

AMSTERDAM EXPEDITIONS TO THE WEST INDIAN ISLANDS, REPORT 15 \*)  
TWO NEW GENERA OF PHREATIC ELMID BEETLES FROM HAITI;  
ONE EYELESS AND ONE WITH REDUCED EYES  
(COLEOPTERA, ELMIDAE)

by

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ABSTRACT

The first known eyeless phreatic elm mid beetle, *Anommatelmis botosaneanui* n. gen., n. sp., is described. In addition, a second new phreatic genus with two new species with reduced eyes, *Lemalelmis minyops* and *Lemalelmis fontana*, is described. Habitus views, illustrations of various structures of taxonomic interest, habitat descriptions, discussion of relationships, and a discussion of the interesting plastron present on all three species are included. These new beetles were collected from wells or karst springs in Haiti.

RÉSUMÉ

On donne la description du premier Coléoptère Elmide phréaticole aveugle connu: *Anommatelmis botosaneanui* n. gen., n. sp. D'autre part, un deuxième nouveau genre phréaticole est décrit, dont les deux nouvelles espèces *Lemalelmis minyops* et *Lemalelmis fontana* ont des yeux réduits. Figures de habitus, illustrations de diverses structures d'intérêt taxonomique, descriptions des habitats, discussions sur les affinités, ainsi qu'une discussion sur l'intéressant plastron présent chez toutes ces trois espèces, sont également inclus. Ces trois nouveaux Coléoptères ont été capturés dans des puits ou bien dans des sources karstiques de Haïti.

1. INTRODUCTION

It is a rare occasion to find an eyeless undescribed beetle, and it is even more rare to find an eyeless undescribed aquatic beetle. Therefore, I was extremely pleased to receive recently, for identification, the first eyeless cavernicolous beetle known for the family Hydrophilidae. That unusual beetle was collected by Dr. Philip Ashmole in Los Tayos Cave in Morona-Santiago Province, Ecuador.

A short time after the description of the cavernicolous hydrophilid was sent to press (Spangler,

1981a), I received a letter from my friend Dr. L. Botosaneanu, of the Zoölogisch Museum, Universiteit van Amsterdam, in which he asked me to identify some presumed stygobiont aquatic beetles that he had collected from wells in northern Haiti. The probability of receiving a second new and very unusual water beetle so soon after receiving the eyeless hydrophilid seemed unlikely because the Haitian specimens were collected from wells which suggested that these beetles would be epigeal forms of hydrophilids or dytiscids which probably entered the wells in search of water; however, I anxiously awaited the arrival of the specimens.

When I received the specimens I was surprised to see that they were elm mid beetles and I thought they must have flown, soon after eclosing, from their stream habitat to the wells — possibly because their streams had dried up. Therefore, when I examined them with the microscope, I was amazed to find that these phreatic beetles lacked eyes and were the first known eyeless beetles for the family Elmidae. Additional study showed that they also lack metathoracic flight wings and could not have flown to the wells. The specimens were light brown and lightly sclerotized and the sclerotized genital structures were visible through the cuticle (when in alcohol) and the sexes were easily separated. Also, the cuticle appeared to be thinner and less rigid than that of most epigeal elmids.

Because these beetles were very unusual, I requested additional information about their habitats from Dr. Botosaneanu. Along with his informative reply he sent additional specimens col-

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lected from several springs on Haiti. To the unaided eye, these additional specimens resembled the specimens originally sent; however, when these beetles were examined with the microscope they provided another surprise because they have remnants of eyes and represent two new species of a new elm mid genus with reduced eyes.

The only other known elm mid with reduced eyes is the cavernicolous *Trogloelmis leleupi* Jeannel (1950) collected from a cave in the Belgian Congo, now Zaire. One additional elm mid described as *Zaitzevia uenoi* Nomura (1961), was collected from subterranean water in Japan. In the illustration of this species the eyes appear normal, no modifications of the eyes is mentioned in the description, and the presence or absence of functional flight wings is not discussed. Considering the lack of obvious adaptations for a subterranean existence, I believe this species is an epigean form rather than a true stygobiont. The three new phreatic elm mid taxa from Haiti are described below.

The material on which the descriptions of the new taxa is based, was collected during the Amsterdam Expeditions to the West Indian Islands, under the leadership of Prof. Dr. Jan H. Stock (University of Amsterdam, Institute of Taxonomic Zoology). The expeditions were made possible by grants of the Netherlands Foundation for the Advancement of Tropical Research (WOTRO), The Hague, the Treub Maatschappij, Utrecht, the Beijerinck-Popping Fonds, Amsterdam, and the Fonds Landbouw Hogeschool, Wageningen.

The specimens have been preserved in the Zoölogisch Museum, University of Amsterdam (ZMA) and the National Museum of Natural History, Smithsonian Institution, Washington (USNM).

## 2. DESCRIPTIONS OF THE NEW TAXA

### *Anommatelmis* n. gen.

**Diagnosis.** — Body form elongate, subparallel; elytra 2.6 times longer than pronotum. Dorsal surface with few golden setae and indistinct rows of shallow punctures. Plastron formed by radial-spiculate setae which impart a glazed appearance to the beetle; plastron covers entire body except antennae, clypeus, labrum, labium, mesosternum, first abdominal sternum between metacoxae, and tarsi. Tracts of hairlike tomentum present laterally on procoxae, mesocoxae, and metacoxae.

Head retracted into pronotum, so mouthparts are only partly visible. Eyes absent (figs. 3-5); with only a small, slight, unfacetted tumosity behind base of each antenna. Antennomeres, 11. Clypeus narrow, transverse, straplike, with anterior margin almost truncate. Labrum also straplike but anterior margin moderately arcuately rounded. Genae covered with plastron microtrichia instead of radiallyspiculate setae. Maxillary palpomeres, 4. Labial palpomeres, 3. Mentum subrectangular. Submentum about as wide as but longer than mentum.

Pronotum elongate, arcuate laterally; with distinct, sublateral, indistinctly bisinuate carinae extending entire length of pronotum; with 2 short but strongly raised prescutellar carinae as long as scutellum and separated by a distance slightly wider than width of scutellum. Elytron with strong sublateral carina on basal third. Metathoracic flight wings absent. Prosternum very long and not carinate in front of procoxae; prosternal process narrow, long, subparallel sided, moderately margined laterally, and slightly wider apically. Mesosternum wide, depressed medially, microreticulate, shiny, strongly margined between mesocoxae. Metasternum wide, with extremely narrow longitudinal suturelike line on midline. Front legs with coxae rounded and trochantins concealed by the hypomera. Tarsal claws narrow and slender.

