

A Revision of the Neotropical
Aquatic Beetle Genus *Stegoelmis*
(Coleoptera: Elmidae)

PAUL J. SPANGLER

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ABSTRACT

Spangler, Paul J. A Revision of the Neotropical Aquatic Beetle Genus *Stegoelmis* (Coleoptera: Elmidae). *Smithsonian Contributions to Zoology*, number 502, 52 pages, 189 figures, 1990.—Eleven species are now recognized in the genus *Stegoelmis*. Two of the three previously described species, *S. geayi* (Grouvelle) and *S. verrucata* Hinton, are redescribed and illustrated; the third previously described species, *S. hintoni* Sanderson, is found to be conspecific with *S. geayi* and is placed in synonymy. Nine new species—*S. andersoni*, *S. crinita*, *S. ennsi*, *S. fera*, *S. ica*, *S. selva*, *S. sticta*, *S. stictoides*, *S. tuberosa*,—and associated larvae of *S. geayi* and *S. selva* are described and illustrated by line drawings and scanning electron micrographs. The presence of spiracular gills on the larvae in place of typical spiracles is described; this is the first instance of this unusual system of respiration reported for the suborder Polyphaga and the family Elmidae. Maps showing known distribution of each species are included and typical biotopes are described and illustrated. Keys in English and Spanish to the elmid subfamilies and the species of *Stegoelmis* are included.

RESUMEN

Actualmente se reconocen once especies en el género *Stegoelmis*. Dos de las tres especies previamente descritas, *S. geayi* (Grouvelle) y *S. verrucata* Hinton, son redescritas e ilustradas; la tercera especie previamente descrita, *S. hintoni* Sanderson, se encontró que es conspecifica con *S. geayi* y es puesta en sinonimia. Se describen e ilustran con dibujos a línea y microfotografías de microscopio electrónico de barrido nueve especies nuevas—*S. andersoni*, *S. crinita*, *S. ennsi*, *S. fera*, *S. ica*, *S. selva*, *S. sticta*, *S. stictoides*, *S. tuberosa*,—y las larvas asociadas de *S. geayi* y *S. selva*. Se describe la presencia de branquias espiraculares sobre las larvas en lugar de los espiráculos típicos; este es el primer ejemplo de este sistema poco usual de respiración reportado para el suborden Polyphaga y la familia Elmidae. Se incluyen mapas mostrando la distribución conocida de cada especie y los biotopos típicos son descritos e ilustrados. Se incluyen claves en inglés y español para las subfamilias de elmidos y para las especies de *Stegoelmis*.

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FIGURE 1.—*Stegoelmis selva*, new species, habitus, dorsal view.

A Revision of the Neotropical Aquatic Beetle Genus *Stegoelmis* (Coleoptera: Elmidae)

Paul J. Spangler

Introduction

Hinton (1939a) described the genus *Stegoelmis* for the new species *S. verrucata* and *Stenelmis geayi* Grouvelle (1908). The only additional species described in the genus was *S. hintoni* by Sanderson in 1953a; however, *S. hintoni* is placed as a junior synonym of *S. geayi* in this revision. In this study, 11 species, 9 of which are new, are recognized for the genus. Associated larvae of *Stegoelmis geayi* and *S. selva*, new species, are described and illustrated. The presence of spiracular gills on the last-instar larvae in place of typical spiracles is described; this is the first instance of this unusual system of respiration reported for the suborder Polyphaga and the family Elmidae.

BIOLOGY

I have collected adults and larvae of *Stegoelmis* from small, shallow, shaded brooks with mixed substrates of gravel, silt, and decaying leaves and woody debris (Figures 41, 126) and from woody debris in larger unshaded streams such as the Rio Baria, Territorio Federal Amazonas (T.F.A.), Venezuela (Figure 40). Adults and larvae often were found together on decaying saplings, on other woody debris, and occasionally in leaf packs. Examination of gut contents of adults and larvae confirmed that they feed on decaying plant material. Colorimetric water chemistry analyses provided the following data: pH, 4–5.5; hardness, 0–5; oxygen, 9–15 ppm; velocity, 17 cm/sec to 1.1m/sec. Water temperature varied from 17°C to 27°C and the streams varied from 1–35 m in width, 1 cm to 1 m in depth, and in altitude from 120 to 370 m above sea level.

The larva of *Stegoelmis* has not been described previously; however, Bertrand (1972) briefly commented about and included a figure of a larva he reported to be the larva of

Potamophilops. Spangler and Santiago (1987), in a treatment of *Potamophilops*, pointed out that the larva mentioned by Bertrand refers to that of *Stegoelmis* rather than *Potamophilops*. That conclusion was based on the fact that on numerous fieldtrips I and others have frequently collected adult *Stegoelmis* and associated larvae on woody detritus in small streams and brooks in areas of South America where members of the genus *Potamophilops* are presently unknown. Those associated larvae are the same as the one partially figured and erroneously identified by Bertrand.

Of all the known elmids larvae from the Western Hemisphere, the larvae of *Stegoelmis* have the most elaborate surface ornamentation. The ornate cuticular imbricated clusters and other setae are so small that details are not evident when examined with a stereoscopic microscope; and although the details of individual setae are more evident when viewed under a compound microscope, the overall patterns of the setae and their finest details are most readily apparent when a clean specimen is examined under the scanning electron microscope.

The distinctive larvae of *Stegoelmis* available for study (N = 92) ranged in length from 3.5 mm to 10.0 mm. No evidence of spiracles was found on the smaller, early instars; however, an elongate respiratory structure was found on the mesonotum (Figures 105, 106, 108–110) of the presumed penultimate and ultimate larval instars. Mature larvae, 9.5–10.0 mm in length, differ from the presumed penultimate larvae by the addition of similar respiratory structures in front of ornate lateral projections on abdominal segments 1–8 (Figures 105, 107, 111–113). Those respiratory structures are tentatively referred to here as spiracular gills, a structure previously reported only for larvae of several families of the suborder Myxophaga (Hinton, 1967). All respiratory systems previously described for elmids larvae consisted of a pair of typical spiracles on the mesonotum, a pair on abdominal segments 1–8, and anal gills.

The apparent absence of spiracular atria on early instars of *Stegoelmis* suggests that they may respire entirely by their anal

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gills or a combination of cuticular and anal gill respiration. The additional elongate gills may have evolved in response to a greater need for oxygen by the larger penultimate and ultimate instars and the cessation of the function of the anal gills when out of water as the ultimate instar leaves its aquatic habitat and pupates on land.

It seems evident that the spiracular gills (Figures 107–113) on the larvae of *Stegoelmis* are part of the respiratory system because each spiracular gill has the minute opening of its presumed spiracular atrium near the base of the gill (Figures 111, 112) and a tracheal branch extending through the body wall (Figures 108–110). In addition, the gills on the larvae of *Stegoelmis* are present anterolaterally on the mesonotum and laterally on abdominal segments 1–8, as are the spiracles in other known elmid larvae and many beetle larvae. A detailed investigation of these unusual gills is not pertinent to this systematic treatment but will be reported later.

DISTRIBUTION

Presently the 11 known species of *Stegoelmis* have been collected from 7 countries in northern South America. The majority of the species of *Stegoelmis* were collected in recent years and, primarily, as the result of two projects—the Ecuador-Peace Corps-Smithsonian Institution Aquatic Insect Survey of Ecuador (1974–1979) and the Survey of the Biota of Cerro de la Neblina, Venezuela (1984–1985). The species are presently recorded as follows: VENEZUELA (6): *S. ennsi*, new species; *S. fera*, new species; *S. geayi* (Grouvelle); *S. selva*, new species; *S. stictoides*, new species; *S. tuberosa*, new species. ECUADOR (4): *S. andersoni*, new species; *S. crinita*, new species; *S. geayi* (Grouvelle); *S. sticta*, new species. BRAZIL (2): *S. ica*, new species; *S. verrucata* Hinton. COLOMBIA (2): *S. andersoni*, new species; *S. sticta*, new species. GUYANA (2): *S. geayi* (Grouvelle); *S. stictoides*, new species. FRENCH GUIANA (1): *S. geayi* (Grouvelle). PERU (1): *S. andersoni*, new species. The specimens available for this study were all collected in lowland rainforests at altitudes ranging up to 370 m.

The localities from which the species are recorded represent, primarily, the areas surveyed by a few elmid beetle collectors, their collecting techniques, and the kinds of habitats sampled. The survey of aquatic insects in Ecuador, over a 5 year period, emphasized collecting from standing water habitats and the use of blacklight traps. The specimens of the four species of *Stegoelmis* reported from Ecuador were all collected at blacklights. In contrast, five species of *Stegoelmis* were collected almost daily in running water habitats during 24 days at the basecamp at Cerro de la Neblina, Venezuela. Blacklight traps were operated most nights beside the Rio Baria near the basecamp and attracted three species. The map (Figure 2) is a composite and shows the known distribution of the species of *Stegoelmis* included in this study and, although the genus is known mainly from the northern part of the Amazon Basin, it represents the area in which collections of stream-inhabiting

water beetles were made. Undoubtedly, the genus will be found to be much more widespread in lowland tropical rainforests and many undescribed species and new distributional records will be found as the tropical South American stream fauna is more widely surveyed.

DISTINGUISHING CHARACTERS

PLASTRON.—The species of *Stegoelmis* have extensive areas with plastron and only the antennae, eyes, clypeus, labrum, ventral surface of the head, genae, apices of the tibiae, tarsi, middle of the mesosternum, and the medial longitudinal impression of the metasternum are without plastron. At first, the plastron on *Stegoelmis* was mistakenly thought to be the fine deposit of a substance, usually calcareous, often found on elmid beetles. When examined under the scanning electron microscope, the plastron was found to be a mixture of scale-like setae and a fine, porous, sheet-like layer resembling that reported for the elmid genera *Pagelmis* by Spangler (1981) and *Stenhelmoidea* by Spangler and Perkins (1989). In *Stegoelmis*, as in *Pagelmis* and *Stenhelmoidea*, it is presumed that the porous plastron layer is exuded from cuticular pores, probably when the pupa changes to the adult form. The pores can be seen where the plastron has been scraped away from the cuticle (Figure 27). In this study, as in those of *Pagelmis* and *Stenhelmoidea*, the types and structure of the plastron have not been used to differentiate species because they are too minute to distinguish without the use of a scanning electron microscope.

Under a stereoscopic microscope the areas covered with plastron appear microreticulate and contrast sharply in microsculpture and, usually, in color with the smooth reddish brown to blackish surfaces without plastron. The areas covered with plastron are essentially the same for all of the species included in this study and descriptions of the areas are included in the generic description.

The plastron present on the species of *Stegoelmis* appears to be of one type that consists of broad, erect setae with fringed margins (Figures 22, 23) and surrounded by a porous layer appearing as though it was exuded from pores and flowed around the bases of the setae (Figures 26, 27). Presumably, the usually pentagonal shapes (Figures 50, 55) of the porous layer surrounding the setae were formed by compression when the "exudate" was still plastic as it flowed from pores. Unlike the continuous porous plastron layers on *Pagelmis* and *Stenhelmoidea*, the layer on *Stegoelmis* is frequently absent from various areas in back of the large urceiform setae (Figures 54–59).

SURFACE SCULPTURE.—The most useful characters found on the various species of *Stegoelmis* are the gibbosities or protuberances found on the pronotum and elytra. The term gibbosity, as used in this study, refers to convex areas as seen on the basal third of the pronotum where, usually, there are four transversely arranged swellings (Figures 1, 45, 67); these gibbosities vary in height and are described as distinct or

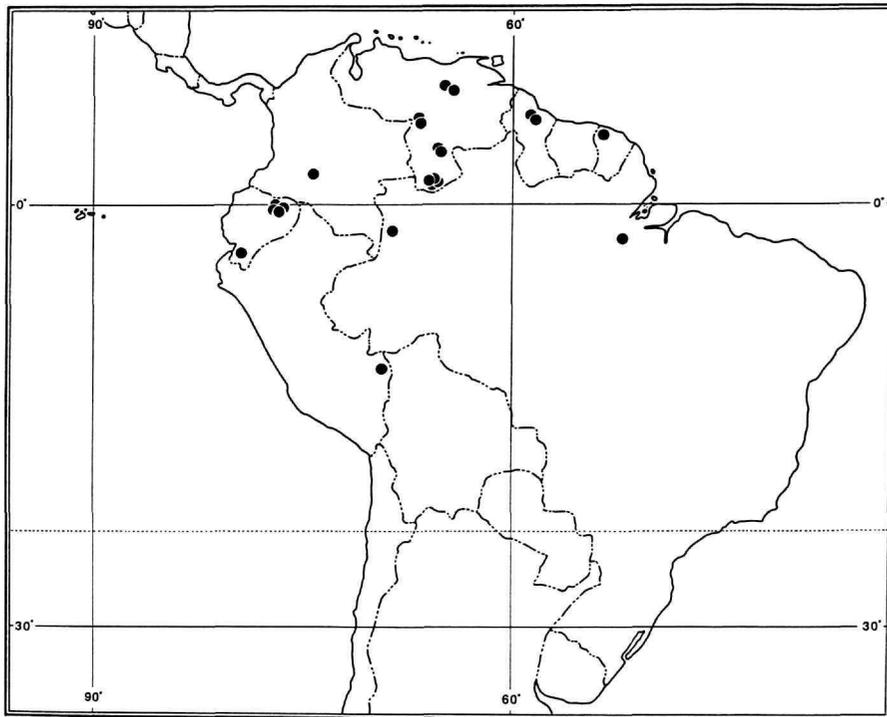


FIGURE 2.—Known distribution of genus *Stegoelmis*.

indistinct. The innermost gibbosities are obvious on all of the *Stegoelmis* studied; however, the sublateral gibbosities may be indistinct with only a vaguely higher surface area in some species (Figure 151) while other species have distinct sublateral gibbosities (Figures 28, 67). When the swellings are angular like a blunt thorn rather than rounded at their highest point (as on the apicolateral margins of the elytra of *S. selva*, new species), I have called them protuberances (Figures 46–48). The humeral swellings on most species of *Stegoelmis* are low (Figure 46) and are referred to as gibbosities in the descriptions. When the elytral intervals are raised, as intervals 2, 3, and 4 are basally on most of the taxa, they are referred to as being swollen.

Most species of *Stegoelmis* have the head, pronotum, and elytra punctate, but the punctures are sometimes partially obscured by the plastron. However, the differences in the separation of the punctures is useful in recognition of various species.

HEAD.—The head is usually retracted into the pronotum and little of the surface is exposed for observation in dry, pointed specimens. The exposed area from the top of the head to the labrum is partially obscured by the plastron but provides useful diagnostic characters. Most useful is the presence/absence, length, and depth of a median longitudinal impression between

the antennal acetabula as well as the comparative diameters of the punctures on the frontal area. The frontal area also may be concave or flat and provides another character state that aids in distinguishing some taxa.

THORAX.—The pronotum offers helpful characters for species discrimination. The differences in the shape and size of the gibbosities and protuberances are most useful and are discussed under sculpture. The length, width, and relative depth of the medial longitudinal impression, the differences in size of the hypomeral punctures, and the comparative development and extent of the rimmed margins will help separate various taxa.

ELYTRA.—The extent of the development of the elytral gibbosities or protuberances and swollen intervals provide useful diagnostic characters. The rows of coarse punctures are not very distinctive because they are obscured by the plastron. The rounded, angulate, dehiscent, or indehiscent elytral apices provide useful characters for separating taxa. Where these subjective differences have been used in the keys, the user should refer to the figures cited.

ABDOMEN.—The abdominal sterna are generally similar, but differences in size and distribution of the punctures have proved useful to separate several taxa. The males of one species, *S. selva*, new species, have a distinctive apicomedial

concavity on the last sternum but the concavity is obscured by a patch of dense, long, golden, hair-like setae (Figure 62). The patch of setae distinguishes the males of *S. selva* from all other species presently known in the genus.

LEGS.—The legs of various species of *Stegoelmis* are very similar. The most useful characters are the differences in the lengths of the cleaning fringes of golden, hair-like setae on the inner margin of the metatibiae. The fringes are uniformly small and obscure on all species of *Stegoelmis* except males of *S. andersoni*, new species (Figure 19) and *S. crinita*, new species (Figure 24).

GENTILIA.—Differences in the male genitalia in the genus *Stegoelmis* are very useful and provide stable definitive characters for segregation of the species. Although the series of specimens available for this study have not been extensive, no significant intraspecific variations have been noticed in the genitalia of the males. Only small interspecific differences have been noticed in the female genitalia in the genus and those structures are not useful for separating the taxa.

SECONDARY SEXUAL CHARACTERS.—The fringes of dense, golden, hair-like setae on the inner margins of the metatibiae of the males of *S. andersoni*, new species, and *S. crinita*, new species, and the distinctive patch of long, golden, hair-like setae in the concave apicomedial margin of the last abdominal sternum of *S. selva*, new species, are the only secondary sexual characters noted in the genus. Unfortunately, except for the three species mentioned above, I have found no characters for distinguishing males from females without dissecting each specimen.

MATERIAL STUDIED

Specimens listed without abbreviations indicating the depository are those deposited in the collections of the National Museum of Natural History, Smithsonian Institution (USNM = the former United States National Museum, collections now in the National Museum of Natural History). Depository abbreviations are the same as those given for institutions in the "Acknowledgments."

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For support of the fieldwork during which specimens of most of the newly described taxa were collected, I gratefully acknowledge the financial assistance of the administrators of the Scholarly Research Fund (1985) and Research Opportunities Fund of the Smithsonian Institution (1986, 1987). In addition, I thank the following: The administrators of the U.S. Peace Corps in Ecuador; Philip Lopes, former Peace Corps Country Director; Tomas Guerrero P., Program Manager, Agriculture (Ecuador); Julio Molineros, formerly Ministry of Agriculture, Quito, Ecuador; Peace Corps volunteers Andrea Langley and Jeffrey Cohen (1975–1977) and Joseph Anderson (1978–1979) who conducted fieldwork for the Ecuador-Peace Corps-Smithsonian Institution Aquatic Insect Survey and collected some of the specimens included in this study; Paulo Vanzolini, Maria Beatriz Ribiero do Valle, and the Consórcio Nacional de Engenheiros Consultores, S.A. for supporting fieldwork on the Rio Xingu, Pará, Brazil, during which time new aquatic beetles, including specimens of *Stegoelmis verrucata*, were collected; The Center for Research, Boston, Massachusetts, for supporting The Earthwatch Expedition to Guyana, 1983, during which specimens of *Stegoelmis geayi* were collected; The Women's Committee of the Smithsonian Associates, for financial support for preparation of specimens.

Several new species described in this revision were collected by participants of a biotic survey of Cerro de la Neblina, Territorio Federal Amazonas, Venezuela, and I thank the institutions and supporting organizations for that opportunity. The expedition was organized and directed by the Foundation for the Development of Physics, Mathematics, and Natural Sciences of Venezuela, with patronage of the following Venezuelan institutions: the Ministry of Education, the Ministry of the Environment, the Venezuelan Air Force, the National Council of Scientific and Technological Research, and the National Institute of Parks. The expedition was coordinated by Dr. Charles Brewer Carías and was conducted in collaboration with the National Science Foundation of the United States, the American Museum of Natural History, the Missouri Botanical Garden, the New York Botanical Garden, and the Smithsonian Institution; biologists from several other universities and institutions also participated.

The following people contributed much to this revision and I appreciate their assistance: Cheryl B. Barr, Robin A. Faitoute, Oliver S. Flint, Philip D. Perkins, Phyllis M. Spangler, and Warren E. Steiner for their help in collecting specimens; Young T. Sohn, Smithsonian Institution staff artist for the line drawings, maps, and mounting the micrographs; Susann G. Braden and Robin A. Faitoute for the SEM micrographs; Phyllis M. Spangler for typing the manuscript into the word processor and editorial assistance; Silvia Santiago for the Spanish translations.

Family ELMIDAE Shuckard, 1839

Key to the Subfamilies of the ELMIDAE

(Adults)

- Body with plastrons, especially on venter. Not pubescent except cleaning tufts on tibiae of some taxa. Cuticle typically hard. Procoxae usually round and trochantin not exposed. Adults aquatic, rarely leave water; rarely fly. **ELMINAE**
- Body without plastrons; densely pubescent. Cuticle moderately soft. Procoxae strongly transverse and trochantin exposed. Adults riparian, only occasionally entering water; commonly fly. **LARAINAE**

Clave para las Subfamilias de la ELMIDAE

(Adultos)

- Cuerpo con plastron, especialmente en la superficie ventral. No pubescente excepto por los cepillos limpiadores sobre las tibias de algunos taxa. Cutícula típicamente dura. Procoxas generalmente globosas y trocantín no expuesto. Adultos acuáticos, raramente fuera del agua; raramente voladores. **ELMINAE**
- Cuerpo sin plastron; densamente pubescente. Cutícula moderadamente blanda. Procoxas fuertemente transversas y trocantín expuesto. Adultos ribereños, solo ocasionalmente entran al agua; comunmente voladores. **LARAINAE**

Subfamily ELMINAE

- LIMNIDAE Stephens, 1829:104.
- ELMIDAE Shuckard, 1839:151.
- ELMINI Erichson, 1847:520.—Hinton, 1940:224.—Steffan, 1961:255.
- ELMISSIENS Mulsant and Rey, 1872:12.
- HELMINAE Zaitzev, 1910:20.
- HELMIDAE Leng, 1920:186.
- ELMINAE Hinton, 1935:177; 1936a:89; 1936b:418; 1939b:133.—Sanderson, 1938:660; 1953b:150; 1954:1.—Blackwelder, 1944:271.—Brown, 1983:3.—Spangler and Santiago, 1987:3.

Genus *Stegoelmis* Hinton, 1939

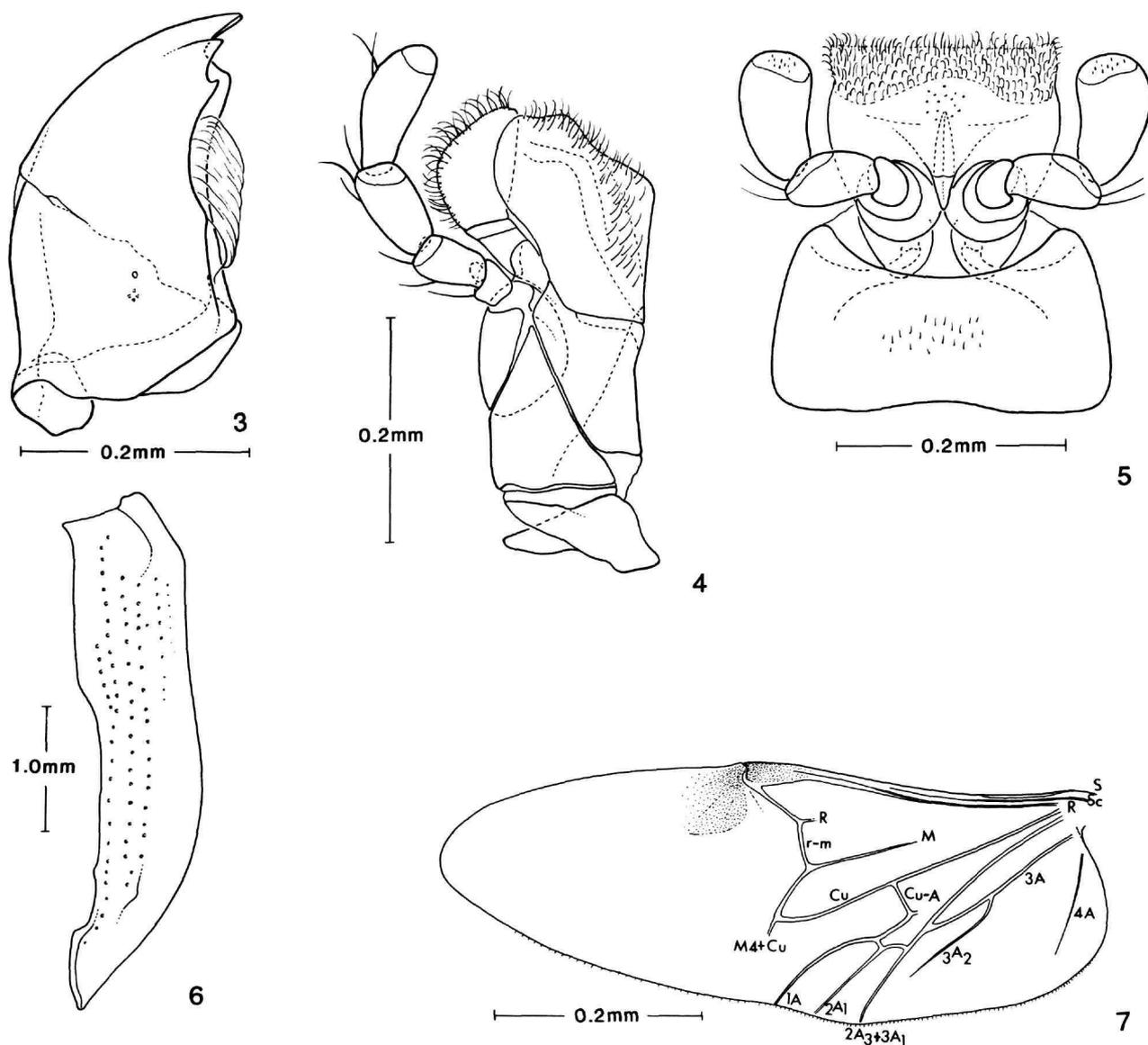
Stegoelmis Hinton, 1939a:30 [type species: *Stenelmis geayi* Grouvelle, 1908:181; by original designation].—Blackwelder, 1944:271 [checklist].—Sanderson, 1953a:33 [describes *S. hintoni*].—Bertrand, 1972:494 [discusses larva of *Stegoelmis* as larva of *Potamophilops*].—Hinton, 1976:1535 [illustrates plastron setae].—Spangler and Santiago, 1987:38 [discusses Bertrand's larval misidentification].

DIAGNOSIS.—Body robust, elongate, subparallel (Figure 42). Integument mostly covered with a fine plastron and with sparse, often scale-like setae; pronotum usually with gibbosi-

ties and/or protuberances (Figures 42, 45, 67); elytra usually with gibbositities or protuberances in humeral areas and subapically (Figures 42, 46–48). Epipleuron vertical adjacent to mesepisternum and metepisternum, then effaced posteriorly (Figure 6).

ADULT (REDESCRIPTION).—Head, when seen from below, retracted into pronotum so mouthparts are hidden. Antenna, 11 segmented; last segment subapically with a dense dorsal and a ventral row of setae (Figures 52, 53). Clypeus with anterior margin thickly rimmed. Mandible (Figure 3) with an acute apical tooth and 2 less acute subapical teeth; prostheca small, membranous, and densely pubescent. Maxillary palpus (Figure 4), 4 segmented; stipes with a well-developed palpifer; galea and lacinia separate and apex of each densely setose or spinose. Labial palpus, 3 segmented (Figure 5). Mentum as broad but slightly longer than submentum. Gula anteriorly nearly as broad as submentum; sides almost parallel.

Pronotum (Figures 45, 67) with basal margin trisinate, broadly and deeply so on each side and more narrowly and shallowly so in front of scutellum; without sublateral carinae; with or without a shallow, broad, median, longitudinal



FIGURES 3-7.—*Stegoelmis selva*, new species, adult: 3, mandible; 4, maxilla; 5, labium; 6, elytron, lateral view; 7, metathoracic wing.

impression; usually with gibbosities or protuberances at midlength; anterolateral angles obtuse; posterolateral angles obtuse or acute; sides distinctly or indistinctly rimmed. Elytra striate, punctate; without accessory striae; humeral and subapical areas usually with gibbosities or protuberances; without sublateral carinae; intervals 2, 3, and 4 swollen at base and interval 3 often swollen behind midlength (Figure 46). Hypomeron (Figure 70) and epipleura with fine plastron.

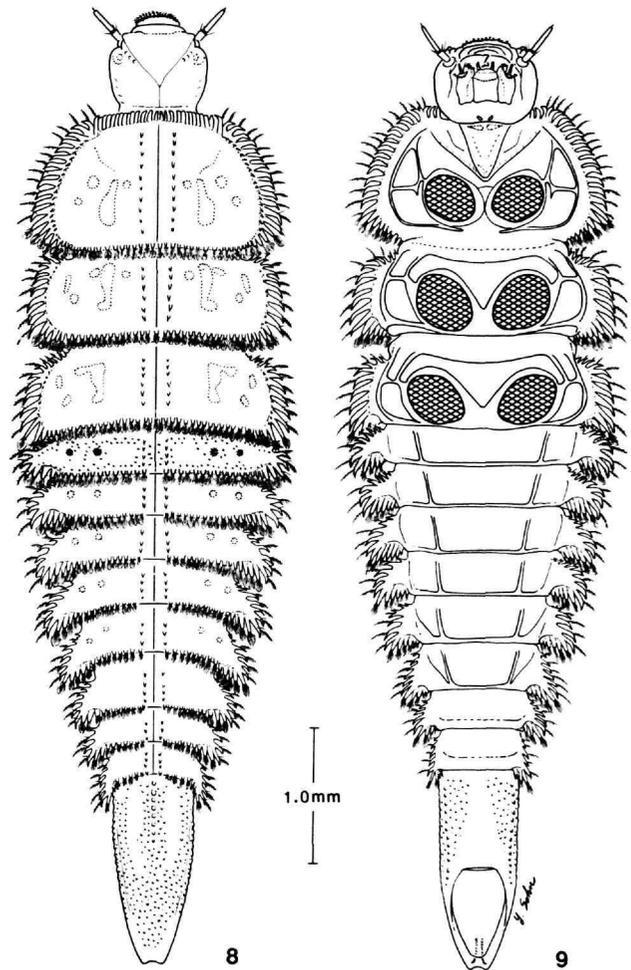
Epipleuron vertical adjacent to mesepisternum and metepisternum and then effaced posteriorly. Prosternum (Figures 43, 60) moderately long in front of procoxae. Metathoracic wing (Figure 7) without a radial cross vein or anal cell; with the apical portion of the first anal present; second anal with the first and third branches present and the second branch absent; third anal with a well-developed second branch; fourth anal well developed; cubito-anal crossvein complete and joining

cubitus to first anal. Prosternal process long, moderately narrow; with posterior margin rounded or emarginate. Mesosternum with a deep, moderately narrow groove for reception of prosternal process. Legs with visible portion of forecoxae globular and trochantin concealed by hypomera and sternum. Femora without a patch of long, golden, hair-like setae as seen in some elmid genera. Protibiae each with a small but distinct apical cleaning fringe and a dense row of robust smoothing setae (Figures 72, 73, 75). Mesotibiae each with a small but distinct apical cleaning fringe but without dense row of smoothing setae. Metatibiae each with a small but distinct or a large cleaning fringe (males of some species) but without dense row of smoothing setae. Metacoxae with a large lateral puncture (Figures 76, 77). Tarsal claws robust; without teeth (Figure 74). Lateral margins of abdominal sternum 3 with a broad distinct lobate process that clasps emarginate sides of elytron (Figure 49).

