STUDIES ON THE FAUNA OF CURAÇAO AND OTHER CARIBBEAN ISLANDS: No. 101.

POLYCLADIDA FROM CURAÇAO AND FAUNISTICALLY RELATED REGIONS

by

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Professor Dr. DIVA DINIZ CORRÊA, Head of the Department of Zoology of the University of São Paulo, was able to work at the "Caraïbisch Marien-Biologisch Instituut" (Caribbean Marine Biological Institute: Carmabi) at Curaçao from December 1965 to March 1966, thanks to a grant received from the Government of the Netherlands. There she collected 26 species of Polyclads, and took notes of their shapes and colours.

Furthermore Dr. PIETER WAGENAAR HUMMELINCK, of Utrecht, sent us a large collection of polyclads from the Caribbean area, gathered on his trips from 1930 to 1964. He had also collected in 1963 in the Miami area. We received some samples from the latter area from Prof. Dr. CORRÊA and Prof. Dr. FREDERICK M. BAYER, of Miami. Drs. LILIANA FORNERIS, WALTER NARCHI, and SÉRGIO DE ALMEIDA RODRIGUES, all of São Paulo, gave us interesting Brazilian material.

The indications (B), (C), (F), (H), or (N) after the date denote the collectors. Dr. HUMMELINCK's station numbers (H 1008A, 1064b, etc., cf. Fig. 100), under which a description of the habitat can be found, refer to his list of 1930–1949 localities in the 4th volume of this series, or to a forthcoming paper, in which the 1955–1964 localities will be described.

The specimens collected by Dr. HUMMELINCK and Dr. BAYER will be returned to Utrecht and Miami, respectively, the other ones are kept in the Department of Zoology, Faculty of Philosophy, University of São Paulo. The greater part of Dr. HUMMELINCK's material has been presented to the Rijksmuseum van Natuurlijke Historie in Leiden.

TABLE 1.

Localities of the Polyclads

treated in this paper cf. Figs. 99–100;.

Material of DIVA DINIZ CORREA (C), P. WAGENAAR HUMMELINCK (H), F. M, BAYER (B), LILIANA FORNERIS (F), W. NARCHI & S. DE ALMEIDA RODRIGUES (V).

Localities / Species	Aruba	Curaçao	Bonaire & Klein Bonaire	Los Frailes, Coche	Grenada	Islote Aves	Antigua	Barbuda	St. Kitts	St. Barts	St. Martin	St. Croix	Puerto Rico	Key Biscayne, Virginia Key	Atlantic Ocean	Brazil
1 *Latocestus whartoni*	.	.	.	.	.	.	.	.	.	.	.	.	.	H	.	.
2 *Stylochus frontalis*	.	C	.	.	.	.	.	.	.	.	.	.	.	C	.	.
3 *Stylochus oculiferus*	.	H	.	.	.	.	.	.	.	.	.	.	.	.	.	.
4 *Stylochus ticus*	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	F
5 *Stylochus catus*	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	F
6 *Cryptocelis lilianae*	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	F
7 *Phaenocelis purpurea*	.	C	.	.	.	.	.	.	.	.	.	.	.	.	.	.
8 *Phaenocelis peleca*	.	C	.	.	.	.	.	.	.	.	.	.	.	.	.	.
9 *Igluta tipuca*	.	C	.	.	.	.	.	.	.	.	.	.	.	.	.	.
10 *Zygantroplana yrsa*	H	CH	H	H	H	H	H	H	.	.	.	.	.	.	.	.
11 *Stylochoplana leptalea*	.	CH	.	.	.	.	.	H	.	.	.	.	.	H	.	N
12 *Stylochoplana walsergia*	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	N
13 *Stylochoplana bayeri*	.	.	.	.	.	.	.	.	.	.	.	.	.	BH	.	.
14 *Stylochoplana snadda*	.	H	H	.	.	.	.	.	.	.	.	H	.	BH	.	.
15 *Stylochoplana wyona*	.	.	.	.	.	.	.	.	.	.	H	.	.	.	.	.
16 *Notoplanides alcha*	.	.	.	.	.	.	.	.	H	.	.	.	.	.	.	.
17 *Candimba rabita*	.	C	.	.	.	.	.	.	.	.	.	.	.	.	.	.
18 *Notoplana ferruginea*	.	C	H	.	.	.	.	.	.	.	.	.	.	.	.	.
19 *Notoplana lactoalba*	.	H	.	.	.	.	.	.	.	.	.	.	.	BH	.	.
20 *Notoplana megala*	.	C	.	.	.	.	.	.	.	.	.	.	.	.	.	.
21 *Notoplana annula*	.	CH	.	.	.	.	.	.	.	.	.	.	.	H	.	.
22 *Notoplana queruca*	.	CH	.	.	.	.	.	.	.	.	H	.	.	H	.	.
23 *Notoplana lapunda*	.	C	.	.	.	.	.	.	.	.	.	.	.	.	.	.
24 *Hoploplana divae*	.	H	.	.	.	.	.	.	.	.	.	.	.	.	.	.
25 *Gnesioceros sargassicola*	.	CH	H	.	.	.	.	.	.	H	.	.	H	H	H	.
26 *Styloplanocera fasciata*	H	C	H	.	.	.	.	.	.	.	.	.	.	.	.	.
27 *Amyris hummelincki*	.	H	H	.	.	.	.	.	.	.	.	.	.	.	.	.
28 *Amyris ujara*	.	.	H	.	.	.	.	.	.	.	.	.	.	.	.	.
29 *Pericelis orbicularis*	.	.	.	.	.	.	.	.	.	.	.	.	.	B	.	.
30 *Pericelis cata*	.	CH	.	.	.	.	.	.	.	.	.	.	.	.	.	.
31 *Boninia antillarum*	.	C	H	.	.	.	.	.	.	.	.	.	.	.	.	.
32 *Boninia divae*	.	C	.	.	.	.	.	.	.	.	.	.	.	.	.	.
33 *Thysanozoon brocchii*	.	CH	.	.	.	.	.	.	.	.	.	.	.	C	.	.
34 *Thysanozoon nigrum*	.	.	H	.	.	.	.	.	.	.	.	.	.	.	.	.
35 *Pseudoceros bicolor*	.	C	.	.	.	.	.	.	.	.	.	.	.	.	.	.
36 *Pseudoceros crozieri*	.	H	.	.	.	.	.	.	.	.	H	.	.	C	.	.
37 *Pseudoceros mopsus*	.	CH	.	.	.	.	H	.	.	.	.	.	.	.	.	.
38 *Pseudoceros texanus*	.	.	H	.	.	.	.	.	.	.	.	.	.	C	.	.
39 *Cycloporus gabriellae*	.	C	.	.	.	H	H	.	.	.	.	.	.	.	.	.
40 *Acerotisa notulata*	.	H	.	.	.	.	.	.	.	.	.	.	.	.	.	.
41 *Acerotisa bituna*	.	H	.	.	.	.	.	.	.	.	.	.	.	.	.	.
42 *Acerotisa piscatoria*	.	.	H	.	.	.	.	.	.	.	.	.	.	.	.	.
43 *Prosthiostomum cyclops*	.	.	H	.	.	.	.	.	.	.	.	.	.	.	.	.
44 *Prosthiostomum pulchrum*	.	CH	H	.	.	.	H	.	H	.	.	.	.	.	.	.
45 *Prosthiostomum milcum*	.	.	H	.	.	.	.	.	.	.	.	.	.	H	.	.
46 *Lurymare matarazzoi*	.	.	H	.	.	.	.	.	.	.	.	.	.	.	.	.
47 *Lurymare utarum*	.	.	.	.	.	.	.	.	.	.	.	.	.	C	.	.
48 *Euprosthiostomum pakium*	.	.	.	.	.	.	.	.	.	.	.	.	.	B	.	.
49 *Enchiridium evelinae*	.	C	.	.	.	.	.	.	.	.	.	.	.	.	.	.

List of species classified in the present paper

Order POLYCLADIDA
Suborder ACOTYLEA
Superfamily CRASPEDOMMATIDEA
Family LATOCESTIDAE

1. *Latocestus whartoni* (Pearse, 1938)

Family STYLOCHIDAE

2. *Stylochus* (*Stylochus*) *frontalis* Verrill, 1892 — Fig. 1
3. *Stylochus* (*Imogine*) *oculiferus* (Girard 1853) — Fig. 2–3
4. *Stylochus* (*Imogine*) *ticus* Marcus, 1952
5. *Stylochus* (*Imogine*) *catus* du Bois–Reymond Marcus, 1958 — Fig. 4–6

Family CRYPTOCELIDAE

6. *Cryptocelis lilianae*, spec. nov. — Fig. 7–9
7. *Phaenocelis purpurea* (Schmarda, 1859) — Fig. 10
8. *Phaenocelis peleca*, spec. nov. — Fig. 11–12
9. *Igluta tipuca*, gen. nov., spec. nov. — Fig. 13–15

Superfamily SCHEMATOMMATIDEA
Family LEPTOPLANIDAE
Subfamily Leptoplaninae

10. *Zygantroplana yrsa*, spec. nov. — Fig. 16–17
11. *Stylochoplana leptalea* Marcus, 1947 — Fig. 18–19
12. *Stylochoplana walsergia*, spec. nov. — Fig. 20–22
13. *Stylochoplana bayeri*, spec. nov. — Fig. 23–25
14. *Stylochoplana snadda*, spec. nov. — Fig. 26–28
15. *Stylochoplana wyona*, spec. nov. — Fig. 29–30
16. *Notoplanides alcha*, spec. nov. — Fig. 31–32
17. *Candimba rabita*, spec. nov. — Fig. 34–35

Subfamily Notoplaninae

18. *Notoplana ferruginea* (Schmarda, 1859) — Fig. 36
19. *Notoplana lactoalba* (Verrill, 1900) — Fig. 33
20. *Notoplana megala* Marcus, 1952
21. *Notoplana annula*, spec. nov. — Fig. 37–38
22. *Notoplana queruca*, spec. nov. — Fig. 39–40
23. *Notoplana lapunda*, spec. nov. — Fig. 42–44

Subfamily Hoploplaninae

24. *Hoploplana divae* Marcus, 1950 — Fig. 41

Family PLANOCERIDAE

25. *Gnesioceros sargassicola* (Graff, 1892) — Fig. 45–49
26. *Styloplanocera fasciata* (Schmarda, 1859)
27. *Amyris hummelincki*, gen. nov., spec. nov. — Fig. 50–52
28. *Amyris ujara*, spec. nov. — Fig. 53–55

Suborder COTYLEA
Family PERICELIDAE

29. *Pericelis orbicularis* (Schmarda, 1859) — Fig. 56
30. *Pericelis cata*, spec. nov. — Fig. 57–59

Family BONINIIDAE

31. *Boninia antillarum* (Hyman, 1955) — Fig. 60–64
32. *Boninia divae*, spec. nov. — Fig. 65–70

	Family PSEUDOCERIDAE	
33.	*Thysanozoon brocchii* (Risso, 1818)	
34.	*Thysanozoon nigrum* Girard, 1851	Fig. 78
35.	*Pseudoceros bicolor* Verrill, 1901	Fig. 71–72
36.	*Pseudoceros crozieri* Hyman, 1939	Fig. 75–77
37.	*Pseudoceros mopsus* Marcus, 1952	
38.	*Pseudoceros texanus* Hyman, 1955	
	Family EURYLEPTIDAE	
39.	*Cycloporus gabriellae* Marcus, 1950	
40.	*Acerotisa notulata* (Bosc, 1802)	Fig. 79–82
41.	*Acerotisa bituna* Marcus, 1947	Fig. 74
42.	*Acerotisa piscatoria* Marcus, 1947	Fig. 73
	Family PROSTHIOSTOMIDAE	
43.	*Prosthiostomum cyclops* (Verrill, 1901)	Fig. 84–85
44.	*Prosthiostomum pulchrum* Bock, 1913	Fig. 83
45.	*Prosthiostomum milcum*, spec. nov.	Fig. 86–87
46.	*Lurymare* (gen. nov.) *matarazzoi* (Marcus, 1950)	Fig. 88
47.	*Lurymare utarum* (Marcus, 1952)	
48.	*Euprosthiostomum pakium*, spec. nov.	Fig. 89–90
49.	*Enchiridium evelinae*, Marcus, 1949	Fig. 91

1. **Latocestus whartoni** (Pearse, 1938)

PEARSE 1938, p. 83 (*Oculoplana whartoni*); HYMAN 1940, p. 458 (*Latocestus whartoni*).

FLORIDA: *Key Biscayne*, N point at Bear Cut, sandy bottom with *Thalassia* and *Cymodocea* beds, ½–1 m deep, 1.IX.1963 (H 1410), 1 specimen; northeastern tip, surf-swept beach rock with pools, 0–1 m, 7.IX.1963 (H 1411), 1 spec.

Further distribution: Florida; North Carolina.

As the classification is warranted by the form of the body, the position of the pharynx, the eyes, and the transversely elongated Lang's vesicle, the specimens were not sectioned.

The absence of marginal eyes in the type species of *Latocestus*, *L. atlanticus* PLEHN (1896a, p. 159), is evidently an error of observation (BOCK 1913, p. 67; HYMAN 1953b, p. 185).

KEY to the classification of the Westatlantic species of *Latocestus*:

1 Granule vesicle unchambered 2
– Granule vesicle with epithelial tubes 3

2 Marginal eyes around the entire body . . . *whartoni* (see above)
– Marginal eyes limited to anterior part of body . . . . . *caribbeanus* PRUDHOE (1944, p. 322)

3 Sperm ducts slightly muscularized, but without spermiducal bulbs . . . . . *brasiliensis* HYMAN (1955c, p. 12)
– Sperm ducts with strong spermiducal bulbs 4

4 Male and female pores 1 mm distant from one another; cerebro-frontal eyes in 2 fields which do not reach the anterior margin; Lang's vesicle very long, extending nearly to the rear of the body . . . . . *atlanticus* PLEHN (1896a, p. 159)
– Male and female pores close together (MARCUS 1947, pl. 1 fig. 1, s, r), by contraction united into a common gonopore (ibid., fig. 3); cerebro-frontal eyes spreading from the brain region to the anterior margin in a fan-like manner, principally along the main nerve trunks, but not in separate fields; Lang's vesicle short, ending far in front of the rear of the body . . . . . *ocellatus* MARCUS (1947, p. 100)

Notes on **Stylochus** Ehrenberg, 1831

For an allocation of a species of the Stylochidae the reproductive organs must be considered; especially the seminal vesicle is important. When the eyes are examined in clarified, sexually mature animals of *Stylochus*, they are systematically very useful (BOCK 1925b, p. 154 ff.). Since LAIDLAW (1903b, p. 7), and also in our studies of species of *Stylochus*, the complete or incomplete circle of the marginal eyes has been recorded. Also the study of the seminal vesicle suggests an adequate separation of the about 50 species of the genus into two nearly equal groups, or better subgenera.

The seminal vesicle is simple and receives the sperm ducts which are not specially muscular in the type species of *Stylochus*, *St. suesensis* Ehrenberg 1831, which must be understood according to PALOMBI's interpretation (1928, p. 582). Sometimes the sperm ducts unite before they enter the seminal vesicle and may together form a thin-walled dilatation. The name *Stylochus* must be maintained for this subgenus.

In a second group of species the terminations of the sperm ducts are very muscular. These spermiducal bulbs (HYMAN 1953a, p. 272) fuse with the ental end of the seminal vesicle to form a trilobed or

tripartite seminal vesicle. As *Imogine oculifera* GIRARD (1853, p. 367) belongs to this group (HYMAN 1940, p. 466, fig. 28a), the name of the second subgenus and its type species are settled.

To *Stylochus* (*Stylochus*) belong: *alexandrinus* Steinböck 1937; *arenosus* Willey 1897, sections in JAKUBOVA 1906; *atentaculatus* Hyman 1953 (a); *californicus* Hyman 1953 (a); *castaneus* Palombi 1939 (b); *coseirensis* BOCK 1925 (b, p. 123; new name for *reticulatus* in FRIEDA MEYER 1921, p. 145); *djiboutiensis* Meixner 1907; *flevensis* Hofker 1930; *franciscanus* Hyman 1953 (a); *frontalis* (nr. 2); *insolitus* Hyman 1953 (a); *isifer* du Bois-Reymond Marcus 1955; *martae* Marcus 1947, for additions see DU BOIS-REYMOND MARCUS 1955, p. 39; *meixneri* BOCK 1925 (b, p. 123; new name for *reticulatus* Meixner 1907 of uncertain subgeneric position, as male organs are young); *neapolitanus* (Delle Chiaje 1841) Lang 1884; *pilidium* (Goette 1881) Lang 1884; *plessisii* Lang 1884; *pusillus* Bock 1913; *salmoneus* Meixner 1907; *sixteni* MARCUS 1947 (p. 106; new name for *crassus* Bock 1931, non Verrill 1892, p. 466); *suesensis* Ehrenberg 1831, completed by Palombi 1928; *tauricus* Jakubova 1909, seminal vesicle also in STEINBÖCK 1937, p. 4; *vigilax* Laidlaw 1904 (a), Meixner 1907; *zanzibaricus* Laidlaw 1903 (b).

To *Stylochus* (*Imogine*) belong: *aomori* Kato 1937 (c); *catus* (nr. 5); *ceylanicus* Laidlaw 1904 (b); *ellipticus* (Girard 1850), for synonyms see HYMAN 1940, p. 459; *exiguus* Hyman 1953 (a); *hamanensis* Kato 1944; *hyalinus* Bock 1913; *ijimai* Yeri & Kaburaki 1918 (b); *izuensis* Kato 1944; *marmoreus* Bock 1925 (b); *megalops* (Schmarda 1859) STUMMER-TRAUNFELS 1933, p. 3488, 3556; *minimus* Palombi 1940; *miyadii* Kato 1944; *oculiferus* (nr. 3); *orientalis* and var. *splendida* Bock 1913; *pulcher* Hyman 1940; *refertus* du Bois-Reymond Marcus 1965; *rutilus* Yeri & Kaburaki 1918 (b); *speciosus* Kato 1937 (f); *ticus* (nr. 4); *tripartitus* Hyman 1953 (a); *uniporus* Kato 1944; *zebra* (Verrill 1882), for sections see HYMAN 1939a, p. 130.

A geographic separation of the two subgenera does not result from this survey. Nearly half of the species of *Imogine* are from eastern Asiatic waters, wherefrom true *Stylochus* have not been recorded.

The reproductive organs of *St. cinereus* Willey 1897 and *St. bermudensis* Verrill 1901 are not known, so that their subgeneric po-

sitions remain open. We have not seen the description of *St. vesiculatus* JAKUBOVA (1909, p. 4).

Stylochus crassus VERRILL (1892, p. 466), found in more than 2.000 m depth off the North American coast, is no *Stylochus* (LAIDLAW 1903b, p. 107). MEIXNER (1907, p. 404) supposed it to be a *Cycloporus*. If the "low, inconspicuous prominences" were nuchal tentacles, as VERRILL thought, one might think of an *Opisthogenia* PALOMBI (1928, p. 608).

Stylochus (*Imogine*) *ellipticus* (Girard 1850; HYMAN 1940, p. 459; full synonymy), and *St.* (*I.*) *oculiferus* (nr. 3) are exceptions as regards the absence of a penis stylet (MEIXNER 1907, p. 407; BOCK 1913, p. 110; BRESSLAU 1933, p. 286) in the Stylochinae.

2. **Stylochus (Stylochus) frontalis** Verrill, 1892 Fig. 1

VERRILL 1892, p. 465; MEIXNER 1907, p. 427; PALOMBI 1931, p. 219 (*St. inimicus*); 1936, p. 4 (*St. tenax*); PEARSE & WHARTON 1938, p. 607 (*St. inimicus*); PEARSE 1938, p. 69 (*St. inimicus*; *tenax* synonymized); HYMAN 1940, p. 461 (*St. frontalis*; *inimicus* syn.).

CURAÇAO: Piscadera Baai, outer part, in dead oysters and barnacles growing on iron tubes under the pier of the Caribbean Marine Biological Institute, 18.XII.1965 and 29.I.1966 (C); inner part, in dead oysters on the roots of mangrove, 13.I.1966 (C), 22 specimens.
FLORIDA: *Virginia Key*, in empty oyster shells on the panels hung under the pier of the Institute of Marine Science, University of Miami, I. 1959 (C), 5 spec.

Further distribution: Florida to Texas, oyster beds, probably also northwards to the Carolinas (HYMAN, l.c.). The living specimen of the original description was taken at Provincetown, Mass., from the bottom of a whaling vessel recently returned from a cruise off the Carolina coast. "Some of the associated species were of distinctly southern origin" (VERRILL).

The worms from Curaçao and Florida conform fully, but diverge in minor details from the previous descriptions of *St. frontalis* and its synonyms. These descriptions are not uniform, as PALOMBI's confrontation of his two species from one and the same locality shows.

The biggest preserved specimens from Curaçao are 20 mm in length, 17 mm in width, those from Florida are 15 × 16 mm. These measurements agree with PALOMBI's records of preserved worms. The maxima of living animals are 51 × 27 mm when crawling active-

ly, at rest 40 × 31 mm (PEARSE & WHARTON). Some of our animals are as thin as *inimicus*, others as thick as *tenax*; the height depends upon the state of contraction rather than upon the contents of the gut.

Alive the colour was greyish pink (D. D. CORRÊA). Orange coloured intestinal branches were observed by VERRILL, not by PEARSE & WHARTON. In the preserved specimens the light ground colour is mottled with dark pigment on the back, producing a yellow grey olive tone. Sometimes a dorso-median light line occurs, flanked by dark lines. The border and the ventral side are light.

The marginal eyes encircle the entire body; they are more numerous in front, scarce behind. Their distribution is compatible with PALOMBI's text-figures 2 and 3 (1931). In VERRILL's figure 1 (pl. 44) and in PEARSE's (1938, fig. 23) the number of eyes is greater than in our material, but the differences, 65 eyes in one tentacle of our material, 80 in PEARSE & WHARTON's (p. 610), may be due to difference of body sizes. Especially in species with many eyes their number increases with size (BOCK 1925b, p. 155). The cerebro-frontal eyes begin behind the tentacles and spread in front of the brain to join the marginal band. This corresponds to *St. frontalis*.

The pharyngeal folds are 6–9; in specially stretched animals the mouth lies in front of the middle of the pharynx, generally in its centre.

PALOMBI's descriptions of the copulatory organs are sufficient to recognize that the seminal vesicle is simple and its musculature thinner than that of the granule vesicle. These characters are the same in our material (Fig. 1). For both of his species PALOMBI indicated 7 epithelial tubes in the granule vesicle. The only tolerable figure, however (1936, text-fig. 6), shows 10 tubes; they lie almost perpendicular to the wall. This number and disposition agree sufficiently well with our material. The horizontal position of the lemon shaped granule vesicle (PALOMBI 1931, text-fig. 4) contrasts with the more perpendicular, ovoid vesicle (q) in our material from Curaçao and Miami. Presumably the contraction of the worm effects this difference. A dilated outer vagina is mentioned in PALOMBI's description, but not such a chamber-like one as in our material from both localities (Fig. 1, v). We found a similar, though farther ectal

vaginal chamber in *St. californicus* HYMAN (1953a, p. 285). This species differs from *frontalis* by the very shallow male antrum.

As *Stylochus frontalis* is the only true *Stylochus* from Westatlantic warm waters with eyes around the entire margin, we are sure of our classification.

The worms move with irregular protractions of various parts of the anterior half, followed by slow adductions of the remaining part of the body (D. D. CORRÊA), as already observed by LANG (1884, p. 635). They do not swim.

3. **Stylochus (Imogine) oculiferus** (Girard, 1853) Fig. 2–3

GIRARD 1853, p. 367; PEARSE 1938, p. 71 (*St. floridanus*); HYMAN 1940, p. 464; 1955a, p. 122.

CURAÇAO: Piscadera Baai, entrance to inner bay and in inner bay, *Rhizophora*, rocky, sandy and muddy bottoms, 0–1 m (H 1463, 1464, 1469, 1473, 1485, 1489, 1493), 8 specimens.

Further distribution: Bahama Islands; NW coast of Florida; North Carolina; found mostly on oyster beds (HYMANN 1940).

Some measurements of the preserved worms are 6 × 4.2 mm (that of the drawings), 12 × 8, 15 × 12, and 18 × 18 mm. The border is wavy; the larger specimens are thick and very folded. Of the original colour a distinct reddish marginal band and roundish sienna flecks forming meshes on white background are sometimes preserved. The pigment lies between and under the subepidermal musculature, so that the longitudinal fibres interrupt it and render it finely striped.

The marginal eyes encircle the body. In front they are much denser and bigger (diameter up to 25 μ) than behind (up to 14 μ). Very few eyes (up to 30 μ) are frontal ones lying between the marginal and the cerebral eyes (Fig. 2). Of the latter there are 33 and 36 (up to 30 μ) in the small stretched, and therefore well analyzable animal. They are scattered over the area from 0.45 to 1 mm behind the anterior end. The tentacles contain about 30 eyes (up to 25 μ). The tentacles are colourless, 0.2 mm in length; their bases are 0.7 mm behind the body tip.

The finely ruffled pharynx begins at 1.3 mm and ends at 3.2 mm, the male pore lies at 5.2 mm, the female pore at 5.5 mm. The dorsal epidermis is 30 μ high and rich in rhabdites which occur also in the ventral, 17 μ high epidermis. The subepidermal musculature is dorsally thinner, ventrally thicker than the epithelium.

The testes are ventral, the ovaries not developed yet in the sectioned specimen, but seen in dorsal position in another animal. The sperm ducts (Fig. 3, d) open from behind into the 0.2 mm long spermiducal bulbs. The tripartite seminal vesicle (w), 0.5 mm in length and filled with sperm, has thick muscular walls. Their nuclei lie mingled with the muscle fibres in the coat of the spermiducal bulbs, while they are peripheral in the outermost part of the vesicle. This narrowed part emits the ejaculatory duct (eu) which unites with the granule duct at the base of the broad penis papilla (p). The granule vesicle (q), about 0.35 mm in length, 0.2 mm in width, is chambered, its extracapsular glands (ic) are apposed to the thick muscle mantle. The common male duct ends with a minute stylet (25 μ), projecting into the ample antrum (r).

The common uterine duct (n) enters the inner vagina (vi) from the postero-ventral side. The middle vagina (vm) is somewhat widened, but the cement glands (c) are not differentiated yet.

Among the Westatlantic species of *Imogine* with marginal eyes also in the posterior half of the body *St. (I.) zebra* (Verrill 1882) HYMAN (1939a, p. 129) and *St. (I.) pulcher* HYMAN (1940, p. 462) are easily recognizable by their colour pattern.

Few cerebral eyes occur in *St. (I.) catus* (n° 5) and *St. (I.) ellipticus* (Girard 1850), which must be mentioned in this connexion, because some individuals of *ellipticus* have a few small eyes scattered along the posterior region (HYMAN 1939a, p. 131). *St. catus* and *St. ellipticus* differ by details of the cerebral eyes and by the presence (*catus*) and absence (*ellipticus*) of a penis sheath. The different size is of less importance, as 8 mm long (VERRILL 1873, p. 632) and even 4 mm long (HYMAN 1939a) *St. (I.) ellipticus* were recorded with the male system fully developed.

Numerous cerebral eyes occur in *St. (I.) refertus* DU BOIS-REYMOND MARCUS (1965, p. 179) and *St. (I.) oculiferus*, both reaching a larger size and both without a penis sheath. In the former even the foremost cerebral eyes lie behind the tentacles, in the latter they extend forward far beyond the tentacular level.

From the American Pacific coast only *St. exiguus* HYMAN (1953a, p. 287) belongs to *Imogine* and has a complete circle of marginal

eyes. Its copulatory complex lies in extreme posterior position, and it has a posterior notch.

4. **Stylochus (Imogine) ticus** Marcus, 1952

MARCUS 1952, p. 79.

BRAZIL: off Ubatuba (23°27′ S, 45°06′ W), dredged in 6–30 m, generally on muddy bottom (F), 13 specimens.

Further distribution: Same area, 50 km farther West, among algae of the intertidal zone.

5. **Stylochus (Imogine) catus** du Bois-Reymond Marcus, 1958

Fig. 4–6

DU BOIS-REYMOND MARCUS 1958, p. 401.

BRAZIL: off Ubatuba, dredged in 6–20 m, generally on muddy bottom (F), 16 specimens.

Further distribution: Coast of São Paulo, Island of São Sebastião, in coarse sand near the low water-line.

Preserved the animals are broadly or longish oval, up to 6.6 mm in length, 3.2 mm in width. Some of them are a little more pointed in front and behind, but such varying contractions are without taxonomic value in preserved material. The ventral side is always light, uncoloured, but the back of many specimens shows brown pigment lying in the superficial layer of the parenchyma. It forms round spots which are finely ramified chromatophores, principally in two paramedian bands (Fig. 4) and sometimes scattered diffusely.

The marginal eyes (Fig. 5, e) encircle the entire body. Those in front are biggest, up to 40 μ in diameter, and form about 3 rows. Towards the sides the eyes are smaller, and behind they are scarce and no more than 18 μ in diameter. The tentacles are long and pointed, reaching 0.4 mm in height in one well stretched animal. They contain 16–20 small eyes (ea) along their whole length, and at their roots each 2 eyes deep in the parenchyma. These eyes lie 1.2 mm behind the fore end. Farther in front, at 0.9 mm, there are 2 pairs of cerebral eyes on the level of the granular masses of the brain (b). The latter extends from 0.9 to 1.1 mm from the fore end. In front of the brain there are 2 pairs of frontal eyes at the level of 0.67 mm. These eyes are 25 μ in diameter.

The ruffled pharynx (h) begins 1.3 mm and ends 2.95 mm behind the anterior border; the mouth (m) lies at 2.2 mm. The common gonopore (co) is 0.23 mm in front of the hind end.

The dorsal and ventral epidermis contains few rhabdites and many gland cells with eosinophilous granules. The basement membrane is distinct; the subepidermal muscle layers are thin, not as high as the epidermis.

The germ layer of the ovaries is dorsal, but full-grown ovocytes lie among the ventral testes under the gut. The sperm ducts are dilated and sinuous in their ectal course (Fig. 6, d). Approaching the male apparatus from behind the ducts acquire muscular walls and become spermiducal bulbs. These fuse with the ental end of the true seminal vesicle (w) to form a tripartite seminal vesicle. A mantle of nuclei surrounds the layer of muscle fibres. The vesicle narrows to a sinuous ejaculatory duct (eu) which unites with the duct of the granule vesicle (q) inside the short but broad penial papilla (p). The latter is lodged in a penial pouch (y) separated by a penial sheath (x) from the tubular male antrum (r).

The granule vesicle (q) is large, 0.25 × 0.14 mm, its muscle mantle is 20 μ in diameter; the nuclei of the muscle cells lie between the fibres. The musculature forms 8 cups lined with flat glandular cells. Between the cups the gland cells of the epithelium are high.

The uteri (u) or oviducts contain eggs up to 80 μ in diameter. The 6 dyad chromosomes are of different shape, contrary to KATO's figure 6 b (1940). The oviducts run ventrally to the sides of the male apparatus, ascend to the dorsal side on the level of the gonopore (co), meeting at their entrance into the inner vagina (vi). The dilated middle vagina (vm) receives the cement glands (c), radially disposed clusters of which surround also the female aperture quite near the common genital pore. The outer vagina (v) is tubular.