Abdominal sterna 1-5 moderately convex; lateral margins of third and fourth sterna narrowly overlapping epipleura; fifth sternum moderately and distinctly emarginate and lobed laterally at about apical third.

**Type-species of the genus.** — *Anommatelmis botosaneanui* n. sp.

**Etymology.** — The name *Anommatelmis* is derived from *anommatos* (Greek), eyeless, plus *elmis* from the nominate genus, *Elmis*, of the family group name. Gender: feminine.

**Comparative notes.** — This genus may be recognized immediately from all other known elm mid genera by the absence of eyes; in other characters, *Anommatelmis* shows affinities with *Cylloepus*. However, *Anommatelmis* may be easily

distinguished from *Cylloepus* by (1) the absence of eyes; (2) the hypomera covered with plastron; (3) extensive plastron composed of radiallyspiculate setae (except microtrichia on genae) which gives a glazed appearance to most cuticular surfaces; and (4) absence of metathoracic flight wings.

***Anommatelmis botosaneanui* n. sp. Figs. 1, 3-16**

**Material.** — One ♂ (holotype), one ♀ (allotype), one ♂ (paratype). Amsterdam Expeditions to the West Indian Islands, sta. 79/689: Haiti, well of Presbytère Catholique of Limbé (19°42'14"N 72°23'55"W), 11 Dec. 1979, coll. L. Botosaneanu & J. Notenboom (holo- and allotype in ZMA, paratype in USNM).

One ♂ (paratype). Do., sta. 78/238: Haiti, Limbé, well on north side of road D 100 (19°42'29"N 72°23'53"W), 10 May 1978, coll. J. H. Stock (ZMA).

One ♀ (paratype). Do., sta. 78/241: Haiti, village of Camp-Coq (= south of Limbé), well of school (E. side of

road D 100) (19°38'09"N 72°25'13"W), 10 May 1978, coll. J. H. Stock (ZMA).

One ♀ (paratype). Do., sta. 79/693, same locality as previous station, 11 Dec. 1979, coll. L. Botosaneanu & J. Notenboom (USNM).

Four ♂♂ (paratypes). Do., sta. 79/694: Haiti, village of Camp-Coq, well near the Presbytère Catholique (this some 200 m from the previous station), 11 Dec. 1979, coll. L. Botosaneanu & J. Notenboom (2 ♂♂ in ZMA, 2 ♂♂ in USNM).

**Holotype male.** — Body form and size: Elongate (fig. 1), subparallel; dorsal surface moderately convex. Length 2.8 mm; width 1.2 mm.

**Coloration:** Light reddish brown when wet but appearing glazed when dry because of extensive plastron of radiallyspiculate setae (figs. 10-12) covering body except those portions listed in generic description; with few recumbent golden setae in indistinctly arranged rows on elytra.

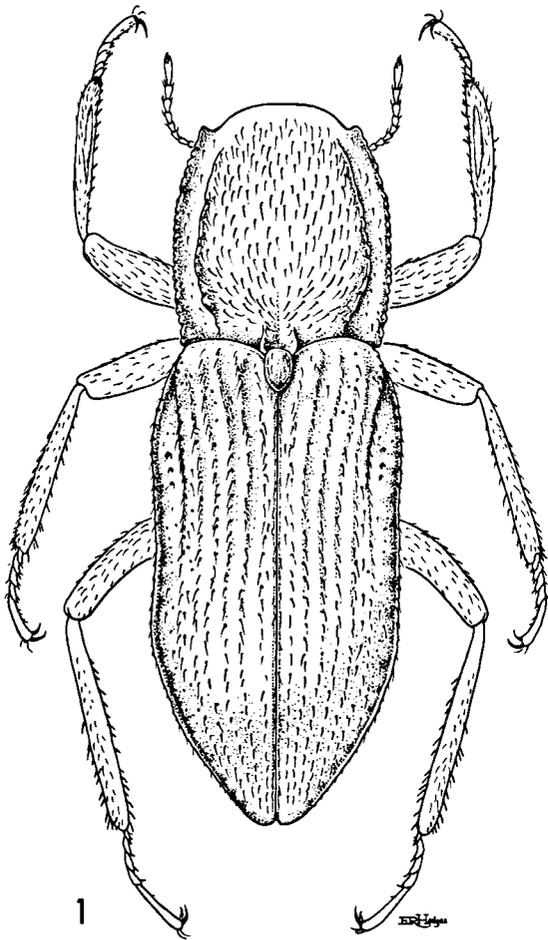


Fig. 1. *Anommatelmis botosaneanui* n. gen., n. sp.; habitus.