LARVA (Figures 8, 9).—Elongate, tapering posteriorly, and moderately strongly depressed dorsoventrally. Head not concealed by pronotum. One ocellus on each side. Antenna, 3 segmented. Clypeus fused to frons but frontoclypeal suture vaguely indicated. Labrum transversely rectangular and arcuate. Mandible (Figure 10) with 4 subacute apical teeth; with a long, slender, setose protheca. Maxilla (Figure 11) with 4 segmented palpus; stipes without palpifer; galea and lacinia separate and apex of both densely spinose. Labium (Figure 12) with postmentum undivided. Labial palpus, 2 segmented; prementum with a palpiger. Gula well developed.

Prosternal region with cervical sclerite medial, large, V-shape. Prepleurite a single sclerite, narrowed medially, and slender in front of procoxal cavities; postpleurite divided into 2 sclerites. Posterior sternum absent, thus procoxal cavities open posteriorly. Mesosternum and metasternum each with 2 pleural sclerites. Abdominal segments without tergopleural sclerites; segments 1-6 with sternopleural sclerites; segment 9 narrow, elongate, slightly longer than combined length of preceding four segments, subcarinate on meson, apex emarginate; retractile anal gills present as 3 tufts—1 dorsomedially and 2 ventrolaterally. Operculum ovate, tapering to a subacute apex. Tubular spiracular gills (mature larvae) dorsolaterally on anterior margin of mesonotum (Figures 105, 106, 108-110) and anterolaterally on abdominal segments 1-8 (Figures 105, 107, 111-113). Opercular chamber with 2 long, slender, retractile anal hooks with a fringe of long, slender setae on dorsal edge.

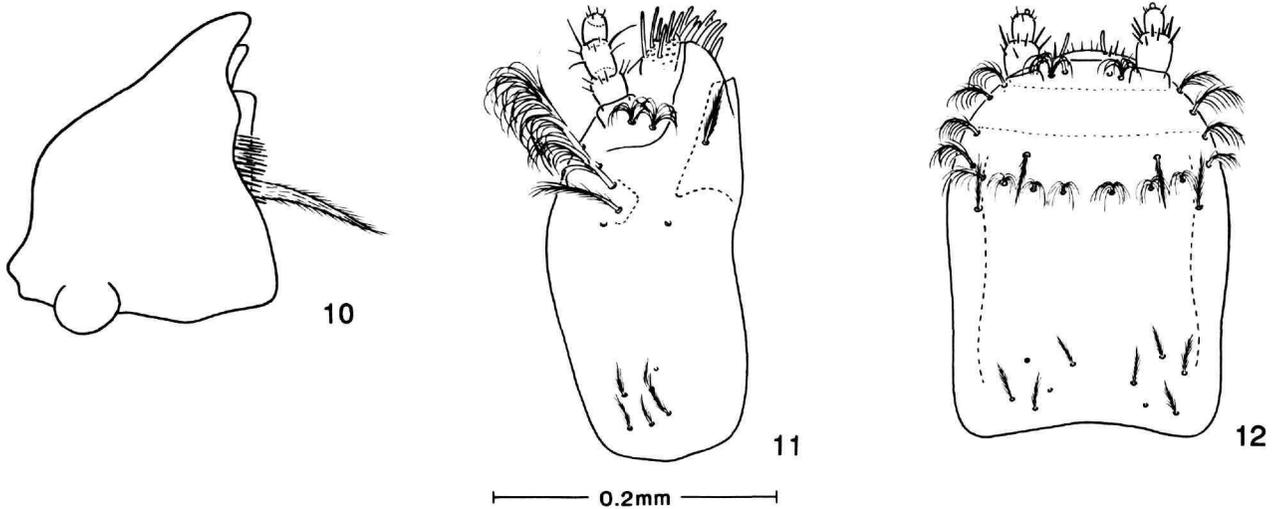
COMPARATIVE NOTES.—The large size (length, 3.8 to 5.75 mm) combined with the broad, shallow, median, longitudinal, pronotal impression and the gibbositities or protuberances on the pronotum and elytra and their distinctive larvae will distinguish known members of the genus *Stegoelmis* from all other elmid genera known from the Western Hemisphere. Hinton (1939a) mentions that this genus resembles *Stenelmis* by lacking apical cleaning fringes on the tibiae; however, members of the genus *Stegoelmis* do have small tibial cleaning fringes and a dense



FIGURES 8, 9.—*Stegoelmis selva*, new species, larva (most setae and ultrasculpture not shown): 8, dorsal view; 9, ventral view.

row of robust smoothing setae on the protibia. In addition, specimens of *Stegoelmis* are much larger than those of *Stenelmis* and, unlike members of *Stenelmis*, have a plastron on the dorsal surface as well as the ventral surface. Members of *Stegoelmis* are presently known only from the tropical regions of northern South America.

The dorsoventrally compressed, elongate-ovate, and ornate associated larvae of *Stegoelmis* are very different from the subcylindrical larvae of *Stenelmis*. The larva of *Stegoelmis* resembles the larva of an elmid described by Bertrand (1962:728, fig. 10A) as genus M from Madagascar. Delève (1963:456), when he described the genus *Potamolatres* from Madagascar, stated that Bertrand's genus M probably is the larva of *Potamolatres*.



FIGURES 10-12.—*Stegoelmis selva*, new species, larva: 10, mandible; 11, maxilla; 12, labium.

Key to the Species of *Stegoelmis*
(Males)

1. Metatibiae with long, distinct, medial cleaning fringe of dense, golden, hair-like setae on apical half, or a large distinct tufted fringe on apical eighth [Figures 19-21, 24, 25]. 2
- Metatibiae with very short, indistinct, apicomedial cleaning fringe of sparse, golden, hair-like setae [Figures 72, 73]. 3
2. Metatibial cleaning fringe long and slender; present from midlength to apex [Figure 19]. Elytral apices only slightly prolonged and moderately dehiscent [Figure 14]. Posterolateral margins of elytra with low gibbosity or low protuberance [Figure 14]. 1. *S. andersoni*, new species
- Metatibial cleaning fringe a short, dense, wide tuft on apical eighth [Figure 24]. Elytral apices strongly prolonged and widely dehiscent [Figure 29]. Posterolateral margins of elytra with strong protuberance [Figure 29]. 2. *S. crinita*, new species
3. Elytral apices rounded and not dehiscent [Figures 34, 115, 121, 128]. 4
- Elytral apices not rounded but dehiscent [Figures 133, 140, 146, 152, 185]. 7
4. Apex of last abdominal sternum shallowly concave; with patch of dense, long, golden, hair-like setae [Figures 43, 62]. 3. *S. selva*, new species
- Apex of last abdominal sternum not concave; without patch of long, golden, hair-like setae. 5
5. Metasternum sparsely and moderately coarsely punctate. Abdominal sternum 1 with coarse punctures only across apical third. Abdominal sternum 2 more finely and sparsely punctate. 4. *S. tuberosa*, new species
- Metasternum and abdominal sterna 1 and 2 with entire surface densely and coarsely punctate. 6
6. Pronotal longitudinal impression narrow, deep, and extending from base almost to apex [Figure 120]. Hypomeron with punctures about as dense as those on pronotal disc. 5. *S. verrucata* Hinton
- Pronotal longitudinal impression wide, moderately deep, and short [Figure 127]. Hypomeron with punctures much coarser than those on pronotal disc. 6. *S. fera*, new species

- 7. Head with moderately deep median longitudinal impression between antennal acetabula. 8
 Head without median longitudinal impression between antennal acetabula.
 7. *S. ennsi*, new species
- 8. Pronotum with indistinct, shallow, and narrow longitudinal impression [Figure 139]. 8. *S. stictoides*, new species
 Pronotum with distinct and deep longitudinal impression. 9
- 9. Sublateral pronotal gibbosities and posterolateral elytral protuberances large and distinct. Abdominal sterna 1 and 2 coarsely, densely punctate.
 9. *S. ica*, new species
 Sublateral pronotal gibbosities absent, only vaguely indicated, or low. Posterolateral elytral protuberances small [Figures 152, 185]. Only abdominal sternum 1 with coarse, dense punctures. 10
- 10. Longitudinal median impression between antennal acetabula shallow, broad, not extending to thickened clypeal rim. Hypomerale punctures coarse and dense.
 10. *S. geayi* (Grouvelle)
 Longitudinal median impression between antennal acetabula deep, narrow, extending to thickened clypeal rim. Hypomerale punctures fine and dense.
 11. *S. sticta*, new species

Clave para las Especies de *Stegoelmis*
(Machos)

- 1. Metatibias con un cepillo limpiador medial, largo y evidente, constituido de sedas densas y doradas sobre la mitad apical, o con un mechón de sedas piliformes grande y evidente en el octavo apical [Figuras 19-21, 24, 25]. 2
 Metatibias con un cepillo limpiador apicomedial, muy corto y poco diferenciado de sedas piliformes escasas y doradas [Figuras 72, 73]. 3
- 2. Metatibia con cepillo limpiador largo y delgado; presente desde la parte media hasta el ápice [Figura 19]. Apices elitrales solo ligeramente prolongados y moderadamente dehiscentes [Figura 14]. Márgenes posterolaterales de los élitros con una gibosidad pequeña o una ligera protuberancia [Figura 14].
 1. *S. andersoni*, especie nueva
 Metatibia con cepillo limpiador corto, denso y con un mechón amplio en el octavo apical [Figura 24]. Apices elitrales fuertemente prolongados y ampliamente dehiscentes [Figura 29]. Márgenes posterolaterales de los élitros con una fuerte protuberancia [Figura 29]. 2. *S. crinita*, especie nueva
- 3. Apices elitrales redondeados y no dehiscentes [Figuras 34, 115, 121, 128]. . . . 4
 Apices elitrales no redondeados pero dehiscentes [Figuras 133, 140, 146, 152, 185]. 7
- 4. Apice del último externo abdominal someramente cóncavo; con un denso mechón de sedas piliformes largas y doradas [Figuras 43, 62].
 3. *S. selva*, especie nueva
 Apice del último externo abdominal no cóncavo; sin mechón de sedas largas y doradas. 5
- 5. Metasterno punteado, puntuaciones escasas y moderadamente gruesas. Esterno abdominal 1 con puntuaciones gruesas dispuestas transversalmente solo en el tercio apical. Esterno abdominal 2 mas fina y escasamente punteado.
 4. *S. tuberosa*, especie nueva
 Metasterno y esternos abdominales 1 y 2 con la superficie entera densa y gruesamente punteada. 6

6. Pronoto con impresión longitudinal angosta, profunda y extendiéndose desde la base hasta casi el ápice [Figura 120]. Hipómero con puntuaciones tan densas como las del disco pronotal. 5. *S. verrucata* Hinton
- Pronoto con impresión longitudinal amplia, moderadamente profunda y corta [Figura 127]. Hipómero con puntuaciones mucho más gruesas que las del disco pronotal. 6. *S. fera*, especie nueva
7. Cabeza con una impresión longitudinal moderadamente profunda entre los acetábula antenales. 8
- Cabeza sin impresión longitudinal entre los acetábula antenales. 7. *S. ennsi*, especie nueva
8. Pronoto con una impresión longitudinal angosta, somera y poco evidente [Figura 139]. 8. *S. stictoides*, especie nueva
- Pronoto con una impresión longitudinal profunda y evidente. 9
9. Gibosidades sublaterales del pronoto y protuberancias elitrales posterolaterales grandes y claras. Esternos abdominales 1 y 2 densa y gruesamente punteados como el metasterno. 9. *S. ica*, especie nueva
- Gibosidades sublaterales del pronoto ausentes, solo vagamente indicadas o muy pequeñas. Protuberancias elitrales posterolaterales pequeñas [Figuras 152, 185]. 10
10. Impresión mediolongitudinal entre los acetábula antenales somera, amplia, no extendiéndose hasta el engrosado reborde clipeal. Hipómero con puntuaciones gruesas y densas. 10. *S. geayi* (Grouvelle)
- Impresión mediolongitudinal entre los acetábula antenales, profunda angosta y extendiéndose hasta el engrosado reborde clipeal. Hipómero con puntuaciones finas y densas. 11. *S. sticta*, especie nueva

1. *Stegoelmis andersoni*, new species

FIGURES 13-23

DIAGNOSIS.—Males of this species may be distinguished from all other described species of *Stegoelmis* by the long, slender cleaning fringe of golden, hair-like setae on the apical half of the metatibia (Figure 19).

HOLOTYPE (♂).—*Body Form and Size*: Elongate, subparallel. Length, 4.47 mm; greatest width, 1.76 mm.

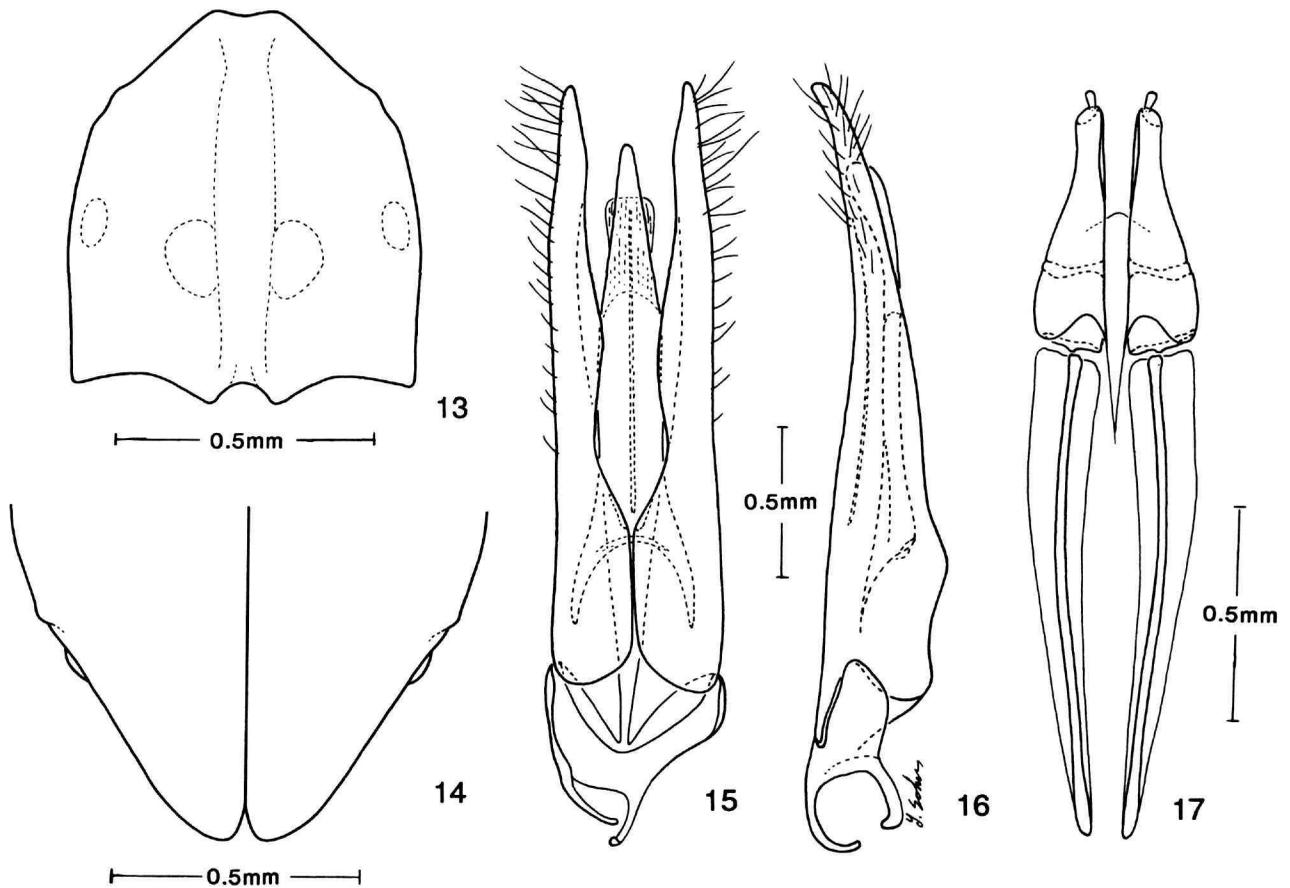
Color: Head with mottled light and dark gray plastron; clypeus, labrum, and antennae reddish brown. Pronotum with surface mottled light and dark gray like head; apical half of longitudinal groove light gray; with sparse, short, light yellow setae. Elytra with plastron mostly dark gray but sparsely flecked with light gray. Mouthparts (except dark brown mandibles), mesosternum between procoxae and metacoxae, extreme tips of tibiae, and entire tarsi reddish brown; remainder of ventral surface and legs with mottled light and dark gray plastron.

Plastron: Covers entire body except antennae, eyes, clypeus, labrum, middle of mesosternum, extreme apices of tibiae, and tarsi.

Head: Concave medially; deeply, longitudinally depressed on midline between antennal acetabula; coarsely punctate between and behind eyes. Frontoclypeal suture deeply depressed and well below antennal acetabula. Clypeus thickened,

strongly reflexed; surface finely, densely punctate. Labro-clypeal suture deep and broad. Labrum a narrow, transverse rectangle; smooth; with a transverse row of long, golden, hair-like setae at midlength and a fringe of golden setae along anterior margin.

Thorax: Pronotum slightly shorter than wide; length, 1.20 mm; broadest width, at midlength, 1.24 mm; base slightly wider than apex; lateral margin moderately sinuate; medial longitudinal groove broad, moderately deep, and extending from between medial gibbosities to anterior margin; with 4 gibbosities across basal third as illustrated (Figure 13); anterior margin projecting over head and arcuately emarginate apicomediaally; surface sculpture like that of head; punctures fine, obscured by plastron; with few, short, fine, yellowish setae; setae with apices directed posteriorly. Hypomera, sides of prosternum, and middle of mesosternum coarsely, densely punctate. Prosternal process sparsely, finely punctate; rather slender; apically, about a third as wide as procoxa; slightly converging apically and apex moderately rounded. Metasternum finely, sparsely punctate but with a short, narrow, longitudinal, impunctate, shiny sulcus on posterior half; fine, sparse punctures adjacent to sulcus; posterior half of disc concave; medial punctures between mid and hind coxae moderately large; punctures laterad of mesocoxae and metacoxae very sparse. Protibia with a short cleaning fringe of short, dense, golden setae apicomediaally; length of fringe about as



FIGURES 13-17.—*Stegoelmis andersoni*, new species: 13, pronotum; 14, elytral apices; 15, male genitalia, dorsal view; 16, male genitalia, lateral view; 17, female genitalia.

long as combined length of tarsal segments 1 and 2; with a row of robust smoothing setae adjacent to fringe, row twice as long as length of fringe. Mesotibia with only a very small tuft of long, golden, hair-like setae apicoventrally. Metatibia with cleaning fringe of short, dense, golden, hair-like setae medially on apical half. Last tarsal segments very robust and about 1.5 times as long as combined length of tarsal segments 1-4. Elytra more than twice as long as pronotum; length, 3.32 mm; combined width, 1.79 mm; apices dehiscent and rounded; humeri gibbose; posterolateral margins with very small protuberance (Figure 14); surface as that of pronotum; striae deep basally, less so apically; discal striae punctures coarse, deep, round, almost half as wide as intervals and separated longitudinally by about 2 to 4 times their diameter; intervals slightly convex and intervals 2, 3, and 4 slightly swollen basally; intervals with fine, short, sparse, yellow setae; sublateral punctures slightly coarser than discal punctures.

Scutellum flat, elongate-ovate; with very few, fine punctures.

Abdomen: Intercoxal process of sternum 1 broadly, moderately deeply concave and more densely punctate than metasternal disc. Punctures become progressively smaller on sternum 2-5. Lateral margins of sternum 3 with large lobate process that clasps emarginate side of elytron. Last sternum convex subapically.

Genitalia: As illustrated (Figures 15, 16).

FEMALE GENITALIA.—As illustrated (Figure 17).

SEXUAL DIMORPHISM.—The male metatibia on the medial surface has a long, slender cleaning fringe from midlength to apex; this fringe is reduced to a small tuft of short, golden setae at the apex of the female metatibia.

VARIATIONS.—The light gray pronotal markings are more extensive on 4 of the 7 specimens and form a broad, inverted Y with the stem extending from the apicomедial margin posteriorly almost to the gibbositities where the arms branch

laterally and then posteriorly to the posterior pronotal margin between the medial and sublateral gibbositities. On specimens with the light gray pronotal markings this extensive, the light gray elytral markings are also more extensive. Males vary from 4.34 to 4.71 mm in length and the single female available for study is 4.44 mm in length.

TYPE DATA.—*Holotype* (σ^7): ECUADOR: NAPO: Río Yasuni, site 2, 17 Sep 1977, J.J. Anderson; deposited in the National Museum of Natural History, Smithsonian Institution.

Allotype: Same data as holotype.

Paratypes: Same data as holotype, 1 σ^7 . COLOMBIA: CAQUETA: Río Orteguzza near Río Peneya, 14–18 Jan 1969, Duckworth and Dietz, 2 σ^7 . ECUADOR: NAPO: Lago Agrio (2 km N), 26 Sep 1975, Andrea Langley, 1 σ^7 ; Lago Agrio (18 km E), Río Aguarico, 23 Sep 1973, Andrea Langley, 1 σ^7 . PERU: MADRE DE DIOS: Puerto Maldonado (30 air km SW), Río Tambopata, 290 m, 11–15 Nov 1979, subtropical moist forest, J.P. Heppner, 1 σ^7 .

DISTRIBUTION.—Known only from Colombia, Ecuador, and Peru (Figure 18).

ETYMOLOGY.—The specific epithet is a patronym for Joseph J. Anderson, former Peace Corps volunteer and collector of this new species and many other aquatic insects while participating

in the Ecuador-Peace Corps-Smithsonian Institution Aquatic Insect Survey of Ecuador.

HABITAT.—Unknown; specimens were collected at black-light.

2. *Stegoelmis crinita*, new species

FIGURES 24–32

DIAGNOSIS.—The males of this species may be distinguished from all other members of the genus by the wide, dense tuft of golden, hair-like setae on the apical eighth of the metatibia. The tuft extends beyond the tibial apex to about the midlength of tarsal segment 2 (Figure 24).

HOLOTYPE (σ^7).—*Body Form and Size*: Elongate, subparallel. Length, 5.58 mm; greatest width, 2.37 mm.

Color: Head dark gray with some light gray flecks; clypeus, labrum, and antennae reddish brown. Pronotum with surface mottled and flecked with light and dark gray like head; apical half of longitudinal groove dark gray; with sparse, short, light yellow setae. Elytra with plastron mostly dark gray but sparsely flecked with light gray. Mouthparts (except black mandibles), mesosternum between procoxae and metacoxae, extreme tips

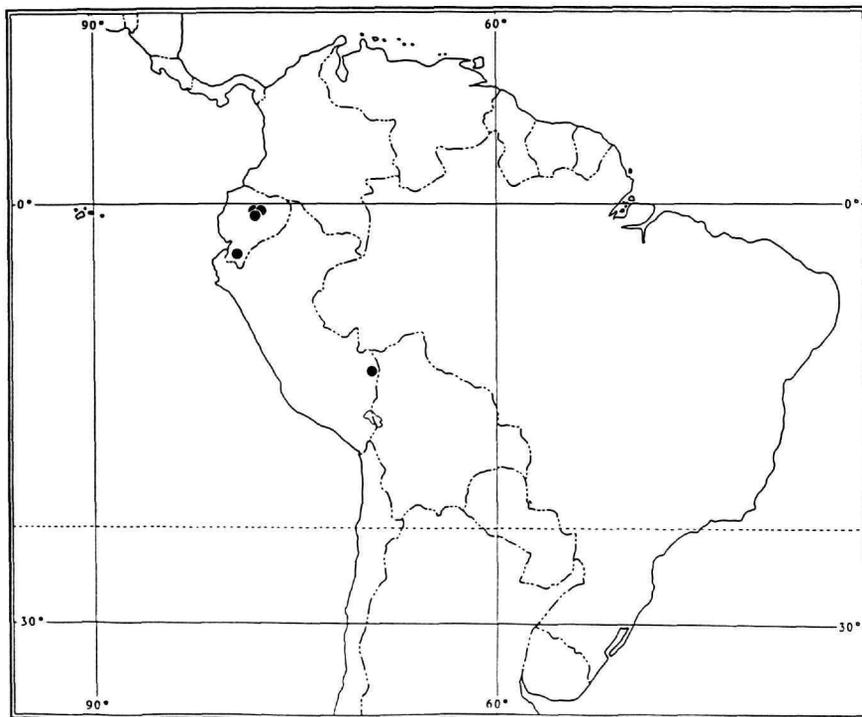
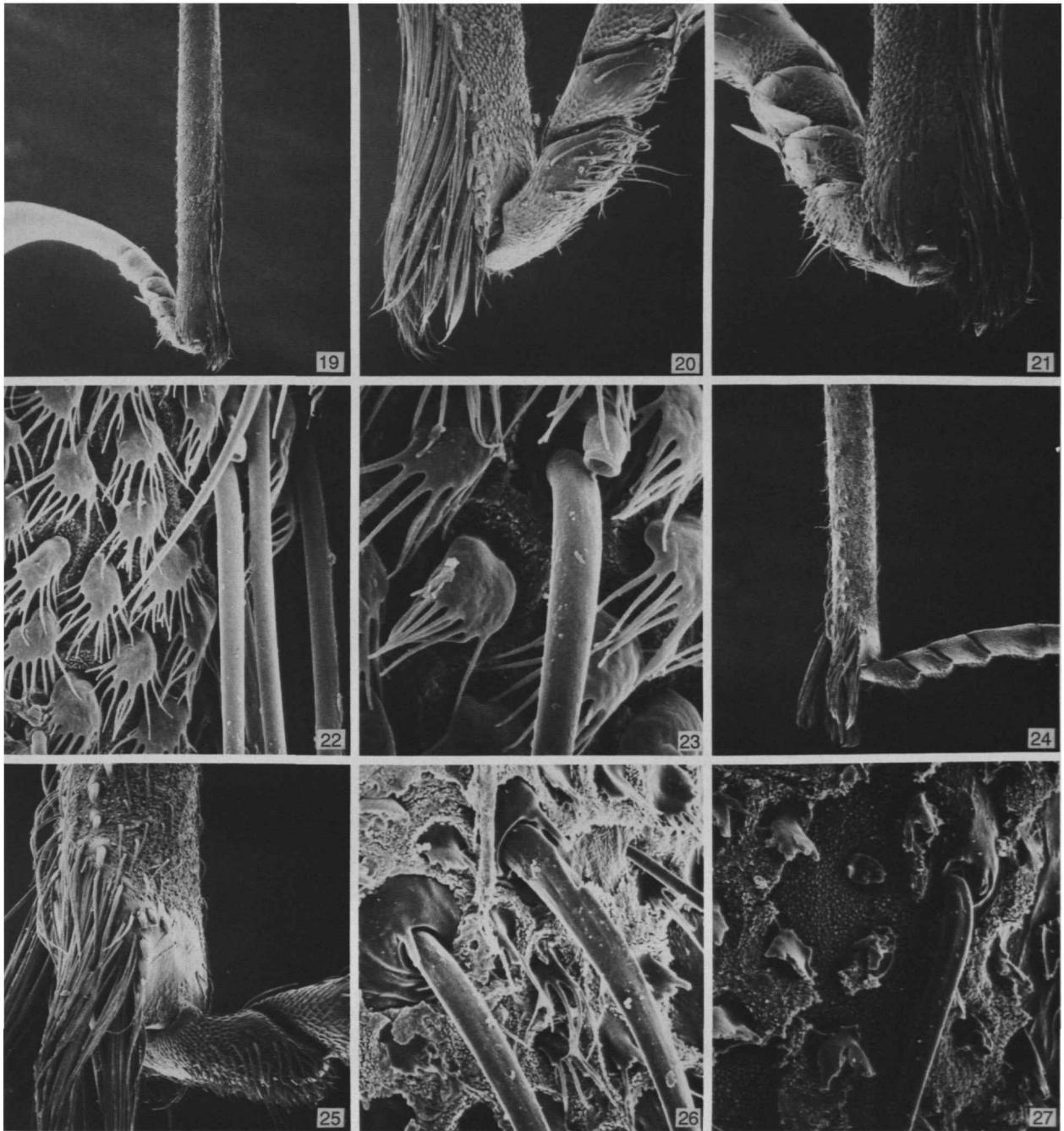


FIGURE 18.—Known distribution of *Stegoelmis andersoni*, new species.



