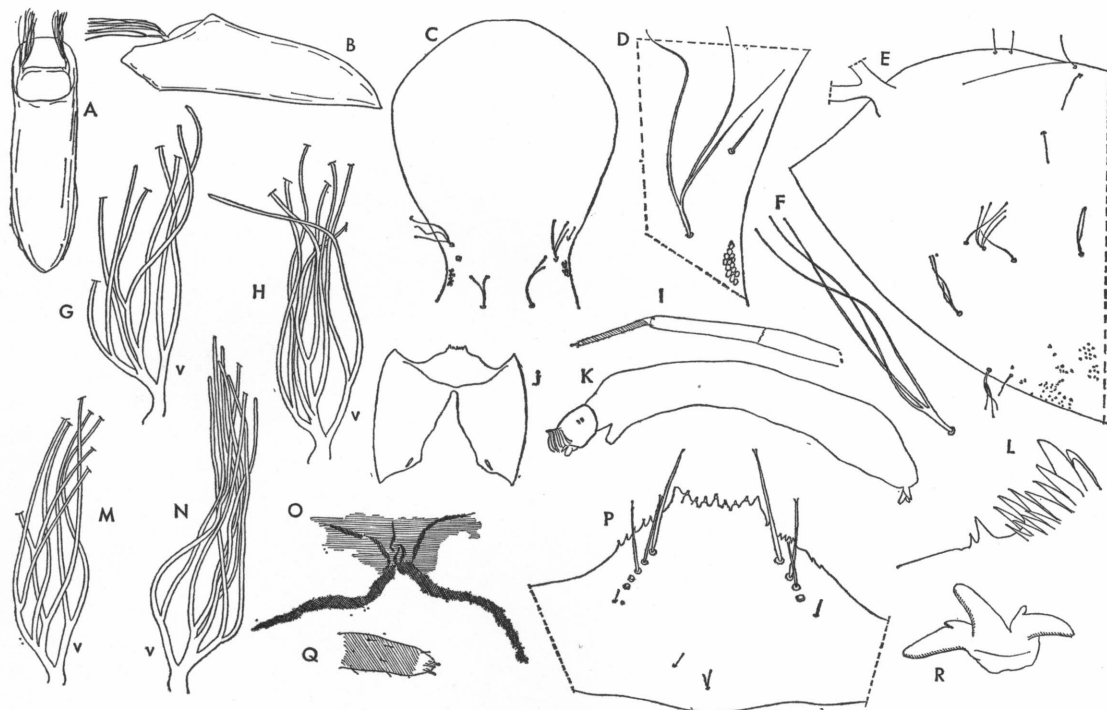


FIG. 2. *Simulium bachmanni*. A-H. Pupa. A. Pupa with cocoon, dorsal view. B. Pupa with cocoon, lateral aspect. C. Clypeus. D. Facial trichomes, enlarged. E. Portion of thorax. F. Thoracic trichome, enlarged. G, H. Respiratory organ, different specimens. I-L. Larva. I. Antenna. J. Head, seen from below. K. General aspect, lateral view. L. Teeth of mandible. M, N. Pupal respiratory organs. O-R. Larva. O. Anal sclerite, scales not shown. P. Hypostomium. Q. Maxillary palp. R. Anal gills. The small letter v indicates the ventral primary branch of the respiratory organ.

two species mentioned) and from that of *nigristrigatum* by the presence of light-colored spots on the seventh abdominal tergite.

The female of *bachmanni* differs from that of *nigristrigatum* and *walterwittmeri* by the apically truncate paraprocts which are similar in shape to those of *limay*, but in the latter species tergites VIII and IX of the female are almost completely black, and neither the fore nor the mid femur is darkened apically.

The pupa of the new species differs from that of *limay* by the absence of granulosity from the thoracic disc, and from that of *walterwittmeri* by the smaller number of thoracic trichomes and the very long ventral primary branch.

The very large postgenal cleft of the larva is remarkable.

Simulium (Pternaspatha) deagostinii Coscarón and Wygodzinsky

Figure 3A—O

Simulium deagostinii COSCARÓN AND WYGODZINSKY, 1962, p. 322, figs. 185-236.

The original description of this species was very detailed, and only a few of the characters of *deagostinii* are illustrated here; the figures are self-explanatory.

The description of the color pattern of the abdomen of the male was omitted from the original description; it is here presented.

Abdomen of male velvet black dorsally, gray on under surface. Tergites II, VI, VII, and VIII each with 1+1 large, sublateral, silvery white spots. Spots of tergite II the largest, spots gradually decreasing in size from tergite VI to VIII; spots of VI distinctly

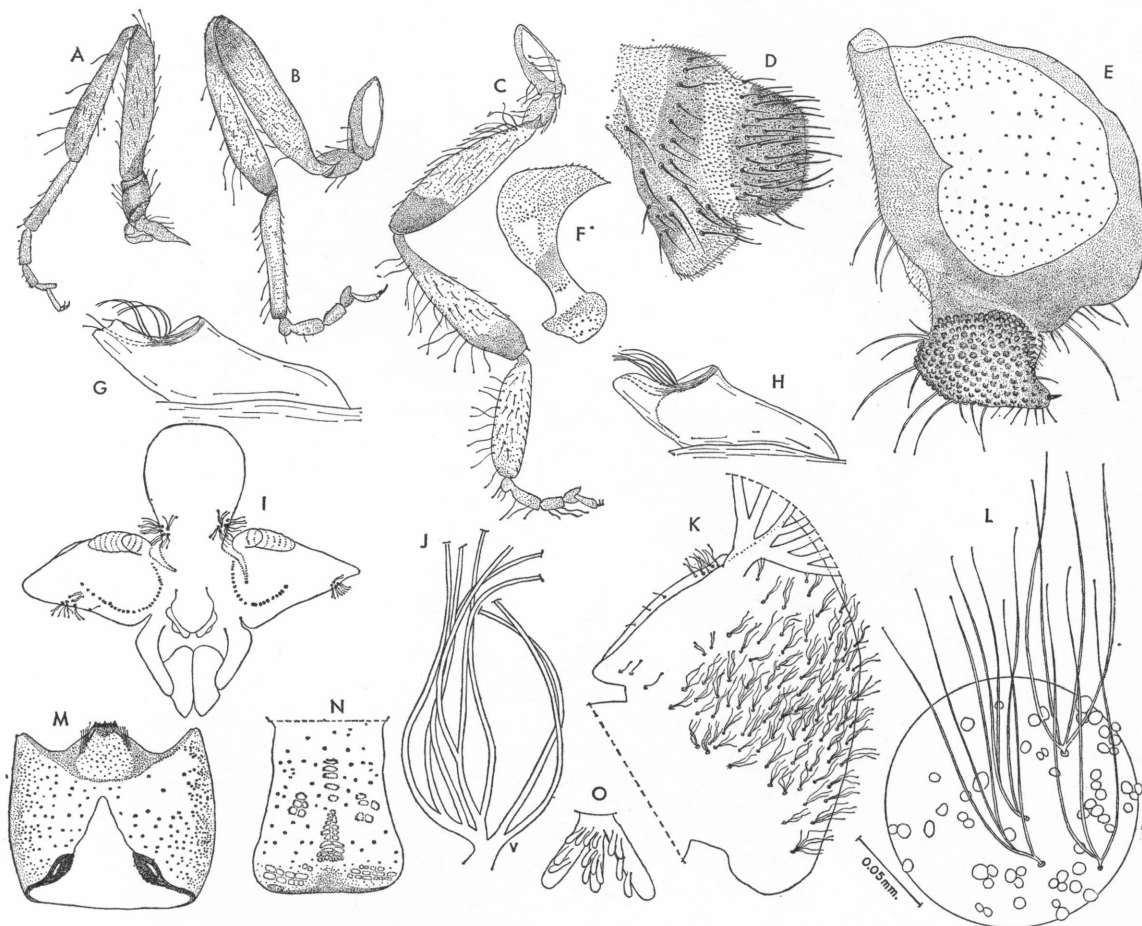


FIG. 3. *Simulium deagostinii*. A-C. Male. A. Foreleg. B. Mid leg. C. Hind leg. D. Female, paraproct and cercus. E, F. Male. E. Paramere. F. Ventral plate, lateral aspect. G-L. Pupa. G, H. Pupa and cocoon, side view, different specimens. I. Head, extended. J. Respiratory organ. K. Portion of thorax. L. Trichomes and platelets of thorax, enlarged. M-O. Larva. M. Head, seen from below. N. Cephalic apotome, with color pattern. O. Anal gills. The small letter v indicates the ventral primary branch of the respiratory organ.

separated by a well-developed black area.

MATERIAL EXAMINED: Argentina: Chubut: Río Senguerr, 10 kilometers below Lago Fontana, February 15, 1961 (S. Coscarón; Instituto Nacional de Microbiología), several larvae and pupae. Tierra del Fuego: Arroyo Valdez, near Lago Fagnano, January 25, 1962 (S. Coscarón; Instituto Nacional de Microbiología), numerous larvae and pupae.

This species was described from Tierra del Fuego and has not been reported elsewhere.

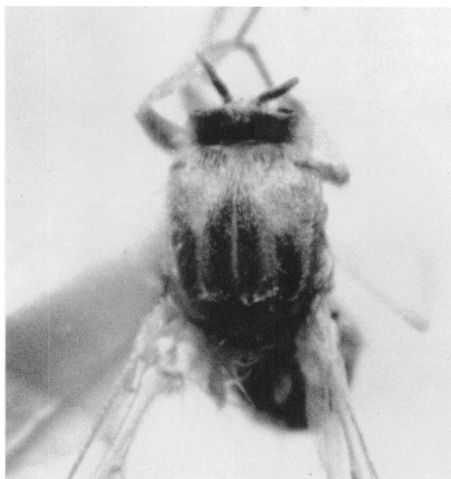
***Simulium (Pternaspatha) dureti*, new species**

Plate 2, figures 1-3; text figures 4-6

FEMALE: Length of wing, 3.6 mm.

Body with an over-all gray tinge. Color of head like that of *memorale*; hairs of clypeus silvery.

Color of mesonotum very similar to that of *memorale*, but grayish pattern elements more extended, occupying anteriorly one-third of surface of mesonotum (pl. 2, figs. 1, 2). Adpressed setae of mesonotum silvery, very dense, giving mesonotum over-all grayish aspect. Scutellum grayish brown, its apical portion darker. Pleural tuft silvery white. Wing veins stramineous; hairs at base of wings silvery white. Stem of halteres brown; their knob yellowish white. Legs light brown, their hairs silvery to black; following regions dark-



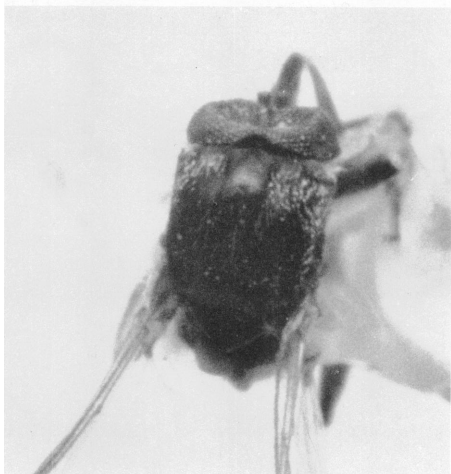
1



2



3



4



5

1. *Simulium dureti*, female. 2. *Simulium dureti*, female, different view. 3. *Simulium dureti*, male.
4. *Simulium herreri*, male. 5. *Simulium herreri*, female

ened: all coxae and trochantera, basal and distal spots on fore and mid femora and conspicuous distal annulus on hind femur, basal spot and distal annulus on fore tibia, and apical annulus on mid and hind tibiae; entire fore tarsus, apical third of first and apical two-thirds of second segment, and entire third

to fifth segments of mid tarsus, apical third of hind basitarsus, apical half of second segment, and entire third to fifth segments of hind tarsus. Exact distribution and relative intensity of pigment of legs as shown in figure 4G, I, J.

Over-all color of abdomen (fig. 4L, P) light

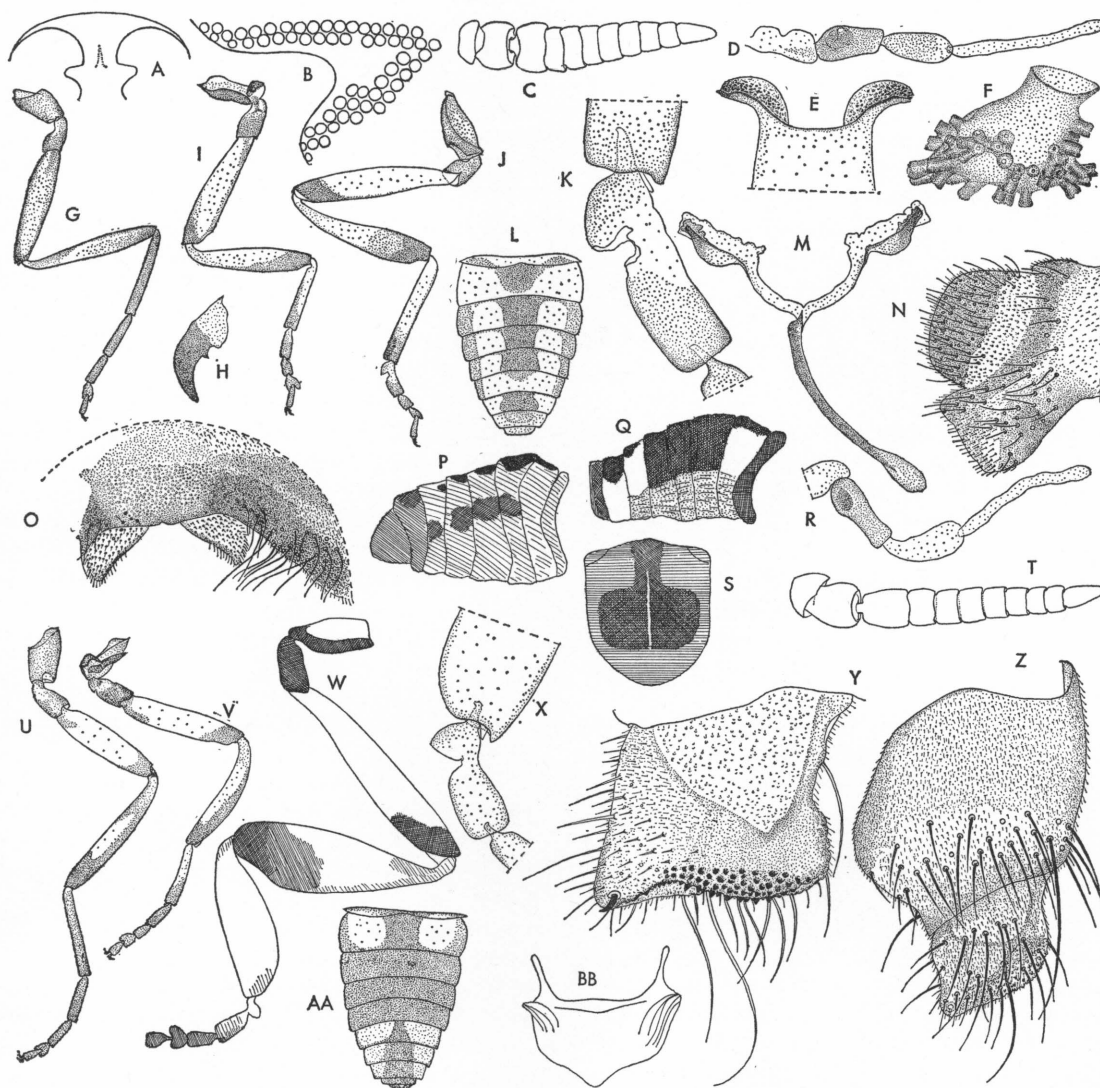


FIG. 4. *Simulium dureti*. A-P. Female. A. Frons. B. Fronto-ocular triangle. C. Antenna. D. Maxillary palp. E. Base of cibarium. F. Sensory vesicle of maxillary palp. G. Foreleg. H. Claw of hind leg. I. Mid leg. J. Hind leg. K. Apex of hind basitarsus, with second tarsal segment. L. Color pattern of abdomen, seen from above. M. Genital fork. N. Paraproct and cercus. O. Eighth sternite. P. Color pattern of abdomen, side view. Q-Z, AA, BB. Male. Q. Color pattern of abdomen, lateral aspect. R. Maxillary palp. S. Color pattern of mesonotum, highly schematized. T. Antenna. U. Foreleg. V. Mid leg. W. Hind leg. X. Apex of posterior basitarsus, with second tarsal segment. Y. Distimere. Z. Paramere. AA. Color pattern of abdomen, dorsal aspect. BB. Basal plate, slightly twisted.

gray, dull; first segment darker. Tergites II–V with well-developed, central, velvety black spot, separated from 1+1 slightly less intense, lateral, dark spots by gray areas as wide as central spots. Tergite VI with very small, in some cases indistinct, black spot; lateral dark areas present. Tergites VII and VIII with large, dark gray spots at center, in some cases entire tergites darkened.

Frons as shown in figure 4A, with obsolete median sulcus. Fronto-ocular triangle (fig. 4B) slightly longer than wide. Shape and proportions of antennal segments as shown in figure 4C. Last segment of maxillary palp more than twice as long as penultimate and longer than the two preceding segments combined (fig. 4D). Diameter of sensory vesicle larger than half of diameter of third segment, its structure as shown in figure 4F. Cibarium with well-sclerotized, lateral projections (fig. 4E). Maxillae with about 25, mandibles with approximately 40, teeth.

General aspect of wings like that in *memorale*. Sc with not more than 10 setae on its central portion. Setae and spines on R_1 arranged in one, or in some cases two, irregular rows. Setae on R_s arranged in one series.

Shape and proportions of articles of legs as shown in figure 4G, I, J. Calcipala very small but distinct, somewhat wider at base than long (fig. 4K). Claws with small tooth (fig. 4H).

Posterior portion of eighth sternite with 1+1 groups of long setae becoming progressively shorter toward center; about 30 setae in each group (fig. 4 O). Central portion of eighth sternite less pigmented than lateral. Gonapophyses subtriangular, covered with microtrichia; their internal border sclerotized. Paraprocts and cerci as shown in figure 4N. Cerci higher than wide, their apical border rounded. Apex of paraprocts subrectangular. Genital fork (fig. 4M) with median process distinctly sclerotized, its extreme apex widened; anterior projections with wide, lateral expansions; external border of distal portion pigmented. Spermatheca like that in *memorale*.

MALE: Length of wing, 3 mm.

Body with over-all gray tinge.

Color of head and its appendages like that in *memorale*.

Mesonotum with the color pattern of the

group, but all of anterior half gray under most angles except at middle, and posterior gray area also more widely extended than usual (fig. 4S; pl. 2, fig. 3). Mesonotum with very numerous silvery, adpressed hairs. Pleura, halteres, and wings like those in female. Legs light brown, their hairs from silvery to black; following regions dark: all coxae and trochanters; basal spots and distal annuli on fore and mid femora, a conspicuous apical annulus on hind femur; basal spots and distal annulus as well as a lateral connecting stripe on all tibiae; entire tarsus of fore legs, entire tarsus of mid legs except basal half of basitarsus, hind basitarsus at base and apex, second segment faintly on apical half; all remaining segments of hind tarsus darkened lightly but distinctly. Exact proportions and intensity of darkened areas as shown in figure 4U–W.

Abdomen (fig. 4Q, AA) with dorsal surface velvety black, under surface grayish. Tergites II, VI, VII, and in some cases also VIII, with 1+1 light gray spots, smaller and with a bluish sheen on posterior segments. Hairs of abdomen including those of basal fringe, silvery.

Shape and proportion of antennal segments as shown in figure 4T. Last segment of maxillary palp (fig. 4R) approximately twice as long as penultimate; diameter of sensory vesicle slightly less than half of diameter of segment.

Wings like those in female, but Sc devoid of hairs, and spines and hairs of R_1 invariably in a single row.

Shape and proportion of articles of legs as shown in figure 4U–W. Hind basitarsus 3.2–3.4 times as long as wide. Calcipala very small but distinct, approximately as long as wide at base (fig. 4X).

Genitalia as shown in figure 4Y, Z, BB. Distimere subquadrate, apical concavity beset with very numerous heavily pigmented tubercles. Ventral plate like that in *deagostinii*, viz., translucent areas not distinct.

PUPA: Pupae single or forming compact groups (fig. 5A–E). Cocoon shoe-shaped, with large, anteroventral bridge. Surface of all cocoons examined covered with foreign particles of various sizes (fig. 5A). Cocoon closely woven, threads not individualized; rim of aperture slightly reinforced. Respiratory organs covered laterally on basal half by walls of cocoon, in some cases only extreme apex vis-

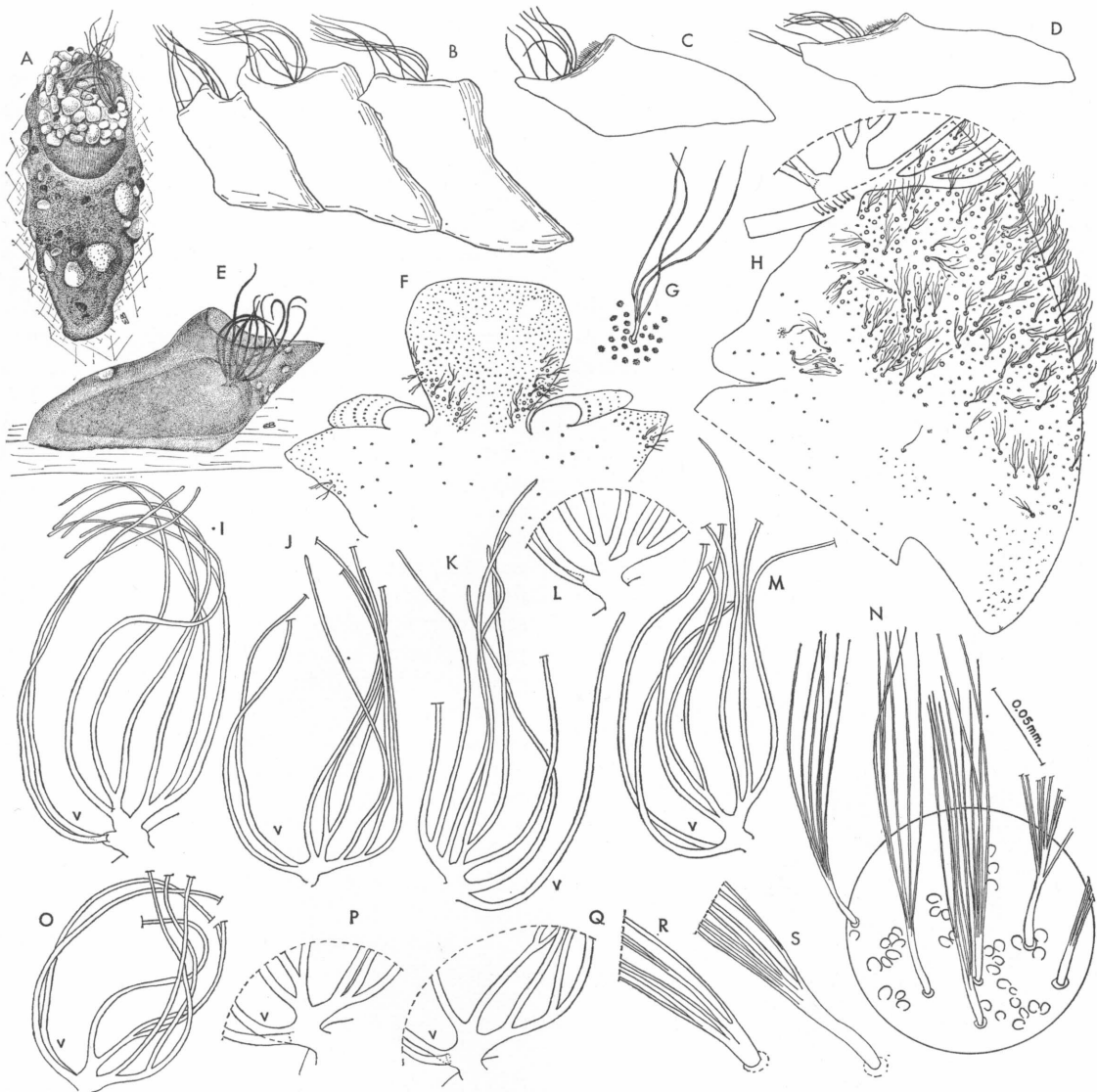


FIG. 5. *Simulium dureti*, pupa. A. Pupa and cocoon, foreign bodies adhering to latter. B. Pupae, with cocoons, side view. C-E. Pupa with cocoon, lateral view, different specimens. F. Anterior portion of head, extended. G. Trichome of clypeus, enlarged. H. Portion of thorax; circlets representing insertion of detached trichomes. I-M. Respiratory organs of various pupae. N. Trichomes and platelets of thorax, enlarged. O-Q. Respiratory organs of various pupae. R, S. Base of trichomes of thorax, enlarged. The small letter v indicates the ventral primary branch of the respiratory organ. A and E drawn by Elvira Bueno.

ible. Length of cocoon at dorsum along middle to border of aperture, 3.3-4.0 mm.; maximum length along base to anterior border of antero-ventral bridge, 4.3 mm.

Length of body of pupa, 3.5-4.5 mm.; length of respiratory organs, 2.0-2.5 mm., viz., less than half as long as cocoon, and slightly more than half as long as pupa proper.

Respiratory organs (fig. 5I-M, O-Q) with eight filaments, general arrangement of primary branches and of filaments similar to that of *nemorale*, but filaments more strongly diverging on basal half. Exact position of origin of filaments somewhat variable, especially on dorsal and median branch, more constant on ventral branch. Filaments progressively

tapering toward their rounded apex, covered entirely by minute, spirally arranged granules.

Head and thorax of pupa light brown. Chaetotaxy of head and thorax as shown in figure 5F, H.

Clypeus covered with small platelets. Head with 1+1 groups composed each of approximately 17 branched frontal and facial trichomes (fig. 5F) and 1+1 groups of three branched, ocular trichomes each.

Exposed portion of thorax more strongly sclerotized than remainder, covered with tubercles and long, branched trichomes. General arrangement of platelets like that in *deagostinii*, but tubercles smaller and less heavily sclerotized, those situated toward midline more or less pointed, spinelike. Trichomes with as many as 10 branches (fig. 5H, N, R, S); their average length, 0.2 mm. Total number of thoracic trichomes approximately 150+150.

Chaetotaxy of abdomen like that in *ne-morale*.

LARVA: Maximum length, 8.5 mm. Width

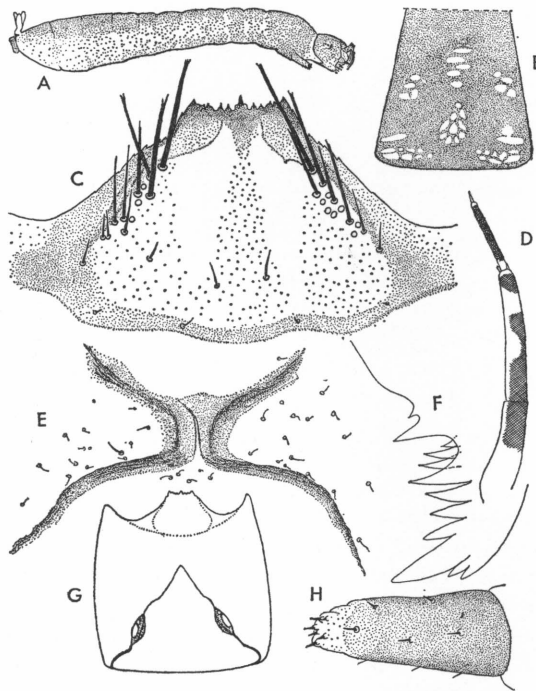


FIG. 6. *Simulium dureti*, larva. A. General aspect, side view. B. Cephalic apotome, with color pattern. C. Hypostomium. D. Antenna. E. Anal sclerite. F. Teeth of mandible. G. Head, seen from below. H. Maxillary palp.

of head capsule, 0.7 mm. General body shape as shown in figure 6A.

Color yellowish, with dark greenish brown hypodermal pigment over whole body surface, especially intense on posterior half dorsally. Pattern elements of cephalic apotome as shown in figure 6B. Body integument smooth, with short setae at base of anal sclerite.

Antennae dark brown, pigment most intense on subapical segment; first and second segments slightly rugose on internal border, second segment with two constrictions accompanied by unpigmented areas (fig. 6D). Ratios of lengths of segments I to III, 1/1.3–1.45/0.7–0.8, viz., last segment distinctly shorter than first. Mouth brushes with approximately 46 rays in large fan. Tothing of mandible as shown in figure 6F; two external, one strong apical, three subapical, four internal, and two external teeth. Maxillary palp as shown in figure 6H. Anterior border of hypostomium strongly pigmented (fig. 6C); median tooth as prominent as lateral ones, intermediate teeth gradually increasing in size from submedian to lateral ones; sublateral tooth barely perceptible. Lateral borders of hypostomium with five to seven very small serrations. Number of hypostomial setae about 14 in each group, arranged in two irregular series. Disc of hypostomium with some short, simple setae. Gular cleft deep (fig. 6G), almost twice as deep as postgenal bridge.

Anal sclerite as shown in figure 6E, without scales at its base. Crochet ring with approximately 90 rows, each composed of about 17 hooks. Anal gills with three simple lobes.

MATERIAL EXAMINED: *Argentina*: Salta: Río Escoipe, Cuesta del Obispo, 2000 meters, October 3, 1965 (S. Coscarón; the American Museum of Natural History), several larvae and pupae, one male, holotype, one female, allotype, one male, four females, paratypes, all reared; *idem* (S. Coscarón; Instituto Nacional de Microbiología), numerous larvae and pupae, one male, four females, paratypes, all reared; Campo Quijano, Río Toro dam, October 9, 1960 (S. Coscarón; the American Museum of Natural History), several larvae and pupae; Abra Muñano, 3800 meters, November 1, 1947 (J. Duret; Duret collection), two females, paratypes. Jujuy: Río Grande, Tilcara, Quebrada de Humahuaca, approximately 2000 meters, September 13, 1962 (S.

Coscarón; Instituto Nacional de Microbiología), several larvae and pupae, one male, one female, paratypes, reared; *idem* (S. Coscarón; the American Museum of Natural History), several larvae and pupae, two males, two females, paratypes, reared; Río Grande, Juella, near Monterrey, 2400 meters, September 13, 1962 (S. Coscarón; Instituto Nacional de Microbiología), several larvae and pupae; Río Grande, Maimará, 1800 meters, September 11, 1962 (S. Coscarón; Instituto Nacional de Microbiología), several larvae and pupae; Oro Mayo, 4200 meters, November 16, 1947 (J. Duret; Duret collection), one female, paratype; Fundición, 4300 meters, November 18, 1947 (J. Duret; Duret collection), one female, paratype; Esquina Blanca, sources of the Río Grande, 3500 meters, December 12, 1965 (S. Coscarón; Instituto Nacional de Microbiología), one pupa; Yavi, Río Yavi, 2800 meters, December 9, 1965 (S. Coscarón; Instituto Nacional de Microbiología), two larvae, two pupae. *Bolivia*: Potosí: Moraya, 3000 meters, December 10, 1965, with *Simulium huayrayacu* (S. Coscarón; Instituto Nacional de Microbiología), one pupa.

