STUDIES ON THE FAUNA OF CURAÇAO AND OTHER CARIBBEAN ISLANDS: No. 36.

THYSANURA AND MACHILIDA OF THE LESSER ANTILLES AND NORTHERN SOUTH AMERICA

by

P. WYGODZINSKY
(Instituto Miguel Lillo, Tucumán)

The present study is based on material obtained by Dr. P. WAGENAAR HUMMELINCK on his various trips to the Caribbean, the greater part of which was received from the Zoölogisch Museum at Amsterdam, where the types and most of the other specimens are deposited. Mr. R. H. COBBEN, entomologist of the Landbouwhogeschool at Wageningen, who collected on the Netherlands Antilles in 1956, was also kind enough to let me have his material for study.

The following species are now known to occur in the area under consideration:

Order THYSANURA
- Family NICOLETIIDAE
  - *Grassiella* sp.
- Family LEPISMATIDAE
  - *Lepisma saccharina* L.
  - *Isolepisma horni* Stach
  - *Ctenolepisma hummelincki* sp.n.
  - *Ctenolepisma reducta* Folsom
  - *Ctenolepisma targioniana* Silvestri
  - *Ctenolepisma versluysi* Escherich
  - *Ctenolepisma dubitalis* sp.n.
  - *Acrotelsa collaris* (F.)
  - *Stylifera gigantea* (Escherich)
  - *Stylifera impudica* (Escherich)

Order MACHILIDA

Family MEINERTELLIDAE

Neomachilellus sp.

Meinertellus xerophilus sp.n.

Meinertellus margaritae sp.n.

Notes on the distribution of each species will be given in the text, and a general discussion of the subject follows at the end of the paper.

Dr. HUMMELINCK has informed me that only during his visit to the Leeward Group in 1936/37 did he purposely try to obtain a representative series of *Thysanura*. His other material from this region, as well as his finds in other localities, must be considered as having been collected more or less incidentally.

Most of the localities have been briefly described in the first, second, and fourth volumes of the present series; localities dated 1955 will be dealt with in a forthcoming "Third List of Localities".

All figures (with the exception of the map) have been drawn by the author.

Order THYSANURA

The *Thysanura* found in the present material can be determined as follows:

1. Eyes absent; body limuloid in shape, golden yellow in colour.. *Grassiella* sp.
- Eyes present; body elongate, whitish in colour, often with violaceous hypodermal pigment; scales generally dark . . 2
2. Last tergite sharply pointed apically, with more than 1 + 1 bristle combs (figs. 34, 49) 3
- Tergite X not sharply pointed apically, with only 1 + 1 bristle-combs (figs. 10, 14, 26) 5
3. Median portion of thoracic sterna covered by coxae, prosternum with tuft of large setae centrally on disc; male with parameres . . . . . *Acrotelsa collaris* (F.)
- Median portion of thoracic sterna not covered by coxae, prosternum without central tuft of large setae; males without parameres 4
4. Abdominal sternites with 2 + 2 bristle-combs at hind border, one at each side of insertion of stylets, the latter in more than two pairs; gonapophyses of females without fossorial spines *Stylifera gigantea* (Esch.)

– Abdominal sternites with 1 + 1 bristle-combs at hind border, mesad of insertion of stylets, the latter in two pairs only; gonapophyses of females with fossorial spines (figs. 29–33). . *Stylifera impudica* (Esch.)

5. Large setae bare, often bifid or trifid apically 6
– Large setae feathered or barbed (figs. 24, 36, 46) 7
6. Abdominal sternites with median bristle-combs in addition to sublateral ones; abdominal tergites with only 1 + 1 bristle-combs in addition to isolated macrochaetae; ovipositor of female hardly extends beyond apex of inner processes of coxites IX; two pairs of stylets; tergite X rather elongate, distinctly longer than wide . . . . . *Lepisma saccharina* L.
– Abdominal sternites without median bristle-combs; abdominal tergites on several segments with 2 + 2 bristle-combs in addition to isolated macrochaetae, even when the bristle-combs are composed of two or three macrochaetae only; ovipositor of female extends far beyond the apex of inner processes of coxite IX; tergite X rather short, subsemicircular, shorter than wide . . . . . *Isolepisma horni* (Stach)
7. Last tergite subtriangular, strongly salient apically (figs. 1, 10) *Ctenolepisma hummelincki* sp.n.
– Last tergite subtrapezoidal or broadly rounded apically . . 8
8. Last tergite subcircular; 3 + 3 bristle-combs on abdominal tergites II–VI . . . . . *Ctenolepisma versluysi* Escherich
– Last tergite of different shape; distribution of bristle-combs on abdominal tergites different 9
9. 3 + 3 bristle-combs present on abdominal tergites II–VII or II–VIII; ovipositor of female with fossorial spines (figs. 29–33) *Ctenolepisma dubitalis* sp.n.
– 3 + 3 bristle-combs present on abdominal tergites II–V only; ovipositor of female without fossorial spines. 10
10. 2 pairs of stylets in both sexes. . *Ctenolepisma reducta* Folsom
– 3 pairs of stylets in both sexes *Ctenolepisma targioniana* Silv.

Grassiella sp.

Los Testigos. *Isla de Conejo*, sta. *165*, entrance of small cave in porphyritic rock, 17.VI.1936 (1 ♀).

This specimen is not well enough preserved for specific identification. *Grassiella* is widely distributed over the whole of the neotropical region.

It is interesting to note that the family *Nicoletiidae*, to which *Grassiella* belongs, is represented here by a single specimen only.

Lepisma saccharina L., 1758

ST. MARTIN. Mullet Pond Bay, sta. *610*, limestone debris, 27.VI.1955 (1 ♂).

The common European household *Lepisma* is rare in the tropics; the single specimen found among the abundant material examined again confirms this.

Isolepisma horni (Stach, 1933)

ARUBA. Boca Grandi, sta. *253*, sandy leaf decay on limestone, 5.I.1937 (numerous ♂♂ and ♀♀). Spaansch Lagoen, *262B*, neglected aloes, 1.I.1949 (3 ♀♀). Seroe Canashito, *266*, limestone debris with dead Agave, 7.XII.1936 (1 ♂). *Bucuti*, *278A*, coral shingle with sandy leaf decay of Conocarpus, 17.I.1949 (numerous ♂♂ and ♀♀).

CURAÇAO. Jack Evertszberg, sta. *214*, limestone debris with little leaf decay, 10.X.1936 (1 juv.). Top of Seroe Christoffel, *234a*, 360 m, dry leaf decay between pieces of chert, 24.X. 1948 (3 juv.). Seroe Christoffel, *235A*, 300 m, leaf decay, 23.XII.1948 (several specimens). Baranca Martha Koosje, *344*, decaying Agave, 24.VIII.1948 (1 ♂). Seroe Gracia, *349*, 230 m, cherts with leaf decay of Coccoloba, 17.VIII.1948 (3 juv.).

BONAIRE. Lima, sta. *305*, leaf decay of Coccoloba and Hippomane on limestone, 5.IX.1948 (several juv.). Boca Onima, *310*, decay of Hippomane on sand, 19.IX.1948 (10 ♂♂ and ♀♀).

LAS AVES. *Ave de Barlovento*, sta. *179A*, clumps of Cyperaceae of sandy beach vegetation, 27.VII.1936 (3 spec.).

LOS ROQUES. *Cayo de Agua*, sta. *178*, dead trunk of Cocos in sandy beach vegetation, 26.VII.1936 (2 ♀♀).

ORCHILA. *Huespén*, sta. *174*, scanty leaf decay of Cordia in fissures of granitic rock, 23.VII.1936 (2 ♂♂ 1 ♀).

LOS HERMANOS. Morro Fondeadero, sta. *169*, pieces of hornblende rock, 20.VII.1936 (1 ♀).

LOS TESTIGOS. *Chiwo*, sta. *159*, granitic rock with some leaf decay, 15.VI.1936 (1 ♂ 3 ♀♀).