FIGURES 19-27.—*Stegoelmis androgynis*, new species (figures 19-23): 19, metatibial fringe, $\times 80$; 20, metatibial apex, lateral view, $\times 250$; 21, metatibial apex, medial view, $\times 250$; 22, metatibial plastron and fringe, $\times 2500$; 23, metatibial plastron and urceiform seta, $\times 5000$. *Stegoelmis crinita*, new species (figures 24-27): 24, metatibial apex, medial view, $\times 80$; 25, metatibial apex and fringe, medial view, $\times 250$; 26, metatibial plastron, $\times 2500$; 27, metatibial plastron, $\times 3000$. (Reduced to 64% for publication.)

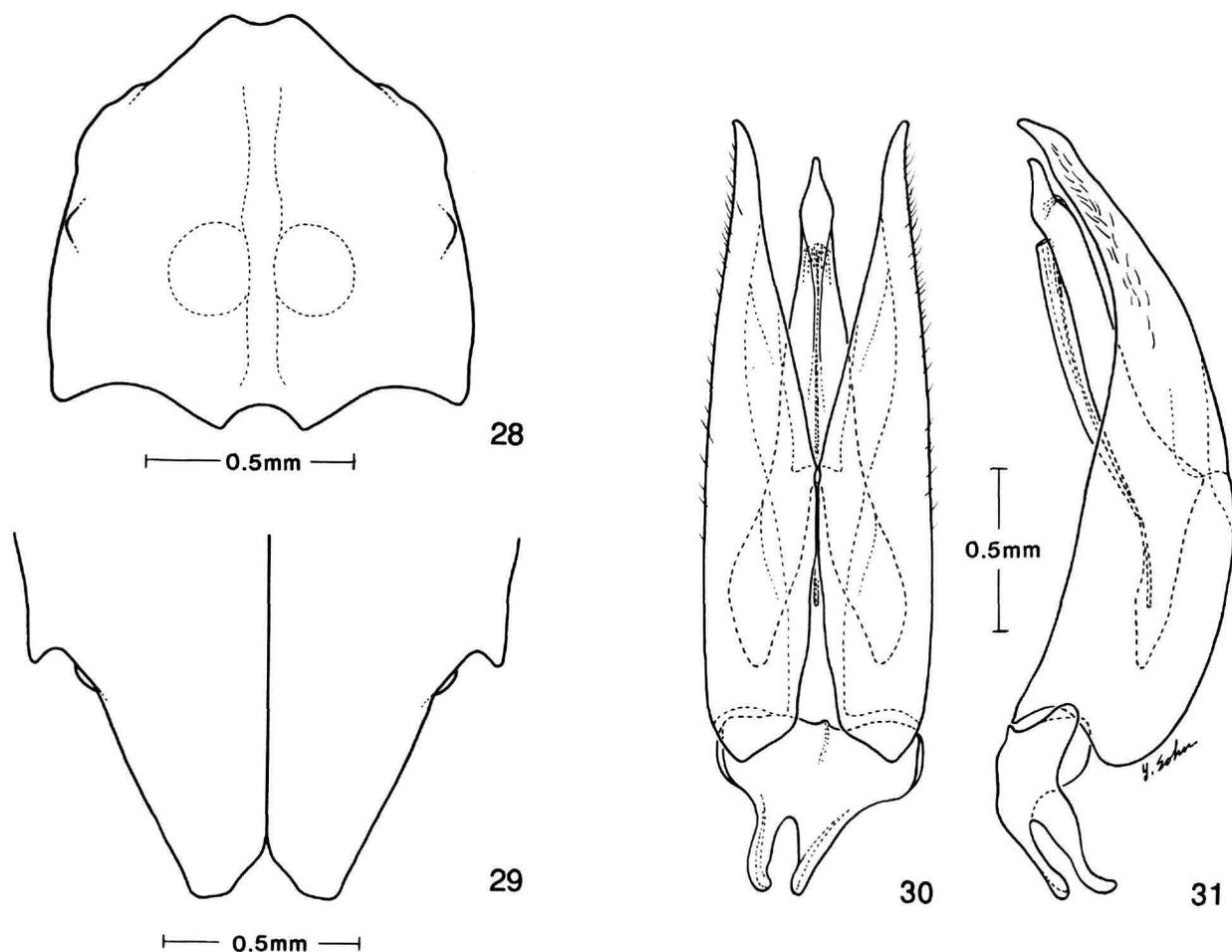
of tibiae, and entire tarsi reddish brown; remainder of ventral surface and legs with mottled light and dark gray plastron.

Plastron: Covers entire body except antennae, eyes, clypeus, labrum, middle of mesosternum, extreme apices of tibiae, and tarsi.

Head: Concave medially; raised between eyes and granulate posteriorly; moderately deeply, longitudinally depressed on midline between antennal acetabula; finely punctate between and behind eyes. Frontoclypeal suture deeply depressed and well below antennal acetabula. Anterior margin of clypeus with thick rim; surface finely, sparsely punctate and vaguely micoreticulate. Labroclypeal suture deep and broad. Labrum a narrow, transverse rectangle; smooth; with a transverse row of long, golden, hair-like setae at midlength and a fringe of golden setae along anterior margin.

Thorax: Pronotum slightly wider than long; length, 1.64

mm; broadest width, slightly behind midlength, 1.89 mm; base slightly wider than apex; lateral margin moderately sinuate; medial longitudinal groove broad, moderately deep, and extending from base almost to anterior margin; with 4 distinct protuberances across basal third as illustrated (Figure 28); anterior margin projecting over head and arcuately emarginate apicomediaally; surface sculpture like that of head; punctures fine, obscured by plastron; with few, short, fine, yellowish setae; setae with apices directed posteriorly. Hypomera finely, moderately densely punctate; sides of prosternum and middle of mesosternum coarsely, densely punctate. Prosternal process sparsely, coarsely punctate; moderately slender; apically, about half as wide as procoxa; slightly converging apically and apex moderately rounded. Metasternum with entire surface moderately coarsely, sparsely punctate and a narrow, longitudinal, impunctate sulcus on posterior two-thirds; intercoxal process



FIGURES 28-31.—*Stegoelmis crinita*, new species: 28, pronotum; 29, elytral apices; 30, male genitalia, dorsal view; 31, male genitalia, lateral view.

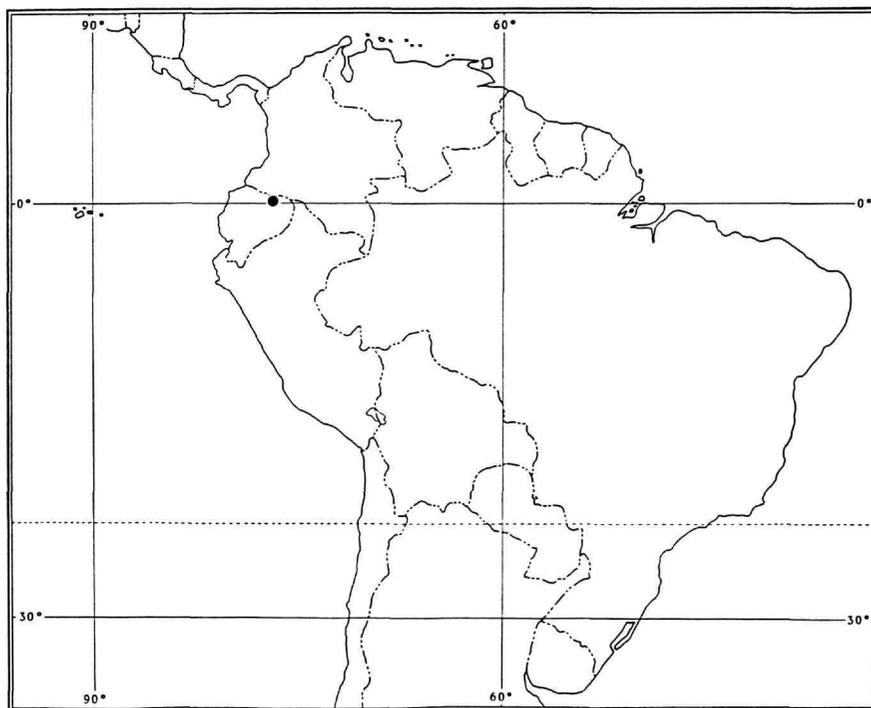


FIGURE 32.—Known distribution of *Stegoelmis crinita*, new species.

between mesocoxae concave; posterior half of disc shallowly, broadly concave. Protibia with a cleaning fringe of short, dense, golden setae apicomediaally; length of fringe about as long as length of tarsal segment 1; with a row of robust smoothing setae adjacent to fringe, row 4 times as long as length of fringe. Mesotibia with only a few long, golden, hair-like setae apicoventrally. Metatibia with a large dense apicoventral tuft of long, golden, hair-like setae; tuft almost as long as combined lengths of metatarsal segments 1–4 and extending beyond tibial apex to midlength of tarsal segment 2 (Figure 24). Last tarsal segments very robust and about 1.3 times as long as combined length of tarsal segments 1–4. Elytra more than twice as long as pronotum; length, 4.21 mm; combined width, 2.38 mm; apices projected and widely dehiscent (Figure 29); humeri each with gibbosity; posterolateral margins each with distinct protuberance; surface similar to that of pronotum but with fewer setae and without fine punctures; striae shallow basally and then effaced; discal strial punctures coarse, deep, round, about a fourth as wide as intervals and separated longitudinally by about 2 to 4 times their diameter; intervals vaguely convex and intervals 2, 3, and 4 slightly swollen basally; intervals with few, fine, short, yellow setae; sublateral punctures slightly coarser than discal punctures. Scutellum flat, broadly ovate; with very few, fine punctures.

Abdomen: Intercostal process of sternum 1 broadly, moder-

ately deeply concave and sparsely punctate; less densely punctate than metasternum. Punctures becoming progressively less coarse and less dense on sterna 2–5. Lateral margins of sternum 3 with large lobate process that clasps emarginate side of elytron. Last sternum convex subapically.

Genitalia: As illustrated (Figures 30, 31).

FEMALE GENITALIA.—Female is unknown.

TYPE DATA.—*Holotype* (♂): ECUADOR: NAPO: Aguarico, small stream, 16 Aug 1975, Andrea Langley; Ecuador-Peace Corps-Smithsonian Institution Aquatic Insect Survey; deposited in the National Museum of Natural History, Smithsonian Institution.

DISTRIBUTION.—Presently known only from the type locality in Ecuador (Figure 32).

ETYMOLOGY.—From the Latin adjective *crinitus* (“hairy”) in reference to the male metatibial cleaning fringe which is composed of long, dense, golden, hair-like setae.

HABITAT.—Small stream.

3. *Stegoelmis selva*, new species

FIGURES 1, 3–12, 33–113

DIAGNOSIS.—The males of *S. selva* may be distinguished from all other described species of the genus by the distinctive

dense patch of long, golden, hair-like setae in the concave apicomedial margin of the last abdominal sternum (Figure 62).

HOLOTYPE (σ^7).—*Body Form and Size*: Elongate, subparallel. Length, 4.29 mm; greatest width, 1.87 mm.

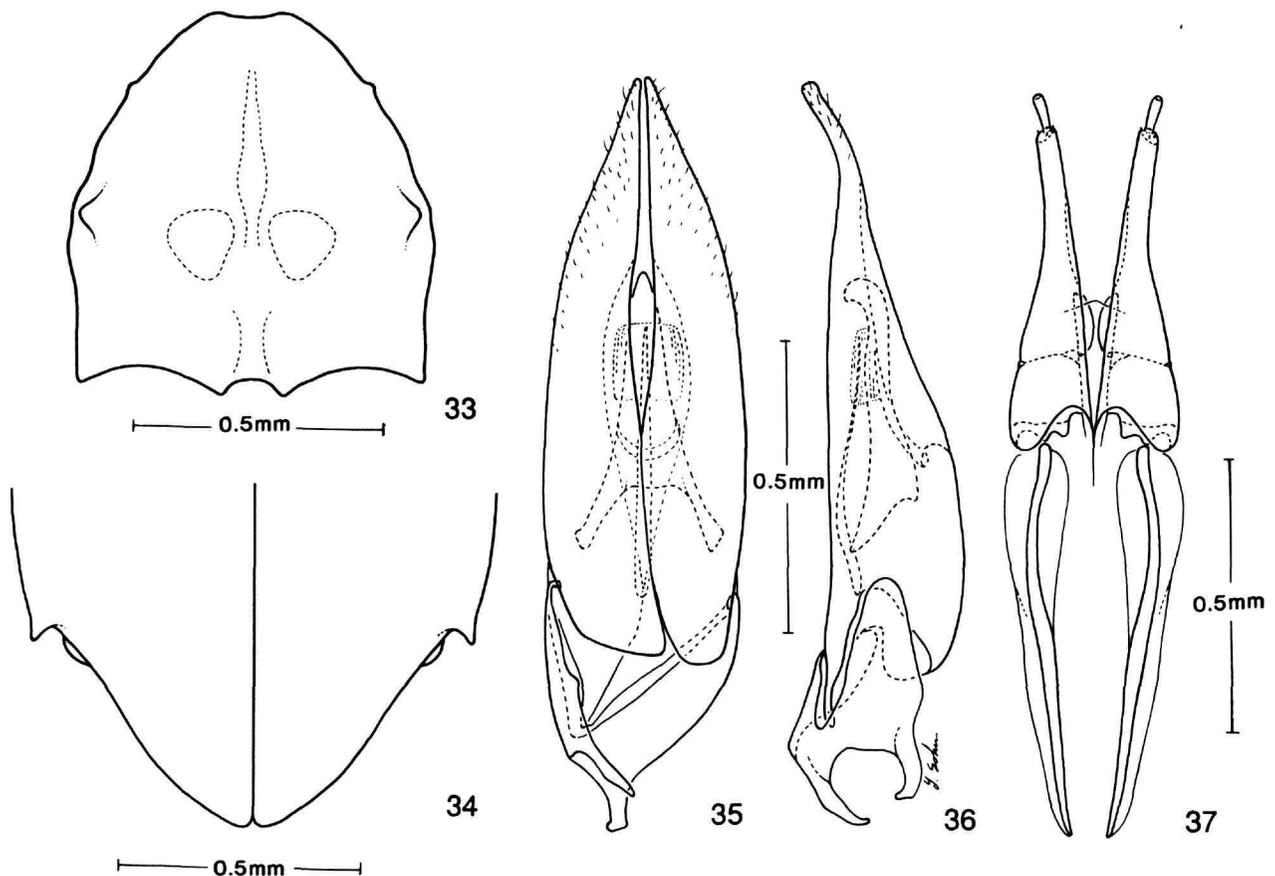
Color: Head with mottled light and dark gray plastron; clypeus, labrum, and antennae reddish brown. Pronotum with surface dark gray except light gray on protuberances, apicomedial margin and a few flecks elsewhere; with sparse, light yellow setae. Elytra with plastron mostly dark gray and sparsely flecked with light gray. Mouthparts (except black mandibles), mesosternum between procoxae and metacoxae, extreme tips of tibiae, and entire tarsi reddish brown; remainder of ventral surface and legs with mottled light and dark gray plastron.

Plastron: Covers entire body except antennae, eyes, clypeus, labrum, middle of mesosternum, extreme apices of tibiae, and tarsi.

Head: Convex medially between antennal acetabula; moder-

ately coarsely punctate between and behind eyes. Frontoclypeal suture moderately deeply depressed and well below antennal acetabula. Clypeus thickened; surface finely, densely punctate and densely microreticulate. Labroclypeal suture deep and broad. Labrum a narrow, transverse rectangle; smooth; with a transverse row of long, golden, hair-like setae at midlength and a fringe of golden setae along anterior margin. Basal segment of antenna with short, dense, golden setae, especially on ventral surface.

Thorax: Pronotum almost as long as wide; length, 1.27 mm; broadest width, at midlength, 1.32 mm; base slightly wider than apex; lateral margin moderately sinuate; medial longitudinal impression moderately broad, shallow, and extending from base to slightly in front of medial protuberances; with 4 distinct protuberances across basal third as illustrated (Figure 33); anterior margin projecting over head and arcuately emarginate apicomediaally; surface sculpture like that of head except less densely punctate; punctures absent or obscured by plastron;



FIGURES 33-37.—*Stegoelmis selva*, new species: 33, pronotum; 34, elytral apices; 35, male genitalia, dorsal view; 36, male genitalia, lateral view; 37, female genitalia.

with few, short, fine, yellowish setae; setae with apices directed posteriorly. Hypomera, sides of prosternum, and middle of mesosternum coarsely, densely punctate. Prosternal process sparsely, coarsely punctate; rather slender; apically, about half as wide as procoxa; slightly converging apically and apex moderately rounded. Metasternum coarsely, densely punctate laterally but with a short, narrow, longitudinal, impunctate, shiny sulcus on posterior four-fifths; punctures fine and sparse adjacent to sulcus; posterior half of disc strongly concave; punctures between mid and hind coxae very large and dense. Protibia with a cleaning fringe of short, dense, golden setae apicomediaally; length of fringe about as long as combined length of tarsal segments 1 and 2; with a row of robust smoothing setae adjacent to fringe, row about 3 times as long as length of fringe. Mesotibia and metatibia with only a very small tuft of long, golden, hair-like setae apicoventrally. Tarsal segments 1-4 densely microreticulate, with short but dense, golden yellow setae on ventral surfaces; last tarsal segments very robust and about 1.5 times as long as combined length of tarsal segments 1-4. Elytra more than twice as long as pronotum; length, 3.19 mm; greatest combined width, 1.88 mm; apices rounded and not dehiscent; humeri each with protuberance; posterolateral margins with distinct protuberance; surface as that of pronotum; striae deep basally; discal striae punctures coarse, deep, round, almost half as wide as

intervals and separated longitudinally by about 2 to 4 times their diameter; intervals slightly convex and intervals 2, 3, and 4 moderately swollen basally; interval 3 moderately swollen slightly behind midlength (Figure 46); intervals with fine, short, sparse, yellow setae; sublateral punctures slightly coarser than discal punctures. Scutellum almost flat, subovate; with very few, fine punctures.

Abdomen: Intercoxal process of sternum 1 broadly, deeply concave and more densely punctate than metasternal disc. Punctures become progressively smaller on sterna 1 and 2, are very fine on sterna 3 and 4, and are coarser and denser on sternum 5. Lateral margins of sternum 3 with large lobate process that clasps emarginate side of elytron. Last sternum moderately concave subapically and concavity obscured by long, dense, golden tuft of setae.

Genitalia: As illustrated (Figures 35, 36).

FEMALE GENITALIA.—As illustrated (Figure 37).

SEXUAL DIMORPHISM.—The only secondary male sexual characteristic noted is the tuft of long, golden setae in the concave apex of the last abdominal sternum; the apex of the female is indistinctly concave and lacks the tuft of golden, hair-like setae.

VARIATIONS.—The light colored markings of this species are much less extensive than on most of the other species. The light gray pronotal markings are consistent in their position and only



FIGURE 38.—Known distribution of *Stegoelmis selva*, new species.

vary slightly in extent. On some specimens elytral interval 3 has a basal light gray linear mark and another slightly behind the midlength. In length, males vary from 4.04 to 4.30 mm and females from 4.40 to 4.51 mm.

TYPE DATA.—*Holotype* (σ^7): VENEZUELA: TERRITORIO FEDERAL AMAZONAS: Cerro de la Neblina, basecamp, 140 m, 0°50'N 66°10'W, 18 Feb 1985, from leaf packs among rocks in small stream in rainforest, P. and P. Spangler, R.A. Faitoute, W.E. Steiner; deposited in the National Museum of Natural History, Smithsonian Institution.

Allotype: Same data as holotype.

Paratypes: VENEZUELA: TERRITORIO FEDERAL AMAZONAS: Same data as holotype, 11 σ^7 , 6 f . Same data as holotype except: basecamp (1 km SE), 21 Feb 1985, seined from rocks and leaf packs in rapids of whitewater stream, 1 σ^7 ; seined from rocks in rapids of Rio Baria: 27 Jan 1985, 2 σ^7 , 8 f ; 28 Jan 1985, 1 σ^7 ; 29 Jan 1985, 1 σ^7 ; 12 Feb 1985, 1 f ; 20 Feb 1985, netted along margin of Rio Baria, 1 σ^7 , 6 f ; Cerro de la Neblina, basecamp, 0°50'N 66°10'W, 19 Mar 1984, O.S. Flint and J.



FIGURE 39.—Aerial view of Rio Baria, at base of Cerro de la Neblina, Territorio Federal Amazonas, Venezuela. (Photo by Robert Noonan)



FIGURE 40.—Biotope at basecamp, Rio Baria, Cerro de la Neblina, Territorio Federal Amazonas, Venezuela, for: *Stegoelmis geayi* (Grouvelle); *Stegoelmis ennsi*, new species; *Stegoelmis selva*, new species; *Stegoelmis tuberosa*, new species.

Louton, 2 f .

DISTRIBUTION.—Presently known only from Venezuela (Figure 38).

ETYMOLOGY.—From the Spanish (“jungle”) in reference to the type of biotope that this species inhabits; a noun used in apposition to the genus.

HABITAT.—All of the specimens of the type series were seined or netted from the large blackwater Rio Baria (Figures 39–41) or from leaf packs in a small whitewater stream near the basecamp. Description of the Rio Baria is reported under the habitat of *Stegoelmis tuberosa*, new species. The whitewater stream (Figure 41) was approximately 5 m wide and 45 cm deep and had a substratum of sand and gravel. Colorimetric water analyses in the whitewater stream on 21 Feb 1985 provided the following data: pH, 5; hardness, 0; oxygen, 9 ppm. The water temperature was 27°C and the air temperature was 42.5°C at the time the analyses were made.

The aquatic beetle families and genera associated with *S.*



FIGURE 41.—Biotope of *Stegoelmis selva*, new species and *Stegoelmis geayi* (Grouvelle); 1 km southeast of basecamp, at Cerro de la Neblina, Territorio Federal Amazonas, Venezuela.

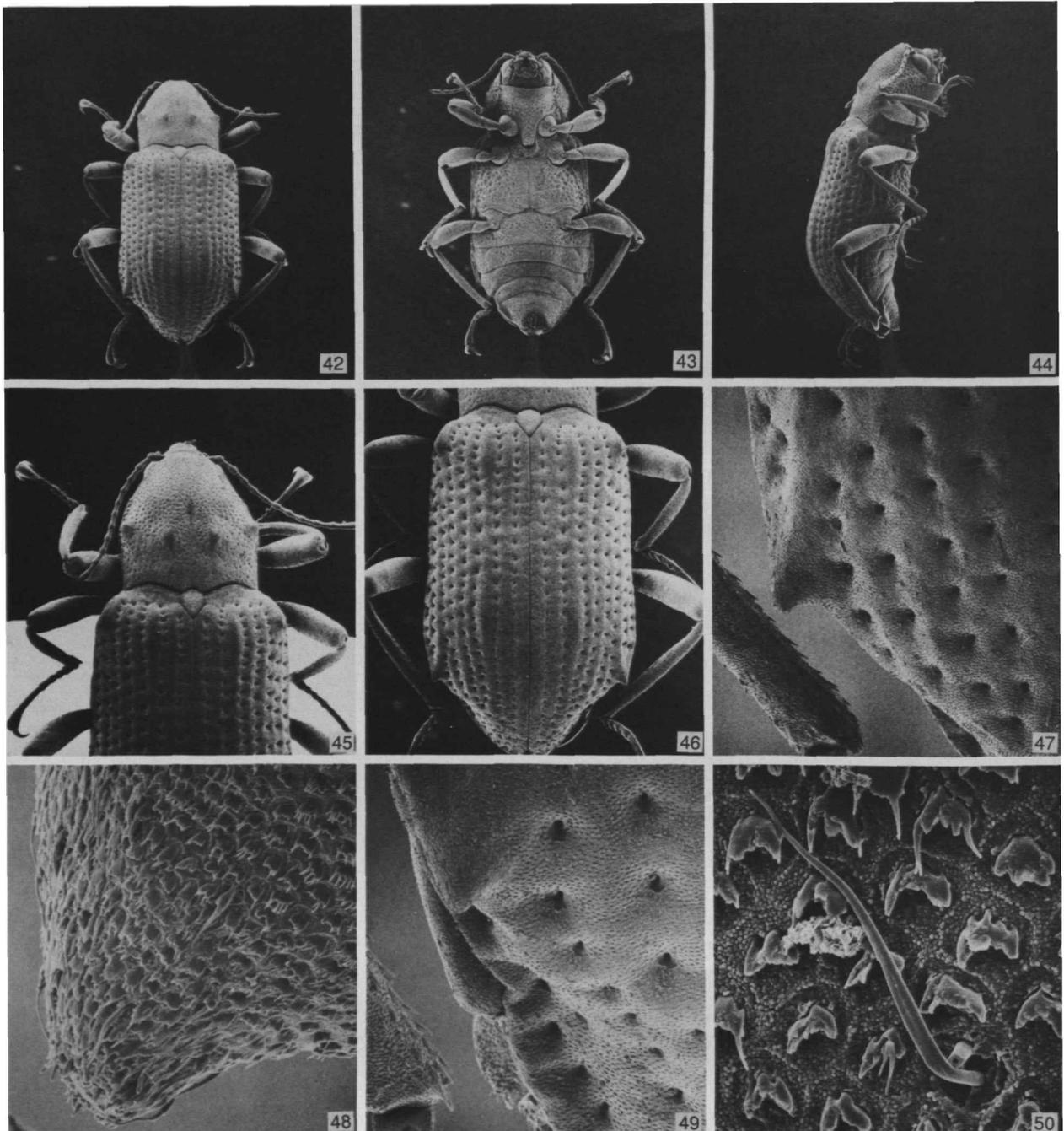
selva in the Rio Baria at Cerro de la Neblina basecamp are given under the habitat data for *S. tuberosa*. The taxa collected with *S. selva* in the whitewater stream, 1 km southeast of the basecamp are as follows: Dytiscidae: *Hydrodessus*, *Hypodessus*, *Laccodytes*, *Laccophilus*, *Microdessus*; Elmidae: *Austrolimnius*, *Gyrelmis*, *Heterelmis*, *Hexacylloepus*, *Hintonelmis*, *Macrelmis*, *Microcyloepus*, *Neoelmis*, *Neolimnius*, *Pagelmis*, *Pilielmis*, *Stenhelmoides*, *Tyletelmis*, *Xenelmis*, new genus; Gyrinidae: *Gyretes*; Hydraenidae: *Adelphydraena*.

LARVA (by association) (Figures 78–104).—Mature larva with generic characters given under generic diagnosis plus the following.