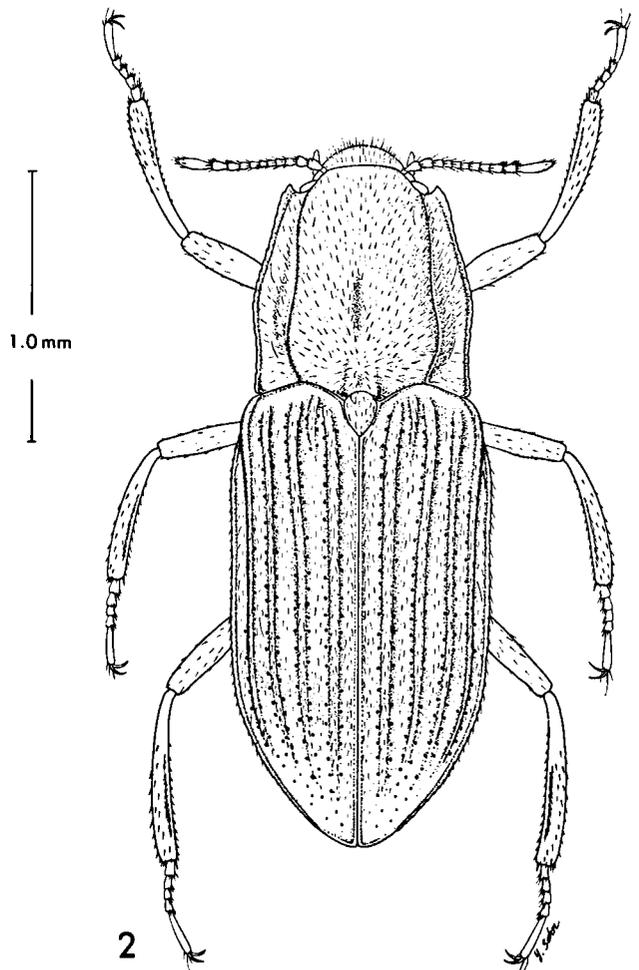
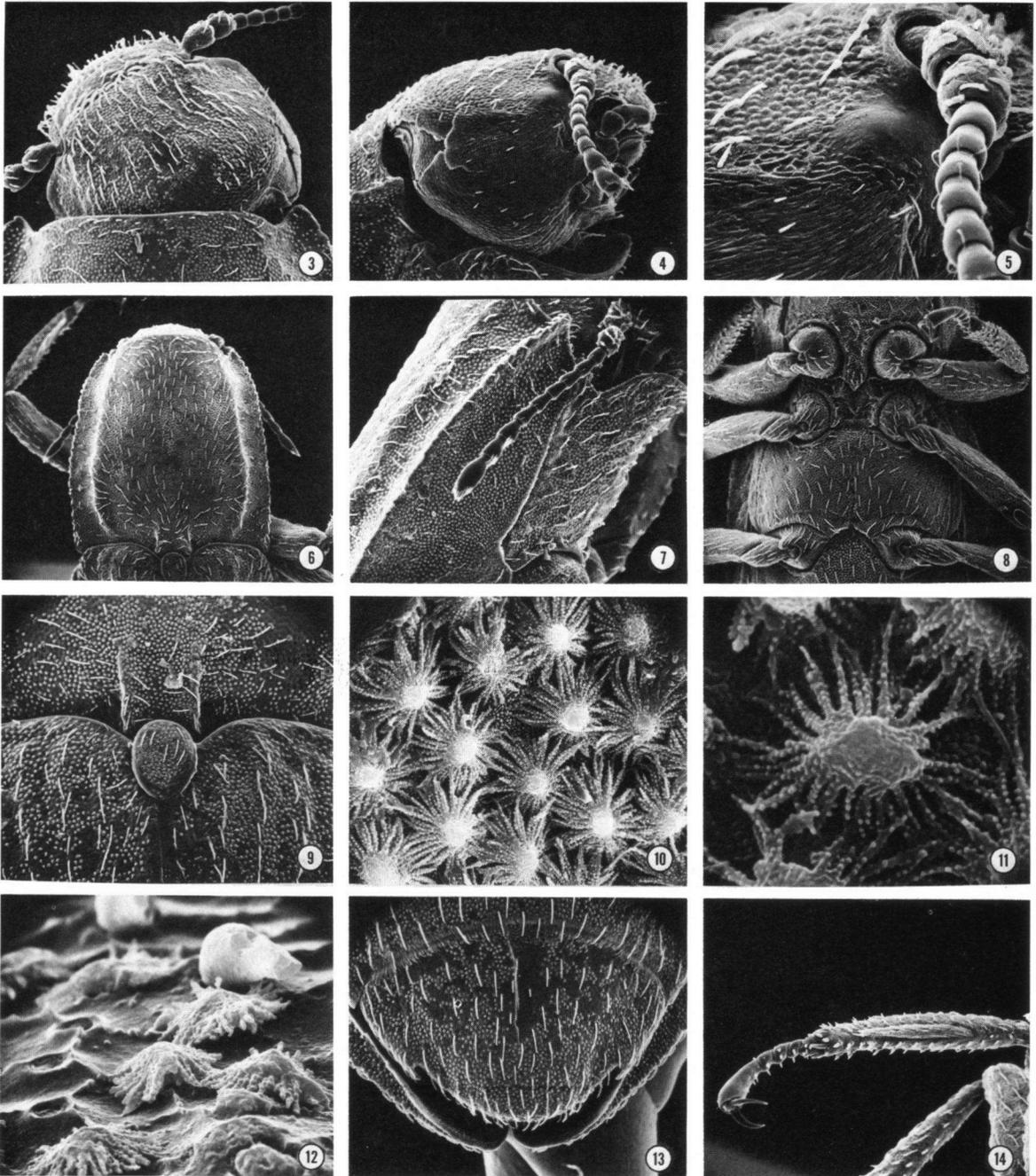


Fig. 2. *Lemalelmis minyops* n. gen., n. sp.; habitus.

Head (figs. 3-5): Finely, sparsely granulate but cuticle obscured by plastron. Eyes absent. Antennomeres, 11. Clypeus narrow, transverse, straplike, and anterior margin almost straight. Labrum similarly straplike but anterior margin moderately

arcuately rounded. Genae covered with plastron microtrichia (figs. 4 & 5) instead of radialspiculate plastron setae (figs. 10-12). Maxillary palpomeres, 4. Labial palpomeres, 3. Mentum subrectangular; with a few setae on anterior margin

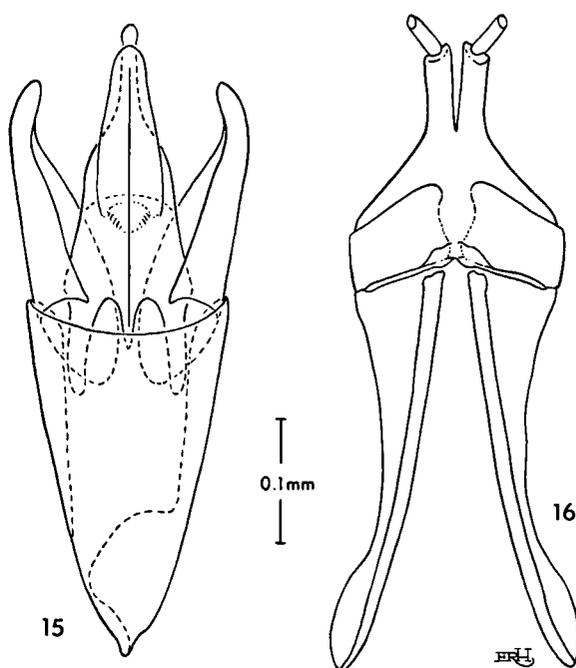


Figs. 3-14. *Anommatelmis botosaneanui* n. gen., n. sp.: 3, head, dorsal view, 93 X; 4, head, lateral view, 88 X; 5, head, lateral view, 250 X; 6, pronotum, dorsal view, 41 X; 7, pronotum, lateral view, 80 X; 8, prosternum, mesosternum, and metasternum, 43 X; 9, scutellum, 100 X; 10, radialspiculate plastron setae, 1600 X; 11, radialspiculate plastron setae, 3750 X; 12, radialspiculate plastron setae, 2375 X; 13, last abdominal sternum, 100 X; 14, protibia, 75 X.

and between labial palpi. Submentum about as wide as mentum; anterior portion smooth, with a few setae in a narrow area; posterior portion microalutaceous, with a few setae.