ECOLOGICAL DATA: Larvae and pupae were found attached to trailing leaves and to rocks in high mountain streams. The level of the water was low when the material was collected; after the start of the heavy summer rains no specimens could be found.

DISCUSSION: The new species is named for Dr. José P. Duret who first collected it.

Simulium dureti seems to be closest to *Simulium deagostinii*, from Tierra del Fuego. The adults of *dureti* can be distinguished by the over-all gray tinge, the presence of a small calcipala which is lacking completely from *deagostinii*, the relatively elongate fronto-ocular triangle of the female, and the wider extension of the gray areas of the mesonotum in the male. The pupa of *dureti* differs from that of *deagostinii* by the larger number of frontal and facial trichomes and the greater length of the thoracic trichomes. The larva of *dureti* is characterized by the different color pattern of the clypeus, slight differences in the toothings of the mandibles, and chiefly by the absence of secondary lobes to the anal gills. *Simulium dureti* seems also very close to *S. strigidorsum*, at least in the female sex. The two species differ mainly by the pigmentation of the abdo-

men: the lateral dark areas of tergites III–VI found in *dureti* are absent from *strigidorsum*, the fronto-ocular triangle of *dureti* is longer, and the tooth of its claws is more pronounced.

***Simulium* (*Pternaspatha*) *huemul*, new species**

Figure 7

MALE: Length of wing, 2.9 mm.

Head blackish. Eyes dark purple. Palpi and antennae piceous, latter with two basal segments brownish. Clypeus gray pollinose. Long hairs on occiput, clypeus, and between eyes from grayish to dark brown.

Mesonotum black, with sides and posterior declivity gray; 1+1 small, white, triangular, submedian spots at anterior border. Mesonotum covered with long and very dense adpressed light brown hairs, forming a distinct line along middle longitudinally. Scutellum dark, its lateral and hind borders narrowly stramineous, with long silvery hairs. Metanotum dark, with silver-gray pollinosity. Pleura dark, silvery pollinose. Pleural tuft silvery white. Veins of wings whitish. Tufts of hairs at base of wings whitish, with small, interspersed areas of dark hairs. Stem of halteres brownish; knob yellow. Legs yellowish white, their hairs from brownish to silvery white, very numerous on fore femur; following areas of legs dark: all coxae and trochantera except base of latter; distinct basal spot on fore and mid femora and conspicuous annulus on apex of all femora; spot on base and distinct annulus on apex of all tibiae, basal spot very conspicuous on fore tibiae where it is connected to apical annulus by a longitudinal stripe, but faint on mid and hind tibiae; whole fore tarsus, entire mid tarsus except basal three-fifths of first and extreme base of second segment, extreme apex of hind basitarsus with heavy pigment, scale and extreme apex of second segment and apical half of third segment of hind tarsus faintly pigmented, entire fourth and fifth segments strongly pigmented. Exact distribution and relative intensity of pigmented areas of legs as shown in figure 7A–C.

Abdomen velvety black, its hairs silver-colored; first tergite piceous. Tergites II–VII with 1+1 silvery white sublateral spots (fig. 7D), those of II and VI very large, those of III, V, and VII medium-sized, those of IV minute.

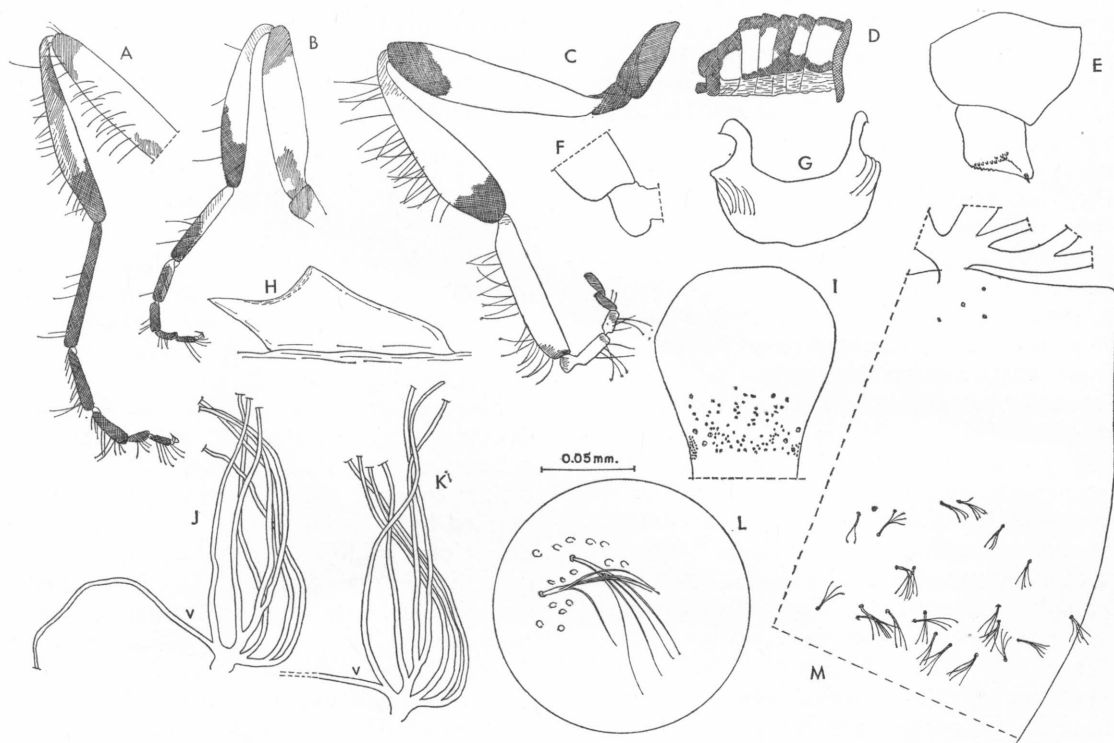


FIG. 7. *Simulium huemul*. A-G. Male. A. Foreleg. B. Mid leg. C. Hind leg. D. Color pattern of abdomen, lateral aspect. E. Paramere. F. Apex of posterior basitarsus, with base of second tarsal segment. G. Basal plate. H-M. Pupa. H. Cocoon, lateral view. I. Clypeus, with platelets and insertions of trichomes. J, K. Respiratory organs. L. Trichomes and platelets of thorax, enlarged. M. Portion of thorax. The small letter v indicates the ventral primary branch of the respiratory organ.

Antennae and mouth parts not examined in detail.

General structure of wings like that in *nemorale*. Sc lacking setae. Setae and spines on R_1 and setae on R_s arranged in a single row.

Shape and proportions of articles of legs as shown in figures 7A-C. Hind basitarsus very narrow, about five times as long as wide. Calcipala very small, in shape of a triangular projection (fig. 7F).

Genitalia as illustrated in figure 7E, G. Basimere wider than long. Distimere tuberculate on apical surface. Disc of basal plate with 1+1 faint, translucent areas.

PUPA: Cocoon slipper-shaped (fig. 7H), with distinct anteroventral bridge. Color of cocoon light brown, its surface smooth, closely woven, threads not distinct. Rim of aperture faintly reinforced. Only extreme base of respiratory organs protected laterally by walls of cocoon; all filaments free. Length of cocoon at dorsum along middle, 3.2 mm.,

length along base to anterior border of anteroventral bridge, 4.8 mm.

Length of respiratory organ, approximately 2 mm., viz., less than half as long as cocoon.

Respiratory organs with eight filaments arising from three primary branches (fig. 7J, K). Primary branches dividing near their bases, only second division of median primary branch somewhat more remote from base. Ventral filament of ventral primary branch sharply diverging from remainder of filaments, directed downward and inward, adhering to dorsal surface of anteroventral bridge, meeting first ventral filament of opposite side on midline. Filaments gradually tapering, their surface structure and apex like those in *nemorale*.

Head and thorax of pupa light brown.

Head with 3+3 frontal trichomes. Basal third of clypeus with numerous platelets; apical two-thirds glabrous (fig. 7I).

Thorax with exposed portion covered by

very numerous small platelets (not shown in fig. 7M). Basal half of exposed portion with approximately 22+22 trichomes (fig. 7M), latter slender, hairlike, multibranched (fig. 7L) their average length, 0.08 mm.

Chaetotaxy of abdomen like that in *ne-morale*.

MATERIAL EXAMINED: Argentina: Chubut: Río Huemules, February 8, 1961 (S. Coscarón; Museo de La Plata), one pupa, one male, holotype, reared.

DISCUSSION: The specific name of *huemul* is taken from its type locality. The "huemul" is a small deer of western Patagonia (*Hippocamelus bisulcus*).

The male of *Simulium huemul* differs from that of all other species of the *nigristrigatum* group by the number and extension of the silvery white spots on the abdomen. The pupa is characterized by the trichomes of the thorax and the sharply divergent ventral filament of the ventral primary branch.

***Simulium (Pternaspatha) limay* Wygodzinsky**

Figure 8A-C, F, K

Simulium limay WYGODZINSKY, 1958, p. 123, figs. 1-20, 22-30.

[*Simulium (Pternaspatha)*] *limay*: STONE, 1963, p. 17.

A few diagnostically important features are

illustrated here; nothing needs to be added to the original description.

This species is known only from the provinces of Neuquén and Río Negro in Argentina.

***Simulium (Pternaspatha) nigristrigatum* (Enderlein)**

Figure 9

Pternaspatha nigristrigata ENDERLEIN, 1930, p. 88, fig. 3; 1934, p. 275. STONE, 1962, p. 208.

Simulium nigristrigatum: SMART, 1945, p. 509. VARGAS, 1945, p. 170. STUARDO ORTÍZ, 1946, p. 41. WYGODZINSKY, 1949, p. 304. VARGAS AND DÍAZ, 1953, p. 142, figs. 4-11. WYGODZINSKY, 1958, p. 132, fig. 21.

Simulium (Simulium) nigristrigatum: EDWARDS, 1931, p. 154. ORFILA, 1939, p. 1533.

[*Simulium*] (*Pternaspatha*) *nigristrigata*: STONE, 1963, p. 17.

Acropogon edwardsi ENDERLEIN, 1934, p. 279. VARGAS, 1945, p. 134.

Simulium edwardsi: STUARDO ORTÍZ, 1946, p. 41.

This is the type species of *Pternaspatha*. As long as its larvae and pupae remain unknown, a full description of this species cannot be given. For comparative purposes, a few characters of the female are illustrated here; the figures are self-explanatory.

The available descriptions of the male contain a discrepancy of some interest. The ratio of length to width of the hind basitarsus, a

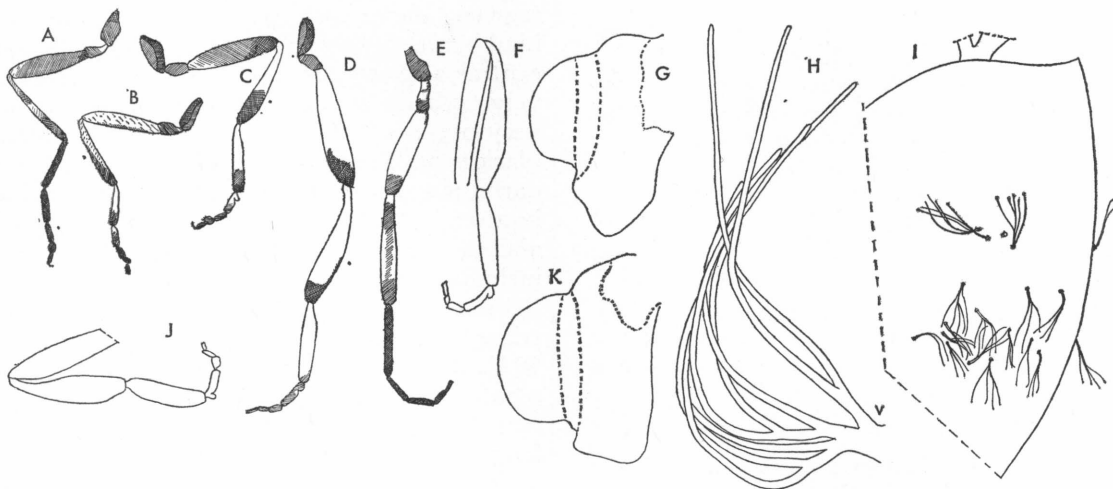


FIG. 8. A-C. *Simulium limay*, female. A. Foreleg. B. Mid leg. C. Hind leg. D, E. *Simulium walterwittmeri*, female. D. Hind leg. E. Foreleg. F. *Simulium limay*, male, hind leg; pigment not shown. G-J. *Simulium walterwittmeri*. G. Female, cercus and paraproct. H. Pupa, respiratory organ. I. Pupa, portion of thorax. J. Male, hind leg; pigment not shown. K. *Simulium limay*, female, cercus and paraproct. The small letter v indicates the ventral branch of the respiratory organ.

taxonomically very important character in *Pternaspatha*, is 3.3/1 as measured from Enderlein's (1930) drawing, and 3.9/1 as taken from the drawing given by Vargas and Díaz (1953).

MATERIAL EXAMINED: Argentina: Río Negro: Plateau approximately 40 kilometers southeast of General Roca, August 13, 1963 (A. Bachmann; the American Museum of Natural History), four females; *idem* (A. Bachmann; Instituto Nacional de Microbio-

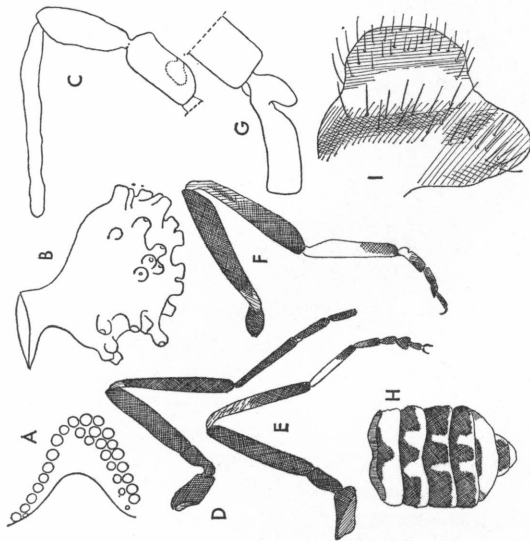


FIG. 9. *Simulium nigristrigatum*, female. A. Fronto-ocular triangle. B. Sensory vesicle of maxillary palp. C. Maxillary palp. D. Foreleg, tarsus incomplete. E. Mid leg. F. Hind leg. G. Apex of posterior basitarsus, with second tarsal segment. H. Color pattern of abdomen, dorsal view. I. Paraproct and cercus.

logía), four females; Cinco Saltos, August 21, 1959 (S. Coscarón; the American Museum of Natural History), one female; *idem* (S. Coscarón; Instituto Nacional de Microbiología), one female; Villa Regina, October 10, 1960, biting horses and cattle (S. Coscarón; the American Museum of Natural History), three females; *idem* (S. Coscarón; Instituto Nacional de Microbiología), four females.

***Simulium (Pternaspatha) pichi*, new species**

Figures 10, 11

FEMALE: Length of wing, 2.4–2.9 mm.

Head blackish; color of appendages and hairs like that of *memorale*.

Mesonotum similar to that of *S. dureti*, dark gray, with three percurrent, longitudinal, light gray lines: a central very delicate one not attaining anterior border, and 1+1 wider submedian ones which meet the central line posteriorly, posterior fourth of mesonotum light gray; lateral borders of mesonotum also light gray (fig. 10I). Mesonotum covered with very numerous adpressed, silvery hairs. Scutellum light brown, with long silvery or dark brown hairs. Metanotum brown, tinged faintly with violaceous, delicately pollinose. Pleural tuft silvery white. Wing veins whitish; setae at base of wings whitish. Base of halteres brownish, knob yellowish white. Legs light brown, following regions darkened: all coxae and trochantera, except extreme base of latter; entire fore femur, basal spot and distal annulus of mid femur, distal annulus of hind femur; entire fore tibiae except somewhat more light-colored central three-fifths, apical annulus of mid and hind tibiae, both of which also have a very faint basal spot; entire fore tarsus, apical two-fifths of basitarsus and apical three-fourths of second segment of tarsus of mid legs as well as entire third to fifth segments, apical fourth of hind basitarsus, apical half of second and entire third to fifth segments of hind tarsus entirely. Exact distribution and relative intensity of pigment on legs as shown in figure 10E–G.

Abdomen (fig. 10J) dull silvery gray. First segment dark, with the central region and hind border light gray. Tergites II–V with one central, and tergites III–VI with 1+1 lateral, velvety black spots; light-colored areas on II very large, on III–V at least as wide as central black spot. Tergites VII and VIII with large dark central spot not quite attaining posterior border; IX entirely dark. Ventral surface of abdomen grayish brown. Hairs of abdomen, including basal fringe, silvery white.

Frons like that of *memorale*; fronto-ocular triangle approximately as long as wide (fig. 10A). Shape and proportions of antennal segments as shown in figure 10B. Last segment of maxillary palp (fig. 10C) more than twice as long as penultimate, and approximately as long as two preceding segments combined. Diameter of sensory vesicle as large as half of diameter of third segment. Cibarium with well-sclerotized lateral projections (fig. 10D).

General aspect of wings like that in *ne-*

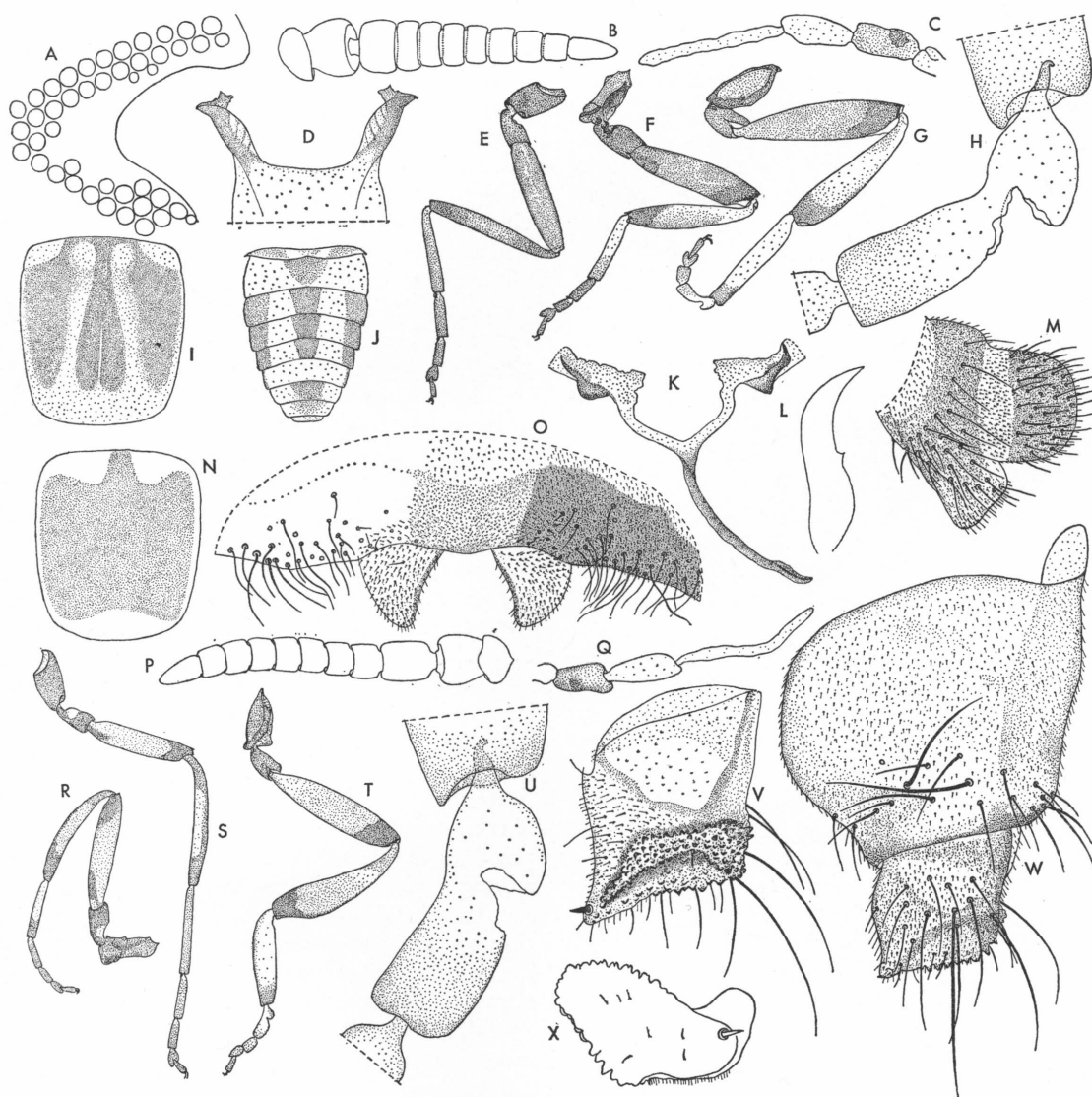


FIG. 10. *Simulium pichi*. A-M. Female. A. Fronto-ocular triangle. B. Antenna. C. Maxillary palp. D. Base of cibarium. E. Foreleg. F. Mid leg. G. Hind leg. H. Apex of posterior basitarsus, with second tarsal segment. I. Color pattern of mesonotum. J. Color pattern of abdomen, dorsal view. K. Genital fork. L. Claw of hind leg. M. Paraproct and cercus. N. Male, color pattern of mesonotum. O. Female, eighth sternite. P-X. Male. P. Antenna. Q. Maxillary palp. R. Foreleg. S. Mid leg. T. Hind leg. U. Apex of posterior basitarsus, with second tarsal segment. V. Distimere. W. Paramere. X. Apex of distimere, seen from behind.

morale. Sc in most cases without, rarely with one or two, setae on its center. Setae and spines on R_1 arranged in one row, in rare cases in an irregular double row on basal portion of vein. Setae on R_s arranged in one series.

Shape and proportions of articles of legs as shown in figure 10E-G. Calcipala very small,

wider than long (fig. 10H). Claws with a small tooth (fig. 10L).

Posterior portion of eighth sternite with 1+1 groups of approximately 35 long setae, their size diminishing toward central region (fig. 10 O); central portion of sternite slightly less pigmented than lateral areas. Gonapoph-

yses subtriangular, beset with microtrichia, their internal borders more strongly sclerotized. Paraprocts and cerci as shown in figure 10M. Cerci higher than wide, their distal border rounded. Projecting portion of paraprocts subtriangular, extreme apex rounded. Genital fork (fig. 10K) with median process well sclerotized, its extreme apex widened; anterior projections narrow, with large lateral expansions at their tips, their external border pigmented. Spermatheca like that in *nemorale*.

MALE: Length of wing, 2.3–2.6 mm.

Head, palpi, and labrum dark brown; eyes dark purple. Antennae blackish, first and second segment slightly lighter. Frons, clypeus, and labrum silvery pollinose; hairs of palpi from silvery to black.

Mesonotum velvet black, lateral margins and anterior and posterior declivities silvery pollinose, under certain angles with 1+1 submedian grayish spots adjacent to anterior gray border (fig. 10N). Hairs of mesonotum very dense, silvery, decumbent, giving the mesonotum over-all grayish cast. Metanotum dark brown, tinged with violaceous. Pleura dark brown, grayish pollinose. Pleural tuft silvery white. Color of wings and halteres like that in female. Legs from yellowish to brownish; following regions dark brown: all coxae and trochantera; elongate basal spots on fore and mid femora and distal annuli on all femora; a basal and a distal annulus connected by longitudinal stripe on all tibiae, basal annulus very faint on second and third pairs; entire fore tarsi, entire mid tarsi except basal two-thirds of basitarsus, apex of basitarsus of hind legs, basal scale and apical half of second and entire third to fifth segments. Exact distribution and relative intensity of pigment of legs as shown in figure 10R–T.

Dorsal surface of abdomen velvety black, with 1+1 silvery gray spots on tergites II, VI, and VII, those on tergites II and VI very large, almost meeting dorsally at middle. Ventral surface of abdomen grayish brown. Hairs of abdomen, including those of basal fringe, silvery white.

Shape and proportion of antennal segments as shown in figure 10P. Last segment of maxillary palp (fig. 10Q) longer than two preceding segments combined. Diameter of sensory vesicle about as large as half of diameter of

third segment, this segment notably darker than remainder.

Wings like those of female, but no setae on Sc, and setae and spines on R_1 invariably in a single row, even at base of vein.

Shape and proportion of articles of legs as in figure 10R–T. Hind basitarsus narrow, 3.8 times as long as wide. Calcipala very small, wider at base than long (fig. 10U).

General structure of genitalia very similar to that of *S. durenti*. Parameres as shown in figure 10V–X. Ventral plate with 1+1 distinct, translucent areas.

PUPA: Cocoon slipper-shaped, with moderately extended anteroventral bridge (fig. 11A, B). Color of cocoon light brown, surface smooth, closely woven, but threads perceptible under moderate magnification. Rim of aperture distinctly reinforced. Respiratory organs covered by cocoon only at their extreme base. Length of cocoon along dorsal surface, 2.7–3.4 mm.; along ventral surface, 3.8–4.7 mm.

Length of body of pupa, 2.8–3.0 mm.; length of respiratory organs, 1.2–1.6 mm., viz., less than half as long as cocoon, and about half as long as pupa proper.

Respiratory organs (fig. 11F–H) with eight filaments, slightly diverging on basal, and approximately parallel on apical, half. General arrangement of primary branches and of filaments much like that in *nemorale*. Exact position of origin of filaments from primary branches not very variable. Filaments rather stout on basal, rather abruptly narrowed on apical, half, covered entirely by spirally arranged granules.

Head and thorax of pupa light brown.

Head (fig. 11C) with 3+3 branched frontal and 1+1 branched facial trichomes. Clypeus densely covered with small platelets.

Exposed portion of thorax (fig. 11D) covered with numerous platelets and branched trichomes, latter limited to posterior half of exposed portion. Trichomes slender, hairlike, with from two to five branches (fig. 11E); average length of trichomes, 0.12 mm. Total number of trichomes of thorax approximately 60+60.

Chaetotaxy of abdomen like that in *nemorale*, but tubercles on tergites VI–VIII less numerous.

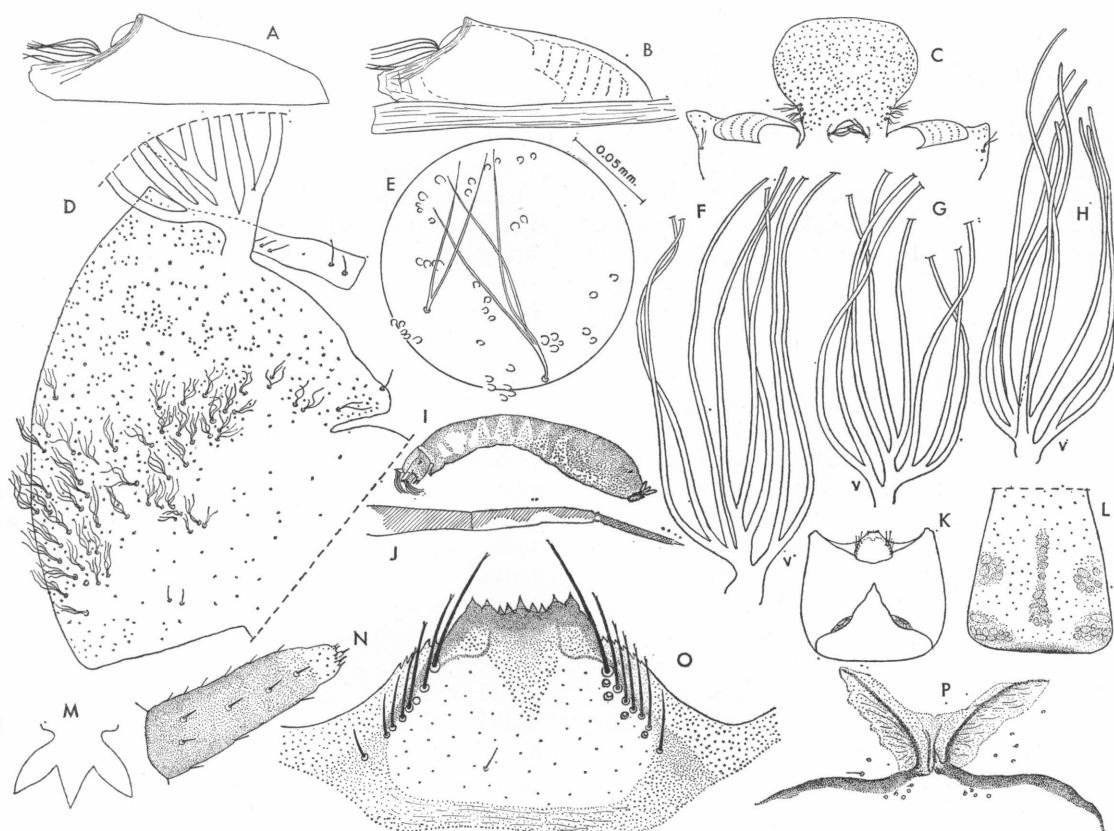


FIG. 11. *Simulium pichi*. A-H. Pupa. A, B. Pupa and cocoon, side view, different specimens. C. Anterior portion of head, extended. D. Portion of thorax. E. Trichomes and platelets of thorax, enlarged. F-H. Respiratory organ, different specimens. I-P. Larva. I. General aspect, side view. J. Antenna. K. Head, seen from below. L. Cephalic apotome, with color pattern. M. Anal gills. N. Maxillary palp. O. Hypostomium. P. Anal sclerite. The small letter v indicates the ventral primary branch of the respiratory organ.

LARVA: Maximum length, 6.7 mm.; maximum width of head capsule, 0.6 mm. General body shape as shown in figure 11I.

Color of larva light brown, with faint, dark, hypodermal pigment on dorsal surface and on under side of anterior third of body. Head stramineous; cephalic apotome with faint brown pattern elements as shown in figure 11L. Body integument smooth, hairs present at base of anal sclerite.