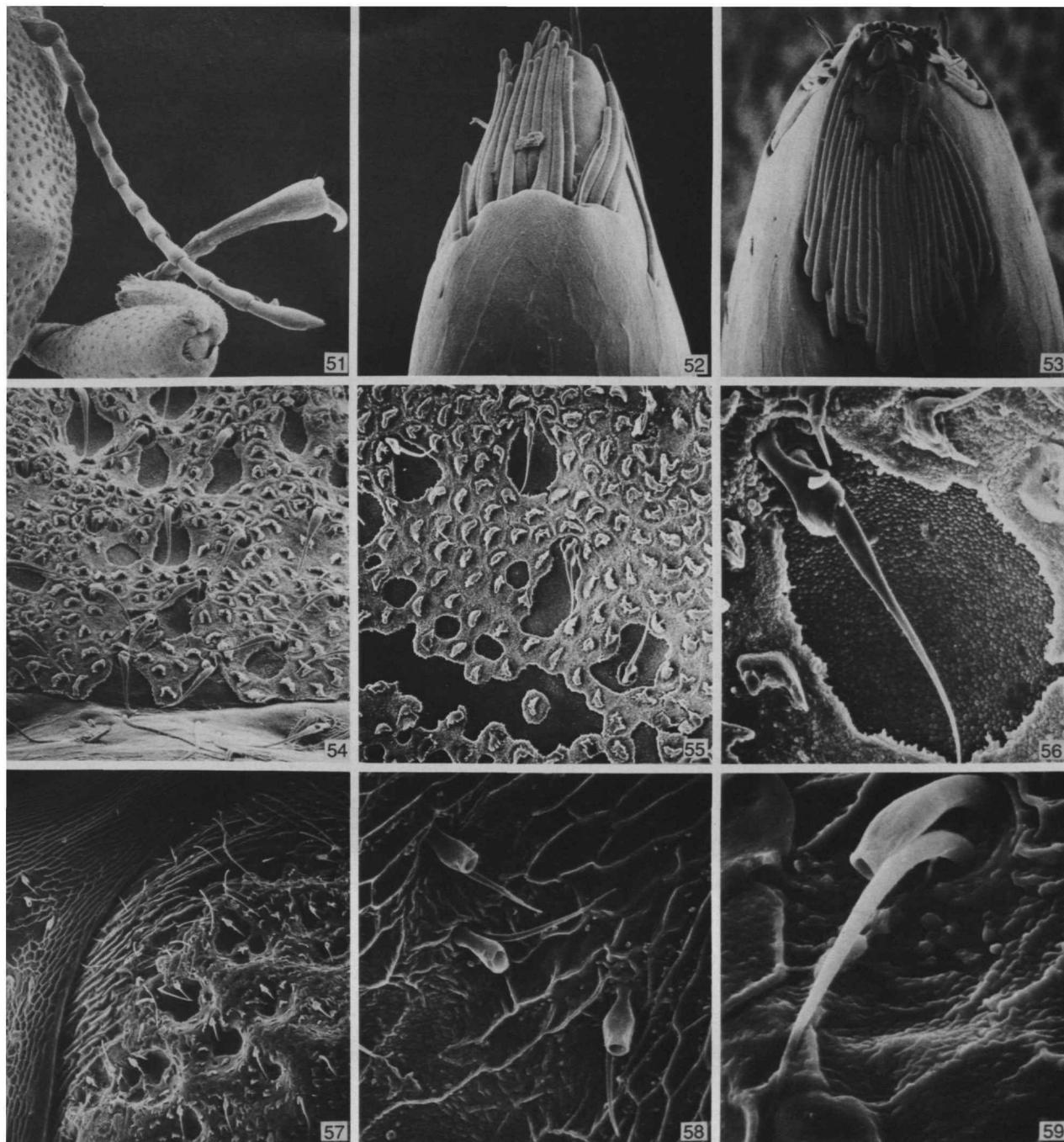
Length, 10.0 mm; greatest width (across abdominal segment 1), 2.1 mm. Form elongate, tapering posteriorly, moderately compressed dorsoventrally. Cuticle yellowish brown to dark reddish brown. With 2 large and several small depressed signa (Figures 87, 96, 97) on prothoracic, mesothoracic, and metathoracic terga. Hind margins of all segments except abdominal segment 9 with a row of large clusters of imbricated ornate setae; a flat, wide, gill-like seta at apex of each cluster

(Figures 99, 100). Lateral margins of abdominal segments 1–8 bordered with spinous processes bearing numerous ornate setae (Figures 98, 101). Lateral margins of segment 9 with falciform projections covered with imbricated setae; apex of projection with a single elongate catkin-like seta. Terga of abdominal segments 1–9 with 2 rows of longer and dorsally projecting tubercles covered by imbricated setae; 1 row on each side of meson and separated by a distinctive gap (Figure 102).

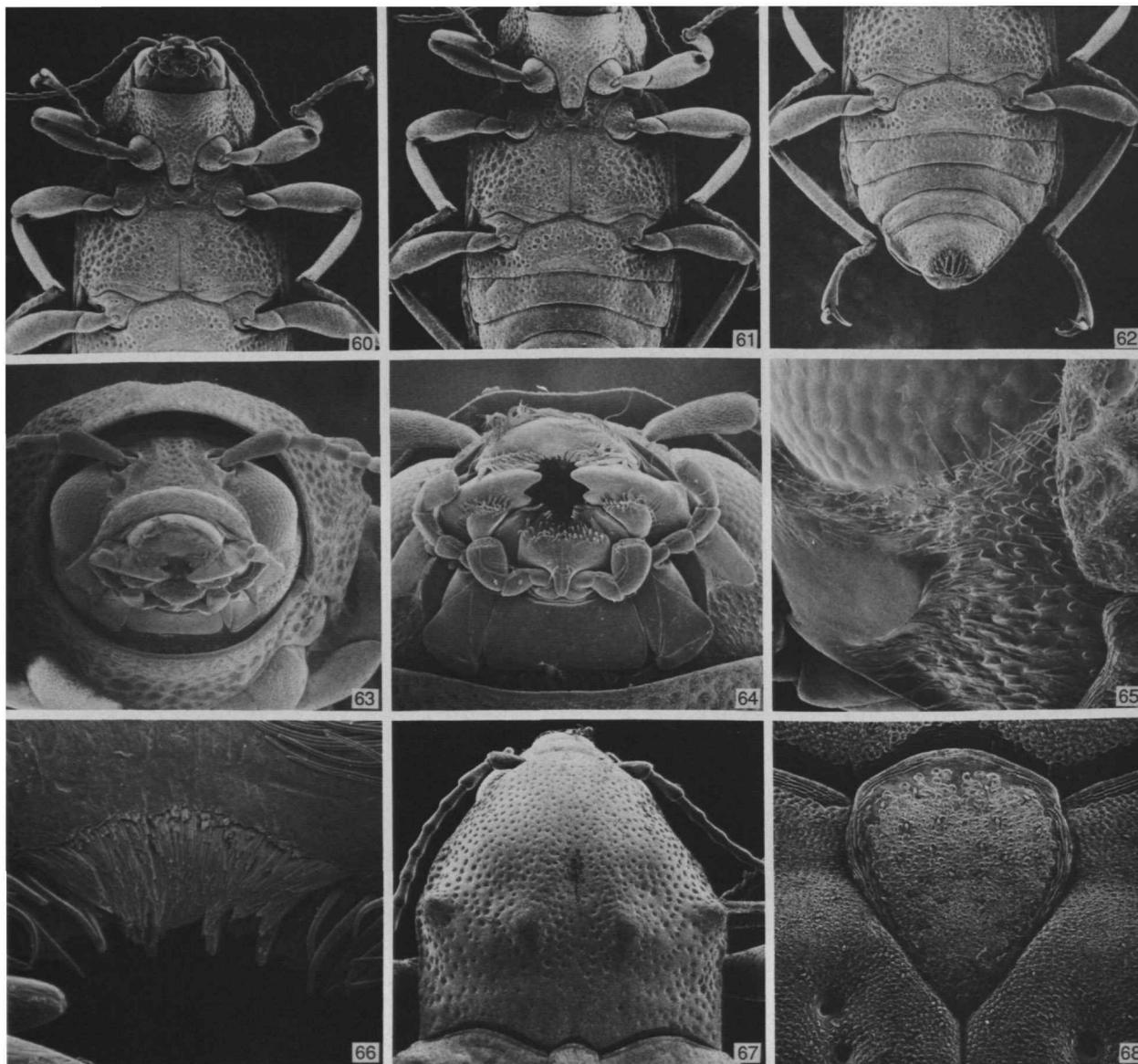
Head (Figure 81) when seen from above, not concealed by pronotum; slightly wider than long. Ecdysial cleavage line broadly Y-shaped; basal stem short, frontal arms extend from basal stem obliquely to base of respective antenna. Surface with numerous setae; imbricated setae of cluster flattened and smooth edged (Figures 82, 83) and arranged above a larger, wider seta with fringed edges. Labrum with fringe of long, frondose, recurved setae apically. Flattened, finely branched, frondose setae in an oval pattern around mouth, on anterior edge of the clypeus, on distal edge of maxillary stipes, in a transverse row across labium (Figures 84, 85), and on apex of antennal segment 1 (Figures 94, 95). Gena with abundant,



FIGURES 42-50.—*Stegoelmis selva*, new species: 42, habitus, dorsal view, $\times 20$; 43, habitus, ventral view, $\times 20$; 44, habitus, lateral view, $\times 20$; 45, head, pronotum, and base of elytra, $\times 35$; 46, elytra, $\times 35$; 47, elytral posterolateral protuberance, $\times 150$; 48, elytral posterolateral protuberance, sculpture, $\times 1000$; 49, clasp on abdominal sternum 3, dorsal view, $\times 200$; 50, elytral plastron, $\times 3500$. (Reduced to 64% for publication.)



FIGURES 51-59.—*Stegoelmis selva*, new species: 51, antenna, dorsal view, $\times 90$; 52, antennal apex, dorsal view, sensilla, $\times 2000$; 53, antennal apex, ventral view, sensilla, $\times 2000$; 54, plastron, on frons, $\times 1000$; 55, pronotal plastron, $\times 1000$; 56, pronotal plastron and seta, $\times 4800$; 57, mesocoxal sculpture, $\times 500$; 58, mesosternal sculpture and urceiform setae, $\times 2500$; 59, mesosternal urceiform seta, $\times 6000$. (Reduced to 64% for publication.)

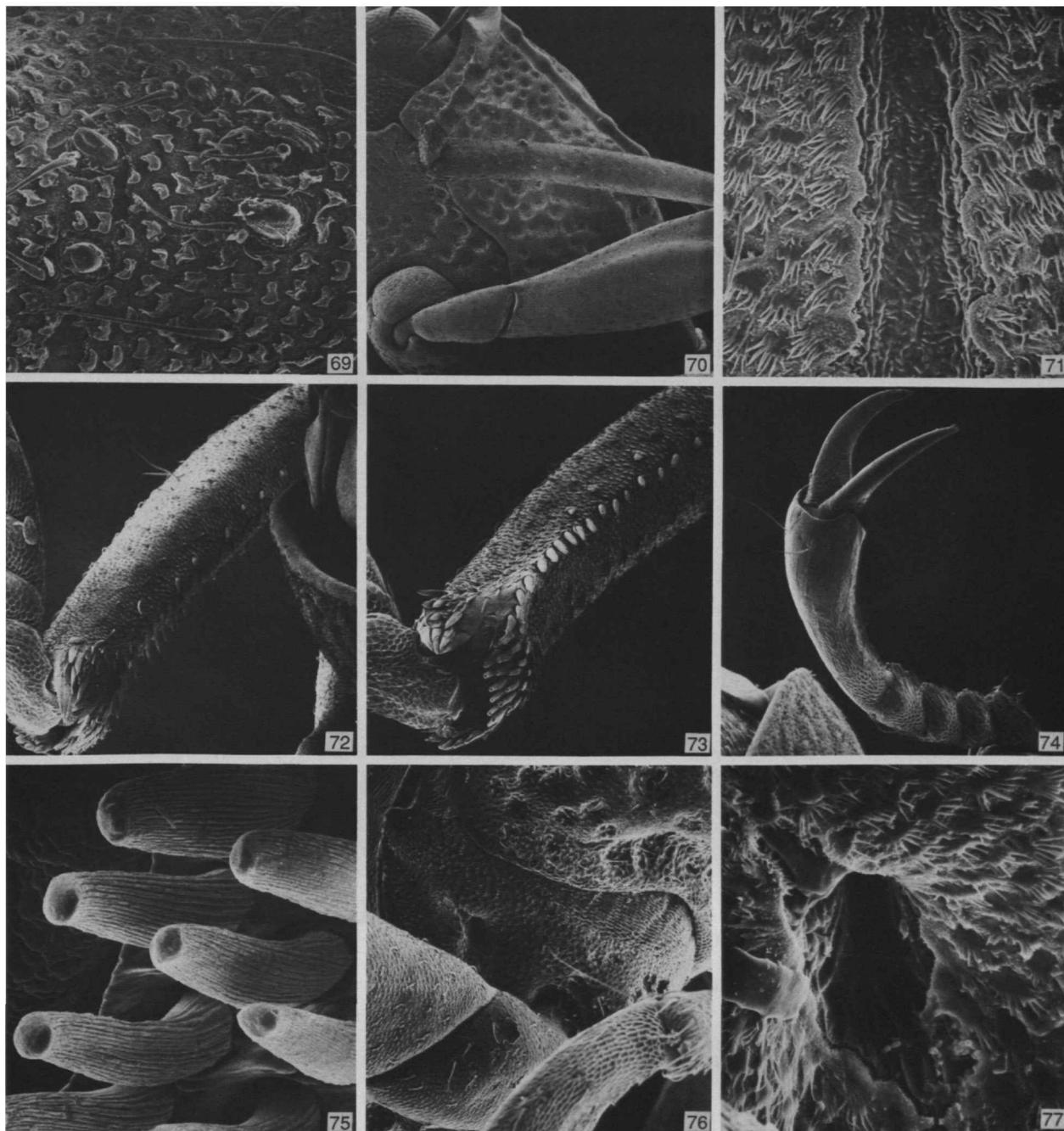


FIGURES 60–68.—*Stegoelmis selva*, new species: 60, head, prosternum, mesosternum, $\times 35$; 61, prosternum, mesosternum, metasternum, $\times 35$; 62, abdomen, σ^7 , ventral view, $\times 35$; 63, head, adoral view, $\times 90$; 64, head, ventral view, $\times 150$; 65, head, genal area, $\times 400$; 66, labrum, anterior margin, $\times 1300$; 67, pronotum, $\times 70$; 68, scutellum, $\times 300$. (Reduced to 60% for publication.)

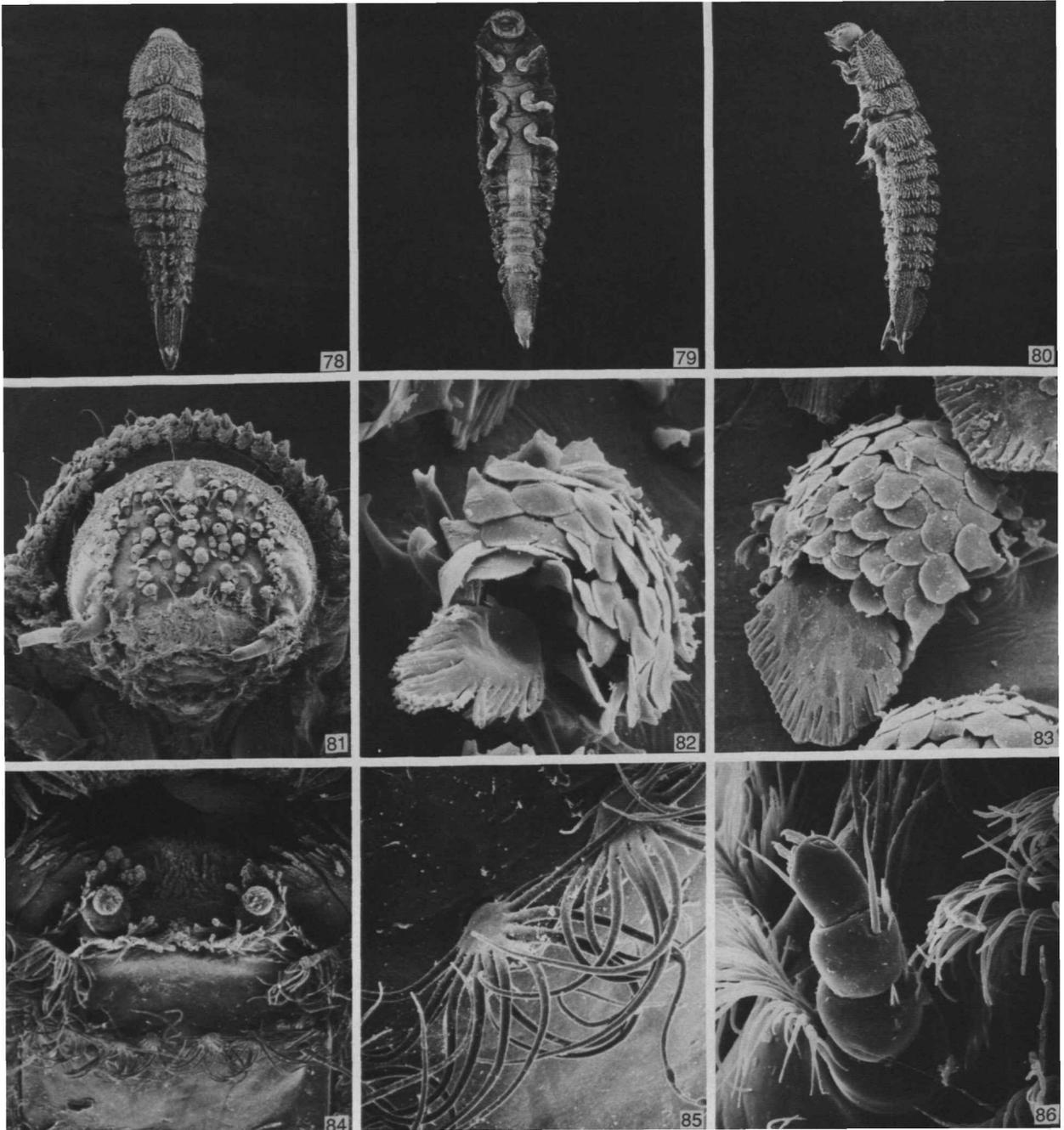
minute, spiniform setae and occasional flattened, fringed setae scattered over surface.

Thorax having terga of pronotum, mesonotum, and metanotum with clusters of imbricated setae (Figures 87, 88, 96)

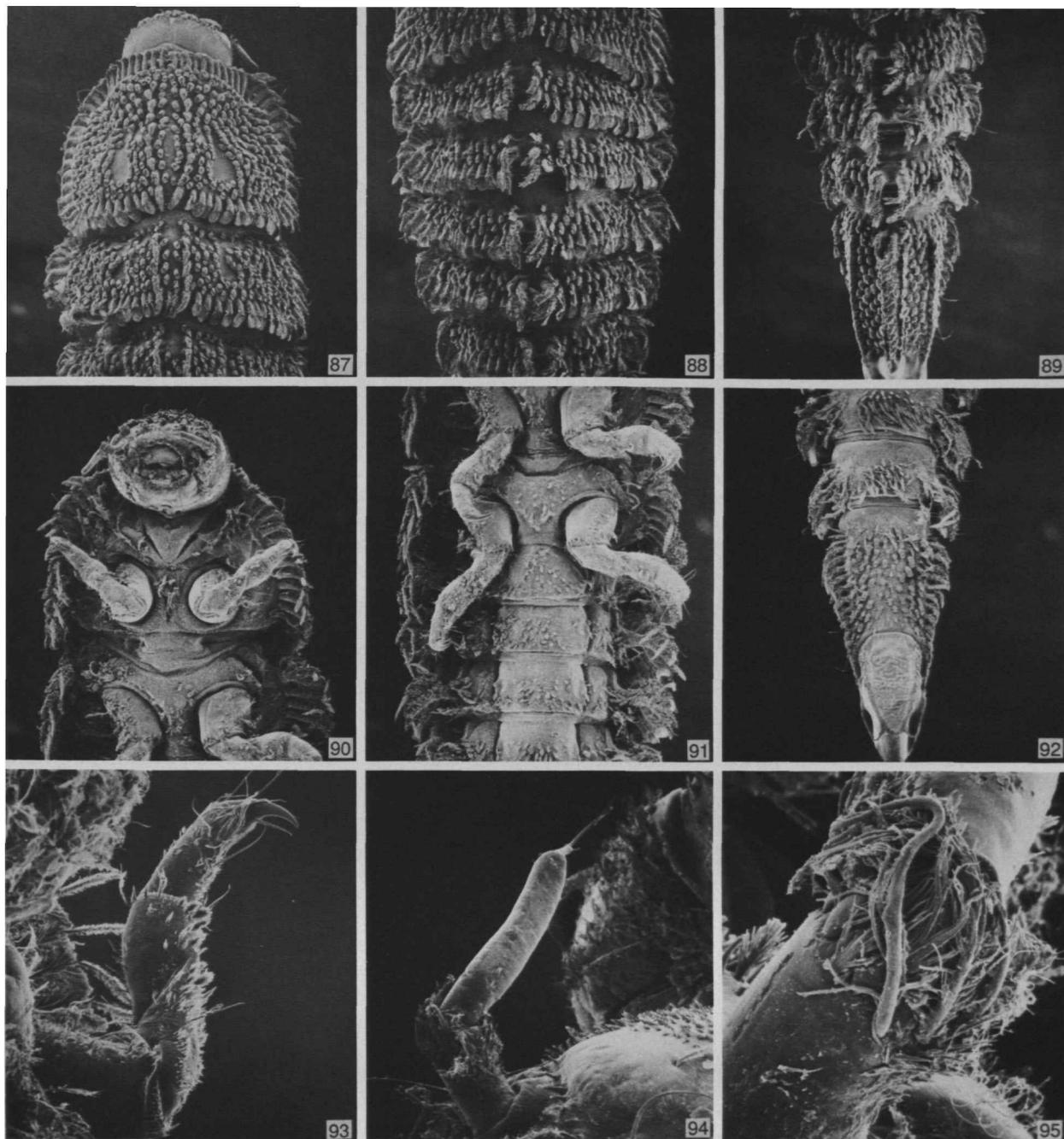
similar to those on head. With several depressed signa; signa without clusters of setae, slightly alutaceous, and bordered by minute setae with flattened and fringed apices (Figures 96, 97). Pronotum margined anteriorly and laterally by elongate,



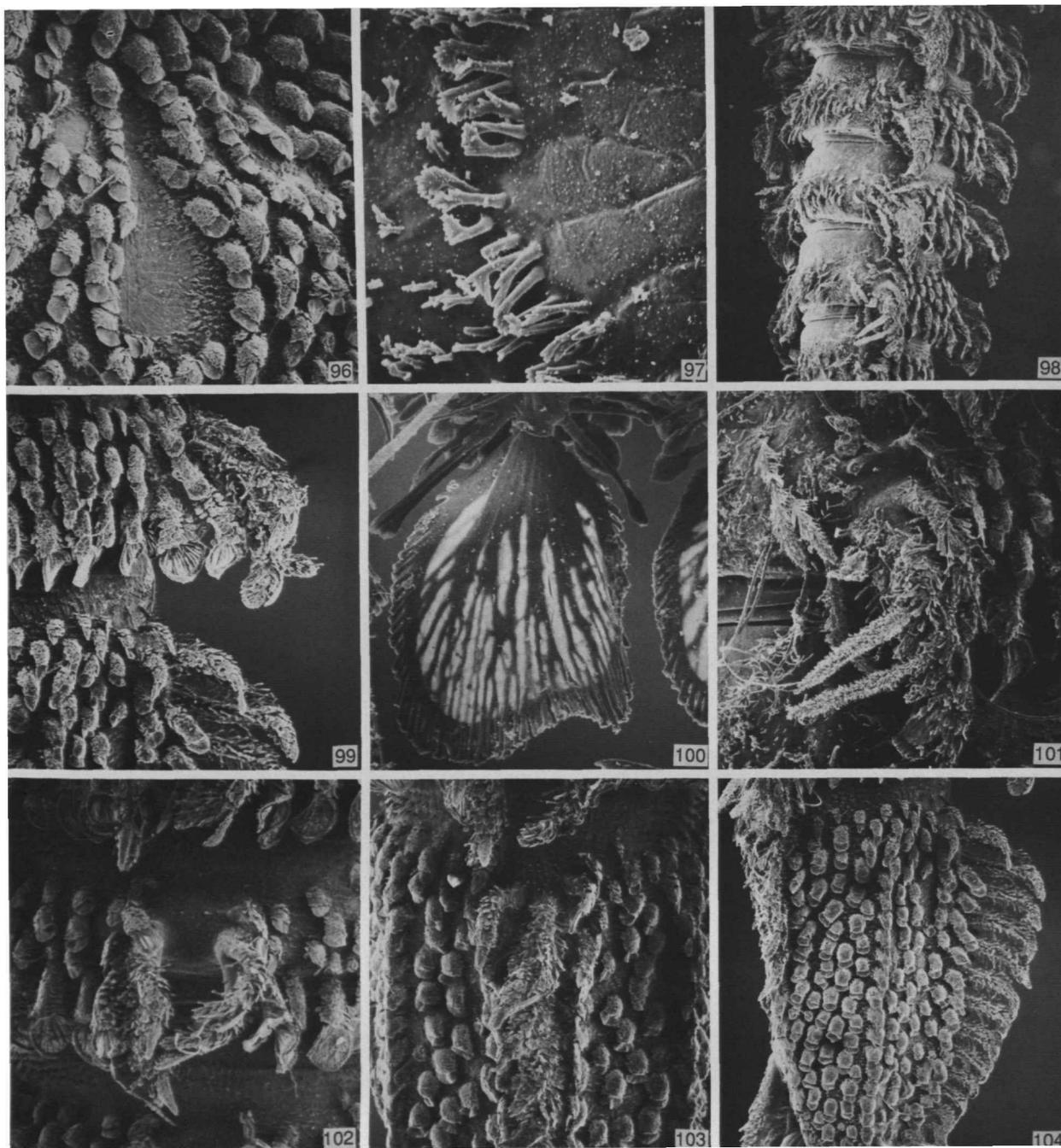
FIGURES 69-77.—*Stegoelmis selva*, new species: 69, profemoral plastron, $\times 1300$; 70, hypomeron, $\times 100$; 71, metasternal groove and plastron, $\times 1500$; 72, protibial cleaning fringe and smoothing setae, $\times 300$; 73, protibia, ventrolateral view, $\times 300$; 74, protarsus, $\times 180$; 75, protibia, apical spines, $\times 3000$; 76, metacoxa, $\times 250$; 77, metacoxal puncture, $\times 1500$. (Reduced to 64% for publication.)



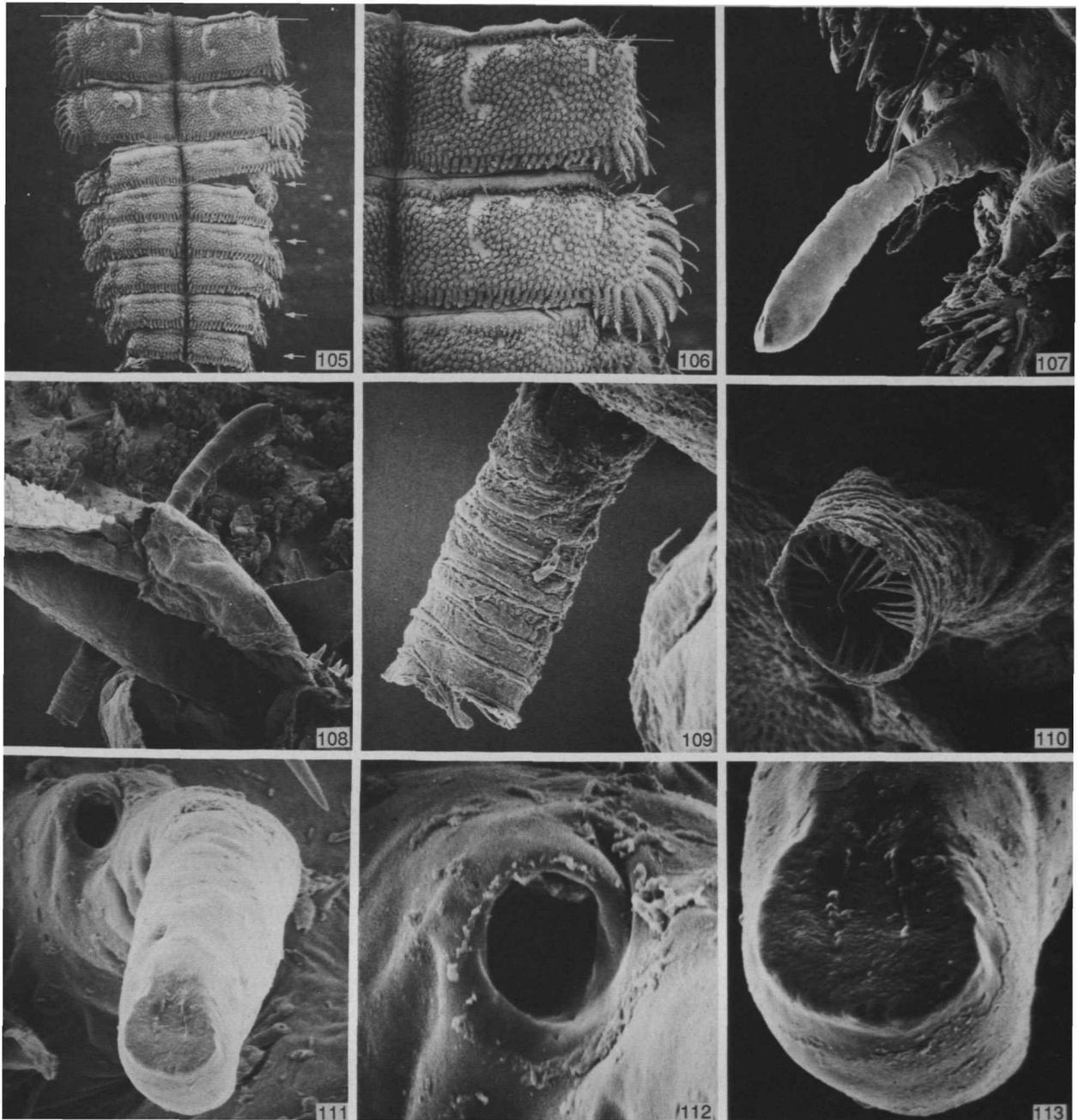
FIGURES 78-86.—*Stegoelmis selva*, larva: 78, habitus, dorsal view, $\times 19$; 79, habitus, ventral view, $\times 1700$; 80, habitus, lateral view, $\times 17$; 81, head, adoral view, $\times 1200$; 82, cluster of imbricated setae on head, $\times 3000$; 83, cluster of imbricated setae on head, $\times 2200$; 84, labium and mouthparts, $\times 550$; 85, labial setae, $\times 2200$; 86, maxillary palpus, $\times 1300$. (Reduced to 64% for publication.)



FIGURES 87-95.—*Stegoelmis selva*, larva: 87, pronotal and mesonotal sculpture, $\times 50$; 88, metanotal and abdominal sculpture, $\times 60$; 89, abdominal sculpture, $\times 60$; 90, head, prosternum, mesosternum, $\times 60$; 91, mesosternum, metasternum, abdominal sterna 1-4, $\times 60$; 92, abdominal sterna 7-9 and operculum, $\times 60$; 93, foreleg, $\times 170$; 94, antenna, $\times 350$; 95, antennal segment 1, apical setae, $\times 1100$. (Reduced to 64% for publication.)