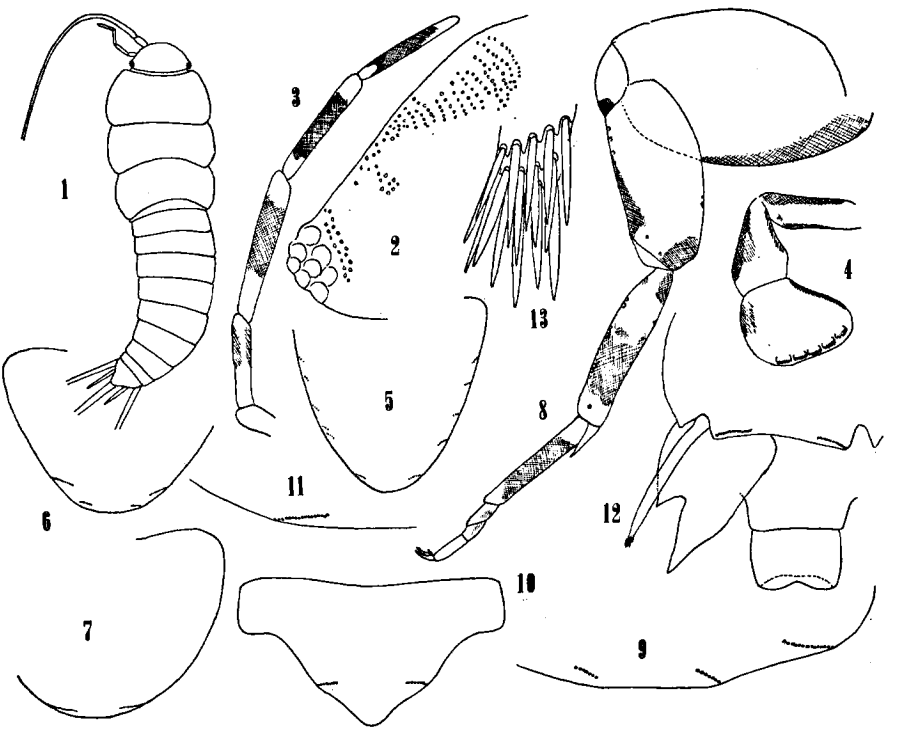
This species, which is quite common here, was formerly known only from Ecuador (Bahía de Carracas). Though the specimens are not too well preserved, they agree perfectly with the original description based on a single female. The stylet is somewhat more slender than in the figure given by STACH (1933); the male likewise possesses a single stylet only.

Ctenolepisma hummelincki sp.n.

Male. — Maximum length of body 9 mm. Body yellowish white, with rather intense violaceous hypodermal pigment on various parts of body and appendages: margins of head dorsally; 1 + 1 spots on clypeus and labrum; maxillary and

labial palps as in figs. 3 and 4; sides and apical border of scapus of antennae; flagellum entirely pigmented; lateral borders of thoracic nota; legs as in fig. 8; spical segments of abdomen, tenth tergite on apical two thirds, stylets entirely; pigmentation of caudal appendages unknown. Shape as in fig. 1; thorax distinctly though not very much wider than abdomen, two thirds as long as the latter. Macrochaetae and scales as usual for the genus, the latter with very numerous delicate rays.

Shape and chaetotaxy of head as in figs. 1 and 2; eyes relatively small. Shape and relative measurements of maxillary and labial palps as in figs. 3 and 4; apical segment of the latter somewhat wider than long, its five sensory papillae arranged in a single row. Mandibles and antennae as usual for the genus, the antennae probably as long as the body.



Ctenolepisma hummelincki sp.n., male. — Fig. 1, general aspect, dorsally; fig. 2, half of anterior portion of head, with insertion of macrochaetae; fig. 3, maxillary palp; fig. 4, labial palp; fig. 5, prosternum; fig. 6, mesosternum; fig. 7, metasternum; fig. 8, hind leg, with insertion of macrochaetae shown on femur and tibia; fig. 9, lateral portion of hind border of tergite V; fig. 10, tergite X; fig. 11, lateral portion of hind border of urosternite V; fig. 12, genital segments with penis; fig. 13, setae of apex of stylet VIII.

Thorax as in fig. 1; outline of nota not continuous. Lateral borders of nota with 8–11 transverse bristle-combs, each composed of 2–4(–5) macrochaetae; hind borders with 1 + 1 sublateral bristle-combs each composed of 8–10 macrochaetae. Sterna as in figs. 5–7; prosternum subtriangular, broadly rounded apically, meso- and metasternum subsemicircular. Prosternum along its lateral borders with 5–6 + 5–6 bristle-combs composed of 4–6 sometimes irregularly arranged macrochaetae; mesosternum near hind border with 2 + 2, metasternum with 1 + 1 bristle-combs, the former composed of 8–10, the latter of up to 14 macrochaetae each. Legs of medium size; shape and pigmentation of hind legs as in fig. 8; the small spot on trochanter is often more conspicuous than the other pigment.

Abdominal tergite I with 1 + 1, II–VI with 3 + 3, VII and VIII with 2 + 2 and IX without bristle-combs. Infralateral combs with (8–)10–16, lateral and sublateral combs with 6–8 macrochaetae. Tenth tergite (figs. 1, 10) subtriangular, shorter than wide, apex narrowly rounded, sides slightly emarginate behind apex and before base; 1 + 1 subapical bristle-combs, each composed of 8–10 macrochaetae. Abdominal sternites I and II without, III–VIII with 1 + 1 sublateral bristle-combs, each composed of 16–20 macrochaetae. Three pairs of stylets, apically with a brush-like group of short stout spiniform setae (fig. 13). Shape of genital segment and penis as in fig. 12.

Caudal appendages not preserved.

BARBUDA. Highlands near Dark Cave, sta. *599*, under piece of limestone with little plant decay, 6.VII.1955 (1 ♂, holotype). Martello Tower, *596*, limestone detritus with sandy leaf decay, 8.VII.1955 (1 ♂, paratype). River Quarter W of Bull Hole, *597*, dried mud with pieces of limestone, 9.VII.1955 (1 ♂, paratype).

ST. KITTS. Brimstone Hill, SE limestone cliff, sta. *605*, debris of marly limestone with some plant detritus, 21.VII.1955 (2 ♂♂, paratypes).

It gives me particular pleasure to name this species after Dr. WAGENAAR HUMMELINCK, its collector, who has done so much to further knowledge of Caribbean zoology. *Ctenolepisma hummelincki* agrees with *C. versluysi* Escherich, 1905, and *C. pretoriana* Wygodzinsky, 1955, in the presence of three pairs of bristle-combs on tergites II–VI and three pairs of stylets. It can easily be distinguished from both these species by the peculiar shape of the tenth tergite.

Ctenolepisma reducta Folsom, 1923

LA GOAJIRA (Colombia). Uribia, sta. *288*, decay of Cereus on sandy sabana, 17.I.1937 (1 ♂).

ARUBA. Oranjestad, X.1949, A. D. Ringma coll. (1 ♀).

First described from Puerto Rico, *Ctenolepisma reducta* has also been recorded from the Marquesas (SILVESTRI, 1934).

Ctenolepisma targioniana Silvestri, 1908

PARAGUANÁ (Venezuela). Carirubana, sta. *279*, debris of marly limestone with little decay of Cercidium and Philoxerus, 15.II.1937 (1 ♂ 1 ♀). Cerro Transverso, E of Carirubana, *280*, under flat pieces of limestone with

very little decay, 16.II.1937 (3 ♂♂ 2 ♀♀). West of Santa Ana, *281*, under piece of sandstone with little decay of Aveledoa and Opuntia, 16.II.1937 (1 ♀).

CURAÇAO. Hofje Santa Barbara, sta. *327*, among decaying leaves of Hippomane on muddy soil, 14.VIII.1948 (2 ♂♂).

MARGARITA. Punta Mosquito, sta. *152*, under pieces of limestone, 4.VI.1936 (2 ♂♂ 2 ♀♀).

CUBAGUA. North-west shore, sta. *130*, debris of marly limestone with next to no plant decay, 21.V.1936 (1 ♂ 1 ♀).

Originally known from East Africa, *Ctenolepisma targioniana* has also been recorded from Brazil (Pernambuco) and Venezuela (Guárico).

Only detailed study of topotypical material of this and the preceding species will show whether they are really different.

Ctenolepisma versluysi Escherich, 1905

LA GOAJIRA (Colombia). Punta Tucacas, sta. *285*, leaf decay of sandy beach vegetation, 14.I.1937 (1 ♂).