This description refers to the present material; the original small specimen (2.5 × 1.5 mm preserved) was re-examined and found compatible in all respects. The dark spots of our first worm hid the scarce and small posterior marginal eyes, so that they had been overlooked. They are, however, present, hence *St. catus*, together with *St. refertus* DU BOIS-REYMOND MARCUS (1965, p. 129), belongs

to the Brazilian species of the genus with eyes encircling the entire body. *St. refertus* is distinguished from *catus* by its size (38 × 28 mm in oil of cloves), cerebral groups of about 70 eyes each, and the pharynx 23 mm in length.

6. **Cryptocelis lilianae,** spec. nov. Fig. 7–9

BRAZIL: off Ubatuba (23°27′ S, 45°06′ W), dredged in 6–20 m, generally on muddy bottom (F), 6 specimens.

The worms are oval, without colour; the adult ones are 6.2–7.2 mm in length, 3.1–3.5 mm in width; 3 immature animals are under 5 mm long.

The marginal band of eyes (Fig. 7, e) completely encircles the body, in front their arrangement is rather dense and their diameter up to 21 μ; behind they are scarce and up to 15 μ in diameter. There are no distinct frontal eyes but 2 widely scattered groups of cerebrotentacular eyes. They begin well in front of the brain (b) and end far behind it; in one animal they nearly reach the pharynx (h). The midline is free from eyes; the biggest of them are 18 μ in diameter. By their pigment cups, obliquely open to the sides, some eyes near the granular masses of the brain differ from the rest, at least in one specimen. These might be defined as tentacular eyes. The total number of the eyes is widely different in the animals at hand. Tentacles do not occur (characteristic of the family).

The brain (b), 0.3 mm in antero-posterior direction, lies 1.2–1.3 mm behind the anterior margin, the pharynx (h) begins 2.7, 2.5, and 3.2 mm (a strongly contracted pharynx) from the front. The length of the pharynx varies from 1.4 to 1.9 mm, that of the granule vesicle (q) from 0.9 to 1.8 mm. The mouth (m) is located behind the middle of the pharynx. There are about 10 folds on either side of the pharynx. The pharyngeal pouch and the intestinal diverticula lodge Nematoda.

The ovaries which are young in our sectioned animal are dorsal. The testes are mature and extend from the ventral side to half the height of the body.

Where the sperm ducts (d) approach the granule vesicle (q) from the sides, they form muscular spermiducal bulbs. These become thin

in their most ectal courses, which curve forwards and ascend to their separate entrances into the granule vesicle.

Within this vesicle the common sperm duct is a thin tube, followed by a wide portion whose epithelium is thrown into 7–9 annular folds (Fig. 9). Its cells secrete red-staining granules. The next part of the ejaculatory duct is vesicular without epithelial folds (eu). The ectal section is tubular again. In one of the 3 mature animals the ejaculatory duct runs winding (Fig. 8), in the 2 others straight. The outer muscle mantle of the granule vesicle consists of mainly longitudinal fibres. The inner one shows muscular septa at regular intervals, composed of annular and radial fibres. Between the septa lies a nucleated tissue, evidently gland cells sunk in from the epithelium of the ejaculatory duct. The red-staining secretion observed between the epithelium and the muscle layer in several species of *Cryptocelis* is evidently produced by this inter-muscular tissue.

Immediately behind the male pore (t) the ejaculatory duct forms a conspicuous dorsal diverticulum (xi). The epithelium is high, the outer wall formed of two layers, an inner muscular and an outer one of sunken glands. In part the nuclei of the gland cells lie also between the muscle fibres.

About 0.3 mm behind the male aperture the female pore (f) is located. The inner vagina receives the oviducts (uteri) coming from in front. In the sectioned specimen the female antrum, the outer (v) and the middle vagina are of the same tubular character. Throughout its course the vagina is surrounded by the usual cloud of cement glands (c), still incipient in the present animal. There is no Lang's vesicle (generic character).

Holotype: One whole mount and 2 slides with sagittal sections of the copulatory organs.

The species is named for the collector.

This is the first Atlantic member of the genus, to date known from the Mediterranean (2 species), the Black Sea (1), Japan (4), California S of point Conception (1), and the Galápagos Islands (1). The names of these 9 species are recorded by HYMAN (1953b, p. 187). This discontinuous range of morphologically well related species is evidently due to the difficulty of finding them in their preferential habitat (LANG 1884, p. 632), sandy and muddy bottoms. The only

previously described species of *Cryptocelis* with a musculo-glandular organ annexed to the efferent male apparatus is *C. glandulata* JAKUBOVA (1909, p. 14) from the Bay of Sevastopol. We owe excellent photos of the anatomy of this species (JAKUBOVA 1909, pl. 1 fig. 4, 6) to the great kindness of Dr. ELENA ANDROSSOVA, Department of Zoology, Academy of Sciences, Leningrad. These show an epithelial ventral fold of the male antrum and a long diverticulum of the ejaculatory duct shortly before it reaches the antrum. This musculo-glandular organ is dorsal, as in our species, because the figure 6 of JAKUBOVA is drawn upside down. However the organ in her species is much larger. Ring folds at the entrance of the male duct into the antrum, and a smooth ental chamber of the granule vesicle are further characters of *glandulata* different from *lilianae.*

We emphasize the occurrence of a straight and a winding course of the ejaculatory duct in our small material, because this character is considered as specific in the literature.

The entrance of 2 separate seminal ducts into the granule vesicle observed in the present species occurs in the Japanese species too; the Mediterranean and the Western American species have an unpaired common duct.

7. **Phaenocelis purpurea** (Schmarda, 1859) Fig. 10

SCHMARDA 1859, p. 18 (*Leptoplana purpurea*); STUMMER-TRAUNFELS 1933, p. 3499 (*Phaenocelis purpurea*); HYMAN 1944, p. 7 (*Comprostatum insularis*; *C. veneris* for fig. 16 is a lapsus); 1952, p. 195 (*Ph. purpurea*; *C. insularis* synonymized); 1955b, p. 259.

CURAÇAO: Piscadera Baai, outer part, under a stone and coming up from algae, II. 1966 (C), 2 specimens.

Further distribution: Florida, Key Largo; Jamaica.

The largest of the present preserved animals is 16 mm long, 6 mm broad; there are no tentacles.

By comparison with *Ph. medvedica* MARCUS (1952, p. 81) we classified the present worms as *purpurea,* though the pharynx and the ejaculatory duct between granule vesicle and penis papilla are a little longer than in the original material. In *medvedica* the pharynx is 1/3 of the body length, in the present worms 1/4, and in SCHMAR-

DA's material less than 1/4. In HYMAN's figure 14 it is everted; the text indicates "short". The ejaculatory duct is as long as the granule vesicle in *medvedica*; in the present material less than half as long. STUMMER-TRAUNFELS and HYMAN say that the granule vesicle of *purpurea* passes directly into the penis papilla, but in STUMMER-TRAUNFELS' figure 24 a short duct, not quite half the length of the granule vesicle, is recognizable.

The common uterine duct in the original material (STUMMER-TRAUNFELS, fig. 25) is short; the right and left ducts unite, as usual, behind the vagina. In the present material, in *Ph. medvedica* MARCUS (1952, fig. 144, w), and in the following species it originates in front of the vagina and is very long. Possibly this difference should be indicated by a special name for the animals from Curaçao, but we think that more material must be awaited before an exact definition of the different lengths of the ejaculatory duct and the common uterine duct.

8. **Phaenocelis peleca,** spec. nov. Fig. 11–12

CURAÇAO: Piscadera Baai, outer part, under stones and coming up from *Halimeda*, I.–II. 1966 (C), 5 specimens.

Alive the length was up to 20 mm, the body rounded in front and pointed behind. The intestinal ramifications were visible through the transparent surface without lens. The preserved animals are broadly oval, e.g. 13 × 9 and 8.2 × 5 mm. There are no tentacles.

Marginal eyes occur around the entire body (Fig. 11); they are numerous in front, scarce behind. They are widely scattered, forming a band 0.8 mm broad in front. The 33–34 cerebral eyes of each group begin 2.3 mm behind the fore end of a 13 mm long animal and end at 3.4 mm. Their diameter reaches 24 μ. The tentacular eyes form two clusters, each of 11–13 eyes, at the level of 3.3 mm; the largest are 35 μ in diameter. The brain measures 0.33 × 0.4 mm; its anterior border lies 3.2 mm from the tip. The pre-cerebral ganglia or granule masses are extremely large, as in the other species of the genus, each measuring 0.28 mm in width, 0.16 mm in length.

The pharynx is relatively long, extending from 4.6 to 9.6 mm; the mouth lies at the level of 6 mm behind the tip. There are about 8

pairs of deep pharyngeal folds, flanked by the uteri bulged by eggs and projecting backwards beyond the end of the pharynx. The male pore lies 0.2 mm behind the pharynx, the female opening 1 mm farther behind.

Both the ovaries and the testes are dorsal. The sperm ducts are distended ectally and enter the short, muscular seminal vesicle from either side. The outlet of the vesicle passes into the granule vesicle, the secretion-storing epithelium of which continues into the root of the small penis papilla. The latter is 0.17 mm in length, curved, pointed, and lodged in a deep male antrum.

The right and left uterine ducts (Fig. 12, u) unite in front of the vagina and form a long common duct (n). In *Ph. purpurea* the "ductus uterinus medianus" (STUMMER-TRAUNFELS 1933, fig. 25, udm) is quite short. The "stalk" of the Lang's vesicle is of medium length, as in HYMAN's fig. 16 of *purpurea*; in the original material it is longer. The ampulla of the vesicle is approximately spherical, distinctly shorter than in the 3 other species of *Phaenocelis*. The middle vagina which receives the cement glands curves to the ventral side followed by the curved, muscular, outer vagina, the ental section of which, neighbouring to the middle vagina, is dilated.

Holotype: A total mount of the anterior part and a slide with sagittal sections of the copulatory organs.

The dispersed marginal eyes furnish the most salient character of *Ph. peleca* for a key, but also the short, curved and pointed penis papilla and the globular, not elongated, ampulla of the Lang's vesicle are specific. The shape of the present animals, discordant from the "long, slender form" indicated for the genus (HYMAN 1953a, p. 297) was assumed in preservation, and though this reaction may also be specific, it might not appear under different conditions.

KEY to the classification of the species of *Phaenocelis*:

1 Male duct between granule vesicle and penis shorter than half the length of the vesicle or practically absent 2
– Male duct between granule vesicle and penis longer than granule vesicle and winding . . . . . *medvedica* MARCUS (1952, p. 81)

2 Penis papilla much longer than broad; male antrum deep . . 3

– Penis papilla not longer than broad; male antrum shallow . . . *mexicana* HYMAN (1953a, p. 299)

3 Marginal eyes in a narrow row along the border of the body (Fig. 10) . . . . . *purpurea* (SCHMARDA 1859, p. 18) STUMMER-TRAUNFELS 1933, p. 3499

– Marginal eyes dispersed over a broad zone on the border of the body . . . . . *peleca*, sp. n.

Igluta, gen. nov.

Cryptocelidae with spermiducal bulbs (accessory seminal vesicles) the ducts of which unite without forming a seminal vesicle, with penial pouch, stylet, and Lang's vesicle.

Type species: *Igluta tipuca*, spec. nov.

The only other cryptocelid that combines an armed penis papilla and a Lang's vesicle is *Amemiyaia pacifica* KATO (1944, p. 271) from southern Japan. It has no spermiducal bulbs, a distinct, though small, seminal vesicle, a long ejaculatory duct coiling in a muscular granule bulb, and a vagina bulbosa.

9. **Igluta tipuca**, spec. nov. Fig. 13–15

CURAÇAO, Piscadera Baai, inner part, coming up from *Thalassia*, 1.II.1966 (C), 2 specimens.

One of the animals, measured in alcohol, is 23 × 9 mm, the other, in oil of cloves, 16 × 5 mm. The body is elongate, the colour white. There are no tentacles as in all cryptocelids.

The small marginal eyes, up to 14 μ in diameter, lie in a single row in front to the level of the brain and continue rarefied around the entire body. The two clusters of tentacular eyes, the diameter of which reaches 29 μ, contain 4–7 eyes each. The 9–10 cerebral eyes of either side, up to 18 μ in diameter, lie mainly in front of the tentacular eyes.

The short pharynx begins at 3.9 mm behind the anterior border of

the 16 mm-specimen and ends at 7.2 mm. The mouth lies at 5.7 mm, the male opening at 8.6, and the female pore at 9.0 mm.

The testes are dorsal; ovaries have not yet developed. The distended sperm ducts bend forward and form strongly muscular spermiducal bulbs (as). These emit thin ducts which unite into a common sperm duct passing through the thick musculature of the granule vesicle (q), where it projects into the lumen. The epithelium of the longish-ovoid granule vesicle stores red secretion; extracapsular glands were not seen. The outlet of the granule vesicle or common male duct is ciliated and opens into the canal of a stylet (ps), 1.1 mm in length, 40 μ in width. The stylet is lodged in a penis pocket (y) or inner male antrum. The thick wall of the pocket is formed by loose muscle fibres. The short, ciliate outer male antrum (r) is separated by a minute penis sheath from the pocket.

The uterine ducts unite in front of the vagina (Fig. 15, v). The common uterine duct (n) is 0.28 mm in length and opens into the anterior wall of the vagina. Behind its entrance begins the backwards directed duct (on) of the Lang's vesicle, consisting of 20 beads. The large ampulla (1), 1.4 mm in length, contains sperm and red granular secretion. The vagina (v) is rather muscular. As the cement glands are not developed yet, the vaginal sections can only be defined approximately.

Holotype: One slide with the anterior and posterior parts as whole mounts and one with sagittal sections of the copulatory organs.

10. **Zygantroplana yrsa**, spec. nov. Fig. 16–17

ARUBA: Spaans Lagoen, NW side, rocky shore of muddy lagoon with many algae. Near *Rhizophora*, 0–1 m, 1.I.1949 (H 1008), 10 specimens. – Malmok, rocky sandy beach, 0–1 m, 14.VIII.1955 (H. 1301), 1 spec.

CURAÇAO: Piscadera Baai, outer and inner bays, coming up from algae, I.–III. 1966 (C), 12 spec.; Piscadera outer bay, pebbles, 0–½ m (H 1459), 2 spec. – Boca Lagoen, N side, steep stony cliff, 0–½ m, 13.XI.1948 (H 1020), 2 spec. – Plaja Hoeloe, stony cliff, near sandy reef, tidal zone, 2.IV.1949 (H 1024), 1 spec.

KLEIN BONAIRE: East coast, sandy shore with reef debris, 0–1½ m, 10.IX., 17.X. & 8.XI.1930, and 13.IX.1948 (H 1049, 1049a, 1049B), many spec.

BONAIRE: Paloe Lechi, rocky beach with small tidal pools, ½–1 m, 24. & 27.II. 1949 (H 1056Aa, 1056Ba), 6 spec. – Kralendijk, near Pasanggrahan, coral fragments and rocky beach, 0–½ m, 3. & 5.IX.1930 (H 1057), many spec. – De

Hoop, S of Kralendijk, rocky cliff and sandy reef, 0–1½ m, 17.V.1930 (H 1058), 1 spec. – Lagoen, surf-swept diabase rock, debris, 0–1 m, 2.IV.1955 (H 1376), 1 spec.
Los Frailes: *La Pecha*, SW shore, sandy debris of igneous rock, 1–2 m, 19.VI.1936 (H 1215), 1 spec.
Coche: Coche Baai, Chacopata, on pearl oyster, about 3 m deep, 25.VI.1936 (H), 1 spec.
Grenada: White Bay, Point Salines, beach rock on sandy beach, pools, some *Thalassia*, 0–1 m, 26.I.1955 (H. 1389), 1 spec.
Islote Aves (Bird Island), W of Dominica: Northern Lagoon and Northern Reef, sandy shore with some coral debris and beach rock, 0–1 m, 12.V.1949 (H 1114 & 1115), 3 spec.
Antigua: Deep Bay, volcanic tuffoid rock, pebbles, sandy, in surf, 0–1 m, 17.VII.1955 (H 1393), 2 spec.
Barbuda: Two Feet Bay, surf-swept limestone cliff, sandy rock pools, some *Thalassia*, 10.VII.1955 (H 1395), 2 spec.

The preserved animals which are often brittle, are oblong with a median notch behind and slightly folded margins. They are whitish and without tentacles. Their proportions are diverse, e.g., 3.6 × 2.5 mm or 6.3 × 2.1 mm and 8.1 × 3.3 mm.

The brain lies 1.5 mm behind the tip in a 6.3 mm-animal (Fig. 16), it is not especially small, and also the granule masses are of normal size. The eyes extend from 1.2 to 1.9 mm. They form two rows with a few eyes lying farther laterally. On either side in front of the brain 28–30 cerebral eyes occur, the diameter of which is up to 22 μ, 4–6 post-cerebral ones, and 11–12 tentacular eyes, 30–40 μ in diameter, directed obliquely.

The pharynx is little folded, begins at 2.2 mm and ends at 4.0 mm; the mouth lies behind its middle, at 3.5 mm, the male (t) and female (f) pores at 5.65 and 5.8 mm, respectively.

The ovaries and the testes begin at the level of the pharynx, the former extend from the dorsal to the ventral side, and some of the ventral testes reach the back. The sperm ducts (Fig. 17, d) run coiling under the post-pharyngeal uteri (u) backwards and enter the small, globular seminal vesicle (w). The looping ejaculatory duct penetrates with a minute papilla into the following tubular section, which may be called a granule vesicle. Its epithelium stores a pink secretion; extra-capsular glands were not seen. A slight constriction, theoretically a common male duct, leads to the ectal part of the male duct. In this antrum the epithelium contains granular, orange-

staining secretion. A penis papilla is absent. The character of the antral epithelium with its granules extends from the wide male opening (t) about 0.15 mm forwards and backwards to the female aperture (f).

The uteri (u) lie behind the pharynx and in front of the Lang's vesicle (l). The short uterine ducts unite into a quite short common duct (n) which enters the inner vagina from behind. The vagina media begins with a dilated part (vm) where most of the cement glands open. The outer tubular part receives sparse cement glands in the two sectioned specimens. The outer vagina (v) is short, the female antrum minute. Entally to the entrance of the common uterine duct a short duct (on) connects the inner vagina with the ampulla of the Lang's vesicle (l). This contains sperm; its epithelium is high.

Holotype: Anterior part of a specimen from Curaçao as whole mount and a series of sagittal sections of the copulatory organs.

This is the second species of the genus with separate gonopores and without stylet. The first is *Zygantroplana plesia* CORRÊA (1949, p. 200) from Brazil, Antonina (25°26′ S, 48°42′ W). This small species, 2.3 × 1.5 mm preserved, has cerebral eyes only in front of the brain and differs slightly from *yrsa* in the copulatory organs. Its granule vesicle is better set off against the male antrum, and the vaginal dilatation lies between the vagina media, which receives the cement glands, and the outer vagina.

In the type species of *Zygantroplana*, *Z. verrilli* LAIDLAW (1906, pl. 52 fig. 2), *Z. clepeasta* KATO (1944, p. 278), and *yrsa* the granule vesicle, the common male duct, and the antrum cannot be defined. They are intermediate between the Leptoplaninae and the Euplaninae. BOCK (1913, p. 170) allocated *Zygantroplana* to his third group, the Euplaninae MARCUS (1947, p. 129), CORRÊA (1949, p. 175, 202) to the Leptoplaninae MARCUS (1947, p. 110). Besides the known difficulties of separating the Notoplaninae from the Leptoplaninae (l.c. p. 121), BOCK's and CORRÊA's divergent opinions are evidence of the impossibility of subdividing the Leptoplanidae rigorously, due to their "variation incoordonée et répétée des caractères" (BEAUCHAMP 1961, p. 56).

The close relationship of the Emprosthommatidea to the Leptoplanidae presumed by BOCK (1913, p. 57) is revealed by *Z. clepeasta*, a leptoplanid with emprosthommatidean eyes.

Notes on **Stylochoplana**

BOCK (1913, p. 172–173) united the species with cuneate body as group A, and those with a different shape as groups B (penis unarmed) and C (penis with stylet). As there are now four times as many species of *Stylochoplana* than in 1913, these groups need further subdivisions for taxonomic orientation.

We exclude *Stylochoplana siamensis* PALOMBI and *St. caraibica* PALOMBI (1923, p. 36; 1924, p. 15, 17) from the genus, because their granule vesicles are evidently free, not intercalate. *Stylochoplana plehni* BOCK (1913, p. 180) probably belongs to *Notoplana*, as HYMAN (1953a, p. 305) supposed, because the epithelium of the granule vesicle is folded (PLEHN 1898, p. 93). As *Stylochoplana genicotyla* PALOMBI (1939b, p. 101) has a sucker or pit between the genital apertures, we allot it to *Leptoplana* Ehrenberg 1831, emend. Bock 1913. The latter genus cannot be defined without this feature, and therefore we remove the 4 species without genital pit, that HYMAN (1953a, p. 314) located in *Leptoplana*, to *Stylochoplana*.

Stylochoplana viridis FREEMAN (1933, p. 118) must remain in this genus. It cannot pass (HYMAN 1953a, p. 334) to *Phylloplana* LAIDLAW (1903b, p. 107), the single species of which has no granule vesicle as *St. viridis*, but a secretion storing epithelium in the ental section of the ejaculatory duct. *Phylloplana lactea* Laidlaw belongs to BOCK's third series of the Leptoplanidae (1913, p. 168), our Euplaninae MARCUS (1947, p. 129).

We distinguish the following groups:

A 1. – Tentacles present; penial papilla unarmed; no penis pocket: *agilis* LANG (1884, p. 456); *challengeri* (GRAFF 1892, p. 213) PRUDHOE (1950b, p. 713); *clara* KATO (1937f, p. 357); *conoceraea* (SCHMARDA 1859, p. 35) STUMMER-TRAUNFELS (1933, p. 3563); *gracilis* HEATH & MCGREGOR (1912, p. 463) HYMAN (1953a, p. 303); *hancocki* HYMAN (1953a, p. 307); *maculata* (QUATREFAGES 1845, p. 144) LANG

(1884, p. 459) BOCK (1913, p. 173); *palmula* (QUATREFAGES 1845, p. 143) LANG (1884, p. 457); ? *tarda* (GRAFF, 1878, p. 460) LANG (1884, p. 462), anatomically unknown, perhaps young specimens of *St. palmula*.

If the groups should receive the rank of subgenera or genera, group *A 1* must be called *Stylochoplana* Stimpson 1857, because it contains the type species *St. maculata*.

A 2. – Penial papilla armed; no penial pocket:
aulica MARCUS (1947, p. 114); *reishi* HYMAN (1959b, p. 5); *taurica* JAKUBOVA (1909, p. 8); *viridis* FREEMAN (1933, p. 118). All except *reishi* with tentacles.

B 1. – Tentacles absent; penial papilla unarmed; no penial pocket; Lang's vesicle present:
chilensis (SCHMARDA 1859, p. 17) STUMMER-TRAUNFELS (1933, p. 3494); *chloranota* (BOONE 1929, p. 43) HYMAN (1953a, p. 310); *graffi* (LAIDLAW 1906, p. 708) BOCK (1913, p. 179); *lanceolata* (SCHMARDA 1859, p. 19) STUMMER-TRAUNFELS (1933, p. 3496), a synonym of *St. chilensis*; *longipenis* HYMAN (1953a, p. 305); *minuta* HYMAN (1959a, p. 549); *nadiae* (MELOUK 1941, p. 44); *parva* PALOMBI (1939b, p. 104); *suesensis* PALOMBI (1936, p. 13); *utunomii* KATO (1943a, p. 72); *walsergia*, sp. n. (no. 12).
As the female apparatus of *St. suosensis* KATO (1943a, p. 70) is not known, it remains open, whether the species belongs to B 1 or B 2.

B 2. – Tentacles absent; penial papilla unarmed; no penial pocket; Lang's vesicle absent:
the species are mentioned in the following discussion of *St. bayeri*, sp. n. (no. 13).

B 3. – Tentacles present; penial papilla unarmed; no penial pocket; Lang's vesicle present:
amica KATO (1937a, p. 213); *lynca* DU BOIS-REYMOND MARCUS (1958, p. 403); *parasitica* KATO (1935, p. 123); *pusilla* BOCK (1924, p. 2); *selenopsis* MARCUS (1947, p. 116; 1949, p. 74).
It may be noted that BOCK (l.c.) introduced *Stylochoplanoides* as subgeneric name for *St. pusilla*. As the uterine ducts of this species bifurcate in a peculiar manner (KATO 1934, p. 125), it is doubtful,

whether BOCK's name can be used for all species of group B 3, when this receives subgeneric or generic rank.

B 4. – Tentacles present; penial papilla unarmed; no penial pocket; Lang's vesicle present; frontal eyes besides the cerebral and tentacular ones:
aberrans KATO (1944, p. 274).

C 1. – Tentacles absent; penial papilla with stylet; penis pocket present:
the species are mentioned in the following, in the discussions of *St. snadda*, sp. n. (no. 14) and *St. wyona*, sp. n. (no. 15).

C 2. – Tentacles present; penial papilla with stylet; penis pocket present:
divae MARCUS (1947, p. 112); *evelinae* MARCUS (1952, p. 83); *vesiculata* PALOMBI (1940, p. 113), tentacles observed by BEAUCHAMP (1951, p. 77).

D. Male genital canal opening into antrum without penis papilla:
diaphana (STUMMER-TRAUNFELS 1933, p. 3531); *limnoriae* HYMAN 1953a, p. 313).

11. **Stylochoplana leptalea** Marcus, 1947 Fig. 18–19

MARCUS 1947, p. 118; 1948, p. 177.

CURAÇAO: Piscadera Baai, outer and inner bay, coming up from algae, I.–II. 1966 (C), 18 specimens. Piscadera Baai, entrance of inner bay and inner bay, various soft bottoms, also on iron beams and poles, and on buoy, 0–2 m (H 1460A, 1462, 1464, 1473A, 1475, 1477, 1480a, 1482, 1485, 1487, 1495, 1503), many spec. – Fuik Baai, Newport Bath, rocky shore of large lagoon, muddy sand with some *Thalassia*, 0–1 m, 20.XI.1948 (H 1309), 2 spec.
ANTIGUA: Deep Bay, volcanic tuffoid rock, pebbles, sandy, surf, 0–1 m, 17.VII.1955 (H 1393), 1 spec.
FLORIDA: *Virginia Kev.* NE side. sand flat with *Cymodocea* and *Thalassia* beds, 0.5–2 m, 4.IX.1963 (H 1408), 1 spec.
BRAZIL: Abrolhos Rocks, Ilha Sta. Barbara, 17°55′ S, 38°39′ W, under a stone, 26.IX.1965 (N), 1 spec.

Further distribution: Brazil, Bay of Santos.

The preserved specimen from the Abrolhos is 17 mm long, hence full-grown. The length of the seminal vesicle is 0.45 mm, that of the granule vesicle 0.37 mm, that of the stylet 0.65 mm. The gut of the

living worm shone brownish yellow through the transparent skin (N).

The preserved animals from Curaçao (Fig. 18) have very different shapes; the lengths vary from 1.8 to 3.7 times the breadths, e.g., 22 × 6 mm. Their stylets are 0.9–1.4 mm long. Also the size and the shape of the granule masses or precerebral ganglia vary. The tentacular eyes lie on the level of the posterior border of the brain or farther behind, often asymmetrically. The previously described short cone of the ejaculatory duct at its entrance into the granule vesicle is specific. In the specimens from Brazil and those from Curaçao the common male duct forms a loop between granule vesicle and stylet (Fig. 19).

12. **Stylochoplana walsergia,** spec. nov. Fig. 20–22

BRAZIL: Caravelas (17°42′ S, 30°09′ W), on anomurans of the genus *Callianassa* (Dr. SÉRGIO DE ALMEIDA RODRIGUES det.), 23.IX.1965 (N), 5 specimens.

The biggest worm was alive 8 mm long, 5 mm broad. Preserved and in oil of cloves it is 6.5 × 4.5 mm. The second in size is preserved 5 mm in length, 2.5 mm in width. Its sections are 0.33 mm high. The shape of the preserved animals is broadly elliptic; alive the largest worm was lozenge-shaped; the greatest breadth lies behind the level of the brain (Fig. 20). The colour of the living worm was sienna, vermillion towards the middle, the pharynx and the intestinal branches shone light through the skin (N). The parenchyma contains dark pigment spots in the area around the pharynx.

Two groups of eyes lie behind the brain (Fig. 21, b), the location of which corresponds to tentacular eyes (ea). There are 4–6 eyes in each group, different numbers on both sides are frequent. The diameter of the eyes reaches 11 μ; they are orientated in different directions. Enormous granule masses (ce) lie apposed to the anterior cerebral lobes outside the brain capsule. Each mass consists of numerous small nerve cells surrounding a dense central core of fibres which pass through the capsule into the brain (HADENFELDT 1929, p. 607–608). In the smaller animal, to which also the following measurements refer, the brain is about 0.18 mm long, and its posterior border

lies 1 mm behind the fore end. The greatest diameter of each granular mass equals the length of the brain.

The pharynx (h) extends from 1.6 to 3.1 mm behind the anterior end; it has few deep folds. The mouth (m) lies at 2.6 mm, hence a little behind the middle of the body. Male (t) and female (f) pores are widely spaced, the former at 3.3 mm, the latter at 4.15 mm from the fore end.

The height of the dorsal and the ventral epidermis is 16 μ. The cilia are 3 μ long in the middle of the ventral skin. The main intestine (i) extends forward with one branch ventrally to the brain (Fig. 21); granular clubs in the main intestine occur still behind the Lang's vesicle.

The testes begin dorsally, but the ripe sperms lie ventrally. The ovaries begin ventrally, and the grown ovocytes, in the sectioned specimen only 5, are dorsal. The efferent ducts (Fig. 22, d) contain some sperm. Their most ectal parts are muscular and enter from behind into the 0.25 mm long, thin-walled spermiducal vesicles (sv). These are posterior and ventral to the 0.14 mm long seminal vesicle (w). The ejaculatory duct (eu), 0.12 mm in length, runs backwards, upwards, and curves downwards, where it is slightly dilated into a granule vesicle (q). The diameter of the latter is 37 μ, but its lumen is only 5 μ wide, because the epithelium of either side is 16 μ high. This epithelium stores the red-staining secretion of extra-vesicular glands (ic), which lie between the penial muscles (mu). If the mantle of these muscles is considered as the ental limit of the copulatory organ, the length of the latter is 0.18 mm. The high epithelium of the granule vesicle reaches the tip of the penial papilla, so that the granule duct functions as common male duct. The conical penial papilla is not cuticularized and is coated with a flat, nonciliate epithelium. It projects into a deep male antrum (r), the epithelium of which is higher and ciliate.

The oviducts or uteri (u) which contain some sperm, but no eggs yet, unite 0.21 mm before the female pore. The common uterine duct (n) is 0.1 mm long and opens into the inner vagina (vi) from below. Backward the moniliform duct of Lang leads to a spherical vesicle (l), 0.17 mm in diameter, which contains some sperm. The vagina runs forward beyond the ends of the uteri, curves first down-

ward, then backward and obliquely upward and finally to the ventral side as outer vagina (v). The whole part between the first and the second ventral bends must be termed middle vagina, as it receives the cement glands (c). These are disposed with intervals in the sectioned worm in the complete male and incipient female phases. In the largest, totally mounted animal in terminal female phase, the cement glands (Fig. 20, c) occupy a much broader area than in the sectioned specimen. The vaginal musculature is moderately developed.

Holotype: Two slides containing horizontal sections of the anterior part and sagittal sections of the posterior part.

The species is named for the collectors.

