

STUDIES ON THE FAUNA OF CURAÇAO AND OTHER
CARIBBEAN ISLANDS: No. 182

MARINE OLIGOCHAETA (TUBIFICIDAE
AND ENCHYTRAEIDAE) FROM THE CARIBBEAN SEA

by

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This paper deals with annelid worms collected by Dr. P. WAGENAAR HUMMELINCK (Utrecht) in various Antillean coastal water environments.

The anatomy was studied by a combination of three methods: a) The animals were stained *in toto* by Mayer's Paracarmin and mounted in Canada Balsam; b) the animals stained by Paracarmin were dissected and the parts mounted in Canada Balsam; c) the first 20 segments were sectioned at 8 μ m and stained by Mallory's triple stain (PANTIN 1964: 41).

All specimens studied were clitellate ones; they have been deposited in the Department of Zoology of São Paulo, Brazil (ZU).

LOCALITIES

Aruba

- 1008 Spaans Lagoen, NW side; 1.I.1949; limestone shore of muddy lagoon with many algae, near *Rhizophora*; 0-1½ m.
 1010a Lagoen Master; 29.IV.1955; muddy pool; ¼-1 m.

Curaçao

- 1640 Spaanse Water, Spaans Lagoen; 1.XI.1968; sandy debris with corals; 3 m.
 1666 Awa di Oostpunt, 30 m from N shore; 22.II.1970; sand with scattered *Thalassia* on limestone with *Ptychodera*; 1/10 - ¼ m.
 1666A -, 30-50 m from N shore; 22.II.1970; sandy, *Thalassia* with *Porites*; ¼-1 m.
 1669 Rifwater, N shore at St. Elisabeth Gasthuis; 24.II.1970; sandy area of disturbed part of lagoon with *Halodule*, *Cassiopea*; 0-½ m.
 1670A -, near N shore at St. Elisabeth Gasthuis, 24.II.1970; mud on sand with shell debris near *Rhizophora*; 1 m.

Bonaire

- 1554 Lagoen, SW corner; 19.IX.1967; muddy *Avicennia* grove; 0-¼ m.
 1580 Lac, NE part, NW Puitu; 10.VIII.1967; soft mud with *Rhizophora* leaf decay; ¼-½ m.
 1596A -, S part, Boca Jewfish; 24.VIII.1967; sandy mud with decay; 2 m.
 1604 -, NW (saline) part, Punta Wanapa; 18.VIII.1967; creeks in *Salicornia*-flat near *Avicennia*, with *Batophora* and *Ruppia*; 0-¼ m.
 1647A -, Entrance, Cas di Meeuchi, S border; 28.X.1968; whitish sandy mud; 0-½ m.
 1647 Aa -, Entrance, Cas di Meeuchi, S border; 9.III.1970; greyish sandy mud with *Rhizophora*; 0-½ m.
 1653A -, S part, Sorobon, near Boca Jewfish; 10.III.1970; muddy sand with *Thalassia* and *Halimeda*; ¼-1 m.

Nevis

- 413 Fort Charles, S of Charlestown; 28.VI.1949; sandstone and coral sand, between and below wet algae, cast ashore.

Puerto Rico

- 1423 Bahía Fosforescente, central part; 17.IX. 1963; muddy bottom; 4-4½ m.
 1423A -. SW part; 17.IX. 1963; sandflat with *Thalassia* and *Halimeda*; 1-1½ m.

Maps with positions of the localities may be found in HUMMELINCK's description of localities (1953, 1977).

TUBIFICIDAE

***Peloscolex gabriellae* Marcus, 1950**

Peloscolex gabriellae MARCUS, 1950: 1, pl. 1, figs. 1-4.

ARUBA: 1008, 1 specimen (ZU-370).

CURAÇAO: 1640, 1 spec. (ZU-371).

There is some confusion about this species. It was described from 4 specimens collected in the sea at 5 m depth near São Sebastião, São Paulo, Brazil. BRINKHURST (1965: 133) enlarged the diagnosis of the species to include the new varieties *P. g. heterochaetus* from Halifax Harbour, Nova Scotia, and *P. g. nerthoides* from Tomales Bay and Point Richmond, California, and St. Andrews Bay, Bay County, Florida. BRINKHURST & COOK (1966: 71) corrected *heterochaetus* to *apectinata*; they indicated two subspecies: *typica* from Point Richmond, and *nerthoides* from San Francisco Bay, both in California. They do not mention the animals from Florida. BRINKHURST (1971: 512, 513) raised *apectinata* and *nerthoides* to species level, but he maintained the enlarged diagnosis of *gabriellae* (: 522). COOK (1970a: 980) indicated with doubts the occurrence of *P. gabriellae* in the Bermudas slope; Cape Cod, Massachusetts; San Francisco Bay, California; Eniwetok Atoll, Marshall Islands, Micronesia. So the only certain occurrence of *P. gabriellae* is the type locality. Our animals agree with MARCUS' description.

Limnodriloides bori sp. n.

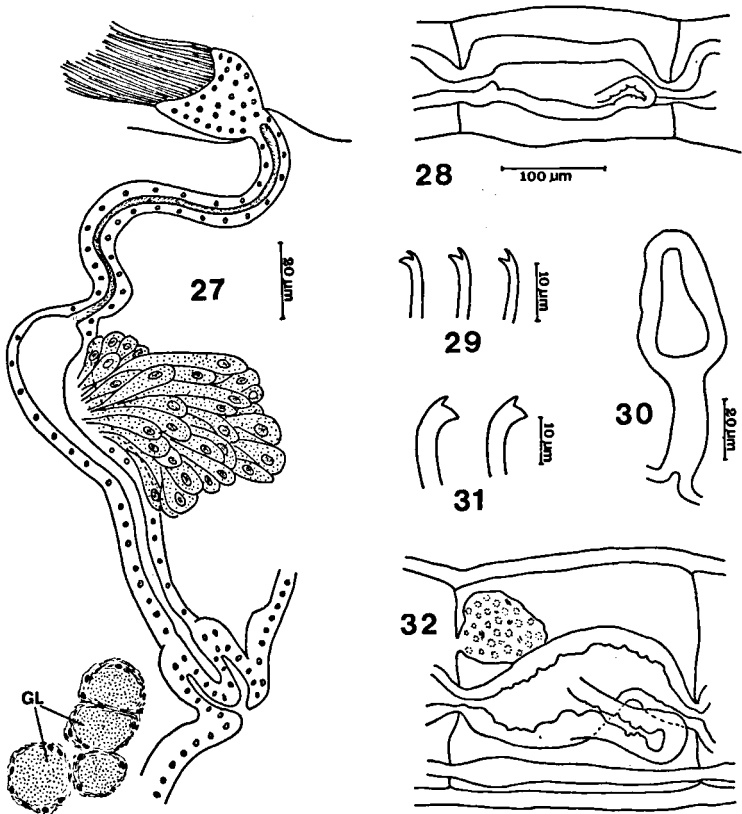
(Figs. 27–30)

BONAIRE: 1596, 12 specimens (ZU-372).