ARUBA. Rooi Prins, sta. *246*, schists with some decay of Bontia, 9.I.1937 (3 ♂♂ 1 ♀). Dunes of Boca Prins, *247B*, sandy leaf decay of Coccoloba, 26.VIII.1949 (1 ♀). Vader Piet, *252*, diabase debris with next to no plant decay, 9.II.1937 (4 ♂♂ 2 ♀♀). Fontein, *252A*, diabase debris, 9.II.1937 (1 ♂ 4 ♀). Culebra, *254*, limestone debris with practically no plant decay, 5.I.1937 (1 ♀). Seroe Corrá, *254A*, under pieces of limestone, 2.V.1955 (1 ♂ 1 ♀). Rooi Lamoenchi, *257*, decaying leaves of Cocos, 29.XII.1936 (1 ♂). Sabana Blancoe, *362*, under tufa crusts and limestone debris in Aloe field, 31.XII.1948 (3 ♂♂ 2 ♀♀). Cuba Cubai, 25.IV.1957, R. H. Cobben coll. (2 ♂♂ 1 ♀).

CURAÇAO. Top of Seroe Ronde Klip, sta. *201*, 125 m, under limestone slabs with little leaf decay, 20.X.1936 (1 ♂). Top of Seroe Christoffel, *234a*, 360 m, among cherts with leaf decay, 24.X.1948 (2 ♂♂).

KLEIN CURAÇAO. S of lighthouse, sta. *322*, under limestone among very scanty beach vegetation, 1.X.1948 (1 ♀).

LOS ROQUES. *El Gran Roque*, sta. *176*, between some Aloe plants on bare amphibolite rock detritus, 25.VII.1936 (1 ♂ 1 ♀).

BLANQUILLA. Valuchu, sta. *171*, under coral limestone with little leaf decay of Condalia and Croton, 21.VII.1936 (1 ♂).

LOS HERMANOS. Top of *Morro Pando*, sta. *170*, 200 m, under diorite boulders and in fissures with little plant decay, in dead Cephalocereus, 20.VII.1936 (about 12 ♂♂ and ♀♀).

LOS TESTIGOS. Top of *Tamarindo*, sta. *163B*, 200 m, among ferns and mosses on granitic rock, 16.VI.1936 (6 spec.).

ANTIGUA. East of Nelson's Dockyard, sta. *591*, among limestone debris, 13.VII.1955 (1 ♀). Parham Hill, *593*, marly limestone with scanty vegetation, 14.VII.1955 (3 spec.). Yepton Mill, *595*, rock detritus with small shrubs and grasses, 17.VII.1955 (2 ♂♂ 1 ♀).

ST. JOHN. Chocolate Hole, sta. *618A*, behind bark of Tamarindus, 19.VI.1955 (1 ♂).

Originally described from Blanquilla, this species was later also recorded from Mexico (Acapulco); it now proves to be one of the most common species of the region considered here.

Ctenolepisma dubitalis sp.n.

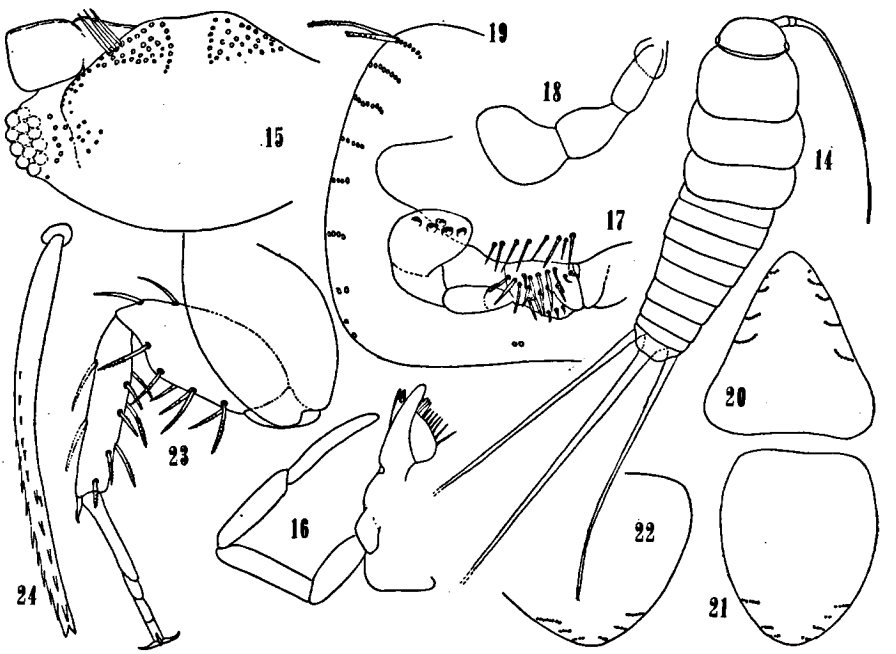
Length of body 9–10 mm. Body, mouth parts and legs yellowish white, antennae faintly, and caudal appendages more distinctly, annulated violaceous. Pattern formed by scales unknown; the latter are of two types, either large, with rather coarse, widely spaced rays, or smaller, with very numerous delicate rays. Macrochaetae delicately barbed (fig. 24).

Shape as in fig. 14; thorax almost as long as abdomen, only slightly wider than the latter.

Antennae longer than body, shape and chaetotaxy of segments as usual for the genus.

Mandibles strongly chitinized apically.

Maxillary palp slender, last article about as long as penultimate (fig. 16).



Ctenolepisma dubitalis sp.n. — Fig. 14, general aspect, dorsally; fig. 15, head with insertion of macrochaetae; fig. 16, maxilla with palp; fig. 17, labium with palp, female; fig. 18, labial palp of male; fig. 19, part of pronotum; fig. 20, prosternum; fig. 21, mesosternum; fig. 22, metasternum; fig. 23, hind leg, with macrochaetae shown on femur and tibia; fig. 24, macrochaetae of tibia.

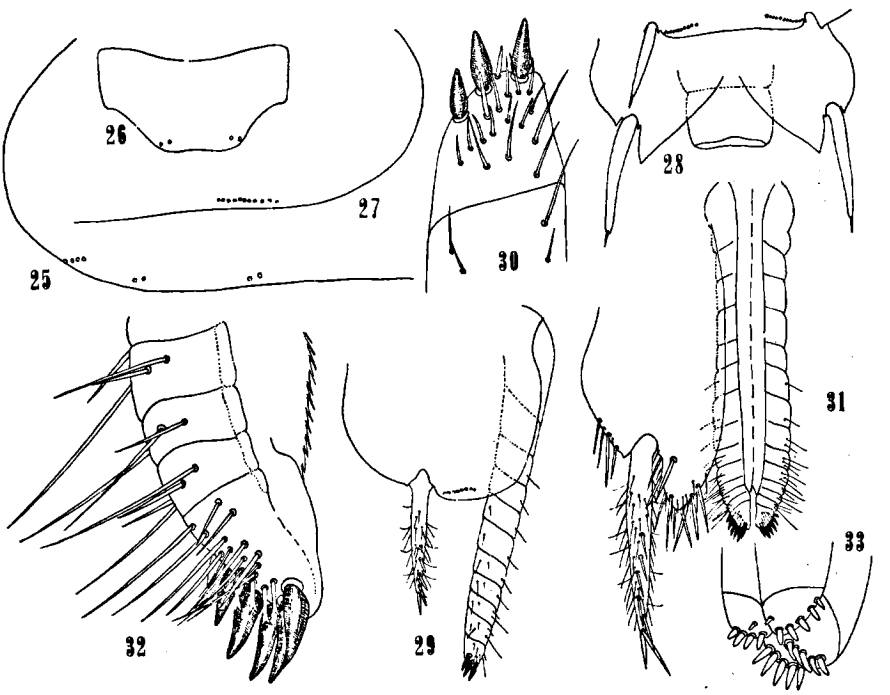
Shape and chaetotaxy of labium as in fig. 17; palps of male and female with apical segment slightly wider than long, bearing 5 sensory papillae of usual type.

Thorax as described above, lateral borders of nota not continuous, the latter each with 5–8 lateral bristle-combs composed of 2–8 macrochaetae (fig. 19). Hind border of nota with 1 + 1 sublateral bristle-combs, each composed of 3 macrochaetae.