FIGURES 96-104.—*Stegoelmis selva*, larva: 96, pronotal sculpture and signum, $\times 250$; 97, setae bordering signum, $\times 2500$; 98, abdominal sculpture, segments 5-9, oblique view, $\times 80$; 99, abdominal sculpture, segments 8, 9, lateral view, $\times 200$; 100, gill-like seta, $\times 1000$; 101, catkin-like lateral setae, abdominal segment 8, $\times 300$; 102, sculpture, midline, abdominal segment 5, dorsal view, $\times 200$; 103, sculpture, midline, abdominal segment 9, dorsal view, $\times 200$; 104, sculpture, abdominal segment 9, lateral view, $\times 130$. (Reduced to 64% for publication.)



FIGURES 105-113.—*Stegoelmis selva*, new species: 105, position of spiracular gills (arrows) on terga of mesonotum and abdominal segments 1-6, $\times 22$; 106, gill (arrow) on mesonotum, $\times 50$; 107, spiracular gill, abdominal segment 1, $\times 800$; 108, spiracular gill on mesonotum, trachea extending through body wall, $\times 500$; 109, trachea (and taenidia) from mesonotal gill, $\times 2200$; 110, spicules of inner walls arising from taenidia, $\times 2500$; 111, external opening of spiracular atrium near base of spiracular gill, abdominal segment 1, $\times 2500$; 112, opening of spiracular atrium, abdominal segment 1, $\times 7000$; 113, spiracular gill apex, abdominal segment 1, $\times 6000$. (Reduced to 63% for publication.)

branched processes that terminate in short, catkin-like setae (Figure 87); margined posteriorly by long processes that terminate in broad, flattened, gill-like setae (Figures 87, 100). Mesonotum and metanotum without elongate processes on anterior margins; lateral and posterior processes as those on pronotum. Thoracic sterna with very few broad setae mesially (Figures 90, 91).

Abdomen with terga densely covered with clusters of imbricated setae (Figures 88, 89) similar to those on head and thoracic terga; with lateral and posterior processes similar to those on thorax. Terga 1–8 each with a row of long tubercles paralleling meson; tubercles covered with imbricated setae (Figure 102) and bearing catkin-like seta apically. Tergum 9 with longitudinal rows of tubercles similar to those of terga 1–8 plus a third row basally (Figure 103); clusters of imbricated setae on declivous sides dense (Figure 104) and arranged above a short, broad seta with fringed edges. Sterna 1–8 with moderately dense, elongate setae as illustrated (Figures 91, 92); sternum 9 with dense clusters of short, broad imbricated setae. Operculum ovate, tapering to a subacute apex; without clusters of imbricated setae (Figure 92).

The specimen described above is one of six larvae collected from the Rio Baria in Venezuela where it was collected along with adults of *S. selva*. The larvae are labeled the same as the holotype of *S. selva*.

4. *Stegoelmis tuberosa*, new species

FIGURES 114–119

DIAGNOSIS.—Specimens of *S. tuberosa* have the elytral apices rounded and indehiscent; the metasternum sparsely and moderately coarsely punctate; abdominal sternum 1 with coarse punctures only across apical third; and abdominal sternum 2 more finely and sparsely punctate. The broadly expanded gonopore of the male genitalia (Figure 116) will distinguish males of *S. tuberosa* from all other males known in the genus. From *S. verrucata* Hinton and *S. fera*, which also have the elytral apices rounded, *S. tuberosa* may be distinguished by the coarse punctures across only the apical third of abdominal sternum 1 instead of coarsely and densely punctate across entire sterna 1 and 2.

HOLOTYPE (♂).—*Body Form and Size*: Elongate, subparallel. Length, 4.09 mm; greatest width, 1.78 mm.

Color: Head with mottled light and dark gray plastron; clypeus, labrum, and antennae reddish brown. Pronotum with surface mottled light and dark gray like head; apical sixth of longitudinal groove light gray; with sparse, short, light yellow setae. Elytra with plastron mostly dark gray but sparsely mottled with light gray. Mouthparts (except black mandibles), mesosternum between procoxae and metacoxae, extreme tips of tibiae, and entire tarsi reddish brown; remainder of ventral surface and legs with mottled light and dark gray plastron.

Plastron: Covers entire body except antennae, eyes, clypeus,

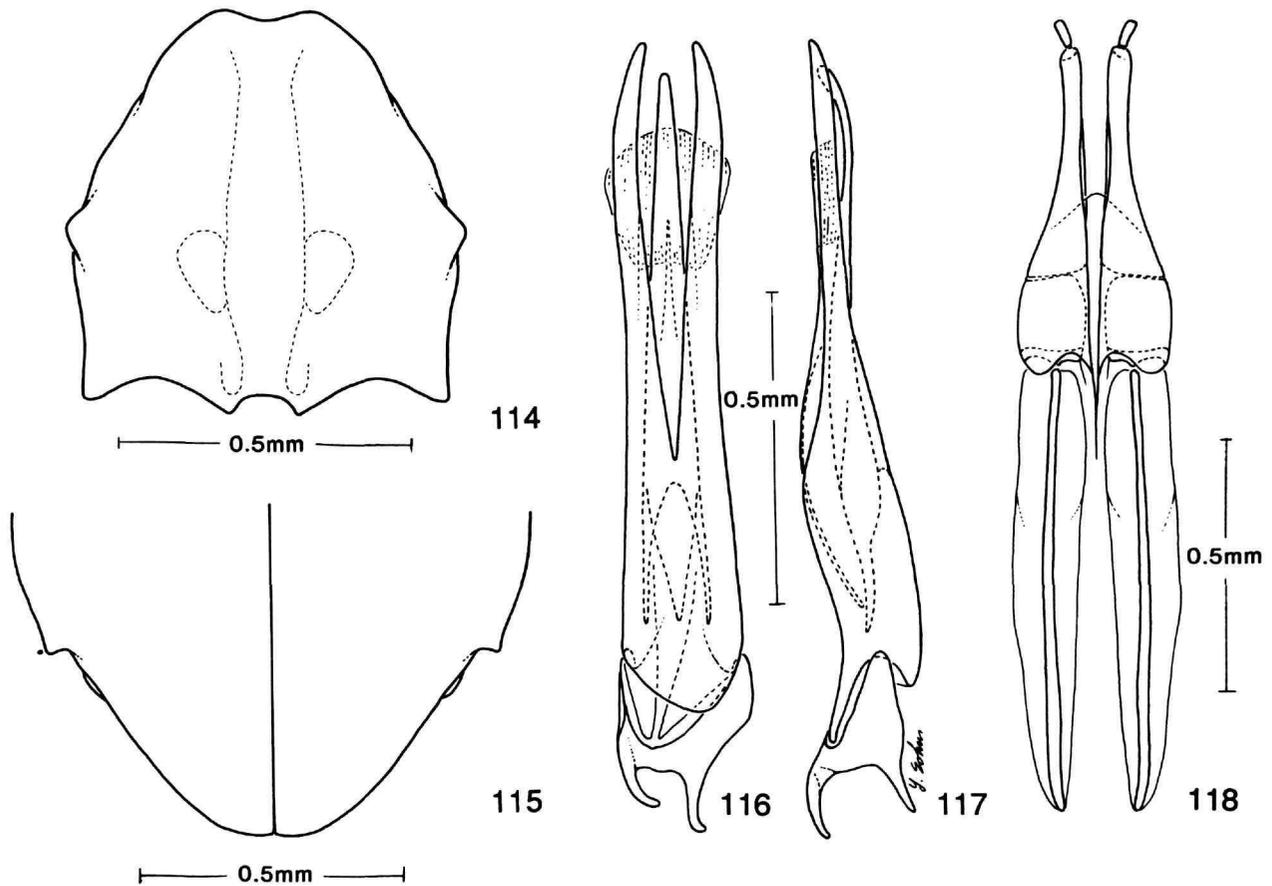
labrum, middle of mesosternum, extreme apices of tibiae, and tarsi.

Head: Concave medially; shallowly, longitudinally depressed between antennal acetabula; finely punctate between and behind eyes. Frontoclypeal suture deeply depressed and well below antennal acetabula. Clypeus thickened; surface finely, densely punctate and densely microreticulate. Labro-clypeal suture deep and broad. Labrum a narrow, transverse rectangle; smooth; with a transverse row of long, golden, hair-like setae at midlength and a fringe of golden setae along anterior margin.

Thorax: Pronotum slightly shorter than wide; length, 1.10 mm; broadest width, slightly behind midlength, 1.20 mm; base slightly wider than apex; lateral margin moderately sinuate; medial longitudinal groove broad, moderately deep, and extending from base almost to anterior margin; with 4 distinct protuberances across basal third as illustrated (Figure 114); anterior margin projecting over head and arcuately emarginate apicomediaally; surface sculpture like that of head; punctures fine, obscured by plastron; with few, short, fine, yellowish setae; setae with apices directed posteriorly. Hypomera, sides of prosternum, and middle of mesosternum coarsely, densely punctate. Prosternal process sparsely, finely punctate; moderately slender; apically, about half as wide as procoxa; slightly converging apically and apex moderately rounded. Metasternum with entire surface coarsely, densely punctate and a narrow, longitudinal, impunctate sulcus on posterior fourth-fifths; posterior half of disc slightly depressed. Protibia with a cleaning fringe of short, dense, golden setae apicomediaally; length of fringe about as long as length of tarsal segment 1; with a row of robust smoothing setae adjacent to fringe, row 4 times as long as length of fringe. Mesotibia and metatibia with only a few long, golden, hair-like setae apicoventrally. Last tarsal segments very robust and about 1.5 times as long as combined length of tarsal segments 1–4. Elytra more than twice as long as pronotum; length, 3.07 mm; combined width, 1.78 mm; apices rounded and not dehiscent; humeri each with protuberance; posterolateral margins each with distinct protuberance; surface as that of pronotum; striae deeper basally; discal strial punctures coarse, deep, round, almost half as wide as intervals and separated longitudinally by about 2 to 4 times their diameter; intervals slightly convex and intervals 2, 3, and 4 vaguely swollen basally; interval 3 vaguely swollen slightly behind midlength; intervals with fine, short, sparse, yellow setae; sublateral punctures slightly coarser than discal punctures. Scutellum flat, elongate-ovate; with very few, fine punctures.

Abdomen: Intercostal process of sternum 1 broadly, moderately deeply concave and densely punctate across anterior margin; less densely punctate than metasternum. Punctures similarly dense on sterna 2–5. Lateral margins of sternum 3 with large lobate process that clasps emarginate side of elytron. Last sternum convex subapically.

Genitalia: As illustrated (Figures 116, 117).



FIGURES 114–118.—*Stegoelmis tuberosa*: 114, pronotum; 115, elytral apices; 116, male genitalia, dorsal view; 117, male genitalia, lateral view; 118, female genitalia.

FEMALE GENITALIA.—As illustrated (Figure 118).

VARIATIONS.—The light gray pronotal markings are more extensive on 8 of the 19 specimens examined. On these eight specimens, the light gray markings are on the raised sides of the longitudinal medial groove, on the four protuberances, on the apicomedial margin narrowly, between the medial protuberances, and broadly between and behind the sublateral and medial protuberances. Specimens with the extensive light gray pronotal markings also have larger gray elytral markings. A light gray mark is present on about the apical third of the scutellum of 16 of the 19 specimens. A dark partial band at the proximal third of the protibiae, mesotibiae, and metatibiae is obvious on 14 of the specimens and absent on the other 5 specimens examined. In length, males vary from 3.91 to 4.30 mm and females from 4.10 to 4.39 mm.

TYPE DATA.—*Holotype* (σ): VENEZUELA: TERRITORIO FEDERAL AMAZONAS: Cerro de la Neblina, basecamp, 140 m, 0°50'N 66°10'W, 26 Jan 1985, at blacklight on bank of

Rio Baria, P. and P. Spangler, R.A. Faitoute, W.E. Steiner; deposited in the National Museum of Natural History, Smithsonian Institution.

Allotype: Same data as holotype.

Paratypes: Same data as holotype except: 6 Feb 1985, 1 σ , 1 q ; 23 Feb 1985, 1 σ , 4 q ; at blacklight in rainforest clearing near Rio Baria: 10 Feb 1985, 1 σ , 2 q ; 11 Feb 1985, 1 σ , 1 q ; 21 Feb 1985, 2 q ; 21–28 Feb 1985, 1 σ ; seined from stream in rapids of Rio Baria, 14 Feb 1985, 1 σ ; from leaf packs among rocks in small stream in rainforest, 18 Feb 1984, 1 σ , 2 q ; netted from margins of Rio Baria, 20 Feb 1985, 1 σ ; 13–20 Feb 1984, 0°50'N 66°9'44"W, D. Davis and T. McCabe, 2 q .

DISTRIBUTION.—Presently known only from the type locality in Venezuela (Figure 119).

ETYMOLOGY.—From the Latin adjective *tuberosus* (“full of lumps or protuberances”) in reference to the obvious pronotal gibbosities and elytral protuberances on this species.

HABITAT.—Although most of the type material was col-

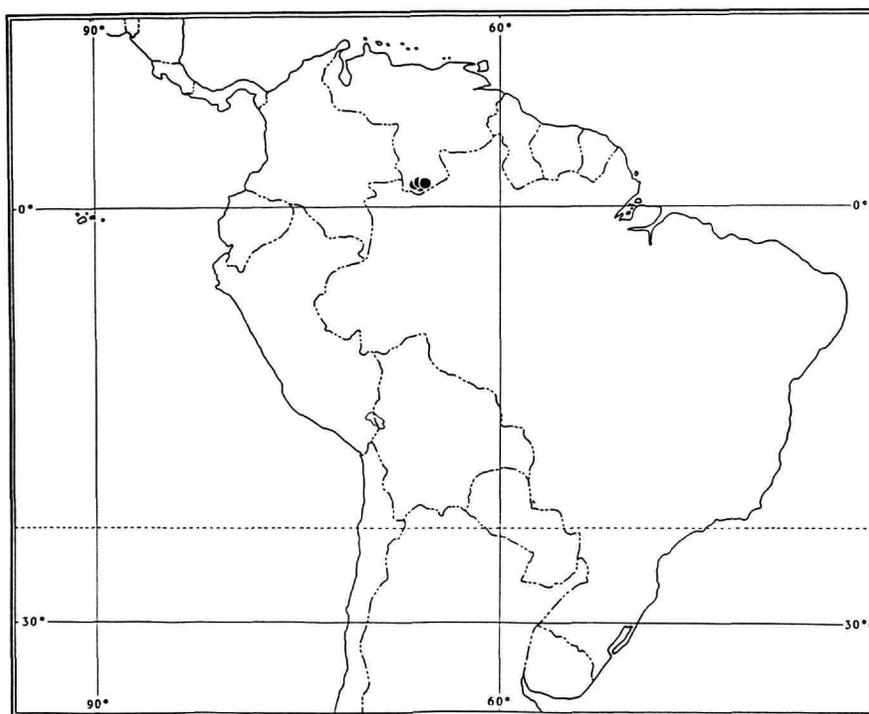


FIGURE 119.—Known distribution of *Stegoelmis tuberosa*, new species.

lected from blacklights operated beside or near the Rio Baria some were collected from a small tributary to the Rio Baria. Probably, all of the specimens obtained at the blacklights originated from the Rio Baria and its tributaries. All of the specimens were collected at or very close to the basecamp at about 140 m elevation.

The Rio Baria (Figure 40) is a blackwater stream without suspended material and flows through a series of pools and riffles; it is about 15–35 m wide and at the riffles it varied in depth from 0.33 to 0.5 m at the time the specimens were collected. The stream is subject to flash flooding and the substratum consists of sand, gravel, occasional boulders, and bedrock. The small whitewater tributary from which specimens were obtained from leaf packs was about 1 m wide and 1 to 2 cm deep and was shaded by a dense canopy.

The water temperature was 17°C and colorimetric water chemistry analyses in the Rio Baria at basecamp provided the following data: pH, 4; hardness, 0; oxygen, 9 ppm.

The following aquatic beetle families and genera were collected with *S. tuberosa* from the Rio Baria. The genera followed by an asterisk were collected from eddies with a leaf substrate adjacent to the shore and are considered inhabitants of lentic rather than lotic habitats. Dytiscidae: *Bidessodes*,* *Hydrodessus*, *Hypodessus*, *Laccodytes*, *Microdessus**; Elmidae: *Austrolimnius*, *Cylloepus*, *Gyrelmis*, *Heterelmis*, *Hexacycloepus*, *Hintonelmis*, *Macrelmis*, *Microcylloepus*, *Neoelmis*,

Pagelmis, *Stenhelmoides*, *Tyletelmis*, *Xenelmis*, and a new genus; Gyrinidae: *Gyretes*; Noteridae: *Notomicrus**; Psephenidae: *Psephenops*.

The following water beetles were collected along with *S. tuberosa* from a small, marshy, meandering whitewater rivulet with occasional shallow, leafy pools, 1 km south of the basecamp at Cerro de la Neblina. These families and genera are representative of lentic as well as lotic habitats; those considered lentic taxa are followed by an asterisk. Dryopidae: *Dryops*, *Pelonomus*; Dytiscidae: *Agaporomorpha*,* *Celina*,* *Copelatus*,* *Derovatellus*,* *Desmopachria*,* *Hydrodessus*, *Laccophilus*,* *Macrovatellus**; Elmidae: *Gyrelmis*, *Hexacycloepus*, *Neoelmis*, *Pilielmis*, new genus; Gyrinidae: *Gyretes*; Hydraenidae: *Hydraena**; Hydrophilidae: *Anacaena*,* *Deralulus*,* *Enochrus*,* *Helochaeres*,* *Notionotus*,* *Paracymus*,* *Tropisternus**; Noteridae: *Hydrocanthus*,* *Notomicrus*,* *Suphisellus**; Psephenidae: larva (probably *Psephenops*).

5. *Stegoelmis verrucata* Hinton

FIGURES 120–126

Stegoelmis verrucata Hinton, 1939a:31.—Blackwelder, 1944:271.—Sanderson, 1953a:34.

DIAGNOSIS.—This species may be distinguished by the rounded and indehiscent elytral apices; metasternum and

abdominal sterna 1 and 2 with entire surface densely and coarsely punctate. From *S. fera*, which has sterna 1 and 2 similarly punctate, *S. verrucata* may be distinguished by the narrow and deep pronotal longitudinal depression on the meson extending from base almost to apex and by hypomeral punctures that are about as dense as those on pronotal disc. Also, in lateral view, the apical half of the parameres of the male genitalia of *S. verrucata* are sinuate (Figure 123), whereas *S. fera* has the parameres evenly arcuate (Figure 130).

REDESCRIPTION (σ^7).—*Body Form and Size:* Elongate, subparallel. Length, 3.80 mm; greatest width, 1.70 mm.

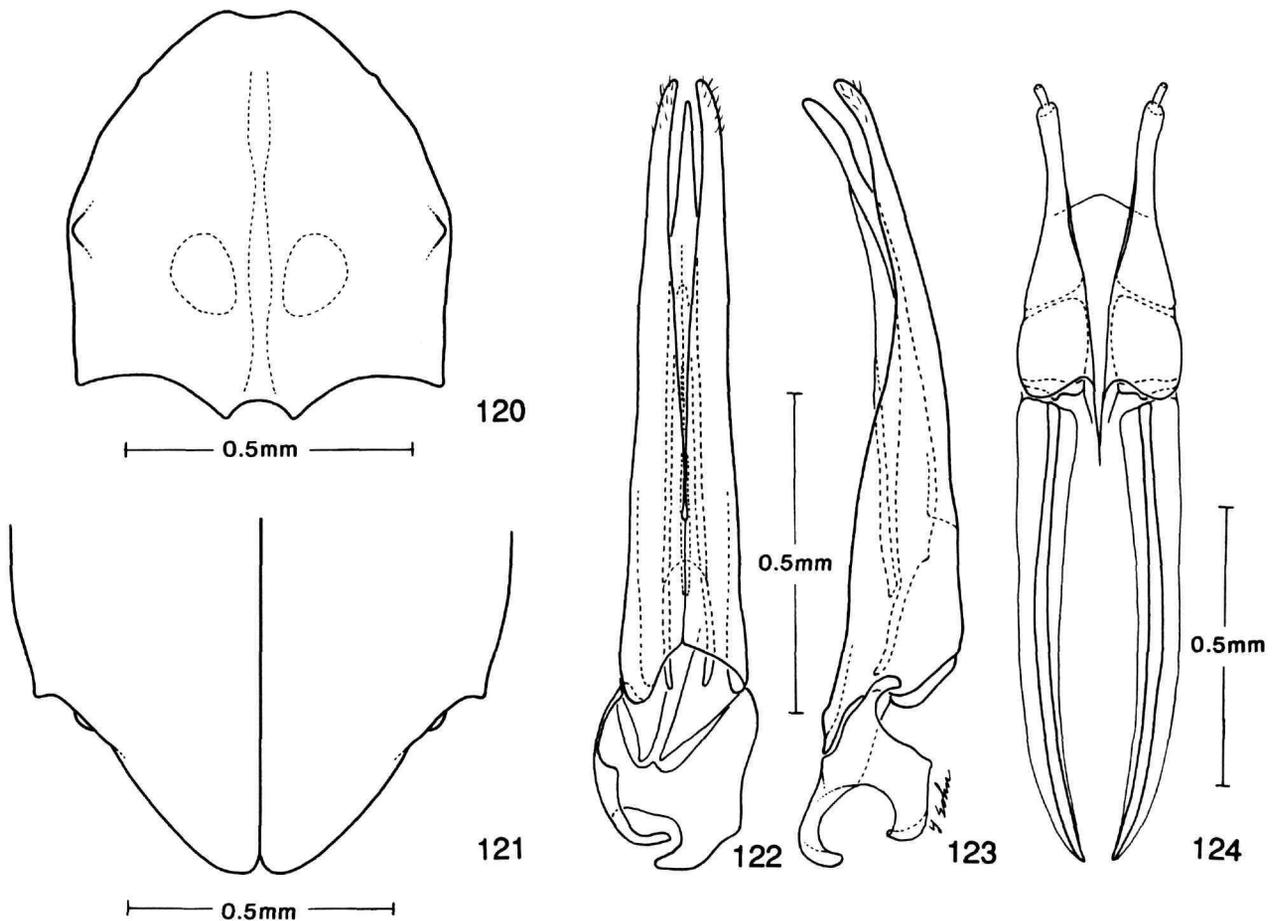
Color: Head dark reddish brown with flecks of gray; clypeus, labrum, and antennae lighter reddish brown. Pronotum dark reddish brown with gray flecks like head; with sparse, short, light yellow setae. Elytra dark reddish brown, with gray plastron in striae and punctures. Mouthparts (except black mandibles), mesosternum between procoxae and metacoxae, extreme tips of tibiae, and entire tarsi reddish brown; remainder

of ventral surface and legs with light gray plastron.

Plastron: May cover entire body except antennae, eyes, clypeus, labrum, middle of mesosternum, extreme apices of tibiae, and tarsi. However, it is unclear whether a true plastron was present and is now abraded or whether some kind of coating was deposited on the cuticle and is now mostly abraded with remnants in depressed areas of the cuticle.

Head: Concave medially; moderately deep longitudinal depression between antennal acetabula; moderately coarsely punctate between and behind eyes. Frontoclypeal suture deeply depressed and well below antennal acetabula. Clypeus thickened; surface finely, densely punctate and densely micoreticulate. Labroclypeal suture deep and broad. Labrum a narrow, transverse rectangle; smooth; with a transverse row of long, golden, hair-like setae at midlength and a fringe of golden setae along anterior margins.

Thorax: Pronotum slightly wider than long; length, 1.20 mm; broadest width, slightly behind midlength, 1.23 mm; base



FIGURES 120–124.—*Stegoelmis verrucata* Hinton: 120, pronotum; 121, elytral apices; 122, male genitalia, dorsal view; 123, male genitalia, lateral view; 124, female genitalia.

slightly wider than apex; lateral margin moderately sinuate; medial longitudinal groove broad, moderately deep, and extending from base almost to anterior margin; with 4 distinct gibbosities across basal third as illustrated (Figure 120); anterior margin projecting over head and arcuately emarginate apicomediaally; surface sculpture like that of head; punctures moderately coarse, possibly obscured by plastron (but now abraded); with few, short, fine, yellowish setae; setae with apices directed posteriorly. Hypomera, sides of prosternum, and middle of mesosternum coarsely, densely punctate. Prosternal process sparsely, coarsely punctate; moderately slender; apically, about half as wide as procoxa; slightly converging apically and apex moderately rounded. Metasternum with entire surface coarsely, densely punctate and a narrow, longitudinal sulcus on posterior four-fifths; posterior half of disc slightly depressed. Protibia with a cleaning fringe of short, dense, golden setae apicomediaally; length of fringe about as long as length of tarsal segment 1; with a row of robust smoothing setae adjacent to fringes, row 2 times as long as length of fringe. Mesotibia and metatibia with only a few long, golden, hair-like setae apicoventrally. Last tarsal segments very robust and about 1.5 times as long as combined length of tarsal segments 1-4. Elytra more than twice as long as pronotum; length, 3.80 mm; combined width, 1.70 mm; apices rounded and slightly dehiscent; humeri each with protuberance; posterolateral margins each with distinct protuberance; surface as that

of pronotum; striae deeper basally; discal strial punctures very coarse, deep, round, almost as wide as intervals and separated longitudinally by about $\frac{1}{2}$ to 1 times their diameter; intervals slightly convex and intervals 2, 3, 4, and 5 swollen basally; interval 3 vaguely swollen slightly behind midlength; intervals with fine, short, sparse, yellow setae; sublateral punctures slightly coarser than discal punctures. Scutellum almost flat, subovate; with very few, fine punctures.

Abdomen: Intercostal process of sternum 1 broadly, moderately deeply concave and densely, coarsely punctate; about as densely punctate as metasternum. Punctures similarly dense on sternum 2, becoming finer on sterna 3, 4, and 5. Lateral margins of sternum 3 with large lobate process that clasps emarginate side of elytron. Last sternum convex subapically.

Genitalia: As illustrated (Figures 122, 123).

FEMALE GENITALIA.—As illustrated (Figure 124).

VARIATIONS.—Except in length, no variations have been noted in the nine specimens examined. In length, males vary from 3.80 to 3.91 mm and females from 4.02 to 4.50 mm.

SPECIMENS EXAMINED.—BRAZIL: PARA: Altamira (~22 km SE), 6 Oct 1986, P. Spangler and O. Flint, 2♂, 6♀. Belem, 21-23 Sep 1937, H.E. Hinton, 1 paratype (abdomen missing, sex undetermined) (BMNH). Specimens will be deposited in the Museu de Zoologia, Universidad de São Paulo, São Paulo, Brazil, and the National Museum of Natural History, Smithsonian Institution.

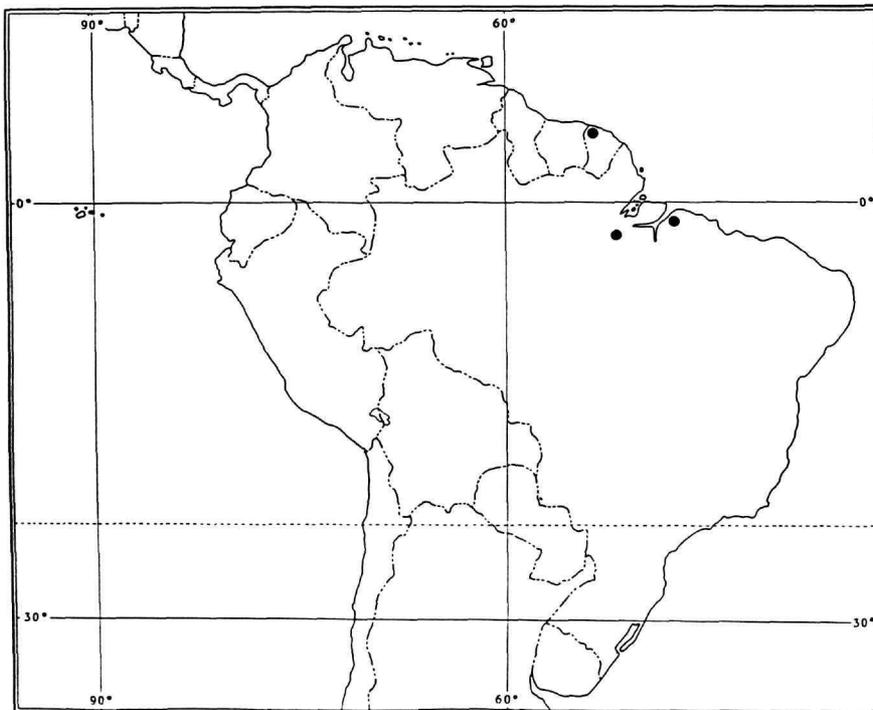


FIGURE 125.—Known distribution of *Stegoelmis verrucata* Hinton.

Hinton (1939a) reported that his male type and 3 paratypes were collected from "BRAZIL: State of Pará, Belem, 21-23.IX.1937 (H.E. Hinton)" and another paratype was collected from "FRENCH GUIANA: St. Laurent du Maroni, X.1937 (H.E. Hinton)." I have seen only the one paratype listed above. Christine von Hayek, British Museum (Natural History), kindly searched for a slide that Hinton may have prepared of the male genitalia of *S. verrucata* but none was found.

DISTRIBUTION.—This species is presently known from Brazil and French Guiana (Figure 125).