The peculiar shape of *St. walsergia* cannot be evaluated taxonomically. The body shape is helpful for recognizing species in a well-inventoried local fauna, but much less so for preserved specimens, as Schmarda's collection (STUMMER-TRAUNFELS 1933) or BOCK's figures of *St. pusilla* (1924, pl. 1, fig. 1, 2) show. BOCK used the shape for grouping his few species (1913, p. 172–173), but later on his concept of a cuneate outline was so much enlarged, that it was applied also to species with an anteriorly rounded and posteriorly tapering body.

The occurrence of a defined area where the granule glands open and their secretion is stored, leads us to include the present species in *Stylochoplana*, though the granule vesicle is quite uncommonly small, even smaller than in *St. chilensis* drawn by STUMMER-TRAUNFELS (1933, fig. 13, 16). The Euplaninae have no granule vesicle; the Hoploplaninae no true seminal vesicle. *Indiplana* STUMMER-TRAUNFELS (1933, p. 3527) belongs to the latter. Therefore it cannot receive *St. walsergia*, though *Indiplana oosora* (Schmarda 1859) lacks tentacles and stylet as does *St. walsergia*.

Besides the small granule vesicle also the absence of cerebral eyes separates *St. walsergia* from group *B 1* of *Stylochoplana*. Certainly the absence of these eyes in a flatworm associated with burrowing crayfish does not justify more than a specific separation. Though some species of the Plehniidae are eyeless (PLEHN 1896a, p. 147; HYMAN 1953a, p. 279), BOCK (1913, p. 69) was right to include this family in the Craspedommatidea, generally with marginal and frontal eyes besides the central ones. *Macginitiella* HYMAN (1953a,

p. 337) which has only few tentacular eyes belongs to the Schematommatidea.

13. **Stylochoplana bayeri,** spec. nov. Fig. 23–25

FLORIDA: Coral Gables Canal, in slough along road to Tahiti Beach, in algae, 19.I.1963 (B), 4 specimens. – *Virginia Key*, piling of Marine Laboratory, concrete pools in muddy water, tidal flow, 0–1½ m, 1.IX.1963 (H 1409), 3 spec.

The worms are 6.5–9.5 mm long, preserved, 2.5–4.0 mm wide, and about 0.5 mm in height. They are thick, opaque, and some of them have brown dots on the back. Sometimes these dots are densely set on the margins, forming a dark pattern. The shape is longish, a little broader in front than behind. Tentacles are absent. The animals have strongly pronounced marginal folds, though not all of them so much as that of Figure 23.

The tentacular eyes (Fig. 24, ea) form two clusters of 10–17 eyes each; they are directed obliquely forward and backward; their maximum diameter is 57 μ. The cerebral eyes (g) stand in two irregular rows, principally in front of the brain (b), a few behind it. They are directed upward and downward, and reach 50 μ in diameter. The brain is 2 mm distant from the fore end in the largest specimen.

The pharynx is ruffled, 1.8 mm long and extends from 3.2 to 5.0 mm behind the fore end. The mouth (m) lies in the centre of the body, behind the middle of the pharynx. The male pore (t) is 5.7 mm, the female pore (f) 5.8 mm from the anterior border of the body.

The epidermis is 26 μ high dorsally, 20 μ ventrally; the cilia are not preserved. The main intestine reaches the brain and contains granular clubs backward to the region of the root of the penial papilla.

The testes and ovaries occupy the entire height of the body; the ripe sperms accumulate ventrally. The sperm ducts (Fig. 25, d) are distended by sperm and dilated into spermiducal vesicles from the mouth backward. The muscle layer of the vesicles is weak. Each vesicle emits an 80 μ long muscular duct, 15 μ in diameter. Both ducts enter the seminal vesicle (w) at a distance of 0.1 mm from one another. The seminal vesicle is small, 0.18 mm in length, its muscular wall 10 μ thick. The ectal end of the seminal vesicle is prolonged into

a 0.18 mm long ejaculatory duct (eu) which runs upward and enters the longish granule vesicle (q). The latter's maximum length is 0.34 mm; in the sectioned specimen of 7.3 mm body length it is 0.24 mm. The muscle layer of the granule vesicle is rather thick, 35 μ, and does not contain nuclei. There are no extracapsular glands. The pointed end of the granule vesicle passes gradually into the common male duct. This curves upwards to the base of the penial papilla (p), a conspicuous organ, 0.46 mm long in all present specimens, and 0.1 mm thick at its root. Its layers are: a thin cuticle; high, somewhat vesicular epithelial cells; longitudinal muscles; parenchyma; annular muscles, and flat epithelium of the common duct containing longitudinal nuclei. The penial papilla lies in an undivided male antrum (r).

The uteri (u) are united in front of the pharynx. The oviducts curve to the midline behind the level of the female gonopore. The common uterine duct (n) passes to the inner vagina (vi). There is no posterior continuation of the female apparatus, duct and ampulla of Lang's vesicle. The cement glands (c) open into the inner vagina and into the ental part of the outer vagina (v). The ectal part of the latter does not receive cement glands. The outer vagina is wide, folded, and provided with long cilia; its muscle layer is not especially strong.

Holotype: Anterior part as whole mount and 1 slide with sagittal sections of the copulatory organs.

The species is named for the first collector.

St. bayeri belongs to group *B 2*, of which only 2, possibly 3, species are known.

St. inquilina HYMAN (1950, p. 55). Shape lanceolate; a median white band and two lateral tawny bands; a white margin along the entire periphery; about 40 tentacular eyes; seminal vesicle larger than granule vesicle.

St. pallida (QUATREFAGES 1845, p. 133) LANG (1884, p. 489) BOCK (1913, p. 179). Genital pores widely distant from one another; penis papilla small.

St. suosensis KATO (1943a, p. 70). Female apparatus not developed in the described specimen. Mouth at the level of the first third of the body. Penis papilla thin.

14. **Stylochoplana snadda,** spec. nov. Fig. 26–28

CURAÇAO: Piscadera Baai, inner bay, northern part, *Rhizophora*, muddy sand 0–½ m (H 1479), 1 specimen.
BONAIRE: Lac, Rancho island, shallow mud flat, ½–1 m, 26.X.1930 (H 1063), 5 spec. – Lac, Poejito, on *Rhizophora* in muddy lagoon, 0–1 m, 17.IX.1948 (H 1064b), 1 spec.
ST. CROIX, Krausse Lagoon, entrance, canal among *Rhizophora* with tidal flow, ½–1 m, 15.VI.1955 (H 1405), 9 spec.
FLORIDA: Coral Gables Canal, in slough along road to Tahiti Beach, in algae, 19.I.1963 (B), 1 spec. – *Virginia Key*, piling of Marine Laboratory, concrete pools in muddy water, tidal flow, 0–1½m, 1.IX. 1963 (H 1409), 5 spec. – *Key Biscayne*, N point at Bear Cut, sandy bottom with *Thalassia* and *Cymodocea* beds, single *Rhizophora*, 0–1 m, 1.IX.1963 (H 1410 & 1410A), 5 spec.

The animals are 10–12.5 mm long and 4–5 mm broad, preserved. They are elongate, rounded in front and taper gradually towards the end (Fig. 26). The margins are strongly undulate. There are no tentacles. The gonads are darker than the remaining parts of the body.

The tentacular eyes (Fig. 27, ea), which reach a diameter of 80 μ, form dense clusters of 8–15 eyes. Most of them are directed obliquely outward. The cerebral eyes (g) begin a little in front of the middle of the brain and extend forward for more than one brain's length. They number 15–28. A further single cerebral eye lies behind each tentacular cluster. The direction of the cerebral eyes is upward and downward. The cerebral eyes are up to 40 μ in diameter.

The following measurements refer to the 12.5 mm-long specimen from Coral Gables. The ruffled pharynx (h) is 2 mm long, it begins at 3.1 mm from the anterior border. The mouth lies at 4.7 mm, that is in front of the centre of the body and behind the middle of the pharynx. The male and female pores (t, f) are 7.6 and 8.2 mm behind the fore end, respectively.

The dorsal epithelium is 11 μ high, the basement membrane 3 μ, the corresponding ventral measurements are 13 μ and 5 μ. There are more rhabdites ventrally than dorsally. The main intestine is hidden by the uteri.

The testes extend farther to the ventral than to the dorsal side of the body, while the ovaries occupy the entire height. The sperm ducts (Fig. 28, d) enter the seminal vesicle from the ventral side. The vesicle (w) is 0.41 mm long, its muscular wall is 80 μ thick. The

ejaculatory duct is short. The granule vesicle (q) is thick-walled and smaller (e.g. 0.25 × 0.17 mm) than the seminal vesicle, but not always as small as in the drawn animal. The common male duct traverses the penis papilla the length of which depends on contraction. In the drawn specimen from Coral Gables it is much shorter than in a sectioned specimen from Key Biscayne, where it is 0.35 mm in length. The stylet (ps), up to 0.9 mm long and 40 μ wide at the base, is lodged in a penis pocket (y) which is separated from the male antrum (r) by a conspicuous penis sheath (x).

The uteri are H-shaped in the specimen from Coral Gables. The common oviduct (n) enters the inner vagina (vi) from the ventral side. Backwards a moniliform, up to 0.6 mm long, duct of Lang's vesicle extends which ends with a folded ampulla (l), 0.5 mm in maximum extension. The inner vagina bears long cilia. Its descending section, Bock's vagina media (1913, p. 41), receives the cement glands (c). The outer vagina (v) is not ciliated. It is surrounded by a strong sphincter and opens into the antrum (a) through the anterior wall. The sphincter of the drawn specimen appears more concentrated than in the other animals.

Holotype: Three slides containing the fore end and the sagittal sections of the copulatory organs.

St. snadda belongs to group *C 1* and must be compared with the following species:

St. affinis PALOMBI (1940, p. 117). Granule vesicle larger than seminal vesicle. Lang's vesicle with 2 accessory vesicles.

St. leptalea (no. 11). Cerebral eyes in front and behind the brain; ejaculatory duct projecting into granule vesicle; common male duct looping; penis sheath small; no special sphincter between vagina and antrum.

St. panamensis (PLEHN 1896a, p. 151) HYMAN (1953a, p. 301). Granule vesicle long and narrow; Lang's vesicle extraordinarily large and elongated.

St. robusta (PALOMBI 1928, p. 596). Stylet short; penis sheath minute; Lang's vesicle small. Described as *Notoplana*, but actually a *Stylochoplana*. PALOMBI (1928, p. 603) referred to *N. ovalis* BOCK (1913, p. 212), today *N. erythrotaenia* (SCHMARDA 1859) (see STUMMER-

TRAUNFELS 1933, p. 3520), as another *Notoplana* with smooth epithelium of the granule vesicle, but BOCK (l.c.) described 8 tubes in it. PALOMBI stated (1939b, p. 107, note 1) that of his original figures (1928), fig. 176 (p. 593) belongs to *robusta*, fig. 180 (p. 598) to *St. suesensis* Palombi 1939.

15. **Stylochoplana wyona,** spec. nov. Fig. 29–30

ST. MARTIN (Sint Maarten): Simson Bay Lagoon, Flamingo Pond, with *Batophora*, on *Rhizophora* and *Avicennia*, 0–1 m, 8.VI.1949 (H 1132), 3 specimens.

The shape is oval, rounded in front and behind; the margins are undulated. The 3 worms are 4.9, 5.2, and 5.8 mm in length; their width is 2–2.1 mm. The preserved animals are brownish, translucent. Some of the pharyngeal glands are black and in the sections still brown, perhaps due to the liquid of preservation or to the cork.

There are no tentacles. The tentacular eyes form two fields, on either side of the brain (Fig. 29). The largest specimen has 12–14 tentacular eyes, the middle-sized one 19–21, and the smallest worm 16–18. The diameters of these eyes, 46 μ, 45 μ, and 40 μ correspond to the body sizes. Most of the cerebral eyes lie in front of the tentacular eyes, 1–2 of them behind these, more cerebral eyes might be hidden by the larger tentacular eyes. The number of the cerebral eyes is 14–15 in each cluster (largest worm), 18 (middle sized specimen) and 14–16 or more (smallest animal). The corresponding diameters are 24, 30, and 30 μ.

The shape of the pharynx varies, it is little or strongly ruffled (Fig. 29). It measures 1.0–1.4 mm, begins in front of the middle of the body and ends behind it; the mouth lies in its posterior half. The intestinal branches anastomose. The male pore (Fig. 30, t) is situated about 0.7 mm behind the pharynx (oo), the female orifice (f) 0.20 mm behind the male aperture in the sectioned 5.8 mm-specimen.

Testes and ovaries occupy the middle level of the body height. The sperm ducts (d), which are united by a transverse communication behind the female apparatus, are distended by sperm, but do not form strongly muscularized bulbs. Coming from behind they

enter the seminal vesicle (w) the muscle mantle of which is weak. The ejaculatory duct is short, the epithelium of the granule vesicle (q) smooth. A short common male duct enters the conical stylet (ps), 0.3 mm in length and 26 μ thick at its base. The stylet is lodged in a narrow penis pocket (y), separated by a short sheath (x) from the wide antrum (r). The latter contains granules, evidently proceeding from circumjacent clusters which do not have the character of glands, but rather that of degenerated matter passing to the antrum.

The uteri contain single large eggs, measuring e.g. 230 × 82 μ. The uterine ducts open through a common pore (n) into the inner vagina (vi). The latter is vesicular, contrasting with the following, obliquely descending tubular section. This is the densely ciliated middle vagina (vm) which receives cement glands (c). Also a great number of glands open into the widened outer vagina (v) which slants backward and is not ciliated. The short female antrum (a) is without glands.

Holotype: Anterior part of the largest specimen as whole mount and sagittal sections of its copulatory organs.

The species belongs to our group *C r*, whose species were mentioned in the discussion of *St. snadda* (nr. 14). They all have a Lang's vesicle and so need no special comparison with *St. wyona*.

16. **Notoplanides alcha,** spec. nov. Fig. 31–32

St. Kitts (Saint Christopher): Frigate Bay, exposed cliff of volcanic rock, coarse sand, 0–1 m, 20.VII.1955 (H 1397), 1 specimen.

The animal which is in male phase is elongate, 7.6 mm in length, 2.3 mm in width. The purplish colour of the back (ei) lies in the outer part (4 μ) of the high epidermal cells. Besides there are 3 black stripes on either side of the back which unite in front and behind (Fig. 31). The outermost stripes are accompanied by marginal black spots in the anterior fourth, the innermost stripes overlie the cerebral eyes, concealing them. The coarse granules of the black pigment (se) are located in the conjunctive tissue under the cutaneous muscles. In the clarified worm the purplish colour appears yellow.

The height of the dorsal epidermis is 20 μ with 5 μ long cilia; the corresponding measurements are 16 μ and 10 μ for the ventral side. Dorsal and ventral epidermis contain rhabdites. The tentacles stand

1.5 mm behind the tip and at a distance of 0.4 mm from each other; their height is 0.2 mm. As they have no pigment, they look white, but contain numerous black eyes. The cerebral eyes form two separate bands in front of the tentacles.

The strongly ruffled, richly glandular pharynx extends approximately from 3.4 to 7 mm, where the mouth (Fig. 32, m) lies. The main intestine (i) reaches the end of the pharynx. The male pore (t) is 0.13 mm behind the mouth, and the female aperture (f) lies at the level of 7.26 mm from the tip.

The testes are ventral; the ovaries are not differentiated yet. The sperm ducts (d), which are already distended by sperm, do not form spermiducal bulbs. Over the mouth they enter the ventral limb of the seminal vesicle (w). The dorsal, more dilated limb of the latter opens into the granule vesicle (q) by a very short ejaculatory duct. The high epithelium of the granule vesicle is smooth. The short common male duct pierces the small, blunt penis papilla (p) which projects into the long and narrow male antrum (r).

The ciliated uterine ducts unite into a wide common duct (n), which first runs backward, then bends upward and forward, where it opens into the inner vagina (vi), still directed forward. So is the middle vagina (vm), the cement glands (c) of which are incipient. The outer vagina (v) bends to the ventral side, widens and opens through the female pore (f). There is no Lang's vesicle.

Holotype: Anterior part of the body as a whole mount and sagittal sections of the copulatory organs.

If the posterior position of the pharynx in the present species was not considered, it might be allotted to group *B* of *Stylochoplana*, but it cannot be classed in one of the subgroups due to the combination of "tentacles present" and "Lang's vesicle absent". Moreover, the central pharynx cannot be disregarded for the classification of a species of the Leptoplaninae.

In this subfamily there is a monotypic genus, *Notoplanides* PALOMBI (1928, p. 599), which differs from *Stylochoplana* only by the posterior pharynx. PALOMBI overlooked BOCK's description of 8 tubes in the granule vesicle of *Notoplana ovalis* (1913, p. 212), today *N. erythrotaenia* (see our *Notoplana* group *B 1* in the following), and

approximated his *Notoplanides opisthopharynx* from Suez to *N. ovalis*. However, PALOMBI's species belongs to the Leptoplaninae (MARCUS 1947, p. 121, 164). PALOMBI (p. 603) added a quite immature Leptoplanid from Juan Fernandez (BOCK 1923b, p. 356) to *Notoplanides*, but this might as well be a *Pucelis* (MARCUS 1947, p. 129, 165).

The colour, the tentacles and the eyes, the strongly ruffled pharynx, the location of the mouth, and the absence of a Lang's vesicle separate *N. alcha* from *N. opisthopharynx*, but all these characters are on the specific level in the Leptoplaninae. Therefore we did not create a new genus for the present species.

Candimba Marcus, 1949

Leptoplanidae, Leptoplaninae of elongated form, without tentacles, with folded, not ruffled pharynx, located in the anterior half of the body. Cerebral and tentacular eyes seriate. Uteri short, situated between granule vesicle and Lang's vesicle.

Type species: *Candimba divae* MARCUS (1949, p. 76).

In order to avoid creating another monotypic genus of the Leptoplanidae we drop the references to the male and female efferent organs from the original diagnosis. Principally the pharynx and the uteri, but also the arrangement of the eyes furnish characters known to be constant in species in which the copulatory organs show considerable diversity.

The copulatory bursa of the present new species is an organ known in the Planoceridae and Apidioplanidae, but not yet in the Leptoplanidae. If we allot a species with bursa and one without bursa to one and the same genus, we follow the example of HYMAN (1953b, p. 191; 1959a, p. 555) in her genus *Aquaplana*.

17. **Candimba rabita,** spec. nov. Fig. 34–35

CURAÇAO: Piscadera Baai, outer part, coming up from algae, 18.I. and 1.III. 1966 (C), 4 specimens.

The largest specimen (Fig. 34) is 5.2 mm long and 1.5 mm wide, preserved. Its anterior end is narrow; the maximum breadth lies in the posterior fourth, at the level of the Lang's vesicle. Farther

backward the body narrows again. The animals are, preserved, whitish with gonads a little darker; alive they had two longitudinal chestnut brown bands (collector's note), as in *C. divae* (MARCUS 1949, fig. 114).

The eyes form two forward-converging rows, from which only a few eyes stand out. By their oblique direction and greater diameter (27 μ) the tentacular eyes differ from the smaller cerebral eyes (22 μ) directed upward and downward. Both types alternate, each row containing 25–28 eyes.

The pharynx is a hardly folded, short collar extending from 1.5 to 2.2 mm behind the tip; the mouth lies at 1.8 mm. The genital pores are near to each other, at 3.4 and 3.6 mm, respectively.

The dorsal ovaries and the ventral testes both extend to the opposite side. The ovaries begin at the level of the pharynx, the testes farther in front and farther to the sides. The sperm ducts (Fig. 35, d) run coiled from the pharynx backward, pass ventrally to the seminal vesicle (w), and enter the hind end of the latter united. The ejaculatory duct bends backward still within the muscle mantle of the seminal vesicle. The 0.7 mm long granule vesicle (q) is lined with a high, smooth epithelium filled with red-staining secretion, and surrounded by spiral muscles, the nuclei of which accompany the fibres. A short common male duct pierces the penis papilla which bears a conical stylet (ps), 0.27 mm in length and 60 μ in width at its base. The stylet lies in a narrow pocket (y). The penis sheath (x) nearly reaches the tip of the stylet which distends the antrum (r) backward. In the not distended parts of the antrum its epithelium is high and locally contains granular secretion.

The uteri are located between granule vesicle and Lang's vesicle Fig. 34, (l). The uterine duct bears a vesicle (Fig. 35, uv) filled with sperm, comparable to the uterine vesicles of some species of *Notoplana* (*annula, megala, nationalis*). The duct (on) of the Lang's vesicle (l) is very short, the ampulla ample, 0.6 mm in length. The short middle vagina (vm) receives the cement glands (c). The outer vagina (v) has an antero-dorsal pouch, a copulatory bursa (bu). Its epithelium is high, but in the centre of the ceiling it is transformed into a curved cuticular spur with a broad base and a pointed tip, which nearly reaches the vagina media. As in the bursa of *Apidioplana*

mira BOCK 1925 (1927, p. 62) the nuclei of the thick musculature form a layer around the fibres. The female antrum (a) is small.

Holotype: A whole mount of the anterior part, and a slide with sagittal sections of the copulatory organs. Two specimens were stained and mounted in canadabalsam; one was left in alcohol.

Notes on **Notoplana**

Beginning with BOCK's subdivision (1913, p. 186–187) of *Notoplana* into groups we try to make the survey of this largest genus of the Acotylea easier by separating it farther. Possibly some of our groups, e.g., *A 1*, *A 2*, *C 1*, are natural units, others are certainly not, so that we warn against subgeneric names for our groups.

A 1. – With tentacles; with penis pocket, sheath, stylet, and deep male antrum. Lang's vesicle small or absent.
cotylifera MEIXNER (1907, p. 448) BOCK (1913, p. 190); *dubia* (SCHMARDA 1859, p. 25) STUMMER-TRAUNFELS (1933, p. 3536); *evansii* LAIDLAW (1903a, p. 302) BOCK (1913, p. 187), a synonym of *dubia*, now the type species of *Notoplana*. *N. willeyi* JAKUBOVA (1906, p. 131) BOCK (1913, p. 190).

A 2. – Without tentacles; with penis pocket, sheath, stylet, and deep male antrum. Lang's vesicle small or absent.
mortenseni BOCK (1913, p. 191); *parvula* PALOMBI (1923, p. 37; 1924, p. 19); *plecta* MARCUS (1947, p. 127); *queruca*, sp. n. (no. 22).

A 3. – Without tentacles; with penis pocket and sheath, but no stylet. Male antrum deep; Lang's vesicle small.
ferruginea (no. 18) and its synonyms *bahamensis* Bock 1913, *binoculata* (Verrill 1901), and *caribbeana* HYMAN 1939; *koreana* KATO (1937b, p. 234).

B 1. – Without tentacles, except *N. divae*. With penis pocket, sheath, and stylet. Male antrum small or medium-sized. Lang's vesicle large, or at least distinct.
annula, sp. n. (no. 21); *atlantica* BOCK (1913, p. 207, pro *Leptoplana nationalis* PLEHN 1896b, p. 6); *atomata* (O. F. MÜLLER, 1776; LANG 1884, p. 514) BOCK (1913, p. 195) HYMAN (1940, p. 468, synonyms);

australis (SCHMARDA 1859, p. 21) STUMMER-TRAUNFELS (1933, p. 3517); *australis* (LAIDLAW 1904a, p. 3), a synonym of *N. australis* (Schmarda); *australis huina* MARCUS (1954, p. 56); *delicata* YERI & KABURAKI (1918a, p. 435; 1918b, p. 13); *divae* MARCUS (1948, p. 178); *fallax* (QUATREFAGES 1845, p. 135; LANG 1884, p. 492) BOCK (1913, p. 204); *inquilina* HYMAN (1955d, p. 1); *kükenthali* (PLEHN 1896a, p. 149) BOCK (1913, p. 202); *lactoalba* (Verrill), nr. 19; *micheli* MARCUS (1949, p. 78); *micronesiana* HYMAN (1959a, p. 551); *puma* MARCUS (1954, p. 59); *sawayai* MARCUS (1947, p. 121); *stilifera* BOCK (1923b, p. 348); *virilis* (VERRILL 1892, p. 478), a synonym of *atomata* (HYMAN 1940, p. 468).
The shape of the stylet seems to be useful for the classification of future material, though not all published figures are univocal. Generally it is cylindrical, only pointed at the tip, but conical from the root in *divae, puma,* and probably *delicata,* infundibular in *micheli,* and spiral in *sawayai.*

B 2. – Without tentacles. With penis pocket, sheath and stylet. Male antrum small or medium-sized. Lang's vesicle small or absent.
longastyletta (FREEMAN 1933, p. 119) HYMAN (1953a, p. 325); *megala* Marcus 1952 (nr. 20); *vitrea* (LANG 1884, p. 493) BOCK (1913, p. 207).

B 3. – With small tentacles; with penis pocket and sheath, but without stylet. Male antrum small; Lang's vesicle large.
japonica KATO (1937a, p. 215).

C 1. – Without tentacles. Penis pocket and sheath absent, stylet present.
alcinoi (O. SCHMIDT 1861, p. 7; LANG 1884, p. 486) BOCK (1913, p. 210); *insularis* HYMAN (1939c, p. 1); *sanpedrensis* FREEMAN (1930_t p. 337), according to HYMAN (1953a, p. 325) probably without style and identical with *N. acticola* (see *C 2*); *serica* KATO (1938, p. 564).

C 2. – Without tentacles, except for *humilis* and *septentrionalis.* Penis pocket, sheath, and stylet absent. With Lang's vesicle, except for *martae.*
acticola (BOONE 1929, p. 38) HYMAN (1953a, p. 321); *chierchiai* (PLEHN 1896a, p. 155) BOCK (1913, p. 211); MARCUS (1954, p. 63); DU BOIS-REYMOND MARCUS (1957, p. 173); *erythrotaenia* (SCHMARDA

1859, p. 21) STUMMER-TRAUNFELS (1933, p. 3518); *gardineri* (LAIDLAW 1904b, p. 134) BOCK (1913, p. 211); *humilis* (STIMPSON 1857, p. 4, 9) YERI & KABURAKI (1918b, p. 11); *lapunda*, sp. n. (nr. 23); *libera* KATO (1939a, p. 68); *longiducta* HYMAN (1959c, p. 10); *longisaccata* HYMAN (1959c, p. 8); *lyrosora* (SCHMARDA 1859, p. 24) STUMMER-TRAUNFELS (1933, p. 3532, a synonym of *erythrotaenia*); *martae* MARCUS (1948, p. 180); *natans* FREEMAN (1933, p. 123) HYMAN (1953a, p. 328); *otophora* (SCHMARDA 1859, p. 18) STUMMER-TRAUNFELS (1933, p. 3497); *ovalis* BOCK (1913, p. 212), a synonym of *N. erythrotaenia*, see STUMMER-TRAUNFELS 1933, p. 3519; *palaoensis* KATO (1943b, p. 81); *palta* MARCUS (1954, p. 65); *rupicola* (HEATH & MCGREGOR 1912, p. 464) HYMAN (1953a, p. 315); *sanguinea* FREEMAN (1933, p. 122) HYMAN (1953a, p. 327); *sanjuania* FREEMAN (1933, p. 128) HYMAN (1953a, p. 330); *saxicola* (HEATH & MCGREGOR 1912, p. 467) HYMAN (1953a, p. 318); *sciophila* (BOONE 1929, p. 40) HYMAN (1953a, p. 323); *septentrionalis* KATO (1937e, p. 127); *sophia* KATO (1939a, p. 70); *syntoma* MARCUS (1947, p. 123; 1948, p. 183); *tavoyensis* PRUDHOE (1950a, p. 44); *timida* (HEATH & MCGREGOR 1912, p. 466).

We did not find a satisfactory subdivision for this large group. The ejaculatory duct, i.e. the duct between the seminal and granule vesicles, is generally much shorter than the seminal vesicle, but nearly as long or even longer in *longisaccata, palaoensis, palta*, and *sciophila*. The ampulla of the Lang's vesicle is ample or rather ample in the great majority of the species of group C 2, but small in *erythrotaenia, longiducta*, and *saxicola*. A small penis papilla is common; a medium-sized one occurs in *acticola, longiducta, longisaccata, palaoensis, palta, sanjuania*; a big one in *erythrotaenia, sanguinea*, and *saxicola*.

D. – A common genital antrum.

celeris FREEMAN (1933, p. 125); HYMAN (1953a, p. 329); *inquieta* (HEATH & MCGREGOR 1912, p. 470); HYMAN (1953a, p. 319); *microsora* (SCHMARDA 1859, p. 22) STUMMER-TRAUNFELS (1933, p. 3520); *nationalis* (PLEHN 1896b, p. 5) BOCK (1913, p. 207).

This artificial group contains species with penis pocket and stylet (*inquieta, nationalis*), and *celeris* and *microsora* without them. In

microsora and *nationalis* there is no Lang's vesicle, in the 2 other species it is large. *N. nationalis* has tentacles, the other species have none.

18. **Notoplana ferruginea** (Schmarda, 1859) Fig. 36

SCHMARDA 1859, p. 22 (*Polycelis ferruginea*); VERRILL 1901, p. 43 (*Discocelis binoculata*); BOCK 1913, p. 208 (*Notoplana bahamensis*); STUMMER-TRAUNFELS 1933, p. 3521 (*Notoplana ferruginea, N. bahamensis* synonymized); HYMAN 1939b, p. 8 (*N. binoculata*); ead., 1939c, p. 2 (*N. caribbeana*); ead. 1955a, p. 131 (all species united).

CURAÇAO: Piscadera Baai, outer part, under stones and coming up from algae, e.g., *Halimeda*, XII.1965–II.1966 (C), about 30 specimens.
KLEIN BONAIRE: East coast, sandy shore with reef debris, 0–1 m, 10.IX.1930 (H 1049), 1 spec.
BONAIRE: Paloe Lechi, overflow of Salinja, coral debris and muddy sand, ½–1 m, 4.IX.1948 (H 1055), 1 spec.

Further distribution: Bermudas; Bahamas; Jamaica; Puerto Rico; Old Providence Island (Providencia), 13°20′ N, 81°24′ W.

This common West Indian species shows some variability of the cerebral eyes (HYMAN 1955b, p. 260). Like other polyclads it darkens when preserved, so that specimens milky white when alive become practically black (ead. 1955a, p. 131). The present animals were up to 40 mm long alive and 10 mm broad (C), white or light grey. In several worms a rusty pigment of the parenchyma occurs, especially in animals from algae (C). The colour is darkest in the middle, excepting the pharyngeal region.

Due to the degree of contraction of the strong musculature of the efferent male organs the figures in the literature appear somewhat different, though their elements are the same. Fig. 36 agrees well with those of the material from Jamaica (STUMMER-TRAUNFELS, fig. 62, 63). The cerebral eyes are not as small and scanty as in STUMMER-TRAUNFELS' figure 61, but more like those cited by HYMAN (1955a, p. 131). The shape of the tentacular eyes agrees with STUMMER-TRAUNFELS' figure.

When the stone is turned over, the worms seek the dark; they swim well (C). VERRILL called it a very active species.

19. Notoplana lactoalba (Verrill, 1900) Fig. 33

VERRILL 1900, p. 595 (*Leptoplana lactoalba*); 1901, p. 46 (*Leptoplana lactoalba* var. *tincta*); BOCK 1913, p. 179 (*Stylochoplana? lacteoalba*); HYMAN 1939b, p. 6 (*Notoplana lactoalba*).