Prosternum (fig. 20) subtriangular, almost pointed apically, with 4 + 4 lateral bristle-combs each composed of 4–8 macrochaetae, the anterior combs larger than the posterior ones. Mesosternum suboval, metasternum broadly triangular, each with 3 + 3 lateral bristle-combs composed of 3–8 macrochaetae (figs. 21, 22).

Legs moderately slender, shape and distribution of macrochaetae on femur and tibia of hind legs as in fig. 23. Claws of normal size. Tarsus four-segmented.

Abdominal tergite I with 1 + 1, II–VIII (II–VII in one specimen observed) with 3 + 3, IX without bristle-combs. Number of macrochaetae in infralateral bristle-combs 4–6, in lateral and sublateral bristle-combs (1–)2. Tergite X (figs. 14,



Ctenolepisma dubitalis sp.n. — Fig. 25, lateral portion of tergite V; fig. 26, tergite X; fig. 27, lateral portion of urosternite V; fig. 28, genital segments and penis of male; fig. 29, coxite VIII with anterior gonapophysis of female; fig. 30, apex of gonapophysis VIII; fig. 31, coxite and gonapophysis IX; fig. 32, apex of posterior gonapophysis; fig. 33, apex of ovipositor, only fossorial spines shown.

26) shorter than wide, broadly truncate and very slightly emarginate at apex, with 1 + 1 bristle-combs each composed of 2 macrochaetae.

Urosternites I and II without, III–VIII with 1 + 1 sublateral bristle-combs, each composed of (8–)10–12 macrochaetae; disc of inner process of coxite IX of female with one isolated macrochaeta (fig. 31). Two pairs of stylets, in both sexes, their shape and chaetotaxy as in figs. 28, 29, 31.

Genital segments and penis of male as in fig. 28; parameres absent.

Ovipositor of female short and stout, hardly extending beyond apex of inner processes of coxite IX; maximum number of segments of gonapophyses 14, their shape and chaetotaxy as in figs. 29–32. Hairs short and not very numerous. Apical segment of anterior gonapophyses bears 3(–6) fossorial spines; apical segment of posterior gonapophyses bears 5–7 fossorial spines; apical segment of posterior gonapophyses also bears several short, apically bifid setae (fig. 32), in addition to the usual bristles. Posterior gonapophyses fused for most of their length.

Caudal appendages as long as body.

> KLEIN CURAÇAO. Eastern shore, sta. *321*, flotsam with dried algae on debris, 1.X.1948 (1 ♀ holotype, 4 ♀♀ paratypes). South of lighthouse, *322*, under stones with very scanty beach vegetation, 1.X.1948 (1 ♀ paratype).
> BONAIRE. Zuidpunt, sta. *182*, under tufa crusts on salt clayish soil, 26.III.1937 (1 ♂ allotype, 3 ♂♂ 1 ♀ paratypes). Goto, *315*, under rocks with decay, chiefly of Ephydra pupae, along salt lake, 22.II.1949 (1 ♂).

Within the genus *Ctenolepisma* this species is rather aberrant, owing to the presence of numerous fossorial spines on the apical segments of both pairs of gonapophyses. In some African species the apical portion of the gonapophyses may be somewhat more strongly chitinized and spine-shaped, but nothing resembling the conditions in *dubitalis* is known in other species. *Leucolepisma* Wall, 1954, a genus endemic to the arid southwest of the United States, possesses an ovipositor not unlike that of the present species, but it differs from *Ctenolepisma* in its extremely elongated tarsal claws. *Acrotelsa* and *Stylifera* have females with fossorial spines, but the genera mentioned differ from all *Ctenolepisma* and from *Leucolepisma* in having an acutely triangular tenth tergite provided with more than 1 + 1 bristle-combs. It should be noted that *Ctenolepisma dubitalis* is marginal in relation to the known area of *Ctenolepisma*; such species are apt to show aberrant characters with regard to the main stock of the genus concerned.

C. dubitalis can be easily distinguished from the other known species of *Ctenolepisma* which also possess 3 + 3 bristle-combs on the eighth tergite (*plusiochaeta* Silvestri, 1922 and *C.* [*Sceletolepisma*] *arenicola* Wygodzinsky, 1955) by the structure of the female gonapophyses. In either sex, *dubitalis* also differs from *plusiochaeta* in its shorter tenth tergite; the presence of several pairs of bristle-combs on the metasternum; the absence of bristle-combs on the second sternite; and the absence of median bristle-combs on all abdominal sternites. *C. arenicola* is easy to distinguish from the new species by the presence of 2 + 2 bristle-combs on the first abdominal tergite and by the single pair of extremely short stylets.

As mentioned in the description, one specimen has been found (sta. 315) that possesses only 2 + 2 bristle-combs on tergite VIII. In all other characters this male agrees perfectly with the typical specimens; I therefore consider it to be a variant (individual?) of *dubitalis*. If keyed out in a key for the species of the genus,

this specimen would run to *laticauda* Silvestri, 1922; it differs from the latter in the same characters as were mentioned in the comparison with *plusiochaeta* Silvestri.

Acrotelsa collaris (Fabricius, 1793)

CURAÇAO. Cas Corá, Agr. Exp. Sta., sta. *331B*, 20.I.1949, A. C. J. Burgers coll. (2 ♀♀ 1 juv.). Piscadera Bay, in bungalow, 13.X.1936 (1 ♂).
BONAIRE. Kralendijk, in bungalow of Zeebad, 10.IV.1955 (1 ♀).
MARGARITA. Porlamar, sta. *155*, patio, 25.V.1936 (1 ♂). Porlamar, hotel room, 10.I.1936 (1 ♀).

This pantropical species, described originally by FABRICIUS from "Americae meridionalis insulis", was previously reported from Curaçao by ESCHERICH (1905).

Stylifera gigantea (Escherich, 1905)

Acrotelsa gigantea Escherich, 1905 — *Acrotelsa* (*Stylifera*) *galapagoensis gigantea* Stach, 1932 — *Acrotelsella gigantea* Wygodzinsky, 1952

NE VENEZUELAN CONTINENT. *Morro de Esmerarda*, sta. *124*, among sandy debris of schists near beach, with dead Opuntia, 10.VI.1936 (3 ♀♀). Morro de Chacopata, Araya, *127*, schists with some plant decay, 27.VI.1936 (1 ♂ 1 additional spec.).
LA GOAJIRA (Colombia). Cabo de la Vela, sta. *289*, pebbles of quartz schists with decay of Aloe and cow manure, 22.I.1937 (2 ♂♂ 3 ♀♀).
ARUBA. Seroe Canashito, sta. *266*, under pieces of limestone in abandoned Aloe field, 7.XII.1936 (1 juv.). Oranjestand, X.1949, A. D. Ringma coll. (2 ♂♂).
CURAÇAO. Groot Piscadera, sta. *334a*, Cocos grove, 10.I.1949, A. C. J. Burgers coll. (1 ♂). Groot Piscadera, *335*, decaying Swietenia, 27.I.1949 (2 ♂♂ 1 ♀).
BONAIRE. Tanki Onima, sta. *194*, under pieces of limestone on moist leaf decay of Conocarpus and Crescentia, 13.XI.1936 (9 spec.).
MARGARITA. Punta Mosquito, sta. *152*, under pieces of limestone without plant decay, 4.VI.1936 (2 ♀♀).
ST. THOMAS. Bolongo Bay, sta. *621*, rock debris with little decay, 17.VI. 1955 (1 ♂).

All specimens possess 7 pairs of stylets and greatly widened apical segments of labial palps.

This species was described originally from the Antilles (St. Thomas, Margarita, Cap Haiti); later it was also recorded from the dry coastal regions of Perú (WYGODZINSKY, 1952). A very closely related or perhaps even identical species occurs on the Galapagos Islands (see below).

STACH (1932) introduced the new subgenus *Acrotelsa* (*Stylifera*) for *Lepisma galapagoensis* Banks, 1901, the species mentioned above. This was the first effort made to subdivide the genus *Acrotelsa* Escherich, 1905, which at that time con-

tained rather heterogeneous elements. Two years later, SILVESTRI (1934), apparently ignoring STACH's paper, definitely subdivides *Acrotelsa*, creating *Allacrotelsa* gen.n. (for *Lepisma spinulata* Packard, 1872) and *Acrotelsella* gen.n., as the type of which he named *Acrotelsa producta* Escherich, 1905.