Length 8–11 mm, diameter in central body region 95–175 μm ; number of segments 47–58. Prostomium short and nearly conic. The setae are sigmoid, bifid; they are similar along the body (Fig. 29). Their upper tooth is as long as the lower, but thinner. In segments II–VIII the setae are implanted in the equator of the segments, from IX onward they originate from the posterior third of the segments. There are 2 setae per bundle in II–VII, and only 1 from VIII backward, except X and XII where they are replaced by spermathecal and male pores respectively. Clitellum on XI–1/3 XII.

Pharyngeal glands occur till segment V. From VI backward the intestine has a coating of chloragogen cells. The intestine has two retro-lateral diverticula of large lumen at the anterior third of IX (Fig. 28). Coelomocytes are absent. There are a pair of testes and spermathecae in X, and a pair of ovaries in XI. The spermathecal ampullae (Fig. 30) are well marked off from the ducts, which are as long as the greatest diameter of the ampullae. The spermatozoa are coiled inside the ampullae, more or less transverse. One pair of male funnels with a large tuft of spermatozoa is fastened to septum 10/11 (Fig. 27). Each slightly sinuous vas deferens runs up and backwards close to the ovaries, and it opens apically into the atrium. The diameter of the vasa deferentia varies from 6.25–8.75 μm , its length being the same as the corresponding atrium. The atrial chamber is pear-shaped and curved, its greatest diameter is between 12.5 and 18.75 μm . The prostate gland joins broadly on the ventral face of the atrium. The long and sinuous atrial duct is 6.25–9 μm wide. Its wall is formed by glandular cells, the granules of which stain blue by Mallory's technique. This duct ends in a conical penis of 7.5–13.75 μm long, with thin cuticular sheath. All specimens have the penis retracted.

Three or four pairs of voluminous glands (Fig. 27, GL) protrude into the body cavity at the posterior third of XI; probably they are related with reproduction. They open on the surface in two more or



Figs. 27–30. *Limnodriloides bori*: 27, male duct; 28, lateral view of segment IX, 29, setae of the segments II, VIII, and XV; 30, spermatheca. – Figs. 31–32. *Marcusaedrilus hummelincki*: 31, setae; 32, lateral view of segment IX. – GL = glands.

less longitudinal series, slightly dorso-lateral from the male pores. In sections we see that each gland has a connective sheath surrounding a homogeneous mass stained violet by Mallory's technique. It was not possible to recognize cell-boundaries.

Remarks: In its 2 setae per bundle anteriorly and 1 posteriorly *Limnodriloides bori* resembles *L. agnes* Hrabě, 1967 and *L. monothecca* Hrabě, 1975. The main characters distinguishing these species from *L. bori* are:

- *L. agnes*. Setae present in X. Vas deferens shorter than the remaining male duct. Copulatory organ is a pseudopenis. Spermathecae with cylindrical ampulla and inconspicuous duct.
- *L. monothecca*. Vas deferens shorter than the remaining male duct. Spermatheca unpaired, and dorsal.

The name of the new species is a corrupt form of "Boriken", an amerindian tribe from the region in which the material has been collected.

Marcusaedrilus, gen. n.

Diagnosis: Bifid setae only. Without differentiated genital setae. One pair of esophageal diverticula. Vasa deferentia almost as long as the atria, where they open apically. Each atrium broadly associated with a discrete prostate gland. The two atria join in an unpaired ejaculatory duct, which opens through a median ventral penial bulb. Penial sheath absent. Unpaired ventral spermatheca. Spermatophores and spermatozeugmas absent.

Type-species: *Marcusaedrilus hummelincki*, sp. n.

Remarks: *Marcusaedrilus* closely resembles *Limnodriloides* Pierantoni, 1904, and *Bohadschia* Hrabe, 1971, because of the presence of esophageal diverticula. The new genus can be distinguished by the unpaired ejaculatory duct and male pore.

The new genus is named in honour of Dr. EVELINE DU BOIS – REYMOND MARCUS.

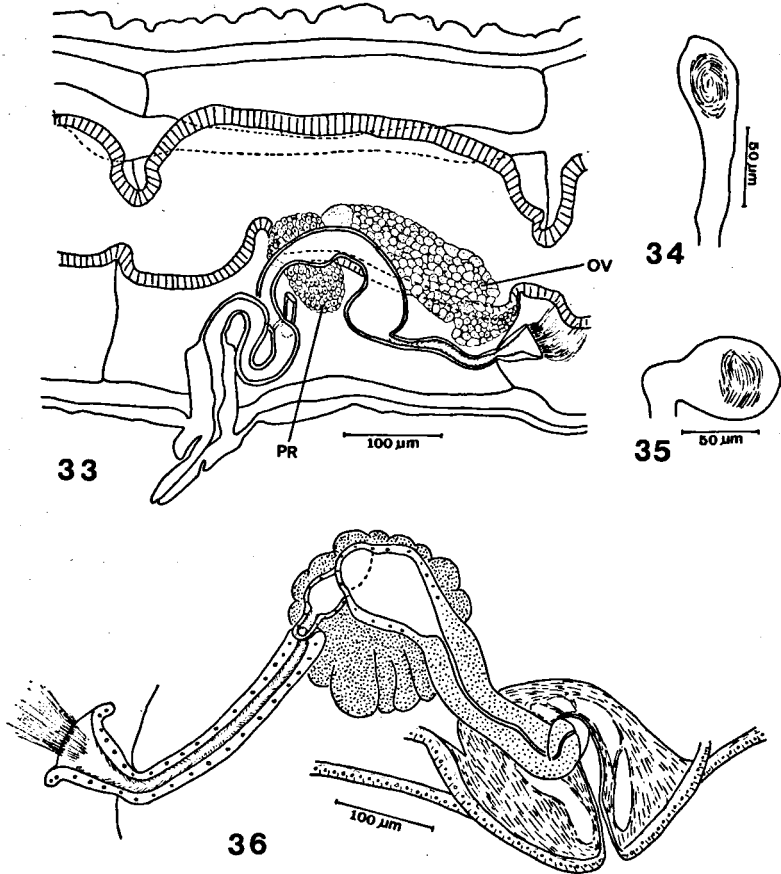
Marcusaedrilus hummelincki, sp. n.