Antennae (fig. 11J) light brown, last segment darkest. Second segment with two slight constrictions, coinciding with unpigmented areas. Ratios of lengths of segments I to III, 1/1.1-1.15/0.9, viz., third segment distinctly shorter than first. Mouth brushes with about

26 rays in large fan. Maxillary palp as shown in figure 11N. Anterior border of hypostomium strongly pigmented (fig. 11O); median tooth almost as prominent as lateral and outermost intermediate teeth, remaining intermediate teeth smaller; sublateral tooth absent. Lateral borders of hypostomium with seven or eight minute serrations. Number of hypostomial setae from seven to 11 in each group, arranged in one, rarely in two, irregular series. Disc of hypostomium glabrous or with an occasional simple short seta. Gular cleft deep (fig. 11K), about twice as deep as postgenal bridge.

Anal sclerite as shown in figure 11P; scales at base absent. Crochet ring with about 83 rows composed of about 18 hooks each. Anal

gills simple, composed of three simple lobes (fig. 11M).

MATERIAL EXAMINED: Argentina: Santa Cruz: Arroyo El Pluma, February 3, 1961 (S. Coscarón; Museo de La Plata), one male, holotype, one female, allotype, both reared; *idem* (S. Coscarón; the American Museum of Natural History), several larvae and pupae, three males, three females, paratypes, all reared; *idem* (S. Coscarón; Instituto Nacional de Microbiología), several larvae and pupae, one male, four females, paratypes, all reared.

ECOLOGICAL DATA: The larvae and pupae of this species were collected in a crystal-clear stream about 2 meters wide and 1 meter deep. The specimens were found attached to stems and leaves of *Potamogeton* sp. and *Heleocharis* sp., but mostly on reeds, generally on the downstream side of the leaves. Larvae of Ephemeroptera, Plecoptera, and Trichoptera, as well as gastropods, Hirudinea, and Turbellaria were found here in identical situations.

DISCUSSION: The specific name is taken from the Araucanian word *pichi*, meaning small, in allusion to the fact that this is one of the smallest species of the group.

Simulium pichi resembles *S. dureti*, from which it differs by its smaller size, the smaller extension of the anterior gray portion on the mesonotum of the male, the virtual absence of setae from Sc in the female and the more salient cerci in the same sex, fewer and less branched cephalic and thoracic trichomes of the pupa, and the different pigmentation of the larval head. Other Patagonian species, the pupae of which have a respiratory organ of eight filaments, differ, among other characters, either by a well-developed calcipala, as in *nemorale*, or its complete loss, as in *deagostinii*, or *nigristrigatum* and its allies.

***Simulium* (*Pternaspatha*) *strigidorsum*
(Enderlein)**

Figure 12

Acropogon strigidorsum ENDERLEIN, 1934, p. 279.

Simulium strigidorsum: SMART, 1945, p. 514. VARGAS, 1945, p. 199.

FEMALE: Wing length, 3.3–3.6 mm.

Head black; antennae and mouth parts piceous; occiput, frons, and clypeus gray pollinose. Pilosity of antennae very short, of

palpi somewhat longer; occiput with long hairs.

Mesonotum dark gray to black, with 1+1 light gray, median, longitudinal stripes arising from 1+1 anterior white spots; a narrow, median, longitudinal line separated from gray stripes on its central two-fourths by elongate blackish areas. Stripes and midline confluent on posterior third of sclerite, connected to equally gray though somewhat darker lateral borders of mesonotum. Width of submedian gray stripes each about one-eighth of total width of mesonotum. Pubescence of mesonotum sparse and short, decumbent, silvery. Scutellum and metanotum piceous, silvery pollinose; scutellum with long decumbent and erect silvery hairs. Pleural tuft silvery. Pleura and sterna piceous, silvery pollinose. Wing veins stramineous, hairs and setae black, tufts of hairs at base of wings whitish. Legs of Peruvian specimens (fig. 12I, H): All coxae and trochantera blackish, gray pollinose. Forelegs entirely dark brown. Mid legs brown; basal half of tibia, basal three-fourths of first and basal half of second tarsal segment yellowish. Hind legs dark brown; extreme base of femur and proximal half of tibia yellowish, basal two-thirds of first and proximal half of second tarsal segment whitish; very small dark spot on base of second tarsal segment. Legs of Argentinian specimens (fig. 12D–F): Forelegs with dorsal surface of femur and basal half of tibia light brown. Mid legs with femur light brown, slightly darkened ventrally and with apical annulus. Hind legs with pigment slightly less extensive than in Peruvian specimens.

Dorsal surface of abdomen dull silvery gray. First segment darkened, its posterior fringe whitish. Tergites II–V each with a median velvety black spot (fig. 12K, O); lateral dark spots or areas absent. Tergite VI entirely gray. Tergite VII with a distinct gray spot, VIII faintly darkened at center.

Frons wide; fronto-ocular triangle about as long as wide (fig. 12A). Shape and proportion of antennal segments as shown in figure 12G. Last segment of maxillary palp more than twice as long as penultimate and longer than two preceding segments combined. Diameter of sensory vesicle about half as large as diameter of third segment of palp; its structure as shown in figure 12B.

Wings as usual for the subgenus. Sc and

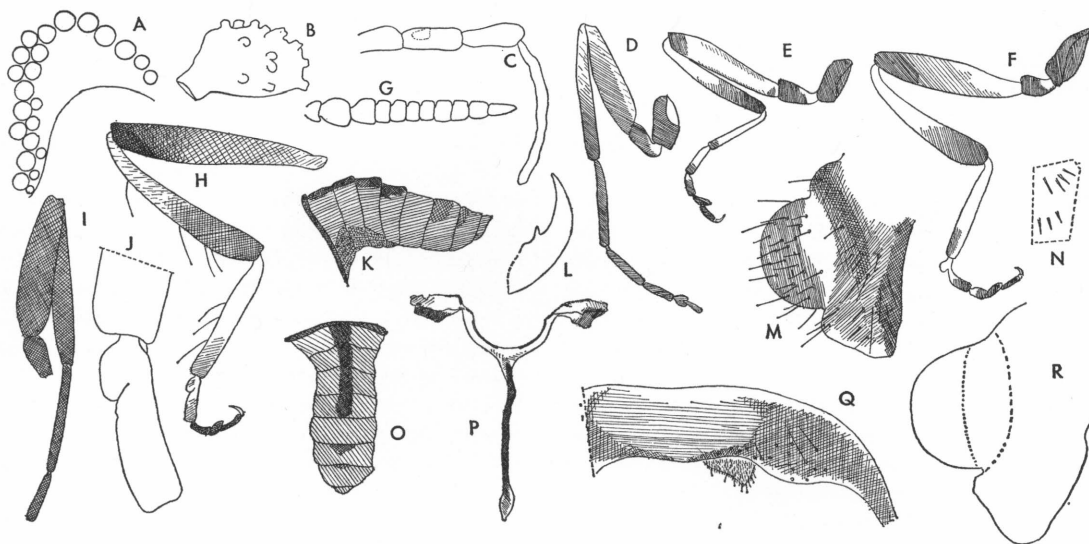


FIG. 12. *Simulium strigidorsum*, female. A. Fronto-ocular triangle. B. Sensory vesicle of maxillary palp. C. Maxillary palp. D. Foreleg. E. Mid leg. F. Hind leg. G. Antenna. H. Hind leg. I. Foreleg. J. Apex of posterior basitarsus, with second tarsal segment. K. Color pattern of abdomen, side view. L. Claw of hind leg. M. Cercus and paraproct. N. Structure of inner surface of spermatheca. O. Color pattern of abdomen, dorsal view. P. Genital fork. Q. Eighth sternite. R. Cercus and paraproct. A-G, L, P, R taken from a specimen from Mendoza; H-K, M-O, Q, from a type.

basal portion of R bare. R_1 with setae and spines arranged in single row, setae of R_s in single row.

Shape and proportions of articles of legs as shown in figure 12D-F. Calcipala (fig. 12J) very small, in shape of a small protrusion. Claws with small tooth (fig. 12L).

Genitalia as illustrated in figure 12M, N, P, Q, R. Central portion of eighth sternite less strongly pigmented than lateral areas, only its hind margin narrowly dark; setae of lateral portion of sternite not very numerous. Gonapophyses membranous, subtriangular, beset with microtrichiae. Cerci rather short (fig. 12M, R); paraprocts somewhat more intensely pigmented than cerci, their free extremity very shortly salient. Spermatheca subglobular, spiculae of inner surface as shown in figure 12N. Genital fork as shown in figure 12P.

MATERIAL EXAMINED: *Peru*: [Puno]: Juliaca, June 14, 1903 (Zoological Museum of the Humboldt University, Berlin), two female types, one of which is herein designated lectotype. *Argentina*: Mendoza: Laguna Diamante, 3380 meters, January 27, 1950 (M. Aczel; the American Museum of Natural History)

five females; *idem* (M. Aczel; Instituto Nacional de Microbiología), two females; *idem* (M. Aczel; Instituto Miguel Lillo), several females.

DISCUSSION: The differences between the types from Peru and the Argentinian specimens are very slight, and we do not hesitate to consider all specimens as conspecific. The color pattern of the abdomen of the female is unique in the subgenus.

Simulium (Pternaspatha) walterwittmeri
Wygodzinsky

Figure 8D, E, G-J

Simulium walterwittmeri WYGODZINSKY, 1958, p. 129, figs. 31-48.

Simulium [(*Pternaspatha*)] *walterwittmeri*: STONE, 1963, p. 17.

A few important characters of this species are illustrated here.

Simulium walterwittmeri is known only from the province of Neuquén, Argentina.

***Illiesi* SUBGROUP**

***Simulium (Pternaspatha) illiesi*, new species**

Figures 13-15

FEMALE: Description based on specimen

dissected from pupa: Color of head and thorax unknown. Color pattern of legs apparently similar to that of male, but base of mid and hind tibiae lacking pigment. Color pattern of abdomen approximately as in figure 13K, viz., tergite II with 1+1 large, tergites III–V with 1+1 small, and tergites VI and VII again with 1+1 large, silvery white spots; tergites VIII and IX extensively silvery white.

Fronto-ocular triangle about as long as wide (fig. 13A). Shape and proportions of antennal segments as shown in figure 13B. Diameter of sensory vesicle of maxillary palp equal to half of width of third segment; structure of vesicle as shown in figure 13C. Maxillae with 28–29 teeth, mandibles with approximately 43 teeth.

Wings not examined in detail.

Calcipala well developed (fig. 13F). Claws with relatively large tooth (fig. 13G, H).

Eighth sternite as illustrated in figure 13E, its central portion more strongly sclerotized than lateral areas. Gonapophyses triangular, beset with microchaetae, their inner border faintly sclerotized. Cerci (fig. 13I) higher than wide, their distal border rounded. Paraprocts as shown in figure 13I, salient, their free portion subtriangular; paraprocts slightly more strongly sclerotized than cerci. Genital fork as illustrated (fig. 13D). Spermatheca globular, its inner surface with minute spiculae, single or arranged in groups of two or three.

MALE: Length of wing, more than 3.5 mm.

Color of head and cephalic appendages like that in *memorale*.

Thorax black, with abundant, adpressed, golden-colored setae. Distribution of light-colored areas of mesonotum as usual for *Pternaspatha*. Scutellum dark brown, with long, light brown setae. Metanotum dark violaceous brown, with silvery pollinosity. Pleura blackish. Color of wings and halteres like that in *memorale*. Legs light brown, following regions dark: all coxae; apical half of trochantera; very faint basal spot on fore and mid femora, and distinct apical annulus on mid and hind femora; distinct area on base of fore tibia and very faint areas on bases of mid and hind tibiae, as well as distal areas on all tibiae; entire fore tarsus, entire mid tarsus, except basal two-thirds of basitarsus and submedian portion of second tarsal segment. Exact proportions and relative intensity of pigmented areas as shown in figure 13N–P.

Abdomen dark, almost black on tergites III–V, dark gray on tergite IX. Tergites II, VI, and VII with 1+1 large, silvery white spots, III–V with 1+1 small, almost imperceptible spots (fig. 13R).

Shape and proportion of antennal segments as shown in figure 13L. Last segment of maxillary palp (fig. 13M) twice as long as penultimate. Diameter of sensory vesicle (fig. 13J) slightly less than half of width of third segment.

Wings like those of *memorale*, but setae on R_s in a single row.

Shape and proportions of articles of legs as shown in figure 13N–P. Hind basitarsus 4.5 times as long as wide. Calcipala well developed but shorter than wide at base (fig. 13Q).

Parameres as shown in figure 13U, V. Basimere subtrapezoidal, slightly wider than long. Distimere with distal portion widely concave, heavily tuberculate; apical spine inserted on distinct salience. Ventral plate (fig. 13S) very short and wide; its disc with 1+1 faintly translucent areas. Aedeagus and median sclerite as shown in figure 13T.

PUPA: Cocoon shoe-shaped (fig. 14A–C, F), with large, anteroventral bridge. Color of cocoon light brown. Surface smooth, closely woven, but threads individualized. Rim of aperture distinctly reinforced. Respiratory organs protected laterally by wall of cocoon. Length of cocoon at dorsum along middle to rim of aperture, 4–4.5 mm.; total length to border of anteroventral bridge, 5.5–7 mm.

Length of body of pupa, 4–5 mm. Length of respiratory organs, 1.8–2 mm., viz., slightly less than one-third of length of cocoon, and not quite half so long as pupa proper.

Respiratory organs whitish, with eight filaments (fig. 14G, K, L, N), arranged in fanlike pattern. Three primary branches arising from a short basal trunk. Dorsal primary branch with three filaments, arising simultaneously or at a very short distance from one another, close to base of branch. Median similar in structure to dorsal primary branch. Ventral primary branch divided into two filaments at its base, ventral filament often conspicuously thickened at base, strongly divergent from dorsal filament. Filaments gradually tapering toward their rounded tip. Surface of filaments delicately granulose, granules arranged in spirals.

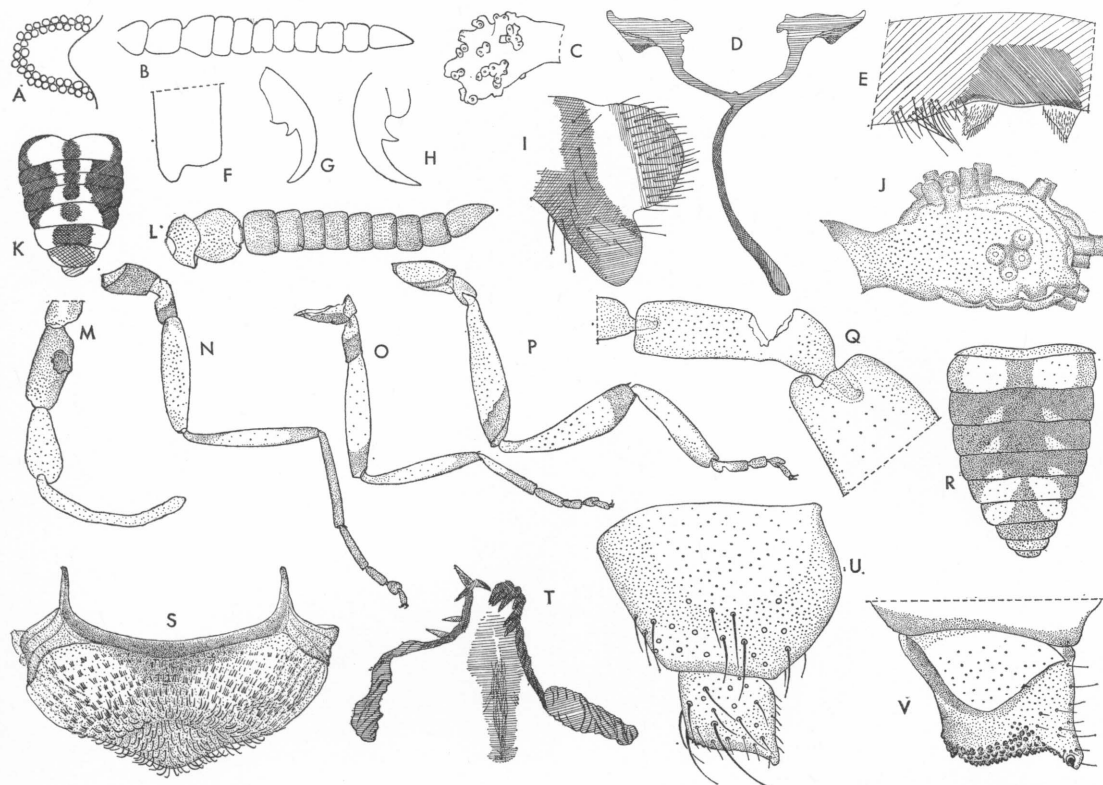


FIG. 13. *Simulium illiesi*. A-I. Female. A. Fronto-ocular triangle. B. Antenna. C. Sensory vesicle of maxillary palp. D. Genital fork. E. Portion of eighth sternite. F. Apex of posterior basitarsus. G, H. Claws of hind leg. I. Paraproct and cercus. J. Male, sensory vesicle of maxillary palp. K. Female, color pattern of abdomen, dorsal view. L-V. Male. L. Antenna. M. Maxillary palp. N. Foreleg. O. Mid leg. P. Hind leg. Q. Apex of posterior basitarsus, with second tarsal segment. R. Color pattern of abdomen, dorsal view. S. Ventral plate. T. Aedeagus, with ventral sclerite. U. Paramere. V. Distimere.

Head and thorax of pupa dark brown. Chaetotaxy of head and thorax shown in figure 14D, J.

Head (fig. 14D) with approximately 40 frontal and facial, and apparently 4+4 ocular, trichomes, their shape as described below for thoracic trichomes. Clypeus heavily beset with platelets.

Thorax (fig. 14J) strongly sclerotized on exposed portion, latter heavily beset with platelets and with a large number (approximately 140+140) trichomes. Trichomes (fig. 14E, H-J, M) narrow at extreme base, then flattened and band-shaped, apically again narrowed and pointed. Trichomes simple or divided near base into from two to four branches, latter closely parallel and difficult to individualize. Length of trichomes, 0.17-0.26 mm.

Chaetotaxy of abdomen much like that of *memorale*, but row of tubercles on tergite VI very poorly developed.

LARVA: Maximum length, 9 mm. Maximum width of head capsule, 0.8 mm. General body shape as shown in figure 15A.

Color of larva whitish (in alcohol). Cephalic apotome light colored, extension of dark pigment much reduced (fig. 15H). Cuticle glabrous, a few hairs near base of anal sclerite.

Antennae as shown in figure 15C, light brown. Second segment with two light constrictions, areas of constriction devoid of pigment. Ratio of length of antennal segments I to III, 1/1.6/0.8; third segment relatively stout, distinctly shorter than first. Mouth brushes with 28-32 rays in large fan. Toothings of mandibles as shown in

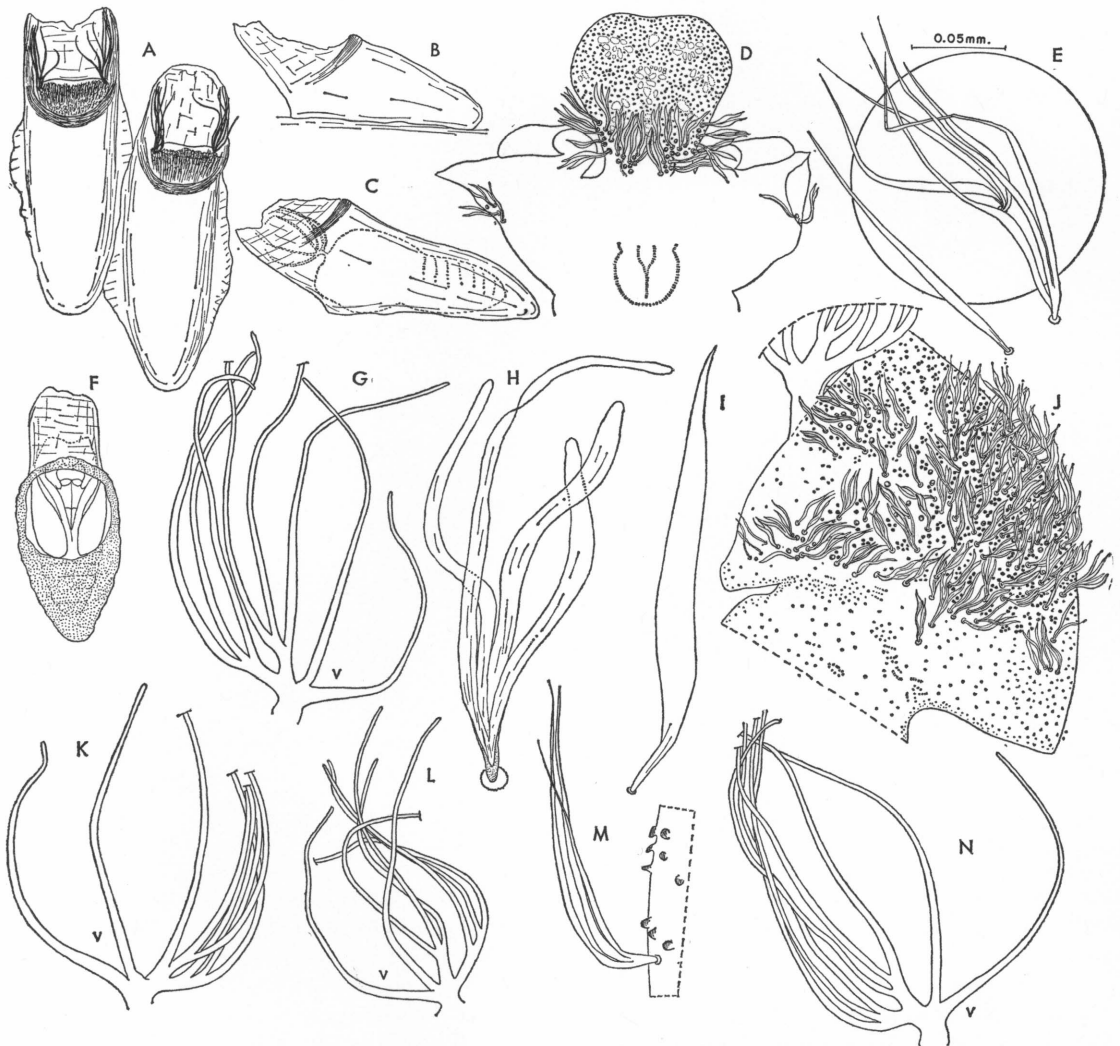


FIG. 14. *Simulium illiesi*, pupa. A. Pupae with cocoons, dorsal view. B, C. Pupa with cocoon, side view, different specimens. D. Head, extended. E. Trichomes of thorax, enlarged. F. Cocoon with pupa, seen from below. G. Respiratory organ. H, I. Trichomes of thorax, enlarged. J. Portion of thorax. K, L. Respiratory organ, different pupae. M. Platelets and trichome at dorsum of thorax, enlarged. N. Respiratory organ. The small letter v indicates the ventral primary branch of the respiratory organ.

figure 15F, similar to that of *nemorale*. Maxillary palp (fig. 15B) faintly pigmented, rather stout. Pigment pattern of hypostomium as shown in figure 15E. Median tooth more pronounced than lateral ones. Lateral serrations distinct. Hypostomial setae arranged in two rows, 15–17 in each group. Disc of hypostomium posteriorly with 1+1 bifid setae. Postgenal cleft pointed, very deep, its apex very close to hypostomial groove (fig. 15D).

Anal sclerite as shown in figure 15G; its

base with simple to trifid scales, few in number. Crochet ring with approximately 86 rows of about 16 hooks each. Anal gills not examined.

MATERIAL EXAMINED: *Argentina*: Chubut: Arroyo Los Repollos [near limits with Río Negro], January 12, 1962 (S. Coscarón; Museo de La Plata), one male, holotype, reared. *Chile*: Aconcagua: stream below Portillo, on Mendoza-Santiago highway, 3000 meters, March 22, 1958 (J. Illies; the Ameri-

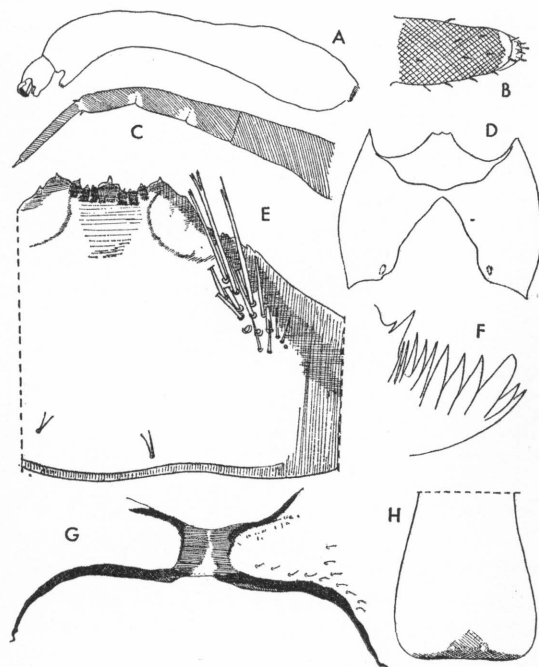


FIG. 15. *Simulium illiesi*, larva. A. General aspect, side view. B. Maxillary palp. C. Antenna. D. Head, seen from below. E. Hypostomium. F. Teeth of mandible. G. Anal sclerite. H. Cephalic apotome, with color pattern.

can Museum of Natural History), several larvae and pupae, one female, allotype, dissected from pupa; one male dissected from pupa.

DISCUSSION: This species is named for Dr. J. Illies who collected part of this and other material.

Simulium illiesi is characterized by the unique chaetotaxy of the pupal thorax. In the shape of its cocoon it resembles *nemorale*, but the latter has a very different thoracic chaetotaxy. The male can be distinguished from that of similar species as shown in the key; the female is not well enough known to be compared with females of related species.

***Simulium (Pternaspatha) simile* Silva Figueroa**

Simulium simile SILVA FIGUEROA, 1917, p. 33, figs. 19, 20. PINTO, 1931, p. 730. VARGAS, 1945, p. 196. BEQUAERT, 1945, p. 114. STUARDO ORTÍZ, 1946, p. 41. WYGODZINSKY, 1949, p. 304; 1958, p. 133. STONE, 1962, p. 207.

Simulium (Simulium) simile: EDWARDS, 1931, p. 153. ORFILA, 1939, p. 1534.

Acropogon simile: ENDERLEIN, 1934, p. 280.

[*Simulium (Pternaspatha)*] *simile*: STONE, 1963, p. 17.

Simulium figueroa Smart, 1944, p. 133 (unnecessary emendation); 1945, p. 505. VARGAS AND DÍAZ, 1951, p. 134, figs. 4-6.

Simulium barbatipes (part) VARGAS AND DÍAZ, 1953, p. 141.

We have examined several males and females of a species of *Pternaspatha* from Chile that we believe to be *simile* Silva Figueroa, as they agree reasonably well with the available descriptions. We have used these specimens to examine the characters for the inclusion of the species in our keys to the males and females of *Pternaspatha*. However, we have not prepared a redescription of *simile*, as this should be based on the complete knowledge of all stages of, preferably, topotypical material.

The species was described from the province of Santiago, Chile.

Nemorale GROUP

***Simulium (Pternaspatha) caprii*, new species**

Figures 16A-M, O-Z; 17; 18

FEMALE: Length of wing, 3.1-3.5 mm.

Head blackish; antennae, palpi, and labium brown, with eyes and basal article of palpus darkest; first and second antennal segments somewhat more light-colored than remainder. Antennae with short hairs, those on two basal segments distinctly longer. Hairs of frons, clypeus, occiput, and palpi silvery to black.

Color pattern of mesonotum very similar to that of *nemorale*, with decumbent, brass-colored to black hairs. Median, longitudinal, light-colored line formed by hairs only, not by gray pigment as in remaining species of the group. Scutellum grayish brown, with long silvery to black hairs. Metanotum and pleura dark brown, with velvety violaceous pollinosity. Pleural tuft pale brass-colored. Color of wings and halteres like that in *nemorale*. Legs brown, with silvery to black hairs; following regions dark: all coxae and trochantera; a small spot on base and a large one on apex of all femora; base and apex of all tibiae; entire fore tarsus, apical half of basitarsus and all remaining segments of mid tarsus, extreme base and apex of basitarsus and second segment, as well as entire

third to fifth segments, of hind tarsus. Exact distribution and relative intensity of pigment of legs as shown in figure 16G-I.

Abdomen (fig. 16J) piceous. Tergites II-V velvety black at center, dark gray at sides; tergite II with 1+1 large, silvery white spots; tergites VI-IX dark, with 1+1 sublateral, silvery white spots decreasing progressively in size toward posterior segments. Ventral surface of abdomen brown.

Frons as shown in figure 16A, with obsolete median sulcus. Fronto-ocular triangle approximately as wide as long (fig. 16B). Shape and proportions of antennal segments as shown in figure 16D. Last segment of maxillary palp (fig. 16E) much longer than two preceding segments combined, and three

times as long as penultimate segment. Diameter of sensory vesicle approximately equal to half of diameter of segment; structure of vesicle as shown in figure 16F. Cibarium with well-sclerotized lateral projections (fig. 16C). Maxillae with about 27, mandibles with about 45, teeth.

General aspect of wings like that in *nemorale*. Sc with approximately 10 setae on central and apical regions. Spines and setae on R_1 in two very irregular rows; setae on R_2 in one row, in some places in two irregular rows.

Shape and proportion of articles of legs as shown in figure 16G-I (as seen in specimen dissected from pupa). Calcipala well developed, slightly wider at base than long (fig.