The type species of *Acrotelsella* and that of *Acrotelsa* (*Stylifera*) are very closely related, the main character differentiating them being the presence, in *Acrotelsa* (*Stylifera*), of 2 + 2 bristle-combs on several abdominal sternites, one at each side of the insertion of the stylets; *producta* and allied species possess only 1 + 1 bristle-combs. Though this character certainly represents a specialization within the present species complex, and is also accompanied by an increase in the number of stylets (a character which varies within the species [see WYGODZINSKY, 1952]), it is felt that the difference is not on the same level as those differences usually taken into account in defining genera in the present group of the *Lepismatidae*.

As *galapagoensis* doubtless differs generically from *Acrotelsa* sensu strictu, I herewith propose to elevate *Stylifera* to generic rank. Until evidence to the contrary becomes available, *Acrotelsella* should be considered a synonym of *Stylifera*.

Stylifera impudica (Escherich, 1905)

Acrotelsa impudica Escherich, 1905

Male and female. — Maximum length of body 11 mm. Shape of body as in fig. 34, rather slender, almost parallel-sided, thorax very slightly wider than abdomen. Scales of dorsal surface dark, scales of ventral surface light-coloured; exact pattern unknown. Colour of body yellowish white; hypodermal pigment violaceous, diffuse but distinct, on flagellum of antennae, maxillary palp (faintest on apical segment), labial palp (most intense on margins of segments), legs (on margins of coxa and trochanter, and over whole surface of tibia and tarsus), and apical portion of abdomen, especially on coxites VIII and IX, genitalia of both sexes, all over stylets, and on tenth tergite; caudal appendages rather dark violaceous, with narrow whitish annulations. Macrochaetae delicately but intensively barbed, pointed or bifid apically (figs. 36, 48). Scales either elongate oval, sometimes with rather irregular outlines, their rays very numerous and delicate, or transversely elliptical (fig. 41), with basal margin thickened and rays almost imperceptible.

Shape and chaetotaxy of head as in figs. 34 and 35.

Mandibles without special characters.

Maxillae as usual, shape and relative measurements of palps as in fig. 37. Labium and palps as in figs. 38 and 39, apical segment of the latter bears five normal-sized sensory papillae arranged in a single row; segment distinctly wider than long, more conspicuously so in the male (fig. 39) than in the female (fig. 38).

Antennae without special characters, about as long as the body.

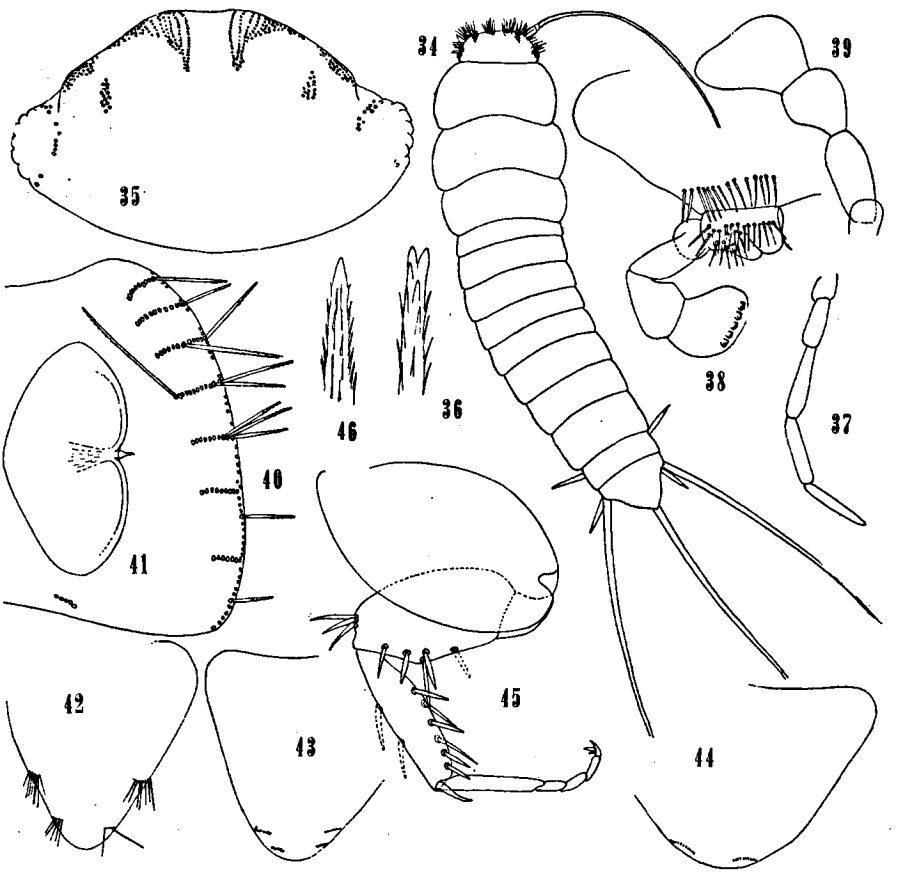
Thorax half as long as abdomen, distinctly detached from the latter, outlines of nota not continuous. Lateral borders of nota with 6–8 bristle-combs, each composed of 6–12 macrochaetae, the number decreasing from anterior to posterior combs. Hind border of nota with 1 + 1 sublateral bristle-combs, each composed of 4–5 macrochaetae (fig. 40).

Prosternum (fig. 42) rather narrowly triangular, with rounded tip; lateral borders with 2 + 2 bristle-combs, each composed of 6–9 macrochaetae; mesosternum

(fig. 43) of similar shape, though somewhat wider, likewise with 2 + 2 bristle-combs, both of which are situated near tip of sclerite; metasternum wider than long, broadly rounded apically, with 1 + 1 bristle-combs near apex (fig. 44).

Legs short; shape and chaetotaxy of hind legs as in fig. 45.

Shape of abdomen as in fig. 34. Tergite I with 1 + 1, II–VII with 3 + 3, VIII with 2 + 2 and IX without bristle-combs. Number of macrochaetae in infralateral bristle-combs 8–12, in lateral and sublateral bristle-combs 6–8. Tergite X (figs.



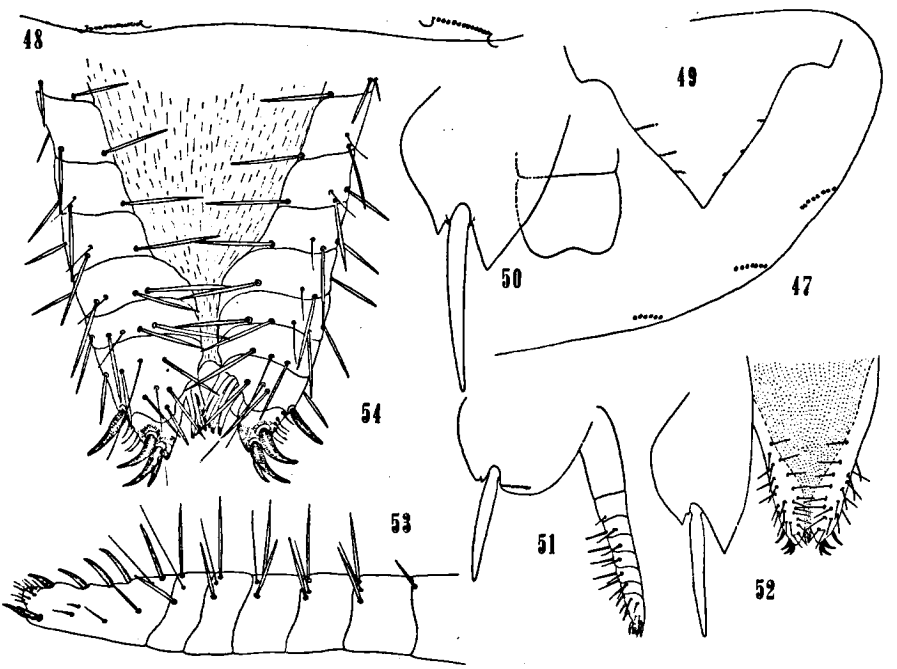
Stylifera impudica (Escherich). — Fig. 34, general aspect, dorsally; fig. 35, head, dorsally; fig. 36, apex of macrochaeta of head; fig. 37, labial palp; fig. 38, labium with palp of female; fig. 39, labial palp of male; fig. 40, lateral portion of pronotum; fig. 41, scale; fig. 42, prosternum; fig. 43, mesosternum; fig. 44, metasternum; fig. 45, hind leg, with macrochaetae shown on femur and tibia; fig. 46, apex of macrochaeta of tibia.