(Figs. 31–35)

CURAÇAO: 1666, 9 specimens (ZU-373). – 1666A, 1 spec. (ZU-374).

PUERTO RICO: 1423A, 2 spec. (ZU-375).

Length 8–12 mm; diameter in the middle body region 0.22–0.35 mm; number of segments 45–60, without particularities on the surface. The setae are all bifid, with the upper tooth slightly thinner



Figs. 33–35. *Marcusaedrilus hummelincki*: 33, lateral view of segment XI; 34 and 35, spermathecae. – Fig. 36. *Curacaodrilus sinus*: male duct. – OV = ovary; PR = prostate gland.

and shorter than the lower one (Fig. 31). The number of setae per bundle in segment II is 2, in III–IX it is 2–3, rarely 4. In X there are 2 normally bifid setae per bundle; setae are absent in XI. In the postclitellar region there are 2 setae, rarely 1 seta per bundle. The spermathecal pore opens in the mid-ventral line of X, nearer to the setae than to intersegment 9/10. The unpaired male pore lies medio-ventrally in XI. The clitellum occupies segments XI–2/3 XII.

Pharyngeal glands appear in IV and V. Chloragogen cells begin in VI. One pair of latero-ventral esophageal pouches is found in IX; they may reach septum 9/10 (Fig. 32). One pair of testes is fastened on the posterior face of 9/10, and one pair of ovaries on 10/11. The pair of male funnels is small and bell-shaped; they are antero-ventrally attached to 10/11. From each funnel a wide and more or less straight vas deferens almost as long as the corresponding atrium originates (Fig. 33). The atria are formed by two ampullae disposed as an arch. The first and largest ampulla receives the vas deferens apically, and the smaller rear ampulla is associated with a discrete prostate gland. Each atrium is continued into a short duct, that opens together with the duct of the other side into a wavy ejaculatory duct associated with a penial bulb. The unpaired spermatheca (Figs. 34-35) has a rounded to ovoid ampulla in X. Spermatozoa are disposed more or less transverse inside the ampulla.

The name of the new species has been given in homage to Dr. P. WAGENAAR HUMMELINCK.

Curacaodrillus, gen. n.

Diagnosis: Bifid setae only. Modified genital setae may be present or not. Coelomocytes sparse or absent. Esophageal diverticulae absent. Vas deferens wide, somewhat shorter than remaining male duct; it opens entally into the atrium. The elongated pear-shaped atrium may end in a copulatory organ or not. A massive, not stalked prostate gland joins the atrium just posterior to the vas deferens. Spermathecae may be present or not. Spermatophores and spermatozeugmas not seen.

Type-species: *Curacaodrillus sinus*, sp. n. – Other species: *Limnodriloides roseus* Pierantoni, 1904, *L. pectinatus* Pierantoni, 1904, *Spiridion scrobicularae* Lastockin, 1937, *L. gurwitschi* Hrabe, 1971, *Thalassodrillus belli* Cook, 1974, and probably *Bohadschia pierantoni* Hrabe, 1971.

Remarks: In his revision of *Spiridion*, COOK (1969: 24) mentioned *S. scrobicularae* Lastockin, 1937, *S. roseus* (Pierantoni, 1904), and

S. pectinatus (Pierantoni, 1904) as "species dubiae". BRINKHURST (1971: 568) followed the same interpretation. HRABE (1971b: 216) did not accept this, and he transferred the last two species, with *Rhyacodrilus prostatus* Knöllner, 1935, and *Limnodriloides gurwitschi* Hrabé, 1971 to *Thalassodrilus*. The latter genus was erected by BRINKHURST (1963: 711) for *Rhyacodrilus prostatus*, which cannot belong to *Rhyacodrilus* as has been shown by MARCUS (1949: 9). *Thalassodrilus* is characterized by the junction of the massive prostate gland to the vas deferens, and by the lateral opening of the latter into the muscular pear-shaped atrium. For this reason the species *roseus*, *pectinatus*, *gurwitschi*, and *belli* cannot be placed in *Thalassodrilus*. More recently ERSÉUS (1975: 33) collected some animals identified as *Rhyacodrilus prostatus* on the West coast of Sweden. ERSÉUS verified that the prostate gland does not open into the vas deferens, but into the atrium, at their junction. He also found another prostate gland opening into the atrium ectally. Therefore he transferred *R. prostatus* to *Phallogdrilus*; thus *Thalassodrilus*, erected on account of false interpretations, must be rejected.

Spiridion has a pedunculate prostate, therefore it cannot include the species *scrobicularae*, *roseus*, *pectinatus*, and *gurwitschi*. *Torodrilus* presents a prostate gland broadly united to the atrium, as in *Curacaodrilus*; however its vas deferens is thin, and longer than the atrium (COOK, 1970b: 283). *Limnodriloides* and *Bohadschia* are well characterized by their esophageal diverticula. According to HRABE (1973: 36), the diverticula of *B. pierantonii* Hrabé can hardly be seen; if they are not present, the species should be transferred to *Curacaodrilus*.

KEY TO SPECIES OF *Curacaodrilus*

- 1 Spermathecae absent. 2
- Spermathecae present 3

- 2 Male pores on the apex of voluminous papillae. Prostate joins atrium ventrally. *C. sinus*, sp. n.
- Male pores not associated with papillae. Prostate joins atrium posteriorly *C. gurwitschi* Hrabé, 1971

- 3 Penial setae present 4
 – Penial setae absent. 5
- 4 Penial setae and male pores within an unpaired median genital chamber *C. scrobicularae* Lastockin, 1937
 – Penial setae on tubercles. Male pores at the side of the penial setae. *C. pectinatus* Pierantoni, 1904
- 5 Three setae in the postclitellar bundles
 *C. roseus* Pierantoni, 1904
 – Two setae in the postclitellar bundles.
 *C. belli* Cook, 1974

As PIERANTONI's paper (1904) was not available to us, the data of *Limnodrilus roseus* and *L. pectinatus* were taken from BRINKHURST (1971: 568).