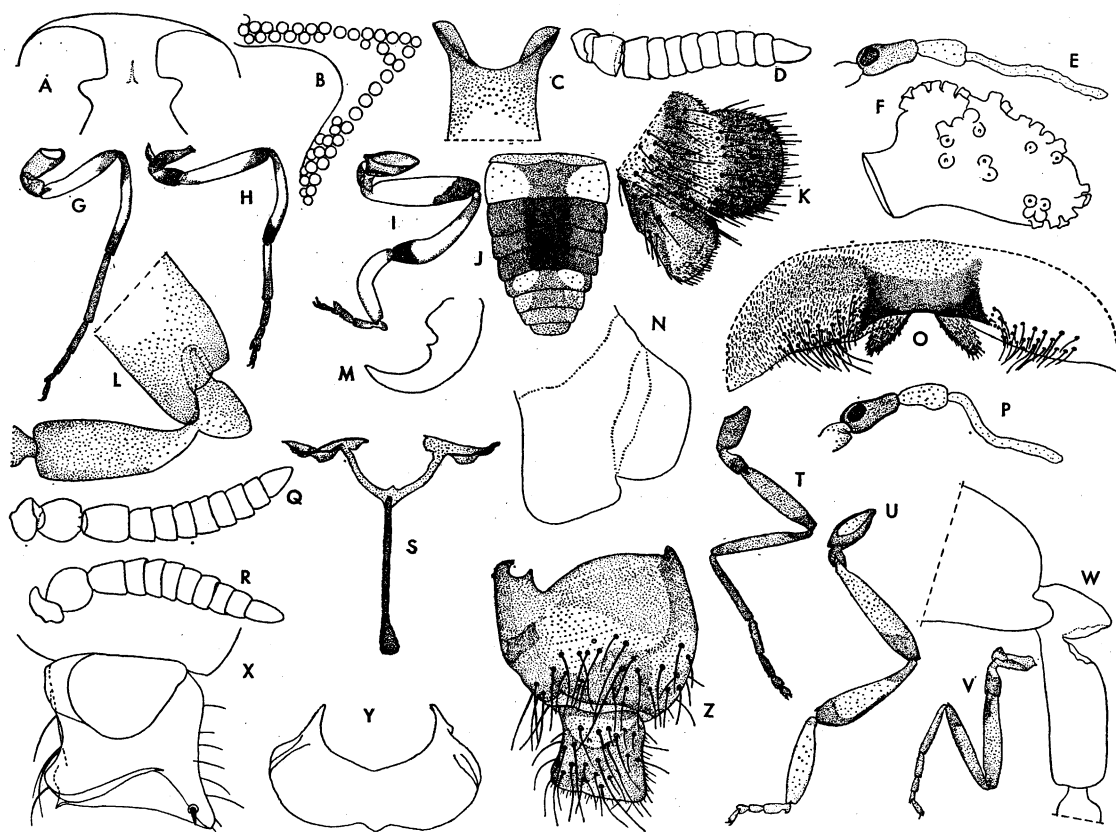


FIG. 16. A-M. *Simulium caprii*, female. A. Frons. B. Fronto-ocular triangle. C. Base of cibarium. D. Antenna. E. Maxillary palp. F. Sensory vesicle of maxillary palp. G. Foreleg. H. Mid leg. I. Hind leg. J. Color pattern of abdomen, dorsal view. K. Paraproct and cercus. L. Apex of posterior basitarsus, with second tarsal segment. M. Claw of hind leg. N. *Simulium schoenemanni*, female, outlines of paraproct and cercus. O-Z. *Simulium caprii*. O. Female, eighth sternite. P-R. Male. P. Maxillary palp. Q, R. Antenna, different views. S. Female, genital fork. T-Z. Male. T. Foreleg. U. Hind leg. V. Mid leg. W. Apex of posterior basitarsus, with second tarsal segment. X. Distimere. Y. Ventral plate. Z. Paramere.

16L). Claws with short tooth (fig. 16M).

Posterior portion of sternite VIII with 1+1 groups of long setae, becoming progressively shorter toward central portion (fig. 16 O); latter more heavily sclerotized than lateral areas. Gonapophyses subtriangular, with microtrichia as shown in figure 16 O; inner borders more strongly pigmented than remainder. Paraprocts and cerci as shown in figure 16K. Cerci higher than wide, their apical margin rounded. Free border of paraprocts with short setae. Genital fork as shown in figure 16S; median process well sclerotized. Spermatheca subglobular, its structure like that in *memorale*.

MALE: Length of wing, 3.3 mm.

Color of head, thorax, wings, and halteres like that of *memorale*. Legs light brown; following regions dark brown: all coxae; trochantera except base; spots at base of fore and mid, and on apex of all, femora, and on base and apex of tibiae of all legs; entire fore tarsus, tarsus of mid legs except basal two-fifths of basitarsus, base and apex of hind basitarsus, basal scale and apical half of second segment, and entire third to fifth segments, of hind tarsus. Exact distribution and intensity of pigment of legs as shown in figure 16T-V.

Abdomen black, with 1+1 silvery gray spots on tergites II, VI, VII, and VIII, most

conspicuous on second, becoming progressively smaller and fainter on posterior segments.

Antennae as shown in figure 16Q, R; basal segments somewhat darker than remaining and with longer hairs. Last segment of maxillary palp (fig. 16P) longer than the two preceding segments combined. Sensory vesicle smaller than half of diameter of third segment.

Wings like that of female, but Sc with not more than seven setae, and spines and hairs on R₁ and R_s slightly less numerous.

Shape and proportions of articles of legs as shown in figure 16T-V. Hind basitarsus narrow, 3.8-4.0 times as long as wide. Calcipala distinct, about as long as wide at its base (fig. 16W). Coxae, trochantera, and femora of forelegs and hind legs, and also tibiae of hind legs, with a large number of long hairs.

Genitalia (fig. 16X-Z) very similar to those of *memorale*. Distimere subquadrate; apical border widely concave, glabrous. Outlines of ventral plate as shown in figure 16Y; 1+1 translucent areas easily perceptible; setae of lateral portion more numerous than in *memorale*.

PUPA: Cocoon (fig. 17C) slipper-shaped, with relatively small, anteroventral bridge. Color of cocoon dark brown; surface relatively rough, threads individualized. Rim of

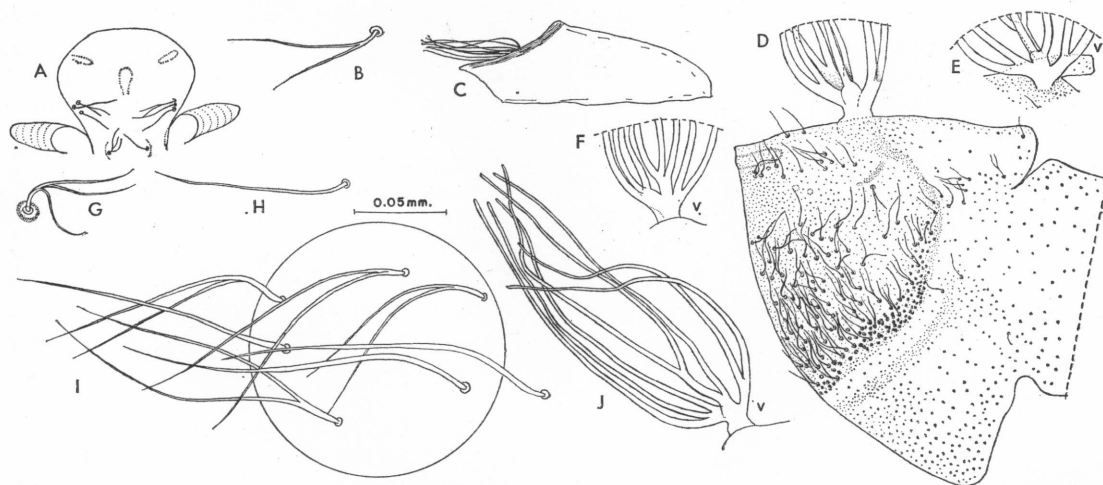


FIG. 17. *Simulium caprii*, pupa. A. Anterior portion of head, extended. B. Frontal trichome, enlarged. C. Pupa and cocoon, lateral view. D. Portion of thorax. E, F. Bases of respiratory organs. G. Facial trichome, enlarged. I. Trichomes of thorax, enlarged. J. Respiratory organ. The small letter v indicates the ventral branch of the respiratory organ.

aperture distinctly reinforced. Respiratory organs protected by walls of cocoon at their extreme base only. Maximum length of cocoon dorsally along middle, 4.2 mm.; maximum length along base, 5.2 mm.

Length of body of pupa, 2.5 mm. Length of respiratory organs, 2.1 mm., viz., less than one-half as long as cocoon, and two-thirds as long as pupa.

Respiratory organs (fig. 17D-F, J) with eight filaments, their general arrangement like that in *memorale*. Some variation observable in different specimens, especially in third filament of dorsal primary branch which in some cases inserts instead on central branch (fig. 17E); location of second division of central primary branch somewhat variable as to its distance from first division. Filaments gradually tapering toward their rounded apex; surface of filaments like that in *memorale*.

Head and thorax of pupa dark brown.

Trichomes of head (fig. 17A) exceptionally long; 3+3 frontal trichomes simple (fig. 17H), or one or two on each side bifid (fig. 17B); 1+1 simple or branched facial (fig. 17G), and

1+1 simple genal, trichomes, latter shorter than others. Clypeus without platelets.

Thorax (fig. 17D) with a band of tubercles adjacent to aperture of cocoon, with numerous interspersed trichomes. Disc of thorax lacking platelets but possessing numerous additional trichomes. Latter slender, hair-like, simple or bifid (fig. 17I), their average length, 0.14 mm. Total number of thoracic trichomes approximately 100+100.

Chaetotaxy of abdomen like that in *memorale*.

LARVA: Maximum length, 7.5 mm.; maximum width of head capsule, 0.7 mm. General body shape as shown in figure 18A.

Color of larva dark greenish brown. Cephalic apotome brown, with darker spots arranged as shown in figure 18B. Some curved, short setae at base of anal sclerite.

Antennae as shown in figure 18C; brown, subapical segment darkest. Second segment with two pigment-free areas, corresponding to two constrictions. Ratios of lengths of antennal segments I to III, 1/1.3/0.9, viz., third segment only slightly shorter than first. Mouth brushes with 35-40 rays in large fan. Toothing of mandible as shown in figure 18F: two external, one strong apical, three subapical, six internal, and two marginal teeth, internal ones variable in size. Maxillary palp as shown in figure 18E. Anterior border of hypostomium strongly pigmented (fig. 18D); median tooth about as prominent as lateral ones; intermediate teeth gradually increasing in size from center to side; sublateral tooth hardly perceptible. Lateral border rugose, with six to seven very small serrations. Hypostomial setae in groups of 12-15, arranged in two irregular series. Disc of hypostomium with few short and simple bifid setae. Gular cleft deep, pointed, similar to that of *memorale*, about twice as deep as postgenal bridge.

Anal sclerite as shown in figure 18G; its base with numerous scales. Crochet ring with approximately 85 rows, each composed of 13-15 hooks. Anal gills (fig. 18H) with three primary lobes, lateral ones each with three or four, median one with from six to eight, lobules.

MATERIAL EXAMINED: Argentina: Chubut: El Triana, February 9, 1961 (S. Coscarón; Museo de La Plata), one female, holotype, reared; *idem* (S. Coscarón; the American Mu-

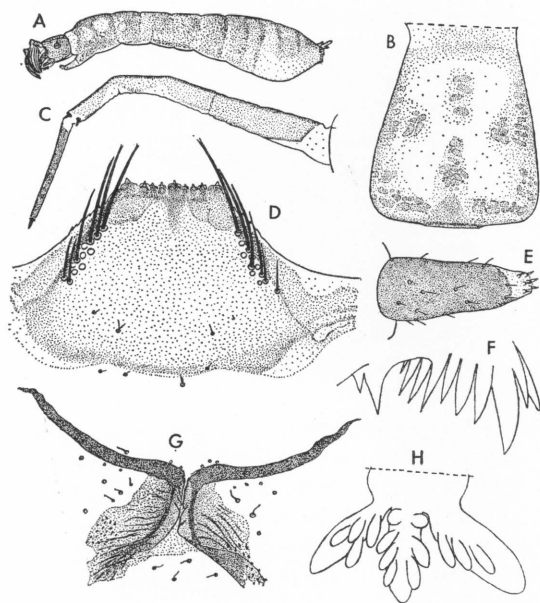


FIG. 18. *Simulium caprii*, larva. A. General aspect, lateral view. B. Cephalic apotome, with color pattern. C. Antenna. D. Hypostomium. E. Maxillary palp. F. Teeth of mandible. G. Anal sclerite. H. Anal gills.

seum of Natural History), several larvae and pupae, one female, paratype, reared; Río Pico, February 17, 1961 (S. Coscarón; the American Museum of Natural History), several larvae and pupae, one male, allotype, reared; *idem* (S. Coscarón; Instituto Nacional de Microbiología), one male dissected from pupa; stream 1 kilometer southeast of Lago Vintter, February 17, 1961 (S. Coscarón; Instituto Nacional de Microbiología), several larvae and pupae.

ECOLOGICAL DATA: The larvae and pupae of this species were found attached to stems of grasses trailing in clear streams as well as on branches of trees that had fallen into the water, and on stones. In El Triana, *Simulium caprii* was found together with *Austrosimulium* (*Paraustrosimulium*) *anthracinum* and with *Gigantodax* sp., and in Río Pico with *Gigantodax* sp.

DISCUSSION: This species is named for our friend Juan J. Capri who accompanied the second author on a field trip to Patagonia where the species was collected.

The new species is similar to *Simulium nemorale* but it is much smaller. The female of *caprii* differs from that of *nemorale* furthermore by the more conspicuous pilosity on the mesonotum which also forms a line along the middle of the sclerite (this line is formed by light-colored pigment in *nemorale* as in all other species of the subgenus), and the central portion of the eighth sternite which is darker than the lateral areas. The males of the two species cannot be distinguished unequivocally by color or structural characters. The most obvious differences between *caprii* and *nemorale* are found in the chaetotaxy of the head and thorax of the pupae, as shown in our descriptions and illustrations.

Simulium (*Pternaspatha*) *nemorale* Edwards

Figures 19–22

Simulium (*Simulium*) *nemorale* EDWARDS, 1931, p. 152, figs. 8b, 10h, 10i, 13f. ORFILA, 1939, p. 1533. VARGAS, 1941, fig. 4b'.

Simulium nemorale: SMART, 1945, p. 509. VARGAS, 1945, p. 168. WYGODZINSKY, 1949, p. 304. VARGAS AND DÍAZ, 1951, p. 138, figs. 8–10.

FEMALE: Length of wing, 3.2–4.0 mm.

Head black; eyes, antennae, palpi, and labium dark brown; occiput, frons, and clypeus gray pollinose. Pilosity of antennae very

short, that of palpi, clypeus, frons, and occiput somewhat longer; hairs brass-colored to black. First and second segments of antennae slightly lighter colored than remainder, and with longer hairs.

Mesonotum (fig. 19H) black, with 1+1 silvery gray, submedian stripes arising from 1+1 anterior white spots. Median dark stripe divided longitudinally by delicate white line; submedian stripes and white line confluent near posterior border of mesonotum connected to gray lateral borders of sclerite. Adpressed setae of mesonotum brass-colored, dense, somewhat obliterating pattern. Scutellum grayish brown, spines and hairs brass-colored to dark brown. Metanotum brown to black, silvery pollinose. Pleural tuft brass-colored. Wings hyaline, veins light brown, spines and hairs black, including those at base of wing. Stem of halteres brownish, their knob yellowish. Legs light brown, their hairs silvery to black; following regions darkened: all coxae, but those of fore legs less intensely so; base and apex of femora (except base of hind femur) and tibiae; entire fore tarsi, mid tarsi except on elongate light-colored area on basal half of basitarsus, hind tarsi with a spot on base and dorsal surface of apical portion of basitarsus, extreme base and apical third of second segment and entire third to fifth segments. Exact proportions and relative intensity of pigmented areas as shown in figures 19M–O.

Abdomen (fig. 19T, U) black; 1+1 large, silvery gray spots on sides of tergite II, and 1+1 smaller and more medially situated spots on tergite III. Tergites IV and V generally entirely black except a narrow line laterally on hind margin, very rarely with traces of paired very narrow gray spots, as shown in figure 19T. Tergite VI white except at sides and a forward-pointing, triangular, central, posterior, dark gray spot. Tergites VI–IX black, with lateral light-colored areas diminishing in size toward posterior segments. Hairs of abdomen, including those of basal fringe, brass-colored, rarely with a silvery tinge.

Frons as shown in figure 19C, with obsolete median sulcus. Fronto-ocular triangle approximately as long as wide (fig. 19A, B). Shape and proportion of antennal segments as shown in figure 19F, G. Last segment of

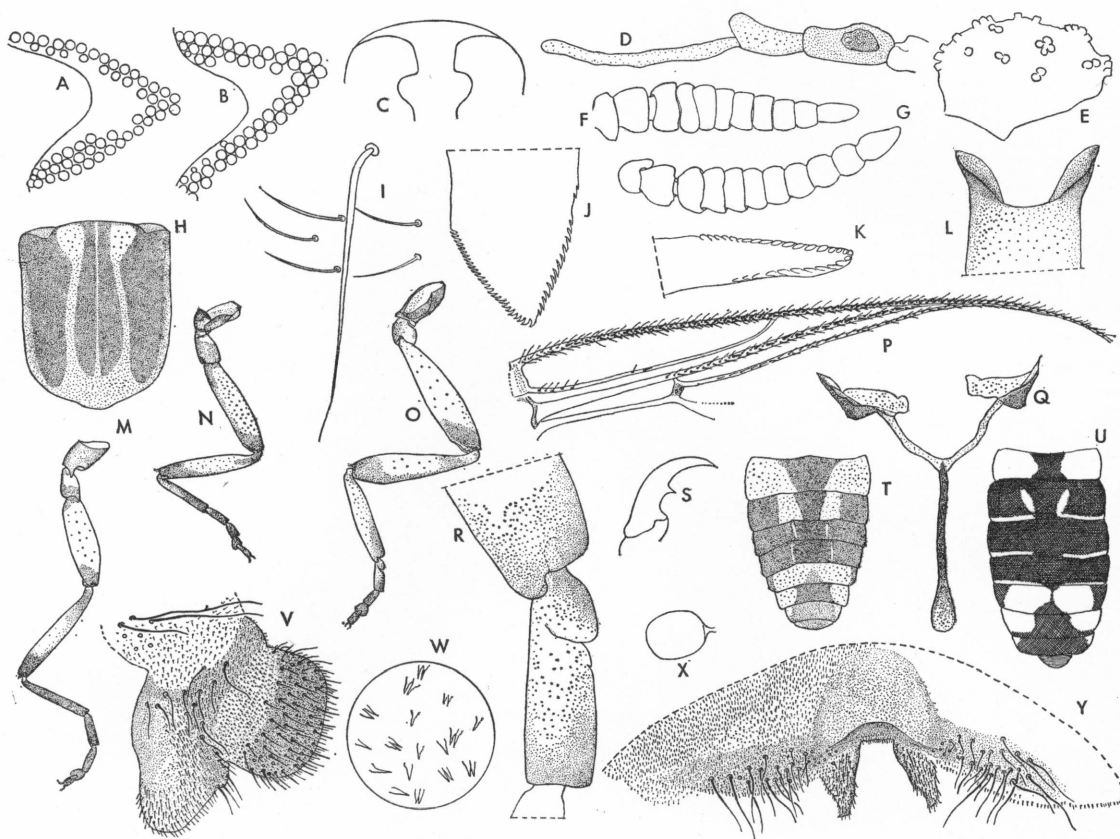


FIG. 19. *Simulium nemorale*, female. A, B. Fronto-ocular triangle, different specimens. C. Frons. D. Maxillary palp. E. Sensory vesicle of maxillary palp. F, G. Antenna. H. Color pattern of mesonotum. I. Setae of mesonotum, enlarged. J. Apex of mandible. K. Apex of maxilla. L. Base of cibarium. M. Foreleg. N. Mid leg. O. Hind leg. P. Anterior portion of wing. Q. Genital fork. R. Apex of hind basitarsus, with second tarsal segment. S. Claw of hind leg. T, U. Color pattern of abdomen, dorsal view. V. Para-proct and cercus. W. Structure of inner surface of spermatheca. X. Outline of spermatheca. Y. Eighth sternite.

maxillary palp (fig. 19D) more than twice as long as penultimate segment and slightly longer than the two preceding segments combined. Diameter of sensory vesicle at least equal to half of the width of third segment; its structure as shown in figure 19E. Base of cibarium with well-sclerotized lateral projections; central portion glabrous, membranous (fig. 19L). Maxillae (fig. 19K) with 25–29, mandibles (fig. 19J) with about 40, teeth.

Mesonotum with isolated long hairs and numerous short, adpressed setae (fig. 19I).

General aspect of wings as illustrated by Edwards (1931, fig. 8b). Sc with a few setae on its basal, and from one to eight setae on its central, portion. Basal portion of R glabrous.

R_1 with hairs and spiniform setae arranged in several rows. R_s with one or two irregular rows of setae (fig. 19P).

Shape and proportions of articles of legs as shown in figure 17M–O. Calcipala distinct, approximately as long as wide at its base (fig. 19R). Claws with well-developed tooth (fig. 19S).

Tergal plates of abdomen large; ventral plates not developed. Posterior portion of eighth sternite with 1+1 groups of long hairs becoming progressively shorter toward inner portion (fig. 19Y); central portion lighter than lateral areas; hind border distinctly pigmented. Gonapophyses subtriangular, beset with microchaetae, their inner border

slightly sclerotized. Paraprocts and cerci as shown in figure 19V. Cerci higher than wide; distal border rounded. Paraprocts short, their apex rounded. Genital fork (fig. 19Q) with median process distinctly sclerotized except its apex which is widened; anterior projections narrow, with wide, medially directed expansions; pigment distribution as illustrated. Spermatheca oval, its inner surface with minute spiculae arranged in rows of from two to five (fig. 19W).

MALE: Length of wing, 3.8 mm.

Head blackish. Eyes, occiput, antennae, and palpi dark brown, almost black; clypeus black, gray pollinose. Antennae with short pubescence; first and second segments with long brown to blackish hairs. Occiput, clypeus, and basal segments of maxillary palp with numerous long hairs, latter also in a row between eyes.

Mesonotum black, with adpressed setae which appear to be golden to black. Scutellum light brown, with brown to black hairs. Metanotum dark brown, golden pollinose. Pleura dark brown, silvery pollinose. Wings

and halteres colored like those in female. Legs brown, their hairs golden to black; following regions dark: all coxae; all trochantera except extreme base; one short basal and one wider distal annulus on fore and mid femora and one apical annulus on hind femur; one basal and one apical annulus on tibiae as well as a lateral band connecting them; entire tarsus of forelegs; entire mid and hind tarsi except basal half of inner surface of mid basitarsus and a white subbasal annulus on posterior basitarsus. Exact proportion and relative intensity of pigmented areas as shown in figure 20C-E.

Abdomen velvety black, its hairs golden to black. Tergites II and VI with 1+1 silvery gray spots, those of second segment larger and more brilliant, those of sixth segment darker, with bluish tinge.

Shape and proportion of antennal segments as shown in figure 20A. Last segment of maxillary palp (fig. 20B) more than twice as long as penultimate; diameter of sensory vesicle smaller than half of diameter of third segment.

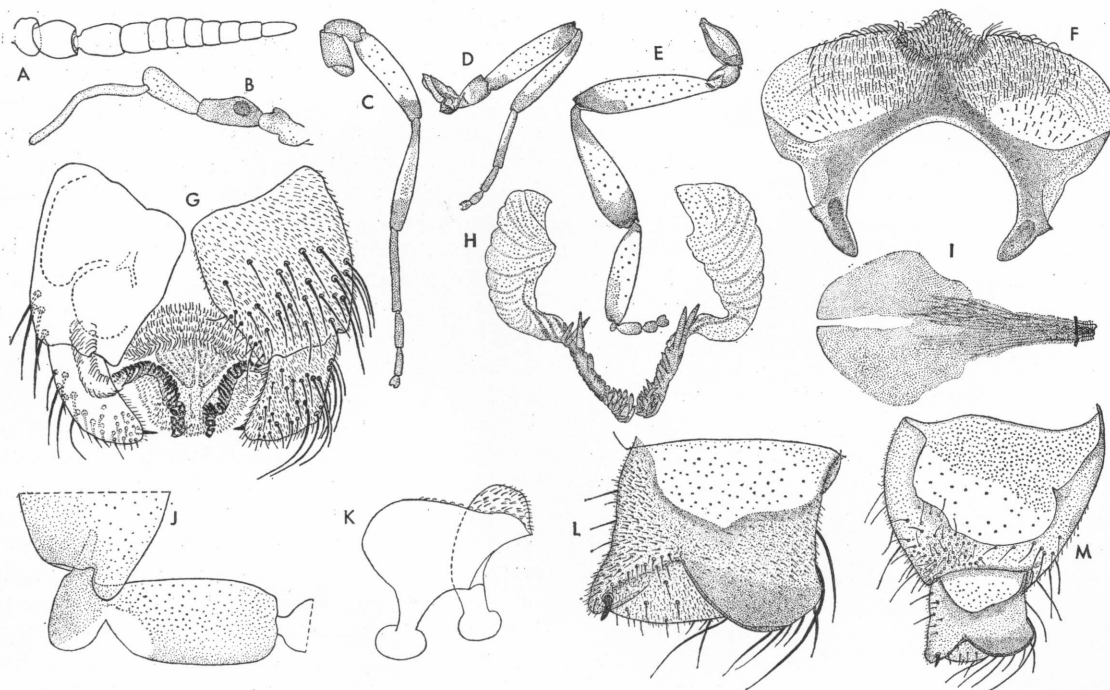


FIG. 20. *Simulium nemorale*, male. A. Antenna. B. Maxillary palp. C. Foreleg. D. Mid leg. E. Hind leg. F. Ventral plate. G. Genitalia, ventral view. H. Aedeagus. I. Median sclerite. J. Apex of posterior basitarsus, with second tarsal segment. K. Ventral plate, anterolateral view. L. Distimere. M. Paramere.

Wings like those of female, but center of Sc only occasionally with setae, and hairs and spiniform setae on R_1 slightly less numerous.

Shape and proportion of articles of legs as shown in figure 20C-E. Hind basitarsus 3.8 times as long as wide. Calcipala well developed, about as long as wide at base (fig. 20J). Dorsal plates of abdominal tergites well developed; ventral plates small. Genitalia as shown in figure 20F-I, K-M. Parameres well pigmented, with abundant long hairs. Basimere subtrapezoidal, slightly wider than long. Distimere subquadrate, distal portion widely concave, glabrous (figs. 20L). Central portion of ventral plate salient posteriorly at middle, with numerous curved setae; lateral projections and basal margin distinctly sclerotized (fig. 20F). Disc of ventral plate with 1+1 translucent areas. Aedeagus (fig. 20H) membranous, with strongly pigmented spines. Median sclerite as shown in figure 20I.

PUPA: Cocoon shoe-shaped (fig. 21D), with large, anteroventral bridge. Color of cocoon light brown; surface smooth, closely woven; threads not individualized. Rim of aperture slightly reinforced. Respiratory organs protected laterally by walls of cocoon, only some of dorsal filaments free. Length of cocoon at dorsum along middle, 4.2 mm.; maximum length along base, 6 mm.

Length of body of pupa, 3.8 mm. Length of respiratory organs 1.9 mm., viz., one-third as long as cocoon and one-half as long as pupa proper.

Respiratory organs (fig. 21C, D, I, J) with eight almost parallel filaments, slightly converging toward their apices. Three primary branches arising from a short basal trunk. Dorsal primary branch with three filaments, ventralmost filament arising at base of branch. Median primary branch with three filaments, first division of branch shortly beyond its origin, second division again at a short but somehow variable distance. Ventral primary branch with two filaments, divided a short distance from its base. Filaments gradually tapering toward their rounded tips (fig. 21B). Surface of filaments delicately granulose, granules arranged in spirals.

Head and thorax of pupa light brown.

Chaetotaxy of head, thorax, and abdomen as illustrated in figure 21A, G, H.

Head with 3+3 simple, short, frontal, 1+1 long, mostly branched facial, and 1+1 simple long, ocular trichomes (fig. 21E, H, M, L); anterior portion of frons more strongly pigmented.

Thorax more strongly sclerotized on exposed than on covered portion. Region adjacent to aperture of cocoon with a band of platelets and numerous interspersed, very short and stout trichomes (fig. 21G, K); several smaller platelets posteriorly on covered portion of thorax. Disc of thorax on each side with approximately 20 additional trichomes; their size and exact distribution individually variable, in some cases bifid, in latter case generally longer than others. Toward ventral surface, along band of platelets, additional trichomes, similar to those described above, but more delicate (fig. 20F). Total number of thoracic trichomes, approximately 60+60.

Abdominal tergites light brown, intensity of pigment diminishing toward posterior segments. Chaetotaxy as shown in figure 21A. Tergite I with 2+2 delicate setae (dorso-lateral and anterior dorsolateral). Tergite II with 3+3 relatively small, anterior, equidistant spines situated approximately in center of posterior half of tergite, and 7+7 setae distributed as follows: 3+3 (or 4+4) lateral, 1+1 dorsolateral (these being largest), and 2+2 anterior dorsolateral, in some cases reduced to 1+1 very small setae. Tergite III with 4+4 large spines, outermost one on each side separated from next by wider space than that which separates others, and 4+4 setae distributed as follows: 1+1 dorsocentrals, 2+2 anterior dorsocentrals, and 1+1 lateral. Tergite IV with 4+4 large spines arranged as on third tergite, and 2+2 dorsocentral setae. Tergite V with 3+3 setae (1+1 dorsal, 1+1 dorsolateral, and 1+1 lateral). Tergite VI with 1+1 combs of spiniform tubercles near anterior border, becoming progressively smaller laterally and finally scalelike, their number in each row about 12, and 1+1 dorsal setae. Tergites VII and VIII with 1+1 combs of from eight to 10 small, spinelike tubercles transformed in lateral regions into scalelike structures, as on foregoing tergite, and with

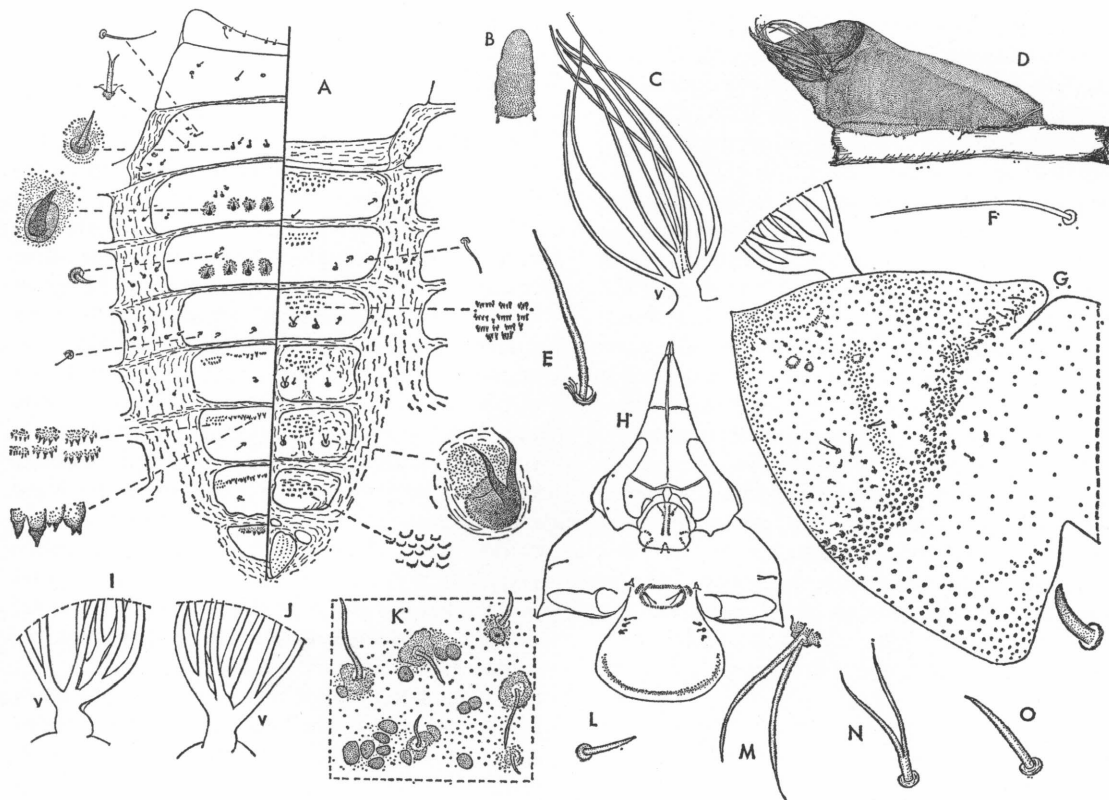


FIG. 21. *Simulium nemorale*, pupa. A. Chaetotaxy of abdomen; tergites to the left, sternites to the right. B. Apex of filament of respiratory organ. C. Respiratory organ. D. Pupa with cocoon. E. Ocular trichome, enlarged. F. Thoracic trichome, enlarged. G. Portion of thorax. H. Head, extended. I, J. Base of respiratory organ, different specimens. K. Platelets and trichomes of thorax, enlarged. L. Frontal trichome, enlarged. M. Facial trichome, enlarged. N, O. Thoracic trichomes, enlarged. The small letter v indicates the ventral branch of the respiratory organ. D by Elvira Bueno.