Thorax: Pronotum (figs. 6 & 7) moderately arcuate laterally; moderately broad, widest at basal fourth; slightly depressed submarginally; anterior margin moderately arcuate over head; anterolateral and posterolateral angles obtuse; surface granulate, less so on discal area, covered by plastron; with 1 distinct sublateral carina on each side and extending length of pronotum but less distinct on anterior fourth; posterior margin strongly bisinuate, bearing 2 short but strongly raised pre-scutellar carinae as long as and separated by distance equal to width of scutellum. Elytron with 1 strong lateral carina on basal third, becoming effaced posteriorly; with 10 poorly defined rows of shallow, barely discernible (except laterally) rows of punctures; without basal accessory stria between first and second striae; humerus with carina very strongly raised; apex evenly rounded and obtuse at suture. Epipleura and hypomera (fig. 7) completely covered by plastron. Scutellum flat and ovate (fig. 9). Prosternum very long and not carinate in front of procoxae; sides covered by plastron; prosternal process covered by plastron, narrow, long, subparallel sided, moderately margined laterally, slightly wider apically, apex obtusely angulate. Mesosternum wide, depressed medially, shiny, microreticulate, strongly margined between mesocoxae (fig. 8). Metathoracic flight wings absent. Metasternum wide; with extremely narrow, longitudinal, shiny, suturelike line on midline; elsewhere covered by plastron. Front legs with procoxae rounded and trochantin concealed by hypomera; protibia with 1 large cleaning fringe of golden setae on medial surface (fig. 14). Mesotibia and metatibia lack cleaning fringes. Tarsal claws narrow, slender, without teeth.

Abdomen: Sterna 1-5 moderately convex; lateral margins of third and fourth sterna narrowly overlapping epipleura; fifth sternum distinctly emarginate laterally and lobed at about apical third (fig. 13); surface, except small intercoxal area of first sternum between metacoxae, covered by plastron.



Figs. 15 & 16. *Anommatelmis botosaneanui* n. gen., n. sp.: 15, male genitalia; 16, female genitalia.

Male genitalia: As illustrated (fig. 15).

Female. — Externally similar to male; genitalia as illustrated (fig. 16).

Variations. — Specimens vary in length from 2.2 to 2.8 mm; males average slightly shorter than females. The extremely narrow, longitudinal, shiny, suturelike line on the midline of the metasternum and the intercoxal area of the first sternum between the metacoxae may be obscured by plastron.

Etymology. — This unusual elm mid species is named for my friend Dr. L. Botosaneanu in recognition of his numerous contributions to our knowledge of stygobiontic animals.

Comparative notes. — *Anommatelmis botosaneanui* and the endemic and epigeal elm mid *Cylloepus baitianus* Darlington (1936) are similar in most character states and *A. botosaneanui* appears to be derived from that taxon. *Anommatelmis botosaneanui* differs from *C. baitianus* in the generic differences and as follows: (1) pronotum

not minutely, sparsely punctate; (2) elytron with only 1 moderately developed lateral carina instead of the 2 well-developed lateral carinae found in *C. haitianus*; (3) length 2.6 mm vs. 2.2 mm for *C. haitianus*; and (4) prosternum without carina in front of each procoxa.

**Habitat data.** — All specimens of *Anomallemis botosaneanui* were obtained near Limbé, a small town in the Département du Nord of Haiti, by use of a Cvetkov net. The water in the three wells is 100% groundwater and the data for each of the collecting stations mentioned above are as follows:

Station 79/689: The covered well, protected by a roof and provided with an electric pump, is very clean; bottom sandy; 2.3 m to water's surface, from opening of well; depth of water 1.2 m; water temperature 26.5° C; chloride 13.8 mg/l. The elmids were collected along with the following stygobiont Crustacea: Amphipoda, Copepoda Cyclopoida, Ostracoda, and Thermosbaenacea.

Station 78/238: The well is closed, round (diameter 1 m), 2 m to the water's surface, water depth 1 m; chloride 240 mg/l. Accompanying organisms: Cyclopoida, Ostracoda, hadziid Amphipoda, *Microcharon* (Isopoda), Thermosbaenacea, mosquito larvae, filamentous algae.

Stations 78/241 and 79/693: These are taken in the same well, located near the school of Camp-Coq, a small village south to southeast of Limbé, at an altitude of ca. 80 m. The well is square, covered with a concrete lid, has masonry sides and is very clean; bottom sandy; provided with a broken windpump; 1.5 to 2 m to the water's surface, depth of water 0.4-0.5 m; temperature 26.6° C; chloride 200 mg/l (1978) or 13.2 mg/l (1979). The elmids were observed crawling slowly on the substrate and were collected along with the following organisms: Oligochaeta, Thermosbaenacea, hadziid Amphipoda, Collembola.

Station 79/694: The well has concrete sides; 3.4 m to water's surface from opening of the well; depth of water 1 m; water temperature 26.2° C; chloride 12.8 mg/l. The elmids were observed crawling slowly on the substrate and were collected along with the following stygobiont organisms: *Cyathura* (Isopoda) and Thermosbaenacea.

### **Lemalelmis** n. gen.

**Diagnosis.** — Body form elongate, subparallel; elytra 2.2 times longer than pronotum. Dorsal surface microreticulate, with golden setae. Elytron with moderate to strong costate intervals and 10 indistinct rows of shallow punctures. Plastron present on venter; genae covered with plastron microtrichia; tracts of hairlike tomentum present laterally on procoxae, mesocoxae, and metacoxae.

Head retracted into pronotum so mouthparts are only partly visible. Eyes very reduced; only a small faceted remnant behind base of each antenna (figs. 17 & 32). Antennomeres, 11. Clypeus narrow, transverse, straplike; distinctly arcuate across anterior margin and rounded laterally. Labrum similarly straplike but anterior margin moderately arcuately rounded. Maxillary palpomeres, 4. Labial palpomeres, 3. Mentum subrectangular. Submentum about as wide as but longer than mentum.

Pronotum elongate; arcuate laterally; with distinct, sublateral, indistinctly bisinuate carinae extending entire length of pronotum; prescutellar carinae on base distinct or effaced. Elytron with some intervals moderately to strongly costate. Prosternum very long and carinate in front of procoxae. Prosternal process moderately wide, long; subparallel sided, slightly wider apically; moderately margined laterally; and apex obtusely angulate. Mesosternum wide, depressed medially; microreticulate; moderately to strongly margined between mesocoxae. Metathoracic flight wings absent. Metasternum wide; surface microreticulate but obscured by plastron. Front legs with coxae rounded and trochantins concealed by the hypomera. Tarsal claws moderately broad and moderately stout.

Abdominal sterna 1-5 moderately convex. Lateral margins of third and fourth sternum narrowly overlapping epipleura. Fifth sternum moderately but distinctly emarginate and lobed laterally at about apical third. Cuticular surface of sterna covered by plastron.