Curacaodrilus sinus, sp. n.

(Figs. 36–38)

ARUBA: 1010a, 1 specimen (ZU-376).
 CURAÇAO: 1666, 1 spec. (ZU-377). – 1669, 3 spec. (ZU-378).
 – 1670A, 1 spec. (ZU-379).
 BONAIRE: 1554, 1 spec. (ZU-382). – 1580A, 1 spec. (ZU-383).
 – 1604, 2 spec. (ZU-380). – 1647A, 6 spec. (ZU-381).

Length 10–19 mm; diameter in the middle body region 0.23–0.32 mm; number of segments 25–64. Prostomium short and conical. All setae are bifid and alike. The upper tooth is thinner and a little shorter than the lower one (Fig. 37). The number of setae varies from 2–6, most commonly 4–5 per bundle, in segments II–IX. There are 2–3 unmodified setae in the bundles of X. In XI ventral setae are absent; 0–1 dorsal ones may be present. In the postclitellar segments the number varies between 1 and 4, most frequently 2–3. The clitellum occupies segments XI–1/2 XII or XII. Male pores open subapically on two voluminous mammillary projections in the posterior third of XI. The body wall may follow the mammillary projections as two more or less triangular folds.

Pharyngeal glands are present up to and including segment V. The chloragogen cells are rounded to club-shaped, appearing from

VI onward. These cells are absent around the intestine in IX, and sometimes also in the anterior half of X; they remain, however, on the dorsal vessel. The intestinal plexus of this region is developed in a special way; it forms a net with very regularly placed transverse vessels; the longitudinal ones are less regular. A lot of capillaries originate from this network, penetrating between the cells of the intestinal epithelium. These cells are cylindrical, higher than in the other intestinal regions, and they have a glandular appearance. Intestinal glandular thickening in X is also known in *Tubifex pseudogaster* (DAHL 1960: 1). Coelomocytes are discoidal, with an egg-shaped eccentric nucleus and fine granular plasm (Fig. 38). Their average diameter is 11 μm ; they are few in number and scattered through the body cavity.

One pair of testes is fastened posterior to 9/10. The pair of male funnels is small and bell-shaped; they lie ventro-laterally to the intestine in X. A small tuft of spermatozoa is fastened to the funnels. The voluminous vasa deferentia run in a dorso-caudal direction. They are nearly two times as long as the remaining male ducts. Each vas deferens narrows slightly but abruptly before it opens into the ental end of the atrium. Each atrium consists of two vesicles, separated by a slight, not always well discernible constriction (Fig. 36). The atrial wall may be thick, with a glandular epithelium where the grains of secretion appear blue when stained by Mallory's technique. A small and not stalked prostate gland joins the atrium ventrally. The atrial duct is wide, with a glandular wall like the atrium; it ends in a pseudopenis. The ectal part of the atrial ducts is bent when the corresponding pseudopenis is retracted. Semicircular muscular bands run from the mammillary projection to the middle region of the atrial duct; they form a pair of voluminous coelomic sacs. In each sac there is a central space between its musculature and the end part of the male duct. These coelomic sacs are very similar to what HRABE (1971a: 34, fig. 1 D-C) named "bell-shaped bulb" in *Limnodriloides gurwitschi*. Of the female genital system we saw a pair of ovaries joined posteriorly at 10/11. An ovi-sac with mature eggs extends till segment XIII. Spermathecae are absent.

Sinus refers to the mammillary projections associated with the male pores.

Kaketio, gen. nov.

Diagnosis: Bifid setae only. Without modified genital setae. Coelomocytes scattered. Esophageal diverticula absent; intestine without sudden widening. Vas deferens wide and shorter than the remaining male duct. Long and tubular atrium with a thin ental part without glands, and a thick glandular ectal part (atrial duct). A wide cylindrical (glandular?) atrial diverticulum covers the ental part of the corresponding atrium ventro-laterally. Voluminous, not stalked prostate gland joining atrial vesicle. The long ejaculatory duct may be protracted as pseudopenis. Atrial and ejaculatory ducts of each side surrounded by a voluminous muscular coelomic sac, attached to an unpaired ventral copulatory chamber in XI. A pair of ventral spermathecal openings in 9/10.

Type-species: *Kaketio ineri*, sp. n.

Remarks: Observed in the whole mounts, the male reproductive system of *Kaketio* resembles that of *Aulodrilus* Bretscher 1899 (MARCUS, 1944: 75; BRINKHURST 1971: 523). In sections *Kaketio* can be distinguished by the particular organization of the atrial region. Moreover, the two genera may be distinguished by the segmental position of the genital organs, shape of the intestine, and absence of a posterior respiratory tube in *Kaketio*.

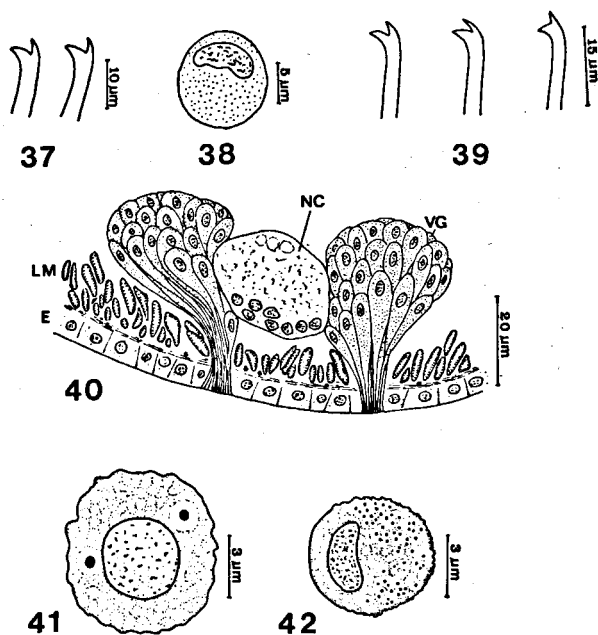
Kaketio has been derived from the name of an old Indian tribe, belonging to the Arawak group, that lived in the Antilles.

Kaketio ineri, sp. n.

(Figs. 39–47)

BONAIRE: 1647A, 3 specimens, two of them without the rear end (ZU-384). -- 1647Aa, 1 clit. spec. without the rear end (ZU-385).