1+1 dorsocentral setae; tubercles on VIII in some cases forming a continuous row.

Sternite III with 1+1 lateral, and 1+1 ventral, setae; anteromedian region with transverse group of small and very delicate, scalelike structures which are found on all sternites to the eighth, becoming progressively larger toward posterior segments. Sternite IV with 3+3 ventrolateral setae, scales arranged in 1+1 anteromedian groups as in remaining sternites. Sternites V–VII with 2+2 spines (ventral and ventrolateral) before posterior margin, spines of each pair close to one another on segment V, separated by wider spaces on segment VI and VII; ventral spines bifid, ventrolateral bifid, or, more frequently, simple. Sternites VI and VII

with 1+1 small setae situated near ventral spines. Sternite VIII without setae but with scales; IX glabrous, slightly more sclerotized than sternite VIII.

LARVA: Maximum length, 6 mm. Width of head capsule, 0.37 mm. General body shape as shown in figure 22A.

Color of larva whitish. Cephalic apotome light-colored, darker along middle and at hind margin (fig. 22E). Cuticle with isolated short hairs, more numerous toward posterior end.

Antennae as shown in figure 22C, light brown, subapical segment darkest; second segment with two slight constrictions, regions of constrictions with unpigmented areas. Ratio of lengths of segments I to III,

1/1.2/0.8; third segment relatively stout, slightly shorter than first. Mouth brushes with 37–40 rays in large fan. Toothing of mandibles as shown in figure 22B; two external, one strong apical, three approximately identical subapical, five internal and two marginal, teeth, first of which much larger than second. Maxillary palp as shown in figure 22H. Anterior border of hypostomium strongly pigmented (fig. 22D); median tooth less prominent than lateral ones; intermediate teeth gradually increasing in size from II to IV; sublateral tooth barely perceptible. Lateral borders rugose, with four to five very small serrations. Hypostomial setae arranged in two irregular rows, about 14 in each group. Disc of hypostomium glabrous. Postgenal cleft (fig. 22G) deep, pointed, its depth much larger than postgenal bridge.

Anal sclerite as shown in figure 22F; its base with from simple to trifid scales in large number. Crochet ring with about 85 rows,

each composed of approximately 15 hooks. Anal gills with three simple lobes.

MATERIAL EXAMINED: *Argentina*: Neuquén: Hua-Hum, Lago Lacar, January 30, 1949 (F. Monrós; the American Museum of Natural History), five females; *idem* (F. Monrós; Instituto Miguel Lillo), five females; Río Negro: Ruca Malen, Lago Correntoso, in river connecting Lago Correntoso and Lago Espejo Chico, November 30, 1950 (P. Wygodzinsky; the American Museum of Natural History), several larvae and pupae, two reared males and three reared females; *idem* (P. Wygodzinsky; collection Coscarón), several larvae and pupae, two reared males and one reared female; Cerro Catedral, 1800 meters, January 9, 1962 (S. Coscarón; the American Museum of Natural History), four females; *idem* (S. Coscarón; collection Coscarón), four females; Paso Córdoba, General Roca, January 1, 1962 (A. Bachmann; the American Museum of Natural History), two females. Chubut: Lago Futalaufquen, January 13, 1962 (S. Coscarón; the American Museum of Natural History), 10 females; *idem* (S. Coscarón, Instituto Nacional de Microbiología), 15 females. Tierra del Fuego: Lago Fagnano, January 19, 1962 (S. Coscarón; the American Museum of Natural History), four females. *Chile*: Aisen: Laguna Fría, Coihaique, valley of Río Simpson, January 20–30, 1961 (L. Peña; Canadian National Collection), eight females; *idem* (L. Peña; the American Museum of Natural History), one female. Two female paratypes preserved in the United States National Museum were also examined.

ECOLOGICAL DATA: The pupae were found attached to roots of the bamboo *Chusquea culeou* Desvaux (common name, *caña colihué*) trailing in the water, at about 10 cm. under the surface.

DISCUSSION: Our specimens differ from Edwards' description by the distinctly bicolored legs of males and females; Edwards' specimens had much darker legs. A different intensity of leg color in one species has been reported also from other neotropical specimens of *Simulium* (Wygodzinsky, 1951).

The genitalia of the female have been found to agree well with those in the description given by Vargas and Díaz (1951).

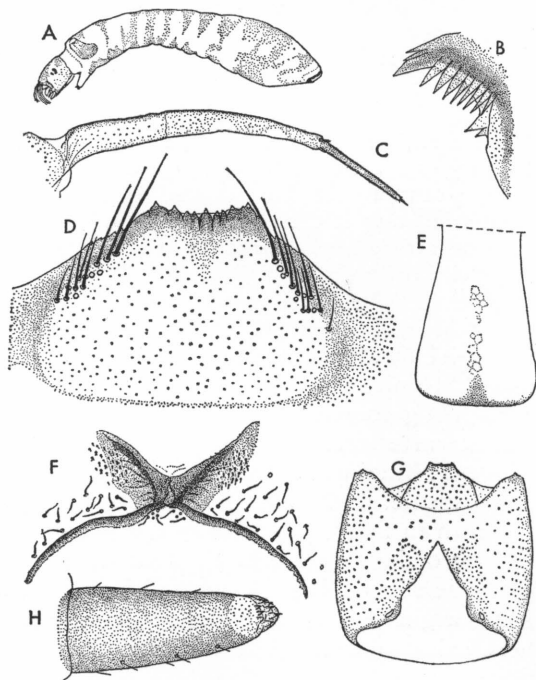


FIG. 22. *Simulium nemorale*, larva. A. General aspect, side view. B. Teeth of mandible. C. Antenna. D. Hypostomium. E. Cephalic apotome, with color pattern. F. Anal sclerite. G. Head from below. H. Maxillary palp.

Simulium (Pternaspatha) schoenemanni
(Enderlein)

Figure 16N

Acropogon schoenemanni ENDERLEIN, 1934, p. 277.

Simulium schoenemanni: SMART, 1945, p. 513. VARGAS, 1945, p. 195. STUARDO ORTÍZ, 1946, p. 41.

This species was described from Cauquenes in central Chile. The type, a female, could not be found. A detailed redescription of this species must await the finding of larvae and especially pupae, if possible, from the area of the type locality.

Specimens from the province of Coquimbo, which we believe to represent this species, are very similar to our *caprii*; the males of the two species cannot be distinguished, but the females differ by the characters given in our key. The cercus and paraproct of a female of *schoenemanni* from Coquimbo are illustrated here in order to show the differences in these sclerites between the two species.

Annulatum GROUP

***Simulium (Pternaspatha) annulatum* Philippi**

Figures 23–25

Simulium annulatum PHILIPPI, 1865, p. 634. KERTÉSZ, 1902, p. 285. KNAB, 1914, p. 18. SILVA FIGUEROA, 1917, p. 30. PINTO, 1931, p. 727. EDWARDS, 1931, p. 153. SMART, 1945, p. 500. VARGAS, 1945, p. 112. STUARDO ORTÍZ, 1946, p. 42.

Simulium varipes PHILIPPI, 1865, p. 634. KERTÉSZ, 1902, p. 291. SILVA FIGUEROA, 1917, p. 30. PINTO, 1931, p. 730. SMART, 1945, p. 515. VARGAS, 1945, p. 205. VARGAS AND DÍAZ, 1951, p. 139, figs. 11–13. STUARDO ORTÍZ, 1946, p. 41. STONE, 1963, p. 5. New synonymy.

Simulium (Simulium) varipes: EDWARDS, 1931, p. 152.

Friesia varipes: ENDERLEIN, 1929, p. 327, fig. 1; 1930, p. 92.

Dasytelmoza varipes: ENDERLEIN, 1934, p. 275.

FEMALE: Length of wing, 3.2 mm.

Color of head and its appendages, and of thorax, halteres, and wings like that in *nemorale*. Legs light brown, following regions darker: mid and hind coxae; apical halves of trochantera; apices of all femora and tibiae; entire fore tarsus, apex of first tarsal segment of mid tarsus as well as all other segments

entirely, apical third of hind basitarsus, apical two-thirds of second and entire third, fourth, and fifth segments of hind tarsus. Exact proportions and relative intensity of pigmented areas as shown in figures 23J–L.

Abdomen (fig. 23O) black on tergites I–V, dark gray on remainder; silvery gray areas distributed as follows: a narrow line on posterior border of tergite I; 1+1 large lateral spots on tergite II; 1+1 very delicate lines on lateral portions of posterior borders of tergites II–V; 1+1 large lateral spots, in some cases meeting medially and thus occupying entire tergite, on tergites VI–IX. Ventral surface of abdomen almost entirely gray pollinose. Hairs of abdomen, including those of basal fringe, silvery.

Frons as shown in figure 23A, median sulcus obsolete. Fronto-ocular triangle slightly wider than long (fig. 23B). Shape and proportions of antennal segments as shown in figure 23E. Last segment of maxillary palp (fig. 23C) almost twice as long as penultimate, and as long as the two preceding segments combined. Sensory vesicle like that in *barbatipes*. Base of cibarium with well-sclerotized lateral projections (fig. 23H). Maxillae with approximately 25 teeth (fig. 23G), mandibles with about 48 teeth (fig. 23F).

Mesonotum with abundant decumbent setae, longer erect ones on posterior declivity.

General structure of wings (fig. 23D) like that in *nemorale*, but setae on Sc more numerous (15–30) and several rows of setae also on basal sector of R. Setae and spines on R₁ arranged in several rows; hairs on R₄ in a single row.

Shape and proportions of articles of legs as shown in figures 23J–L. Calcipala (fig. 23M) well developed, about as long as wide. Claws with well-developed tooth (fig. 23I).

Eighth sternite as shown in figure 23R; central portion glabrous, lighter than lateral areas. Gonapophyses rounded apically, beset with microchaetae, their inner margins more strongly sclerotized. Paraprocts and cerci as shown in figure 23P, Q. Cerci much higher than wide, their distal margin truncate to slightly rounded. Projecting portion of paraprocts subtriangular. Median process of genital fork (fig. 23N) strongly sclerotized, extreme apex widened; anterior projections

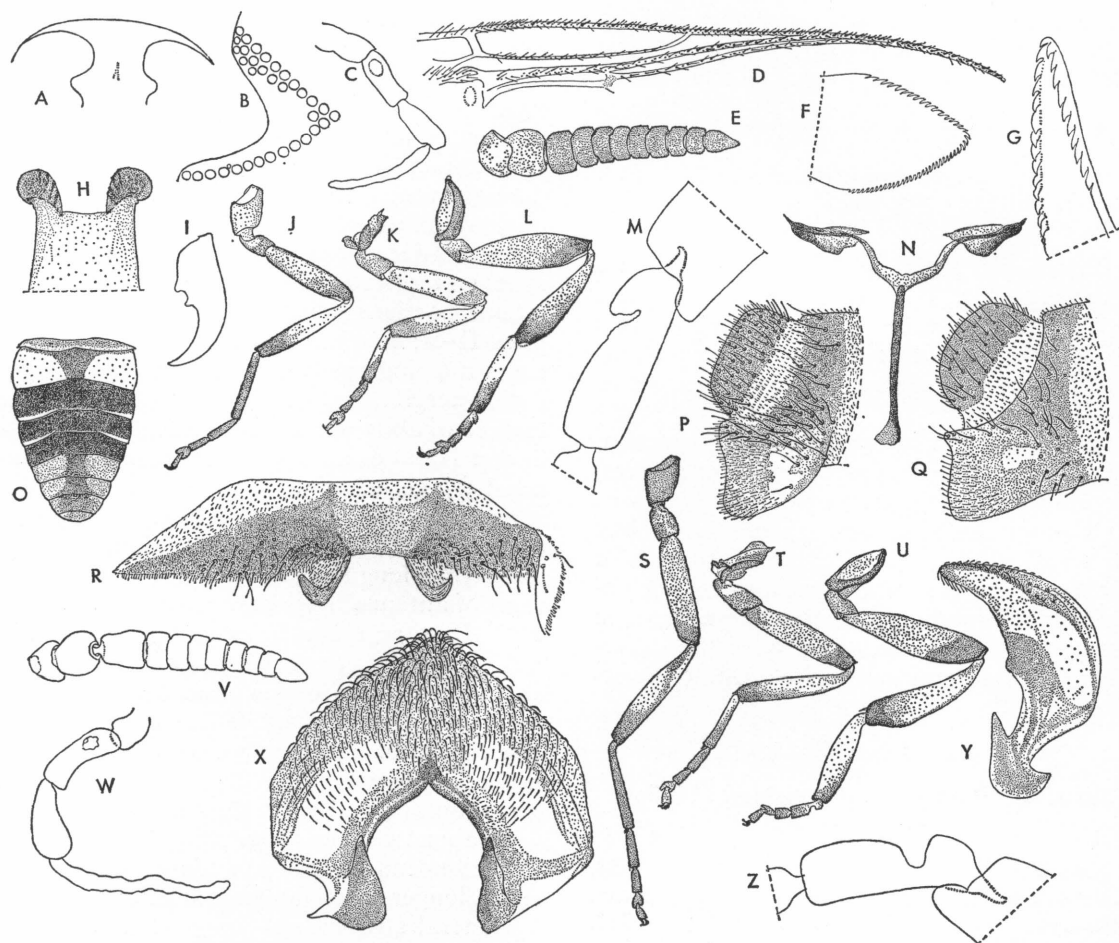


FIG. 23. *Simulium annulatum*. A-R. Female. A. Frons. B. Fronto-ocular triangle. C. Maxillary palp. D. Anterior veins of wing. E. Antenna. F. Apex of mandible. G. Apex of maxilla. H. Base of cibarium. I. Claw. J. Foreleg. K. Mid leg. L. Hind leg. M. Apex of posterior basitarsus, with second tarsal segment. N. Genital fork. O. Color pattern of abdomen, dorsal view. P, Q. Cercus and paraproct, different specimens. R. Eighth sternite. S-Z. Male. S. Foreleg. T. Mid leg. U. Hind leg. V. Antenna. W. Maxillary palp. X. Ventral plate, flattened. Y. Ventral plate, side view. Z. Apex of posterior basitarsus, with second tarsal segment.

narrow, with wide lateral expansions at their tips, more conspicuously pigmented along their borders. Spermatheca ovate, inner surface with minute spiculae as in *barbatipes*.

MALE: Length of wing, 3 mm.

Head and its appendages like those of *nemorale* in color.

Mesonotum black, with golden-colored, decumbent setae. Rest of thorax with halteres and wings like those of *nemorale* in color. Fore legs dark brown, mid and hind legs light brown, setae brown to black; the following regions almost black: coxae and trochan-

tera of all legs; a small basal spot on fore and mid femora, and a large apical annulus on all femora; a basal spot and a distal annulus on all tibiae, connected by a delicate lateral line most distinctive on first pair; entire fore tarsus, all segments of mid tarsus except a narrow white stripe on base of under surface of first article, extreme base and apex of basitarsus of hind leg, base and apical half of second segment and entire third to fifth segments. Exact proportions and relative intensity of pigmented areas as shown in figure 23S-U.

Abdomen velvety black dorsally, with golden-colored hairs; tergites II, VI, and VII with 1+1 lateral silvery gray spots, those of tergite VI with bluish tinge and meeting at center anteriorly, those of VII the smallest and more laterally situated. Tergite IX dark gray pollinose. Sternites grayish to dull brown.

Shape and proportions of antennal segments as shown in figure 23V. Last segment of maxillary palp (fig. 23W) more than twice as long as penultimate, and longer than the two preceding segments combined. Diameter of sensory vesicle approximately half of that of third segment.

Wings like those in female, but hairs on basal portion of R slightly less numerous. Shape and proportions of articles of legs as shown in figures 23S-U. Basitarsus of hind legs 4.2 times as long as wide. Calcipala well developed, slightly wider than long (fig. 23Z).

Genitalia similar to those of *nemorale*, but the 1+1 translucent, window-like areas of of basal plate (fig. 23X) larger, and hairs longer.

PUPA: Cocoon slipper-shaped (fig. 24A, B), with elongate anteroventral bridge. Color of cocoon light or dark brown; surface smooth, closely woven, but individual threads perceptible; rim of aperture slightly reinforced. Respiratory organs protected laterally by cocoon at their extreme base only. Length of cocoon at dorsum along middle, 3.3 mm.; maximum length along base, 4.5 mm.

Length of pupa proper, 3.6 mm.; length of respiratory organs, 2.5 mm., viz., about half as long as cocoon, and two-thirds as long as pupa proper.

Respiratory organs (fig. 24C, D, H-K) with six closely parallel filaments. Three primary branches arising from a short basal trunk, dorsal and ventral branches bifurcated

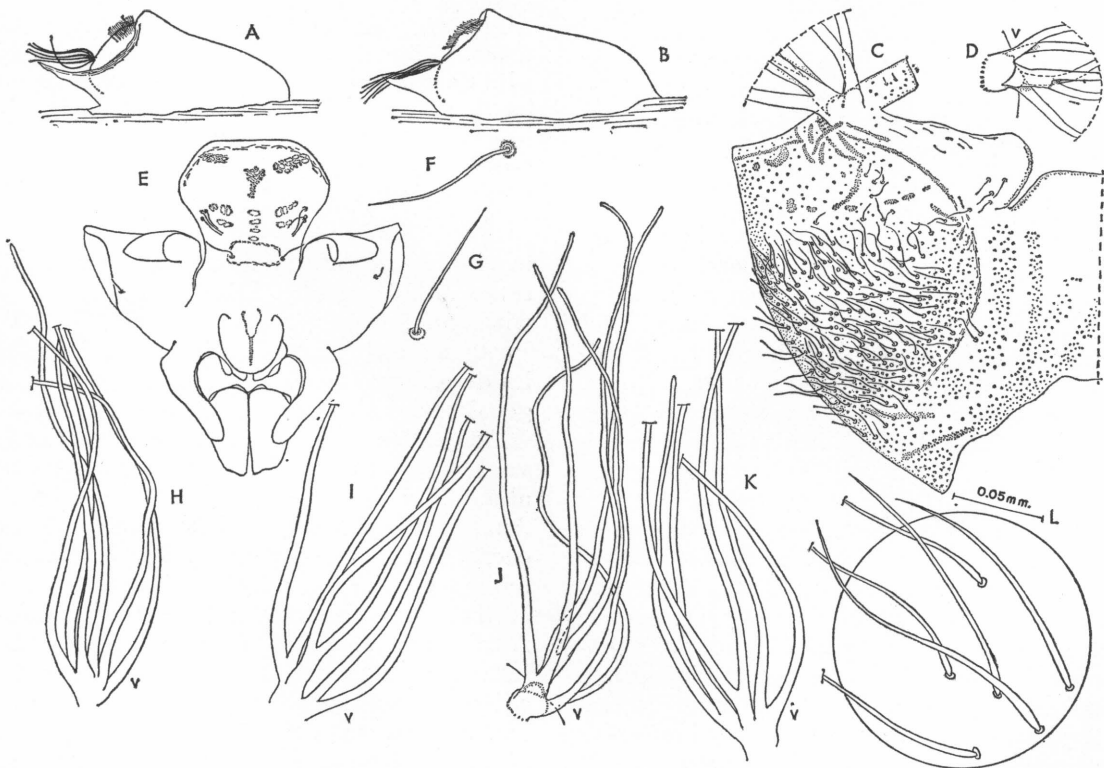


FIG. 24. *Simulium annulatum*, pupa. A, B. Pupa and cocoon, lateral aspect, different specimens. C. Portion of thorax. D. Base of respiratory organ. E. Head, extended. F. Frontal trichome, enlarged. G. Facial trichome, enlarged. H-K. Respiratory organ, different specimens. L. Thoracic trichomes, enlarged. The small letter v indicates the ventral branch of the respiratory organ.

at a very short distance from their base, median branch at a slightly longer distance. Filaments tapering toward their rounded tips. Surface of filaments minutely granulose, granules arranged in spirals.

Head and thorax of pupa distinctly pigmented, more strongly so on frontal region of head and anterior dorsal portion of thorax. Chaetotaxy of head and thorax as shown in figure 24C, E; all trichomes simple, hairlike.

Head (fig. 24E) with 3+3 frontal, 1+1 facial, and 1+1 ocular, trichomes.

Region of thorax adjacent to aperture of cocoon with a band of small platelets, some platelets also dorsally on portion of thorax covered by cocoon. Transverse area of platelets and most of dorsal exposed portion of thorax with a dense cover of long trichomes (fig. 24C, L), their total number approximately 150+150, their length, 0.14–0.17 mm.

Abdomen of pupa much like that of *nemorale*, spines on tergite II relatively smaller.

LARVA: Maximum length, 6.5 mm.; maximum width of head capsule, 0.66 mm. General body shape as shown in figure 25D.

Color greenish brown. Head brown. Markings of cephalic apotome conspicuous, somewhat variable (fig. 25C, E). Body integument with isolated delicate hairs, latter numerous at base of anal sclerite (fig. 25G).

Antennae brown, pigment most intense on third segment (fig. 25A); second segment with two faint constrictions corresponding to less-pigmented areas. Ratio of lengths of segments I to III, 1/1.3/0.9, viz., third segment slightly shorter than first. Mouth brushes with approximately 40 rays in large fan. Toothing of mandibles as shown in figure 25B; two external, one strong apical, three subapical (third somewhat smaller than two anterior ones), five or six dissimilar internal and two marginal teeth, first of latter much larger than second. Maxillary palp as shown in figure 25H; strongly pigmented; setae not numerous. Anterior border of hypostomium (fig. 25F) distinctly pigmented, median tooth less prominent than lateral ones; intermediate teeth gradually increasing in size from inner to outer ones; sublateral teeth very small. Lateral borders of hypostomium serrulated, with five small teeth. Hypostomial setae arranged generally in two,

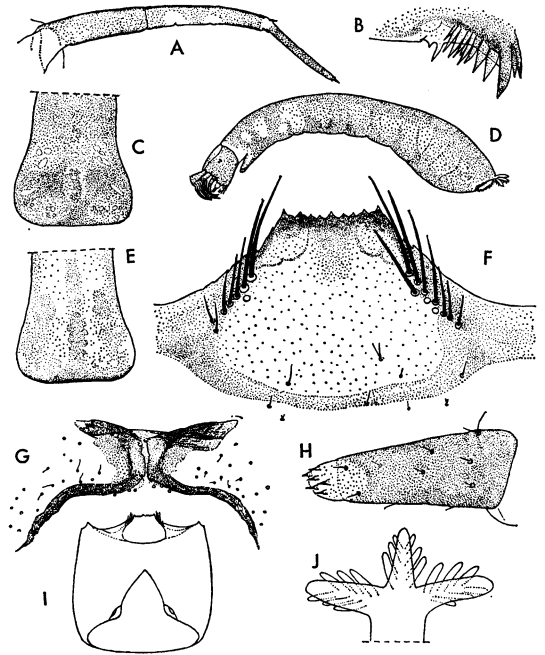


FIG. 25. *Simulium annulatum*, larva. A. Antenna. B. Teeth of mandible. C. Cephalic apotome, with color pattern, dark form. D. General aspect, lateral view. E. Cephalic apotome, with color pattern, light form. F. Hypostomium. G. Anal sclerite. H. Maxillary palp. I. Head, seen from below. J. Anal gills.

rarely in one, irregular series; seven to 13 setae in each group. Disc of hypostomium with short simple or double setae (fig. 25F). Postgenal cleft deep (fig. 25I), subtriangular, its depth much greater than length of postgenal bridge.

Anal sclerite as shown in figure 25G, devoid of scales at base. Crochet ring with about 85 rows, each composed of 13–14 hooks. Anal gills consisting of three primary lobes, each bearing three pairs of long secondary lobules (fig. 25J).

MATERIAL EXAMINED: *Argentina*: Chubut: Alto Río Senguerr, February 15, 1961 (J. Bejarano and S. Coscarón; Instituto Nacional de Microbiología), one female; *idem* (J. Bejarano and S. Coscarón; the American Museum of Natural History), several larvae and pupae, 15 females [biting man]. Neuquén: Lajas, January, 1963 (S. Coscarón; Instituto Nacional de Microbiología), several larvae; Río

Hualcupen, January, 1963 (S. Coscarón; the American Museum of Natural History), several larvae and pupae, two reared males; *idem* (S. Coscarón; Instituto Nacional de Microbiología), two reared males; Río Codi-hué, January, 1963 (S. Coscarón; Instituto Nacional de Microbiología), one reared male; *idem* (S. Coscarón; the American Museum of Natural History), various larvae and pupae, one female dissected from pupa. *Chile*: Llanquihué: Petrohue, March 12, 1959 (J. F. G. Clarke; United States National Museum) 50 females; *idem*, (J. F. G. Clarke; the American Museum of Natural History), four females. Osorno: Petrohue, October 14, 1960 (L. E. Peña; Canadian National Collection), 12 females; Salto de Pilmaiquen, January 27, 1951 (E. Ross and A. E. Michelbacher; the California Academy of Sciences), one female. Valdivia: Enco, 500–700 meters, March 7, 1955 (L. E. Peña; Canadian National Collection), 31 females; *idem* (L. E. Peña; the American Museum of Natural History), one female. Cautin: 20 kilometers east of Temuco, January 8, 1951 (E. Ross and A. E. Michelbacher; the California Academy of Sciences), five females; *idem* (E. Ross and A. E. Michelbacher; the American Museum of Natural History), one female. Bio-Bio: El Abanico, December 30, 1950 (E. Ross and A. E. Michelbacher; the California Academy of Sciences), one female; Salto de Lacha, wide muddy river, November 24, 1957 (J. Illies; the American Museum of Natural History) several larvae and pupae, one male dissected from pupa. In addition to the preceding, the type of *Simulium annulatum* and the probable type of *Simulium varipes* were also examined.

DISCUSSION: Dr. G. Kuschel has made it possible for us to examine the type of Philippi's *annulatum* and of a specimen which is probably the type of *varipes*, both in the Museo Nacional de Chile, in Santiago. Both specimens agree fully with our Chilean and Argentinian material.

The type of *annulatum* bears a handwritten label "*Simulium annulatum* Ph." but no locality label. It agrees well with the original description. Philippi indicated Valle de San Ramon, in the province of Santiago, as the locality of his specimens.

Simulium varipes was described from Valdivia. Philippi's specimen bears a handwritten label, "Valdiv. 1859," but no identification, but the insect was placed below a label for *Simulium varipes* in its drawer. The main alleged difference between Philippi's *annulatum* and *varipes*, taking into account Philippi's descriptions, is the absence, from *varipes*, of the fine, median, longitudinal line dividing the median dark stripe of the mesonotum into two, and the continuation of the dark stripe to the base of the scutellum. Unfortunately, Philippi's specimen of *varipes* does not allow the examination of these characters, as it is pinned through the center of the mesonotum. On the other hand, the absence or presence of the fine median line is often difficult to judge even in undamaged specimens, unless well preserved. There is no evidence that the median stripe reaches the base of the scutellum in any species of *Pternaspatha*. We feel confident that Philippi's distinction between *annulatum* and *varipes* is based on an error. The specimen examined agrees in all observable color and morphological characters with the type of *annulatum*.

Although the specimen that we examined may not be the type, we still believe that we have identified *varipes* correctly. We have examined numerous specimens of *Simulium* from the region of Valdivia, but have seen only two species. The female of one of these species agrees with that of *varipes* (= *annulatum*). The other differs from *varipes* among other characters by the absence of setae from the basal portion of R, and, more importantly, by the presence, in the female, of distinct, light-colored spots on abdominal tergites III–V. In *varipes*, as already described by Philippi, abdominal tergites III–V are almost concolorous black.

The illustrations given by Vargas and Díaz Nájera (1951) of the female genitalia of *varipes* agree very well with those of our specimens.

Simulium annulatum differs from all other species of *Pternaspatha* by the presence of hairs on the basal portion of the radial vein, but agrees with *Pternaspatha* in all other essential characters, such as the chaetotaxy of the pupa and the color pattern and genitalia of the adults. We therefore consider

annulatum as a member of *Simulium* (*Pternaspatha*), but one that forms a distinctive group of its own within the subgenus.

Albilineatum GROUP

Simulium* (*Pternaspatha*) *albicinctum
(Enderlein)

Figure 26

Acropogon albicinctus ENDERLEIN, 1934, p. 277.

Simulium albicinctus: SMART, 1945, p. 500.
VARGAS, 1945, p. 109.

FEMALE: Wing length, 3.6 mm.

Head black; antennae and mouth parts piceous; occiput, frons, and clypeus gray pollinose. Long hairs on occiput, frons, clypeus, basal antennal segments, and basal segments of maxillary palpi.

Mesonotum black, median and submedian stripes dull gray, not contrasting strongly with black areas; lateral and posterior gray areas and 1+1 submedian whitish spots at anterior border as usual. Pubescence of mesonotum relatively dense; a few suberect to decumbent, brass-colored, long hairs present. Scutellum, metanotum, pleura, and sterna like those in male. Wing veins yellowish, their setae dark; tufts of setae at base of wings dark brown. Halteres like those of male.

Coxae of all legs very dark, with grayish pollinosity. Pattern of forelegs and mid legs like that in male. Pattern of hind legs as shown in figure 26A, somewhat darker than that in male.