CURAÇAO: Fuik Baai, sandy mud with rock debris, *Thalassia*, *Sargassum*, ½–1 m, 20.XI.1948 (H 1039A), 1 specimen.
FLORIDA: Coral Gables Canal, in slough along road to Tahiti Beach, in algae, 19.I.1963 (B), 1 spec. – *Key Biscayne*, about 10 m wide creek, *Rhizophora* and *Avicennia*, ½–1 m, 31.VIII.1963 (H 1412), 1 spec.

Further distribution: Bermudas, under stones and corals, chiefly on the shores of Longbird Island.

Length 14 mm, width 3.5 mm, preserved; broadly rounded in front, tapering gradually to the bluntly pointed hind end. Body thin, its edges are ruffled. There are no tentacles.

At the level of the brain (b) the tentacular eyes (ea) are grouped in two clusters, each containing about 10 eyes up to 60 μ in diameter. The cerebral eyes (g) form 2 longitudinal bands which begin far in front of the brain and end in the middle between brain and pharynx (h). Each band comprises about 40 eyes. Their exceptional maximum diameter is 50 μ, most of the largest cerebral eyes reach 45 μ. In HYMAN's specimens, which are larger than the present ones, there are more eyes.

The ruffled pharynx (h) has about 15 pairs of folds. It is 2.8 mm in length and extends from 3.4 to 6.2 mm behind the fore end, hence lies in the anterior half of the body. The mouth (m) is situated behind the middle of the pharynx, on a level of 5.4 mm. The male opening (t) is located at 7.5 mm, the female pore (f) at 8.7 mm. Lang's vesicle (l) ends at 9.7 mm from the fore end.

The sperm ducts enter the large seminal vesicle separately. This vesicle and the 0.41 mm long granule vesicle are oval. As the stylet (ps) of the present specimen protrudes far out of the male pore (t), the granule vesicle is drawn backward and does not lie in front of (HYMAN, 1939b, pl. 3, fig. 12), but over the seminal vesicle. For the clusters of gland cells in the granule vesicle and the short projecting cone of the ejaculatory duct we refer to HYMAN's figures 11 and 12. The common male duct which leaves the granule vesicle runs through a 0.3 mm long penial papilla. On this muscular papilla a 1.7 mm long, 26 μ thick stylet (ps) is inserted. Papilla and stylet are lodged

in a long and narrow penial pocket. This opens on the tip of a papilliform ring fold, the penial sheath, which hangs into the short and wide male antrum.

The uteri (u) are partially filled with eggs, and so only recognizable from the middle of the pharynx (h) backward. The entrance of the oviducts marks the limit between the inner vagina and the duct or stalk of Lang's vesicle, the ampulla (l) of which is elongated and folded in the specimen studied. The inner vagina runs forward coming near to the male antrum, and then curves abruptly backward to the female pore (f). This part of the vagina is surrounded by a thick muscle layer.

The arrangement of the cerebral eyes in two long bands is a good specific characteristic of *Notoplana lactoalba*. The short section of the ejaculatory duct which enters the granule vesicle, and the involution of the latter's epithelial folds were stressed by HYMAN (1939b, p. 7, 8) and ourselves (MARCUS 1947, p. 121).

20. **Notoplana megala** Marcus, 1952

MARCUS 1952, p. 85.

CURAÇAO: Piscadera Baai, outer part, under a stone, 12.I.1966 (C), 1 specimen.

Further distribution: Brazil, coast of São Paulo, 23°27′ S, 45°06′ W and 23°50′ S, 45°20′ W, among algae of the upper littoral.

The uterine vesicles, described and figured for *N. megala*, were only known of *N. nationalis* (Plehn 1896b, p. 5) and of the Cotylea at the time of BOCK (1913, p. 171). In *N. nationalis* the vagina ends at the entrance of the common uterine duct, and this absence of a Lang's duct led PLEHN and BOCK to consider the uterine vesicles as substitutes of Lang's vesicle. Also the small ampulla of *N. megala* favours this idea. In the cotylean Boniniidae, however, in *Candimba rabita* (no. 17), and *Notoplana annula* (no. 21) uterine vesicles as well as ample Lang's vesicles occur.

The uterine or oviducal vesicles function as seminal receptacles, while the Lang's vesicle is lined with a secretory epithelium or with an ingesting one. Therefore a functional substitution of the Lang's vesicle by the uterine vesicles is improbable. The occurrence of both types of vesicles in one and the same species shows that they mor-

phologically cannot be substituted for each other. Probably the uterine ducts are ancestral coelomoducts which opened, together with a proctodaeum, into a cloaca, now they open at the limit between the vagina and the duct of the Lang's vesicle. The latter is in REMANE's (1951) and our opinion a proctodaeum which has lost its connexion with the mesodaeum. It shows the high interspecific variability known for other heterotopic organs.

21. **Notoplana annula,** spec. nov. Fig. 37–38

CURAÇAO: Piscadera Baai, outer part, coming up from algae, 25.I.1966 (C), 1 specimen. – Fuik Baai, Newport Bath, rocky shore of muddy lagoon, muddy sand with some *Thalassia*, 0–1 m, 20.XI.1948 (H 1039), 1 spec.
FLORIDA: *Virginia Key*, piling of Marine Laboratory, concrete pools in muddy water, tidal flow, 0–1½ m, 1.IX.1963 (H 1409), 3 spec.

The body is elongate, narrowed posteriorly, whitish, without tentacles. One specimen from Curaçao, 6 mm in length, 2.5 mm in width, and one from Florida, 8 × 1.6 mm, were sectioned.

The eyes form a row on either side which consists of 10–12 cerebral and 7–8 obliquely directed tentacular eyes. One to two cerebral eyes lie behind the brain. The cerebral eyes reach a diameter of 35 μ, the tentacular eyes a diameter of 40 μ.

In the 8 mm-worm the pharynx lies in the anterior part of the body, beginning at 2.5 mm and ending at 4.0 mm behind the fore end. The mouth lies at 3.5 mm, hence in the posterior half of the pharynx. The male and female pores are located near to each other and to the hind end of the pharynx, the former at 4.8, the latter at 5.0 mm.

The ovaries are dorsal, the testes ventral. The terminal sections of the sperm ducts (Fig. 38, d) are distended, but not especially muscular. The large seminal vesicle (w) ascends obliquely backwards and emits the ejaculatory duct running straight upwards. The nuclei of the musculature of the seminal vesicle lie between the fibres. The ejaculatory duct projects into the granule vesicle (q) the lumen of which contains red secretion. The muscles of its wall are principally longitudinal; the nuclei lie between the fibres. The epithelial lining of the granule vesicle shows that it had folds in a phase preceding the sectioned one. The common male duct is quite short; its lumen

passes into that of the stylet (ps). This is curved, 0.12 mm in length, 17 μ in width, and lodged in a strongly muscular penis pocket (y). The penial sheath (x) which is medium-sized, stores granular secretion in its epithelium, and the same holds for that of the adjacent walls of the antrum (r). The outer part of the male antrum is tubular.

The specimens are in a young female phase. Where each of the uterine ducts (oviducts) bends from its lateral course towards the median plane, it is dilated into a spherical vesicle (uv) containing sperm. The ducts (u) unite into a short common uterine duct (n). From its entrance into the inner vagina (vi) the beaded duct (on) of the Lang's vesicle runs at first nearly horizontally backward. After about 7 beads it bends to the ventral side and forms a loop the beads of which contain sperm, before it opens into the 0.75 mm long ampulla of the Lang's vesicle (l); the lumen of the ampulla lodges sperm and red secretion.

The ciliated vagina (v) has a mainly vertical course and opens into a rather ample female antrum (a). The middle vagina receives the cement glands (c) which open also a little farther inwards and outwards.

Holotype: A whole mount of the anterior part and a series of sections of the copulatory organs of one of the specimens from Florida.

The loop formed by the duct of Lang's vesicle is an exceptional feature of the present species.

22. **Notoplana queruca**, spec. nov. Fig. 39–40

CURAÇAO: Piscadera Baai, outer bay, coming up from algae, 18.I.1966 (C), 1 specimen. – Piscadera, entrance of inner bay, iron poles, 0–1 m (H 1462), 1 spec.
ST. MARTIN, Simson Bay Lagoon, outlet, sandy lagoon with *Rhizophora* and *Thalassia*, tidal flow, 0–1 m, 27.V.1949 (H 1130), 1 spec.
FLORIDA: *Virginia Key*, piling of Marine Laboratory, concrete pools in muddy water, tidal flow, 0–1½ m, 1.IX.1963 (H 1409), 1 spec. – *Key Biscayne*, N point at Bear Cut, sandy bottom with dense *Thalassia* and *Cymodocea*, ½–1 m, 1.IX.1963 (H 1410), 1 spec.

The preserved whitish specimens from Curaçao are rounded in front and behind, slightly broader in front. The biggest is 14.2 mm long, its maximum width 3.8 mm. The animals from Florida are smaller. There are no tentacles.

The following numbers refer to the largest specimen, the smaller ones have lower values, but the same proportions. On either side there are 42–45 cerebral eyes in front of the brain, 3–6 behind it, and between the 2 groups 22–23 tentacular eyes. The maximum diameter of the cerebral eyes is 40 μ, that of the tentacular eyes 60 μ.

The pharynx is central, occupying the levels from 4.0 to 7.0 mm behind the anterior border. The mouth lies a little behind the middle of the pharynx, at 6.0 mm. The male aperture at 9.0 mm is farther from the hind end of the pharynx than from the female opening at 9.5 mm.

The ovaries are dorsal, the testes ventral. The sperm ducts (Fig. 40, d) are not especially muscular; they unite immediately before their opening into the seminal vesicle (w). The latter is a small, carrot-shaped organ, the musculature of which has its nuclei between the fibres. Those of the medium-long, ascending, ejaculatory duct surround the fibres. The still ascending ovoid granule vesicle (q) also has a mantle of nuclei around the muscle cells; half of its lumen is occupied by the cone of the ejaculatory duct. A curved common male duct leads to the horizontal penis papilla which bears a stylet (ps). The stylet is 0.23 mm long, 50 μ wide at its base, and narrows towards the blunt tip. In the smaller specimens the penis papilla is covered with a fine, folded cuticula, not yet strengthened as a stylet. The epithelium of the penis pocket (y) contains red secretion, as does that of the male antrum (r). A hemispherical conspicuous penial sheath (x) separates the penis pocket (inner antrum) from the outer antrum. The antrum is very long, and its wall is folded, except for the outer third. The uterine ducts open into the hindmost end of the inner vagina (vi) which is not followed by a duct or a Lang's vesicle. The inner vagina runs nearly horizontal. Already entally to the anterior bend the vagina receives the secretion of the cement glands (c), so that the entire bend belongs to the vagina media (vm). This occupies also most of the backward slanting course of the female duct. The outer vagina (v) is characterized by its thick musculature which ends where the outer vagina passes into the tubular and vertically descending antrum (a).

Holotype: Anterior part of 10.3 mm-specimen from Curaçao, and sagittal sections of its copulatory organs.

N. queruca belongs to group *A 2*. The only member of this group from the western Atlantic warm-water region, *N. plecta*, is also the morphologically nearest related. Differences are: the spherical granule vesicle, the practically contiguous seminal and granule vesicles, and the circular loop of the common male duct in *plecta*. The male antrum of *N. queruca* is much longer than that of *plecta*.

23. **Notoplana lapunda,** spec. nov. Fig. 42–44

CURAÇAO: Piscadera Baai, outer part, under a stone, in dead oysters and barnacles growing on iron poles under the pier of the Caribbean Marine-Biological Institute, 12. & 29.I.1966 (C), 3 specimens.

The biggest specimen (Fig. 42) is 22 mm long, 7 mm broad, in alcohol. The animals are broader in front than behind. The pharynx is white, the margin of the body light, and the intestinal diverticula are grey.

There are no tentacles. The tentacular eyes form two clusters of about 30 eyes each, reaching 52 μ in diameter. Behind and in front of them about 30 cerebral eyes are situated on either side, with a maximum diameter of 40 μ.

The pharynx lies in the middle of the body or in its anterior half; in the biggest specimen it begins at 4.9 mm and ends at 11 mm behind the fore end, and has about 10 indistinct folds on either side. The mouth, the male and the female pores of this specimen lie at 8.8, 12.0, and 12.3 mm, respectively. The Lang's vesicle ends at 13.7 mm behind the tip of the body.

The ovaries are dorsal, the testes ventral. The sperm ducts are distended in their ectal parts and open widely separated from one another (d) into the seminal vesicle (w), a large, curved organ, the greater part of which lies ventrally. The ejaculatory duct projects as a cone into the granule vesicle (q). This is a long organ the epithelium of which forms longitudinal tubes. The nuclei of the thick muscle mantles which surround the seminal and the granule vesicles lie between their fibres. The granule vesicle is continued into a short, conical penis papilla (p) lodged in a shallow male antrum.

The uterine ducts unite behind the vagina. The duct (on) of the

Lang's vesicle is distended by sperm. Also in the ampulla (l), which is medium-sized and longer than broad, sperm and debris of eggs were found. The epithelial cells of the ampulla are of different height; the ampulla of this species might function as vesicula resorbiens. The inner vagina (vi), where the short common uterine duct (n) opens, is short; the middle vagina (vm) which receives the cement glands (c), forms a sharp bend; the outer vagina (v) and the female antrum make out the heavily muscularized outer section of the female duct.

Holotype: One slide with an anterior part as total mount and one series of sagittal sections of the copulatory organs.

N. lapunda belongs to the group *C 2*. Two species of the American Pacific coast, the literature of which is mentioned in the preceding survey, need separation from *N. lapunda*. One is *N. acticola* from California, the seminal vesicle of which is distinctly smaller than the granule vesicle. The second is *N. chierchiai* from the South American west coast, between the Bay of Reloncavi (41°49′ S, 73°10′ W) and Ancon, about 30 km N of Callao, 12°02′ S, 77°04′ W. *N. chierchiai* differs from *lapunda* by the cordiform granule vesicle and the great distance between the male and female apertures.

24. **Hoploplana divae** Marcus, 1950 Fig. 41

Marcus 1950, p. 79.

Curaçao: Piscadera Baai, entrance of inner bay; *Rhizophora*, muddy bottom, 0–0.5 m (H 1464), 1 specimen.

Further distribution: Brazil, coast of São Paulo.

The present animal is preserved 2.3 mm in length, 2.0 mm in width. Though this size and the small number of eyes shows that the specimen is juvenile, it has already a stylet. Its eyes lie 0.48 mm behind the anterior border, the large pharynx begins at 0.6 mm and ends at 1.5 mm. The mouth lies at 1.0 mm. There are 11 and 12 tentacular eyes, and 6 and 10 cerebral eyes. The scattered distribution of the latter is already recognizable.

Smith's synopsis of the genus *Hoploplana* (1960, p. 387–388) needs some comments, because one more species, *H. luracola* Smith

(1961, p. 69) was added, and the morphology of *H. divae* is emended in the following. *H. luracola* belongs to the group with a smooth dorsal surface, which begins with no. 7 of Smith's key. The next items which lead to the characters of *luracola* are nos. 8, 9, and 10, so that *H. deanna* KATO (1939b, p. 144) is morphologically the most similar, as SMITH had already indicated. The long slender tentacles containing a large number of eyes, and the short clusters of cerebral eyes distinguish *deanna* from *luracola*.

In *Hoploplana divae* there is actually no separation of an inner and an outer male antrum; irregular antral folds were taken for a penis sheath. So the male copulatory organ of this species (Fig. 41) corresponds to the type common in *Hoploplana*, and the differential characters must be established against the other species with papillate back. Of these *H. villosa* (LANG 1884, p. 441) has very numerous and slender papillae without rhabdites; in *H. papillosa* (LANG 1884, p. 442) there are few large tubercles in the middle region of the back only. *H. schizoporellae* KATO (1944, p. 280) with roundish dorsal knobs has 8 cerebral eyes in each cluster against 16–18 in adult *divae*. In *H. rubra* KATO (1944, p. 281) a vaginal section with cyanophilous glands lies between the inner vagina and the middle duct which receives the eosinophilous cement glands. The clusters of cerebral eyes are concentrated in *H. californica* HYMAN (1953a, fig. 106), loose in *divae*.

In 1952 (p. 88) we selected *H. insignis* (Lang 1884) as type species of *Hoploplana*, the only species mentioned and figured by LAIDLAW (1902, p. 303, fig. 73), when he created the genus. Therefore the group with a smooth dorsal surface must keep the name *Hoploplana*, if the smooth and the papillate species were separated as subgenera. However, both groups are Atlantic and Indopacific.

25. **Gnesioceros sargassicola** (Graff, 1892) Fig. 45–49

? non MERTENS 1832, p. 13 (*Planaria sargassicola*); GRAFF 1892, p. 207 (*Stylochoplana sargassicola* Mertens); VERRILL 1892, p. 475 (*Imogine oculifera* Girard; misidentification); PEARSE 1938, p. 77 (*Stylochoplana floridana*; HYMAN 1939b, p. 11 (*Gnesioceros sargassicola* Mertens); ead. 1939a, p. 146 (*G. verrilli*); ead. 1940, p. 478 (*G. floridana*); PRUDHOE 1940, p. 325 (*G. sargassicola* Mertens); HYMAN 1955a, p. 135 (*G. floridana*).

CURAÇAO: Piscadera Baai, inner bay, coming up from algae, 2.II.1966 (C), 2 specimens. Piscadera Baai, entrance to inner bay, sandy decay, *Halimeda* and *Rhizophora*, sandy bottom (H 1460A, 1463), 2 spec. Piscadera inner bay, northern part, soft bottoms, *Thalassia*, *Ulva*, *Rhizophora*, 0–2 m (H 1480A, 1495, 1497, 1498), 4 spec.
KLEIN BONAIRE: East coast, sandy shore with reef debris, 0–1 m, 10.IX.1930 (H 1049), 3 spec.
BONAIRE: Kralendijk, rocky beach with some sand, low tide ½–1 m, 20.IX. 1948 (H 1057C), 1 spec.
SAINT-BARTHÉLEMY (St. Barts): Public, near Gustavia, rocky shore, andesite, debris with sand, 0–½ m, 4.VI.1949 (H 1121), 1 spec.
PUERTO RICO: Bahía Fosforescente, mouth, sandy bottom, 4–5 m, 17.IX.1963 (H 1424A), 1 spec.
FLORIDA: *Virginia Key*, NE side, sand flat with *Cymodocea* and *Thalassia*, ½–2 m, 4.IX.1963 (H 1408), 5 spec.
SARGASSO SEA, 30° N, 41° W, on *Sargassum*, 19.XII.1930 (H), 2 spec.
CENTRAL ATLANTIC OCEAN, 35° N, 63° W (19° C.), and 43°4′ N, 31° W, on *Sargassum*, 4. & 21.XII.1930 (H), 12 spec.

Further distribution: Virgin Islands, St. Thomas; Cayman Islands; from Texas to Massachusetts, common in the southern part of its range (HYMAN 1940); North Atlantic Ocean, between the coasts of America and Africa, from about 5° N to 35° N (PRUDHOE 1944).

The body is anteriorly expanded, widest in front of the brain, and from there it tapers gradually to the pointed posterior tip. The present mature and nearly mature animals from the Atlantic Ocean are 3.3, 5.0, and 5.7 mm long, but specimens up to 10 mm long have been recorded. Our biggest animal from Curaçao is 9 mm in length. The maximum width of our pelagic worms is 2.4 mm, that of the littoral ones 5.3 mm. Animals of which the body is very broad in the anterior fourth and then quickly narrows into the slender, pointed posterior part were called *sargassicola* var. *lata* HYMAN (1939b, p.13).

Preserved animals are colourless or spotted with brown, with the exception of a median stripe; living pelagic ones are translucent with brown spots, especially along the margins; living littoral specimens are pellucid with a delicate greenish tint or carmine, evidently due to the contents of the gut. Yellow marginal spots were also recorded from a living littoral specimen (VERRILL 1892).

Each of the pointed tentacles lodges up to 12 eyes, each of the 2 loose cerebral groups contains 8–15 eyes. These lie in front of the tentacles, between and behind them. In the literature up to 20 eyes in a cerebral group of littoral specimens are mentioned.

The pharynx (Fig. 45) of a pelagic 5.7 mm-animal is 1.5 × 0.5 mm

and strongly ruffled. The mouth is situated in the posterior half of the pharynx, and this holds for the littoral specimens too. Of the latter a 5.9 mm-animal has the same proportion of pharyngeal width/length, 1 : 3, as the pelagic specimen, and the pharynx is also strongly ruffled. Two further littoral worms, which measure 8.4 × 3.3 and 9 × 5.3 mm, have the proportions 1 : 3.3 and 1 : 3.1, respectively. The smaller specimen has a moderately ruffled pharynx (Fig. 46), the larger one a strongly ruffled one (Fig. 47). An immature 2 mm-animal had a non-ruffled, smooth pharynx. It is impossible to distinguish a "littoral variant" (HYMAN 1954, p. 302) with a narrower and less intensely ruffled pharynx (ead. 1939a, p. 148) from the pelagic form. The intestinal branches anastomose in pelagic and littoral specimens, though PEARSE (1938, l.c.) indicated the contrary for the latter. (The animal from Puerto Rico had ingested a copepod).

In worms from both habitats the gonopores lie close together, and their distance from the end of the pharynx is about half that from the hind end of the body. The testes are ventral, the ovaries dorsal. The sperm ducts enter the hind end of the seminal vesicle, a very muscular rounded or pyriform organ which lies under the granule vesicle or to the side of it. The length of the ejaculatory duct varies according to the filling of the seminal vesicle with sperm. The thick wall of the elongated granule vesicle consists of inner circular and outer longitudinal muscles. The two ental thirds of the vesicle have transverse chambers, the ectal third is lined with a tall epithelium. The width/length proportion of the granule vesicle is 1:1.5 in a pelagic specimen (Fig. 48) and 1:1.44, 1:1.75, and 1:2.3 in 3 measured littoral animals (Fig. 49). So a narrower granule vesicle cannot be maintained as a peculiar character of a littoral form.

The cirrus was well described and figured by HYMAN (1939b; 1939a). It is a conical sheath composed of cuticular toothed bands. In the retracted cirrus the bands run lengthwise, parallel to the long body axis, in the protruded cirrus they are transverse. The proportion length of the cirrus/length of the granule vesicle is 1:2.34 (pelagic specimen). Of 3 littoral animals the proportions were 1:2, 1:2.5, and 1:3.3. Hence a longer granule vesicle relative to the cirrus does not characterize a special littoral form.

Also the difference referring to the musculo-glandular ring encircling the vagina disappears in our material. This ring is complete in sections of the pelagic specimen as well as in a littoral animal. In her material from Woods Hole HYMAN (1939a) found this ring, the free surface of which is clothed with a cuticle thrown into longitudinal ridges, well developed only in the anterior wall of the vagina. The posterior wall had a slight muscular thickening and diffusely scattered glands. "A club-shaped object attached to the female genital pore" (HYMAN 1939b, p. 13) was also found in one of our specimens from Curaçao. The sections showed that it was a spermatophore filled with sperm.

We conclude that *G. floridana* must be united with *G. sargassicola*.

Though GRAFF did not recognize the granule vesicle, his material and HYMAN's are conspecific with the present worms. According to PRUDHOE (1950b, p. 710, note) GRAFF's species is probably not identical with MERTENS', whose figures are not available here. MERTENS' description (LANG 1884, p. 454–455), though detailed, does not refer to the characteristic broad fore end of GRAFF's, HYMAN's and our species. LANG included MERTENS' species in *Stylochus*. The position of the mouth, the anterior extension of the pharynx, and the short main intestine, MERTENS' "Magen", agree with the present species, but are neither generically nor specifically peculiar features.

If PRUDHOE's opinion is correct, as it seems to be, Mertens' species continues to be undefined. DIESING (1862, p. 571) substituted MERTENS' *"Planaria"* by *Gnesioceros*, and BOCK (1913, p. 232), unaware of DIESING's name, by *Pelagoplana*. One of DIESING's two species of *Gnesioceros* is now considered as a synonym of the type-species of *Planocera* Blainville 1828 (PRUDHOE 1950b, p. 710–712), the other one is MERTENS' *sargassicola*. Without knowing MERTENS' figures we cannot settle the definitive name for the species and use the above-mentioned provisional form.

26. **Styloplanocera fasciata** (Schmarda, 1859)

SCHMARDA 1859, p. 33 (*Stylochus fasciatus*); BOCK 1913, p. 233 (*Styloplanocera papillifera*); STUMMER-TRAUNFELS 1933, p. 3487, 3550 (*Styloplanocera fasciata*); HYMAN 1955a, p. 135.

ARUBA: Punta Braboe, W of Oranjestad, sandy reef debris, 0–1 m, 16.–18. VI.1930 (H 1001), 1 specimen.
CURAÇAO: Piscadera Baai, St. Michiels Baai, Vaerssen Baai, Sta. Marta Baai, in all localities under pieces of dead corals in the intertidal zone, XII.1965–II.1966 (C), 23 spec.
KLEIN BONAIRE: Northeast coast, shallow limestone flat, rock pools, 0–½ m, 13.IV.1955 (H 1371), 3 spec.
BONAIRE: Paloe Lechi, rocky beach with small tidal pools, ½ m, 24.II.1949 (H 1056Aa), 1 spec. – Kralendijk, near Pasanggrahan, rocky beach, fragments of corals, 0–½ m, 3. & 5.IX.1930 (H 1057, 1057a), 13 spec. – De Hoop, rocky cliff and sandy reef, among *Ptychodera*, ½–1 m, 6.XI.1930 (H 1058b), 1 spec.

Further distribution: Barbados; Virgin Islands, St. Croix; Puerto Rico; Jamaica.

The biggest of the present preserved specimens, 35 mm in length, 12 mm in width, is the largest recorded animal of this species. Alive the worms are up to 40 mm long and 10 mm broad (C). The colour pattern observed in the living animals is preserved. It consists of isolated dark brown spots and a net of brown pigment, especially dense over the pharynx. The marginal papillae, the contractility of which was observed by the collector (C), are all nearly equally short; they are innervated, as already Bock had observed. The diverticula of Lang's vesicle extend to the end of the pharynx in the present material like in BOCK's material (1913, p. 237), while STUMMER-TRAUNFELS (1933, p. 3552) found them much shorter, reaching only the middle vagina.

The worms glide rapidly towards the dark when the piece of dead coral is turned over. If they are touched with a paintbrush, they curl up from the front backwards (C).

Amyris, gen. nov.

Planocerids with true seminal vesicle, interpolated granule vesicle of notoplanine type, cuticularized but not spinous cirrus, and Lang's vesicle.

Type species: *Amyris hummelincki*, spec. nov. (no. 27).

Planctoplana challengeri GRAFF (1892, p. 213) is a *Stylochoplana* (PRUDHOE 1950b, p. 715) of our group *A 1*, probably a synonym of *St. conoceraea* (SCHMARDA 1859, p. 35; STUMMER-TRAUNFELS 1933, p. 3563). Therefore the name of the subfamily of the Planoceridae

that comprises the genera with an interpolated granule vesicle (BOCK 1913, p. 230; BRESSLAU 1933, p. 289) must be changed to Gnesiocerinae. The separation of Gnesiocerinae and Planocerinae must be based only upon the interpolated and the free granule vesicle.

Amyris belongs to the Gnesiocerinae, the genera of which are to be distinguished from *Amyris* as follows:

Alloioplana PLEHN (1896a, p. 142) emend. HYMAN (1953a, p. 346). Cirrus sac armed with a single large median tooth that conveys the common male duct.

Echinoplana HASWELL (1907, p. 475). Cirrus spiny, not enclosed in a sac. Needs reinvestigation.

Gnesioceros DIESING 1862 (literature above). Granule vesicle transversely chambered; cirrus conch-like.

Neoplanocera YERI & KABURAKI (1918a, p. 436; 1918b, p. 17) emend. KATO (1937a, p. 220–223). Male antrum with a musculo-glandular organ ventrally to the cirrus.

Planctoplanella HYMAN (1940, p. 479). Granule vesicle as in *Gnesioceros*; without seminal vesicle and Lang's vesicle; a vermiform cirrus papilla.

Styloplanocera BOCK (1913, p. 233). Granule vesicle as in *Amyris*; marginal sensory papillae; nuchal tentacles; pharynx in anterior half of body; cirrus spiny; Lang's vesicle with paired antero-lateral diverticula.

27. **Amyris hummelincki,** spec. nov. Fig. 50–52

CURAÇAO: Boca Lagoen, N side, steep cliff of coral rock, 0–1 m, 13.XI.1948 (H 1020), 1 specimen.
BONAIRE: Kralendijk, near Pasanggrahan, beach-rock with coral fragments 0–½ m, 3. & 5.IX.1930 (H 1057), 3 spec.

The preserved worms are band-like, pointed behind. They measure in mm, 7.6 × 1.4 (the animal from Curaçao), 7.25 × 1.3, 7.5 × 1.4, and 10.0 × 1.6 (those from Bonaire). They are colourless and without tentacles.

The pharynx lies in the posterior half of the body, from 5.3 to 6.7 mm from the fore end in the largest specimen. The mouth lies near the hind end of the pharynx. The main intestine extends to-

ward the anterior fourth of the body, where it is surrounded by the united uteri. It contains setae of polychaetes. Anastomoses occur between the lateral branches of the intestine.

Eyes directed upward, downward and obliquely; they form two longitudinal series of about 20 eyes each in the largest animal. Tentacular (Fig. 51, ea) and cerebral eyes (g) can be distinguished only approximately; the specimen from Curaçao (Fig. 51) has more cerebral eyes than the animals from Bonaire. The diameter of the obliquely directed eyes reaches 32 μ, that of the other eyes 22 μ.

In the 10 mm-specimen the male pore lies 7.1 mm behind the fore end, the female opening at 7.3 mm. The testes and the ovaries are ventral. The sperm ducts (Fig. 52, d) come from both sides and unite in the middle, where they enter the seminal vesicle (w) from the ventral side. The ascending inner limb of the vesicle is shorter and narrower than the horizontal outer one. The latter narrows abruptly and projects far into the granule vesicle (q) without an intervening ejaculatory duct. The globular muscle coat of the seminal vesicle has its nuclei between the fibres. The spherical lumen of the granule vesicle is subdivided into longitudinal epithelial chambers; there are no extra-capsular glands. The granule vesicle has its own muscle mantle, but besides it is surrounded by muscles contiguous with those of the seminal vesicle in front and forming the cirrus sac (nc) behind. The sac is filled with loose connective tissue containing the cirrus (ci). The latter is a coiled cuticularized tube with slight longitudinal folds. In one specimen its terminal part is evaginated and projects from the shallow pit (t) around the male pore.

The eggs lie one behind the other in the uteri of the largest animal and clustered in the middle-sized one. In the smallest animal the uteri are empty. The united uterine ducts (n) enter the hind end of the inner vagina (vi) from the ventral side. The duct of the Lang's vesicle (on) is beaded, the ampulla small, 90 μ in length, 80 μ in width. The long, ciliated inner vagina runs forward, then bends to the ventral side and slightly backward. The duct of the cement glands (c) or middle vagina (vm) is set off from the strongly muscular outer vagina (v) which is continued into the female antrum. The female opening (f) lies close behind the male aperture (t).

Holotype: The whole mount of the anterior part of the largest specimen and one slide with sagittal sections of its copulatory organs. The stained specimen from Curaçao was mounted in Canada balsam.

The species is named for the collector.

28. **Amyris ujara**, spec. nov. Fig. 53–55

KLEIN BONAIRE: East coast at Landing, sandy shore with reef debris, ½–1 m, 10.IX.1930 (H 1049), 2 specimens.