The only complete specimen is 25 mm long, it has 52 segments and ends in a small pygidium. The diameter in the middle body region of the 4 specimens varies between 250 and 300 μm . The prosto-



Figs. 37–38. *Curacaoadrilus sinus*: 37, setae; 38, coelomocyte. – Figs. 39–42. *Kakelio ineri*: 39, setae of segments V, VII, and XL; 40, transverse section of segment VII; 41 and 42, coelomocytes. – E = epithelium; LM = longitudinal muscle; NC = nervous cord; VG = ventral gland.

mium is short, more or less conical. All setae are bifid. The upper tooth is thinner than the lower one; they have roughly the same length (Fig. 39). The number of setae per bundle in preclitellar segments varies from 3–5, most frequently 4. From XII onward this number varies from 1–3, most commonly 1 or 2. There are 2 or 3 not modified setae per bundle in X; setae are absent in XI. The clitellum is open ventrally on XI–1/2 XII. The ventral surface of XI–XV is thickened, and may have transverse furrows; it consists of cylindrical cells about two times as high as in the remaining epithelium. From segment III to and including IX there is one pair of rounded or egg-shaped ventral glands on either side of the nervous cord (Sta. 1647A, Fig. 40) per segment; they are bigger in VI–VIII, measuring $60 \times 55 \mu\text{m}$ on average. They consist of glandular club-shaped cells which pierce the body wall and open on the surface

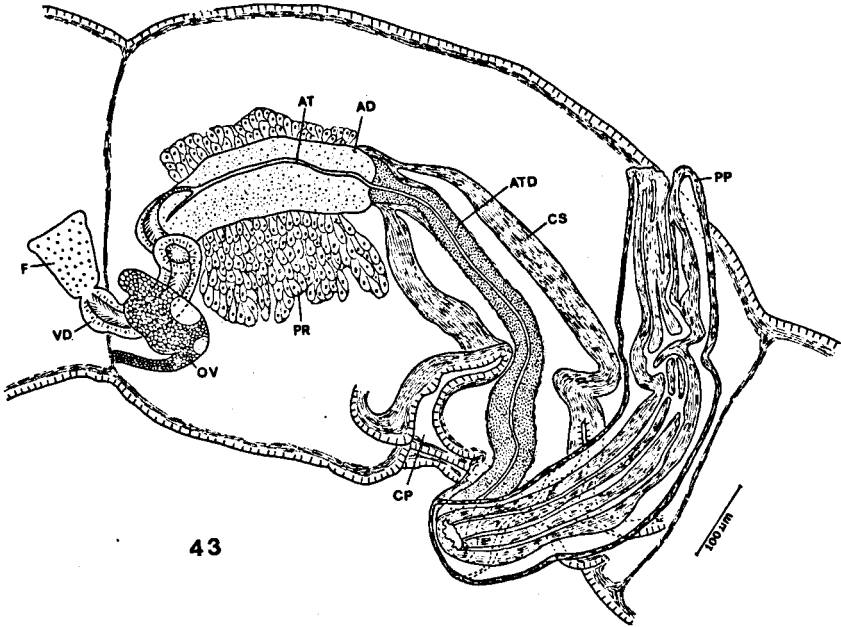


Fig. 43. *Kaketio ineri*: male duct. — AD = atrial diverticulum; AT = atrium; ATD = atrial duct; CS = coelomic sac; CP = copulatory chamber; F = male funnel; OV = ovary; PR = prostate gland; PP = pseudopenis; VD = vas deferens.

through a small circular area to the sides of the ventral mid-line. These glands resemble the so called copulatory glands of the Enchytraeidae, specially those of *Fridericia* studied by HESSE (1894: 12, fig. 25). In the Tubificidae glands associated with the nervous cord in the anterior segments occur in *Alexandrovía onegensis* (HRABE 1962: 325, figs. 12–13), and in *Limnodriloides agnes* (HRABE 1967: 341, figs. 19–20). Since HRABE observed no external openings of the glands, he supposed an endocrine function.

Pharyngeal glands occur till segment V. From VI onwards the intestine is covered by chloragogen cells. They are absent at IX, where the intestinal epithelium is thicker and glandular, as in *Curacaodrillus simus*. The intestinal diameter increases gradually from VI–IX, it narrows a little in X–XII, and caudally to XIII it is almost uniformly similar to that of VIII. Coelomocytes are

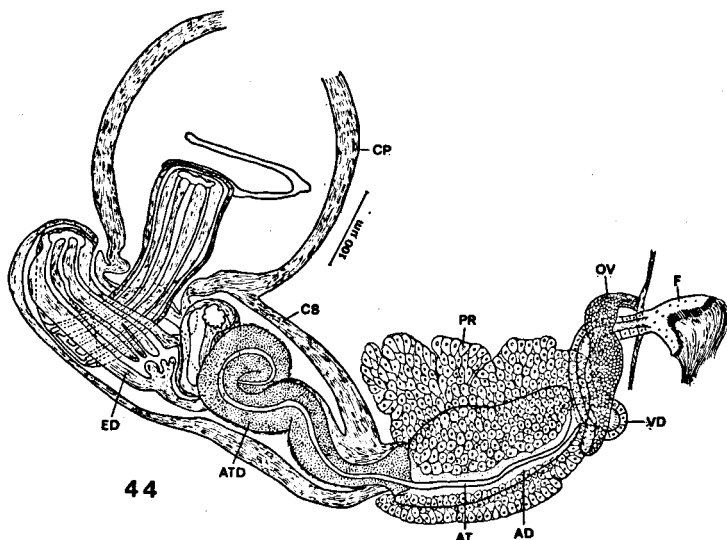
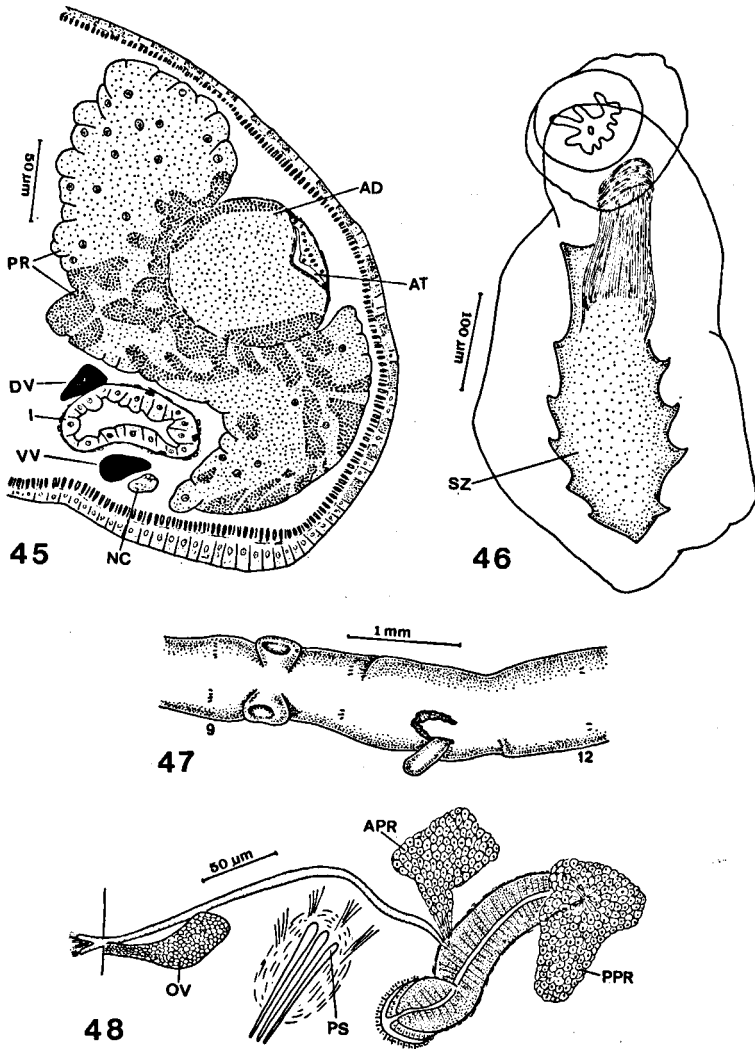