34, 49) triangular, pointed apically, its sides slightly but perceptibly outwardly curved, with 3 + 3 transverse bristle-combs (very rarely 2 or 4), each composed of 5–8 macrochaetae.

Sternites I and II without, III–VIII with 1 + 1 sublateral bristle-combs, composed of 10–14 macrochaetae (fig. 48). Stylets on segments VIII and IX, in both sexes; their shape as in figs. 50–52.

Shape of genital segment and penis of male as in fig. 50; parameres absent.

Ovipositor of female short and stout, not extending beyond inner processes of coxite IX, and protected by the latter; coxites VIII relatively small, not covering base of ovipositor. Anterior gonapophyses composed of I + 7–8 segments, the basal one bare, the second bearing a short bristle, the remaining ones (with the exception of the apical segment) each bearing two stout spine-like setae and one long hair, last segment bearing apically 3–4 short fossorial spines (fig. 53), between which, at the extreme apex, there is a small membraneous projection beset with numerous tiny setae; lateral border of last segment bears a series of spine-like setae intermediate in shape and size between apical fossorial spines and spine-like setae of other segments. Posterior gonapophyses connected throughout almost their whole



Stylifera impudica (Escherich). — Fig. 47, lateral portion of urotergite V; fig. 48, hind border of urosternite V; fig. 49, tergite X; fig. 50, coxite IX of male, with stylet and penis; fig. 51, coxite VIII of female, with anterior gonapophysis; fig. 52, coxite IX of female, with gonapophysis; fig. 53, apical segments of anterior gonapophysis; fig. 54, apical segments of posterior gonapophysis.

length, their apex strongly sclerotized (fig. 54), beset with 4–6 rather long, curved, hook-shaped, outwardly directed fossorial spines and several short bristles; remaining segments, to about middle of gonapophyses, each bearing numerous inwardly and outwardly directed spine-like setae and one or two delicate hairs; region immediately above end of connecting membrane bearing 4 + 4 spine-like, apically slit structures.

Caudal appendages about as long as body.

PARAGUANÁ (Venezuela). Moruy, sta. *283*, sandy debris of gabbroid rocks with little plant decay, 18.II.1937 (1 ♂ 1 ♀).

ARUBA. Rooi Prins, sta. *246a*, schists with leaf decay of Bontia, 26.VIII. 1949 (1 ♂). Rooi Francés, *263*, rock debris with plant decay, 6.I.1937 (1 ♀). Seroe Canashito, *266*, limestone debris with dead Agave, 7.XII.1936 (1 ♂). Hofje Fontein, *359*, among leaf decay, 30.XII.1948 (1 ♀). Sabana Blancoe, *362*, neglected Aloe field, 31.XII.1948 (1 ♂ 1 ♀). Eagle Petroleum Company, sink hole, *562*, plant decay with residual soil, 11.VIII.1955 (1 ♀). Oranjestad, X.1949, A. D. Ringma coll. (1 ♂). Cuba Cubai, 25.IV. 1957, R. H. Cobben coll. (1 ♂).

CURAÇAO. Seroe Pretoe, sta. *213*, limestone debris, 9.X.1936 (2 ♂♂). Koenoekoe Abau, *222a*, under piece of sandy shale, and on Caesalpinia, 20.VIII.1948 (2 ♀♀). Seroe di Cueba, *228*, pieces of coral rock among scanty shrubs, 29.X.1936 (1 ♀). Seroe Christoffel, *235A*, 300 m, among leaf decay and mosses, 23.XII.1948 (1 ♀). Rooi Sánchez, Knip, *236*, 190 m, moist leaf decay, 11.XI.1936 (1 ♀). Groot Piscadera, *334*, Cocos grove, 27.I.1949 (1 ♂). Kleine Berg, *343*, limestone with leaves of Coccoloba, 24.VIII.1948 (3 ♂♂). Baranca Martha Koosje, *344*, decay of Agave on limestone, 24.VIII.1948 (1 ♀). Rooi Beroe, Savonet, *351*, plant decay and mosses on cherts, 23.XII.1948 (3 ♂♂ 2 ♀♀). Seroe Baha So, *353*, 110 m, limestone debris with goat faeces, 16.II.1949 (2 ♂♂ 3 ♀♀). Pos di Wanga, central Curaçao, rock debris, 2.III.1955 (2 ♀♀). Curaçao, 10.XI.1956, R. H. Cobben coll. (5 spec.).

KLEIN CURAÇAO. South of lighthouse, sta. *322*, under pieces of limestone with scanty beach vegetation, 1.X.1948 (1 ♀).

BONAIRE. Fontein, sta. *190B*, fissures of coral limestone escarpment, 11.IX.1948 (1 ♀). Fontein, *191*, under debris of brickwork, 30.III.1937 (1 ♀). Hofje Fontein, *193*, under debris on irrigated fruit plantation, 30.III.1937 (1 ♀). Lima, *305*, leaf decay of Coccoloba and Hippomane on limestone, 5.IX.1948 (1 ♂ 1 ♀). Wecua, near Slagbaai, *316*, pieces of diabase with very little plant decay, 23.II.1949 (1 ♂ 1 ♀).

MARGARITA. Paraguachí, sta. *135*, some leaf decay in fissures of gneiss, 13.V.1936 (1 ♀). Matasiete, *137*, 150 m, some leaf decay of Caesalpinia between disintegrated granitic rock, 27.V.1936 (1 ♂ 1 ♀).

LOS FRAILES. *Puerto Real*, sta. *167*, under diabasic rock fragments with decay and goat manure, 18.VI.1936 (2 juv.).

LOS TESTIGOS. *Morro de la Iguana*, sta. *158*, 100 m, sandy decay of Croton and Cereus on granitic rock, 14.VI.1936 (1 ♂ 1 ♀). *Tamarindo*, *162*, 150 m, under debris of granitic rock among plant decay (2 ♂♂).

TRINIDAD. *Chacachacare*, sta. *579*, beach vegetation, 11.I.1955 (1 ♂).

I identify the specimens examined with the species described somewhat summarily by ESCHERICH (1905), though some details do not seem to agree completely. *Stylifera impudica* was known only from Santa Marta, Colombia; the specimens now seen were collected on the South American mainland as well as on the Caribbean Islands, and even on one of the Boca Islands of Trinidad.

Order MACHILIDA

Only the family *Meinertellidae* is represented in the area under consideration; the genera and species known can be keyed out as follows:

1. Apex of last tarsal segment ventrally with a compact brush of short dark hairs (figs. 64–66) 2
– Apex of last tarsal segment without the group of hairs mentioned *Neomachilellus* sp.
2. Third tarsal segment distinctly longer than wide (figs. 77, 78); labial palp of male with numerous pigment spots (fig. 76) . . . *Meinertellus margaritae* sp.n.
– Last tarsal segment not distinctly longer than wide; labial palp of male lacking pigment (fig. 63) . . *Meinertellus xerophilus* sp.n.

Neomachilellus sp.

BARBUDA. Darby's Cave sinkhole, sta. *600*, limestone debris with plant decay, 10.VII.1955 (1 ♀).

This is a not quite adult specimen, which is not sufficiently well preserved for description.

Neomachilellus is widely spread over the neotropical region, from Mexico to Argentina. The species are usually restricted to rather moist habitats.

Meinertellus xerophilus sp.n.