The ribbon-shaped animals (Fig. 53) are rounded in front, pointed behind, colourless, with wavy borders and without tentacles. They are 6.8 and 7.2 mm long and 1.5 mm wide.

The pharynx lies in the posterior half of the body from 4.3 to 4.9 mm behind the fore end in the larger specimen. The mouth is located behind the middle of the pharynx. The main intestine extends to near the brain, the intestinal branches anastomose. Tissues and setae of polychaetes occur in the gut. The male pore (t) lies at 5.2 mm, the female orifice (f) at 5.5 mm.

The eyes begin 0.8 mm behind the tip and end at 1.3 mm. They form 2 rather simple rows of about 20 eyes each. Six of these are up to 24 μ in diameter and directed obliquely, hence can be distinguished as tentacular eyes from the remaining cerebral eyes, up to 15 μ in diameter, and directed upward and downward.

The testes and the ovaries occupy the entire height of the body. The sperm ducts (Fig. 55, d) come from behind and enter the corners of the ventral limb of the large seminal vesicle (Fig. 54, w). The musculature of the vesicle is not strong; the nuclei lie between the fibres. As the ventral limb of the vesicle is much broader than the dorsal limb, the latter could be termed ejaculatory duct. The muscle coat of the chambered granule vesicle (q) and of the cirrus sac (nc) is weak, in that of the cirrus sac the nuclei surround the fibres. The cirrus (zi) is a coiled tube without spines the ectal part of which is straight. The point of the conical cirrus sac projects into the deep and narrow male antrum (r).

The female apparatus has a quite small and spherical Lang's vesicle (l) connected by a short and straight duct (on) with the vagina (vi). The outer part of the vagina (v) is wide and folded and set off from the female antrum (a) the vertical course of which leads

to the female pore (f). As the cement glands are not developed yet, the sections of the vagina can be indicated (Fig. 55, v, vi) only approximately.

Holotype: A whole mount of the anterior part of the larger specimen and sagittal sections of its copulatory organs.

The essential characters of *A. ujara* are the same as in *A. hummelincki*. The seminal vesicle of *ujara* is twice as large as the cirrus sac, the muscles of the male organs are weak, the male antrum is deep, and the vagina is wide and folded.

29. **Pericelis orbicularis** (Schmarda, 1859) Fig. 56

SCHMARDA 1859, p. 28 (*Eurylepta orbicularis*); STUMMER-TRAUNFELS 1933, p. 3545 (*Pericelis orbicularis*); HYMAN 1955b, p. 262.

FLORIDA: Biscayne Bay, *Key Biscayne*, Southwest Point, in *Halimeda*, 5.VIII.1962 (B), 1 specimen.

Further distribution: Jamaica; Texas, Cline's Point, near the Institute of Marine Science, Port Aransas.

The length of the preserved broadly oval animal is 25 mm, the breadth 19 mm. The margin is very ruffled and somewhat damaged in front, so that the tentacular folds are worn.

A band of marginal eyes, up to 30 μ in diameter, runs around the whole body; they are scarce and weakly pigmented behind. Of the 2 clusters of tentacular eyes only some more closely set eyes remain. At 1.56 to 1.96 mm from the fore end there are 2 longitudinal groups, each consisting of 50–60 round cerebral eyes, up to 40 μ in diameter. They form two broad stripes running close to each other as in the material from Jamaica (STUMMER-TRAUNFELS 1933, fig. 113); they are not heaped as in that from Texas (HYMAN 1955b, fig. 2). Beside the brain and in front of it a few frontal eyes spread to the margin. Their maximum diameter is 30 μ.

The dorsal epithelium contains 10 μ-thick olive brown granules lodged in calyciform cells, as the sections show. The distribution of these brownish cells and the short longitudinal folds of the preserved specimen produce the effect of ramified and coalescent ridges and papillae, but sections prove that the surface is smooth. As in the previous descriptions the parenchyma contains fine brown granules

which form an irregular net, principally developed on the dorsal side.

The very ruffled pharynx is 9 mm long. The genital apertures (f) are located 2 mm behind the end of the pharynx under the middle of an enormous mass of cement glands (c). The sucker (s) lies 1 mm farther backwards. Its opening is small, so that it appears inconspicuous in the total mount. In the sections it measures 0.5 mm in diameter and is rather strong.

The male gonads are absent, and of the ovaries only some yolk spherules in the parenchyma between the intestinal branches remain. When grown ovocytes degenerate, such granules are known to resist longest.

Of the male copulatory organs there is only a thin-walled, 0.55 mm long sac, the male antrum (r); it opens into the anterior wall of the common genital depression of the skin and ends blindly in front.

The uteri (u) bear numerous uterine vesicles (uv) containing eggs. Two pairs of vesicles lie behind the level of the sucker (s). These posterior branches of the uteri (j) are not mentioned in the previous descriptions. The common uterine duct (n) continues into the short inner vagina which enters the cement pouch (z) or vagina media. The outer vagina (v) bends forward and reaches the female antrum. The enormous development of the cement glands (c) differs from the previous descriptions and shows that our specimen is in advanced female phase of egg-laying.

The Pericelidae, the peculiar acotylean characters of which were stressed by most of the previous authors, contain only one valid genus, *Pericelis* LAIDLAW (1902, p. 291). It is true that BOCK (1922, p. 6, 20) mentioned 2 Pacific species of a second genus of this family. Later on (1925a, p. 24) he named it *Thalattoplana*, and characterized it by the union of the ectal parts of the copulatory efferent organs. Though *Thalattoplana* was recorded from the Bonin Islands, it is not listed in the "Polycladida of Japan" (KATO 1944), nor is there any cotylean species with united distal genital ducts in the literature referring to Micronesian and Polynesian polyclads, only the acotylean *Asolenia* HYMAN (1959a, p. 562).

The widely distributed Indo-Pacific *Typhlolepta byerleyana* COL-

LINGWOOD (1876, p. 92) from Borneo is the type species of *Pericelis*. It ranges from Mauritius (PALOMBI 1938, p. 351) through the tropical Indian Ocean (LAIDLAW 1902; MEIXNER 1907, p. 474) to the Palau Islands (KATO 1943b, p. 84) and Rotuma, Fiji (LAIDLAW). The eastern Pacific *P. ernesti* (HYMAN 1953a, p. 286) from the Gulf of California and Clarion Island off the coast of Mexico was allotted to *Pericelis* by its author (HYMAN 1955b, p. 263).

STUMMER-TRAUNFELS distinguishes *P. orbicularis* from *P. byerleyana* by the former's very strong adhesive organ (the so-called sucker), the separation of the male and female pores, and not specified details of the male copulatory apparatus. The first character seems, in fact, to be valid, though the sucker of the Texan material of *orbicularis* is not as large as that of the Jamaican and the present specimens. While there are now 3 figures of the invaginated sucker of *orbicularis*, there is none of that of *beyrleyana*, drawn only once in evaginated condition (MEIXNER 1907, pl. 29, fig. 3). The small size and the poorly developed muscles of the sucker of *byerleyana* were described by MEIXNER (p. 480) and KATO (1943b, p. 86).

The sucker of *P. ernesti*, which had been overlooked in the first description, is "well-developed" (HYMAN 1955b, p. 263).

The separated (*orbicularis*) or united (*byerleyana*) gonopores are no differential character. LAIDLAW (p. 291) found these apertures 2.5 mm distant from one another in *byerleyana*, and KATO (p. 85–86) said "genital pores shortly separated in the extended state, but closely approximated in the contracted state to form a single pore". In *orbicularis* HYMAN (p. 263) describes "male and female copulatory apparatuses open close together into a depression that practically constitutes a common gonopore".

LAIDLAW's and MEIXNER's descriptions agree with regard to the absence of a granule vesicle and of extra-capsular gland cells, but while LAIDLAW found a glandular epithelium in the ental part of the male duct, near the entrance of the sperm ducts, MEIXNER observed it in the middle part. Kato's description agrees with that of MEIXNER.

In *Pericelis ernesti* there is no granule vesicle or glandular epithelium between the seminal vesicle and the penial papilla (HYMAN 1953a, p. 297); the rounded seminal vesicle with a large lumen of

ernesti differs from the nearly tubular innermost section of the male duct in *byerleyana*.

The Jamaican and the Texan specimens of *orbicularis* have the same strongly muscular spherical seminal vesicle as *ernesti*. Ectally follows an elongated part with widened lumen. STUMMER-TRAUNFELS found its wall muscular and its epithelium glandular; HYMAN found the wall thin and no evidence of prostatic secretion.

By the existence of this intercalary vesicula granulorum or prostate one could arrive at a second distinguishing character between *orbicularis* and the 2 Pacific species. The present specimen with its evident regression of the male copulatory organ, however, and the not quite concordant previous descriptions induced us to wait for more material before establishing specific differences of the male apparatus in *Pericelis*.

30. **Pericelis cata,** spec. nov. Fig. 57–59

CURAÇAO: Piscadera Baai, outer part, under stones, 31.XII.1965 and 15.I. 1966 (C), 4 specimens. – Boca Lagoen, N side, steep cliff of coral rock, 0–1 m, 13.XI.1948 (H 1020b), 1 spec.

Alive the worms reach a length of 60 mm. Due to the firm adhesion of the very thin body to the substratum the fixation is very difficult. The smoothest of the preserved specimens measures 33 × 21 mm, the broadest 27 × 21 mm. In the former the width is 63% of the length, in the latter 77.7% (in our *P. orbicularis* 78%). All specimens are soft, and many of their crumpled marginal folds stick together; in Fig. 57 the contours are simplified.

The tentacles are 4 mm distant from one another. The colouring pigment is epidermal. Around the numerous caliciform gland cells of the dorsal 30–40 μ high epithelium there is a network of very finely ramified melanophores. These form a dark pattern interrupted by round areae where the white parenchyma shines through (Fig. 58). Sometimes the white circles coalesce to larger blotches, sometimes the dark patches prevail. The dark patches contain scattered black spots of densely disposed melanophores, which also extend into the connective tissue. Especially dark are the borders of the tentacular folds. Here the black pigment passes a little on to the else white

ventral side. There are light areae over the cerebral eyes, but not over those in the tentacles.

The marginal, cerebral, and tentacular eyes have a maximum diameter of 40 μ. The marginal eyes are most numerous between the tentacles, but also around the hind end there are some marginal eyes, up to 35 μ in diameter. The marginal eyes are arranged in an irregular row; most of them lie so deep in the parenchyma that they are easier to see from the white ventral side. The cerebral eyes are situated 2.75 to 3.5 mm behind the anterior border. The 2 groups are not distinctly separated in the middle. Each group contains 45–55 eyes. The tentacular eyes are densely disposed; as far as the dark pigment allows for a count there are more than 100 eyes in each tentacle. Near the dorsal side two broad and loose tracts of eyes extend from the brain to the tentacular folds; on the ventral side the whole precerebral region bears many eyes which extend to the borders.

The rather narrow pharynx is 15–18 mm long, hence 45.5 to 54.5% of the body length (Fig. 57). Its ruffles are very fine and numerous. The mouth, torn off in all specimens together with part of the ventral skin, lies probably nearly in the middle of the pharynx. The male pore (t) and the female opening (f) lie together 23 mm behind the anterior end of the body, the sucker (s) 1 mm farther behind. It is a 0.35 mm long slit. The sections show the thick muscles of the sucker and the shallow folds of its epithelium.

The ovaries are dorsal, the testes ventral and a little more lateral than the ovaries. The sperm ducts of the sectioned specimen were empty, so that only their terminations (Fig. 59, d) could be seen coming from behind and opening laterally into the seminal vesicle. They are widely separated from each other. The enormous seminal vesicle (w) is 1.2 mm long and 1.0 mm heigh. The ventral muscle mantle is 0.5 mm thick, the dorsal one 0.1 mm. The contents of the vesicle are a few blue-staining sperms and many granules of red-staining secretion. The vesicle emits a thin ejaculatory duct proceeding into the muscular penis papilla (p). The outer part of this duct is lined by a high, glandular epithelium and corresponds to a granule vesicle (q). There are no extra-capsular glands. The granule vesicle ends shortly in front of the tip of the penis papilla. This

mamillary organ is directed obliquely backward. It is 0.5 mm long, 0.3 mm broad at its base, and projects into a short male antrum (r).

The uteri extend to the anterior end of the pharynx (Fig. 57), an acotylean feature. Each of the uterine ducts bears about 10 sperm-containing vesicles, two of which are located behind the level of the sucker. The epithelium of the uteri and their ducts forms ridges of high cells as in *P. byerleyana* (MEIXNER 1907, p. 479); that of the common uterine duct (n) stores the secretion of surrounding glands. The common duct comes from behind and enters the backward bent inner vagina (vi), from which it is separated by a strong sphincter (mu). The cement pouch (z) is flattened dorsoventrally; the epithelium of the outer vagina is folded. The vagina and the male antrum open together (f, t).

Holotype: The fore end and the hind end in whole mounts and a series of sagittal sections of the copulatory organs.

A common character of the species of *Pericelis* is the tenuity of the body and the folding of its margins. Peculiar features of *P. cata* are the enormous seminal vesicle which receives the sperm ducts near its hind end, the glands of the common uterine duct, and its sphincter. *P. byerleyana* LAIDLAW (1902, p. 291) has a long, cylindrical penis papilla (KATO 1943b, p. 86) and a very deep male antrum (MEIXNER 1907, pl. 29, fig. 16). In *P. ernesti* (HYMAN 1953a, p. 296) the cerebral clusters of eyes are well separated from one another; the precerebral region has no eyes in the middle; and the conspicuous male antrum opens into the common antrum by a narrow canal. In *P. orbicularis*, treated above, the tentacular folds are less developed than in *cata*; the parenchyma contains a net of pigment granules; the eyes in the hind part of the body are much smaller; the pharynx is 22.2% to 37.5% of the body length; the epithelium of the sucker is more folded; and the granule vesicle is located farther inwards.

31. **Boninia antillarum** (Hyman, 1955) Fig. 60–64

HYMAN 1955a, p. 116 (*Adenoplana antillarum*).

CURAÇAO: together with *Boninia divae* (no. 32), I.–II. 1966 (C), 2 specimens. BONAIRE: Kralendijk, near Pasanggrahan, beach-rock, 0–½ m, 16.IX.1930 (H 1057a), 1 spec.

Further distribution: Virgin Islands, St. Thomas, Charlotte Amalie.

Among the great number of animals of the following species two flatter and broader ones with fewer and larger eyes called our attention at once.

The uncoloured specimens are 16 mm long and 3.9, 3.5, and 3.3 mm wide; as they are not quite smooth, they may actually be longer. Behind they are pointed and provided with a sucker (s), 0.5 mm in diameter. The anterior border (Fig. 61) bears two pointed tentacles, 0.6 mm in length, widely distant from one another, and without eyes.

The big marginal eyes are interrupted in front and extend to 1.2 mm behind the fore end, i.e., beyond the level of the brain. Their diameter is up to 40 μ; they form several rows which are indistinct; a few marginal eyes extend from the border to the brain. The cerebral eyes, up to 25 μ in diameter, form a group of 3 on either side; a fourth eye lies behind each group.

The ruffled pharynx is 4.5–5 mm long and occupies from 4.3–9.3 or 6.0 to 10.4 mm behind the fore end. The mouth is central. The male pore lies 0.6 mm behind the pharynx; the female aperture 1.4 mm farther backwards. Ovaries and testes extend to the hind end, both are dorsal, but the grown ovocytes reach the ventral side.

The sperm ducts (d) are widened behind the pharynx and united by a transverse commissure in front of the female pore. The muscular seminal vesicle (w) receives the spermiducal vesicles in its anterior ascending part, it then bends downward and opens into the cup-shaped granule vesicle (q). The ejaculatory duct in the penis papilla (p) and the ental part of the ciliated male antrum are slanting backward; the ectal, tubular part of the antrum runs straight to the genital pore (t). An annular fold or penis sheath separates the inner part or penis pocket (y) from the outer part, the male antrum proper (r). The latter receives the ciliated ducts, 0.13 mm in length, of 27

musculo-glandular organs or prostatoids (po); in HYMAN's 8 mm-long worm there were 25. These are armed with small stylets (si). The ducts are 40–50 μ in diameter and seem to be individual for each prostatoid.

The prostatoids correspond to those of *Boninia mirabilis* BOCK (1923c, p. 19–21). They are oblong vesicles (0.16 × 0.13 mm), located in the loose connective tissue between the intestine, gonads and gonoducts, and individualized by muscular envelopes. Each vesicle contains gland cells, which BOCK called extra-capsular glands (ic), because they lie around a flask-shaped capsule. This consists of a muscle layer covering a single cell which stores the secretion of the glands and opens into the prostatoid duct by a hollow stylet.

The uteri (oviducts) bear several uterine vesicles. Behind the female pore the anterior and posterior oviducts unite and run to the median plane, where they continue into the inner vagina. From the entrance of the oviducts (u) a long and wide Lang's vesicle (l) is extended backwards, ending with a simple ampulla. The ascending inner vagina (vi) curves to the ventral side and descends, as middle vagina, straight to the female orifice forming a cement pouch (z). In the sectioned specimen the pouch opens directly outwards; the female antrum is incorporated into an evidently artificial deep transverse fold in front of the female aperture.

In HYMAN's figure 81a the adhesive disc at the posterior end, which reveals the cotylean character of her species, is drawn, but she did not mention it. The tentacles appear in her drawing too, but they were evidently damaged. The prostatoids of the original worm have no stylets, because the animal is young. The ducts of several prostatoids are confluent in HYMAN's animal, but we do not consider this detail as taxonomically significant.

KEY to the species of the Boniniidae:

1 A single prostatoid behind the penis . . . . . *Traunfelsia elongata* LAIDLAW (1906, p. 714)

– Many prostatoids 2

2 Prostatoids open into the male antrum 3

– Prostatoids open into a shallow depression of the body wall . . .
Paraboninia caymanensis PRUDHOE (1944, p. 326)

3 Pharynx entirely in anterior half of body; genital pores in front of the middle, 11 and 12 mm from the fore end in a 29 mm-long preserved animal . . . . . *Boninia mirabilis* BOCK (1923c, p. 1)
– Pharynx in the middle of the body, extending into the posterior half of it; genital pores well behind the middle 4

4 A group of 3 cerebral eyes and a fourth farther behind on either side; less than 30 prostatoids. . . . . .
Boninia antillarum (HYMAN 1955a, p. 116)
– Two long bands of numerous cerebral eyes; more than 50 prostatoids. . . . . *Boninia divae*, spec. nov. (no. 32)

32. **Boninia divae,** spec. nov. Fig. 65–70

CURAÇAO, Piscadera Baai, St. Michiels Baai, Vaerssen Baai, under stones at high water-line, I.–II. 1966 (C), 30 specimens. In all localities the occurrence was patchy.

Alive the worms are 2–4 mm broad and 30–50 mm in length, but when preserved they contract very much (C), so that the longest and straightest of the preserved worms is 25 × 1.7 mm. The colour of the living animals is pure white, pink, yellow or brown, according to the contents of the gut (C).

The pointed tentacles, widely distant from one another, are about 0.5 mm in length and 0.18 mm broad at the base (Fig. 67). Contrary to the evidently stiff tentacles of *Boninia mirabilis* (BOCK 1923c, p. 2) those of *B. divae* are flexible and show very different positions in the preserved specimens, straight to the sides or to the front, upright, or curved backward. In some specimens the marginal eyes enter the base of the tentacles, in others they do not. A transverse sensory furrow, already noted for other Boniniidae (BOCK 1923c, p. 5; PRUDHOE 1944, p. 327), is distinct; it is angulated as described by PRUDHOE, but lies farther backwards than in his species. A muscular adhesive disc or sucker (Fig. 66), 0.5 mm in diameter, lies at the posterior end of the body (Fig. 65, s).

The small marginal eyes are numerous and come to 2 mm behind

the fore end. Their diameter is 23 μ. The cerebral eyes are of the same size; they form two bands, one on either side of the midline, which end 1.3 mm behind the tip of the body. Some eyes lie between these bands and the margin. The number of eyes varies considerably.

The weakly ruffled pharynx (Fig. 65, h) of a 24 mm-worm is 12.5 mm long; the mouth is central, situated 5.2 mm behind the fore end of the pharynx. The male pore lies 0.5 mm behind the pharynx; the female opening 0.9 mm behind the male aperture.

The ovaries and the testes are dorsal. The sperm ducts (d) are distended in their postpharyngeal course; a transverse commissure between them was not recognized. The whole male apparatus (Fig. 68) stands vertically to the long axis of the animal. The seminal vesicle (w) is thin-walled, the flattened granule vesicle (q) is not very muscular and has a high storing epithelium; the extra-capsular glands are deeply sunken into the surrounding parenchyma. The short and broad penis papilla (p) is separated from the ciliated male antrum by an annular fold (x), the penis sheath.

Into the inner area of the male antrum the individual ducts open, about 30 μ in diameter, of more than 50 prostatoids (po), 100 μ long, 80 μ wide. Their structure agrees with that of the preceding species, as each organ has a fibrous envelope, gland cells (ic), and a single, innermost cell with a stylet (si). Around the antrum all prostatoids form a ring surrounded by fibres of the connective tissue (Fig. 69), outward of which the mass of the granule glands is located.

The ovaries are juvenile, even in our largest worms. The uteri (Fig. 70, j, u) bear 8–10 vesicles (uv) on either side, partly behind the uterine ducts, partly in front of them, but not beyond the male apparatus. Behind the entrance of the ducts into the inner vagina (vi) the wide ciliated Lang's vesicle lies. The further course of the vagina with its cement pouch (z) corresponds to the common cotylean scheme.

The worms move quickly to the dark side, when the stone is turned over (C).

Holotype: The anterior part as a whole mount and a slide with sections of the copulatory organs.

The species is named for the collector.

The systematic position of the Boniniidae with their mixture of cotylean and acotylean characters has been amply discussed by BOCK (1923c, p. 22–29); the separation of the five known species of the family is annexed to the description of the preceding species.

33. **Thysanozoon brocchii** (Risso, 1818)

LANG 1884, p. 525–535; PALOMBI 1928, p. 604; KATO 1944, p. 294; MARCUS 1949, p. 81 (*Th. lagidium*); 1952, p. 90 (id.).

CURAÇAO: Piscadera Baai, outer bay, under stone and coming up from algae; inner bay, coming up from growth on roots of mangrove, I.–II. 1966 (C), 6 specimens. Piscadera Baai, entrance to inner bay and inner bay, nearly all worms among mangrove on quite different bottoms in 0–1 m; 1 spec. on the buoy of Station 1482 (H 1462, 1463, 1463a, 1463A, 1464, 1466, 1468, 1469, 1469a, 1473, 1473A, 1475, 1476, 1476a, 1482, 1485, 1487), about 150 spec. FLORIDA: *Key Biscayne*, Marina, in an old shell; *Virginia Key*, on the panels hung under the pier of the Institute of Marine Science, II. 1959 (C), 2 spec.

Further distribution: E Atlantic, from the French Basque coast (BEAUCHAMP, 1961, p. 66) to the W and E Mediterranean; Río de Oro; Cape Verde Islands. W Atlantic, from Florida to southern middle Brazil. Indic, East London. Pacific, Japan; Laysan, W of Hawaii. Not recorded from the W coast of America.

"North Sea" (STUMMER-TRAUNFELS 1933, p. 3573) evidently refers to *Thysanozoon papillosum* M. Sars, published by JENSEN (1878, p. 79) and found at Florö (61°36′ N, 5°04′ E), but this species is a *Cycloporus* (BOCK 1913, p. 262–264). Several older Indo-Pacific records of *brocchii* require confirmation.

A living worm from Curaçao (C) was 15 × 5 mm, preserved it was 13 × 10 mm; the bigger specimen from Florida is 24 × 16 mm preserved. The largest preserved animal from Curaçao (H) measures 22 × 15 mm, the smallest 1.5 mm. The papillae have more melanophores than the back, where they are scarce around the margin, along the border of the tentacles, and sometimes in a midline and in a transverse band, where the papillae are light too. White spots may occur on the dark papillae. The ventral skin is light, not pigmented.

Dr. CORRÊA observed different shapes of the papillae in life, and the worms gliding upside down on the surface film.

LANG's description (1884, p. 531–532) of the external characters of *Th. brocchii* is especially important, because it refers to a rich material of one and the same species from one locality. Thanks to Prof. Dr. DIVA DINIZ CORRÊA we can compare *Th. lagidium* from Brazil

with *brocchii* from Naples, where she collected 22 specimens in 1952.

Several characters of *lagidium* previously considered as different from *brocchii* actually are not. Also in *brocchii* the body may be broader than half its length; the eyes of the right and left tentacles may be separated by a gap in the middle; and only the size of the dorsal papillae, not their number, decreases towards the sides. The female copulatory apparatus of *brocchii* (LANG 1884, pl. 18 fig. 4) and that of our first material (MARCUS 1952, fig. 169) differ in that the female antrum is more elaborate in *lagidium*, approximating LANG's "rare" type of the cotylean female antrum (1884, p. 307, pl. 28 fig. 1). In another adult 30 mm-specimen, however, the antrum is shallower, not subdivided into two chambers, an outer and an inner one. In this specimen the female opening lies on a boss of the ventral surface, as normally in the Pseudoceridae (LANG 1884, p. 307). In our first worm this boss had been retracted, and so the horizontal subdivision of the antrum resulted. The shape of the cement pouch, broader or longer, does not furnish distinguishing characters between *brocchii* and *lagidium* either.

Intestinal diverticula in the dorsal papillae were already mentioned in our first description of *Th. lagidium* (1949, p. 82), so that HYMAN's contrary citation (1952, p. 197) is a lapsus. These diverticula were considered a specific character of *brocchii* by STUMMER-TRAUNFELS (1895, p. 692), who examined 11 extra-European species of *Thysanozoon*, in which they are absent. However they occur in several non-Atlantic species e.g., *Th. skottsbergi* BOCK (1923b, p.358), *Th. japonicum* KATO (1944, p. 297), an Australian species (DAKIN 1953, p. 144), and PLEHN's two species (1896a, p. 163, 165) with unpaired male apparatus (*Thysanoplana*).

According to LANG (1884, p. 134) "the lateral intestinal branches are always paired, opposite to one another on the right and left side of the main intestine". Digestive branches going off from the main intestine on different levels in *Thysanoplana* were emphasized as an exceptional feature by PLEHN (l.c.) in her thesis elaborated under the auspices of LANG. Later on BOCK (1913, p. 256, 304), who found the same arrangement in his *Pseudoceros periphaeus*, stressed it, and so it was noted as remarkable in BRESSLAU (1933, p. 104). Also in *Th. lagidium* thin tubes, the origins of lateral branches, leave the main

intestine on different levels (MARCUS 1949, p. 83; 1952, p. 90) in the region anterior to the sucker. In the lateral parts of the body the anastomosing branches are wider, have thicker walls, and lie more or less in one plane. In sections of *brocchii* from Naples the arrangement of the lateral intestinal branches is the same, though LANG's figure (pl. 18 fig. 1), based on compressed preparations and distorted in some details (p. 147, note; p. 270), does not show it. There may be differences by degree in the number of intestinal outlets, e.g., none were seen in our *brocchii* and *lagidium* leaving the ventral wall of the intestine (PLEHN, l.c.), but a specific distinction of *brocchii* and *lagidium* cannot be based upon the levels of the lateral branches of the intestine.

Th. lagidium has a greyish brown or purplish back due to the combination of a light ground colour with melanophores. The papillae are more or less densely pigmented and may have white tips. A light dorsal midline and a light transverse band near the middle may occur due to an absence of melanophores in the dorsum and its papillae. This colour pattern remains within the range of variation of *Th. brocchii*. LAIDLAW (1906, p. 713) described *Th. brocchii* var. *cruciatum* from the Cape Verde Islands. Its light transverse band lies in front of the middle. *Th. cruciatum* SCHMARDA (1859, p. 30) is a different species, evidently without intestinal diverticula in the papillae (STUMMER-TRAUNFELS 1895, p. 715). Summarizing we are of the opinion that *Th. lagidium* must be united with *Th. brocchii*.

Evidently the *Thysanozoon brocchii* from the northwestern coast of Florida (PEARSE 1938, p. 85) and Biscayne Bay (HYMAN 1952, p. 196) was correctly classified. The colour of the former varied from cream to brown and purple with brown and purplish papillae. The latter was purplish maroon with brown papillae and some white spots along the edge and on the papillae. Both have intestinal branches in the papillae.

This character is not known of *Th. griseum* VERRILL 1901 (p. 41) and *Th. flavotuberculatum* HYMAN (1939b, p. 16), both from the Bermudas, and known from one and two specimens, respectively. Without entering into the question whether these species actually differ from *brocchii*, we only mention the small number of papillae in

young *lagidium* (MARCUS 1949, fig. 121 B, C), now *brocchii*, similar to the "scattered tubercles" of *flavotuberculatum*.

34. **Thysanozoon nigrum** Girard, 1851 Figs. 78, 92–98

GIRARD 1851, p. 137; VERRILL 1901, p. 41; WAGENAAR HUMMELINCK 1933, p. 305; HYMAN 1939b, p. 15; 1940, p. 484; 1952, p. 196, note 1; 1955a, p. 137.

BONAIRE: Lagoen, SE corner, weathered diabase rock with small growth of *Rhizophora*, muddy sand among mangrove roots, 0–1 m, 28.X & 2.XI.1930 (H 1070A, B), 17 specimens.

Further distribution: Florida, Cape Florida and Biscayne Bay region; Bahamas; Bermudas.

The preserved animals are from 4 × 2.5 to 17 × 9 mm. They are greyish black; some are grey. They have no white flecks, though some defects of the epidermis uncover the white parenchyma. The ventral surface is also pigmented, but not as intensely as the back. The pigment lies within the epidermis.

The shape of the tentacles corresponds to STUMMER-TRAUNFELS' hare ear-form (1933, p. 3581). Their dorsal eyes are hidden by the pigment; the separated basal-ventral groups are recognizable. The cerebral clusters are separate, they are approximately triangular.

Each of the dorsal papillae receives an intestinal branch.

The male copulatory complexes are paired. The sperm ducts (d) are distended into spermiducal vesicles and enter the seminal vesicle (w) from behind. The seminal vesicle is tubular and curved, its musculature is disposed around the whole length of the tube in uniform width. In the figured *Th. lagidium* (MARCUS 1952, fig.168), a synonym of *Th. brocchii*, the musculature of the ental region of the vesicle was especially thick, evidently because of contraction of this region, and in HYMAN's specimen of *Th. nigrum* (1939b, fig. 22) a partial contraction of the muscles near the entrance of the sperm ducts is still more pronounced. This led the author to separate the inner and outer parts of the seminal vesicle. She regarded the inner, very muscular region as the seminal vesicle and the outer region as a peculiar organ of *Th. nigrum*, an intervening duct between the seminal vesicle and the ejaculatory duct. The ejaculatory duct (eu) of our sectioned specimen is more coiled than in HYMAN's figure, a morphologically insignificant feature.

Neither do the female organs differ from *brocchi*. A horizontal subdivision of the female antrum, previously regarded as a specific character of *lagidium* and now recognized as resulting from the retraction of the ventral boss (see discussion of the preceding species) does not occur in the specimens of *nigrum* sectioned by HYMAN and ourselves. In other animals it may appear. HYMAN's and our animals have a straight vagina. "The absence of a non-glandular female antrum between the pocket receiving the cement glands and the female pore" is not an anatomical character of *Th. nigrum* as HYMAN (p. 16) thought. Not only in our present *nigrum*, but also in one of our sectioned *brocchii* from Naples the shell glands open into the entire outer region of the straightened vagina, the cement pouch of which was smoothed away. According to LANG (1884, p. 312) part of the shell glands of completely mature animals may open into the neighbouring parts, the antrum and the inner vagina. The slight posterior bend of the latter was described by HYMAN (p. 16); the anterior curve in her drawing is evidently a lapsus.