**Type-species of the genus.** — *Lemalelmis minyops* n. sp.

**Etymology.** — The name *Lemalelmis* is derived from *lemaleos* (Greek), nearly blind, plus *elmis* from the nominate genus, *Elmis*, of the family group name. Gender: feminine.

**Comparative notes.** — All previously known genera of elmid beetles have normal eyes except the eyeless *Anommatelmis* n. gen., and the African *Trogloelmis*, which has reduced eyes. Therefore, *Lemalelmis* may be distinguished by its reduced eyes from all known genera of elmids except *Trogloelmis*. From *Trogloelmis*, which has only 10 antennomeres, *Lemalelmis* may be distinguished easily by its antenna of 11 antennomeres. In other characters, *Lemalelmis* closely resembles some members of the genus *Cylloepus*. However, *Lemalelmis* may be easily distinguished from known species of *Cylloepus* by the reduced eyes and absence of metathoracic flight wings.

***Lemalelmis minyops* n. sp. Figs. 2, 17-31**

**Material.** — One ♂ (holotype), one ♀ (allotype), thirty ♂♂, and nineteen ♀♀ (paratypes). Amsterdam Expeditions to the West Indian Islands, sta. 79/633: Haiti, Jérémie (Département de la Grande Anse), Source Débarasse (karst spring) (18°39'08"N 74°11'30"W), 1 Dec. 1979, coll. L. Botosaneanu, J. Notenboom & E. S. W. Weinberg (holo- and allotype in ZMA; 25 paratypes in ZMA, 24 paratypes, including the specimen coated for examination with the scanning electron microscope, in USNM).

**Holotype male.** — Body form and size: Elongate, subparallel; dorsal surface moderately convex (fig. 2). Length 2.0 mm; width 0.8 mm.

**Coloration:** Light reddish brown; with few recumbent golden setae. Surface of venter appearing glazed because of dense plastron covering cuticle.

**Head (figs. 17, 21 & 22):** Moderately coarsely, densely granulate and moderately densely covered with stout setae. Eyes reduced to small, faceted remnants (figs. 17 & 18). Antennomeres, 11 (fig. 19). Clypeus moderately narrow, transverse, straplike; anterior margin strongly arcuate. Labrum similarly straplike but anterior margin moderately arcuately rounded. Genae covered with plastron microtrichia (figs. 17 & 18). Maxillary palpomeres, 4. Labial palpomeres, 3. Mentum sub-

rectangular; with a few setae on anterior margin and between labial palpi. Submentum about as wide as mentum; anterior portion smooth, with a few setae in a narrow area; posterior portion microalutaceous, with a few setae.

**Thorax:** Pronotum (fig. 23) moderately arcuate laterally; widest at basal fourth; moderately broad; slightly depressed submarginally; anterior margin moderately arcuate over head; anterolateral and posterolateral angles obtuse; surface microalutaceous, not covered by plastron; with 1 distinct sublateral carina on each side and extending length of pronotum but less distinct on anterior fourth; disc with short, shallow, medial depression at midlength; posterior margin strongly bisinuate, bearing 2 slight indications of short prescutellar carinae on base as long as and separated by width of scutellum. Elytron with 5 costae; costae 1, 3, 4, 5, distinct from base to apical four-fifths, costa 2 moderately raised only on base; costa 7 strongly raised, subcarinate, with 10 poorly defined rows of shallow, barely discernible (except laterally) rows of punctures; without basal accessory stria between first and second striae; humerus with carina very strongly raised; apex evenly rounded and obtuse at suture. Hypomera without plastron (fig. 24); epipleura completely covered by plastron microtrichia (figs. 28 & 29). Scutellum flat and not microreticulate (fig. 25). Prosternum (fig. 26) very long in front of procoxae. Prosternal process narrow, long; subparallel sided, slightly wider apically; moderately margined laterally, apex obtusely angulate. Mesosternum wide, depressed medially, microreticulate, strongly margined between mesocoxae. Metathoracic flight wings absent. Metasternum wide; disc with shallow, narrow, longitudinal groove on midline. Front legs with procoxae rounded and trochantin concealed by hypomera. Procoxae, mesocoxae, and metacoxae with lateral tract of microtrichia (figs. 27 & 28). Protibia, mesotibia, and metatibia each with 1 large cleaning fringe of golden setae on medial surface (fig. 20). Tarsal claws moderately broad and moderately stout.

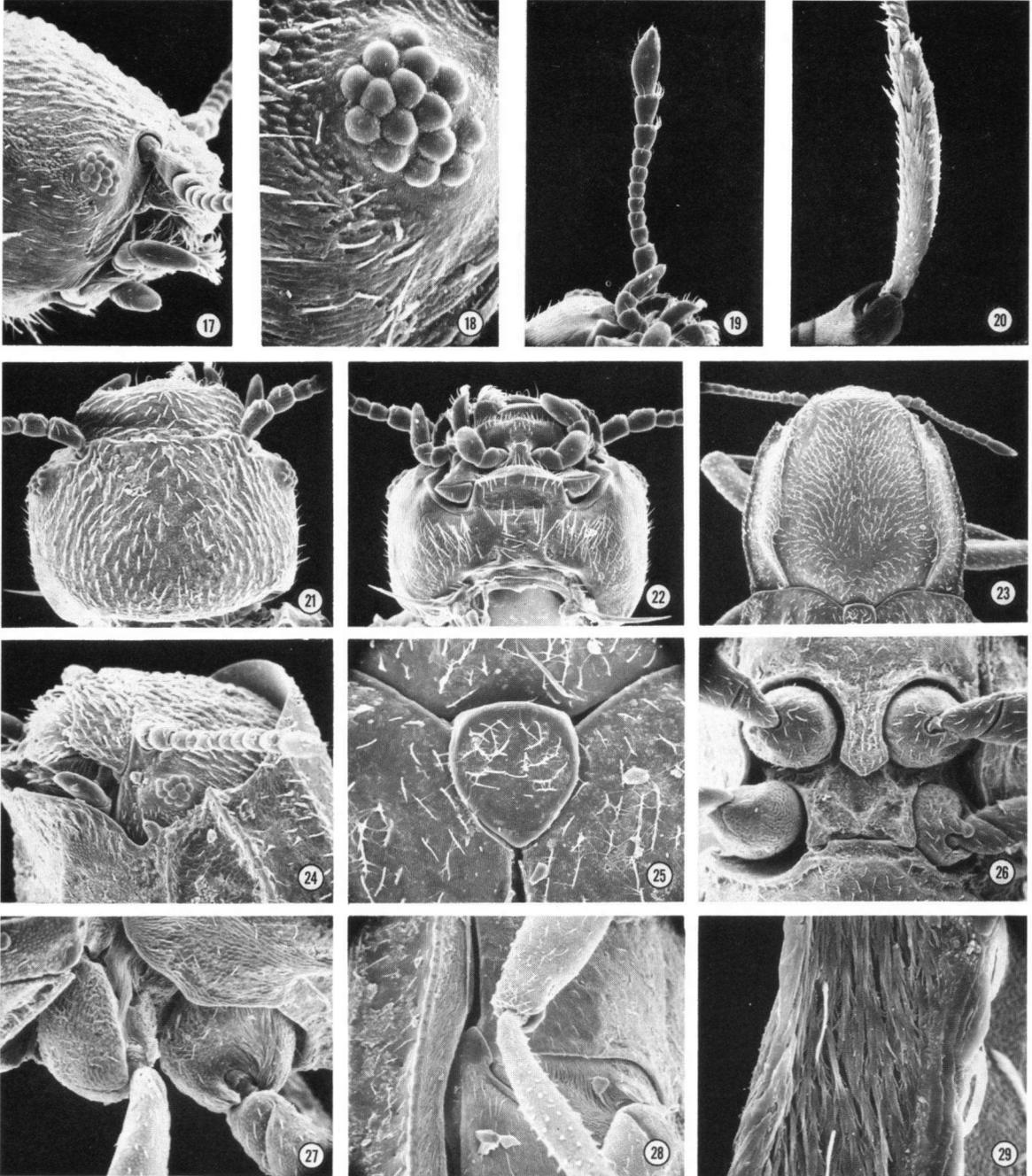
**Abdomen:** Sterna 1-5 moderately convex, with few, short, indistinct, golden setae scattered over surface. Lateral margins of third and fourth sterna narrowly overlapping epipleura. Fifth sternum