Fig. 44. *Kaketio ineri*: male duct. - AD = atrial diverticulum; AT = atrium; ATD = atrial duct; CS = coelomic sac; CP = copulatory chamber; ED = ejaculatory duct; OV = ovary; PR = prostate gland; VD = vas deferens.

scattered, more or less circular in outline, with a diameter of 6.2–7.5 μm ; the surface is irregularly lobulated (Figs. 41–42). The alveolar plasm may have granular inclusions. The nucleus is often egg-shaped, measuring $3.12 \times 1.87 \mu\text{m}$ to $4.37 \times 2.81 \mu\text{m}$; rarely it is rounded, with a diameter from 2.5 to 3.7 μm .

There are a pair of testes and male funnels in X. The anterior seminal vesicle is confined to segment IX; the posterior vesicle reaches XIII–XIV. The funnels contain a cluster of spermatozoa, with long and wavy heads so closely arranged that they appear to have transverse bands. A small constriction separates funnel from vas deferens; the latter has a constriction where it pierces septum 10/11. Each vas deferens is wide and shorter than the remaining male duct (Figs. 43–44); its average diameter is 34.4 μm . In XI each vas deferens (VD) bends upwards and contacts the anterior end of the atrial diverticulum (AD). Here the vas deferens narrows suddenly, runs a short distance over the surface of the diverticulum, and opens into the atrial lumen (AT). The entire lumen of the vas de-



Figs. 45-47. *Kakelio ineri*: 45, transverse section of segment XI; 46, spermatheca; 47, ventral view of segments IX-XII. - Fig. 48, *Phallogrilus adriaticus caribicus*: male duct. - AD = atrial diverticulum; APR = anterior prostate gland; AT = atrium; DV = dorsal vessel; I = intestine; NC = nervous cord; OV = ovary; PPR = posterior prostate gland; PP = prostate gland; PS = penial setae; SZ = spermatheca; VV = ventral vessel.

ferens is ciliated. The atrial diverticulum is more or less cylindrical, and its largest size is $265 \times 145 \mu\text{m}$ and $215 \times 110 \mu\text{m}$ (two animals). In transverse sections the atrium (Fig. 45, AT) appears as a triangular enclave $37 \mu\text{m}$ broad and $21 \mu\text{m}$ deep in the latero-dorsal face of the diverticulum (AD); it has no cilia. The walls of the atrium and atrial diverticulum consist chiefly of transverse muscle fibers. The nuclei of these fibres lie superficially in the widest wall of the atrium, and bulge into the atrial cavity, which has a simple squamous epithelium. Similar epithelium is found in the adjacent wall of the atrial diverticulum. In the remaining inner surface of the diverticulum, the epithelium could not be studied because of the secretion granules. Numerous openings of the innermost atrial wall make communication between atrial diverticulum and atrium possible.

A voluminous prostate gland surrounds the atrial diverticulum almost entirely, not covering the atrium and a small adjacent surface of the diverticulum. The prostate (Figs. 43–45, PR) joins the atrial diverticulum broadly along its medial face, where there are many interruptions in its muscular wall. The superficial portion of the prostate gland cells recalls that of club-shaped glandular cells. However, in the central portion of the prostate, where the slender and juxtaposed portions of the gland cells should be, the cell boundaries are not visible because of the many plasmatic granules. In the sections stained by Mallory's technique two types of granules differ in size and colour. Small granules are the most common; they have an average diameter smaller than $0.6 \mu\text{m}$, and have a bright pink colour contrasting against an amorphous white blue background. In the median and posterior regions of each prostate there are masses of coarse granules with a diameter between 0.9 and $1.8 \mu\text{m}$, coloured conspicuously red. In the atrial diverticulum the coarse granules are placed laterally in the median and posterior region. The remaining regions of the diverticulum are filled with the small pink granules, and an amorphous blue substance. In our material we were unable to interpret the atrial diverticulum precisely. Maybe the filling granules have been produced by the prostate gland only, but it is also possible that they have been produced by glandular epithelium of its own, not recognizable on account of the complete break-down of the secretory cells in mature animals.