HABITAT.—The specimens from Altamira, Brazil, were collected from leaf packs lodged against sticks and saplings in a shaded stream below a small waterfall at Caverna do Tatajuba. The stream (Figure 126) drains a pool below the falls, flows over a substratum of sand with some gravel intermixed and is about 3 m wide, and 45 cm deep.

In the same biotope the following aquatic beetle families and genera were associated with *Stegoelmis verrucata*. The taxa

followed by an asterisk are from the marshy banks of the stream and are considered typical inhabitants of lentic habitats. Dryopidae: *Pelonomus*; Elmidae: *Gyrelmis*, *Neoelmis*; Gyrrinidae: *Gyretes*, *Gyrinus*; Hydraenidae: *Hydraena*; Hydrophilidae: *Derallus*,* *Notionotus*,* *Phaenonotum**; Noteridae: *Siolius*.

6. *Stegoelmis fera*, new species

FIGURES 127-131

DIAGNOSIS.—This species resembles *S. verrucata* but may be distinguished by its wide, moderately deep, and short longitudinal pronotal impression on the meson (Figure 127) and the much coarser punctures on the hypomeron than those on the pronotal disc. A comparison of the characters that separate *S. fera* from *S. verrucata* are given under the diagnosis of *S. verrucata*.

HOLOTYPE (♂).—*Body Form and Size*: Elongate, subparal-



FIGURE 126.—Biotope of *Stegoelmis verrucata* Hinton; 22 km southeast of Altamira, Pará, Brazil; stream below waterfall at Caverna do Tatajuba.

1el. Length, 4.38 mm; greatest width, 1.78 mm.

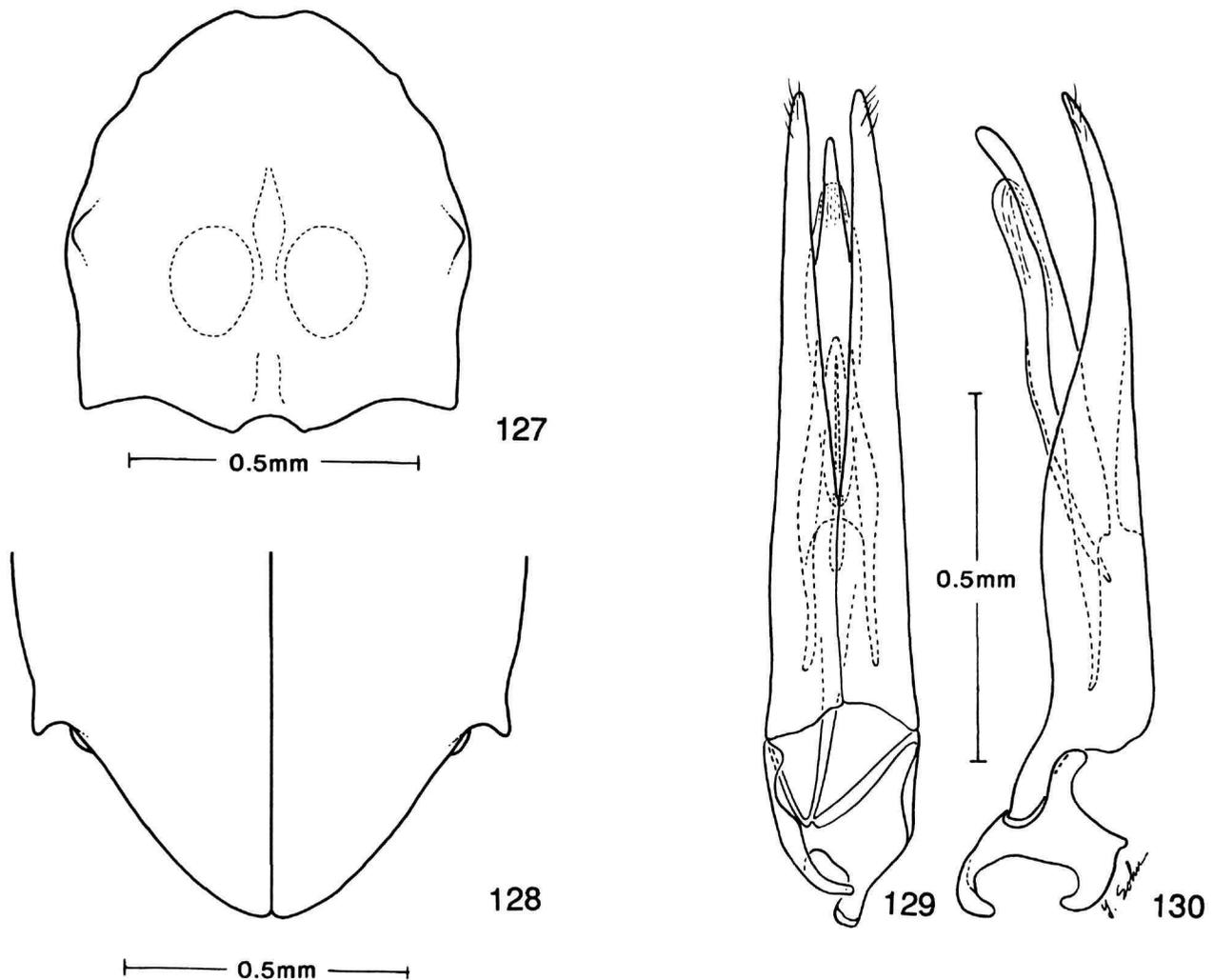
Color: Head with light gray plastron; clypeus, labrum, and antennae reddish brown. Pronotal and elytral surfaces with light gray plastron except where abraded; with sparse, light yellow setae. Mouthparts (except black mandibles), extreme tips of tibiae, and entire tarsi reddish brown; remainder of ventral surface and legs with light gray plastron.

Plastron: Covers entire body except antennae, eyes, clypeus, labrum, middle of mesosternum, extreme apices of tibiae, and tarsi.

Head: Shallowly convex medially between antennal acetabula; coarsely punctate between and behind eyes. Frontoclypeal suture moderately deeply depressed and well below

antennal acetabula. Clypeus thickened; surface finely, densely punctate and densely microreticulate. Labroclypeal suture deep and broad. Labrum a narrow, transverse rectangle; densely microreticulate; with a transverse row of long, golden, hair-like setae at midlength and a fringe of golden setae along anterior margin.

Thorax: Pronotum slightly shorter than wide; length, 1.26 mm; broadest width, at midlength, 1.31 mm; base slightly wider than apex; lateral margin moderately sinuate; medial longitudinal impression moderately broad, moderately deep, and extending from base to slightly in front of medial gibbositities; with 4 protuberances across basal third as illustrated (Figure 127); anterior margin projecting over head



FIGURES 127-130.—*Stegoelmis fera*, new species: 127, pronotum; 128, elytral apices; 129, male genitalia, dorsal view; 130, male genitalia, lateral view.

and arcuately emarginate apicomediaally; surface sculpture like that of head; punctures moderately coarse; with few, short, fine, yellowish setae; setae with apices directed posteriorly. Hypomera, sides of prosternum, and middle of mesosternum coarsely, densely punctate. Prosternal process densely, coarsely punctate; rather slender; apically, about a third as wide as procoxa; slightly converging apically and apex moderately rounded. Metasternum coarsely, densely punctate; with a short, narrow, longitudinal, impunctate sulcus on posterior half; punctures fine and sparse adjacent to sulcus; posterior half of disc shallowly depressed; punctures between mid and hind coxae coarse and dense; punctures laterad of mesocoxae and metacoxae larger and denser. Protibia with a cleaning fringe of short, dense, golden setae apicomediaally; length of fringe about as long as combined length of tarsal segments 1 and 2; with a row of robust smoothing setae adjacent to fringe, row about 4 times as long as length of fringe. Mesotibia and metatibia with only a very small tuft of long, golden, hair-like setae apicoventrally. Last tarsal segments densely microreticulate, very robust, and about 1.5 times as long as combined length of tarsal segments 1–4. Elytra more than twice as long as pronotum; length, 3.03 mm; greatest combined width, 1.78 mm; apices rounded and not dehiscent; humeri gibbose; posterolateral margins each with distinct protuberance; surface with striae deep basally; discal strial punctures coarse, deep,

round, almost half as wide as intervals and separated longitudinally by about 2 to 4 times their diameter; intervals with fine, short, sparse, yellow setae and slightly convex; intervals 2, 3, and 4 moderately swollen basally and interval 3 vaguely swollen slightly behind midlength; sublateral punctures slightly coarser than discal punctures. Scutellum flat, subovate; with very few, fine punctures.

Abdomen: Intercostal process of sternum 1 broadly, moderately deeply concave and more densely and coarsely punctate than metasternal disc. Punctures become progressively smaller on sterna 3 and 4 and denser on sternum 5. Lateral margins of sternum 3 with large lobate process that clasps emarginate side of elytron. Last sternum convex subapically.

Genitalia: As illustrated (Figures 129, 130).

FEMALE GENITALIA.—Unknown.

TYPE DATA.—*Holotype* (σ^7): VENEZUELA: TERRITORIO FEDERAL AMAZONAS: Cerro de la Neblina, basecamp (1 km S), 140 m, 0°50'N 66°10'W, 19 Feb 1985, along small whitewater stream, pools of dead leaves and sticks, P. and P. Spangler, R.A. Faitoute, W.E. Steiner; deposited in the National Museum of Natural History, Smithsonian Institution.

DISTRIBUTION.—Presently known only from the type locality in Venezuela (Figure 131).

ETYMOLOGY.—From the Latin *fera* ("wild beast"), in reference to its presence in the pristine lowland jungle from



FIGURE 131.—Known distribution of *Stegoelmis fera*, new species.

which the specimens were collected.

HABITAT.—The unique holotype was collected from the small whitewater stream described under the habitat of *Stegoelmis tuberosa*; associated taxa are also listed under *S. tuberosa*.

7. *Stegoelmis ennsi*, new species

FIGURES 132–138

DIAGNOSIS.—Having shallowly dehiscent and angulate elytral apices, specimens of *S. ennsi* are similar to *S. andersoni* but may be distinguished by the absence of the deep medial impression between the antennal acetabulae and the short, narrow, longitudinal impression on the pronotal meson (Figure 132). Also, in dorsal view, the parameres of the male genitalia of *S. ennsi* converge apically and each bears a few apical setae (Figure 134), whereas the parameres of *S. andersoni* are

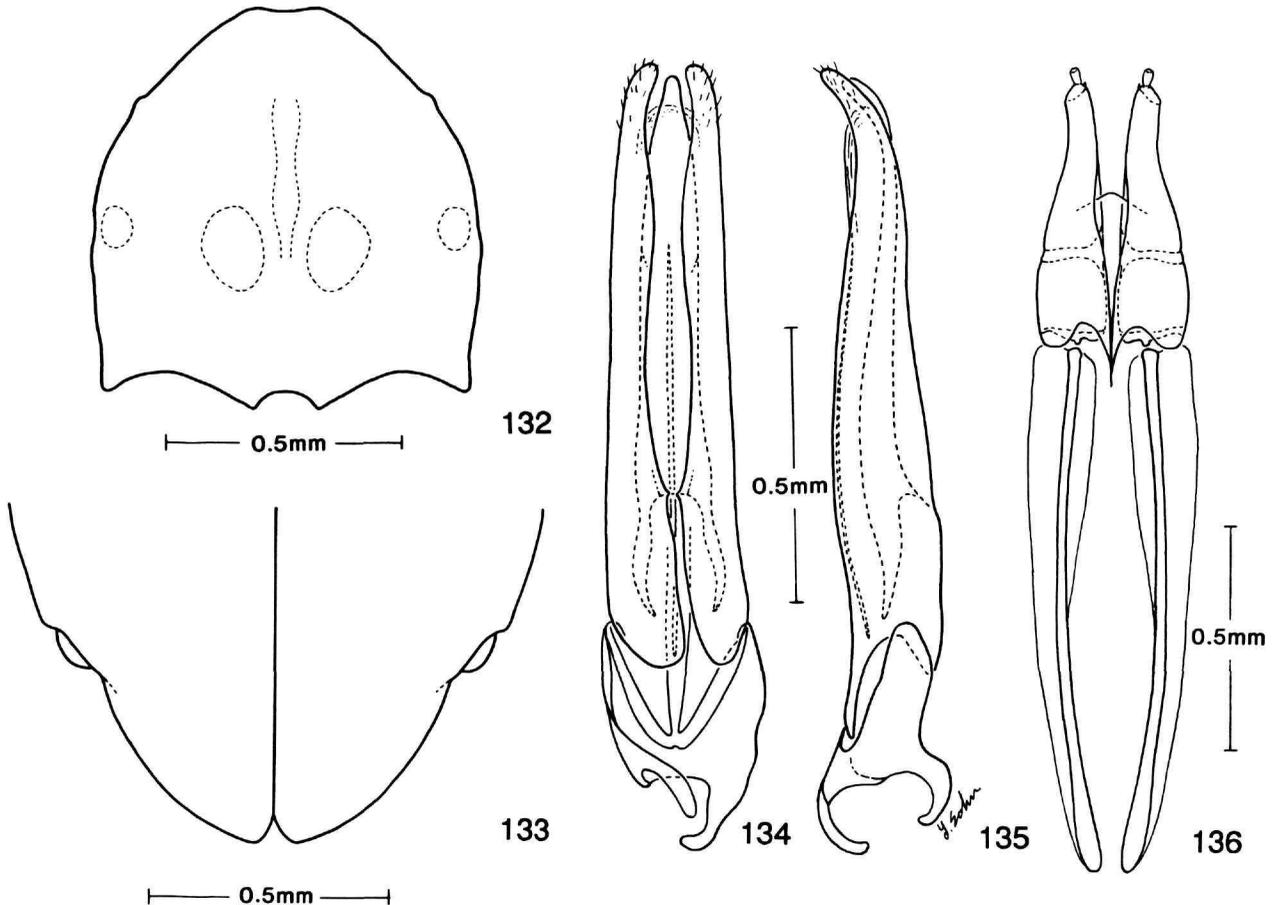
straight or slightly divergent apically and bear setae for half their length (Figure 15).

HOLOTYPE (σ^7).—*Body Form and Size:* Elongate, subparallel. Length, 5.25 mm; greatest width, 2.17 mm.

Color: Head with mottled light and dark gray plastron; clypeus, labrum, and antennae reddish brown. Pronotum with surface light gray and mottled with dark gray laterally and basally; with sparse, short, light yellow setae. Elytra with plastron mostly light gray but sparsely mottled with dark gray laterally and basally. Mouthparts (except black mandibles), mesosternum between procoxae and metacoxae, extreme tips of tibiae, and entire tarsi reddish brown; remainder of ventral surface and legs with mottled light and dark gray plastron.

Plastron: Covers entire body except antennae, eyes, clypeus, labrum, middle of mesosternum, extreme apices of tibiae, and tarsi.

Head: Concave medially; arcuately and vaguely depressed



FIGURES 132–136.—*Stegoelmis ennsi*, new species: 132, pronotum; 133, elytral apices; 134, male genitalia, dorsal view; 135, male genitalia, lateral view; 136, female genitalia.

transversely between dorsomedial corners of eyes; coarsely punctate between and behind eyes. Frontoclypeal suture deeply depressed and well below antennal acetabula. Clypeus thickened; surface finely, densely punctate and moderately microreticulate. Labroclypeal suture deep and broad. Labrum a narrow, transverse rectangle; smooth; with a transverse row of long, golden, hair-like setae at midlength and a fringe of golden setae along anterior margin.

Thorax: Pronotum slightly shorter than wide; length, 1.35 mm; broadest width, at midlength, 1.56 mm; base slightly wider than apex; lateral margin moderately sinuate; with very shallow indistinct medial longitudinal impression, more obvious between medial gibbosities; with 4 low gibbosities across basal third as illustrated (Figure 132); anterior margin projecting over head and arcuately emarginate apicomediaally; surface sculpture like that of head; punctures fine, obscured by plastron; with few, short, fine, yellowish setae; setae with apices directed posteriorly. Hypomera, sides of prosternum, and middle of mesosternum coarsely, densely punctate. Prosternal process densely, coarsely punctate; rather slender; apically, about half as wide as procoxa; slightly converging apically and apex moderately rounded. Metasternum with surface coarsely, densely punctate and a narrow, longitudinal, impunctate, shiny sulcus on posterior four-fifths; posterior half of disc slightly depressed; medial punctures between mid and

hind coxae moderately large. Protibia with a short cleaning fringe of short, dense, golden setae apicomediaally; length of fringe about as long as combined length of tarsal segments 1 and 2; with a row of robust smoothing setae adjacent to fringe, row twice as long as length of fringe. Mesotibia and metatibia with only a very small tuft of long, golden, hair-like setae apicoventrally. Last tarsal segments very robust and about 1.5 times as long as combined length of tarsal segments 1-4. Elytra more than twice as long as pronotum; length, 3.98 mm; greatest combined width, 2.17 mm; apices dehiscent and angular; humeri gibbose; posterolateral margins with very small protuberance; surface as that of pronotum; striae deeper basally; discal strial punctures coarse, deep, round, almost half as wide as intervals and separated longitudinally by about 2 to 4 times their diameter; intervals slightly convex and intervals 2, 3, and 4 vaguely swollen basally; intervals with fine, short, sparse, yellow setae; sublateral punctures slightly coarser than discal punctures. Scutellum flat, elongate-ovate; with very few, fine punctures.

Abdomen: Intercostal process of sternum 1 broadly, moderately deeply concave and punctate as on metasternal disc. Punctures become progressively smaller on sterna 2-5. Lateral margins of sternum 3 with large lobate process that clasps emarginate side of elytron. Last sternum convex subapically.

Genitalia: As illustrated (Figures 134, 135).

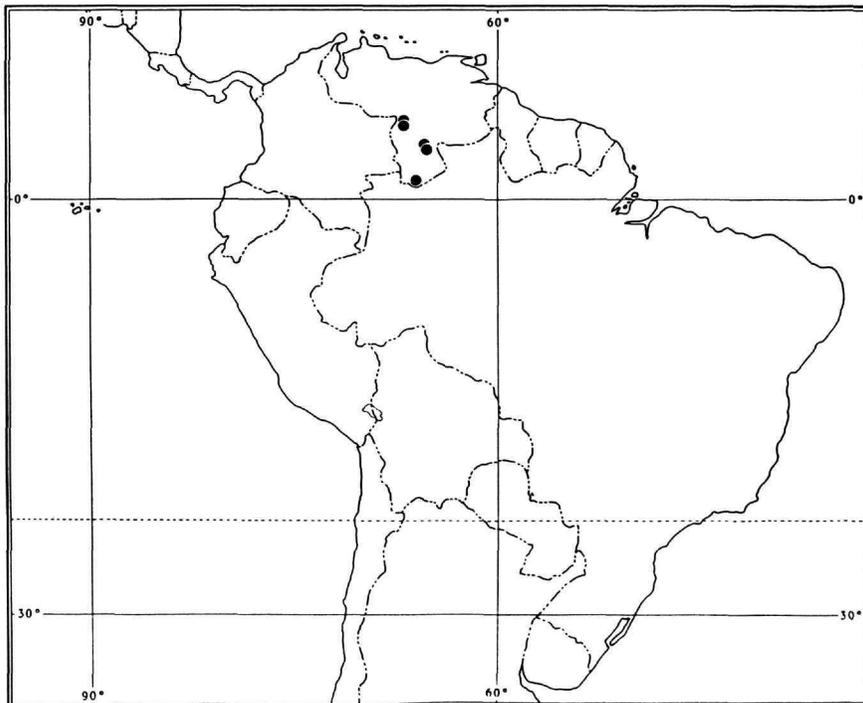


FIGURE 137.—Known distribution of *Stegoelmis ennsi*, new species.

FEMALE GENITALIA.—As illustrated (Figure 136).

SEXUAL DIMORPHISM.—The discal area of abdominal sternum 1 is moderately concave in males and only slightly concave in females.

VARIATIONS.—The light and dark mottled color of this species is highly variable and ill-defined. The only reasonably consistent pattern noted is the light and dark markings at the proximal third of the protibiae, mesotibiae, and metatibiae; these markings are mottled areas and not uniformly dark gray bands as noted on some other species. In length, males vary from 5.16 to 5.25 mm and females from 4.94 to 5.61 mm.

TYPE DATA.—*Holotype* (σ): VENEZUELA: TERRITORIO FEDERAL AMAZONAS: Cerro de la Neblina, basecamp, 140 m, 0°50'N 66°10'W, 28 Jan 1985, at blacklight on bank of Rio Baria, P. and P. Spangler, R.A. Faitoute, W.E. Steiner; deposited in the National Museum of Natural History, Smithsonian Institution.

Allotype: Same data as holotype except 20 Feb 1985, netted along margins of Rio Baria.

Paratypes: VENEZUELA: TERRITORIO FEDERAL AMAZONAS: Culebra, M. Duida, 1–4 Jul 1950, J. Maldonado Capriles, 1 σ ,

1 ϕ ; mouth of Cunucunuma R., 3 Apr 1950, J. Maldonado Capriles, 3 σ , 2 ϕ ; same data except 6 Jun 1950, 1 σ ; Puerto Ayacucho (29 km S), Rio Paria Chico, 20 Feb 1986, P.J. Spangler and W. Sanchez, 9 σ , 5 ϕ ; same locality: 26 Feb 1986, P.J. Spangler, leaf packs, 1 σ ; 17 Nov 1987, P.J. Spangler and R.A. Faitoute, 2 σ ; 20 Jan 1989, P.J. Spangler, R.A. Faitoute, and C.B. Barr, 4 ϕ .

DISTRIBUTION.—Presently known only from Venezuela (Figure 137).

ETYMOLOGY.—The specific epithet *ennsi* is a patronym for Wilbur R. Enns, my friend, former mentor, and avid coleopterist.

HABITAT.—Collected from the Rio Baria; see the description of the Rio Baria under *Stegoelmis tuberosa*, new species. Specimens were also collected from the smaller and different Rio Paria Chico (Figure 138), which is a whitewater stream with a sandy substrate and located 29 km south of Puerto Ayacucho in the lowlands at an altitude of about 130 m. Specimens collected from the Rio Paria Chico were found in leaf packs lodged against a partially submerged tree that had fallen into the stream and other woody debris partially



FIGURE 138.—Biotope of *Stegoelmis ennsi*, new species; 29 kms south of Puerto Ayacucho, Territorio Federal Amazonas, Venezuela; Rio Paria Chico.

embedded in the sandy substrate. The Rio Paria Chico is a small shaded stream about 8 to 10 m wide and 30 cm deep where sampled. Colorimetric water chemistry analyses of the Rio Paria Chico provided the following data: pH, 4; hardness, 0; oxygen, 10 ppm.

The following aquatic beetle family and genera were associated with *S. ennsi* in the Rio Paria Chico: Elmidae: *Gyrelmis*, *Heterelmis*, *Hintonelmis*, *Macrelmis*, *Neoelmis*, *Phanocerus*, *Pilielmis*, *Stenhelmoides*.

8. *Stegoelmis stictoides*, new species

FIGURES 139-144

DIAGNOSIS.—Similar in color pattern to *S. sticta*, new species, but *S. stictoides*, is smaller, shorter (4.41 mm vs 4.95 mm) and may be distinguished by the shallow, short, indistinct longitudinal pronotal impression (Figure 139) and the dark gray bands on the tibiae at midlength instead of at the basal third. In addition, the parameres of the male genitalia of *S. stictoides*, new species, in dorsal view, gradually taper toward the apex and are not sinuous (Figure 141); in lateral view, the parameres are almost straight to the apex and then acutely bent downward (Figure 142).

HOLOTYPE (♂).—*Body Form and Size*: Elongate, subparallel. Length, 4.41 mm; greatest width, 1.70 mm.

Color: Head with mottled light and dark gray-brown plastron; clypeus, labrum, and antennae reddish brown. Pronotum with surface mottled light and dark gray-brown like head; apical fifth of longitudinal groove light gray; with broad disrupted transverse mark in front of gibbositities; with sparse, short, light yellow setae. Scutellum with apical fourth light gray. Elytra with plastron mostly dark gray-brown but sparsely mottled and flecked with light gray. Mouthparts (except black mandibles), mesepisternum, mesosternum between procoxae and metacoxae, metasternal process between metacoxae, extreme tips of tibiae, and entire tarsi reddish brown. Remainder of ventral surface and legs with flecked light and dark gray-brown plastron. Tibiae light gray with dark gray-brown banding at midlength.

Plastron: Covers entire body except antennae, eyes, clypeus, labrum, middle of mesosternum, extreme apices of tibiae, and tarsi.

Head: Concave medially; moderately deeply, broadly longitudinally depressed between antennal acetabula; finely punctate between and behind eyes. Frontoclypeal suture deeply depressed and well below antennal acetabula. Clypeus thickened; surface finely, densely punctate and vaguely microreticulate. Labroclypeal suture deep and broad. Labrum a narrow, transverse rectangle; smooth; with a transverse row of long, golden, hair-like setae at midlength and a fringe of golden setae along anterior margin.

Thorax: Pronotum slightly shorter than wide; length, 1.22 mm; broadest width, slightly behind midlength, 1.27 mm; base

slightly wider than apex; lateral margin moderately sinuate; with 4 low gibbositities across basal third as illustrated (Figure 139); longitudinal groove on meson narrow, shallow, and extending from gibbositities to anterior margin; anterior margin projecting over head and arcuately emarginate apicomediaally; surface sculpture like that of head; punctures fine, obscured by plastron; with few, short, fine, yellowish setae; setae with apices directed posteriorly. Hypomera, sides of prosternum, and middle of mesosternum coarsely, densely punctate. Prosternal process sparsely, finely punctate; moderately slender; apically, about a third as wide as procoxa; converging apically and apex moderately rounded. Metasternum with entire surface moderately coarsely, densely punctate and a narrow, longitudinal, impunctate sulcus on posterior fourth-fifths; posterior half of disc slightly depressed. Protibia with a cleaning fringe of short, dense, golden setae apicomediaally; length of fringe slightly longer than length of tarsal segment 1; with a row of robust smoothing setae adjacent to fringe, row 2 times as long as length of fringe. Mesotibia and metatibia with only a few long, golden, hair-like setae apicoventrally. Last tarsal segments very robust and about 1.5 times as long as combined length of tarsal segments 1-4. Elytra more than twice as long as pronotum; length, 3.25 mm; combined width, 1.70 mm; apices obtusely angled and dehiscent; humeri each with distinct gibbosity; posterolateral margins each with distinct protuberance; surface as that of pronotum; striae deeper basally; discal strial punctures small, moderately deep, round, about a third as wide as intervals and separated longitudinally by about 3 to 5 times their diameter; intervals slightly convex, with fine, short, sparse, yellow setae; intervals 2, 3, and 4 vaguely swollen basally and interval 3 vaguely swollen slightly behind midlength; sublateral punctures slightly coarser than discal punctures. Scutellum flat, elongate-ovate; with very few fine punctures.

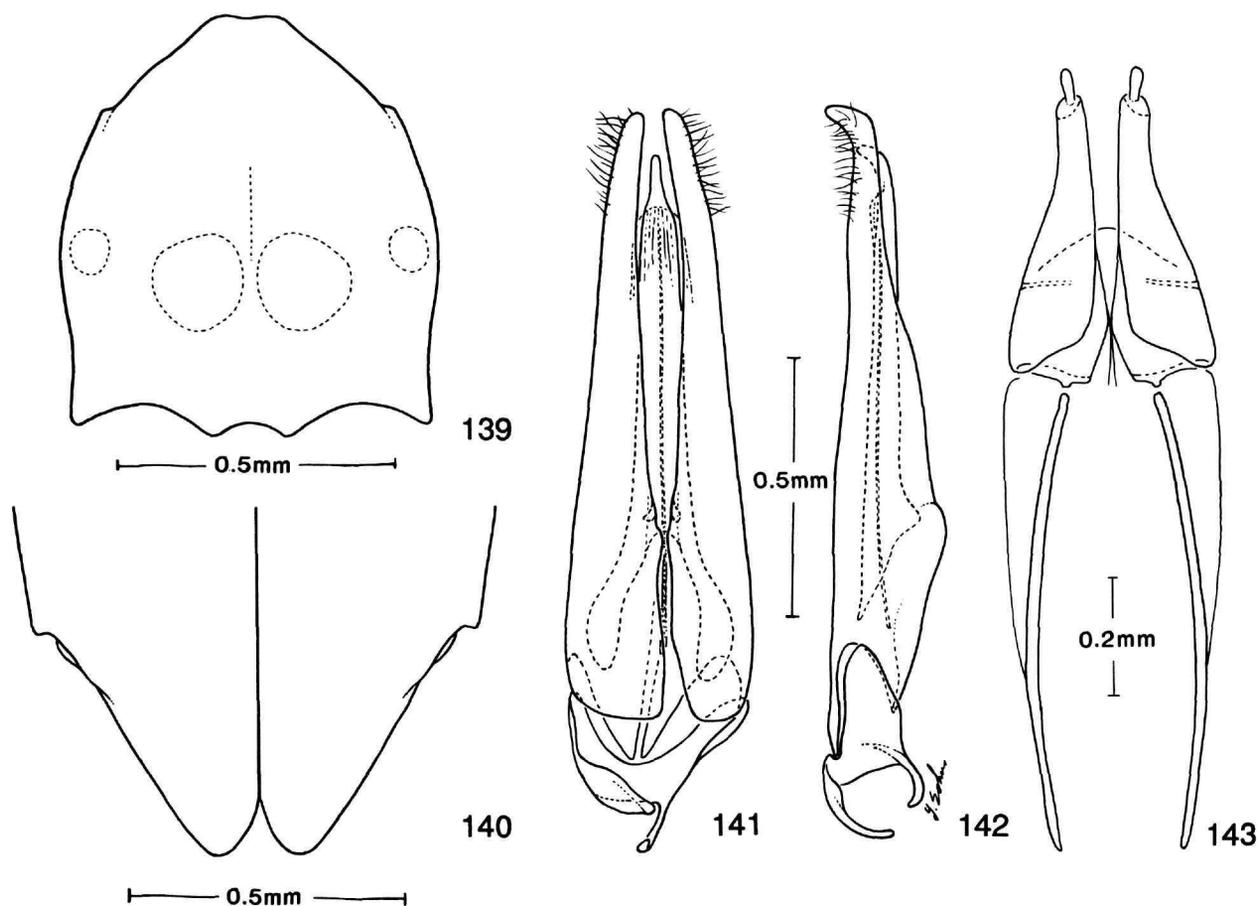
Abdomen: Intercostal process of sternum 1 broadly, moderately deeply concave and moderately densely punctate; about as densely punctate as metasternum. Punctures progressively less dense and smaller on sterna 2-4; those on sternum 5 slightly larger and more dense than those on sterna 3 and 4. Lateral margins of sternum 3 with large lobate process that clasps emarginate side of elytron. Last sternum convex subapically.