distinctly emarginate laterally and lobed at about apical third.

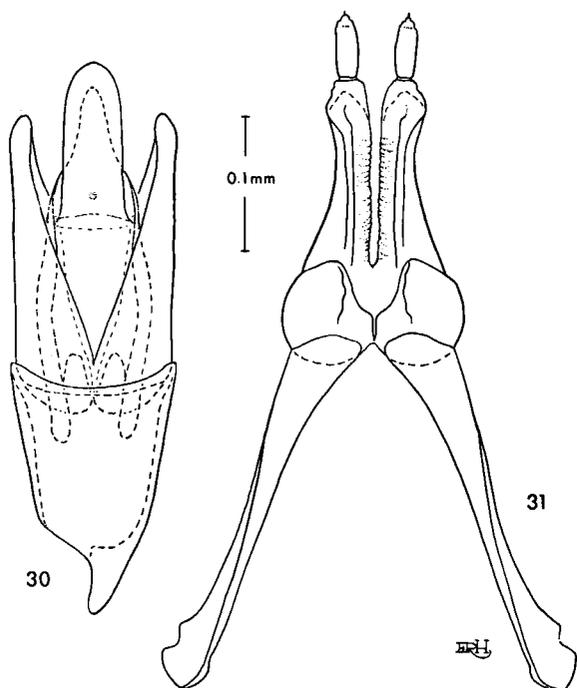
Male genitalia: As illustrated (fig. 30).

Female. — Externally similar to male; genitalia as illustrated (fig. 31).

Variations. — Specimens vary in length from 1.95 mm to 2.5 mm; males average slightly shorter than females. Several have the first and second elytral costae less distinct than on the specimen illustrated (fig. 2).



Figs. 17-29. *Lemalelmis minyops* n. gen., n. sp.: 17, head, lateral view, 100 X; 18, head, lateral view, 325 X; 19, antenna, 80 X; 20, protibial fringe, 88 X; 21, head, dorsal view, 80 X; 22, head, ventral view, 75 X; 23, pronotum, 40 X; 24, head and pronotum, 88 X; 25, scutellum, 150 X; 26, prosternum, 68 X; 27, procoxa and mesocoxa, 110 X; 28, epipleuron and metacoxa, 90 X; 29, epipleural microtrichia, 550 X.



Figs. 30 & 31. *Lemalelmis minyops* n. gen., n. sp.: 30, male genitalia; 31, female genitalia.

**Etymology.** — The name *minyops* is derived from *minys* (Greek), little; plus *ops* (Greek), eye; in reference to the reduced size of the eyes of this species.

**Comparative notes.** — *Lemalelmis minyops* resembles its sister species, *L. fontana* n. sp., described below. However, *L. minyops* may be distinguished from *L. fontana* by the following character states: (1) Head and pronotum without dense, coarse granules and microreticulate sculpture (figs. 21, 23); (2) basal, prescutellar area of pronotum without distinct carinae (fig. 23); (3) elytral costae, except lateral costae, indistinctly defined; (4) pronotal disc without deep, longitudinal groove on basal two-thirds; (5) metasternal disc not strongly elevated above plane of mesosternum and separated from the latter by a shallowly depressed anterior margin between mesocoxae; (6) abdominal sterna with short, indistinct, golden setae on surface; and (7) reduced eyes about one-half to one-third smaller (11-15 facets) than in *L. fontana* (22 facets).

**Habitat data.** — All of the specimens of *L. minyops* in the type-series were collected from the following spring:

Station 79/633: Karst spring, 2 km from the small airfield of Jérémie, a town near the north-west extremity of the southern peninsula of Haiti. The important spring issues from a subterranean, tortuous cleft, ca. 10 m long and 40 cm wide, at the foot of the Morne Débarasse, a humid limestone mountain with dense vegetation. A large room has been hollowed in limestone and the water coming from the subterranean cleft was diverted into several underground large concrete tanks in 1951 to provide drinking water for Jérémie. This underground brook, which flows rapidly through total darkness, is about 10 cm deep; water temperature is 24.7° C; chloride 20.6 mg/l. This partly artificial cave has been penetrated by roots of *Ficus* and these roots form a thick feltlike mat on the rocky bottom of the brook. In the cement tanks, stygobionts were very abundant in the matted rootlets and between the mat and the rocky bottom. The elmids were found almost entirely in the feltlike mat of rootlets which they undoubtedly utilized for food. The elmids were collected along with the following stygobiont Crustacea: Amphipoda and Cirolanidae (Isopoda).

#### *Lemalelmis fontana* n. sp. Figs. 32-44

**Material.** — One ♀ (holotype), and one ♀ paratype. Amsterdam Expeditions to the West Indian Islands, sta. 79/659: Haiti, Tessier, karst spring between Beaucalin and Ravine Blanche (18°35'55"N 74°10'46"W), 5 Dec. 1979, coll. L. Botosaneanu & J. Notenboom (holotype in ZMA, paratype in USNM, the latter coated for scanning electron microscope).