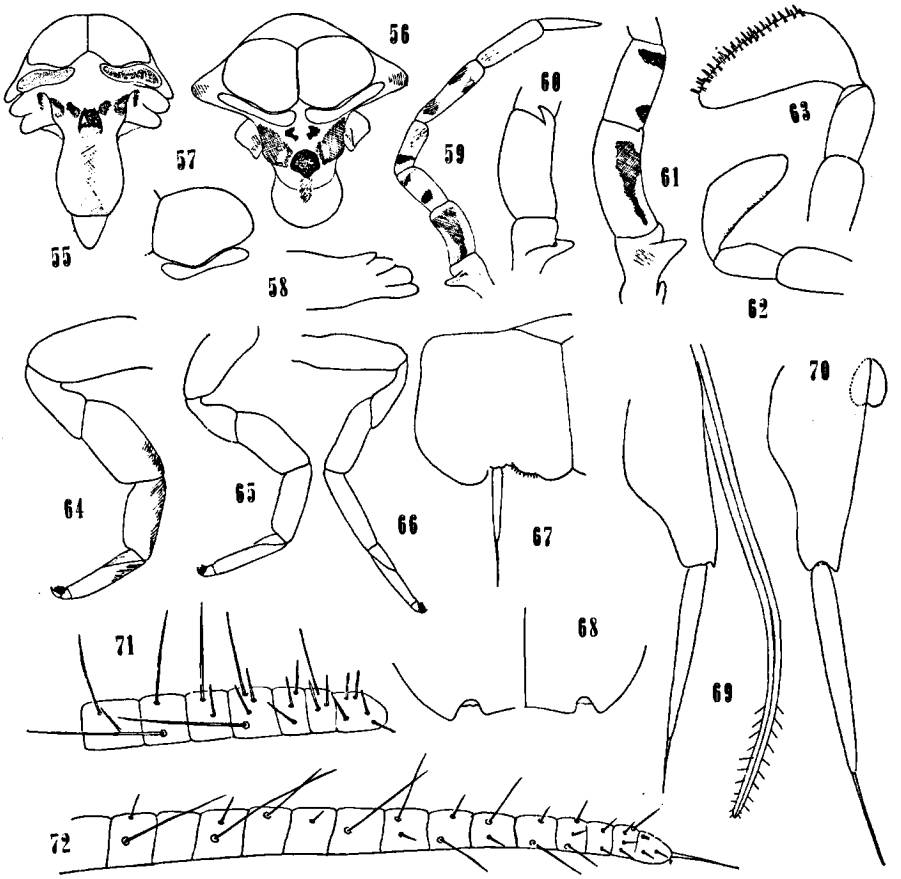
Maximum length of body 8 mm. Pattern formed by scales unknown. Hypodermal pigment on head and appendages.

Pattern of head of male as in fig. 55, of female as in fig. 56.

Pattern of eyes unknown. Relation length: width of eyes = 0.75; line of contact : length = 0.65. Ocelli sole-shaped (figs. 55, 56).

Antennae probably as long as body; scapus and pedicellus without or with very faint hypodermal pigment; flagellum whitish, intermediate jointlets clear brown.

Shape and pigmentation of maxillary palp of female as in fig. 59, of basal segments



Meinertellus xerophilus sp.n. — Fig. 55, head of male, frontal view; fig. 56, head of female, anterior view, somewhat inclined; fig. 57, eye and ocellus, lateral view; fig. 58, apex of mandible; fig. 59, maxillary palp of female; fig. 60, basal segments of maxillary palp of male, inner aspect; fig. 61, outer aspect; fig. 62, labial palp of female; fig. 63, labial palp of male; fig. 64, fore leg of female; fig. 65, fore leg of male; fig. 66, hind leg of male; fig. 67, urosternite V; fig. 68, urosternite VIII of male; fig. 69, coxite IX of female, with ovipositor; fig. 70, coxite IX of male, with penis; fig. 71, apex of anterior gonapophysis of female; fig. 72, apex of posterior gonapophysis.

of maxillary palp of male as in figs. 60 and 61. Second segment [1]) of palp of male bears a rather small hook-shaped process of simple structure apically on dorsal surface; specialized setae apparently absent.

Shape of labial palps of male and female as in figs. 62 and 63; apical segment very strongly widened in male; ventral surface of last segment of palp of female faintly pigmented.

Shape of legs as in figs. 64–66; last tarsal segment not longer than wide. Legs of male lacking pigment, pigmentation of first pair of legs of female as in fig. 64, somewhat less extended on second and less still on third pair. Spiniform setae of ventral surface of segment not perceptible.

Urosternites as in figs. 67–70. Hind border of segment VIII of male slightly emarginate (fig. 68). Setae and apical spine of stylets hyaline, the latter as long as, or longer than, half the length of stylet. Relative length of stylets : coxite, on segments

II–VII = 0.5
VIII = 0.85
IX = 0.9

Penis of male small, as usual in the genus.

Ovipositor of female reaches apex of apical spines of stylets IX. Anterior and posterior gonapophyses with about 60 segments, the basal two thirds bare, the apical third with moderate number of short and long setae (figs. 71, 72); long apical seta absent or present.

ARUBA. Quadirikiri, sta. *249*, between leaf decay of Anthirrhoea, under pieces of limestone, 9.II.1937 (1 ♂, holotype, 1 ♀, allotype, 1 ♀, paratype). Baranco Alto, *260A*, diorite with little plant decay, 29.XII.1936 (1 ♀, paratype). Rooi Francés, *263*, limestone debris with decay, 6.I.1937 (11 ♀♀, paratypes). Santa Cruz, *269*, under pebbles of diorite with some decay of Opuntia, 21.XII.1936 (2 ♀♀, paratypes). Solito, *275*, abandoned Aloe field, 16.XII.1936 (1 ♀, paratype).

The genus *Meinertellus* is represented by several species in NE South America, and by one species in Indonesia.

Meinertellus xerophilus differs from the known species of the genus in the apical tarsal segment, which is not longer than wide. It is now obvious that, in the present genus, characters derived from the distribution of the hypodermal pigment are of prime importance for definition of the species; until the few taxa previously described have been critically re-examined from this point of view, complete comparison will remain difficult.

Meinertellus margaritae sp.n.

Male. — Length of body 6 mm. Hypodermal pigment present on head and appendages. Pattern formed by scales unknown.

Pigmentation of head as in fig. 73. Pattern of eyes unknown. Length: width =

[1]) Following BITSCH (1956) I now consider the machilid maxillary palp to be composed of seven segments.

0.85, line of contact: length = 0.45. Ocelli similar to those of foregoing species (not shown in drawing).

Antennae about as long as body; scapus and pedicellus show various pigment spots; flagellum whitish, intermediate jointlets clear brown.

Shape and pigmentation of basal segments of maxillary palp as in figs. 74 and 75; hook-shaped process of second segment rather large. Specialized setae apparently absent.

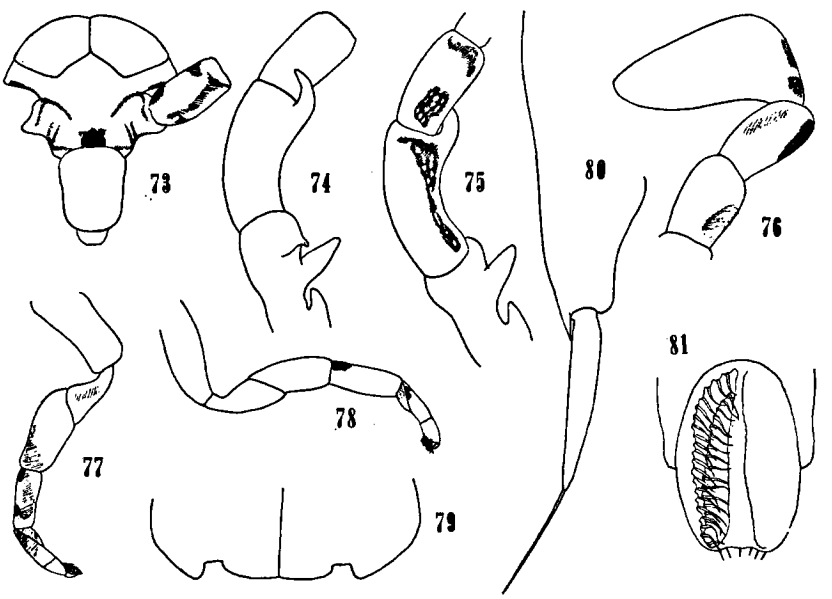
Shape of labial palp as in fig. 76, apical segment strongly widened. Pigmentation of palp intense and rather extensive (fig. 75).