The darkest *brocchii* from Naples recorded by LANG have a dirty black aspect due to a blackish back and black papillae. The difference between this qualification and "jet black" and "velvety black" applied to *nigrum* is slight. The underside of *nigrum* was described as "light smoky brown" or as "dusky". In *brocchii* the ventral surface is light. LANG's old-fashioned denomination "*Thysanozoon brocchii* var. *nigrum*" is quite good. But as the melanism may be a true mutation, and several species of *Pseudoceros* are still characterized by their colour only, one can just as well call the present animals *Thysanozoon nigrum*.

FIELD NOTES of P. WAGENAAR HUMMELINCK when collecting *Thysanozoon nigrum* at Lagoen, Bonaire, 28.X.1930 (Figs. 92–98):

Many specimens were found on submerged *Rhizophora* roots, especially in the mangroves and in other well-sheltered localities. They were also found crawling on the muddy bottom, or even swimming. When crawling, small specimens cover about 1 cm in 6 seconds; large ones 1 cm in 4 seconds. The large specimens, when crawling, are 20–25 mm long, and 1–1½ mm high.

The papillae are very dark, usually with 2–3 creamish-white dots, the largest as a rule on or near the top; already to the naked eye some papillae show white tips. The back is somewhat lighter in colour, with black pigment. The body as a whole has a brownish hue; its margin is darker, with many small white dots. The tentacles are black, yellowish white at the top because of an accumulation of cream-coloured

granules, and have light-coloured margins. The protruding (and retracting) pharynx is yellowish.

On the head an area is found which is often heart-shaped, and, except for a scanty haze of very fine particles (like pencil scrapings) is not pigmented (Fig. 96). In this area an undefinite number of solid black granules is situated, forming a distinct design, which in several specimens is very irregular, and may even be lacking; in the latter case only one or two light coloured areas (without blackish pigment) are observed. These black granules (the cerebral eyes) are usually angular, sharply confined, and completely opaque. This whole area of the eyes is somewhat bulging.

The marginal part of the body has no papillae dorsally, but is not smooth; some small, dull, cream-coloured spots are irregularly distributed on minor elevations. The body, mediodorsally, is much darker in colour than the lateral parts. The papillae on the lateral parts can be discerned as dark pinpoints. This is not the case in the mediodorsal region.

In transmitted light the body shows an irregular, diffuse, beige reticular pattern. This pattern is a complete reticulation, exept at the margin. Intestinal branches enter all papillae.

Ventrally the body is greyish, with a haze of delicate black pigment. Intestinal branches have a diffuse yellowish-orange colour.

The further Westatlantic Pseudoceridae

Besides *Thysanozoon* two closely related genera, *Pseudoceros* Lang (1884, p. 538) with a smooth back and *Acanthozoon* Collingwood (1876, p. 86, 95) with papillate skin occur in the Westatlantic warm waters. *Pseudoceros* comprises over 100 valid species (Hyman, 1959a, p. 565), with few exceptions all from tropical and subtropical seas. The northernmost records are Muroran (or Mororan) Hokkaido (42°18′ N, 140°50′ E; Kato 1937d, p. 37), and Claoquot, Vancouver Island (49°10′ N; Hyman 1953a, p. 368). The centre of these genera is the Indo-Westpacific region, but the disparity of the Westindian region with 9 records of *Pseudoceros* and 2 of *Acanthozoon* is also due to very sporadical studies. This can be seen in Lang (1884, p. 538–548), whose 16 names do not refer to any American species. Only in 1900 the first American records were published.

Alive most of the Westatlantic species are easily distinguishable.

P. splendidus Stummer-Traunfels (1933, p. 3487, note). Bermudas (Verrill 1900, p. 596; Hyman 1939b, p. 19); Puerto Rico (Hyman 1955a, p. 137). Deep bluish black with a light orange border. Two male copulatory organs.

P. pardalis Verrill (1900, p. 595). Bermudas. Brown with yellow spots.

P. aureolineata Verrill (1901, p. 42); Hyman (1939b, p. 18). Bermudas. A broad dorso-median area purplish or purplish-fawn; lateral splotches of the same colour (sometimes absent) on white background and connected or not with the median area in a radiate fashion. Small white or orange spots on the dorsal surface.

P. bicolor (no. 35). Bermudas; Curaçao.

P. crozieri (no. 36). Bermudas; Florida; St. Martin; Curaçao. Light with black crosslines.

P. chloreus Marcus (1949, p. 86). Coast of São Paulo. Greenish yellow with 5 sepia coloured longitudinal marks, one in the middle and two on either side.

P. evelinae MARCUS (1950, p. 81). Coast of São Paulo. Strawberry red in the middle of the back, darker purplish to the sides; brimmed with orange and black.
P. mopsus (no. 37). Coast of São Paulo; Curaçao.
P. texanus (no. 38). Texas; Florida; Bonaire.
Acanthozoon maculosum (PEARSE 1938, p. 85; HYMAN 1940, p. 485). Northwestern coast of Florida. Grey with middorsal light band bordered by darker shade and small dark spots scattered evenly over the back. Cerebral eyes in paired clusters.
Acanthozoon hispidum (DU BOIS-REYMOND MARCUS 1955, p. 38). Coast of São Paulo. Greyish green due to the contents of the gut with white papillae and whitish border. Cerebral eye clusters confluent.

35. **Pseudoceros bicolor** Verrill, 1901 Fig. 71–72

VERRILL 1901, p. 42; HYMAN 1939b, p. 17.

CURAÇAO: Awa di Oostpunt, the southernmost point of the island, coming up from algae, 4.I.1966 (C), 2 specimens.

Further distribution: Bermudas, under stones.

The living specimens were described as dorsally black with irregularly broad white margin. The preserved animals are 16 and 10 mm long, 9 and 6 mm in width; they are immature. The ventral surface is white, the back brownish-black in the larger, black in the smaller worm. Both have a light line over the main intestine. The white margin is interrupted by black languettes. In the bigger specimen (Fig. 71) a rusty line parallel to the border crosses the black languettes in their middle and is interrupted in the white interspaces.

The folded short tentacles have a narrow white border, and their black bases are traversed by the rusty line. In front between the tentacles the black area ends straight, not emarginated as in VERRILL's drawing (1901, pl. 5 fig. 5). The eyes are concealed by the black pigment. The pharynx has few folds; it is short and occupies the levels from 2 to 6 mm in the larger specimen. The mouth is central. The sucker of this animal lies 8 mm behind the fore end. Gonopores are not developed yet.

The size of the present specimens is intermediate between VERRILL's (30 × 15 mm) and HYMAN's (9 × 2.3 mm) records. VERRILL did not mention the reproductive organs; HYMAN's worm was immature. The rusty lateral line described here was not reported by VERRILL nor by HYMAN. It seems better to note this detail than to fix it by a subspecific name.

36. **Pseudoceros crozieri** Hyman, 1939 Fig. 75–77

HYMAN 1939b, p. 17; 1952, p. 197.

CURAÇAO: Piscadera Baai, inner bay, southern part, *Rhizophora*, mud, 0.1 m (H 1466), 16 specimens; southern part, *Rhiz.*, rocky shore, 0–1 m (H 1468), 19 spec.; central part, *Rhiz.*, muddy sand, 0–1 m (H 1475), 38 spec.
ST. MARTIN: Simson Bay Lagoon, Flamingo Pond, muddy lagoon with rocky shore, with *Batophora*, on *Rhiz.*, 0–1 m (H 1132), 2 spec.
FLORIDA: *Key Biscayne*, Marina, from an old oyster shell and on an ascidian, I.1959 (C), 2 spec.

Further distribution: Bermudas, on or near ascidian colonies; Florida, Biscayne Bay.

Living animals (C) reach a length of 50 mm. The largest preserved specimen (H) is 32 mm long, 21 mm wide. The smallest animals (H) are 2.6 × 2.2 mm (Fig. 75). The living worms (C) were light reddish-brown with black transverse lines; the border of the back and the ventral side were white. The preserved specimens are sand coloured with black lines and a lighter border; the ventral surface is light. The slightly wavy transverse lines are much less numerous in young animals (Fig. 75) than in the adult ones. Sometimes they are not continuous from side to side, and sometimes they coalesce. Often thicker and thinner lines alternate, and they are generally thickened at their ends. Isolated black spots along the sides, independent of the cross lines, as may occur in the animals from the Bermudas, are not developed in the present material. There is a broad black transverse band in front of the brain which extends over the bases of the tentacles, and one in or over the middle of the tentacles (Fig. 76).

The shape of the tentacles of the preserved specimens varies, they may be pointed or blunt, and also their direction is highly variable; sometimes they are even bent to the ventral side. There are two cerebral eyes on either side immediately behind the black frontal band and at some distance from them the two cerebral clusters. These are broader behind than in front, well separated from one another, and each is composed of about 40 eyes in a preserved 22mm-specimen. The tentacular eyes form a dense group on the base of each tentacle, and some are scattered parallel to the edge in the upper half. The latter have not been recorded from the Bermudas.

The mouth lies in the middle of the pharynx or in front (Fig. 77), sometimes quite near its anterior end. The pharyngeal pocket is

smooth. The short collar-shaped pharynx is nearly without folds; it may be elongated as if compressed (h), or nearly circular. The protruded pharynx is disc-shaped with a thicker border. The main intestine contains tailed larvae of ascidians, probably of composite forms in which development takes place within the body of the parent. The intestinal branches, 12 on each side in an 11 mm-animal, are anastomosed into a network.

A preserved specimen of 11.0 × 8.2 mm has 1.6 mm long tentacles, and the insertion of the pharynx is 1.3 mm long (Fig. 77). The male pore lies 2.5 mm behind the anterior border at the end of the pharynx. The female pore is situated at 2.8 mm, the sucker from 4 to 4.3 mm, and the main intestine ends at 8.8 mm.

All specimens have a single male copulatory apparatus. The testes are ventral, the ovaries dorsal. The copulatory organs agree with the original figures (HYMAN 1939b, fig. 26, 27), except for the stylet, not developed in her material. In not quite adult animals of stylet-bearing species the absence of a stylet is not exceptional. The shapes of the seminal vesicle and of the penis sheath in our material differ slightly from the cited figures; the former is more pointed at its outlet, and the latter is not broadly truncate, but narrowed outwards, as generally in the pseudocerids.

The ramification of the uteri does not extend far to the sides, or at least only the more central branches filled with eggs are recognizable. At Curaçao the individuals of *P. crozieri* seem to have more than one reproductive period. The 32 mm-specimen had functioning ovaries, a 22 mm-animal had ovaries in degeneration with senile pigmentation and young testes, a 12 mm-worm had only young testes but no ovaries visible in the whole mount. We regard the latter specimen as being young in protandrous phase, that of 22 mm as being at the end of one reproductive phase and in the beginning of the following one, and our biggest worm as being at the height of reproduction again.

Another Westindian zebrine cotylean is *Prostheceraeus zebra* HYMAN (1955b, p. 266) from western Florida and Jamaica. The collar-shaped (Pseudoceridae) and bell-shaped (Euryleptidae) pharynges are not distinguishable in all cases, especially not in some species of

Prostheceraeus (LANG 1884, p. 104). The pharynx of *P. zebra* is evidently cylindrical (HYMAN 1955b, fig. 8), and the uteri seem to be the same tubular, not ramified organs as in *P. maculosus* (Verrill 1892) (see HYMAN 1952, fig. 1). The network of the anastomosed intestinal branches is the same in *Pseudoceros* and *Prostheceraeus*. The "pointed ear" type of tentacles which may occur in *Pseudoceros* (STUMMER-TRAUNFELS 1933, p. 3538), and the triangular lobules or lamellae in *Prostheceraeus* (ibid.) resemble each other, and also those of *Pseudoceros* may be held erect in the living animal (MARCUS 1952, fig. 173).

The colour pattern of *Leptoteredra tentaculata* KATO (1943c, p. 48) is similar, except for the tentacles destitute of black cross bands.

37. **Pseudoceros mopsus** Marcus, 1952

MARCUS 1952, p. 91.

CURAÇAO: Piscadera Baai, outer bay, among growth on the pier of the Biological Institute, 16.I.1966 (C), 1 specimen. Piscadera Baai, entrance of inner bay, *Rhizophora*, sandy bottom, 0–½ m (H 1460, 1463), 2 spec.; inner bay, southern part, *Rhiz.*, sandy rock, 0–1 m (H 1469), 1 spec.
ANTIGUA: Deep Bay, volcanic tuffoid rock, pebbles, sandy, 0–1 m, 17.VII. 1955 (H 1393), 1 spec.

Further distribution: Brazil, coast of São Paulo.

Of the colour alive, an irregular dark net with light yellowish areae and a yellowish margin brimmed with a continuous black line around the entire body (C), the dark reticulate pattern and the black line along the edge are preserved. The dark tentacles have white tips; the ventral surface is white. The specimens are smaller than those of the first description, viz. 8.5–12 × 4.5–9 mm. The largest animal has scattered black spots on the dorsal surface, not present in our first Brazilian specimens but found in later collected ones on the coast of São Paulo. The cerebral eyes of the present worms form an undivided cluster as in the original material (1952, fig. 176).

38. **Pseudoceros texanus** Hyman, 1955

HYMAN 1955b, p. 264.

BONAIRE: Lac, Cay, shallow part of muddy lagoon with *Rhizophora* and *Avicennia*, ½ m, 19.III.1937 (H 1066b), 1 specimen.

FLORIDA: *Virginia Key*, Virginia Beach, under old mangrove roots on muddy bottom, I.1959 (C), 2 spec.

Further distribution: Texas, Port Aransas.

The preserved, brittle specimens from Florida are 27 and 25 mm long and 10 mm and 15 mm wide. They have a whitish ground colour due to the light parenchyma. The epidermis contains dark meshes and blotches and a few scattered black spots. The reticulate pattern reaches the edge, but there is no continuous dark border line. The ventral surface is light, except for two dark spots underlying the tentacular eyes.

These eyes are separated in the middle, numerous, and up to 42 μ in diameter. The folded tentacles end pointed. The two cerebral clusters are near together, each contains about 25 eyes. On either side one eye lies farther ventral.

The pharynx of one specimen is little ruffled, as drawn by HYMAN (fig. 5), that of the others more. The pharynx lies from 3 to 7.5 mm behind the fore end, the mouth at 5 mm, the male pore at 7 mm, the female aperture at 9 mm, and the sucker at 12 mm.

The separated groups of cerebral eyes and the colour pattern, a grey reticulation with some black spots and no black brim of the margin, justify the classification of the small (12 × 9 mm, preserved) specimen from Bonaire, the tentacular region of which was damaged. Its pharynx is minute, only 1.5 mm in length, possibly in regeneration. The copulatory complex was not sectioned, because it is not decisive for the classification. There is only one male apparatus.

The penis papilla is directed forward, protruding from the antrum. The granule vesicle is 0.34 mm long, 0.14 mm high, the corresponding measurements of the strongly muscular seminal vesicle are 0.7 and 0.45 mm. Its wall is 60–80 μ thick. Of the female organs only the circle of cement glands around the vagina is recognizable.

Though the figured specimen of the original description was contracted, so that the penis papilla lies in front of the gonopore, we consider our classification as correct. Already HYMAN distinguished her material from *Acanthozoon maculosum* (Pearse 1938) with a light middorsal band. We pondered the identity of *P. texanus* with *P. mopsus*, but in *mopsus* the border is brimmed with a continuous narrow black line, and the cerebral eye clusters are confluent.

39. **Cycloporus gabriellae** Marcus, 1950

MARCUS 1950, p. 89; 1952, p. 96.

CURAÇAO: Piscadera Baai, outer bay, under a stone, 18.I.1966 (C), 1 specimen. ISLOTE AVES (Bird Island), W of Dominica: Northern Lagoon, sandy shore with some coral debris and beach-rock, ½ m, 12.V.1949 (H 1114), 1 spec. ANTIGUA: Deep Bay, volcanic tuffoid rock, pebbles, sandy, 0–1 m, 17.VII. 1955 (H 1393), 1 spec.

Further distribution: Brazil, Ilha de São Sebastião (23°50′ S, 45°20′ W), among algae and on muddy bottom.

The preserved worms are up to 10 mm in length; the pinkish grey colour with dark spots, dark intestine and light ovaries has no diagnostic value. The surface is uniformly rough, not papillose. The cerebral eyes form two groups, each thrice as long as broad. The groups end at the anterior level of the pharynx, different from LANG's figure of *C. papillosus* (1884, p. 569, text-fig. 47). There are 9 pairs of lateral intestinal branches and one pair in front. The gut contains about 40 tailed developmental stages, probably sucked out of a colonial ascidian.

As specimens without papillae of *C. papillosus* are recorded (var. *laevigatus* LANG 1884, p. 570; BOCK 1913, p. 263), the following Key does not apply this feature.

Key to the species of *Cycloporus*:

1 Anal pores joined directly to the peripheral ramifications of the intestinal branches 2
– Anal pores united to the intestinal branches by long, capillary tubes . . . . . *variegatus* KATO (1934, p. 133)

2 Cerebral eyes of adult animals in 2 clusters, each a little longer than broad . . . . . *misakiensis* KATO (1939b, p. 149; *japonicus* KATO 1944, p. 305 is a synonym)
– Cerebral eyes of adult animals in 2 bands, each more than twice as long as broad 3

3 Intestine on either side with 1 anterior and 6 lateral branches . . *papillosus* (JENSEN 1878, p. 179); LANG 1884, p. 568.

– Intestine on either side with 1 anterior and 9 lateral branches . *gabriellae* MARCUS (1950, p. 89; 1952, p. 96).

40. **Acerotisa notulata** (Bosc, 1802) Fig. 79–82

? Bosc 1802, p. 254 (*Planaria notulata*); GRAFF 1892, p. 217 (*Pl. notulata*); HYMAN 1939b, p. 21 (*Acerotisa notulata*).

CURAÇAO: Piscadera Baai, outer bay, pebbles, 0–½ m (H 1459), 1 specimen; inner bay, central part, *Rhizophora*, muddy sand, 0–1 m (H 1475), 1 spec.; southern part, *Rhiz.*, sandy rock, 0–1 m (H 1469), 4 spec.; northern part, *Rhiz.*, muddy, 0–1 m (H 1489), 1 spec.

Further distribution: Sargasso Sea, on floating *Sargassum*.

The preserved whitish specimens are 1.1–2 mm long, 0.85–1.2 mm broad, and 0.19 mm high in the pharyngeal region of the sections. The anterior border is slightly concave in the middle, so that the limits of this concavity project a little as allusive tentacles (Fig. 79), similar to *A. baeckströmi* (BOCK 1923b, text-fig. 12).

The following measurements refer to a 1.1 mm-animal, before it was sectioned. The pharynx begins 0.34 mm behind the tip and ends at 0.48 mm; the female opening lies at 0.63 mm. The sucker is everted and flattened out; its diameter is 90 μ, as in HYMAN's figure 34.

There are 3–6 tentacular eyes on either side, the large ones, up to 30 μ in diameter, are the foremost. The cerebral eyes (Fig. 81) are 2 on either side, one double eye (g), 47 μ in length, and one smaller eye in front of it. The eyes conform to GRAFF's figure (1892, pl. 9, fig. 6).

The ciliate epidermis (Fig. 80) reaches 30 μ in height on the dorsal side and contains clusters of rhabdites as in HYMAN's figure 37; ventrally it is low. The epithelium of the sucker (s) is about 10 μ in height and stores red-staining granules, the secretion of subepidermal glands.

The pharynx (h) is tubular, somewhat narrowed in the middle (HYMAN: "slightly hour-glass shaped") and directed obliquely forward and downward. The mouth (m) lies under the middle of the pharyngeal cavity (oo). The glands which open on the rim of the pharynx are mostly cyanophilous. The ciliate main intestine (i) extends to near the hind end, while its anterior diverticulum is

rather short. There are probably 5 intestinal branches on either side the course of which could not be followed.

The testes begin on the ventral side, but reach the back on the flat sides of the body. The sperm ducts (Fig. 82, d) are somewhat distended by sperm, unite in the midline, and enter the seminal vesicle (w) as a quite short common sperm duct from behind. The ciliated vesicle has a strong mantle of annular muscle fibres. The narrow ejaculatory duct passes around the granule vesicle (q) and runs to the penis papilla. The epithelium of the globular granule vesicle is high. The penis lies transversely; the central capillary stylet (ps) is 35 μ long; the penis sheath (x) is thick. The opening (t) of the male antrum (r) lies shortly behind the mouth (m).

There are about 4 ovaries on each side, the germ zones of which are ventral, while the grown ovocytes reach the back. Certain portions of the oviducts are distended by sperm; on one side there are 3 such dilatations, on the other side one. These vesicles contain a ventral amorphous mass and dorsal thick tufts or orientated spermatozoa sticking with their long heads in this mass and hanging with their tails into the oviducts. The uteri are empty in the sectioned worm. Coming from either side the uterine ducts unite into the ciliated common uterine duct (u) which enters the nearly vertical vagina. The cement glands (c) surround the flattened, disc-shaped cement pouch (z). The opening (f) of the shallow female antrum (a) is less distant from the sucker than from the male gonopore (t).

We use the name *notulata* (Bosc) following GRAFF and HYMAN, whose animals agree well with the present specimens. BOSC's description, however, copied by LANG (1884, p. 514), refers to a species 5–6 mm long and 3–4 mm wide, and it is highly improbable, that GRAFF's, HYMAN's, and our species reaches this size. GRAFF's and HYMAN's localities agree with that of BOSC's *notulata*, the Sargasso Sea.

Though the eyes increase in number with the growth of the body, and specimens half the size of the largest ones (HYMAN 1955a, p. 139) may be mature, we consider the arrangement and number of the eyes, especially of the cerebral eyes, as the best taxonomic character

in *Acerotisa* (MARCUS 1947, p. 141–142). Whether the intestinal branches only ramify or anastomose, is sometimes impossible to recognize. An intestinal network has been indicated for *A. alba* (FREEMAN 1933), but this is not certain (HYMAN 1953a, p. 378), *arctica* HYMAN (1953a, p. 379), *bituna* MARCUS (1947, p. 138), *leuca* MARCUS (1947, p. 139), *meridiana* (RITTER-ZÁHONY 1907, p. 5), *multicelis* HYMAN (1955a, p. 139), and *typhla* (BOCK 1913, p. 273). Simple ramification is not settled for all of the remaining 8 species. The male gonopore near the mouth is certainly an important character, but it seems that the male apparatus extends farther forwards with sexual maturity (HYMAN 1959a, p. 587), so that this feature can be established only in fully mature specimens.

Besides *Acerotisa notulata* 5 species have 5 or less cerebral eyes in each group: *A. baiae* HYMAN (1940, p. 489), *bituna*, *californica* HYMAN (1953a, p. 379), *inconspicua* (LANG 1884, p. 589), and *leuca*. Of these *baiae* has more numerous tentacular eyes than the present specimens and is considerably larger (3.2 × 1.8 mm, preserved); *leuca* has a single tentacular eye, and in *californica*, preserved animals of which reach a length of nearly 3 mm, the details of both cerebral and tentacular eyes are different. The male gonopore of *californica* lies directly behind the brain in front of the anterior end of the pharynx. *A. inconspicua* is uniformly stippled with black due to pigment granules immediately below the basement membrane of the epidermis.

The separation of *notulata* and *bituna* is indicated in the discussion of the latter (no. 41).

41. **Acerotisa bituna** Marcus, 1947 Fig. 74

MARCUS 1947, p. 138.

CURAÇAO: Piscadera Baai, entrance to inner bay, *Rhizophora*, sandy 0–½ m (H 1460), 1 specimen; inner bay, southern part, *Rhiz.*, sandy rock, 0–1 m (H 1469), 4 spec.

Further distribution; Brazil, Bay of Santos.

In all worms the roots of the intestinal branches and the tips of their ramifications are pigmented. The black granules are intracellular. Some specimens are truncate in front, so that two slight tenta-

cular angles result; behind the body is regularly rounded. The largest worm (2 × 1.4 mm) was somewhat folded; a middle-sized animal (1.45 × 0.9 mm) was sectioned. The sides are convex; the height is 0.3 mm.

In a 1.35 × 1.0 mm-animal the mouth lies at 0.31 mm, the male opening at 0.42 mm, the female pore at 0.54 mm, and the sucker at 0.85 mm. The corresponding measurements for animals 1.45 mm (and 2.0 mm) in length are 0.42 (0.6), 0.46 (0.7), 0.57 (0.78), and 0.8 (1.2). The diameter of the sucker is 75–100 μ; in the sectioned worm it is invaginated.

There are 2 cerebral eyes on either side, a small one in front and a double eye behind it, 35 μ in length, 28 μ in width in the smallest specimen, 52 μ long in the largest worm. There are 3 and 4 tentacular eyes in the smallest specimen (maximum diameter 23 μ) and in the largest one (33 μ). A middle-sized animal (1.45 mm) has 4–6 tentacular eyes (34 μ). The position of the eyes, farther in front or farther behind, is not correlated with their size.

The dorsal epidermis is about 13 μ thick, it contains bundles of rhabdites; the ventral epidermis is 7 μ, that of the sucker, 10 μ.

The pharynx of the sectioned worm stands rather vertically, it is straight, about 0.3 mm long and 0.15 mm in diameter. The mouth lies farther in front in the whole mount than in the sections. Blue-staining glands open along the border of the pharynx. The main intestine ends 1 mm behind the tip in the small specimens where it is well marked by the dark side branches, 6 on one, 7 on the other side, one in front and one behind. The dark tips of the ramifications produce a marginal pattern. The branches ramify dichotomously, the anterior ones 4 times, the hind ones 5 times; some anastomoses occur.

The testes are ventral. The sperm ducts enter the seminal vesicle from behind. The vesicle is slender, its annular musculature distinct but thin. Ventrally to the spherical vesicle the ejaculatory duct reaches the bulbous penis papilla, the stylet and big penis sheath of which correspond to our first figure (1947, fig. 73). The male copulatory apparatus is directed nearly vertically downward.

Evidently there is an ovary between every two intestinal branches, a total of about 16. In the outlets of the ovaries tufts of sperms were

seen, the tails of which are directed towards the oviducts, as in our Brazilian material. Widenings of the oviducts or oviducal vesicles were not observed. Also the female efferent organs agree well with our first figure.

We have compared our Brazilian material of *A. bituna*, now one whole mount and the series of sections, with the present specimens. The characteristic black intestinal branches, a peculiar feature, the cerebral eyes, and the thin muscle coat of the seminal vesicle agree perfectly. There are no more than 3 tentacular eyes in the Brazilian material. Certainly there are slight differences between the Brazilian *A. bituna* and those from Curaçao, if every detail is considered, but this is natural, when so few animals of far distant populations are compared.

Acerotisa notulata differs from *bituna* by the smaller number of ovaries and intestinal branches, which are colourless, by a thicker musculature of the seminal vesicle, and a much higher dorsal epidermis. The body of *A. notulata* is much thinner (0.19 mm) than that of *bituna* (0.3 mm), so that the different aspect was noted at first sight.

42. **Acerotisa piscatoria** Marcus, 1947 Fig. 73

MARCUS 1947, p. 136.

BONAIRE: Kralendijk, near Pasanggrahan, rocky beach, tidal zone, 3. & 5.IX. 1930 (H 1057), 2 specimens.

Further distribution: Brazil, Bay of Santos; perhaps Alligator Harbor, Florida (HYMAN 1952, p. 199).

The preserved animals measure 1.35 × 0.88 mm and 3.23 × 2.3 mm. Especially the larger one is truncate and slightly undulate in front, so that tentacle-like projections appear. Brown pigment occurs between the cerebral and the tentacular groups of eyes and in spots along the borders.

Each tentacular group comprises about 16 (in the smaller animal 6) eyes, reaching 21 μ (15 μ) in diameter. Both groups are distinctly separated from one another, forming accumulations at the antero-lateral corners. One of the cerebral groups has 12 (6), the other 9 (6) eyes, up to 34 μ (30 μ).

The tubular pharynx is 0.5 (0.2)mm long and directed more anteriorly than ventrally. The mouth lies 0.6 (0.33) mm from the anterior margin of the body, at the fore end of the pharynx. The male pore is situated at 0.75 mm, shortly behind the mouth, the female pore at 1.3 (0.63) mm, and the sucker at 1.7 (0.8) mm. The main intestine ends 0.8 (0.27) mm before the hind end. Five intestinal branches on either side were recognizable in the smaller animal.

The testes are ventral, the ovaries dorsal. The seminal vesicle, a longish and muscular organ, lies behind the granule vesicle, and the ejaculatory duct curves sidewards around the small granule vesicle. The granule duct and the ejaculatory duct unite at the root of the penis papilla which is armed with a short, straight stylet. The penis pocket is narrow, because the long penis sheath is apposed to the papilla.

The female organs agree with the first description and figure.

According to its eyes, the most important taxonomic character in *Acerotisa*, the present species must be compared with *A. baeckströmi* (Bock 1923b, p. 362) from Juan Fernandez, *A. meridiana* (Ritter-Záhony 1907, p. 5) from the Magellanic area, and *A. nationalis* (Plehn 1896b, p. 7) from the SW coast of Portugal. The cerebral eyes of *baeckströmi* form 2 narrow groups, of which the hindmost elements lie over the pharyngeal pocket; the pharynx of *meridiana* is one third of the body length and extends backward over the sucker; in *nationalis* the male pore is located behind the pharynx.

43. **Prosthiostomum cyclops** (Verrill, 1901) Fig. 83, 85

Verrill 1901, p. 43 (*Discocelis cyclops*); Hyman 1939b, p. 19 (*Prosthiostomum cyclops*).

Bonaire: Lac, Boca, behind sandy reef with debris, continuous wave action, 1–2 m, 1.X.1948 (H 1068a), 1 specimen.

Further distribution: Bermudas.

The preserved colourless worm is 6.5 mm long, 1.7 mm wide, rounded in front and pointed behind. The band of marginal eyes (Fig. 83, e) extends backward maximally to the middle of the brain (b), and is interrupted in front, as frequently in young specimens of

Prosthiostomum. The band is about 3 loose rows wide, and the eyes are 12 μ in diameter. There are about 52 eyes on either side. The elongated cerebral clusters have 30 and 29 eyes (g) which begin in front of the brain and end behind it. A foremost pair of eyes (ie) lies in the deep layer of the parenchyma. The clusters are distinctly separated in the midline. Two straight rows of large eyes, up to 22 μ in diameter, border the eyeless interspace. On the level of the brain each cluster is expanded outward, farther in front and behind it is narrower.

The mouth (m) lies 1 mm behind the fore end; the pharynx (h) is in regeneration in the present specimen. The root of the pharynx lies 3.3 mm behind the tip. The male pore (Fig. 85, t) is situated 30 μ behind the beginning of the pharyngeal pocket. The female pore (f) is located in the middle between the male pore and the centre of the sucker (s). The latter is 0.3 mm in diameter; its centre lies 3.7 mm behind the anterior border of the body.

The sperm ducts (d) enter the seminal vesicle (w) asymmetrically, one in front of the other. The shape of the heavily muscular seminal vesicle is oblong. The sinuous ejaculatory duct (eu), the widely separated accessory vesicles (av), one dorsal to the duct, the other ventral, the armed penis papilla (ps), and its pocket (y), the epithelium of which stores granular secretion, and the deep male antrum (r) are typical of the genus.