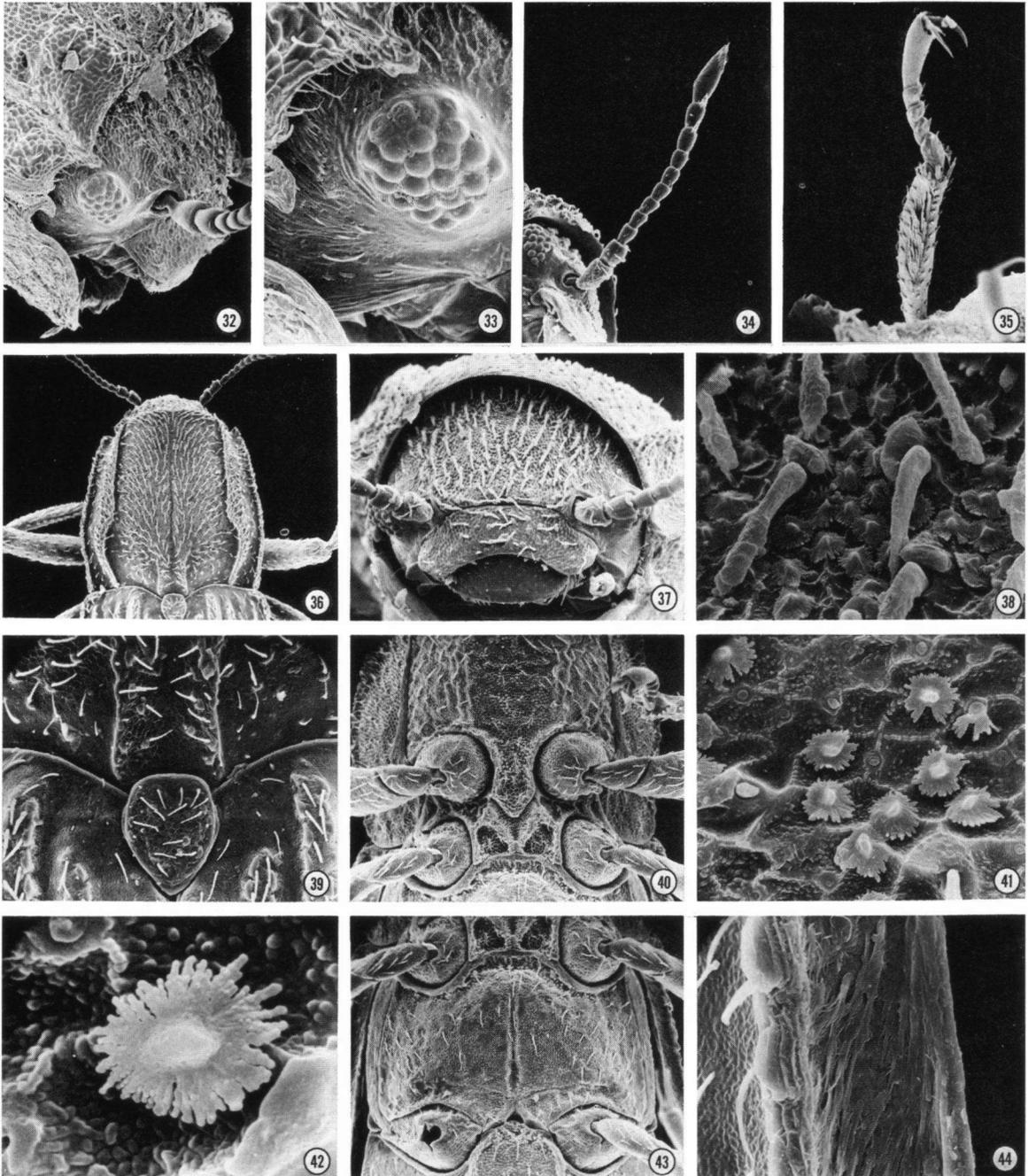
**Holotype female.** — Body form and size: Elongate, subparallel; dorsal surface moderately convex. Length 2.4 mm; width 1.0 mm.

**Coloration:** Light reddish brown; with few recumbent golden setae primarily on pronotal disc and elytral costae. Surface of venter appearing glazed because of dense plastron covering cuticle.

**Head** (figs. 32, 37 and 38): Very coarsely, densely granulate and densely covered with stout setae. Eyes reduced and moderately small; faceted remnants (figs. 32, 33). Antennomeres, 11 (fig.

34). Clypeus moderately narrow, transverse, strap-like; anterior margin strongly arcuately emarginate (fig. 37). Labrum similarly straplike but anterior margin moderately arcuately rounded. Genae covered with plastron microtrichia (figs. 32, 33).

Maxillary palpomeres, 4. Labial palpomeres, 3. Mentum subrectangular; with a few setae on anterior margin and between labial palpi. Submentum about as wide as mentum; smooth except for a few setae.



Figs. 32-44. *Lemaelmis fontana* n. sp.: 32, head & pronotum, 113 X; 33, head lateral view, 325 X; 34, antenna, 80 X; 35, protibial fringe, 88 X; 36, pronotum, 40 X; 37, head, adoral, 93 X; 38, head, discal and plastron setae, 1250 X; 39, scutellum, 150 X; 40, hypomera, prosternum, & mesosternum, 68 X; 41, prosternal plastron setae, 1000 X; 42, prosternal plastron setae, 3750 X; 43, metasternum, 68 X; 44, epipleural microtrichia, 450 X.

Thorax: Pronotum (fig. 36) moderately sinuate laterally; widest at basal fourth; moderately broad; depressed submarginally; anterior margin moderately arcuate over head; anterolateral angles acute; posterolateral angles obtuse; surface microreticulate, not covered by plastron; with 1 distinct sublateral carina on each side and extending length of pronotum; disc with deep, broad, medial, longitudinal groove on basal two-thirds; posterior margin strongly bisinuate; 2 distinct short pre-scutellar carinae on base (fig. 39) that are slightly longer than scutellum and separated by width of scutellum. Elytron with 5 very distinct costae; first, third, fourth, and fifth costae distinct from base to apical fifth; second costa strongly raised only on base; fifth costa strongly raised and carinate; with 10 poorly defined, shallow, barely discernible rows of punctures; without basal accessory stria between first and second striae; humerus with very strongly raised, carinate costa; apex evenly rounded and obtuse at suture, with slight constriction of margins subapically. Hypomera without plastron (figs. 32, 40). Epipleura with plastron microtrichia (fig. 44). Scutellum (fig. 39) flat, ovate, and microreticulate. Prosternum (fig. 40) very long and carinate in front of procoxae, bearing plastron setae (figs. 41, 42). Prosternal process narrow, long; slightly wider apically; subparallel sided; moderately margined laterally; apex obtusely angulate. Mesosternum wide, very deeply depressed medially, microreticulate, strongly margined between mesocoxae. Metathoracic flight wings absent. Metasternum wide, deeply depressed along anterior margin (between mesocoxae), then raised abruptly to discal area; disc with deep, moderately broad, longitudinal groove on midline (fig. 43). Front legs with procoxae rounded and trochantin concealed by hypomera. Procoxa, mesocoxa, and metacoxa each with lateral tract of microtrichia (figs. 40, 43). Protibia, mesotibia, and metatibia each with 1 large cleaning fringe of golden setae on medial surface (fig. 35). Tarsal claws moderately broad and moderately stout.