Genitalia: As illustrated (Figures 141, 142).

FEMALE GENITALIA.—As illustrated (Figure 143).

VARIATIONS.—The paratypes differ from the holotype as follows. The light gray marking on the apex of the scutellum is simply an off-centered preapical fleck. The declivous elytral apices are bordered by a light gray mark. The light gray pronotal marks are present on the apicomediaal margin and are partially joined transversely between the sublateral gibbositities; two others, each between sublateral and medial gibbositities, extend to pronotal base. In length, males vary from 4.33 to 4.60 mm and females from 4.68 to 4.89 mm.

TYPE DATA.—*Holotype* (♂): VENEZUELA: BOLIVAR: MO-



FIGURES 139-143.—*Stegoelmis stictoides*, new species: 139, pronotum; 140, elytral apices; 141, male genitalia, dorsal view; 142, male genitalia, lateral view; 143, female genitalia.

richal Tauca, 22 km E, Rio Caura, 8-9 Feb 1976, C.M. Flint and O.S. Flint; deposited in the National Museum of Natural History, Smithsonian Institution.

Allotype: Same data as holotype except: Las Cocuizas (5 km N), 2 Nov 1982, J.L. Hellman.

Paratypes: Same data as holotype, 1♂. Same data as allotype, 3♂. GUYANA: MAZARUNI-POTARO DISTRICT: Takatu Mountains, 6°15'N 59°5'W, 5 Dec 1983, Earthwatch Research Expedition, at blacklight in forest clearing near streams, W.E. Steiner, 1♂; same data except 7 Dec 1983, 11 Dec 1983, and 13 Dec 1983, P.J. Spangler, R.A. Faitoute, P.D. Perkins, 3♀. VENEZUELA: BOLIVAR: El Dorado (65 km S), 5 Nov 1982, R.F. Denno, 1♀.

DISTRIBUTION.—Presently known only from Guyana and Venezuela (Figure 144).

ETYMOLOGY.—The specific epithet *stictoides* was formed

by combining the Greek *stiktos* ("spotted") with *oides* ("like"), in reference to the extensive markings on the dorsal surface that resemble those of *S. sticta*.

HABITAT.—Unknown; all specimens were collected at blacklights. Presumably this species inhabits streams similar to, if not the same as, that described for *S. geayi* in Guyana.

9. *Stegoelmis ica*, new species

FIGURES 145-150

DIAGNOSIS.—This species has the elytral apices angulate and deeply dehiscent (Figure 146); a moderately deep longitudinal impression between the antennal acetabula; a distinct and deep longitudinal pronotal impression on the meson; the sublateral pronotal gibbositities low but distinct; and the posterolateral elytral protuberances large and distinct.

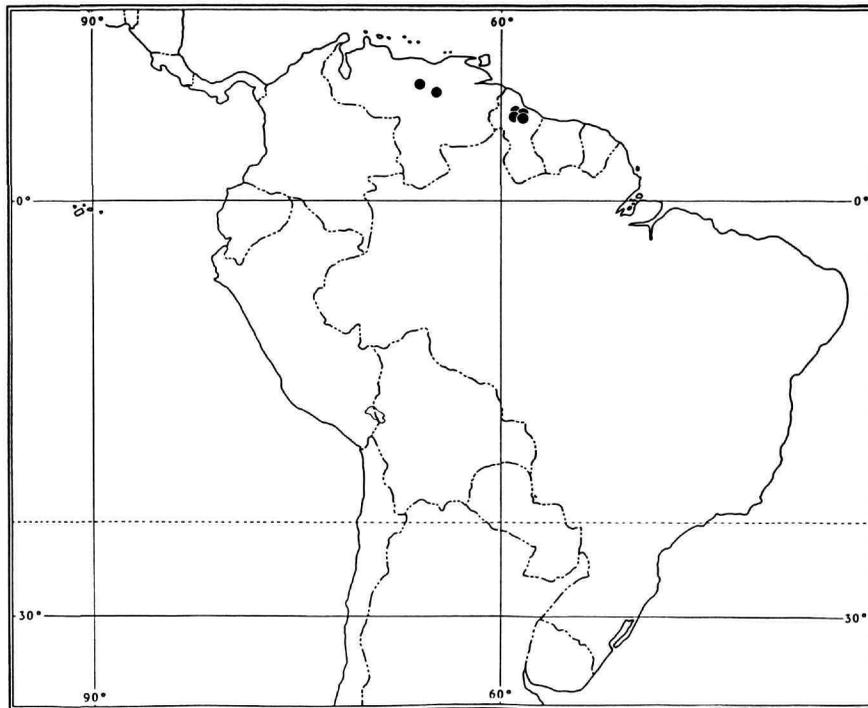


FIGURE 144.—Known distribution of *Stegoelmis stictoides*, new species.

Although *S. ica* is similar to *S. sticta* and *S. stictoides*, it is very dark gray with sparse, greenish gray flecks dorsally, while *S. sticta* and *S. stictoides* are dark reddish brown with extensive reddish gray markings. In dorsal view, the parameres of the male genitalia of *S. ica* are narrow and nearly straight apically (Figure 147) instead of converging as in *S. sticta* (Figure 186); and, in lateral view, the parameres are arcuate instead of straight to the apex and then strongly bent downward as in *S. stictoides* (Figure 142).

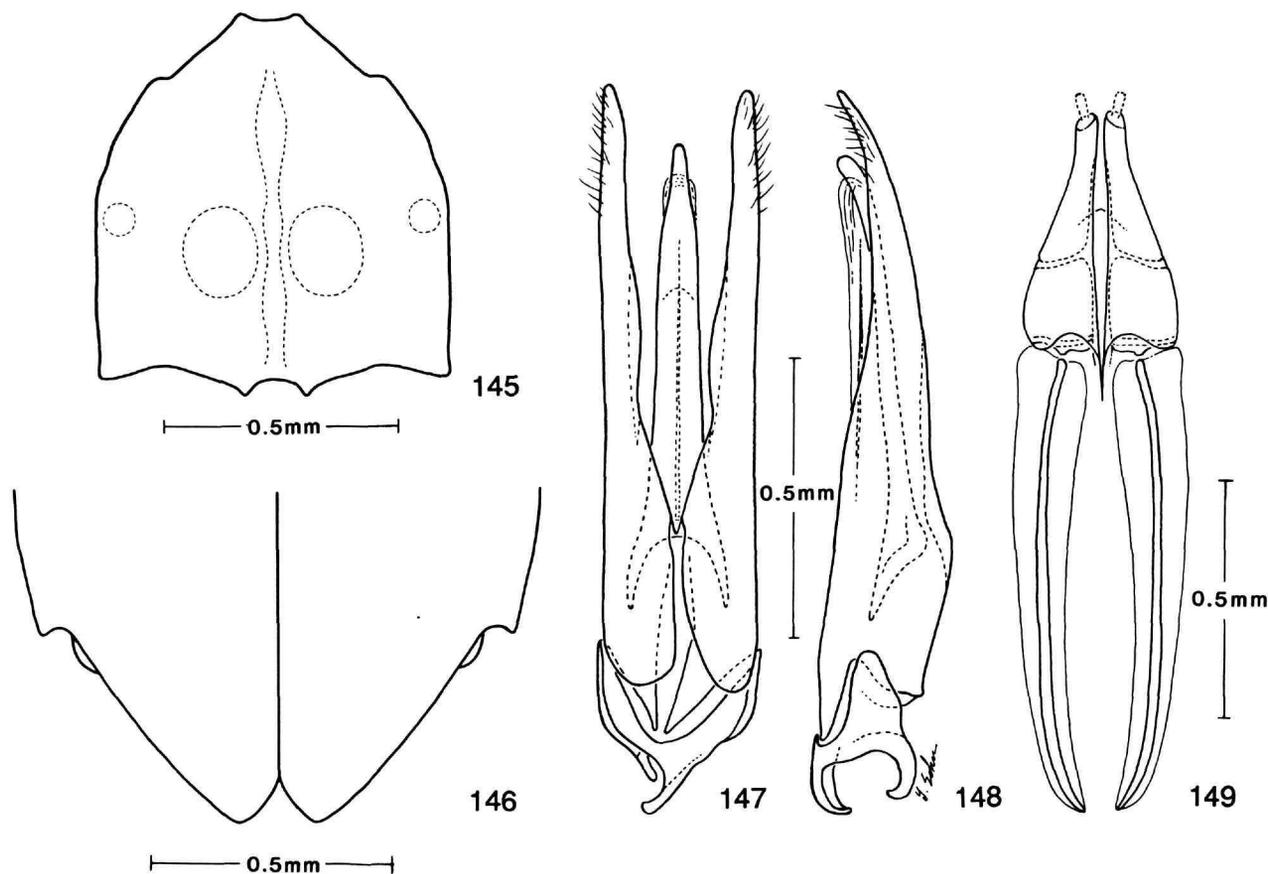
HOLOTYPE (♂).—*Body Form and Size*: Elongate, subparallel. Length, 4.62 mm; greatest width, 1.95 mm.

Color: Head with mottled light and dark gray plastron; clypeus, labrum, and antennae reddish brown. Pronotum with surface mottled light and dark like head; apical eighth of longitudinal groove light gray; with sparse, short, light yellow setae. Elytra with plastron mostly dark gray but sparsely flecked with light gray. Mouthparts (except dark brown mandibles), mesosternum between procoxae and metacoxae, extreme tips of tibiae, and entire tarsi reddish brown; remainder of ventral surface and legs with dark gray plastron and occasional light gray flecks.

Plastron: Covers entire body except antennae, eyes, clypeus, labrum, middle of mesosternum, extreme apices of tibiae, and tarsi.

Head: Shallowly concave medially; deeply, longitudinally grooved on midline between swellings mediad of antennal acetabula; surface, except that of thickened anterior rim of clypeus, coarsely and densely punctate. Frontoclypeal suture deeply depressed and well below antennal acetabula. Clypeus thickened; surface finely, densely punctate and microreticulate. Labroclypeal suture deep and broad. Labrum a narrow, transverse rectangle; finely punctate; with a transverse row of long, golden, hair-like setae at midlength and a fringe of golden setae along anterior margin.

Thorax: Pronotum slightly shorter than wide; length, 1.30 mm; broadest width, slightly behind midlength, 1.44 mm; base slightly wider than apex; lateral margin moderately sinuate; medial longitudinal groove broad, moderately deep, and extending from base to anterior margin; with 4 distinct protuberances across basal third as illustrated (Figure 145); anterior margin projecting over head and arcuately emarginate apicomediaally; surface sculpture like that of head except discal punctures less coarse and dense and obscured by plastron; with few, short, fine, yellowish setae; discal setae with apices directed posteriorly, other setae directed posterolaterally. Hypomera coarsely, sparsely punctate. Prosternum and middle of mesosternum coarsely, densely punctate. Prosternal process coarsely, densely punctate; moderately slender; apically, about



FIGURES 145-149.—*Stegoelmis ica*, new species: 145, pronotum; 146, elytral apices; 147, male genitalia, dorsal view; 148, male genitalia, lateral view; 149, female genitalia.

half as wide as procoxa; slightly converging apically and apex moderately rounded. Metasternum with entire surface coarsely, densely punctate and a narrow, longitudinal sulcus on posterior three-fourths; posterior half of disc distinctly depressed. Protibia with a short cleaning fringe of short, dense, golden setae apicomediaally; length of fringe about as long as length of tarsal segment 1; with a row of robust smoothing setae adjacent to fringe, row 4 times as long as length of fringe. Mesotibia and metatibia with only a few long, golden, hair-like setae apicoventrally. Last tarsal segments very robust and about 1.5 times as long as combined length of tarsal segments 1-4. Elytra more than twice as long as pronotum; length, 3.41 mm; combined width, 1.95 mm; apices angulate, rounded, and dehiscent (Figure 146); humeri each with distinct protuberance; posterolateral margins each with distinct protuberance; surface as that of pronotum; striae deeper basally; discal strial punctures moderately coarse, deep, round, almost half as wide as intervals and separated longitudinally by about 2 to 4 times their diameter; intervals with fine, short, sparse, yellow setae

and slightly convex; intervals 2, 3, and 4 distinctly swollen basally and interval 3 strongly swollen slightly behind midlength; sublateral punctures slightly coarser than discal punctures. Scutellum flat, elongate-ovate; with very few, fine punctures.

Abdomen: Intercostal process of sternum 1 broadly, moderately deeply concave and densely, coarsely punctate; more densely punctate than metasternum. Punctures becoming progressively less dense on sterna 2-5. Lateral margins of sternum 3 with large lobate process that clasps emarginate side of elytron. Last sternum convex subapically.

Genitalia: As illustrated (Figures 147, 148).

FEMALE GENITALIA.—As illustrated (Figure 149).

VARIATIONS.—The two specimens examined differ in the light and dark gray markings. The light markings on the holotype are sparse and simple flecks, whereas the allotype has larger and more numerous light markings. On both specimens, the dark gray area at the proximal third of the tibia is vague and not band-like as on most species of *Stegoelmis*. The single male

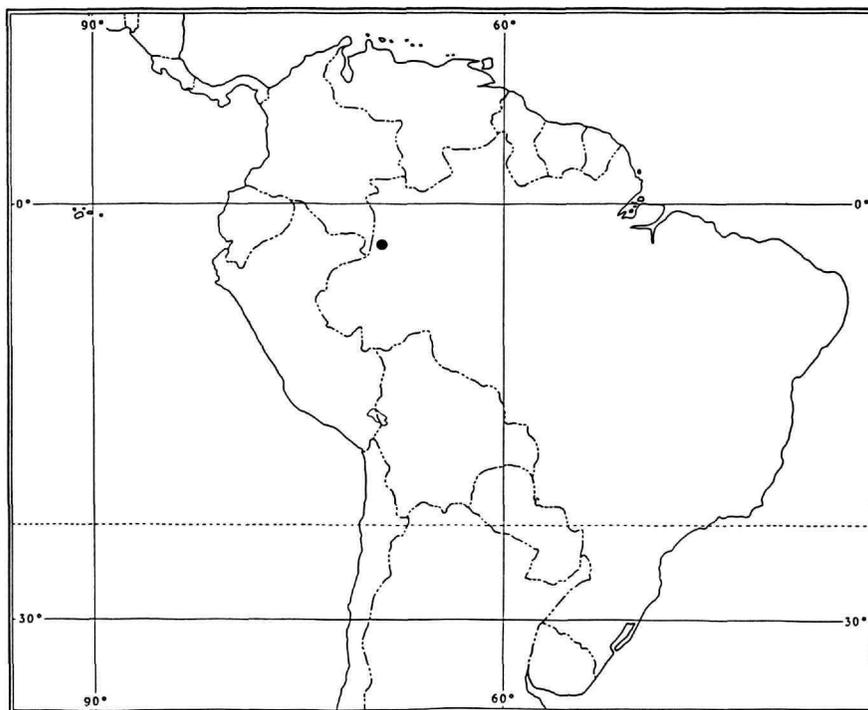


FIGURE 150.—Known distribution of *Stegoelmis ica*, new species.

available for study is slightly longer (4.62 mm) than the single female (4.48 mm).

TYPE DATA.—*Holotype* (σ): BRAZIL: AMAZONAS: near mouth of Rio Ica at Indian village of Betania, 24 Feb 1977, J. Bruce Wallace; deposited in the National Museum of Natural History, Smithsonian Institution.

Allotype: Same data as holotype.

DISTRIBUTION.—Presently known only from the type locality in Brazil (Figure 150).

ETYMOLOGY.—From the Brazilian Rio Ica; in reference to the fact that the type locality of this species was at the Indian village Betania near the mouth of the river; a noun in apposition to the genus.

HABITAT.—From submerged log in a 6.1–9.1 m wide blackwater stream in terra firma forest.

10. *Stegoelmis geayi* (Grouvelle)

FIGURES 151–183

Stenelmis geayi Grouvelle, 1908:181.

Stegoelmis geayi.—Hinton, 1939a:30.—Blackwelder, 1944:271.—Sanderson, 1953a:33.

Stegoelmis hintoni Sanderson, 1953a:34 [new synonym].

DIAGNOSIS.—Specimens of *S. geayi* may be recognized by

the following combination of characters. Male metatibiae with short, indistinct, apicomедial cleaning fringe of golden setae; elytral apices dehiscent, not rounded; head with median, shallow, broad, longitudinal impression between antennal acetabula not extending to thickened clypeal rim; pronotum with distinct, deep, longitudinal impression on meson; sublateral gibbositities absent or vague; posterolateral elytral protuberances small; hypomeral punctures coarse and dense. The distinctive male genitalia of *S. geayi* (Figures 153, 154) will distinguish them from all other presently described species of *Stegoelmis*.

REDESCRIPTION (σ).—*Body Form and Size*: Elongate, subparallel. Length, 4.95 mm; greatest width, 2.07 mm.

Color: Head with mottled light and dark gray plastron; clypeus, labrum, and antennae reddish brown. Pronotum with surface mottled light and dark gray like head; with sparse, short, light yellow setae. Elytra with plastron mostly dark gray but moderately mottled with light gray. Mouthparts (except black mandibles), extreme tips of tibiae, and entire tarsi reddish brown; remainder of ventral surface and legs with mottled light and dark gray plastron.

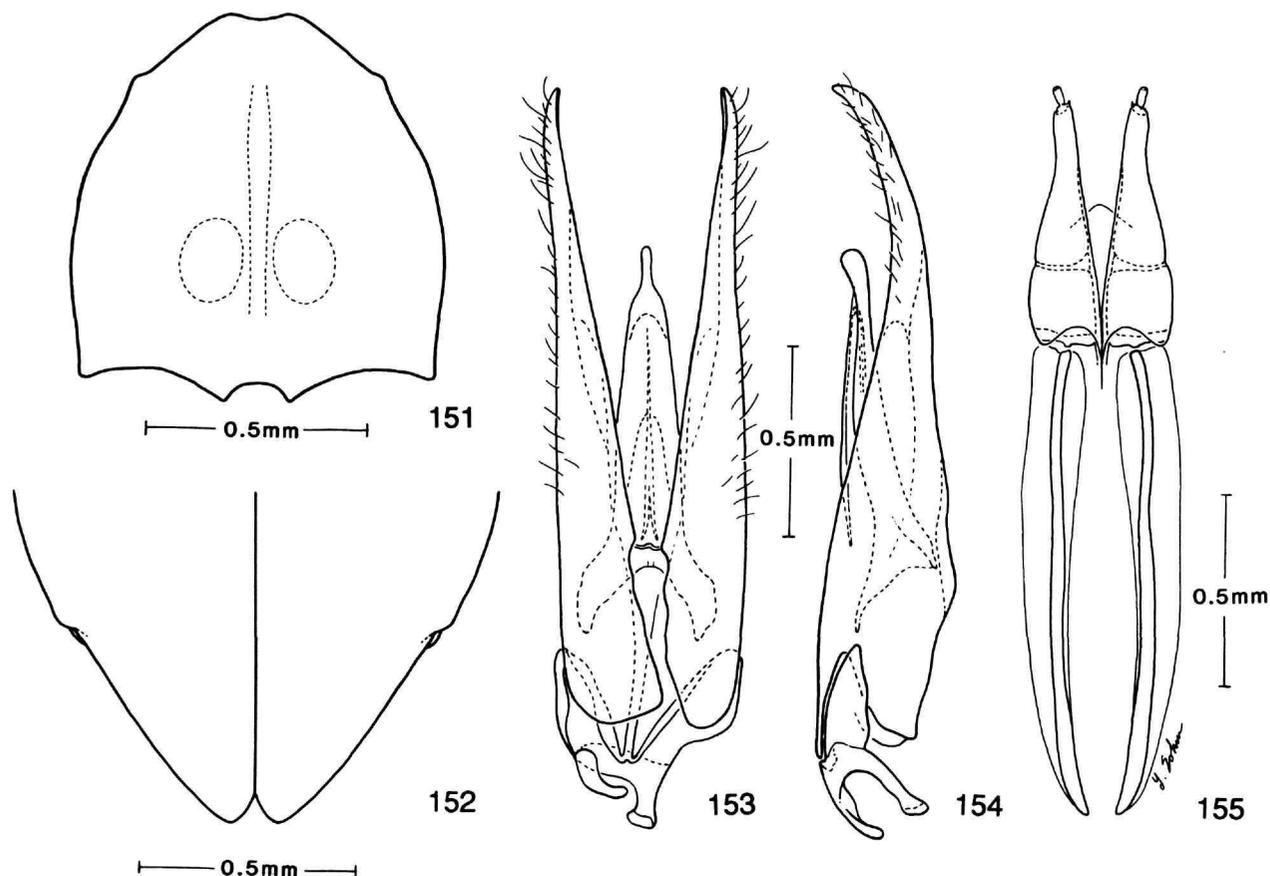
Plastron: Covers entire body except antennae, eyes, clypeus, labrum, middle of mesosternum, extreme apices of tibiae, and tarsi.

Head: Slightly swollen next to each antennal base; with

shallow median longitudinal depression between antennae; coarsely punctate between and behind eyes. Frontoclypeal suture deeply depressed and well below antennal acetabula. Clypeus thickened; surface finely, densely punctate. Labroclypeal suture deep and broad. Labrum a narrow, transverse rectangle; smooth; with a transverse row of long, golden, hair-like setae at midlength and a fringe of golden setae along anterior margin.

Thorax: Pronotum slightly shorter than wide; length, 1.33 mm; broadest width, at midlength, 1.59 mm; base slightly wider than apex; lateral margin moderately sinuate; medial longitudinal impression moderately broad, moderately deep, and extending from medial gibbositities almost to anterior margin; with only 2 indistinct gibbositities at basal third adjacent to groove as illustrated (Figure 151); anterior margin projecting over head and arcuately emarginate apicomediaally; surface sculpture like that of head; punctures fine, partially obscured by plastron; with few, short, fine, yellowish setae; setae with

apices directed posteriorly. Hypomera, sides of prosternum, and middle of mesosternum coarsely, densely punctate. Prosternal process densely, coarsely punctate; rather slender; apically, about a third as wide as procoxa; slightly converging apically and apex moderately rounded. Metasternum with surface moderately coarsely, sparsely punctate and a short, narrow, longitudinal, impunctate, shiny sulcus on posterior two-thirds; punctures sparse adjacent to sulcus; posterior half of disc concave; lateral punctures between mid and hind coxae moderately large; punctures laterad of mesocoxae and metacoxae more dense than those on discal area. Protibia with a cleaning fringe of short, dense, golden setae apicomediaally; length of fringe about as long as combined length of tarsal segments 1 and 2; with a row of robust smoothing setae adjacent to fringe, row twice as long as length of fringe. Mesotibia and metatibia with only a very small tuft of long, golden, hair-like setae apicoventrally. Last tarsal segments very robust and about 1.5 times as long as combined length of tarsal



FIGURES 151-155.—*Stegoelmis geayi* (Grouvelle): 151, pronotum; 152, elytral apices; 153, male genitalia, dorsal view; 154, male genitalia, lateral view; 155, female genitalia.

segments 1–4. Elytra more than twice as long as pronotum; length, 3.73 mm; greatest combined width, 2.07 mm; apices dehiscent and angular; humeri gibbose; posterolateral margins each with a very small gibbosity; surface as that of pronotum; striae deeper basally; discal strial punctures coarse, deep, round, almost half as wide as intervals and separated longitudinally by about 2 to 4 times their diameter; intervals slightly convex and intervals 2, 3, and 4 vaguely swollen basally; intervals with fine, short, sparse, yellow setae; sublateral punctures slightly coarser than discal punctures. Scutellum flat, elongate-ovate; with very few, fine punctures.

Abdomen: Intercostal process of sternum 1 broadly, moderately deeply concave and more densely and more coarsely punctate than metasternal disc. Punctures become progressively smaller on sterna 2–5. Lateral margins of sternum 3 with large lobate process that clasps emarginate side of elytron. Last sternum convex subapically.

Genitalia: As illustrated (Figures 153, 154).

FEMALE GENITALIA.—As illustrated (Figure 155).

VARIATIONS.—The light and dark gray mottled pronotal and elytral color pattern of this species is highly variable. The most consistent light gray marking is a narrow stripe extending from the apicomedial margin posteriorly (sometimes as far as the discal gibbosities) in the median, longitudinal pronotal groove. This stripe is present on 20 of the 21 specimens examined and varies primarily in its length. In length, the males vary from

4.70 to 5.01 mm and the females from 5.19 to 5.75 mm.

SPECIMENS EXAMINED.—ECUADOR: ORIENTE (NAPO): Rio Napo watershed, Jatun Yacu, 700 m, 28 Mar 1937, Clarke MacIntyre, 1♂, 1♀ (holotype and allotype of *S. hintoni* Sanderson) (KU); Tena (12 km SW), 7 Jul 1976, in malaise trap, Jeffrey Cohen, 1♀. FRENCH GUIANA: St. Laurent, Oct 1937, H.E. Hinton, 1♂, 2♀ (BMNH). GUYANA: MAZARUNIPOTARO DISTRICT: Takatu Mountains, 6°15'N 59°5'W, 3–10 Dec 1983, berlese of leaf packs from rocky shaded stream, Earthwatch Research Expedition, P.J. Spangler, R.A. Faitoute, P.D. Perkins, 2♂, 1♀; same data except blacklight, 19 Dec 1983, 1♂. VENEZUELA: TERRITORIO FEDERAL AMAZONAS: Cerro de la Neblina, 1 km S. basecamp, 140 m, 0°50'N 66°10'W, 11 Feb 1985, along small whitewater stream, pools of dead leaves and sticks, P. and P. Spangler, R.A. Faitoute, W.E. Steiner, 1♂, 1♀; same data except: 17 Feb 1985, 3♂, 5♀; 19 Feb 1985, 2♀; 21 Feb 1985, 1♂, 1♀; blacklight in rainforest clearing near Rio Baria, 21–28 Feb 1985, 1♀; seined from rocks in rapids of Rio Baria, 29 Jan 1985, 1♀; small whitewater stream in rainforest, W.E. Steiner and R. Halling, basecamp (1 km S), 8 Feb 1985, 2♂; in small ponds full of dead leaves, rainforest ridge, 250 m, 1.5 km S. basecamp, 7 Feb 1985, R. Cocroft, 1♀.

DISTRIBUTION.—Presently known from Ecuador, French Guiana, Guyana, and Venezuela (Figure 156).