Dorsal surface of abdomen (fig. 26H) velvety black. Tergite II with 1+1 silvery white spots, dorsal dark area very small. Tergite III with 1+1 smaller spots, their distance from each other about subequal to their diameter. Tergites IV and V entirely black. Tergite VI entirely silvery white. Tergite VII black at center, extensively silvery white at sides. Tergite VIII light-colored at sides, otherwise dark but not black. Tergite IX entirely dark. Hairs of fringe of first segment whitish, hairs of posterior segments dark.

Frons wide: ocular area well developed, about as long as wide.

Chaetotaxy of wings like that of male.

Tarsi of forelegs narrow; hind legs as shown in figure 26A; calcipala small but distinct (fig. 26D). Claws with a small tooth (fig. 26B).

Genitalia not examined in detail. Para-procts salient, their apex rounded (fig. 26G).

MALE: Wing length, 3.1 mm.

Head black. Eyes, antennae, and palpi piceous. Clypeus black, silvery pollinose. Conspicuous dark long hairs on occiput, between eyes, on clypeus, basal two segments of antennae, and basal segments of maxillary palpi.

Mesonotum velvet black; median longitudinal line not clearly perceptible; pre-scutellar region and sides grayish at a certain angle; anterior border with 1+1 distinct, submedian, silvery white spots. Mesonotum with rather sparse, long, suberect and decumbent, brass-colored setae. Scutellum dark brown, slightly shining, with long and very long, erect and decumbent, dark or light-colored hairs. Metanotum black, slightly shining. Pleura and sterna piceous, with gray pollinosity. Pleural tuft silvery. Wing veins yellowish, their setae black. Halteres yellow, their stem darker. Coxae black, grayish pollinose. Trochanter of forelegs dark, femur stramineous, with apical fifth piceous, tibiae and tarsi piceous, with central portion of tibiae somewhat lighter. Pattern of mid legs like that of forelegs, but first tarsal segment somewhat lighter at base. Pattern of hind legs as shown in figure 26C. Femur yellowish, its apical third piceous; tibiae yellowish, apex and base piceous, connected by pigment along dorsal surface of article; basitarsus whitish, its extreme base slightly darkened; second tarsal segment whitish, faintly darkened at extreme base and apex; remaining tarsal segments dark. Hairs of legs whitish.

Dorsal surface of abdomen (fig. 26F) velvety black; long hairs of fringe of first segment, and hairs of other segments, whitish. Tergites II and VI each with 1+1 large, silvery white spots, dark dorsal portion small; at a certain angle entire sixth tergite silvery white. Tergite VII with 1+1 smaller, silvery white spots; dorsal dark spot large. Tergite VIII dark, with small, lateral, silvery spots visible only at a certain angle.

Antennae and mouth parts not examined in detail.

Wings: Sc and basal section of R glabrous. Setae and spines on R_1 arranged in a single row, setae on R_s in single row.

Forelegs long and slender, tarsi not wid-

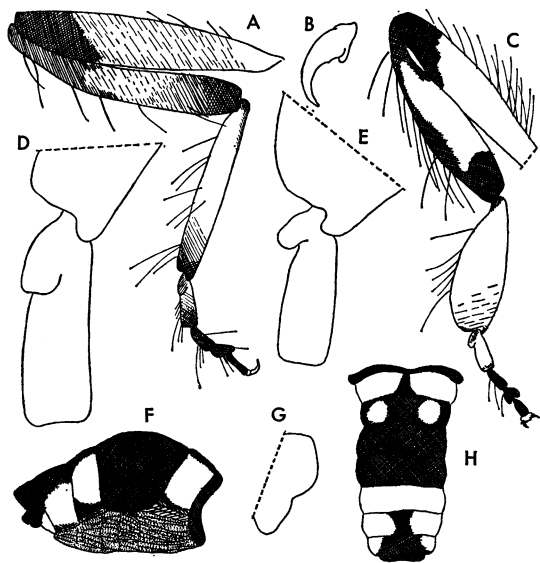


FIG. 26. *Simulium albicinctum*, types. A, B. Female. A. Hind leg. B. Claw of hind leg. C. Male, hind leg. D. Female, apex of posterior basitarsus, with second tarsal segment. E. Male, apex of posterior basitarsus, with second tarsal segment. F. Male, color pattern of abdomen, side view. G. Female, approximate outlines of paraproct and cercus. H. Male, color pattern of abdomen, dorsal aspect.

ened. Coxae and femora dorsally with very long hairs. Hind legs as shown in figure 26C; numerous long hairs on dorsal surface of most articles. Basitarsus slightly less than three times as long as wide. Calcipala small but distinct (fig. 26E).

Abdomen with very long hairs, those of fringe of first segment attaining level of center of abdomen.

Genitalia not examined in detail. Distimere apparently smooth apically.

MATERIAL EXAMINED: Hoch-Peru [High Peru] (Zoological Museum of the Humboldt University, Berlin), one male, one female, both labeled "Type."

DISCUSSION: The two specimens examined are the only individuals known. Both were designated types by Enderlein. Because in the present group the female may have better specific characters than the male, the above-mentioned female is here made the lectotype.

The male and female of *albicinctum* can be distinguished from those of related species by

color characters, as shown in our keys. The male is also characterized by an unusually wide posterior basitarsus. Better differential characters will probably be found in the pupa once it becomes known.

***Simulium (Pternaspatha) albilineatum*
(Enderlein)**

Figures 27–29

Pternaspatha albilineata ENDERLEIN, 1936, p. 115.

Simulium albilineata: SMART, 1945, p. 500.

Simulium albilineatum: VARGAS, 1945, p. 109.

FEMALE: Wing length, 3.5–3.7 mm.

Color of head like that of *herreri*. Color of thorax like that of *herreri*, but knob of halteres pale yellow. Legs yellowish brown, their hairs from silvery to black; the color pattern, illustrated in figure 27B–D, much like that of *herreri*, but dark spot at base of fore and mid femora narrowly elongate, first tarsal segment of second pair of legs darkened dorsally to base, and second segment with a small but conspicuous light area at base.

Abdomen (fig. 27F) black. Tergite II with 1+1 large, silvery white spot; tergites II and V with 1+1 smaller ones; tergite IV either entirely black or with 1+1 minute whitish spots. Tergite VI silvery white, darkened only at lateral extremities. Tergite VII dark at middle, silvery white on lateral thirds, dark region widened posteriorly. Tergite VIII black, silvery only at lateral extremities; tergite IX silvery to black. Tergites II and III narrowly banded with grayish on lateral portions of hind margin (not shown in illustration). Hairs of fringe of first segment yellowish white, those of rest of abdomen brass-colored to very dark.

Fronto-ocular triangle (fig. 27A) about as long as wide. Structure of antennae, maxillary palpi, and cibarium like that of *herreri*. Maxillae with 22–28, mandibles with 40–45, teeth.

Chaetotaxy of mesonotum, scutellum, and wings like that of *herreri*.

Shape and proportions of legs as shown in figures 27B–D. Calcipala (fig. 27J) small but distinct, somewhat pointed, about as long as wide. Subbasal projection of claw very small, not in every case distinctly perceptible (fig. 27E).

Eighth sternite as illustrated in figure 27G;

central portion glabrous, distinctly less pigmented than lateral portions. Gonapophyses subtriangular, rounded or pointed apically, their inner border slightly sclerotized, their disc with numerous microtrichiae. Paraprocts and cerci as illustrated in figure 27K; projecting portion of paraprocts angular; cerci not quite twice as high as wide, their distal border rounded. Genital fork and spermatheca like those of *herrerri*.

MALE: Length of wing, 3.5–3.6 mm.

Color of head and its appendages like that of *herrerri*. Color of thorax like that of *herrerri*, but knob of halteres pale yellow.

Legs yellowish brown, their hairs brass-colored to black. Color pattern of legs as shown in figure 27L–N, much like that of *herrerri*, but light portion of femora and fore and mid tibiae much darker than that of *herrerri*, dark spot at base of fore and mid femora

narrowly elongate, and first segment of tarsus of second pair of legs darkened dorsally to base.

Abdomen (fig. 27R) velvety black; hairs, including those of basal fringe, light brass-colored. Segment II with 1+1 very large, silvery white spots closely approaching but not meeting dorsally. Segment III with 1+1 small, silvery white spots laterally at hind margin, these spots in some cases faint. Segment VI almost entirely silvery white except small dark area at center posteriorly; VII with 1+1 medium-sized, silvery white spots widely separated above; IX faintly iridescent.

Structure of head like that of *herrerri*.

Wing like that of female, but no setae on central portion of Sc.

Shape and proportion of legs as shown in figure 27L–N. Hind basitarsus 3.0–3.2 times



FIG. 27. *Simulium albilineatum*. A–G. Female. A. Fronto-ocular triangle. B. Foreleg. C. Mid leg. D. Hind leg. E. Claw of hind leg. F. Color pattern of abdomen, dorsal view. G. Eighth sternite, setae shown only on one side. H, I. Male. H. Foreleg. I. Hind leg. J, K. Female. J. Apex of posterior basitarsus, with second tarsal segment. K. Cercus and paraproct. L–T. Male. L. Foreleg. M. Mid leg. N. Hind leg. O, P. Apex of posterior basitarsus, with second tarsal segment. Q, R. Color pattern of abdomen, side view. S. Color pattern of abdomen, dorsal aspect. T. Paramere. A–G, J–N, P, R, T taken from specimens from Tilarnioc; H, I, O, Q, S, from type.

as long as wide. Calcipala (fig. 27 O, P) small but distinct, slightly wider than long. Legs with numerous long setae as illustrated.

Genitalia much like those of *herrerii*, but distimere distinctly wider than long (fig. 27T).

PUPA: Cocoon (fig. 28B-D) in shape like wall pocket or slipper, with very short antero-ventral bridge. Color light brown, translucent; surface smooth, closely woven, threads not individualized under medium magnification. Rim of aperture feebly reinforced. Length of cocoon at dorsum along middle, 3.5-4 mm.; maximum length along base, 5 mm.

Length of pupa, 3.0-3.5 mm.; length of respiratory organs, 2.5-03.0 mm., viz., about half as long as cocoon and only slightly shorter than pupa proper.

Respiratory organs (fig. 28F, G, K, L) with six filaments, filaments spreading and

forming fanlike structure. Ventral primary branch and its two filaments somewhat bent downward, medially directed, and often lying close to base of respiratory organ. Division of ventral primary branch usually but not invariably closest to base of organ, and that of median slightly more remote than that of dorsal primary branch; dorsal primary branch thickest. Filaments gradually tapering toward their rounded tips; surface of filaments like that of *herrerii*.

Head and thorax of pupa dark brown.

Head with 1+1 short frontal, and 1+1 longer facial, trichomes (fig. 28H-J), latter generally bifid.

Thorax as illustrated in figure 28A. Region adjacent to aperture of cocoon with a band of platelets, becoming evanescent toward sides of thorax; platelets also occupying large area

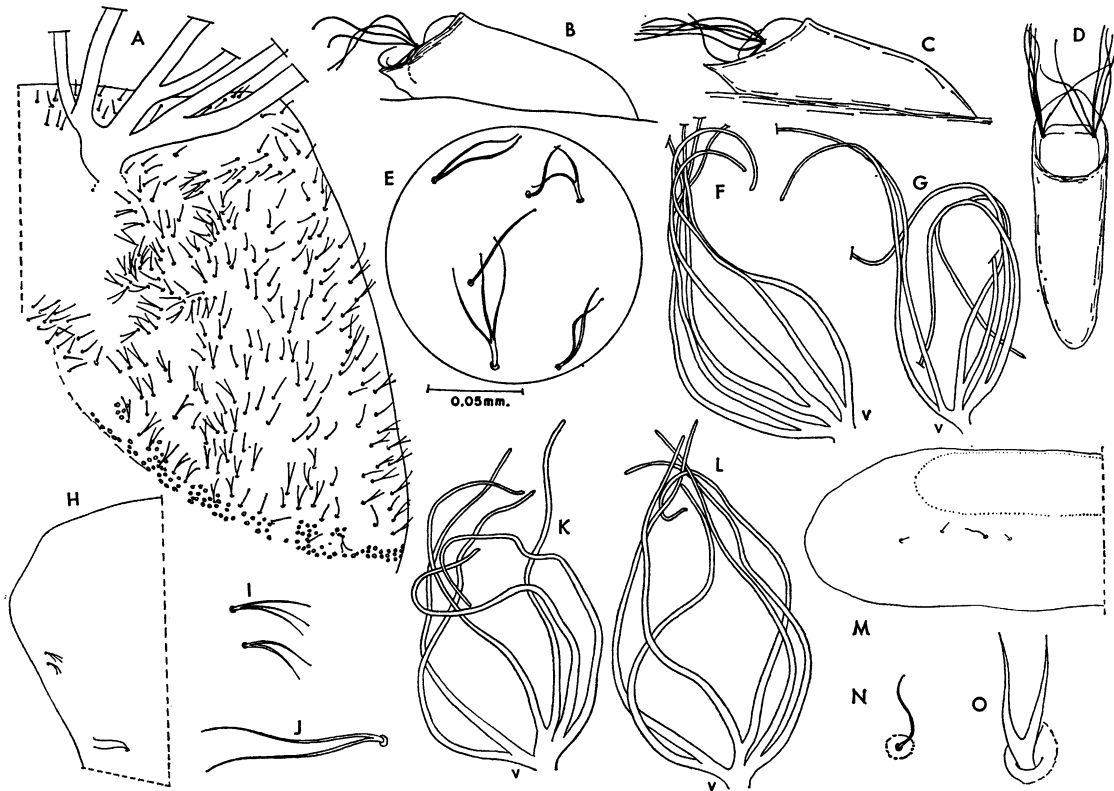


FIG. 28. *Simulium albilineatum*, pupa. A. Portion of thorax. B, C. Pupa with cocoon, lateral view, different specimens. D. Pupa with cocoon, dorsal aspect. E. Thoracic trichomes, enlarged. F, G. Respiratory organ, different specimens. H. Right half of clypeus. I. Frontal trichome, enlarged. J. Facial trichome, enlarged. K, L. Respiratory organ, different specimens. M. Fourth sternite. N. Strong seta of fourth sternite, enlarged. O. Spine of seventh sternite, enlarged. The small letter v indicates the ventral branch of the respiratory organ.

of dorsal portion of that part of thorax covered by cocoon (not shown in illustration). Exposed surface of cocoon with large number of simple or bifid trichomes (fig. 28E), their length, 0.05–0.08 mm., their total number, 250–300+250–300; trichomes also present on region anterior to insertion of respiratory organs.

Chaetotaxy of abdomen much like that of *herrerri*, but sternite IV (fig. 28M, N) in some cases with 1+1 hairs much stronger than others, and spinelike setae of sternites V–VII somewhat more slender.

LARVA: Maximum length, 7 mm.; maximum width of head capsule, 0.7 mm. General shape like that of *herrerri*.

Dark hypodermal pigment on dorsal and ventral surfaces of whole body. Pattern of cephalic apotome as shown in figure 29A. Cuticle with isolated short setae, slightly more numerous on caudal portion.

Antennae as shown in figure 29B, light brown, subapical segment darkest; second segment with two constrictions, areas of constriction lacking pigment. Ratio of lengths of segments I to III, 1/1.25/1. Third segment slender, as long as first. Mouth brushes and mandibles like those in *herrerri*, maxillary palp somewhat more slender (fig. 29D). Structure and pigmentation of hypostomium as shown in figure 29C; median tooth as prominent as lateral ones; lateral serrations well developed, irregular in shape. Hypostomial setae arranged in two irregular rows, with 10–12 setae in each group. Disc of hypostomium with a few setae posteriorly. Postgenal cleft as shown in figure 29E, rather wide, much deeper than postgenal bridge.

Anal sclerite like that of *herrerri*, with well-developed scales at base of sclerite. Crochet ring with only approximately 65–70 rows, each composed of about 17 hooks. Each lobe of anal gills (fig. 29F) with secondary lobules arranged in two rows, from four to six lobules on lateral, and from six to eight lobules on central, lobe.

MATERIAL EXAMINED: Peru: Junín: Kilometer 218 of road from Oroya to Junín, near Tilarnioc, Tarma, 4000 meters, July 13, 1965 (P. and B. Wygodzinsky; the American Museum of Natural History), several pupae and larvae, seven males, six females, all reared; Las Vegas, Tarma, 3900 meters, July

13, 1965 (P. and B. Wygodzinsky; the American Museum of Natural History), several pupae, one male, one female, both reared; Chacabamba, Tarma, on road from Palcomayo to Junín, 3700 meters, July 15, 1965 (P. and B. Wygodzinsky; the American Museum of Natural History), one pupa, one male, reared.

The type of the species, kept in the Zoological Museum of the Humboldt University in Berlin, was also examined.

ECOLOGICAL DATA: The larvae and pupae were found on blades of heavy aquatic vegetation trailing in the stream; the temperature of the latter was 10° C.

DISCUSSION: The above description is based on the material recently collected. The type of the species, a poorly preserved male, has also been examined. It differs from our specimens by its smaller size (wing length, 3.0 mm.), the forelegs which appear uniformly dark even on a slide mount (fig. 27H), and the slightly greater width of most articles of the hind legs (fig. 27I), probably due to the technique employed for mounting. The mesonotum is rubbed and thus shows more clearly than in a perfect specimen the 1+1 submedian, light-colored lines which form 1+1 elongate faint spots on the second

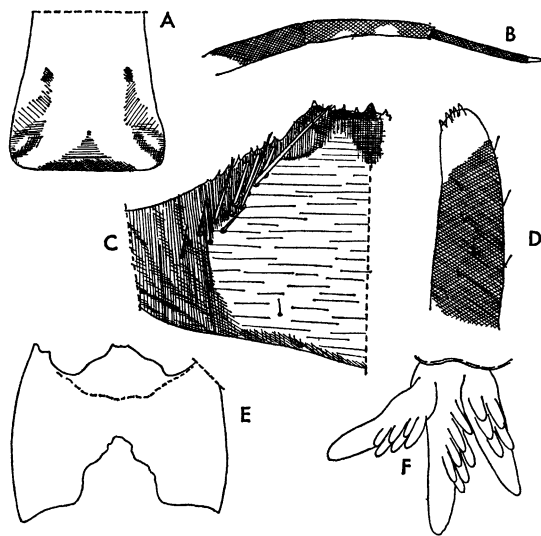


FIG. 29. *Simulium albilineatum*, larva. A. Cephalic apotome, with color pattern. B. Antenna. C. Part of hypostomium. D. Maxillary palp. E. Head, seen from below. F. Anal gills.

fourth of the mesonotum. The abdominal color pattern (fig. 27Q, S) is like that in our specimens, except for the presence of 1+1 very small, silver-white areas before the posterior margin of the fifth segment.

The differences mentioned fall well within the range of individual variation, and we believe that our material is specifically identical with *albilineatum*.

The type is from "Callanga," probably the Callanga River in the Department of Cuzco, only a few hundred miles south of the region where our specimens were collected, and also east of the continental divide.

The adults of *abilineatum* are very similar to those of *herrerri* and *yacuchuspi* described below. The color characters indicated in our key will suffice to distinguish the male of *abilineatum* from the males of the other species. The female of *albilineatum* can be recognized by the combination of its color characters and the morphology of the paraprocts, as shown in the key. The more convergent filaments of the respiratory organ and the structure of the thoracic trichomes distinguish the pupa of *albilineatum* from the pupae of *herrerri* and *yacuchuspi*; in the latter two, one or two filaments of the respiratory organs sharply diverge from the remainder, and the thoracic trichomes are quite different, as shown in our illustrations. The differential characters of the larva of *albilineatum* are indicated in our key.

Simulium (Pternaspatha) barbatipes
(Enderlein)

Figures 30-33

Acropogon barbatipes ENDERLEIN, 1934, p. 277.
STONE, 1962, p. 206.

Simulium barbatipes: SMART, 1945, p. 501.
VARGAS, 1945, p. 119. VARGAS AND DÍAZ, 1953,
p. 141, pl. 1. WYGODZINSKY, 1953, p. 321, figs. 1-
29; 1958, p. 133. STONE, 1962, p. 206; 1963, p. 17.

[*Simulium (Pternaspatha)*] *barbatipes*: STONE,
1963, p. 1.

FEMALE: Length of wing, 3.1-3.9 mm.

Head black; occiput, frons, and clypeus gray pollinose; palpi and antennae black, latter with two basal segments more or less conspicuously orange-colored.

Mesonotum as usual in group; medium, narrow, longitudinal, white line distinct. Adpressed setae of mesonotum very pale

brass-colored. Scutellum and metanotum piceous, former with long, pale, brass-colored or dark hairs. Pleura gray pollinose; pleural tuft pale brass-colored. Wings hyaline, veins light yellow or stramineous; setal tuft at base of wing pale brass-colored. Base of halteres dark, remainder yellowish white. Legs light brown, their hairs silvery to black; following regions darkened: mid and hind coxae; apical half of trochantera; a small longitudinal spot at base of fore and mid femora, and apical annulus on all femora (very faint on forelegs); apex of all tibiae, but their base not distinctly darkened; entire fore tarsus, mid tarsus except basal half of first and extreme base of second segment, and entire hind tarsus except basal half of basitarsus. Exact proportions and relative intensity of pigmented areas as shown in figure 30J-L.

Abdomen (fig. 30I) dark gray, tergites II-V deep black at center. Tergite II with 1+1 large, silvery white spots. Tergites III-V with 1+1 small spots, those on III the largest, those of IV and V very small, in some cases difficult to perceive. Tergite VI extensively silver-gray, black at lateral extremities, in some cases very faintly darkened at center. Tergite VII dark, light gray at sides. Tergites VIII and IX entirely dark. Hairs of abdomen, including those of basal fringe, silver-colored.

Frons as shown in figure 30A, with obsolete median sulcus. Fronto-ocular triangle (fig. 30B, C) slightly wider than long. Shape and proportions of antennal segments as shown in figure 30D. Last segment of maxillary palp (fig. 30E) more than twice as long as penultimate. Diameter of sensory vesicle approximately half of that of third segment of maxillary palp; structure of vesicle as shown in figure 30G, H. Base of cibarium as shown in figure 30F. Maxillae with about 25, mandibles with 40-47, teeth.

Venation of wings like that of *memorale*. Sc with a few setae on central portion. Setae and spines on R₁ in a single row, setae on R₂ in a single series.

Shape and proportions of articles of legs as illustrated in figure 30J-M. Calcipala small, about as long as wide at base (fig. 30O). Claws with small but distinct tooth (fig. 30N).

Tergal plates of abdomen large; ventral

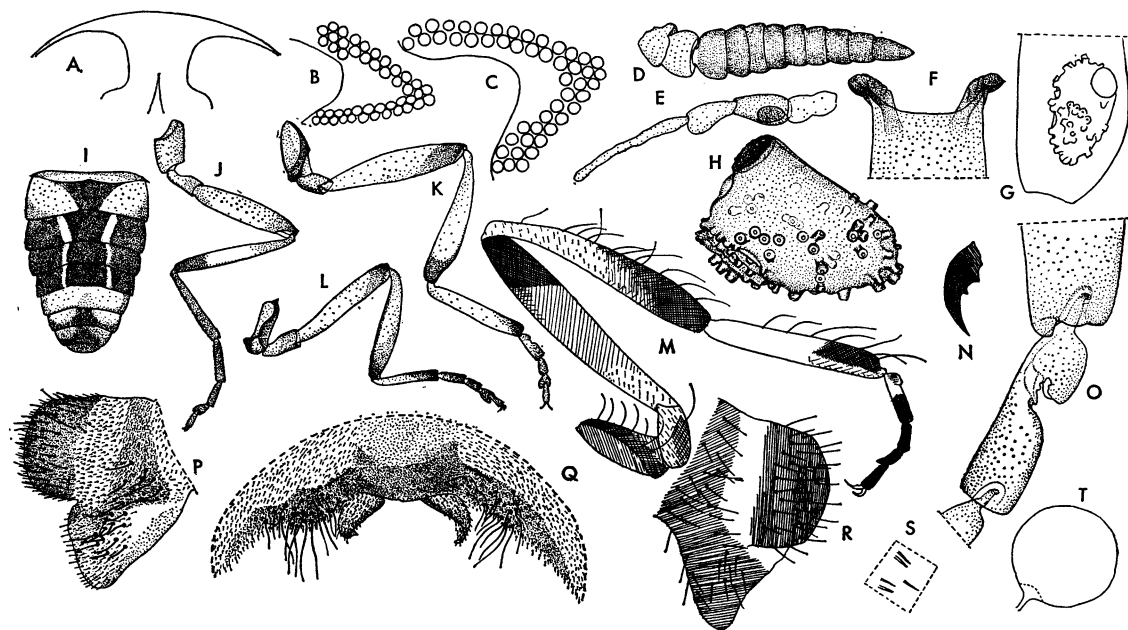


FIG. 30. *Simulium barbatipes*, female. A. Frons. B, C. Fronto-ocular triangle, different specimens. D. Antenna. E. Maxillary palp. F. Base of cibarium. G, H. Sensory vesicle of maxillary palp. I. Color pattern of abdomen, dorsal view. J. Foreleg. K. Hind leg. L. Mid leg. M. Hind leg. N. Claw of hind leg. O. Apex of posterior basitarsus, and second tarsal segment. P. Cercus and paraproct. Q. Eighth sternite. R. Paraproct and cercus. S. Detail of inner surface of spermatheca. T. Outline of spermatheca. M is taken from a type from Bolivia; all others are from specimens from Tucumán.

plates not developed. Eighth sternite as shown in figure 30Q; its lateral portions more heavily pigmented than central area, latter with posterior dark band. Gonapophyses subtriangular, membranous, beset with microchaetae, inner border faintly sclerotized. Paraprocts and cerci as shown in figure 30P, R. Cerci much higher than wide, their distal border rounded. Protruding portion of paraprocts subtriangular, their apex rounded. Median process of genital fork strongly sclerotized, its apex widened, light-colored; anterior projections slightly darker than arms of fork. Spermatheca globular (fig. 30T), its inner surface with minute spicules arranged in groups as shown in figure 30S.

MALE: Length of wing, 3.4–4.0 mm.

Head blackish; eyes, antennae, and palpi dark brown, almost black, first two and extreme base of third antennal segments lighter, all with silvery pilosity; palpi, basal two antennal segments, clypeus, a line between eyes, and occiput all with long black hairs.

Mesonotum as usual for the group; ad-

pressed setae brass-colored. Scutellum brown, with brass-colored hairs. Metanotum and pleura dark brown, silvery pollinose; pleural tuft brass-colored. Color of wing and halteres like that of female. Legs whitish to brown, their hairs brass-colored, longest on fore and hind femora and tibiae; following regions dark: all coxae and trochanters; elongate basal spot on fore and mid femora, and distal annulus on all femora; a distinct annulus on base of fore tibia, very faint or almost imperceptible annulus on base of mid and hind tibia; apical two-fifths of all tibiae distinctly; entire fore and mid tarsi except basal half of hind basitarsus, hind tarsus except basal half of basitarsus and basal third of second segment, but basal scale dark. Exact distribution and intensity of pigment as shown in figure 31A–D.

Abdomen velvety black; its hairs, including those of basal fringe, silvery. Segment II with 1+1 large, silvery white spots, segments VI and VII with 1+1 smaller ones (fig. 31I, K).

Shape and proportion of antennal segments

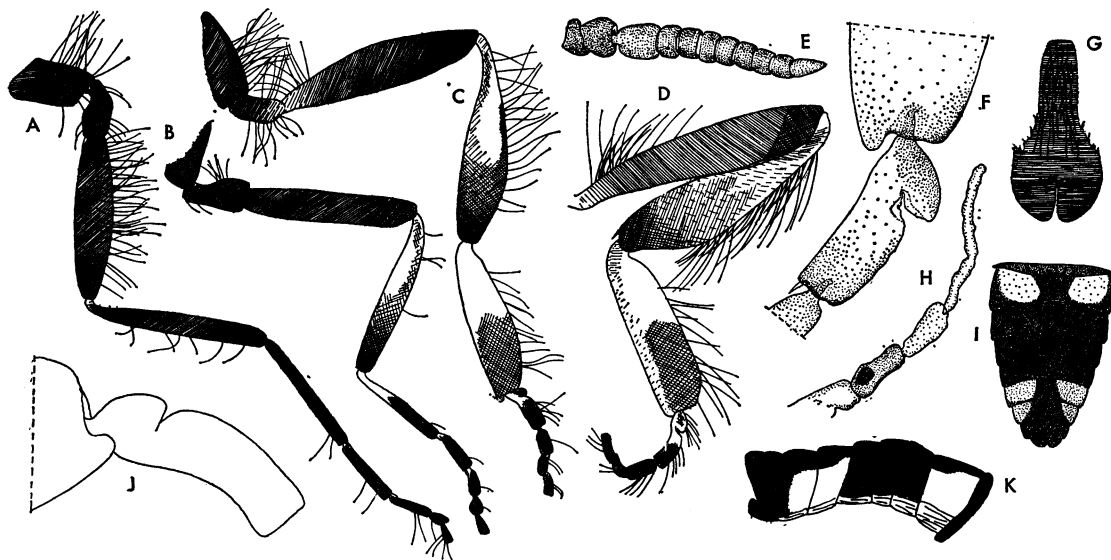


FIG. 31. *Simulium barbatipes*, male. A. Foreleg. B. Mid leg. C, D. Hind legs. E. Antenna. F. Apex of posterior basitarsus, with second tarsal segment. G. Median sclerite. H. Maxillary palp. I. Color pattern of abdomen, dorsal aspect. J. Apex of posterior basitarsus, with second tarsal segment. K. Color pattern of abdomen, side view. A–C, E–I are taken from specimens from Tucumán; D, J, from the lectotype from Bolivia; and K is from a specimen from Cuzco.

as shown in figure 31E. Last segment of maxillary palp (fig. 31H) more than twice as long as penultimate; diameter of sensory vesicle approximately half of that of third segment of palp.

Wings like those of female, but Sc devoid of setae.

Shape and proportions of articles of legs as shown in figure 31A–D. Hind basitarsus 3.4–3.9 times as long as wide. Calcipala slightly shorter than wide at base (fig. 31F, J).

Genitalia very similar to those of *nemorale*. Basimere longer than wide; distimere with apical portion glabrous. Disc of basal plate with 1+1 distinct translucent areas. Median sclerite as shown in figure 31G.

PUPA: Cocoon slipper-shaped (fig. 32A), with very narrow anteroventral bridge; very rarely shoe-shaped. Color of cocoon brown; surface smooth, closely woven, threads not distinctly individualized. Rim of aperture slightly reinforced. Only extreme base of respiratory organs protected by lateral walls of cocoon, all filaments free. Length of cocoon at dorsum along middle, 3.0–3.6 mm.; maximum length along base, 4.2–5.1 mm.