Abdomen: Sterna 1-5 moderately convex, with numerous distinct, golden setae scattered over surface. Lateral margins of third and fourth sterna narrowly overlapping epipleura. Fifth sternum

distinctly emarginate laterally and lobed at about apical third.

Male. — Unknown.

Etymology. — The name *fontana* is derived from *fontis* (Latin), of a spring, in reference to the habitat of this new species.

Habitat data. — The two specimens of this species were collected from the following spring:

Station 79/659: This is one of two karst springs feeding the brook of Tessier between Beaucaulin and Ravine Blanche, ca. 250 m from the road along Vallée de la Grande Anse (on northwest extremity of the southern peninsula of Haiti); this rheocrenous spring is gushing from limestone at the foot of Morne Castel. The water temperature was 24° C; substrate was stones and sand; chloride not determined. The elmid beetles, along with stygobiont Amphipoda, were found by disturbing the rocky substrate at the origin of the spring and filtering the water through a net.

### 3. PLASTRON

In a discussion of plastron respiration in numerous aquatic or semiaquatic bugs and beetles, Hinton (1976) referred to plastron hairs, plastron scales, and plastron setae. In a description of a new genus and species of an elmid beetle, Spangler (1981b) described another type of plastron that is composed of a porous sheetlike layer covering almost all of the cuticle. In that description I suggested that the extensive plastron may have evolved in that genus because the beetles may inhabit slow-moving streams or similar habitats in the Amazon Basin and these habitats may be low in dissolved oxygen. Unfortunately, all of the specimens available for that description were collected in a black-light trap and their habitat, therefore, is unknown. The plastron on *Anommatelmis botosaneanui*, composed of distinct radiallyspiculate setae — not sheetlike, also covers most of the cuticle and whether this extensive plastron is an adaptation to water with low dissolved oxygen content remains to be verified because the dissolved oxygen in the well water has not been measured. How-

ever, the less robust last segment of the tarsi and the slender tarsal claws of *Anommatelmis* also suggest that these beetles are not adapted for life in fast flowing waters because elmids living in fast currents usually have the last tarsal segment and claws well developed.

The plastron on *Lemalelmis minyops* and *L. fontana*, although extensive on the ventral surface, does not occur on the dorsal surface of these species as the plastron does on *Anommatelmis botosaneanui*. The less extensive plastron on the two species of *Lemalelmis*, therefore, suggests that (1) the habitat niches for the two genera may differ so that *Anommatelmis* occurs in water with low dissolved oxygen and *Lemalelmis* occurs in water with higher amounts of dissolved oxygen or; (2) the surface area covered by the plastron does not reflect the amount of oxygen in the aquatic habitat. The descriptions of the habitats provided by Dr. Botosaneanu support the suggestion that the habitats may differ in the amount of oxygen present in them. For example, all of the specimens of *Anommatelmis* were collected in wells, apparently fed by waters which permeate slowly through aquifers. Conversely, all of the specimens of *Lemalelmis minyops* and *L. fontana* were collected from a spring coming from "an underground brook" (*L. minyops*) or a rheocrenous spring "gushing from limestone" (*L. fontana*). Obviously, this evidence is circumstantial and more information is needed to verify or refute the suggestion that an extensive plastron evolved in response to reduced oxygen in some aquatic habitats.

#### 4. DISCUSSION

Most elmid beetles (especially those in the subfamily Elminae) are poor fliers and usually fly for only a short period of time after the adults eclose. Because of this low flight potential, it is not surprising to find relatively few elmid taxa on islands. The number of elmid genera and species found on Hispaniola — six genera and eight species (number of species in parentheses): Elminae: *Anommatelmis* (1), *Cylloepus* (2), *Lemalelmis* (2), and *Neoelmis* (1); Larinae:

*Hispaniolara* (1) and *Phanocerus* (1) — is greater than the number of elmid taxa known from any of the other Greater Antillean Islands (Cuba, four genera and five species; Jamaica, one genus, one species; and Puerto Rico, three genera and four species). These new phreatic taxa are closely related by external morphology to the elmine *Cylloepus haitianus* (Darlington, 1936) and apparently are derived from this Haitian species. The discovery of these highly derived phreatic taxa on Hispaniola provides an opportunity to study an interesting phase in the evolution of island elmids.

The complete loss of the eyes, reduced elytral costae, reduction of tibial cleaning tufts from all tibiae except the protibiae, and the extension of the plastron onto the dorsal surface are character states found on *Anommatelmis botosaneanui* that suggest the ancestors of that species probably entered the hypogean habitat long before the ancestors of *Lemalelmis minyops* and *L. fontana*. The species of *Lemalelmis* have moderate or distinct elytral costae, cleaning tufts present on all tibiae, and the normal ventral plastron, all of which are character states found on their epigeal relatives on Haiti. However, the greatly reduced eyes found in *Lemalelmis* are unlike the normal eyes present on the epigeal forms.

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#### ADDENDUM

After this manuscript was in press I was able to visit Haiti for a week to try to collect additional specimens of these stygobiont elmids and other aquatic Coleoptera. Because of a

tropical storm and subsequent floods in the southern peninsula it was impossible to drive to the type-locality of *Lemaelmis*. However, a large series of *Anommatelmis botosaneanui* was collected in the northern peninsula and they are included here as additional paratypes. Some of these paratypes will be distributed to institutions and individuals in addition to those listed previously.

Haiti, Département du Nord: Camp Coq, well beside École Communautaire, 13 Sept. 1981, P. J. Spangler and R. A. Faitoute, 1 male and 1 female; Limbé, Hôpital Le bon Samaritain, well on hospital grounds, 14 Sept. 1981, P. J. Spangler, R. A. Faitoute, and D. Hodges, 52 males, 58 females.

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