The atrium continues in a long and glandular atrial duct (Figs 43–44, ATD), measuring $513 \times 53 \mu\text{m}$ and $465 \times 37 \mu\text{m}$. In whole mounts from 1647A stained by Mayer's Paracarmin, the walls of the atrial ducts are dark brown under transmitted light. In the animal from 1647Aa these walls are whitish pink. In sections the epithelium of the ducts appears to consist of cylindrical cells full of coarse granules stained red, like those of the prostate. Outside there is a slender muscular coat and the peritoneal epithelium. The atrial duct is continued into a long ejaculatory duct (Fig. 44, ED) with a thick muscular wall and multiple folded lumen, that may be protracted as a pseudopenis (Fig. 43, PP). When retracted the atrial and ejaculatory ducts remain inside an egg-shaped coelomic sac (Figs. 43–44, CS), with a thick muscular wall. In two animals the largest diameters of the pair of sacs are $537 \times 160 \mu\text{m}$ and $500 \times 190 \mu\text{m}$. The large cavity of each sac opens caudally into the body cavity so that there are coelomocytes inside. When entirely retracted the ejaculatory ducts stay twisted into the posterior region of the sac and partly into the body cavity. The middle and posterior regions of the coelomic sacs join beside a rounded copulatory chamber (CP). The unpaired copulatory chamber has an inner cuticular sheath; it opens to the body surface midventrally in XI. In the animals from 1647A the surface opening of the chamber is horseshoe shaped (Fig. 47); however, in the animal from 1647Aa it consists of two longitudinal furrows. The length of the entirely protracted pseudopenis corresponds to the body wall diameter. The coelomic sac protrudes into the copulatory chamber, which does not evaginate. The protraction of the pseudopenis is probably due to inner pressure of the coelomic sac, together with relaxing of the pseudopenial musculature. Retraction most probably occurs by an inverse mechanism, since there are no retractor muscles.

One pair of small ovaries joins the septum 10/11 posteriorly, near the vasa deferentia (Figs. 43–44, OV). The ovisac reaches till XV. One pair of spermathecae opens at 9/10. In the 4 animals studied the left spermatheca lies in the cavity of X, the right one in that of XI. Each spermatheca has a voluminous egg-shaped ampulla and a short duct opening through a small pore (Fig. 46). In the specimens from 1647A the pores are in the inner end of two funnel-shaped pro-

jections of the body wall (Fig. 47). In the specimen from 1647Aa these funnels are contracted appearing as cylindrical projections. The spermathecae of one animal from 1647A and in that from 1647Aa have a large bundle of spermatozoa with the heads near the opening. The spermatozoa are fastened to the anterior third of a structure (spermatozeugma?) rectangular in outline and not very thick, nearly as long as the ampulla. This structure (Fig. 46, SZ) has 6 pairs of lateral denticles bent towards the spermathecal pore. In sections stained by Mallory's technique the denticles and the adjacent surface parts are brightly yellow, the remaining major part is dark blue. In the ampullar cavity there are many yellow fragments and few blue ones. The ampullar wall has a muscular coat, 2.5–4 μm thick, and an inner layer of glandular cells 10–12.5 μm high. Between the two layers there is a connective layer 1–1.5 μm thick.

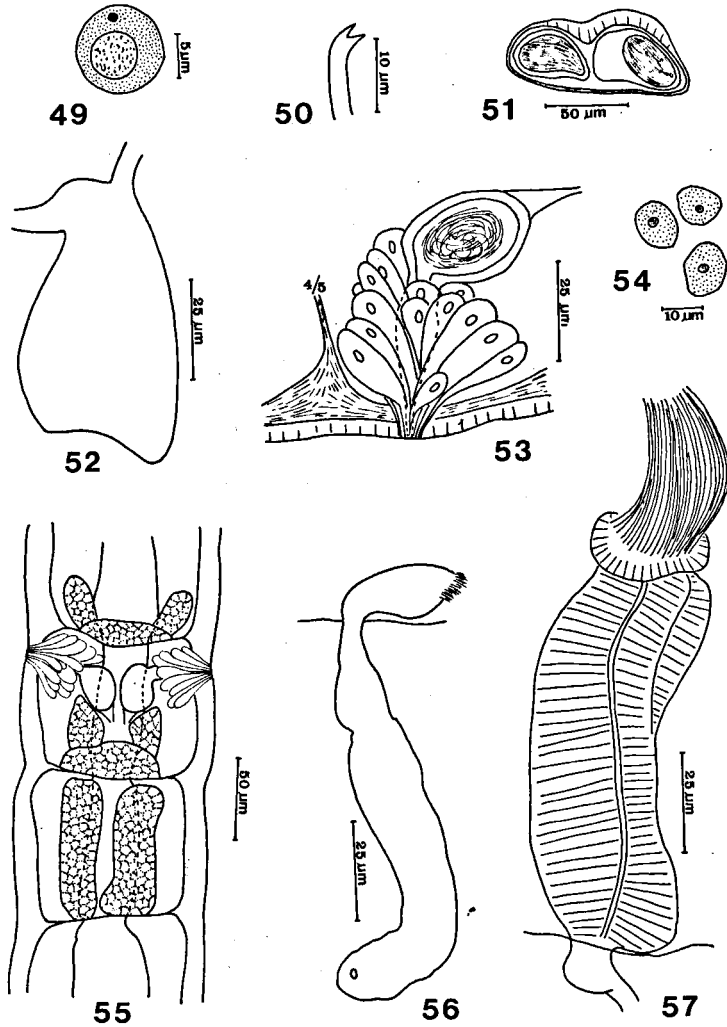
Ineri is the name of an old Indian tribe, belonging to the Arawak group, that lived in the Antillean region.

***Phallodrilus adriaticus caraibicus*, subsp. n.**

(Figs. 48–51)

BOONAIRE: 1653A, 3 specimens, one of them without the rear end (ZU-386).

The two complete animals measure 9×0.22 mm and 10×0.2 mm; they have 62 and 71 segment respectively. The prostomium is more or less conical. The clitellum occupies segments 1/2 X–1/2 XII. There are 4 bundles of setae per segment from II onward. The setae, except the ventral ones of XI, are bifid with their upper tooth slender and almost as long as the lower one (Fig. 50). In II–IX there are 1–3 setae per bundle, generally 3. In X, dorsally in XI, and from XI onward there are 2 setae per bundle; the last 2–3 segments may have 1 seta per bundle. The setae of X are not modified; the ventral ones of XI are modified as penial setae. There are 3 penial setae on each side surrounded by a muscular follicle, and emerging from a small papilla slightly rostro-ventrally to the male pores. The penial setae (Fig. 48, PS) are wider at the proximal end. They narrow towards the apex, ending in a fine point slightly bent towards the medio-ventral line. Their length varies between 76 and 88 μm .