Length of pupa, 3.5–4.0 mm. Length of respiratory organs, approximately 2 mm.,

viz., from less than one-half to one-half as long as cocoon, and from one-half as long as pupa to slightly more than half as long as pupa.

Respiratory organs (fig. 32C, G, J, L–N) consisting of six closely parallel filaments. Three primary branches arising from a short basal trunk, each branch dividing into two filaments not far from its base; exact level of branching somewhat variable. Dorsal primary branch stouter than other branches, and its dorsal filaments stouter than other filaments. Surface structure of filaments like that of *nemorale*.

Head and thorax of pupa dark brown.

Head with 3+3 branched frontal, 3+3 branched facial, and 1+1 branched ocular, trichomes (fig. 32B).

Thorax (fig. 32D–F) more strongly sclerotized on exposed than on covered portion. Zone adjacent to aperture of cocoon with numerous platelets of various sizes arranged in transverse band, interspersed with setae. Thorax with numerous trichomes of different structure: short, simple or bifurcate, spatulate, flattened, in some cases curved, in others hairlike, with from one to six long and delicate filaments (fig. 32D–F, H, I, K).

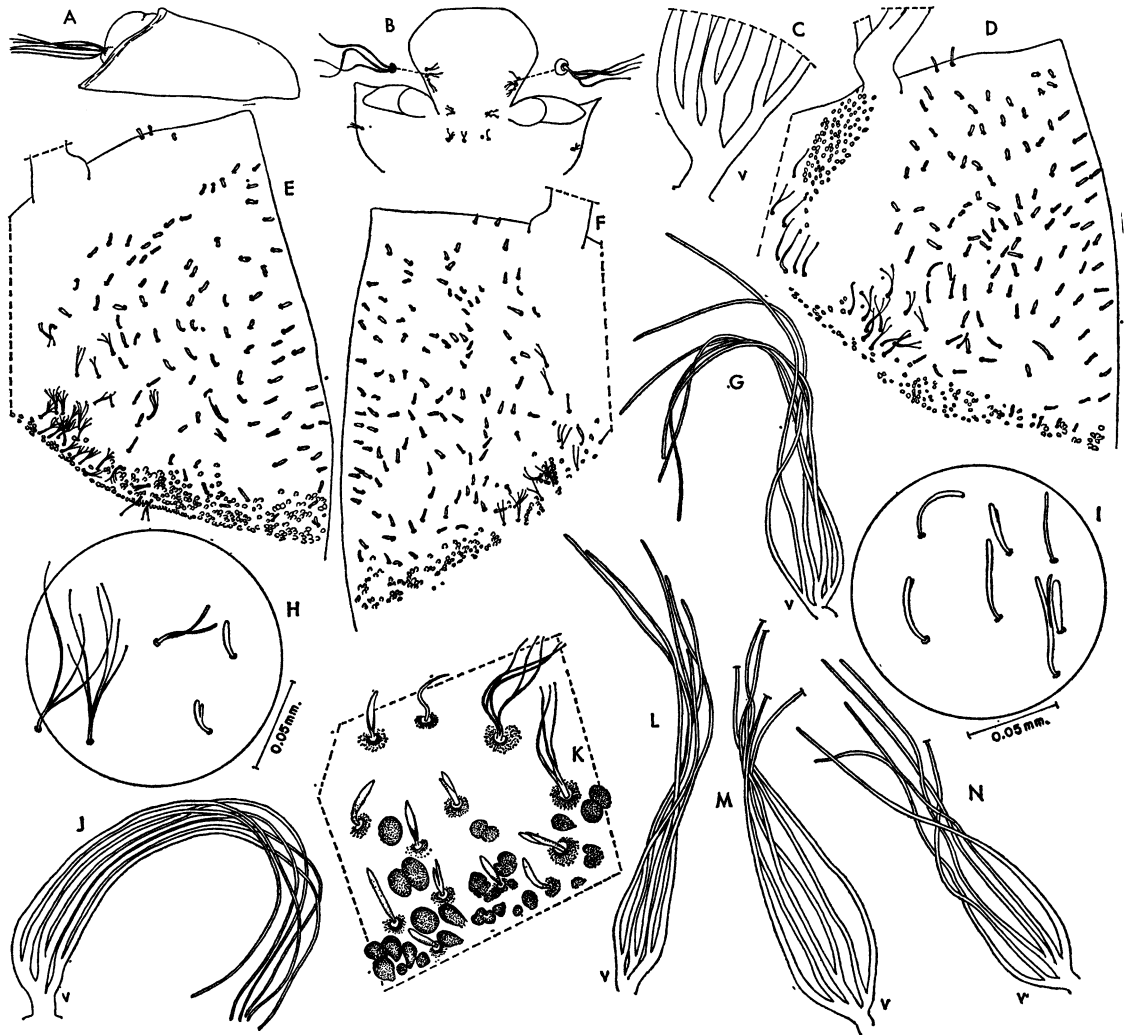


FIG. 32. *Simulium barbatipes*, pupa. A. Pupa and cocoon, side view. B. Head, extended, with enlarged facial and frontal trichomes. C. Base of respiratory organ. D-F. Portion of thorax, different specimens. G. Respiratory organ. H, I. Thoracic trichomes, enlarged. J. Respiratory organ. K. Platelets and thoracic trichomes, enlarged. L-N. Respiratory organ, different specimens. The small letter v indicates the ventral branch of the respiratory organ. A, D, I, M, N are taken from specimens from Cuzco; B, C, F, G, J, K, from specimens from Tucumán; and E, H, L, from a specimen from San Gabriel.

Hairlike trichomes on lower half of exposed portion, especially on zone adjacent to aperture of cocoon. Total number of trichomes, 110-130+110-130.

Chaetotaxy of abdomen like that of *nemorale*. Tubercles on tergite VIII generally forming continuous row.

LARVA: Maximum length, 8 mm. Maximum width of head capsule, 0.7 mm. General shape of body as shown in figure 33A.

Larva with extensive hypodermal pigment

on dorsal and on anterior half of ventral surface of body. Cephalic apotome yellowish, with dark pattern as shown in figure 33B. Body integument virtually glabrous; some short setae at base of anal sclerite (fig. 33G).

Antennae dark brown, subapical segment darkest. Second segment with two slight constrictions, latter more light-colored. Ratio of lengths of segments I to III, 1/1.2/0.72 (fig. 33E); third segment relatively slender, distinctly shorter than first. Mouth brushes with

approximately 40 rays in large fan. Toothing of mandible as shown in figure 33H, similar to that of *nemorale*. Maxillary palp (fig. 33D) well pigmented. Anterior border of hypostomium (fig. 33C) well pigmented; arrangement of teeth like that in *nemorale*. Median tooth more prominent than lateral ones; lateral borders with four or five small serrations. Hypostomial setae arranged in two irregular series, their number about 10 in each group. Disc of hypostomium glabrous. Postgenal cleft (fig. 33F) triangular, its depth larger than length of postgenal bridge. Anal sclerite as shown in figure 33G, its base with numerous small scales. Crochet ring with about 80 rows, each composed of 13–14 hooks. Anal gills (fig. 33I) consisting of three primary lobes, middle one with six, lateral ones with two lobules each.

MATERIAL EXAMINED: *Chile:* Santiago: small tributary of Río Maipo, above San Gabriel, 1200 meters, February 9, 1957 (J. Illies; the American Museum of Natural History), several pupae, some adults dis-

sected from pupae. *Argentina:* Tucumán: Tafi del Valle, 2000 meters, October 6, 1948 (P. Wygodzinsky; the American Museum of Natural History), numerous larvae and pupae, and numerous reared males and females; Río de la Angostura, Tafi del Valle, 1800 meters, October 24, 1949, July 14, 1950 (P. Wygodzinsky; the American Museum of Natural History), numerous males and females, reared; *idem* (P. Wygodzinsky; Instituto Nacional de Microbiología) three males, four females, all reared; El Infiernillo, Tafi, 2500 meters, September 17, 1953 (P. Wygodzinsky; the American Museum of Natural History), one male, reared; *idem* (P. Wygodzinsky; Instituto Nacional de Microbiología), several larvae and pupae, one male, one female, reared; Quebrada de Amaicha, Tafi, 2600 meters, October 27, 1957 (P. Wygodzinsky; the American Museum of Natural History), five males, five females, all reared; *idem* (P. Wygodzinsky; Instituto Nacional de Microbiología), several larvae and pupae, four males, five females, all reared. *Jujuy:* Garganta del Diablo, Tilcara, 2500 meters, September 12, 1962, together with *Simulium lahillei* and *Simulium huayrayacu* (Coscarón; Instituto Nacional de Microbiología), several pupae, adults dissected from pupae. *Peru:* Puno: Arroyo Camacani, near Lake Titicaca, 3850 meters, May 12, 1958 (J. Illies; the American Museum of Natural History), several pupae, one male dissected from pupa. Cuzco: Granja Kayra, 3300 meters, August 6, 1965 (P. and B. Wygodzinsky; the American Museum of Natural History); three larvae, two pupae; Choco, 3500 meters, August 5, 1965 (P. and B. Wygodzinsky), numerous larvae and pupae, seven males, five females, all reared. Junín, Huancayo, December 25, 1943 (the American Museum of Natural History), one female. The types of this species from Bolivia were again examined for this paper.

ECOLOGICAL DATA: This species breeds in fast-flowing high-mountain streams of relatively low temperatures (10° C. to 12° C.). It is also found in irrigation ditches with fast-flowing water. The larvae and pupae are attached to vegetation trailing in the current, to small branches resting in the water, or to the surface of rocks; occasionally pupae are found also on the under surface of small

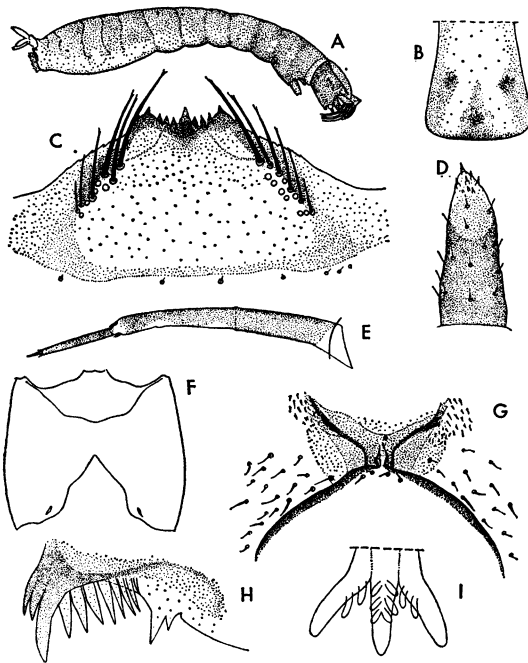


FIG. 33. *Simulium barbatipes*, larva. A. General aspect, side view. B. Cephalic apotome, with color pattern. C. Hypostomium. D. Maxillary palp. E. Antenna. F. Head, seen from below. G. Anal sclerite. H. Teeth of mandible. I. Anal gills.

stones or leaves lying on the bottom of a stream or ditch.

DISCUSSION: The types of *barbatipes* were redescribed by Vargas and Díaz (1953) and in much detail by Wygodzinsky (1953). The present paper contains the first descriptions of the larva and pupa of this species.

This species is one of the most wide-ranging of *Pternaspatha*. Although there is some individual variation, no characters were found that would separate the various populations that were examined.

Vargas and Díaz (1953) incorrectly synonymized *barbatipes* with *simile*. The slide preparation of the male of *barbatipes*, which these authors examined, is the one made by Wygodzinsky (1953) who used it to describe and illustrate the male genitalia; the apex of the distimere is smooth. In the male of *simile*, described previously by Vargas and Díaz (1951) as *figueroa*, the apex of the distimere is tuberculate, as distinctly shown in figure 5 of Vargas and Díaz (*loc. cit.*). This discrepancy in the structure of the male genitalia made it obvious that two different species were involved, and Wygodzinsky (1958) rejected the synonymy suggested by Vargas and Díaz (1953). Stone (1962) suggested that *barbatipes* be accepted as a valid species until a study could be made of the whole group. Such a study has now been carried out, and it is abundantly clear that *barbatipes* and *simile*, at least as understood by Vargas and Díaz (1951), belong to two quite different groups within the subgenus.

Simulium barbatipes differs, in the adult, from its allies by the lack of conspicuous pigment at the base of the tibiae, the orange color of the basal antennal segments of the female, and other color characters. The trichomes of the thorax of the pupa are unique. The differential characters of the larva are less obvious; they are apparent from our key.

***Simulium (Pternaspatha) herreri*, new species**

Plate 2, figures 4, 5; text figures 34–37

FEMALE: Length of wing, 2.8–3.5 mm.

Head black; eyes piceous; antennae, palpi, and labium black, first two antennal segments tinged with gray. Occiput, frons, and clypeus gray pollinose. Pilosity of antennae very short; basal segments of palpi, clypeus, frons, and occiput with some long dark hairs.

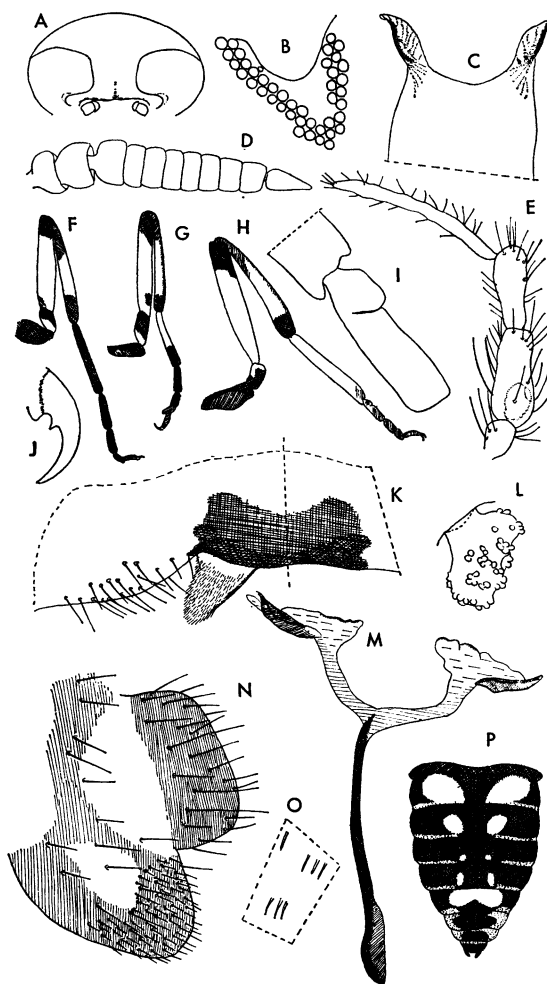


FIG. 34. *Simulium herreri*, female. A. Head, frontal view. B. Fronto-ocular triangle. C. Cibarium. D. Antenna. E. Maxillary palp. F. Foreleg. G. Mid leg. H. Hind leg. I. Apex of posterior basitarsus, and second tarsal segment. J. Claw of hind leg. K. Eighth sternite. L. Sensory vesicle of maxillary palp. M. Genital fork. N. Paraproct and cercus. O. Detail of inner surface of spermatheca. P. Color pattern of abdomen, dorsal view.

Mesonotum (pl. 2, fig. 5) as usual for group, dark regions velvety black. Adpressed setae of mesonotum brass-colored, not very dense, not obliterating pattern. Scutellum grayish brown, with long hairs brass-colored to brown. Metanotum, pleura, and sterna piceous, silvery pollinose. Pleural tuft brass-colored. Wings hyaline, veins stramineous, spines and hairs black; hairs at base of wing black. Stem of halteres dark brown, knob whitish. Legs

light brown, their hairs from silvery to black; following regions darkened: all coxae; trochantera, except a narrow basal ring; a basal spot on first and second femora, and entire apical fifth or sixth of all femora; base and apex of all tibiae, these dark areas generally connected by a narrow, dark, dorsal band; entire fore tarsi, mid tarsi except basal half or three-fifths of basitarsus; hind tarsi dark on extreme apex of basitarsus, remainder of segment entirely dark except at level of pedisulcus. Exact sizes and relative intensity of pigment areas as shown in figure 34F-H.

Abdomen (fig. 34P) black. Tergite II with 1+1 large, silvery white spots, 1+1 smaller ones on tergite III, 1+1 very small ones each on tergites IV and V; tergite VI with a transverse, silvery white, posteriorly emarginated band on central two-fourths; tergites VII and VIII grayish or silvery white on sides. Tergites II-VI narrowly banded with grayish on lateral portions of hind margin. Hairs of fringe of first segment yellowish white, those of rest of abdomen brass-colored to very dark.

Frons as shown in figure 34A. Fronto-ocular triangle about as long as wide. Shape and proportions of antennal segments as shown in figure 34B. Last segment of maxillary palp (fig. 34E) slightly more than twice as long as penultimate, and as long as third and fourth segments combined. Diameter of sensory vesicle about equal to half of diameter of third segment, its surface structure as shown in figure 34L. Base of cibarium as shown in figure 34C. Maxillae with 26 or 27, mandibles with 36-40, teeth.

Mesonotum with adpressed setae on disc; posterior declivity with erect or forwardly curved longer hairs.

Sc with three or four hairs on central portion. Basal portion of R glabrous. R_1 with hairs and spiniform setae arranged in one row, in some cases becoming double on apical portion of vein.

Shape and proportion of articles of leg as shown in figure 34F-H. Calcipala (fig. 34I) small but distinct, about as long as wide. Claws with well-developed tooth (fig. 34J).

Posterior portion of eighth sternite with 1+1 sublateral groups of not very numerous hairs; central portion glabrous, pigmented as shown in figure 34K. Gonapophyses sub-

triangular, rounded apically, their inner border slightly sclerotized, their disc with very numerous microtrichia. Paraprocts and cerci as shown in figure 34N. Projecting portion of paraprocts semi-elliptical; cerci twice as high as wide, their distal border truncate. Genital fork as shown in figure 34M. Spermatheca subglobular, its inner surface with minute spiculae arranged in groups of from one to four (fig. 34O).

MALE: Length of wing, 3.0-3.2 mm.

Head black. Eyes purple. Occiput, antennae, and palps black, clypeus black, gray pollinose. Antennae with short pubescence, first two basal segments with extremely long hairs. Occiput, clypeus, and basal maxillary segments with numerous very long hairs, latter also arranged in row between eyes.

Mesonotum (pl. 2, fig. 4) as usual for group, deep velvety black, on its anterior three-fourths a very delicate, median, longitudinal line. Hairs brass-colored, moderately dense, not obliterating dark background. Scutellum black, its hairs brass-colored. Metanotum, pleura, sterna, halteres, and wings like those of female in color. Legs yellowish brown, their hairs brass-colored to black; following regions dark: coxae of all legs; trochantera of all legs on apical half; all femora on apical third, fore and mid femora, with a dark spot dorsally at base; tibiae with wide basal and apical rings, dark regions connected by a dark dorsal band; entire fore tarsi, entire mid tarsi except basal half of basitarsus and basal sixth of second segment; hind tarsus with extremely faint spot at base of basitarsus and a wide area on apical half, base and apical half of second segment, and entire third to fifth segments. Exact size and relative intensity of pigment areas as shown in figure 35D, F, G.

Abdomen (fig. 35H) velvety black, hairs silvery gray. Segment II with 1+1 very large, silvery white spots closely approaching but not meeting dorsally; segment V in some individuals very faintly iridescent, at a certain angle showing a small, silvery white area dorsally at center; VI entirely silvery white except small dark area dorsally at center posteriorly, VII with 1+1 medium-sized, silvery white spots widely separated above; IX faintly iridescent.

Eyes separated by a series of long hairs

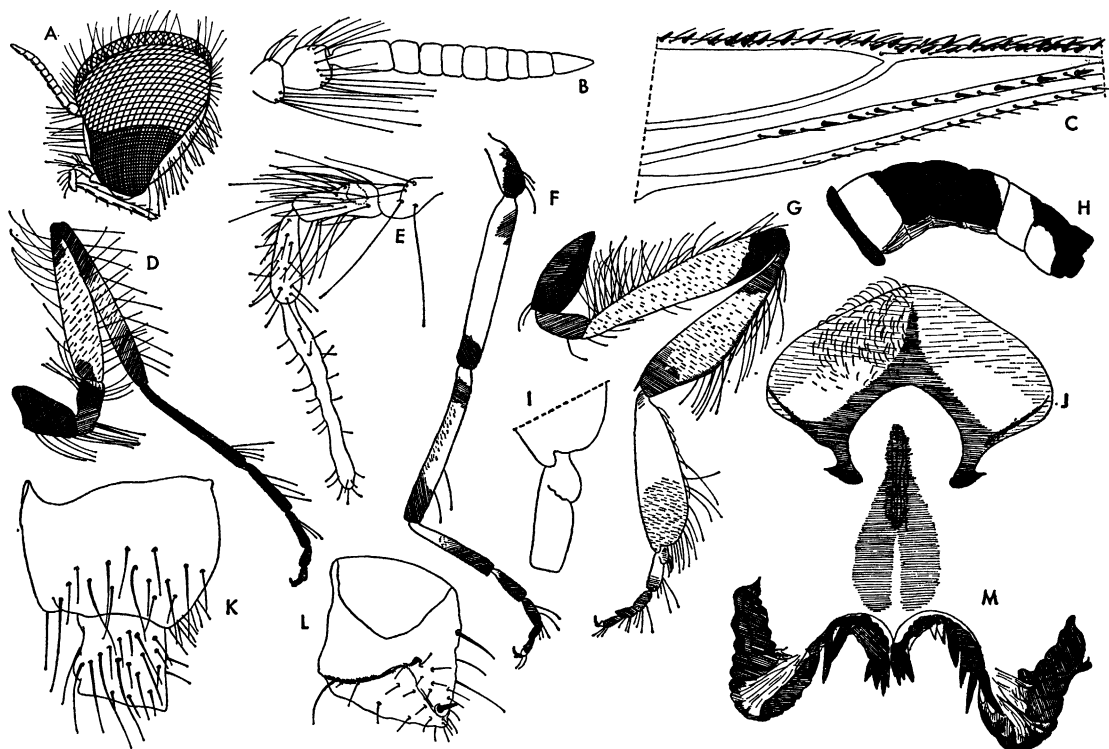


FIG. 35. *Simulium herreri*, male. A. Head, side view. B. Antenna, setae of flagellum not shown. C. Veins of anterior portion of wing. D. Foreleg. E. Maxillary palp. F. Mid leg. G. Hind leg. H. Color pattern of abdomen, lateral aspect. I. Apex of posterior basitarsus, with second tarsal segment. J. Ventral plate, setae shown only on left side. K. Paramere. L. Distimere. M. Aedeagus, with median sclerite.

(fig. 35A). Shape and proportions of antennal segments as shown in figure 35B. Last segment of maxillary palp (fig. 35E) more than twice as long as penultimate; diameter of sensory vesicle half of that of third segment.

Wings like those of female, but no setae on central portion of Sc (fig. 35C).

Shape and proportion of articles of legs as shown in figure 35D, F, G. Hind basitarsus 3.2 times as long as wide. Calcipala (fig. 35I) small but distinct, slightly wider than long. Legs with numerous long setae as shown in illustrations.

Genitalia as shown in figure 35J-M. Basimere wider than long; distimere subquadrate, distal portion widely concave, not tuberculate. Ventral plate with 1+1 distinct, translucent areas. Median sclerite and spines of aedeagus as illustrated.

PUPA: Cocoon (fig. 36A-C) like wall pocket or slipper in shape, with short anteroventral bridge. Color light brown, surface smooth,

closely woven, threads not individualized under medium magnification. Rim of aperture not or only feebly reinforced. Length of cocoon at dorsum along middle, 2.5-3.0 mm.; maximum length along base, 4.0 mm.

Average length of pupa, 3.5 mm. Length of respiratory organs, 2.5-3.0 mm., viz., three-fourths as long as cocoon and only slightly shorter than pupa proper.

Respiratory organs (fig. 36A-D, N-P) with six filaments, dorsal and median primary branches and their filaments forming tight bundle, ventral primary branch and its filaments sharply curved ventrally and backward, filaments almost entirely hidden by cocoon. All primary branches with two filaments, division not far from base of respiratory organ; division of ventral primary closest, and that of median primary branch slightly more remote than that of dorsal primary branch. Dorsal primary branch thickest, ventral primary branch thinnest.

Filaments gradually tapering toward their rounded tips; surface of filaments very delicately granulose, granules arranged in spirals.

Head and thorax of pupa light brown.

Head with 1+1 fields of platelets at base of clypeus (fig. 36F, G), 2+2 frontal and 1+1 facial trichomes, all simple, facial trichomes much longer than frontal; other trichomes not observed.

Thorax as illustrated in figure 36D. Region adjacent to aperture of cocoon with a band of platelets that extends to midline ventrally and attains base of respiratory organs. Most of remainder of exposed surface of thorax covered with trichomes in shape of elongate, lanceolate setae (fig. 36M), their length, 0.07–0.1 mm., their total number approximately 250+250; a few fine hairs

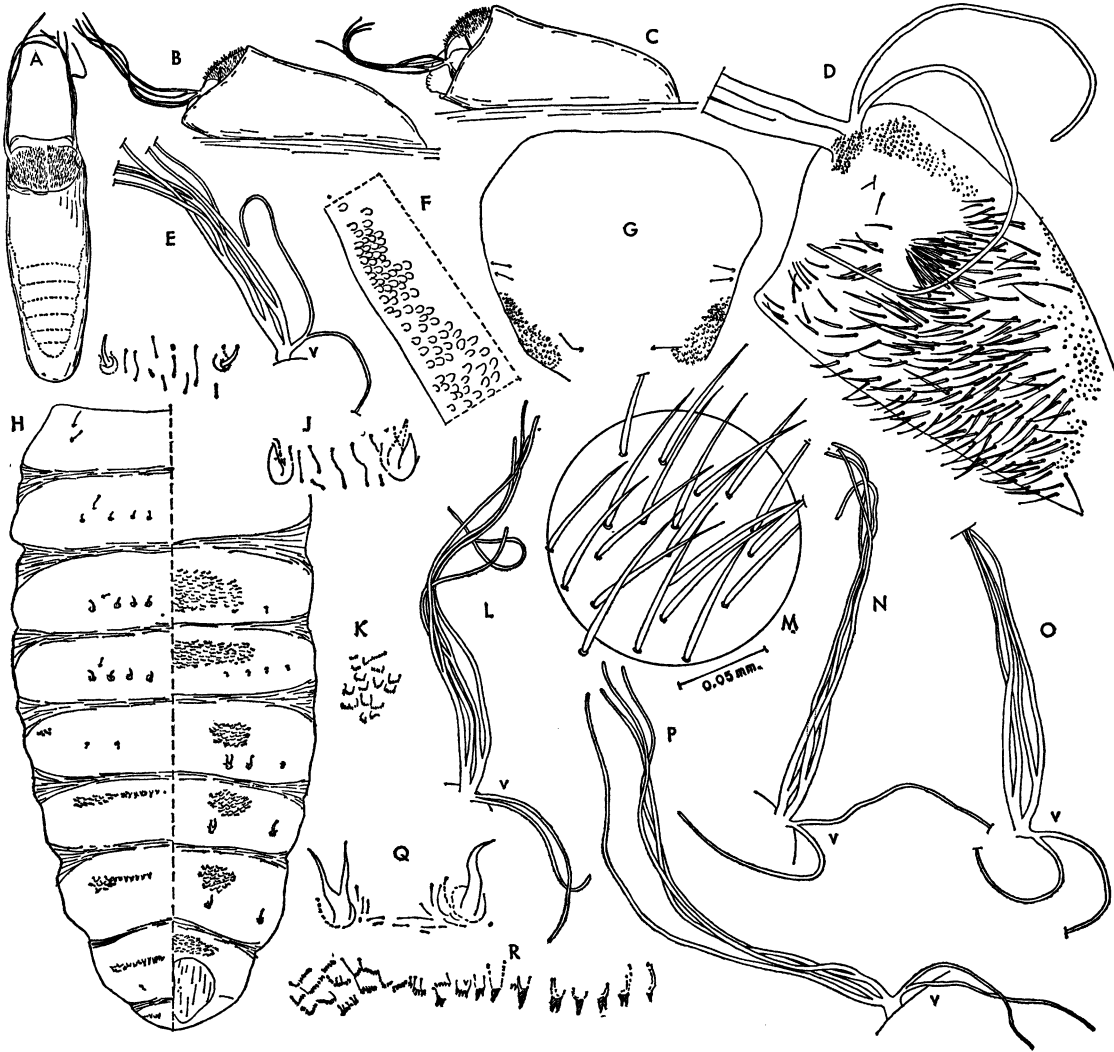


FIG. 36. *Simulium herreri*, pupa. A. Pupa with cocoon, dorsal view. B, C. Pupa with cocoon, side view, different specimens. D. Portion of thorax. E. Respiratory organ. F. Platelets at base of clypeus. G. Clypeus. H. Chaetotaxy of abdomen; tergites to the left, sternites to the right. I. Spines of tergite II, enlarged. J. Spines of tergite III, enlarged. K. Scalelike tubercles of sternite VIII, enlarged. L. Respiratory organ. M. Thoracic trichomes, enlarged. N–P. Respiratory organ, different specimens. Q. Spines of sternite VII, enlarged. R. Tubercles of tergite VII, enlarged. The small letter v indicates the ventral branch of the respiratory organ.

near insertion of respiratory organs.

Chaetotaxy of abdomen as shown in figure 36H-K, Q, R. Tergite I with 2+2 lateral setae. Tergite II with 3+3 relatively small, equidistant spines (acrostichal, dorsal and dorsocentral), and in some cases also a dorsolateral one, smaller than others and somewhat remote from them; one or two anterior dorsocentral and approximately 3+3 lateral setae also present. Tergites III and IV with 4+4 large, spinelike setae, dorsolateral separated from dorsocentral by relatively wide space; tergites III and IV also with 1+1 anterior dorsocentral and 2+2 lateral setae. Tergite V with 1+1 small, dorsal and 1+1 dorsolateral setae, as well as with 1+1 small, anterolateral groups of small, scalelike structures. Tergites VI-VIII at anterior border with 1+1 rows of spiniform, simple, bifid, or trifid tubercles, last transformed laterally into small, scalelike structures arranged in several irregular rows and occasionally with 1+1 dorsocentral setae; rows of tubercles on tergites VI and VII widely separated from one another, those of VIII closely approximated, almost confluent; numbers of tubercles in rows 6-13+6-13 on tergites VI and VII, 10-13+10-13 on VIII. Anterior border of tergite IX in some cases with 1+1 groups of one to three tubercles. Sternite III with 1+1 lateral and 1+1 ventral setae; central region with a transverse area of numerous small and very delicate, scalelike structures. Sternite IV with 3+3 or 4+4 ventral and lateral setae, and a central area of scalelike structures as on III. Sternites V-VII with 2+2 spines before posterior margin; spines of each pair close to one another on fifth, separated by a wider space on both sixth and seventh segments; spines of V generally bifid, but in some cases ventrolateral one simple; on VI and VII, generally ventral spine bifid and ventrolateral one simple, but in some both simple. Sternites V-VII each with 1+1 suboval fields of scalelike structures; VIII with one transverse group of scales near anterior margin.