Shape of legs as in figs. 77–78; last tarsal segment slightly but distinctly longer than wide. Spiniform setae not observable. Pigmentation of first pair as in fig. 77, of second pair similar but somewhat less extensive, of third pair as in fig. 78.

Hind border of urosternite VIII straight (fig. 79). Stylets and their chaetotaxy as in foregoing species. Stylet IX about four fifths as long as coxite.

Penis small, its shape and setae as in fig. 81.

MARGARITA. Toma de Agua del Valle, sta. *144*, 250 m, dense growth of shrubs and trees, in layer of decaying leaves with some antigorite debris, 4.VII.1936 (1 ♂, holotype).



Meinertellus margaritae sp.n., male. — Fig. 73, head, frontal view; fig. 74, maxillary palp, basal segments, inner surface; fig. 75, idem, outer surface; fig. 76, labial palp; fig. 77, fore leg; fig. 78, hind leg; fig. 79, urosternite VIII of male; fig. 80, coxite IX; fig. 81, penis.

Meinertellus margaritae is apparently very closely related to *M. xerophilus* described above; it differs from *M. xerophilus* in several characters, including distribution of the hypodermal pigment, which is not very extensive on the head but is much more so on the labial palp and the legs. The larger process of the second segment of the maxillary palp, and the relatively longer third tarsal segment, are equally useful differential characters.

Meinertellus sp.

CURAÇAO. Seroe Christoffel, sta. *235B*, 250 m, between decaying Bromelia, 23.XII.1948 (3 juv.).

These specimens are immature and cannot be identified specifically. It may be said, however, that they are very similar to *M. xerophilus* sp.n. from Aruba.

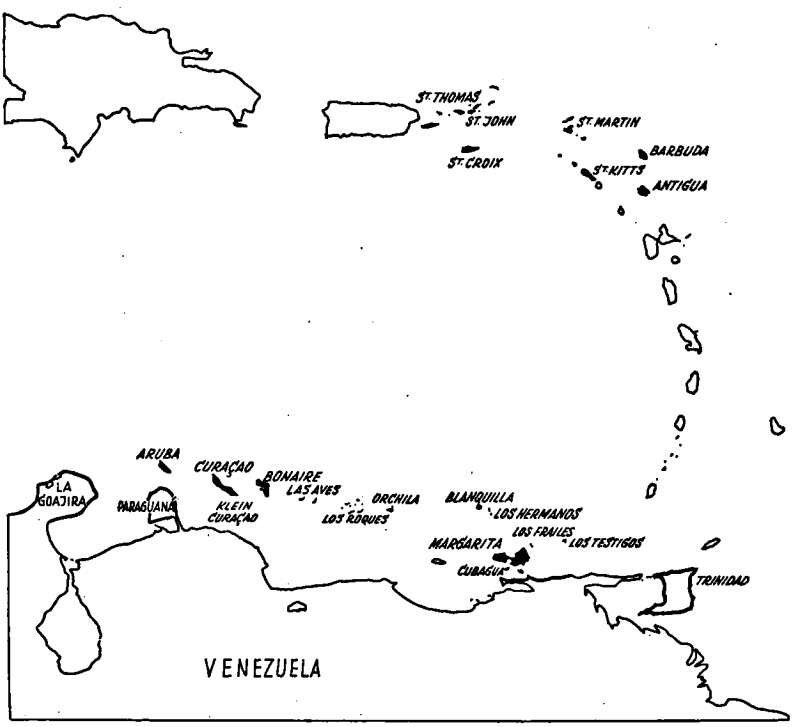


Fig. 82. Geographical distribution of the *Thysanura* and *Machilida* material treated in this paper.

TABLE 11.

Geographical distribution of the *Thysanura* and *Machilida* material treated in this paper.

Species	Leeward Group															Windward Group						S. Amer. mainland		
	Aruba	Curaçao	Klein Curaçao	Bonaire	Las Aves	Los Roques	Orchila	Blanquilla	Los Hermanos	Margarita	Cubagua	Los Frailes	Los Testigos	Trinidad		Antigua	Barbuda	St. Kitts	St. Martin	St. John	St. Thomas	La Goajira	Paraguaná	Est. Sucre
Grassiella sp.													×											
Lepisma saccharina																			×					
Isolepisma horni	×	×		×	×	×	×		×				×				×	×						
Ctenolepisma hummelincki sp.n.																								
Ctenolepisma reducta	×																					×		
Ctenolepisma targioniana		×								×	×												×	
Ctenolepisma versluysi	×	×	×			×		×	×				×			×				×		×		
Ctenolepisma dubitalis sp.n.			×	×																				
Acrotelsa collaris		×		×						×														
Stylifera gigantea	×	×		×						×											×	×		×
Stylifera impudica	×	×	×	×						×		×	×	×									×	
Neomachilellus sp.																	×							
Meinertellus xerophilus sp.n.	×	?																						
Meinertellus margaritae										×														

GEOGRAPHICAL DISTRIBUTION (See: table 11, and fig. 82)

The greatest numbers of species are found on the larger islands of the Leeward Group, viz. Curaçao (7), Aruba (6), Bonaire (5) and Margarita (5).

All the *Thysanura* known from the north coast of the South American continent are found on these islands; but the islands contain species which have not been collected on that part of the mainland, viz. *Acrotelsa collaris*, *Isolepisma horni* and *Ctenolepisma dubitalis*. The first two have been found in other parts of South America, and probably do occur on the north coast; only *Ctenolepisma dubitalis* seems to be endemic to Klein Curaçao and Bonaire. The species of *Thysanura* found on the smaller islands and island groups along the north coast of South America are the same that occur on the larger islands; one species has generally been collected on each island. An exception is *Grassiella* sp. from Los Testigos, which has not been taken anywhere else. A total of 9 species of *Thysanura* and 2 *Machilida* are now known to occur in the Leeward group.

The Windward Group appears to be poorer in species, but was, however, much less thoroughly explored for the presence of *Thysanura* and *Machilida*. A single *Machilida* (belonging to a genus different from that in the Leeward Group), and only four *Thysanura*, have been collected; two of the latter also occur in the Leeward Group, one (*Lepisma saccharina*) is an accidental introduction, and one is restricted to the northern part of the Windward group (*Ctenolepisma hummelincki*). In each island of the Windward group a single species of *Thysanura* has been found.

It is quite difficult to say how many of the *Thysanura* of the area examined are native to it (the species of *Machilida* are probably all native, though their genera are widespread). *Lepisma saccharina*, *Acrotelsa collaris*, *Ctenolepisma reducta* and *Ctenolepisma targioniana* are also found in other zoogeographical regions, though only the first can be said with absolute certainty not to have originated in the

Caribbean. *Stylifera gigantea* is also found in Peru (and probably the Galapagos Islands), *Ctenolepisma versluysi* is also found in Mexico, and *Isolepisma horni* in Ecuador. So far *Stylifera impudica*, *Ctenolepisma dubitalis* and *Ctenolepisma hummelinchi* have only been reported from the Caribbean, though, especially as regards the last two species, it would be premature to consider them as definitely restricted to this region.

REFERENCES

BITSCH, J., 1956. Considérations anatomiques sur le palpe maxillaire des Machilidae. *Trav. Lab. Zool.* Fac. Sc. *Dijon 15*, p. 1–9, 2 pls.

ESCHERICH, K., 1905. Das System der Lepismatiden. *Zoologica (Stuttgart) 18* (1–2) (Heft 43), p. 1–164, 67 figs., 4 pls.

FOLSOM, J. W., 1923. A new lepismid from Puerto Rico. *Proc. Ent. Soc. Washington 25*, p. 170.

SILVESTRI, F., 1934. Marquesan Thysanura. *Bull. Bernice P. Bishop Mus. 114*, p. 305–312, 4 figs.

STACH, J., 1932. Die Apterygoten aus den Galapagos-Inseln. *Nyt. Mag. Naturv. 71*, p. 331–346.

STACH, J., 1933. Heterolepisma horni n.sp. und die Zusammenstellung der Arten der Gattung Heterolepisma (Thysanura). *Anal. Mus. Zool. Pol. 9* (22), p. 341–349, 1 pl.

WYGODZINSKY, P., 1952. Apuntes sobre Thysanura americanas (Apterygota, Insecta). *Acta Zool. Lill. 11*, p. 435–458, 73 figs.