The female copulatory organs are small as they are in HYMAN's figure 31 of one of VERRILL's large specimens. The cement glands are still incipient in our animal, but the cement pouch (z) is already recognizable.

The cerebral eyes and the entrances of the sperm ducts into the seminal vesicle are quite peculiar characters which in our opinion justify the classification of our single juvenile and colourless specimen collected at a place considerably distant from the original locality. An interruption of the marginal band of eyes in the midline is systematically important, when it occurs in adult worms of *Prosthiostomum*, e.g. in *P. lobatum* PEARSE (1938, p. 91; HYMAN 1940, p. 491).

44. **Prosthiostomum pulchrum** Bock, 1913 Fig. 84

Bock 1913, p. 285; Hyman 1955a, p. 142.

Curaçao: Piscadera Baai, outer part, coming up from algae. I.–II.1966 (C), 11 specimens. – Fuik Baai, Newport Bath, rocky shore of muddy lagoon, muddy sand with some *Thalassia*, 0–1 m, 20.XI.1948 (H 1039), 3 spec. – Boca Lagoen, N-side, steep limestone cliff, 0–1 m, 13.XI.1948 (H 1020), 2 spec.

Bonaire: Kralendijk, near Pasanggrahan, coral fragments and beach-rock, 0–½ m, 3. & 5.IX.1930 (H 1057), 1 spec.

Antigua: Deep Bay, volcanic tuffoid rock, pebbles, sandy, in surf, 0–1 m, 17.VII.1955 (H 1393), 1 spec.

St. Kitts: Frigate Bay, exposed cliff of volcanic rock, coarse sand, 0–1 m, 20.VII.1955 (H 1397), 2 spec.

Further distribution: Bahamas, Andros Island; Virgin Islands, St. Thomas and St. Croix.

Alive the animals were up to 8 mm long, the biggest preserved one is 7.6 × 2 mm. They are slender, elongated, only little broader in front than behind. Small pigment granules render the whitish body sand-coloured. In the largest animals the eggs show dark through the surface.

The marginal eyes are up to 12 μ in diameter. Immediately behind the sensorial furrow they form a short band of 60–80 eyes. The band ends on the level of the anterior cerebral eyes and is sometimes of equal width throughout (Fig. 84) as in Hyman's figure 88b, sometimes thinner in the middle and broader at the sides as in Bock's text-figure 62. The cerebral groups are narrower in front and broader behind. They are not well separated from each other and comprise 21–32 eyes each, with a maximum diameter of 22 μ. One pair of large, but not in all specimens the largest, eyes lies farther ventrally in the parenchyma (Lang 1884, p. 203–204, 599–600: *Prosthiostomum*); they are situated far in front, and are sometimes the foremost cerebral eyes.

In a 7.6 mm-specimen the pharynx is 3.1 mm long. Dr. Corrêa observed its protrusion when a larger polyclad came near, and also when the animal lay between cover slip and slide. An immature 6.9 mm-worm had a 2.3 × 0.4 mm-polychaete in its main intestine. The male opening of our biggest animal lies 4.4 mm behind the anterior border, the female opening at 4.6 mm, and the sucker at 4.8 mm. The diameter of the sucker is 0.17 mm; its large size and

high, folded epithelium were described and figured by HYMAN (text-fig. 89a, *44*).

The sperm ducts enter separately through the middle of the ventral wall of the seminal vesicle. This is a long, oval, strongly muscular organ, the narrowed anterior end of which emits the sinuous ejaculatory duct. The 2 spherical accessory vesicles, also very muscular, lie on different levels, one below the fore end of the seminal vesicle, the other farther in front and more dorsally, between seminal vesicle and penis papilla. Their ducts are long and winding. They unite with the ejaculatory duct inside the penis papilla. The penis pocket or inner male antrum around the papilla is provided, as usual in the genus, with an epithelium storing the red-staining granular secretion of circumjacent glands. The curved stylet inserted on the papilla passes through the penis sheath and projects into the outer antrum for a short distance. From its wide ental part the outer antrum slants backwards as a long, rather tubular organ.

Immediately behind the blind posterior end of the seminal vesicle the female apparatus lies. The common uterine duct is vesicular and enters the inner vagina from behind. The dorso-ventrally flattened cement pouch and the slightly dilated female antrum are without specific characters.

The reference to the lists containing the 57 species of the genus can be found in DU BOIS-REYMOND MARCUS' recent paper (1965, p. 132). For the classification of the present material HYMAN's description and figures were decisive. In BOCK's single specimen the copulatory organs were evidently defective. Certainly the eyes are indispensable for the determination of a *Prosthiostomum*, as e.g. YERI & KABURAKI's figures (1918b, on p. 42–45) show. But they should not be overrated, especially not if only one specimen is available. In the preceding description this was said with regard to the marginal eyes. Not only the body size and the age but also unknown factors cause individual differences in number and disposition of the eyes, at least in certain species (LANG 1884, p. 599–600, text-fig. 51).

45. **Prosthiostomum milcum,** spec. nov. Fig. 86–87

BONAIRE: Lac, Poejito, on *Rhizophora,* in muddy lagoon, tidal and lower zone, 17.IX.1948 (1064Ab), 1 specimen.
FLORIDA: *Kev Biscayne.* North Point, from *Thalassia,* 1.IX.1963 (H 1410c), 1 spec.

The length of the preserved complete worm from Bonaire is 4.5 mm. It is mature. The hind part of the specimen from Florida (4.5 mm) is wanting; its length must have been at least 7 mm. The following measurements and numbers refer to this animal. The whitish body is dorsally marked with brown dots which actually are bundles of 16 μ long epidermal rhabdites.

The small marginal eyes, up to 14 μ in diameter, leave a 0.12 mm broad margin free (Fig. 86). They extend backward to the level of the middle of the cerebral clusters, that is the anterior border of the brain. In the midline the band of 70 marginal eyes is thinner than on the sides, where about 3 loose rows are formed. Between the marginal band and the cerebral eyes there are about 25 small scattered eyes. The area of the cerebral eyes is 0.4 mm long. The 2 longish clusters are well separated; they comprise 22 and 23 eyes, which reach a diameter of 32 μ. The 2 so-called ventral eyes lie far in front and are 20 μ in diameter.

The mouth is situated 0.8 mm behind the fore end, near the end of the cerebral groups. The pharynx of the smaller animal is protruted through a wound in the dorsum, that of the larger specimen had been shed. In the latter the positions of the ventral openings are: male pore at 3.0 mm, female pore at 3.2 mm, sucker at 3.4 mm; the diameter of the sucker is 0.23 mm in invaginated condition.

The testes are ventral, the ovaries dorsal. The sperm ducts (Fig. 87, d) enter the seminal vesicle in front, near the beginning of the ejaculatory duct (eu). The strongly muscular seminal vesicle (w), which is empty in the sectioned animal, is of elongated oval shape, 0.35 mm in length. In its course to the penis papilla the ejaculatory duct forms several loops. The 2 accessory vesicles (av) are far distant from each other, one is situated in front of the seminal vesicle, the other ventrally to its hind part. The penis papilla is directed forward; the stylet (ps) is 0.13 mm long and 40 μ wide at its base. The deep male antrum (r) is directed backward.

The vertically disposed female efferent organs begin with a short common uterine duct coming from the dorsal side. The inner vagina, the cement pouch (z), and the outer vagina form 3 dilatations, one over the other.

The species differs clearly from the 13 American and 5 East Atlantic and Mediterranean species, hitherto united under the name *Prosthiostomum*, which is here restricted to the species with separate accessory vesicles (see diagnosis of the following genus): *P. gilvum* MARCUS (1950, p. 98) from the coast of São Paulo has some marginal eyes approaching the cerebral ones (fig. 173), but the total number of marginal eyes (150–165) and the sperm ducts entering the middle of the seminal vesicle on either side (fig. 174) differ from the corresponding organs of *milcum*. The arrangement of the eyes in *P. latocelis* HYMAN (1953a, p. 382) from the southern coast of California and around the adjacent islands agrees with that of *P. milcum*, except for the greater number (about 50) in each cerebral group. The most peculiar feature of *latocelis* is the entrance of the sperm ducts into the seminal vesicle, which open, after an uncommon course, into the posterior end of this vesicle in striking contrast with *P. milcum*.

Lurymare, gen. nov.

Prosthiostomidae with marginal eyes limited to varying lengths of the anterior margin; accessory vesicles of adult worms bound in a common muscle sheath which may include the seminal vesicle; sucker not far behind the female gonopore.

Type-species: *Prosthiostomum drygalskii* Bock, 1931.

Among a total of 57 species of *Prosthiostomum* (DU BOIS-REYMOND MARCUS 1965, p. 132) accessory vesicles connected by muscle fibres were only described for 7 species, but possibly this character will be found in further species, when they are re-examined.

To date the following species of *Lurymare* were described:

1) *L. drygalskii* (BOCK 1931, p. 218). South Africa, Simons Bay.
2) *L. purum* (KATO 1937 f, p. 366). Sagami Bay, Misaki.
3) *L. delicatum* (PALOMBI 1939a, p. 135). Southeast Africa, East London.

4) *L. russoi* (PALOMBI 1939a, p. 141). Southeast Africa, East London.
5) *L. gabriellae* (MARCUS 1949, p. 88). Coast of São Paulo, in coarse sand.
6) *L. matarazzoi* (MARCUS 1950, p. 94). Coast of São Paulo, on calcareous algae (*Jania* sp.); Bonaire, on rocky beach (no. 46).
7) *L. utarum* (MARCUS 1952, p. 98). Coast of São Paulo, on algae; Florida, Virginia Key, under mangrove root (no. 47).

46. **Lurymare matarazzoi** (Marcus, 1950) Fig. 88

MARCUS 1950, p. 94 (*Prosthiostomum matarazzoi*).

BONAIRE: Kralendijk, near Pasanggrahan, coral fragments and beach-rock, 0–½ m, 3. & 5.IX.1930 (H 1057), 1 specimen.

Further distribution: Brazil, coast of São Paulo, Island of São Sebastião, in calcareous algae.

The worm is greyish, 7.84 mm in length, 1.8 mm in width, rounded in front and pointed behind. The band of marginal eyes is uninterrupted in front, backward it reaches approximately to the level of the middle cerebral eyes. Their total number, about 90, is similar to that (83) of the largest (preserved 8 mm) Brazilian specimen. Their diameter is 13 μ, thus smaller than in the original material (27 μ). The same holds for the cerebral eyes, the diameter of which is up to 18 μ in the present worm, up to 40 μ in the original specimens. These have 18 eyes against 25 and 27 in the animal from Bonaire, and also the shape of the clusters is a little different. Other details agree, the largest cerebral eyes are farther distant from the anterior sensorial furrow than the smaller ones, the deep-lying eyes are the foremost, and the clusters are well separated from each other.

The mouth lies 0.9 mm behind the anterior border, the root of the pharynx at 3.8 mm, and the sucker at 4.4 mm. The longitudinal diameter of the latter is 0.24 mm. These measurements are compatible with those given in the original table.

The gonads begin on the ventral side, the ovaries reach the back. The sperm ducts as well as the uteri have each a transverse connection behind the copulatory organs. The sperm ducts coming from the rear enter the seminal vesicle in front, not quite on the same transverse level. The accessory vesicles are ventral to the

ejaculatory duct. They are intimately united. This important character corresponds to the "vesicles united in form of an 8" of the Brazilian specimens. The further male organs do not contain specific peculiarities; they are as in *Prosthiostomum*.

The uterine ducts open from behind into the vagina. The inner vagina does not receive any cement glands, these open into the ventrally following dilatations, the cement pouch and the outer vagina.

The slight differences between the Brazilian material and the worm from Bonaire do not justify a separate name for the latter.

47. **Lurymare utarum** (Marcus, 1952)

MARCUS 1952, p. 98 (*Prosthiostomum utarum*).

FLORIDA: *Virginia Key*, Virginia Beach, under old mangrove roots, muddy, I.1959 (C), 1 specimen.

Further distribution: Coast of São Paulo, Island of São Sebastião, under stones.

Alive the specimen was 30 mm long, 8 mm broad, preserved it is 20 × 6.5 mm. The animal was white and had a brown middorsal band interrupted by the cerebral eyes.

The marginal eyes form 3–4 rows, reaching backward at most to the level of the mouth. As the border is folded, their number, 60 on one side against 78–84 in the original material, was not counted exactly. In front the marginal eyes are continuous in the middle; their diameter reaches 40 μ. The cerebral eyes form 2 longish clusters nearer to one another in front and comprising 35 eyes on the left, 32 on the right side, with a maximum diameter of 52 μ, while the isolated deeper, so-called ventral, eye on either side of the cerebral clusters is only 28 μ.

The curved pharynx is 6 mm long and protruded through a wound in the back. The mouth lies 1.7 mm behind the tip of the body, the genital pores at 7 mm and 8 mm, and the small sucker (diameter 0.3 mm in the sections) at 9 mm.

The sperm ducts proceed from behind and below and enter the strongly muscular seminal vesicle. Some of the muscle fibres of this vesicle wrap the accessory vesicles, which lie in slightly different horizontal levels. The ejaculatory duct passes through the dorsal

groove between the accessory vesicles, which are tightly bound in a common muscle sheath. The penis pocket, the armed penial papilla surrounded by its sheath, and the male antrum as well as the female efferent organs agree with the previous description and figure (1952, pl. 32, fig. 191).

The slight differences between the original specimens and the present one refer to the light brown ground colour of the former and details of the eyes, the pattern of which, however, allows us to unite the materials from Brazil and Florida.

48. **Euprosthiostomum pakium,** spec. nov. Fig. 89–90

FLORIDA: Coral Gables Canal, in slough along road to Tahiti Beach, in algae, 19.I.1963 (B), 1 specimen.

The preserved animal (Fig. 89) is 24 mm long, 4 mm wide, rounded on both ends, and colourless. The consistency of the body is, as in the other species of the genus (MARCUS 1948, p. 184), soft and sticky. The borders are somewhat undulate.

There are 2 clusters of cerebral eyes (Fig. 90, g), up to 50 μ in diameter. The left group contains 23 eyes, the right one 27. Behind the frontal sensorial furrow (k) the marginal eyes (e) occupy a broad zone; backward they reach the level of the pharyngeal pocket (oo). The maximum diameter of the marginal eyes is 40 μ.

The mouth (m) lies 4 mm behind the anterior border; the invaginated oral tube (o) is distinct. The tubular pharynx (h) is 6 mm long. It is torn off at its root, curved, and projects from a wound in the back. The main intestine (i) extends backward beyond the sucker (s). This lies 4 mm in front of the hind end. Its diameter is 0.4 mm, that is 1.7% of the body length. The region of the copulatory apparatus is damaged; these organs are uniform in *Euprosthiostomum*. The cement pouch (z) shines through the skin 1 mm behind the end of the pharynx.

Holotype: A total mount of the worm.

Key to the species of *Euprosthiostomum*:

1 Marginal eyes extend backward beyond the anterior half of the pharyngeal pocket . . . . . *molle* (FREEMAN 1930, p. 334); HYMAN 1953a, p. 386

– Marginal eyes reach backward at most to anterior end of pharynx 2

2 Pharynx about half the length of the body 3
– Pharynx 1/4 of the length of the body 4

3 Two groups of marginal eyes widely separated in front . . . . . *viscosum* PALOMBI (1936, p. 32)
– Band of marginal eyes continuous in front . . . . . *mortenseni* MARCUS (1948, p. 184)

4 About 10 cerebral eyes on either side . . . . . *adhaerens* BOCK (1925a, p. 49)
– 23–27 cerebral eyes on either side . . . . . ***pakium***, sp. n.

The length of the pharynx and the arrangement of the eyes approach *E. pakium* to *E. adhaerens* found in the Bay of Panama in shells inhabited by the pagurid *Petrochirus californiensis* Bouvier. *E. adhaerens* is much smaller, its sucker is 8.33% of the body length, and its eyes are less numerous. Small size and few eyes occur also in the Mediterranean *E. viscosum*, which lives associated with *Eupagurus prideauxi* (Leach). The sucker of this species is 4% of the body length. In preservation the strong muscles of the sucker contract less than the parenchymatous body, so that the size of the sucker can be used for systematic comparisons only in general terms. The sucker of *E. mortenseni* is 2% of the body length, hence about the same size as in *E. pakium*. That of *E. molle*, described as holding the animal "fairly firmly" (FREEMAN 1930, p. 335), is minute, according to the figure (pl. 38 fig. 1). So BOCK was evidently right to consider a strong sucker and a small body of *Euprosthiostomum* as correlated with an association with hermit crabs (1925a, p. 53).

49. **Enchiridium evelinae** Marcus, 1949 Fig. 91

MARCUS 1949, p. 91.

CURAÇAO: Piscadera Baai, outer part, under stones, 28.I. & 21.II.1966 (C), 2 adults; coming up from algae; 23.II.1966 (C), 1 young specimen.

Further distribution: Southern middle Brazil, coast of São Paulo.

Alive the maxima are 50 mm in length and 10 mm in width, preserved 33 × 8 mm. The form is elongated, bluntly pointed behind.

The body is transparent whitish with a dorso-median brown band and numerous spots of various tones of yellow, brown, to black on the back. The density of the ramified pigment cells increases towards the middle and with age, so that they may touch each other to form the median dark band. The colour is preserved in alcohol and Canada balsam, also in specimens collected in 1948.

In adult animals the marginal eyes completely encircle the body. In front they form a broad, though loose, band; they are scarce in the middle and 0.12–0.18 mm distant from the edge. As this eyeless margin is of the same width in young and adult worms, it appears less striking in the latter. From the level of the brain backwards the marginal eyes become scarcer, smaller, and disposed in a single row. The largest marginal eyes are 50 μ in diameter. The cerebral eyes reach a diameter of 45 μ; they form 2 longish clusters, distinctly separated from each other and 0.5 mm in length. The distance between the marginal and the cerebral eyes is twice the length of the clusters. The number of eyes in each cluster is about 50.

The pharynx is 26–27% of the body length in adult animals. The male pore (t) lies 10.9 mm behind the anterior border of the body, the female aperture (f) at 12.3 mm, the sucker at 14.1 mm.

The united sperm ducts (d) open through the anterior wall of the seminal vesicle (w) which is distended by sperm. The seminal vesicle is 0.745 mm long and 0.440 mm wide, hence its width is 60.3% of its length. A ventral cushion of muscles (mu) pierced by the ejaculatory duct (eu) unites the 2 accessory vesicles (av). The long penis papilla (p) and its stylet (ps) are bent backward; the wall of the antrum (r) is folded.

Of the female organs we mention the very long uteri which extend from the fore end of the pharynx to shortly in front of the hind end; the common uterine duct (u) entering the ciliated inner vagina from the anterior side and the cement pouch (z), with a slit-like lumen, as usually flattened in dorso-ventral direction.

The pharynx of *Enchiridium periommatum* Bock (1913, p. 287), from one of the Virgin Islands, is 13.3% of the body length (pl. 5 fig. 6). Compared with the present material (26–27%), and with a well preserved 33 mm-specimen from the Island of São Sebastião

(23°50′ S) found in July 1956, the pharynx of which is 26% of the body length, the difference is considerable. We cannot disregard this, and maintain *E. periommatum* and *E. evelinae* separated because of the pharynges and the characters mentioned in the following.

HYMAN (1955a, p. 146) called a specimen from northwestern Florida *E. periommatum*, though the length of its pharynx is 26% of the body length. Her material from Jamaica (1955b, p. 267) was said to agree with that from Florida.

HYMAN found more cerebral eyes than are drawn in BOCK's specimen which contains 28 eyes in one cluster, 17 in the other, and said "the male antrum leans forward more in the specimen (from Florida) than as shown in BOCK's figure". In *E. evelinae* the pharynx, the cerebral eyes, and the antrum correspond to HYMAN's description.

Our first material of *E. evelinae* has a shorter seminal vesicle than that from Curaçao. The vesicle has been drawn (MARCUS 1949, fig. 131, r) from an oblique section. Its width is 80% of its length, hence different from the present material (60.3%). The distension by sperm mentioned for the sectioned animal from Curaçao may influence the shape of the seminal vesicle, so that this cannot be decisive for systematic distinction.

The topography of the musculature connecting the accessory vesicles seems to be significant. It is developed only ventrally in the Brazilian specimens of *evelinae* and in those from Curaçao; in *periommatum* it surrounds them (BOCK 1913, p. 288 and text-fig. 65). In HYMAN's materials from Florida and Jamaica it is not mentioned.

The nearly globular cement pouch of *E. periommatum*, previously stressed by HYMAN (1953a, p. 387), differs from that of *E. evelinae*, but possibly the filling with secretion modifies the form of the cement pouch, so that it does not furnish a morphological character. The cement pouch of HYMAN's specimens from Florida and Jamaica (1955a, b) was not described. In *Prosthiostomum cyclops* (Verrill 1901) the large cement pouch is considered as a specific character (HYMAN 1939b, p. 20).

Enchiridium japonicum KATO (1943a, p. 75) from Formosa is the only species of the genus with a distance between the marginal and cerebral eyes equal to the length of the cerebral clusters. *E. puncta-*

tum HYMAN (1953a, p. 386) from the southern coast of California and the Gulf of California ("Gulf of Mexico", p. 387, is a lapsus) has a short penis papilla.

ACCOMPANYING ANIMALS

Three species found together with the polyclads called our attention:

1) The platyctenid ctenophore *Vallicula multiformis* Rankin, 1956, originally found at Jamaica, later on on the coast of São Paulo (DU BOIS-REYMOND MARCUS 1956).

CURAÇAO: Piscadera Baai, entrance to inner bay (H 1461, 1463A, 1465); inner bay, southern part (H 1469); and northern part (H 1485a, 1485A, 1497, 1501), XI.-XII.1963. – ANTIGUA: Deep Bay (H 1393), 17.VII.1955. – SABA: Fort Bay (H 1120A), 6.X.1963. – FLORIDA, *Virginia Key* (H 1408). – All from shallow water, with a maximum depth of 2 m.

2) The acoel turbellarian *Hofstenia miamia* CORRÊA (1960, p. 211), described from Florida, Virginia Key (C), and from Curaçao, Piscadera Baai (C) and Antigua (H 1393) (CORRÊA 1963, p. 38).

CURAÇAO: Piscadera Bay, outer bay and entrance to inner bay (C), XII.1965–II. 1966 (H 1463, 1488A, 1503), X.-XII.1963; many specimens. Playa Grandi, Wacao (C), 23.I.1966. – PUERTO RICO: Bahía Fosforescente (H 1423A), 17.IX.1963. – FLORIDA, *Virginia Key* (H 1409), 1.IX.1963. – All from depths of 0–1½ m.

3) A new species of the family Umagillidae from ST. BARTS (H 1121), found together with *Gnesioceros sargassicola* (no. 25) which will be described in the next paper of these "*Studies*".

ZOOGEOGRAPHIC REMARKS

Because of their delicate texture the polyclads are difficult to collect and to preserve in extended condition. Their inner organization, on which the classification is based, can only be sufficiently analyzed by sectioning. This is shown by SCHMARDA's collection (1859), important because of the number of species and their localities, but useful only since 1933 after STUMMER-TRAUNFELS' revision, who sectioned many of them, in part even softening those that had dried up.

The difficult handling of the polyclads is responsible for the lacunar state of our knowledge of these worms. Only the polyclads of the North Atlantic Ocean and those of the seas of Japan are known

sufficiently. Up to the present (August 1966) 73 valid, recognizable species have been recorded from the North American Pacific littoral, from the Aleutian Islands to Cape San Lucas (HYMAN 1953a, 1955d, 1959b). For an area extending over more than 30 parallels this number is small, compared with 57 intertidal species from the subtropical coast of São Paulo, between Ubatuba and Cananéia, a stretch of 350 km. The state of research, not the preference of polyclads for warmer water (BEAUCHAMP 1961, p. 55) explains this disproportion. North of Ubatuba, toward the really tropical waters of Brazil, the number of reported species diminishes considerably. From the more than 30 parallels between Ubatuba and Trinidad only 6 species are reported; *Chromyella saga* Corrêa 1958, *Eurylepta brasiliensis* Palombi 1923, *Latocestus atlanticus* Plehn 1896 (also recorded from the Cape Verde Islands), *L. brasiliensis* Hyman 1955, *Stylochoplana leptalea* (no. 11), and *St. walsergia* (no. 12). This is less than half the number of polyclad species in the North Sea.

On this systematic basis our zoogeographic considerations are quite ephemeral, though herewith they do not differ essentially from other biological views.

For comparison with the present material we inventoried the 61 species previously known from Cape Hatteras to Trinidad. This list is compiled from the literature exclusively from a geographic point of view. So it contains some species which were not microtomized and hence are uncertain. Also inhabitants of drifting *Sargassum* are included, and those from the coast of Texas, where the very low winter temperatures (EKMAN 1953, p. 54–55) do not even produce a subtropical, but only a warm temperate character. Moreover the list comprises all recognizable species from the Bermudas, known for an admixture of Mediterranean elements, and one or two northern species, which enter the warm temperate water south of Cape Hatteras. Our list is by no means overly restricted, it is rather too complex. If the number of species on the immense coastlines within this area is compared with that of the above-mentioned stretch of southern middle Brazil, the exploratory difference is obvious again.

In the last qualitative comparison between the polyclads of the northern (Cape Hatteras-Trinidad) and southern (Brazil) parts

of the western Atlantic warm water region, HYMAN (1955b, p. 259) said: "By West Indian region is meant the central western Atlantic from the Carolinas to southern Brazil including the Gulf of Mexico, the Caribbean and all its islands, and the Bermudas. This area undoubtedly constitutes a faunal unit (EKMAN 1953), although as regards the polyclads scarcely any species has so far been found in common between the West Indian Islands and the coast of Brazil". Her only exception, the genus *Adenoplana*, is not quite to the point. The type species is from Jamaica (STUMMER-TRAUNFELS 1933, p. 3505), the second species from the coast of São Paulo (MARCUS 1950, p. 76), the third (HYMAN 1955a, p. 116) belongs to the cotylean genus *Boninia* (see no. 31), and the fourth (HYMAN 1955c, p. 9) was found at a depth of 19 m in the vicinity of the mouth of River Plate, hence beyond the southern limit of the West Indian region. In 1955 *Zygantroplana henriettae* CORRÊA (1949, p. 173) from the coast of São Paulo and Espirito Santo, related to *Z. angusta* (VERRILL 1892, p. 105; HYMAN 1939a, p. 139) from Florida probably to Cape Hatteras "and from Princeton, Mass., on the bottom of a whaling vessel recently arrived from the Carolina coast (1879)", was, as HYMAN herself said (1952, p. 196), "the first instance of a similarity in the Turbellarian fauna between Florida and Brazil".

Today the status is different. The above-mentioned 61 species between Cape Hatteras and Trinidad are reduced to 60, because *Gnesioceros sargassicola* and *G. floridana* must be united. To these are added 17 new species, as well as 10 species hitherto known only from Brazil: *Stylochoplana leptalea, Notoplana megala, Hoploplana divae, Pseudoceros mopsus, Cycloporus gabriellae, Acerotisa bituna, A piscatoria, Lurymare matarazzoi, L. utarum,* and *Enchiridium evelinae.* The widely distributed *Thysanozoon brocchii* is excluded from this list, as it cannot be included in a faunal comparison of limited areae. So today (August 1966) 87 species of polyclads are known as inhabitants of the northern part (Cape Hatteras to Trinidad) of the West Indian region, 11.5% of which occur also in the southern part (Brazil). This percentage is high, when the relationship between the polyclads of the Pacific and the Atlantic North American coasts, or between those of the North American and the European Atlantic coasts is considered. On the former no identical species have been

found, on the latter only *Notoplana atomata* (O. F. Müller) occurs on either side of the Atlantic Ocean; the above-mentioned *Thysanozoon brocchii* must be excluded.

The rate of 11.5% northern and southern West Indian polyclads is low, compared with 30% of opisthobranchs occurring in both areae. It is true that the study of the Brazilian opisthobranchs dates from much earlier years than that of the polyclads. But the few relationships between the Western and Eastern Atlantic polyclads, the study of which began approximately at the same time, demonstrate that the trend to endemicity in the polyclads is more pronounced than in the opisthobranchs.

In trying to understand this phenomenon we considered the means of geographic distribution of the polyclads. The few inhabitants of *Sargassum* can be excluded. Most Polycladida do not thrive on floating substrata as do the Bryozoa as feeders on plankton, or the Pantopoda, feeders on planktonfeeders (Hydrozoa). The larvae of the Cotylea and some Acotylea swim about for 4–5 days (KATO 1940, p. 564). So they are short-lived in comparison with the larvae of many other bottom animals (THORSON 1946, p. 453). The adult polyclads, however, glide on the surface film upside down (LANG 1884, p. 635). LEVETZOW (1943, p. 190) observed that the widely distributed *Thysanozoon brocchii* moves rapidly, and this may be valid also for other polyclads. LEVETZOW thinks that the worms may cover large distances in calm nights. For carnivores of predaceous and necrophagous habits, as the polyclads are, the intake of food is occasional and possibly does not interfere with these nocturnal migrations, known by the Neapolitan fishermen (LEVETZOW). Therefore the means of distribution of polyclads are not too limited. Also their food does not suggest an intense speciation, which can be observed in feeders of different substrata or certain plants or parts of such.

We suppose that the great number of endemic polyclads results from inner, constitutional factors, not from their peculiarities in locomotion and feeding. Of fossil animals or such as are included in amber, some species remain the same for long periods and under changing conditions, while others are rapidly replaced by newcomers. Evidently most polyclads belong to this genetically unstable type.

Probably the different habitats between Cape Hatteras and Trinidad as well as those on the Brazilian coast are inhabited by endemic species. However, it would be premature to organize such distribution maps of the polyclads, as WARMKE & ABBOTT did (1961, p. 320–328) for many Caribbean seashells. For this purpose the inventory of the northern and still more that of the southern (Brazilian) West Indian polyclads shows too many lacunae. The littoral stretch of Brazil, the polyclads of which are sufficiently known, amounts to 1/17 of the length of the Brazilian coast. Besides it is a peripheral area situated near the southern limit of the West Indian region. Among the northern (Cape Hatteras-Trinidad) West Indian polyclads those from Curaçao and Bonaire are well known, but only few are recorded from the Bahamas, very few from the Caribbean coasts and islands W of Aruba, and none at all from Cuba. Therefore we restrict the following survey of the polyclads in the Cape Hatteras-Trinidad area to 3 groups, the first comprising the species found in the entire area or at least N and S of the Straits of Florida (25° N), the second those only known from N of 25°, and the third those only known from the Antilles. The few records from the Bahamas are included in the third list.