LARVA: Maximum length, 7 mm.; width of head capsule, 0.6-0.65 mm. General body shape as shown in figure 37A, B.

Color variable. Dark hypodermal pigment generally present on dorsal and ventral of anterior half of body and on dorsal sur-

face of posterior half. Cephalic apotome with two different basic color patterns, as illustrated in figure 37D, E. Cuticle with isolated short hairs, becoming more numerous toward posterior end.

Antennae as shown in figure 37H, brown, subapical segment darkest; second segment with two constrictions, areas of constrictions lacking pigment. Ratio of lengths of segments I to III, 1/1.1-1.25/1.0-1.08; third segment very slender, and as long as or slightly longer than first. Mouth brushes with approximately 40 rays in large fan. Tothing of mandibles as shown in figure 37I; two external teeth, one strong apical, three subapical ones gradually decreasing in size, three to four large and two to three shorter internal and two marginal teeth, first of latter much larger than second. Maxillary palp as shown in figure 37F, strongly pigmented. Structure and pigmentation of hypostomium as shown in figure 37C; median tooth as prominent as lateral ones; central intermediate tooth smallest. Lateral serration well developed, irregular in shape. Hypostomial setae arranged in two irregular rows, with an average of 11 setae in each group. Region of insertion of setae lacking pigment. Disc of hypostomium posteriorly with a few short setae. Postgenal cleft rather wide (fig. 37G), its depth not much larger than length of postgenal bridge.

Anal sclerite as shown in figure 37J; scales at its base small and few in number. Crochet ring with approximately 90 rows, each composed of about 15 hooks. Central lobe of anal gills with 1+1, lateral lobes each with one secondary, lobule (fig. 37K).

MATERIAL EXAMINED: Peru: Lima: Chachahuaro, Quebrada de Unturu, Rimac Valley, 2500 meters, September 24, 1963 (F. Blancas, A. Herrer, and P. Wygodzinsky; the American Museum of Natural History), numerous larvae and pupae, one female, holotype, one male, allotype, nine females, three males, paratypes, all reared; *idem* (F. Blancas, A. Herrer, and P. Wygodzinsky; Instituto Nacional de Microbiología), several larvae and pupae, one male, one female, paratypes, reared. Patihuayco, 2300 meters, June 4 to July 7, 1953 (A. Herrer; the American Museum of Natural History), several pupae, 10 males, six females, reared.

ECOLOGICAL DATA: The larvae and pupae

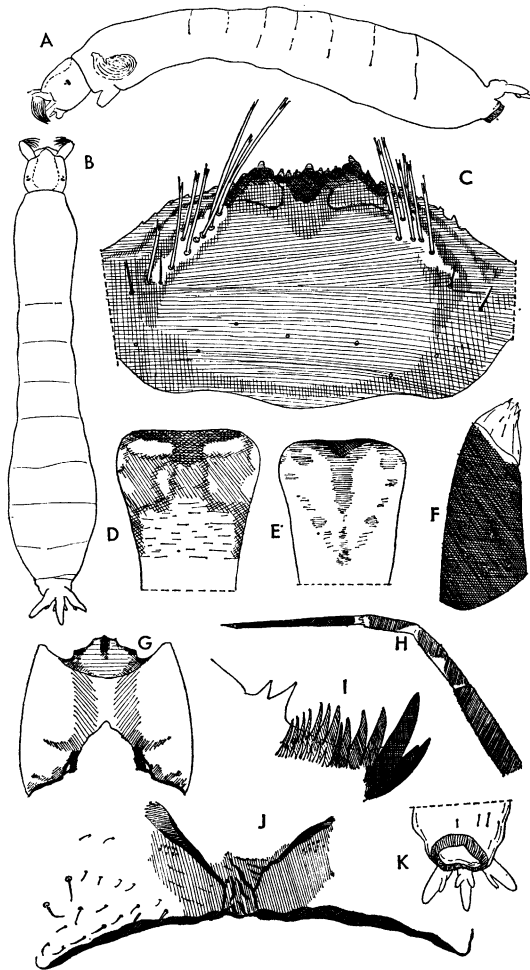


FIG. 37. *Simulium herreri*, larva. A. General aspect, lateral view. B. General aspect, dorsal view. C. Hypostomium. D, E. Cephalic apotome, with color pattern, different specimens. F. Maxillary palp. G. Head, from below. H. Antenna. I. Teeth of mandible. J. Anal sclerite. K. Apical end of abdomen, with anal gills.

from Chacahuaro were collected on trailing grass leaves in a small irrigation ditch, and on the surface of rocks in a small stream. They were found from 1 cm. to 3 cm. below the surface of the water. Pupae frequently formed small aggregations. In both water-courses mentioned, the temperature was 15° C.

DISCUSSION: This species, the only one in *Pternaspatha* so far collected on the western slope of the Andes in Peru, is named for Dr.

Aristides Herrero, in recognition of his unselfish assistance to our work.

In addition to the pupae mentioned above, a total of 54, there were 16 from Chacahuaro and three from Patihuayco with eight filaments in each respiratory organ, viz., the dorsal and median primary branches had three filaments each instead of two. The first divisions of the primary branches are situated at about the same levels as in specimens with six filaments; the position of the second divisions is generally at a considerable distance from the first (fig. 36E, L) but occasionally much closer. In all other respects, these pupae with eight filaments agree with those possessing six, and adults of both sexes obtained from either type of pupae are indistinguishable. We consider the agreement in the chaetotaxy of the pupal thorax, and the presence of fields of platelets at the base of the clypeus, both characters unique in the group, as more significant than the confessedly unusual difference in the number of respiratory filaments. We identify the aberrant individuals discussed here as also belonging to *herreri*, although we do not designate the respective adults as paratypes. The pupa is placed in two different couplets in the key.

Simulium herreri, *albilineatum*, and *yacuchuspi* form a closely knit group. The male of *herreri* differs from males of the two other species by the absence of paired light-colored spots from tergite III; the female of *herreri* is distinguished among other characters by the shape of the paraprocts and the light-colored central portion of the eighth sternite, as indicated in our key. The pupa is characterized by the sharply divergent filaments of the ventral primary branch of the respiratory organ, the conspicuous areas of platelets at the base of the frontoclypeus, and the lanceolate trichomes of the thorax. The differential characters of the larva are mentioned in the key.

Simulium* (*Pternaspatha*) *prodexargenteum
(Enderlein)

Figure 38

Pternaspatha prodex-argenteus ENDERLEIN, 1936, p. 116.

Simulium prodex-argenteus: SMART, 1945, p. 511.

Simulium prodex-argenteum: VARGAS, 1945, p. 186.

MALE: Wing length, 3.1 mm.

Head black. Eyes, antennae, and palpi piceous. Clypeus black, silvery pollinose. Conspicuous long dark hairs on occiput, between eyes, on clypeus, basal two segments of antennae, and basal segment of maxillary palp.

Mesonotum velvety black, with a very narrow, median, longitudinal, white line. Depending on the illumination, 1+1 submedian white spots at anterior border of mesonotum, or sides and posterior third of mesonotum at center dark gray. Mesonotum with sparse, long, suberect, dark, decumbent, brass-colored hairs. Scutellum and metanotum black, slightly shining; scutellum with long, erect and decumbent, dark or light-colored hairs. Pleura and sterna black, with gray pollinosity. Proepisternal tuft brass-colored. Wing veins stramineous; spines black, setae light-colored. Halteres yellow, their stalks darkened. Coxae black, grayish pollinose. Legs dark brown. Proximal half of basitarsus of mid leg yellowish brown. Pattern of hind legs as shown in figure 38A; tibia yellow, its base conspicuously darkened, connected to apical dark area by a narrow, dorsal, dark band. Basitarsus of hind leg whitish, very faintly darkened at base; apical pigmented area occupying two-fifths of total length of article. Hairs of legs whitish or brass-colored. Dorsal surface of abdomen (fig. 38C) velvety black; long hairs of fringe of first segment and remaining hairs whitish. Tergite II with 1+1 very large silver-white spots, dorsal dark area small. Tergites III-V with 1+1 silvery white spots posteriorly. Tergite VI entirely silvery white. Tergite VII with 1+1 very large, silvery white spots. Tergites VIII and IX dark gray, sides slightly iridescent under certain illumination. Under surface of abdomen gray.

Antennae and mouth parts not examined in detail.

Wings: Sc and basal section of R glabrous. Setae and spines on R_1 arranged in a single row. Setae on R_s arranged in a single row.

Forelegs long and slender; tarsi not widened. Coxae and base of femora dorsally with numerous very long hairs. Hind legs as shown in figure 38A; coxae and dorsal surface of femora with numerous very long hairs, a few also on tibia and tarsus. Basitarsus slightly

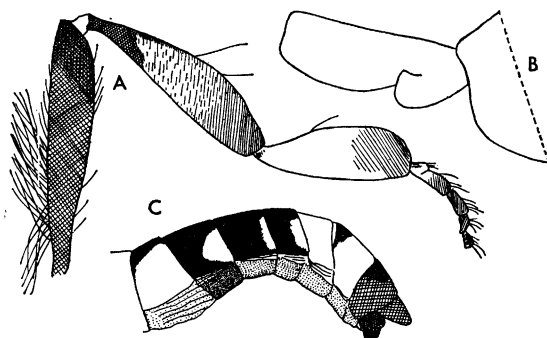


FIG. 38. *Simulium prodexargenteum*, male, type. A. Hind leg. B. Apex of posterior basitarsus, with second tarsal segment. C. Color pattern of abdomen, side view.

less than three times as long as wide. Calci-pala not developed (fig. 38B).

Abdomen with very long hairs, those of fringe of first segment attaining center of fourth segment.

Genitalia not examined in detail. Dististyles apparently smooth apically.

MATERIAL EXAMINED: Hoch-Peru [High Peru] (Zoological Museum of the Humboldt University, Berlin), one male type.

***Simulium (Pternaspatha) yacuchuspi*,
new species**

Figures 39-41

FEMALE: Length of wing, 3.5-3.8 mm.

Pilosity and color of head like those of *herrerri*.

Mesonotum as usual, adpressed setae brass-colored, not dense and not obliterating color pattern. Color of remainder of thorax and its setae like that in *herrerri*. Wings hyaline, veins ochraceous, spines and hairs black. Stem of halteres dark brown, knob white. Legs (fig. 39F, J, K) light brown, their hairs silvery to black; pattern much like that of *herrerri*, but dark spot at base of mid femur elongate, and dark region at base of tibiae fainter.

Abdomen (fig. 39O) black. Tergite II with 1+1 large, silvery white spots, tergite III with 1+1 smaller ones, tergites IV and V each with 1+1 very small ones. Tergite VI entirely silvery white, very faintly darkened posteriorly at center; VII black on central half, white on lateral fourths. Tergite VIII black, silvery white only at lateral extremities.

Tergite IX grayish black. Tergites IV and V narrowly banded with grayish on lateral portion of hind border (not shown in illustration). Hairs of basal fringe and of remainder of abdomen silvery.

Frons as shown in figure 39C. Frontocular triangle about as long as wide. Structure of antennae (fig. 39A), maxillary palp (fig. 39D), and cibarium like that of *herrerri*, but tubercles of sensory vesicle (fig. 39E) relatively larger and somewhat less numerous. Maxillae with 22–27, mandibles with 42–48, teeth.

Chaetotaxy of mesonotum, scutellum, and wings like that of *herrerri*. Shape of legs much like that of *herrerri*; hind leg illustrated in figure 39F. Calcipala distinct (fig. 39L), about as long as wide. Claws with very small tooth (fig. 39M, N).

Eighth sternite and gonapophyses like those of *albilineatum*. Paraprocts and cerci as shown in figure 39P; projecting portion of paraprocts rather narrowly subtriangular. Genital fork and spermatheca like those of *herrerri*.

MALE: Length of wing, 3.0–3.5 mm.

Color of head and its appendages like that of *herrerri*.

Color of thorax like that of *herrerri*, but

knob of halteres yellow. Legs pale yellow, their hairs silvery white to black. Color pattern of legs like that of *albilineatum*, but spot at base of fore femur slightly shorter, and dark portion of hind basitarsus (fig. 39G) more intense and more extended.

Abdomen (fig. 39I) velvety black; hairs, including those of basal fringe, generally silvery, rarely brass-colored. Segment II with 1+1 very large, silvery white spots closely approaching but not meeting dorsally. Segment III with 1+1 small, silvery white spots laterally at hind margin. Segment VI almost entirely silvery white except small dark area at center behind; VII with 1+1 medium-sized, lateral, silvery white spots. Segment IX faintly iridescent.

Structure of head and its appendages like that of *herrerri*; antennae as shown in figure 39B.

Wings like those of female, but no setae on central portion of Sc.

Shape and proportions of articles of legs (fig. 39G) much like those of *herrerri*. Hind basitarsus 2.7–3.0 times as long as wide. Calcipala (fig. 39H) very small but distinct, about as long as wide. Setae of legs like those of *herrerri*.

Genitalia much like those of *herrerri*.

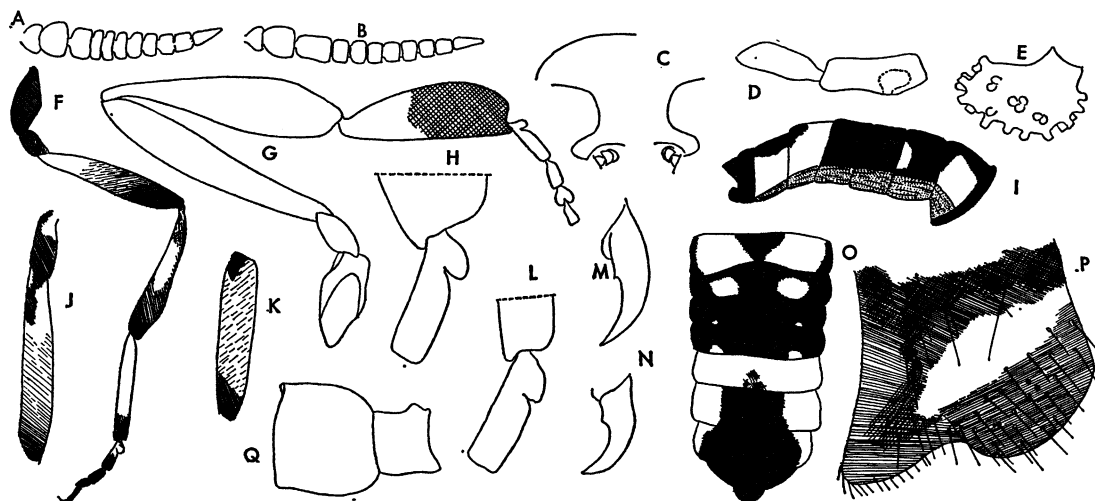


FIG. 39. *Simulium yacuchuspi*. A. Female, antenna. B. Male, antenna. C–F. Female. C. Frons. D. Second and third segment of maxillary palp. E. Sensory vesicle of maxillary palp. F. Hind leg. G–I. Male. G. Hind leg; pigmentation shown only on basitarsus. H. Apex of posterior basitarsus, with second tarsal segment. I. Color pattern of abdomen, side view. J–P. Female. J. Trochanter and femur of mid leg. K. Femur of foreleg. L. Apex of posterior basitarsus, with second tarsal segment. M, N. Claws of hind leg. O. Color pattern of abdomen, dorsal aspect. P. Paraproct and cercus. Q. Male, outlines of paramere.

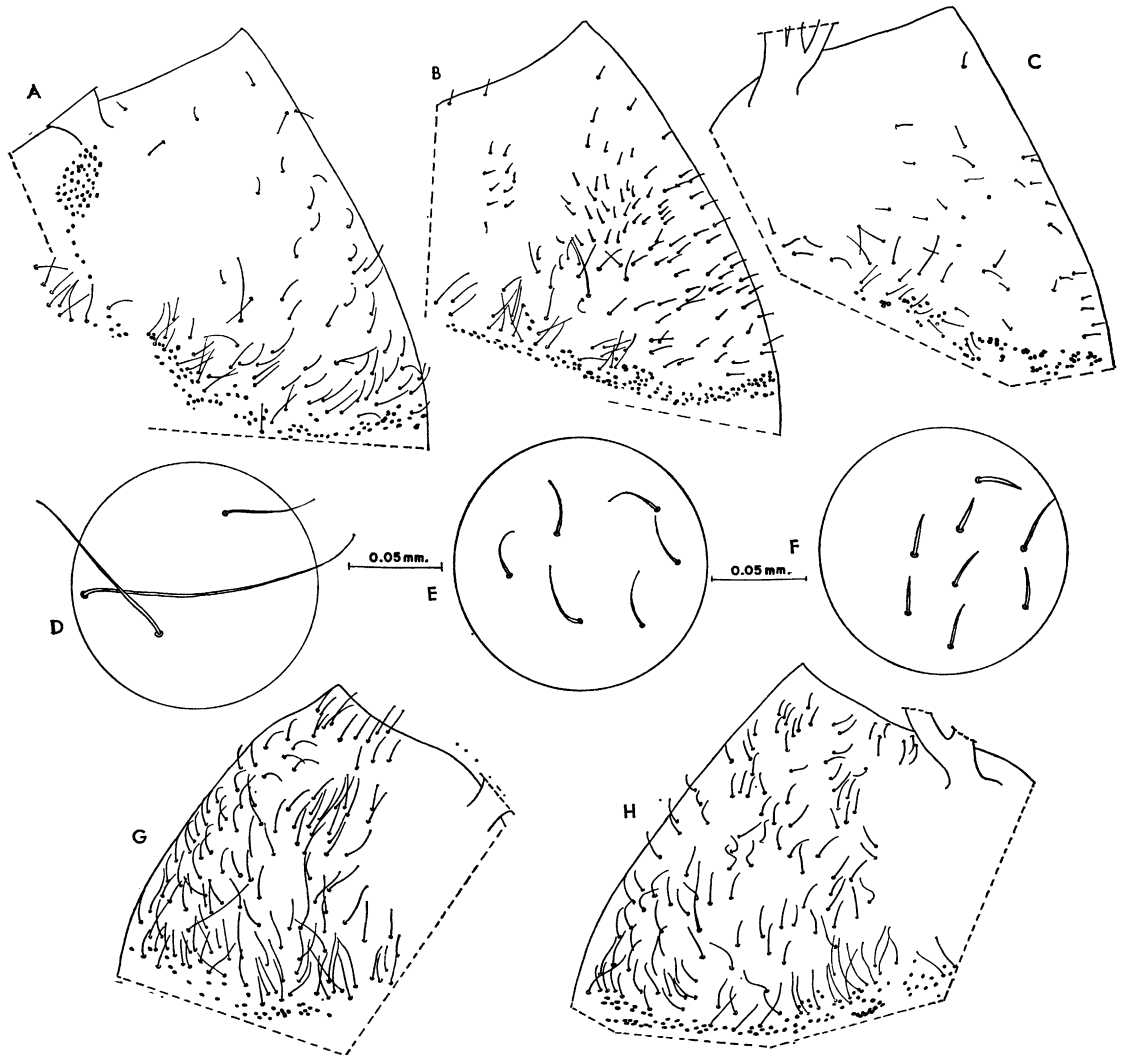


FIG. 40. *Simulium yacuchuspi*, pupa. A-C. Portion of thorax, different specimens. D. Thoracic trichomes of A, enlarged. E. Thoracic trichomes of H, enlarged. F. Thoracic trichomes of B, enlarged. G, H. Portion of thorax, different specimens.

PUPA: Cocoon slipper-shaped (fig. 41B, L) with well-developed anteroventral bridge. Color light brown, translucent, surface smooth, texture closely woven, threads not perceptible under low magnification. Rim of aperture feebly reinforced. Length of cocoon at dorsum along middle, 2.8–3.4 mm.; maximum length along base, 4.1 mm.

Length of body of pupa, 3.2–3.4 mm.; length of respiratory organs, 2.2–2.5 mm., viz., half as long as cocoon, and two-thirds as long as body of pupa.

Respiratory organs (fig. 41A, C–H, N) with six filaments arising from three primary branches; dorsal and median primary branches and their filaments lying closely together, ventral primary branch sharply ventrally bent, its ventral filament curved backward under cocoon, its dorsal filament generally curved forward, but not closely associated with remaining filaments. All primary branches with division into filaments not far removed from base of respiratory organ; division of dorsal primary branch closest to, and

either that of median or ventral branch most remote from, base of respiratory organ. Dorsal primary branch thickest, ventral primary branch thinnest; dorsal filament of dorsal primary branch conspicuously thicker on basal portion than any other. Surface structure of filaments like that of *herrerii*.

Head and thorax of pupa dark brown.

Head (fig. 41I, J) with (1-)2+2(-1) frontal and 1+1 facial trichomes, latter frequently longer, and generally bifid.

Thorax as illustrated in figure 40A-C, G, H. Region adjacent to aperture of cocoon with a band of not very numerous platelets, becoming evanescent toward sides of thorax; small-

er platelets also occupying a large area of dorsal portion of part of thorax covered by cocoon. Exposed surface of thorax with large and very variable number of simple (only very rarely bifid) trichomes, longest and most delicate near band of platelets on lateral portion of thorax, diminishing in size toward dorsum and lateral disc of thorax. Trichomes mostly slender, hairlike, but in some specimens trichomes on disc becoming very short and pointed, almost spinelike (fig. 40D-F). Length of trichomes varying from 0.02 to 0.16 mm., most frequently around 0.1 mm. Total number of trichomes varying from 50+50 to 130+130; type and number

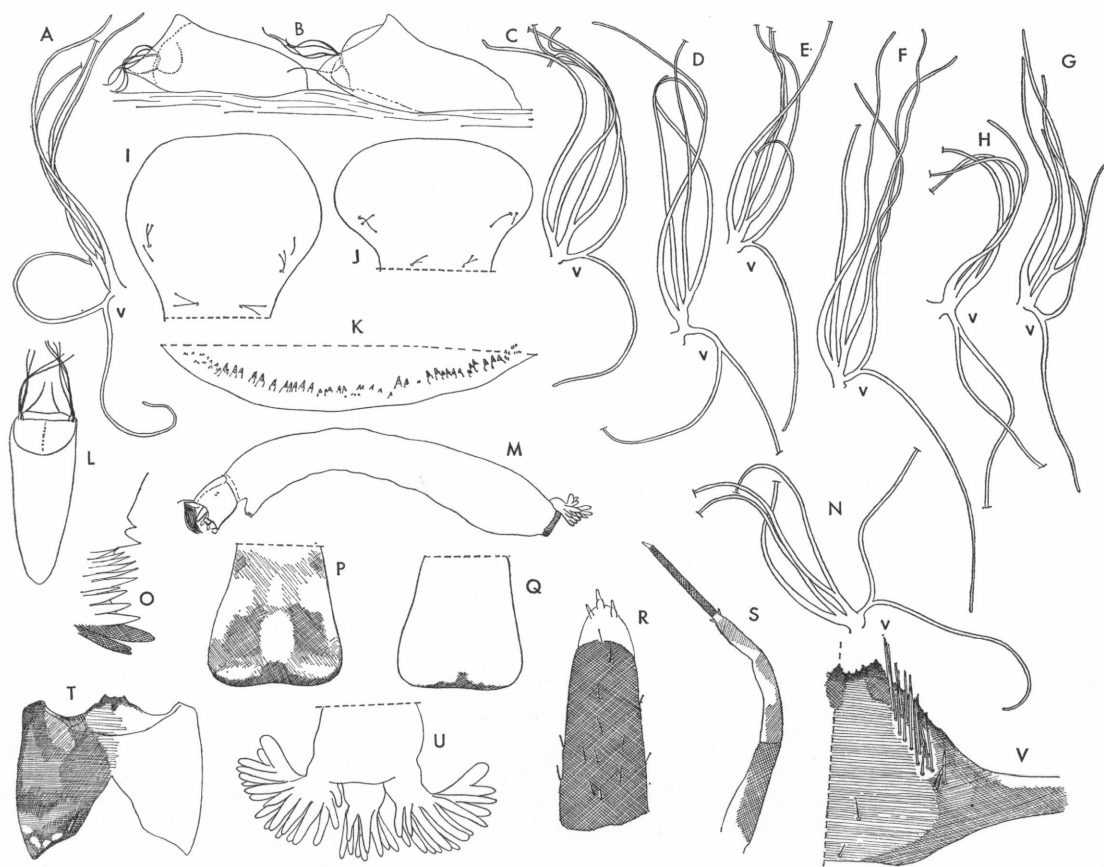


FIG. 41. *Simulium yacuchuspi*. A-L. Pupa. A. Respiratory organ. B. Pupae and cocoons, lateral view. C-H. Respiratory organs, different specimens. I. Clypeus of male pupa. J. Clypeus of female pupa. K. Tubercles of tergite VIII. L. Pupa and cocoon, dorsal view. M. Larva, lateral aspect. N. Pupa, respiratory organ. O-V. Larva. O. Teeth of mandible. P. Cephalic apotome, with pigment pattern, dark specimen. Q. Cephalic apotome, with color pattern, light form. R. Maxillary palp. S. Antenna. T. Head from below, with color pattern on left side. U. Anal gills. V. Hypostomium. The small letter v indicates the ventral branch of the respiratory organ.

of trichomes invariably closely similar on both halves of thorax in one individual.

Chaetotaxy of abdomen like that of *herrerri*, but spiniform tubercles on tergite VIII generally forming a continuous row (fig. 41K).

LARVA: Maximum length, 7 mm.; width of head capsule, 0.65–0.7 mm. General body shape as shown in figure 41M.

Brownish green hypodermal pigment (in alcohol) on whole body except posterior fifth of ventral surface; larvae appearing black in life. Head very variable in color, extremes of pattern of cephalic apotome shown in figure 41P, Q; dark form prevalent. Cuticle with a few scattered short hairs.

Antennae as shown in figure 41S, brown, subapical segment darkest; second segment with two constrictions, extensive areas around constrictions lacking pigment. Ratio of lengths of segments I to III, 1/1.1–1.3/0.75–0.9; third segment slender, shorter than first. Mouth brushes with 40–46 rays in large fan. Toothing of mandibles (fig. 41O) much like that of *herrerri*. Maxillary palp as shown in figure 41R, strongly pigmented. Structure and pigmentation of hypostomium as shown in figure 41V; median tooth more prominent than lateral ones. Lateral serrations well developed, irregular in shape. Hypostomial setae arranged in two irregular rows, with an average of 15 setae in each group. Region of insertion of setae distinctly less pigmented than remainder of disc of hypostomium. Postgenal cleft relatively narrow, pointed apically, its depth larger than length of postgenal bridge (fig. 41T).

Anal sclerite like that of *herrerri*; scales at its base small and few in number. Crochet ring with 81–89 rows, each composed of 15–20 hooks. Central and lateral lobes of anal gills each with 16–20 very long and slender secondary lobes arranged in two to three irregular rows (fig. 41U).

MATERIAL EXAMINED: Peru: Junín: Río Paccha, near Huasqui, Tarma, 3750 meters, July 16, 1965 (P. and B. Wygodzinsky; the American Museum of Natural History), numerous larvae and pupae, one male, holotype, one female, allotype, 18 males, four females, paratypes, all reared.

ECOLOGICAL DATA: The larvae and pupae were found attached to leaves and stems of grass trailing in a small stream, near its sur-

face; the stream was not more than 50 cm. wide and not more than 10 cm. deep; the temperature of the water was 10° C.

DISCUSSION: The variation in the number and in the size of the trichomes of the pupal thorax is amazing. If only the extremes (such as are shown in fig. 40D and F) had been seen, the existence of two different species would have been assumed. Intermediate forms (fig. 41E) occur together with the extreme ones, and no other structural or chromatic differences correlated with the above-mentioned differences in chaetotaxy were encountered in the pupae, in the adults, or in the larvae. We therefore conclude that a single species is involved.

The name of this species is taken from the Quechua *yacu*, water, and *chuspi*, fly.

Simulium yacuchuspi is closely related to *S. herrerri*, *S. albilineatum*, and *S. albicinctum*. The larva differs from that of *herrerri* and *albilineatum* (that of *albicinctum* is unknown) mainly by the large number of secondary lobes of the anal gills. The pupa of *yacuchuspi* differs from that of *herrerri* (with which it shares the backward-directed ventral filament of the ventral primary branch of the respiratory organ) by the characters detailed in the key, and from that of *albilineatum* by virtual absence of bifid trichomes on the thorax and the presence of the above-mentioned backward-directed ventral filament.

The adults are more difficult to distinguish with certainty. The male of *yacuchuspi* differs from that of *albicinctum* by the presence of 1+1 white spots on abdominal tergite III, and a less strongly widened hind basitarsus; from that of *herrerri* by the presence of the spots and the absence of such spots from segment V, but it cannot be separated from the male of *albilineatum*. The female of *yacuchuspi* can be recognized by the structure of its paraprocts. It differs from that of *albilineatum* by the white spots on tergite V which are much smaller than those of tergite III, and from that of *herrerri* also by the dark central portion of the eighth sternite, the poorly developed tooth of the claw, and the almost completely white tergite VI. The female of *S. yacuchuspi* is rather similar to that of *S. albicinctum*, but the latter lacks white spots on tergites IV and V, the dark

area at the base of the posterior tibia is more extended, and the calcipala is wider.

SPECIES INCERTAE SEDIS

***Simulium (Pternaspatha) pulchrum* Philippi**

Simulium pulchrum PHILIPPI, 1865, p. 633. KERTÉSZ, 1902, p. 290. SILVA FIGUEROA, 1917, p. 30. PINTO, 1931, p. 729. VARGAS, 1945, p. 187. SMART, 1945, p. 512. STUARDO ORTÍZ, 1946, p. 42.

The original description of this species, obviously referring to a male, is not sufficient for an exact placement of *pulchrum*, but we feel reasonably sure that it belongs in *Pternaspatha*. As we have not been able to find the type, we prefer to leave this species under *incertae sedis* until the blackfly fauna

of the province of Santiago, Chile, where *pulchrum* was collected, is better known.

***Simulium (Pternaspatha) punctativentris* (Enderlein)**

Acropogon punctativentris ENDERLEIN, 1936, p. 118.

Simulium punctativentris: SMART, 1945, p. 512. VARGAS, 1945, p. 188. STUARDO ORTÍZ, 1946, p. 41.

The original description of *punctativentris* makes it clear that the species belongs to *Pternaspatha*. The type could not be found. The species was described from a single female collected in Cortaderal, Chile; topotypical material will be required before *punctativentris* can be correctly assigned.

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