I have examined the holotype and allotype of *Stegoelmis*

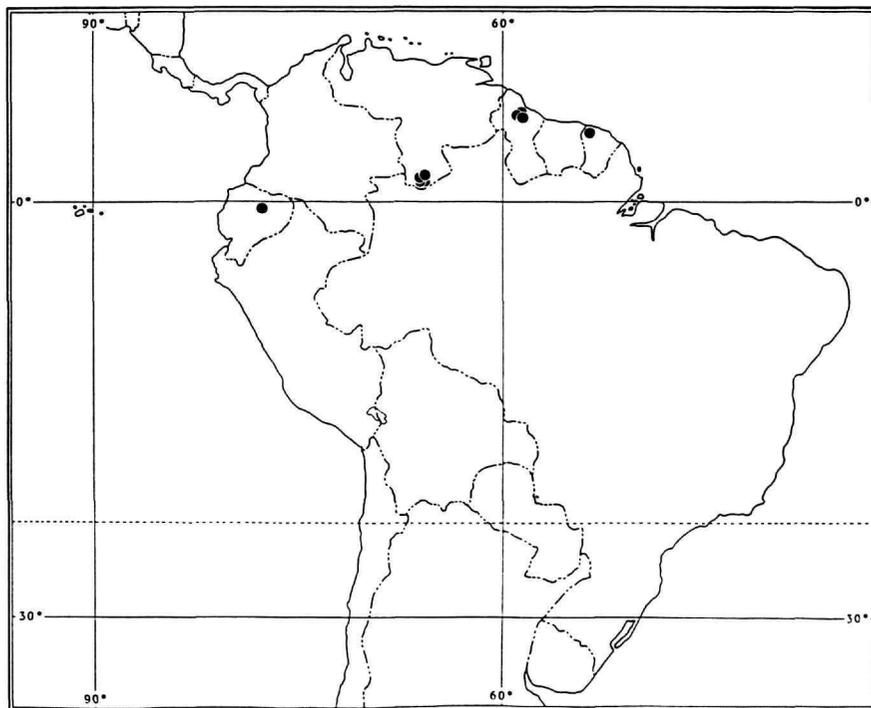
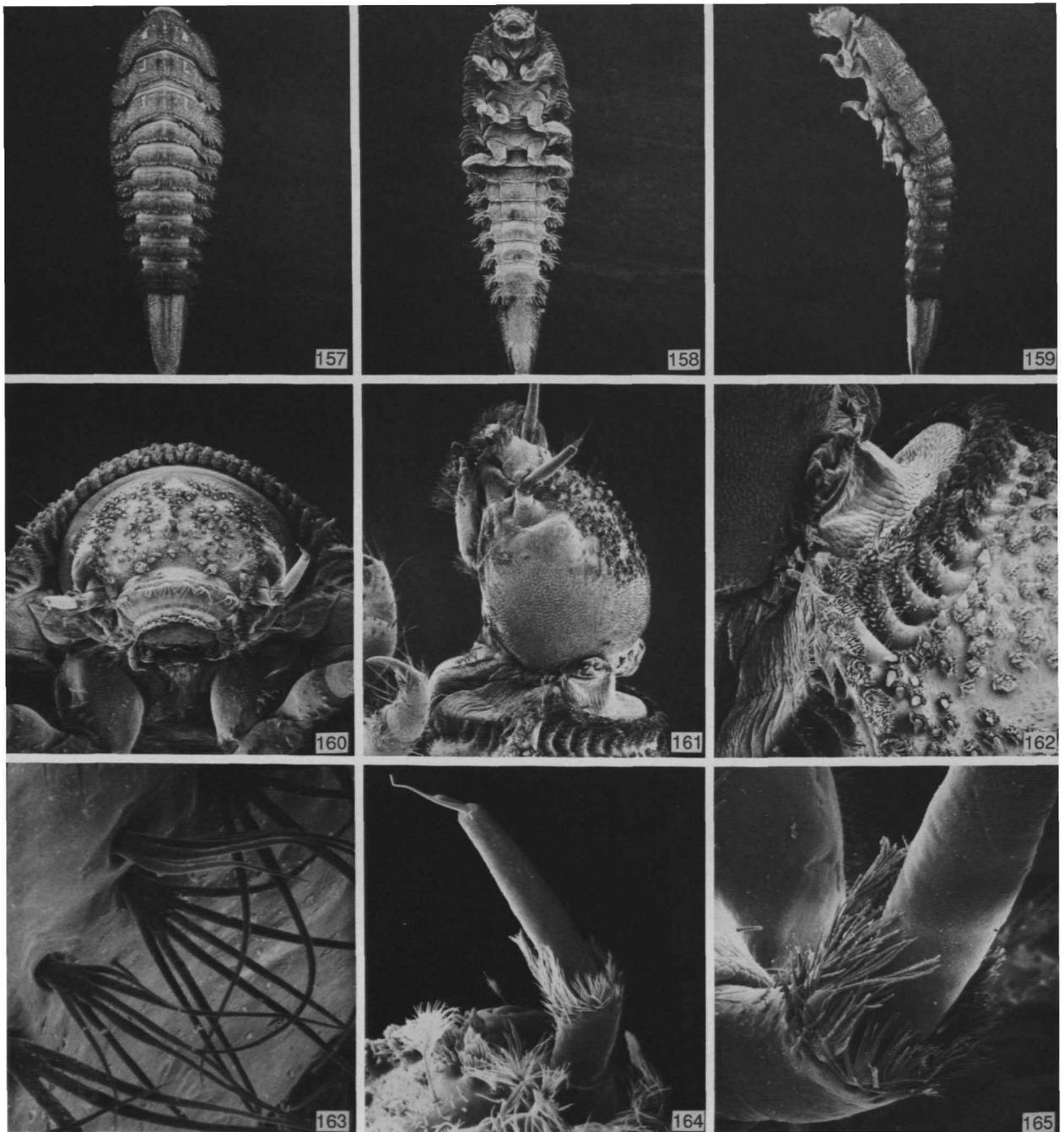
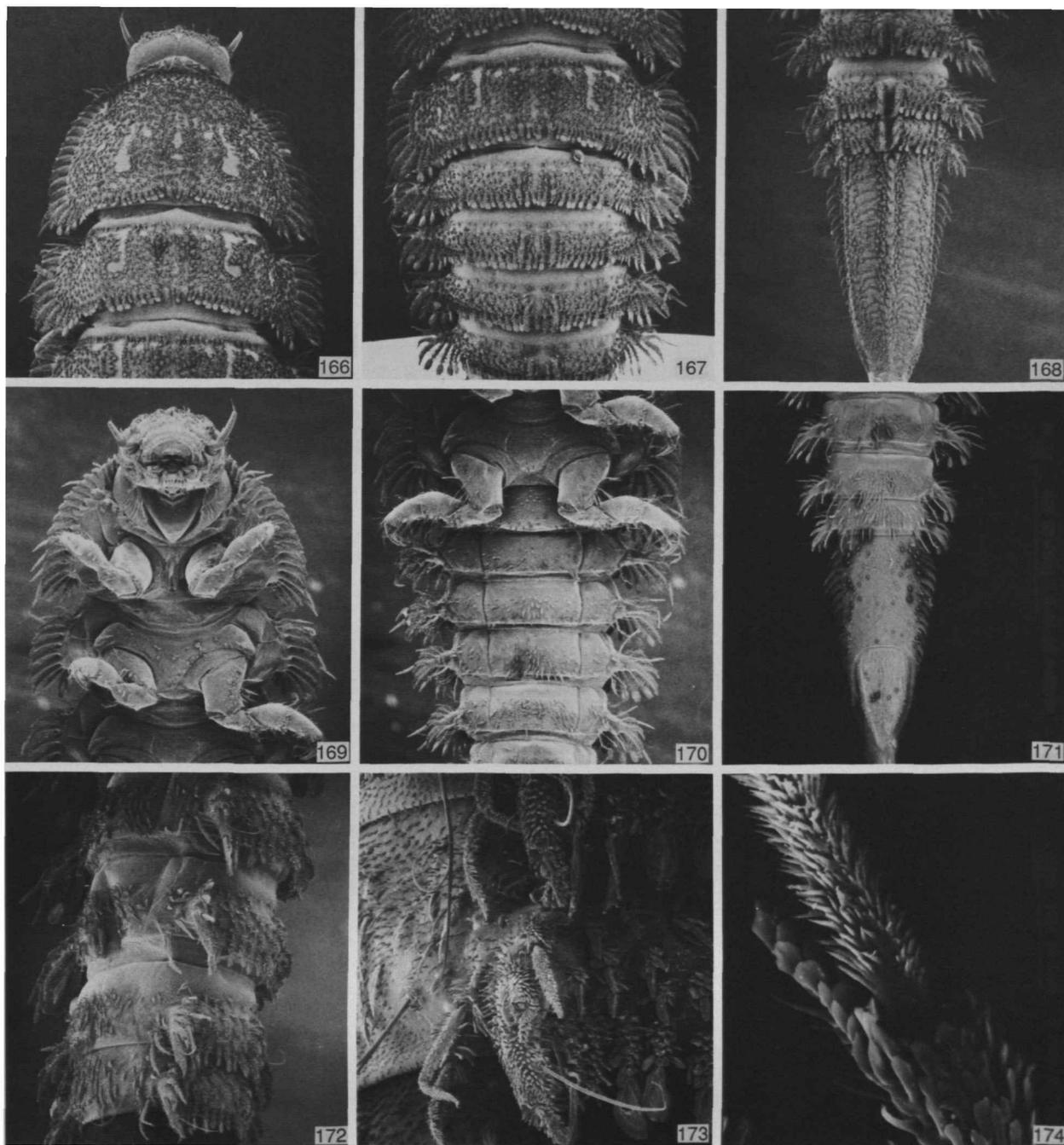


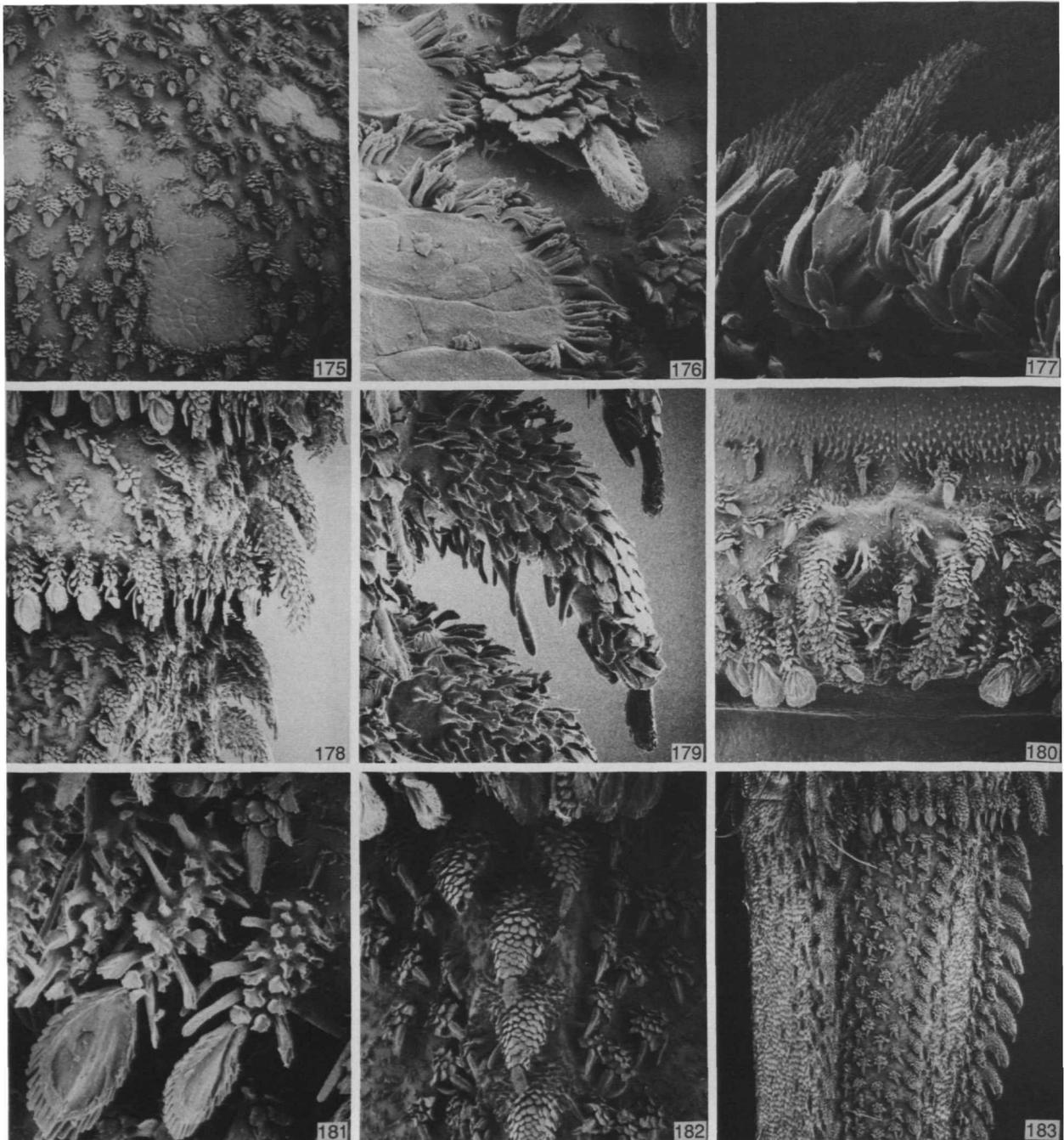
FIGURE 156.—Known distribution of *Stegoelmis gayi* (Grouvelle).



FIGURES 157-165.—*Stegoelmis geayi* (Grouvelle), larva: 157, habitus, dorsal view, $\times 17$; 158, habitus, ventral view, $\times 17$; 159, habitus, lateral view, $\times 17$; 160, head, adoral view, $\times 92$; 161, head, lateral view, $\times 100$; 162, pronotum, anterior margin, lateral view, $\times 200$; 163, labial setae, $\times 1500$; 164, antenna, $\times 293$; 165, antennal segment 1, apical setae, $\times 96$. (Reduced to 64% for publication.)



FIGURES 166-174.—*Stegoelmis geayi* (Grouvelle), larva: 166, pronotal and mesonotal sculpture, $\times 45$; 167, metanotal and abdominal sculpture, $\times 45$; 168, abdominal sculpture, $\times 45$; 169, head, prosternum, and mesosternum, $\times 45$; 170, metasternum and abdominal sterna 1-6, $\times 45$; 171, abdominal sterna 6-9 and operculum, $\times 40$; 172, abdominal segments 5-9, lateral view, $\times 80$; 173, abdominal segment 8, lateral view, $\times 300$; 174, catkin-like lateral setae, abdominal segment 5, $\times 1440$. (Reduced to 64% for publication.)



FIGURES 175-183.—*Stegoelmis geayi* (Grouvelle), larva: 175, pronotal sculpture and signum, $\times 250$; 176, cluster of imbricated setae and setae bordering signum on pronotum, $\times 1500$; 177, pronotal setae, anterior margin, $\times 1700$; 178, sculpture, abdominal segments 8, 9, lateral view, $\times 250$; 179, tubercle with imbricated setae, midline, abdominal segment 9, lateral view, $\times 1100$; 180, sculpture, abdominal segment 5, dorsal view, $\times 250$; 181, sculpture, abdominal segment 7, posterior margin, $\times 800$; 182, tubercle with imbricated setae, midline, abdominal segment 9, $\times 400$; 183, sculpture, abdominal segment 9, lateral view, $\times 130$. (Reduced to 64% for publication.)

hintoni Sanderson and found *S. hintoni* to be a junior synonym of *Stegoelmis geayi* (Grouvelle). The genitalia of the holotype and allotype are cleared and stored in glycerine in microvials pinned beneath each specimen. The three characters used by Sanderson (1953a) in his key to separate *S. geayi* from *S. hintoni*, i.e., pronotal swellings, apex of median lobe and curved profile of lateral lobes of male genitalia are characters that are found to vary when a series of specimens is available for study. In the series of 26 specimens available to me, there is some obvious variation in the development of the gibbositities on each side of the meson at the basal third; e.g., 1 out of the 19 specimens from a small stream near the basecamp at Cerro de la Neblina, T.F.A., Venezuela, has distinct gibbositities while the others are indistinct or moderately distinct. The differences in Hinton's and Sanderson's illustrations of the apex of the median lobe and the profile of the apices of the parameres may be attributed to variation caused by the type of dissection (wet or dry) prepared and drawn.

HABITAT.—The specimens of *S. geayi* from Guyana were collected in a small unnamed brook with a low gradient, sandy substratum, submerged or partially submerged decaying sticks and logs, and leafpacks accumulated against the woody debris and rocks in the stream bed. Adults and larvae were found together feeding on the woody debris and in the leaf packs. The brook was shaded, 1 to 2 m wide, 30 to 75 cm deep, clear, and 130 m above sea level. Colorimetric water chemistry analyses provided the following data: pH, 5.5; hardness, 5.0; oxygen, 9.0 ppm. The water temperature was 24°C and the air temperature was 25°C when the analyses were made.

The following aquatic beetle families and genera were associated with *S. geayi* in the same biotope in Guyana: Dryopidae: *Dryops*, *Etmoparnus*, *Pelonomus*; Dytiscidae: *Laccodytes*; Elmidae: *Heterelmis*, *Microcylloepus*, *Neoelmis*, *Xenelmis*, new genus; Gyrinidae: *Gyretes*, *Gyrinus*; Hydracnidae: *Hydraena*; Hydrophilidae: *Chaetarthria*, *Enochrus*, *Guyanobius*, *Notionotus*. For the families and genera of aquatic beetles collected with *S. geayi* in the Rio Baria and in the small, marshy rivulet 1 km south of the basecamp at Cerro de la Neblina, see the habitat data for *S. tuberosa*.

LARVA (by association) (Figures 157–183).—Mature larva with generic characters given under the generic diagnosis plus the following.

Similar in length and width to the larva of *S. selva* but differing in cuticular ornamentation in the following ways that I interpret as specific characteristics. Pronotum, mesonotum, and metanotum with clusters of imbricated setae at random on meson (Figure 166). Clusters of imbricated ornate setae occurring over much of body surface about as dense as those on *S. selva*; axial seta slender and long (Figures 175, 176, 182) and extending beyond cluster. Imbricated setae of cluster with apical margins fringed (Figure 176); with a smooth, cylindrical, arcuate seta curved under each cluster (Figures 175, 180). Clusters on declivous sides of abdominal tergum 9 sparse

(Figure 183); axial seta of each cluster elongate, slender (Figure 183). Abdominal sternum 9 (Figure 171) with sparse, short, slender, flattened setae in front of operculum; without clusters of imbricated setae; on meson, seen in profile, with row of uniform, short tubercles covered with imbricated setae (Figure 183).

The larva used for the micrographs (Figure 157–183) was collected with adults of *S. geayi* from a piece of rotten wood submerged in the stream bottom in a small unnamed brook from Guyana, Mazaruni-Potaro District, Takutu Mountains, 6°15'N 59°5'W, 3–10 Dec 1983, P.J. Spangler, R.A. Faitoute, and P.D. Perkins. Additional conspecific larvae were obtained with adults of *S. geayi* from berlesed leaf packs from the same stream and others were obtained in association at several localities in Venezuela.

11. *Stegoelmis sticta*, new species

FIGURES 184–189

DIAGNOSIS.—Similar in color pattern to *S. stictoides*, new species, but *S. sticta* is more robust, is longer on average (4.95 mm vs 4.41 mm) and may be distinguished readily from *S. stictoides* by a deeper, broader, and longer pronotal longitudinal impression (Figure 184) and the dark gray bands on the tibiae at about the basal third instead of at midlength as on *S. stictoides*. In addition, the parameres of the male genitalia of *S. sticta*, in dorsal view, are sinuous with apices curved inward (Figure 186) and in lateral view are slightly arcuate apically (Figure 187).

HOLOTYPE (♂).—*Body Form and Size*: Elongate, subparallel. Length, 4.94 mm; greatest width, 1.99 mm.

Color: Head with mottled light and dark gray plastron; clypeus, labrum, and antennae reddish brown. Pronotum with surface mottled light and dark gray like head; apical fourth of longitudinal groove light gray; with sparse, short, light yellow setae. Elytra with plastron mostly dark gray but mottled and sparsely flecked with light gray especially between interval 2–7. Mouthparts (except black mandibles), mesosternum between procoxae and metacoxae, extreme tips of tibiae, and entire tarsi reddish brown; remainder of ventral surface and legs with mottled light and dark gray plastron.

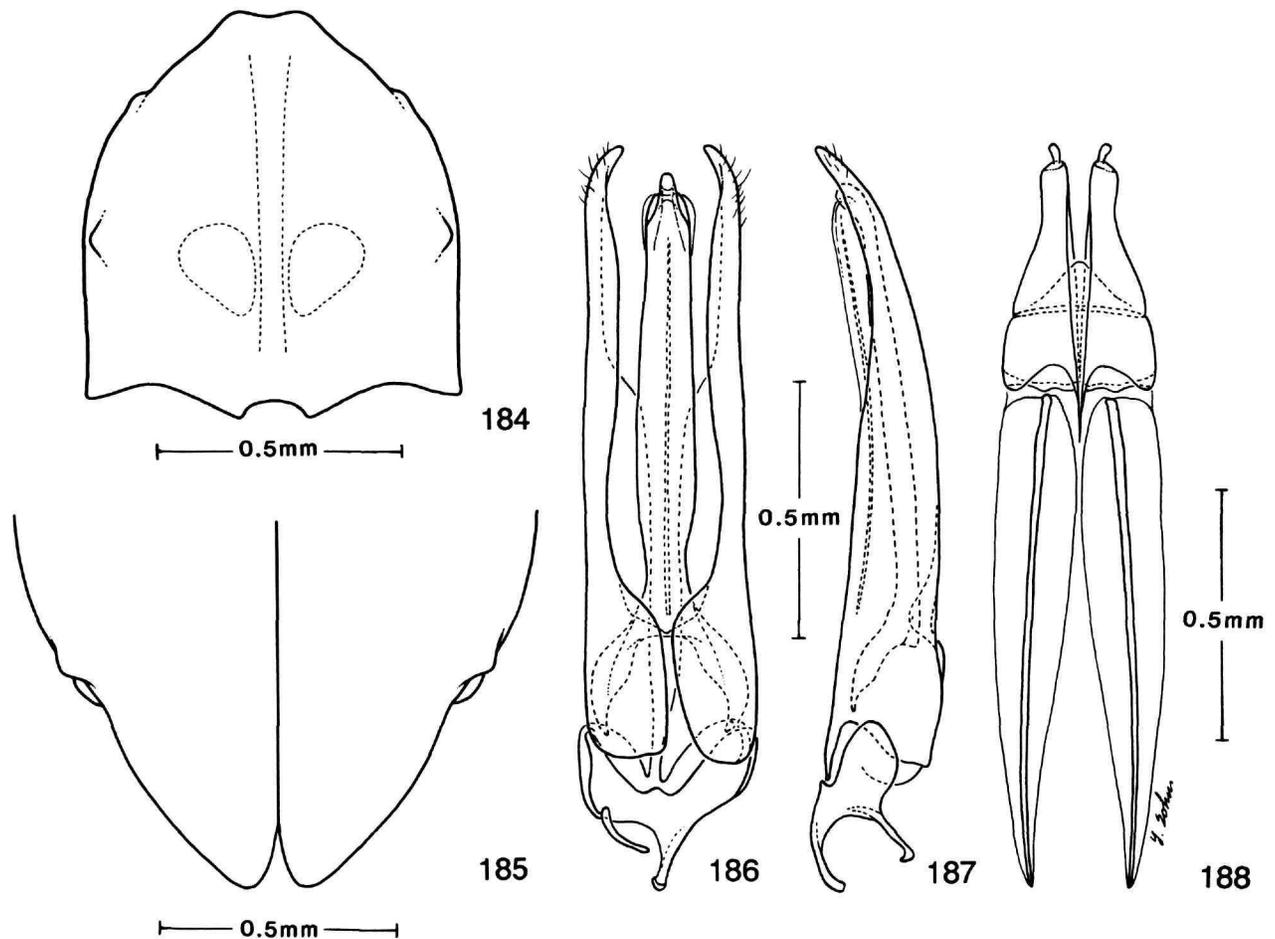
Plastron: Covers entire body except antennae, eyes, clypeus, labrum, middle of mesosternum, extreme apices of tibiae, and tarsi.

Head: Concave medially; deeply, longitudinally grooved on midline between swellings mediad of antennal acetabula; moderately coarsely punctate between and behind eyes. Frontoclypeal suture deeply depressed and well below antennal acetabula. Clypeus thickened; surface moderately coarsely, densely punctate and slightly microreticulate. Labroclypeal suture deep and broad. Labrum a narrow, transverse rectangle; smooth; with a transverse row of long, golden, hair-like setae at

midlength and a fringe of golden setae along anterior margin.

Thorax: Pronotum slightly shorter than wide; length, 1.32 mm; broadest width, slightly behind midlength, 1.47 mm; base slightly wider than apex; lateral margin moderately sinuate; medial longitudinal groove broad, moderately deep, and extending from gibbositities at basal third almost to anterior margin; with 4 low indistinct gibbositities across basal third as illustrated (Figure 184); anterior margin projecting over head and arcuately emarginate apicomediaally; surface sculpture like that of head; punctures fine, obscured by plastron; with few, short, fine, yellowish setae; setae with apices directed posteriorly or posterolaterally. Hypomera, sides of prosternum, and middle of mesosternum moderately coarsely, densely punctate. Prosternal process sparsely, coarsely, punctate; moderately slender; apically, about half as wide as procoxa;

slightly converging apically and apex moderately rounded. Metasternum with entire surface moderately coarsely, sparsely punctate and a narrow, longitudinal, impunctate, shiny sulcus on posterior half; posterior half of disc shallowly depressed. Protibia with a cleaning fringe of short, dense, golden setae apicomediaally; length of fringe about as long as length of tarsal segment 1; with a row of robust smoothing setae adjacent to fringe, row 3 times as long as length of fringe. Mesotibia and metatibia with only a few long, golden, hair-like setae apicoventrally. Last tarsal segments very robust and about 1.5 times as long as combined length of tarsal segments 1-4. Elytra more than twice as long as pronotum; length, 3.69 mm; combined width, 1.99 mm; apices angularly rounded, and dehiscent (Figure 185); humeri each with protuberance; posterolateral margins each with low gibbosity; surface as that



FIGURES 184-188.—*Stegoelmis sticta*, new species: 184, pronotum; 185, elytral apices; 186, male genitalia, dorsal view; 187, male genitalia, lateral view; 188, female genitalia.

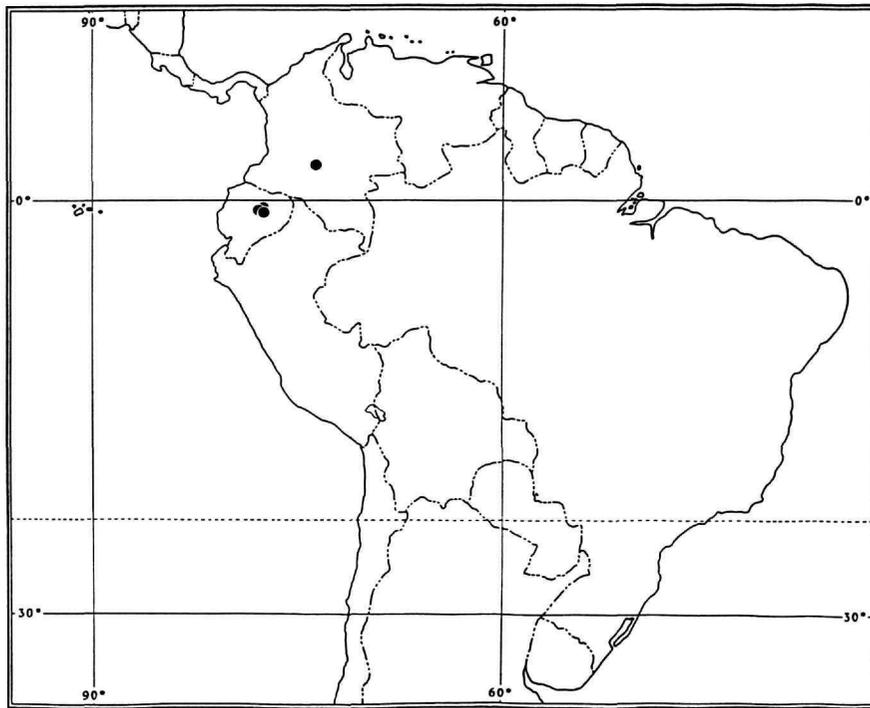


FIGURE 189.—Known distribution of *Stegoelmis sticta*, new species.

of pronotum; striae deeper basally; discal strial punctures coarse, deep, round, almost half as wide as intervals and separated longitudinally by about 2 to 4 times their diameter; intervals with fine, short, sparse, yellow setae and slightly convex; intervals 2, 3, and 4 vaguely swollen basally and interval 3 vaguely swollen slightly behind midlength; sublateral punctures slightly coarser than discal punctures. Scutellum flat, elongate-ovate; with very few, fine punctures.

Abdomen: Intercostal process of sternum 1 broadly, deeply concave and finely, sparsely punctate; slightly more densely punctate than metasternum. Punctures similarly fine and sparse on sterna 2-5. Lateral margins of sternum 3 with large lobate process that clasps emarginate side of elytron. Last sternum convex subapically.

Genitalia: As illustrated (Figures 186, 187).

FEMALE GENITALIA.—As illustrated (Figure 188).

VARIATIONS.—The light gray mottling and flecks on the pronotum and elytra are variable in extent; 7 of the 10 specimens examined have a light gray mark on the apical fourth of the longitudinal pronotal groove and an elongate longitudinal mark between the sublateral and submedial pronotal gibbositities extending to the hind margin of the pronotum. Two

of the specimens have the light gray area covering almost all of the pronotum. The tibia of one specimen is entirely light gray; the other nine specimens have a dark gray band at the proximal third of the tibia. In length, the males vary from 4.57 to 5.19 mm and the females from 5.07 to 5.43 mm.

TYPE DATA.—*Holotype* (σ^7): ECUADOR: NAPO: Lago Agrio (2 km N), 26 Sep 1975, Andrea Langley; Ecuador-Peace Corps-Smithsonian Institution Aquatic Insect Survey; deposited in the National Museum of Natural History, Smithsonian Institution.

Allotype: Same data as holotype.

Paratypes: Same data as holotype except: (2 km N), 26 Sep 1975, 3 ϕ ; (5 km N), at blacklight, 1 σ^7 , 3 ϕ ; (3 km NE), 17 May 1975, at blacklight at Pozo #23, P. Spangler, A. Langley, and J. Cohen, 1 σ^7 ; same data as holotype except (18 km E), Rio Aguarico, 23 Sep 1975, 1 σ^7 , 2 ϕ . COLOMBIA: META: Catimagua, 370 m, 7 Apr 1973, M. Corn, 1 σ^7 (MCZ).

DISTRIBUTION.—Presently known only from Ecuador and Colombia (Figure 189).

ETYMOLOGY.—From the Greek adjective in feminine form *stiktos* ("spotted"), in reference to the numerous and extensive light gray spots on this species.

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