Figs. 49–54. *Phallodrilus adriaticus caraibicus*: 49, coelomocyte; 50, seta; 51, spermathecal ampulla with two spermatozeugma. – Figs. 52–57. *Marionina achaeta nevisensis*: 52, cerebral ganglion; 53, spermatheca; 54, coelomocytes; 55, dorsal view of segments IV–VI; 56, nephridium of the middle body region; 57, male funnel.

The last and smallest pharyngeal glands are in VIII. Chloragogen cells begin in VIII. Coelomocytes are scattered, circular in outline and 10 μm wide on average. Their nucleus is rounded and slightly eccentric; the fine granular plasma may have some larger inclusion grains (Fig. 49).

There is one pair of testes and male funnels with a bundle of spermatozoa in X. Each vas deferens pierces the ovary laterally and runs dorsocaudally on the side of the body wall. It joins the antero-medial region of the atrium, together with the peduncle of the anterior prostate gland (Fig. 48, APR). One posterior prostate (PPR), slightly larger and more dorsal than the first, joins the ental end of the atrium through a short peduncle. The two atria are more or less perpendicular in XI; they are cylindrical, arched a little backward, and measuring $137 \times 35 \mu\text{m}$. They have a thin outer muscle layer and an inner glandular epithelium with cylindrical cells. The atrial lumen continues through a short duct which opens by the male pore; it is 15 μm long and coated by a cubical epithelium. The pore is situated at the medial side of the base of a hemispheric papilla.

There is a pair of spermathecae in X. In each spermatheca the ampulla is voluminous and egg-shaped, and its epithelium is higher on the medial side. Two animals show 2 spermatozeugmata per ampulla (Fig. 51). The spermathecal ducts are short, opening in the anterior third of X, mid-between the lines of the ventral and dorsal setae.

Remarks: *Phallodrilus adriaticus* Hrabe, 1971, was known till now from the type locality, Slota Island in the Adriatic (Yugoslavia) only. The new subspecies differs mainly by number and shape of the penial setae.

ENCHYTRAEIDAE

Marionina achaeta nevisensis, subsp. n.

(Figs. 52–57)

NEVIS: 413, 1 specimen (ZU-387).

Length 4.5 mm, diameter in the clitellum 135 μm , and in the middle of the body 114 μm . Number of segments 40. Prostomium short and conical, a little wider than long. Setae and setal follicles absent. Clitellum ring-shaped on XII–XIII, its glandular cells are disposed in more or less transverse rows. The cerebral ganglion (Fig. 52) is longer than wide, measuring $65 \times 43.7 \mu\text{m}$. It is somewhat deformed, probably by fixation. Its greatest width is near the concave posterior margin. The lateral margins converge anteriorly, where the border is convex. The dorsal vessel begins in segment XV. There are a pair of nephridia per segment from 6/7 onward, all of them are alike. The nephridiopores are disposed in two ventral series at the sides of the nerve cord. Their preseptal portion is egg-shaped. The postseptal part is tubular, 3–4 times longer than the preseptal one, and slightly curved; it can not be distinguished from the terminal nephridial duct (Fig. 56).

Pharyngeal and esophageal peptonophidia are absent. The transition between esophagus and intestine is gradual, without appendages. Chloragogen cells are present from VIII backward. Septal glands are attached to the anterior face of the septa 4/5–6/7 (Fig. 55). The dorsal lobes of the symmetrical glands of IV and V merge broadly, those of the last pair are independent. The ventral lobes of the glands are particularly well developed in VI, occupying the segment's whole length.

The ventral lobes of IV and V are alike, and about half as long as in VI. Coelomocytes are scattered in the body cavity. They are irregularly egg-shaped, with a central nucleus, and their plasma is full of small granules (Fig. 54). Their greatest diameter varies from $10 \times 8 \mu\text{m}$ to $14 \times 10 \mu\text{m}$.

One pair of compact testes lies in XI. Spermatozoa in differentiation fill the cavity of this segment and a large dorsal seminal

vesicle in X. The male funnels (Fig. 57) are cylindrical and 3.5 times longer than wide. They have a well demarcated collar with a diameter similar to that of the glandular portion; a tuft of spermatozoa is attached to it. The vasa deferentia are long, irregularly twisted, and they lie partly in XII and partly inside the ovisac in XIII. They open through a pair of penial bulbs in XII. These bulbs are massive and rounded, 43 μm wide. A voluminous ovisac reaches segment XV; it is full of developing eggs. A pair of spermathecae opens a little posterior to septum 4/5. Each spermatheca (Fig. 53) has an ovoid ampulla full of spermatozoa, and is attached to the dorsal wall of the esophagus by a triangular band. The duct is longer than the corresponding ampulla, and it is surrounded by numerous long and pear-shaped glandular cells, which open around the spermathecal pore.

Remarks: *Marionina achaeta* Lassère, 1964 is known from Sweden, Denmark, Germany, Atlantic and Mediterranean France, Bulgaria (Black Sea), Tunisia, Algeria, United States: Massachusetts and North Carolina (LASSERE 1964: 87; 1966: 300; 1971: 452), and Bermuda Islands (LASSERE & ERSÉUS 1976: 455). According to these authors there are no differences between the European and American animals. Our specimen can be distinguished from the typical form by the number of segments, presence of ventral lobes in the septal glands of 4/5, and by the numerous glandular cells opening around the spermathecal pores.

The name of the new subspecies refers to the collecting site.

SUMMARY

Seven species of Tubificidae and Enchytraeidae (Annelida: Oligochaeta) from Antillean coastal shallow waters have been studied. — The following new Tubificid taxa have been described: *Marcusaedrilus hummelincki*, gen. n., sp. n.; *Kakelio ineri*, gen. n., sp. n.; *Limnodrilus bori* sp. n., and *Phalloedrilus adriaticus caraibicus*, subsp. n. Two new occurrences and some remarks have been added to *Peloscotlex gabriellae* Marcus. *Limnodriloides roseus* Pierantoni, *L. pectinatus* Pierantoni, *Spiridion scrobicularae* Lastockin, *L. gurwitschi* Hrabec, and *Thalassodrilus belli* Cook have been transferred to *Curacaodrilus*; the transference of *Bohadtschia pierantonii* Hrabec has been suggested. Intestinal glandular epithelia have been found in *Curacaodrilus*

sinus and *Kahetio ineri*. Ventral glands (copulatory?) have been described from the preclitellar segments of *Kahetio ineri*. — Of the Enchytraeidae a new subspecies, *Marionina achaeta nevisensis*, has been described.

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