List 1 (24 species found in the entire Cape Hatteras-Trinidad area)

Acotylea

Gnesioceros sargassicola (no. 25)
Hoploplana grubei (Graff, 1892)
Notoplana annula (no. 21)
Notoplana insularis Hyman, 1939
Notoplana lactoalba (no. 19)
Notoplana queruca (no. 22)
Phaenocelis purpurea (no. 7)
Stylochoplana leptalea (no. 11) – also from Brazil.
Stylochoplana snadda (no. 14)
Stylochus frontalis (no. 2)
Stylochus oculiferus (no. 3)

Cotylea

Acerotisa multicelis Hyman, 1955
Acerotisa notulata (no. 40)
Enchiridium periommatum Bock, 1913
Pericelis orbicularis (no. 29)
Prostheceraeus zebra Hyman, 1955
Prosthiostomum cyclops (no. 43)
Prosthiostomum milcum (no. 45)
Pseudoceros bicolor (no. 35)
Pseudoceros crozieri (no. 36)
Pseudoceros splendidus Stummer-Traunfels, 1933 – also Mediterranean; identification from Galapagos Islands doubtful.
Pseudoceros texanus (no. 38)
Thysanozoon brocchii (no. 33) – widely distributed abroad, also from Brazil.
Thysanozoon nigrum (no. 34)

List 2 (27 species known only from N of the Straits of Florida)

Acotylea

Cestoplana microps (Verrill, 1901)
Coronadena mutabilis (Verrill, 1873)
Digynopora americana Hyman, 1940
Enantia pellucida (Pearse, 1938)
Euplana carolinensis Hyman, 1940
Euplana gracilis (Girard, 1850)
Hoploplana inquilina thaisana Pearse, 1938
Latocestus whartoni (no. 1)
Planocera gaimardi Blainville, 1828
Planctoplanella atlantica Hyman, 1940
Stylochoplana bayeri (no. 13)
Stylochus bermudensis Verrill, 1901
Stylochus ellipticus (Girard, 1850)
Stylochus pulcher Hyman, 1940
Stylochus zebra (Verrill, 1882)
Zygantroplana angusta (Verrill, 1892)

Cotylea

Acerotisa baiae Hyman, 1940
Euprosthiostomum pakium (no. 48)
Lurymare utarum (no. 47) – also from Brazil.
Oligoclado floridanus Pearse, 1938
Prostheceraeus floridanus Hyman, 1955
Prosthiostomum lobatum Pearse, 1938
Pseudoceros aureolineatus Verrill, 1901
Pseudoceros maculosus Pearse, 1938
Pseudoceros pardalis Verrill, 1900
Thysanozoon flavotuberculatum Hyman 1939
Thysanozoon griseum Verrill, 1901

List 3 (36 species known only from the Antillean area, incl. Bahamas)

Acotylea

Adenoplana obovata (Schmarda, 1859)
Amyris hummelincki (no. 27)
Amyris ujara (no. 28)
Anandroplana muscularis Hyman, 1955
Anandroplana portoricensis Hyman, 1955
Candimba rabita (no. 17)
Crassandros dominicanus Hyman, 1955
Hoploplana divae (no. 24) – also from Brazil.
Idioplanoides atlanticus Bock, 1913
Igluta tipuca (no. 9)
Indistylochus hewatti Hyman, 1955
Latocestus caribbeanus Prudhoe, 1944
Notoplana ferruginea (no. 18)
Notoplana lapunda (no. 23)
Notoplana megala (no. 20) – also from Brazil.
Notoplanides alcha (no. 16)
Phaenocelis peleca (no. 8)
Phylloplana purpurea (Schmarda, 1859)
Polyposthides caraibica Palombi, 1923
Stylochoplana caraibica Palombi, 1923 – doubtful, evidently not a *Stylochoplana*.
Stylochoplana wyona (no. 15)
Styloplanocera fasciata (no. 26)
Stylochus megalops (Schmarda, 1859)
Zygantroplana yrsa (no. 10)

Cotylea

Acerotisa bituna (no. 41) – also from Brazil.
Acerotisa piscatoria (no. 42) – also from Brazil.
Boninia antillarum (no. 31)
Boninia divae (no. 32)
Cycloporus gabriellae (no. 39) – also from Brazil.
Enchiridium evelinae (no. 49) – also from Brazil.
Lurymare matarazzoi (no. 46) – also from Brazil.
Paraboninia caymanensis Prudhoe, 1944
Pericelis cata (no. 30)
Prosthiostomum angustum Bock, 1913
Prosthiostomum pulchrum (no. 44)
Pseudoceros mopsus (no. 37) – also from Brazil.

It is probably the consequence of the intense collecting at Curaçao and Bonaire, that this list contains more species than the others, and also most of the species hitherto only known from Brazil.

REFERENCES

BEAUCHAMP, P. DE, 1951. Turbellariés de l'Angola. *Publ. Cultur. Comp. Diamantes de Angola 11*, p. 75–84.

BEAUCHAMP, P. DE, 1961. Classe des Turbellariés. GRASSÉ, *Traité de Zoologie 4*, p. 35–212, pl. 1.

BOCK, SIXTEN, 1913. Studien über Polycladen. *Zool. Bidr. Uppsala 2*, p. 31–344, pl. 3–10.

BOCK, SIXTEN, 1922. Two new cotylean genera of polyclads from Japan. *Ark. Zool. 14*, 13, p. 1–31, pl. 1–2.

BOCK, SIXTEN, 1923a. Two new acotylean polyclads from Japan. *Ark. Zool. 15*, 17, p. 1–39, pl. 1.

BOCK, SIXTEN, 1923b. Polycladen aus Juan Fernandez. SKOTTSBERG, *Natural History Juan Fernandez & Easter Island 3*, p. 341–372, pl. 12.

BOCK, SIXTEN, 1923c. Boninia, a new polyclad genus from the Pacific. *Nov. Act. R. Soc. Sci. Uppsala (4) 6*, 3, 32 pp., 1 pl.

BOCK, SIXTEN, 1924. Eine neue Stylochoplana aus Japan. *Ark. Zool. 16*, 7, p. 1–24, pl. 1.

BOCK, SIXTEN, 1925a. Papers from Dr. Th. Mortensen's Pacific Expedition 1914–16. XXV. Planarians. Parts I–III. *Vidensk. Meddel. Dansk naturh. Foren. 79*, p. 1–84, pl. 1–2a.

BOCK, SIXTEN, 1925b. Papers Mortensen's Pacific Exp. XXVII. Planarians. Part IV. New stylochids. *Vidensk. Meddel. Dansk naturh. Foren. 79*, p. 97–184, pl. 3–4.

BOCK, SIXTEN, 1927. Apidioplana, eine Polycladengattung mit muskulösen Drüsenorganen. *Göteb. Vetensk. Vitterh.-samh. Handl. 4, 30*, 1, p. 1–116.

BOCK, SIXTEN, 1931. Die Polycladen der D. Südpolar Expedition. *Deutsche Südp. Exped. 20 (Zool.)*, p. 259–304, pl. 44–47.

BOIS-REYMOND MARCUS, EVELINE DU, 1954. Chave dos Polycladida do litoral de S. Paulo. *Bol. Fac. Fil. Ci. Letr. Univ. S. Paulo, Zoologia 19*, p. 281–288.

BOIS-REYMOND MARCUS, EVELINE DU, 1955. On Turbellaria and Polygordius from the Brazilian coast. *Bol. Fac. Fil. S. Paulo, Zoologia 20*, p. 19–66, pl. 1–6.

BOIS-REYMOND MARCUS, EVELINE DU, 1956. Vallicula multiformis Rankin from Brazil. *Bol. Inst. Oceanogr. 7*, 1 & 2, p. 87–90, pl. 1.

BOIS-REYMOND MARCUS, EVELINE DU, 1957. On Turbellaria. *An. Ac. Bras. Ci. 29*, p. 153–191, pl. 1–6.

BOIS-REYMOND MARCUS, EVELINE DU, 1958. On South American Turbellaria. *An. Ac. Bras. Ci. 30*, p. 391–417, pl. 1–5.

BOIS-REYMOND MARCUS, EVELINE DU, 1965. Drei neue neotropische Turbellarien. *Sitz. Ber. Ges. naturf. Freunde Berlin (n.s.) 5*, 3, p. 129–135.

BOONE, E. S., 1929. Five new polyclads from the California coast. *Ann. Mag. Nat. Hist. (10) 3*, p. 33–46, pl. 2–3.

BOSC, L. A. G., 1802. Histoire naturelle des Vers, contenant leur description et leurs

moeurs, 1, p. 248–262, pl. 8 (not seen, from BRONN's *Kl. Ordn. 4, I.c.: Turbellaria*, p. 1739).

BRESSLAU, ERNST, 1933. Turbellaria. KÜKENTHAL & KRUMBACH, *Handb. Zool. 2*, 1, p. 52–293, 310–320.

COLLINGWOOD, C., 1876. On 31 species of marine planarians collected at Trincomalee and in the eastern seas. *Trans. Linn. Soc. Lond.* (*2*) *1*, p. 83–98, pl. 17–19.

CORRÊA, DIVA DINIZ, 1949. Sôbre o gênero Zygantroplana. *Bol. Fac. Fil. Ci. Letr. Univ. S. Paulo, Zoologia 14*, p. 173–218, pl. 1–5.

CORRÊA, DIVA DINIZ, 1960. Two new marine Turbellaria from Florida. *Bull. mar. Sci. Gulf Car. 10*, p. 208–216.

CORRÊA, DIVA DINIZ, 1963. The Turbellarian Hofstenia miamia in the Caribbean Sea. *Studies Fauna Curaçao 17*, p. 38–40, fig. 17.

DAKIN, WILLIAM J., 1953. *Australian Seashores*. xii + 372 pp., 99 pls.

DIESING, K. M., 1862. Revision der Turbellarien-Abtheilung Dendrocoelen. *Sitz. Ber. (math.-nat.) Akad. Wien 44 (1861)*, p. 485–578.

EKMAN, SVEN, 1953. *Zoogeography of the Sea*. xiv + 417 pp.

FREEMAN, D., 1930. Three polyclads from the region of Point Fermin, San Pedro, California. *Trans. Amer. micr. Soc. 49*, p. 334–341, pl. 38.

FREEMAN, D., 1933. The polyclads of the San Juan region of Puget Sound. *Tr. Amer. micr. Soc. 52*, p. 107–146, pl. 12–23.

GIRARD, CHARLES FRÉDÉRIC, 1850. Descriptions of several new species of Planariae from the coast of Massachusetts. *Proc. Boston. Soc. Hist. Nat. 3*, p. 251–256, 264–265.

GIRARD, CHARLES FRÉDÉRIC, 1851. Description of a new Planaria and a new Nemertes from the coast of Florida. *Proc. Boston Soc. Hist. Nat. 4*, p. 137.

GIRARD, CHARLES FRÉDÉRIC, 1853. Descriptions of new nemerteans and planarians from the coast of the Carolinas. *Proc. Acad. Nat. Sci. Philadelphia 6*, p. 365–367.

GRAFF, L., 1878. Kurze Berichte über fortgesetzte Turbellarienstudien. *Ztschr. wiss. Zool. 30, Suppl.*, p. 457–465.

GRAFF, L., 1892. Pelagische Polycladen. *Ztschr. wiss. Zool. 55*, 2, p. 189–219, pl. 7–10.

HADENFELDT, D., 1929. Das Nervensystem von Stylochoplana maculata und Notoplana atomata. *Ztschr. wiss. Zool. 133*, 3–4, p. 586–638.

HEATH, H. & MCGREGOR, E. A., 1912. New polyclads from Monterey Bay, California. *Proc. Acad. Nat. Sci. Philadelphia 64*, p. 455–488, pl. 12–18.

HOFKER, J., 1930. Faunistische Beobachtungen in der Zuidersee während der Trockenlegung. *Ztschr. Morph. Ökol. Tiere 18*, 1–2, p. 189–216.

HYMAN, LIBBIE H., 1939a. Some polyclads from the New England coast. *Biol. Bull. 76*, 2, p. 127–152.

HYMAN, LIBBIE H., 1939b. Acoel and polyclad Turbellaria from Bermuda and the Sargassum. *Bull. Bingham Oceanogr. Coll. 7*, 1, p. 1–26, pl. 1–9.

HYMAN, LIBBIE H., 1939c. Polyclad worms collected on the Presidential cruise of 1938. *Smithson. Misc. Coll. 98*, 17, p. 1–13.

HYMAN, LIBBIE H., 1940. The polyclad flatworms of the Atlantic coast of the United States and Canada. *Proc. U.S. Nat. Mus. 89*, 3101, p. 449–495.

HYMAN, LIBBIE H., 1944. Marine Turbellaria from the Atlantic coast of North America. *Amer. Mus. Nov. 1266*, p. 1–15.

HYMAN, LIBBIE H., 1950. A new Hawaiian polyclad, Stylochoplana inquilina, with commensal habits. *Occ. Pap. Bernice P. Bishop Mus. 20*, 4, p. 55–58.

HYMAN, LIBBIE H., 1952. Further notes on the turbellarian fauna of the Atlantic coast of the United States. *Biol. Bull. 103*, 2, p. 195–200.

HYMAN, LIBBIE H., 1953a. The polyclad flatworms of the Pacific coast of North America. *Bull. Amer. Mus. Nat. Hist. 100*, 2, p. 265–392.

HYMAN, LIBBIE H., 1953b. Some polyclad flatworms from the Galapagos Islands. *Allan Hancock Exped. 15*, 2, p. 183–210.

HYMAN, LIBBIE H., 1954. Free-living flatworms (Turbellaria) of the Gulf of Mexico. *Fish Wildlife Service 55*, p. 301–302.

HYMAN, LIBBIE H., 1955a. Some polyclad flatworms from the West Indies and Florida. *Proc. U.S. Nat. Mus. 104*, 3341, p. 115–150.

HYMAN, LIBBIE H., 1955b. A further study of the polyclad flatworms of the West Indian region. *Bull. mar. Sci. Gulf Caribb. 5*, 4, p. 259–268.

HYMAN, LIBBIE H., 1955c. Miscellaneous marine and terrestrial flatworms from South America. *Amer. Mus. Nov. 1742*, p. 1–33.

HYMAN, LIBBIE H., 1955d. The polyclad flatworms of the Pacific coast of North America; additions and corrections. *Amer. Mus. Nov. 1704*, p. 1–11.

HYMAN, LIBBIE H., 1959a. A further study of Micronesian polyclad flatworms. *Proc. U. S. Nat. Mus. 108*, 3410, p. 543–597.

HYMAN, LIBBIE H., 1959b. Some Turbellaria from the coast of California. *Amer. Mus. Nov. 1943*, p. 1–17.

HYMAN, LIBBIE H., 1959c. Some Australian polyclads. *Rec. Austral. Mus. 25*, 1, p. 1–17.

JAKUBOVA, LYDIA, 1906. *Polycladen von Neu-Britannien und Neu-Caledonien.* Inaug. Dissert. Phil. Fakult. (Mathem. Naturw.) Zürich, 46 pp., 5 pls. (Also in: *Jen. Ztschr. Naturw. 41*).

JAKUBOVA, LYDIA, 1909. Die Polycladida der Bucht von Sevastopol. *Mém. Acad. St. Pétersb. (8) Physico-Mathém. 24*, 2, p. 1–31, pl. 1 (only seen photocopy of pl. 1 fig. 4, 6).

JENSEN, O. S., 1878. *Turbellaria ad litora Norvegiae occidentalia.* 97 pp., 8 pls.

KATO, K., 1934. Polyclad turbellarians from the neighborhood of the Mitsui Institute. *Jap. Journ. Zool. 6*, 1, p. 123–138, pl. 1.

KATO, K., 1935. Stylochoplana parasitica, sp.n., a polyclad parasitic in the pallial groove of the Chiton. *Annot. Zool. Japon. 15*, p. 123–129, pl. 9.

KATO, K., 1937a. Polyclads collected in Idu, Japan. *Japan. Journ. Zool. 7*, 2, p. 211–232, pl. 14–15.

KATO, K., 1937b. Polyclads from Korea. *Japan. Journ. Zool. 7*, p. 233–240, pl. 16.

KATO, K., 1937c. Stylochus aomori, a new polyclad. *Annot. Zool. Japon. 16*, 1, p. 39–41.

KATO, K., 1937d. Three polyclads from northern Japan. *Annot. Zool. Japon. 16*, 1, p. 35–38.

KATO, K., 1937e. The fauna of Akkeshi Bay, V. Polycladida. *Annot. Zool. Japon. 16*, 2,p. 124–132, pl. 8.

KATO, K., 1937f. Thirteen new polyclads from Misaki. *Japan. Journ. Zool. 7*, 3, p. 347–371, pl. 20–22.

KATO, K., 1938. Polyclads from Amakusa, southern Japan. *Japan. Journ. Zool. 7, 4*, p. 559–576, pl. 36–37.

KATO, K., 1939a. Polyclads in Onagawa and vicinity. *Sci. Rep. Tohoku Univ. (4) 14*, p. 65–79, pl. 3–4.

KATO, K., 1939b. The Polyclada of Mutsu Bay. *Sci. Rep. Tohoku Univ. (4) 14*, p. 143–153, pl. 8–9.

KATO, K., 1940. On the development of some Japanese polyclads. *Japan. Journ. Zool. 8*, 4, p. 537–573, pl. 50–60.

KATO, K., 1943a. Polyclads from Formosa. *Bull. Biogeogr. Soc. Japan 13*, 11, p. 69–77, pl. 3.

KATO, K., 1943b. Polyclads from Palao. *Bull. Biogeogr. Soc. Japan 13*, 12, p. 79–90, pl. 4.

KATO, K., 1943c. A new polyclad with anus. *Bull. Biogeogr. Soc. Japan 13*, 7, p. 47–53, pl. 1.

KATO, K., 1944. Polycladida of Japan. *Journ. Sigenkagaku Kenkyusyu 1*, 3, p. 257–318, pl. 26–29.

LAIDLAW, F. F., 1902. The marine Turbellaria, etc. *Fauna Geography Maldive & Laccadive Archipelagoes 1*, 3, 282–312, pl. 14–15.

LAIDLAW, F. F., 1903a. A collection of Turbellaria Polycladida from the straits of Malacca. *Proc. Zool. Soc. London 1903*, 1, p. 301–318, pl. 23.

LAIDLAW, F. F., 1903b. Turbellaria Polycladida. The Acotylea. *Proc. Zool. Soc. London 1903*, 2, p. 99–113, pl. 9.

LAIDLAW, F. F., 1904a. Notes on some polyclad Turbellaria in the British Museum. *Mem. Proc. Manchester Lit. Phil. Soc. 48*, 3 (15), p. 1–6.

LAIDLAW, F. F., 1904b. On the polyclad Turbellaria. W. A. Herdman, *Rep. Pearl Oyster Fish. Gulf of Manaar 2*, Suppl. Rep. 9, p. 127–136, 1 pl.

LAIDLAW, F. F., 1906. The polyclad Turbellaria ... of the Cape Verde Islands. *Proc. Zool. Soc. London 1906*, p. 705–719, pl. 52.

LANG, ARNOLD, 1884. Polycladen. *Fauna Flora Golfes von Neapel 11*. ix + 688 pp., 39 pls.

LEVETZOW, K. G. v., 1943. Zur Biologie und Verdauungsphysiologie der polycladen Turbellarien. *Zool. Anz. 141*, 9–10, p. 189–196.

MARCUS, E., 1947. Turbelarios marinhos do Brasil. *Bol. Fac. Fil. Ci. Letr. Univ. S. Paulo, Zoologia 12*, p. 99–215, pl. 1–21.

MARCUS, E., 1948. Turbellaria do Brasil. *Bol. Fac. Fil. S. Paulo, Zoologia 13*, p. 111–243, pl. 1–20.

MARCUS, E., 1949. Turbellaria Brasileiros (7). *Bol. Fac. Fil. S. Paulo, Zoologia 14*, p. 7–155, pl. 1–22.

MARCUS, E., 1950. Turbellaria Brasileiros (8). *Bol. Fac. Fil. S. Paulo, Zoologia 15*, p. 5–191, pl. 1–34.

MARCUS, E., 1952. Turbellaria Brasileiros (10). *Bol. Fac. Fil. S. Paulo, Zoologia 17*, p. 5–187, pl. 1–32.

MARCUS, E., 1954. Turbellaria. Rep. Lund Univ. Chile Exped. 11. *Lunds Univ. Aarsskr. (n.s.) 2, 49*, 13, p. 1–114.

MARCUS, EVELINE & ERNST, 1951. Contributions to the natural history of Brazilian Turbellaria. *Com. Zool. Mus. Nat. Montevideo 3*, 63 p. 1–25.

MEIXNER, A., 1907. Polycladen von der Somalikuste. *Ztschr. wiss. Zool. 88*, 3, p. 385–498, pl. 25–29.

MELOUK, M. A., 1941. Leptoplana nadiae, a new polyclad from Ghardaqa (Red Sea). *Bull. Fac. Sci. Univ. Cairo 23*, p. 41–49, pl. 1.

MERTENS, H., 1832. Untersuchungen über den inneren Bau verschiedener in der See lebender Planarien. *Mém. Acad. St. Pétersb. (5) Sci. math. phys. nat. 2*, p. 1–17 pl. 1–2 (not seen, quoted from *Bronn's Kl. Ordn. 4, I. c: Turbellaria*, p. 1747).

PALOMBI, A., 1923. Diagnosi di nuove specie di Policladi della R.N. "Liguria". *Boll. Soc. Nat. Napoli 36*, 33–37.

PALOMBI, A., 1924. Policladi pelagici. *Raccolte planctoniche ... "Liguria" 3*, 1, p. 1–28, pl. 1–2.

PALOMBI, A., 1928. Report on the Turbellaria (Cambridge Exped. Suez Canal 1924). *Trans. Zool. Soc. London 22*, 5 (1), p. 579–631, pl. 1.

PALOMBI, A., 1931. Stylochus inimicus, sp. nov. *Boll. Zool. 2*, 6, p. 219–226, pl. 4.

PALOMBI, A., 1936. Policladi liberi e commensali raccolti sulle coste del Sud Africa. *Arch. Zool. Ital. 23*, p. 1–45, pl. 1.

PALOMBI, A., 1938. Turbellari del Sud Africa. *Arch. Zool. Ital. 25*, p. 329–383, pl. 9.

PALOMBI, A., 1939a. Turbellari del Sud Africa. *Arch. Zool. Ital. 28*, p. 123–149, pl. 11.

PALOMBI, A., 1939b. Turbellaria Polycladidea. *Mém. Mus. R. Hist. Nat. Belg. (2) 15*, p. 95–113, pl. 1.

PALOMBI, A., 1940. Policladi delle coste occidentali dell'Africa. *Rev. Zool. Bot. Afr. 33*, 2, p. 109–121, pl. 4.

PEARSE, A. S., 1938. Polyclads of the east coast of North America. *Proc. U.S. Nat. Mus.*, 86, 3044, p. 67–98.

PEARSE, ARTHUR SPERRY & WHARTON, GEORGE W., 1938. The oyster "leech" Stylochus inimicus Palombi, associated with oysters on the coast of Florida. *Ecol. Monogr. 8*, p. 605–655.

PLEHN, MARIANNE 1896a. Neue Polycladen, gesammelt von Herrn Capitän Chierchia ... "Vettor Pisani". *Jen. Ztschr. Naturw. 30*, p. 137–176, pl. 8–13.

PLEHN, MARIANNE 1896b. Die Polycladen der Planktonexpedition. *Ergebn. Plankt. Exped. 2*, H. f., p. 1–13, 1 pl.

PLEHN, MARIANNE 1896c. Polycladen von Ambon. Semon, Forschungsreise in Australien. *Denkschr. Med. Naturw. Ges. Jena 5*, p. 327–334, pl. 23.

PLEHN, MARIANNE, 1898. Drei neue Polycladen. *Jen. Ztschr. Naturw. 31*, p. 90–99, pl. 5.

PRUDHOE, S., 1944. On some polyclad turbellarians from the Cayman Islands. *Ann. Mag. Nat. Hist. (11) 11*, p. 322–334.

PRUDHOE, S., 1950a. On some polyclad turbellarians from Burma. *Ann. Mag. Nat. Hist. (12) 3*, p. 41–50.

PRUDHOE, S., 1950b. On the taxonomy of two species of pelagic polyclad turbellarians. *Ann. Mag. Nat. Hist. (12) 3*, p. 710–716.

QUATREFAGES, A. DE, 1845. Études sur les types inférieures de l'embranchement des Annelés. *Ann. Sci. nat. (3) Zool. 4*, p. 129–184, pl. 3–7.

RANKIN, J. J., 1956. The structure and biology of Vallicula multiformis, gen. et sp. nov., platyctenid ctenophore. *Journ. Linn. Soc. London, Zool. 43*, 289, p. 55–71, pl. 2–3.

REMANE, ADOLF, 1951. Die Bursa-Darmverbindung und das Problem des Enddarmes bei Turbellarien. *Zool. Anz. 146*, p. 275–291.

RITTER-ZÁHONY, R. v., 1907. Turbellarien: Polycladiden. *Hamburg. Magalhaens. Sammelreise 3*, 8 (1), p. 3–19, pl. 1.

SCHMARDA, L. K., 1859. *Neue wirbellose Thiere 1*, 1. Hälfte. xviii + 66 pp., 15 pls.

SCHMIDT, O., 1861. Untersuchungen über Turbellarien von Corfu und Cephalonia. *Ztschr. wiss. Zool. 11*, 1, p. 1–30, pl. 1–4.

SMITH, EDMUND H., 1960. On a new polyclad commensal of prosobranchs. *An. Acad. Bras. Ci. 32*, 3–4, p. 385–390.

SMITH, EDMUND H., 1961. A new commensal polyclad from Panama. *The Veliger 4*, 2, p. 69–70, pl. 16.

STEINBÖCK, OTTO, 1937. The fishery grounds near Alexandria. 14. Turbellaria. *Not. Mem. Fish. Research Direct. 25*, p. 1–15.

STIMPSON, W., 1857. Prodromus ... animalium evertebratorum ... Pacificum Septentrionalem. *Proc. Acad. Nat. Sci. Philadelphia 9*, p. 19–31.

STUMMER-TRAUNFELS, R. v., 1895. Tropische Polycladen. I. Das Genus Thysanozoon Grube. *Ztschr. wiss. Zool. 60*, 4, p. 689–725, pl. 35–37.

STUMMER-TRAUNFELS, R. v., 1933. Polycladida. *Bronn's Kl. Ordn. 4, I. c*, p. 3485–3596, 1 pl.

THORSON, GUNNAR, 1946. Reproduction and larval development of ... marine invertebrates. *Medd. Komm. Danm. Fisk. & Havunders., Plankton 4*, 1, p. 1–523.

VERRILL, A. E., 1873. Report upon the invertebrate animals of Vineyard Sound. *U.S. Fish. Comm. Rep. 1871–2*, p. 295–778, pl. 1–38, 40.

VERRILL, A. E., 1882. Notice of the remarkable marine fauna occupying the outer banks of the southern coast of New England. *Amer. Journ. Sci. (3) 24*, p. 360–371.

VERRILL, A. E., 1892–93. Marine planarians of New England. *Trans. Connecticut Acad. Arts & Sci. 8*, 24, p. 459–520, pl. 40–44.

VERRILL, A. E., 1900. Additions to the Turbellaria ... of the Bermudas. *Tr. Connecticut Acad. 10*, p. 595–672, pl. 70.

VERRILL, A. E., 1901. Additions to the fauna of the Bermudas. *Tr. Connecticut Acad. 11*, 1 (2), p. 15–62, pl. 1–9 (Turbellaria: pl. 5).

WAGENAAR HUMMELINCK, P., 1933. Reisebericht. Zoologische Ergebnisse einer Reise nach Bonaire, Curaçao und Aruba im Jahre 1930. *Zool. Jahrb. (Syst.) 64*, p. 289–326.

WAGENAAR HUMMELINCK, P., 1953, Description of new localities. *Studies Fauna Curaçao 4*, p. 1–90, pl. 1–8.

WARMKE, GERMAINE L. & ABBOTT, R. TUCKER, 1961. *Caribbean Seashells.* x + 346 pp. 44 pls.

WILLEY, A., 1897. Letters from New Guinea on Nautilus and some other organisms. *Quart. Journ. micr. Sci. (n.s.) 39*, p. 145–180.

YERI, M. & KABURAKI, T., 1918a. Bestimmungsschlüssel für die japanischen Polycladen. *Annot. Zool. Japon. 9*, 4, p. 431–442.

YERI, M. & KABURAKI, T., 1918b. Description of some Japanese polyclad Turbellaria. *Journ. Coll. Sci. Imp. Univ. Tokyo 39*, 9, p. 1–54, pl. 1–2.

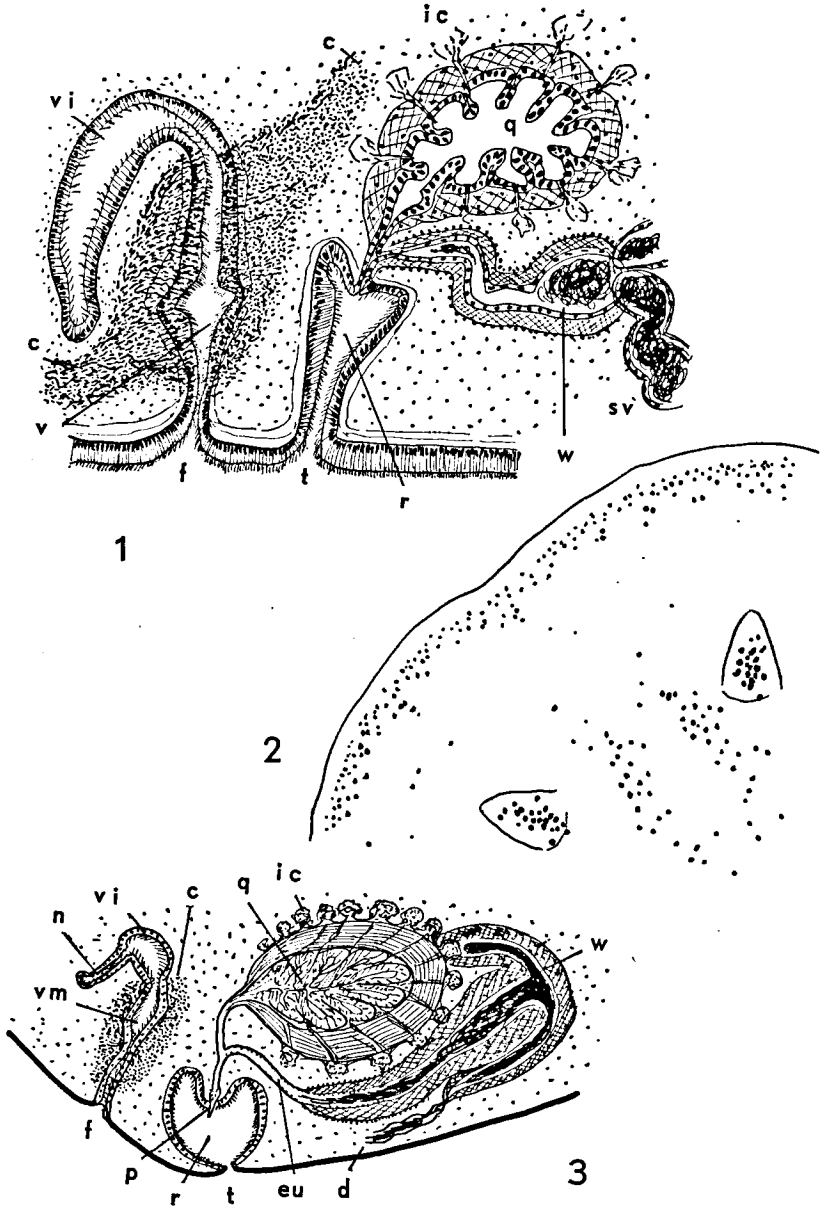


Fig. 1. *Stylochus frontalis* Verr.; combined section of reproductive organs. Fig. 2–3. *Stylochus oculiferus* (Gir.). – 2. Eyes of clarified worm. – 3. Sagittal section of reproductive organs. c – cement glands; d – sperm ducts; eu – ejaculatory duct; f – female pore; ic – extra-capsular glands; n – common uterine duct; p – penial papilla; q – granule vesicle; r – male antrum; sv – spermiducal vesicle; t – male pore; v – outer vagina; vi – inner vagina; vm – middle vagina; w – seminal vesicle.

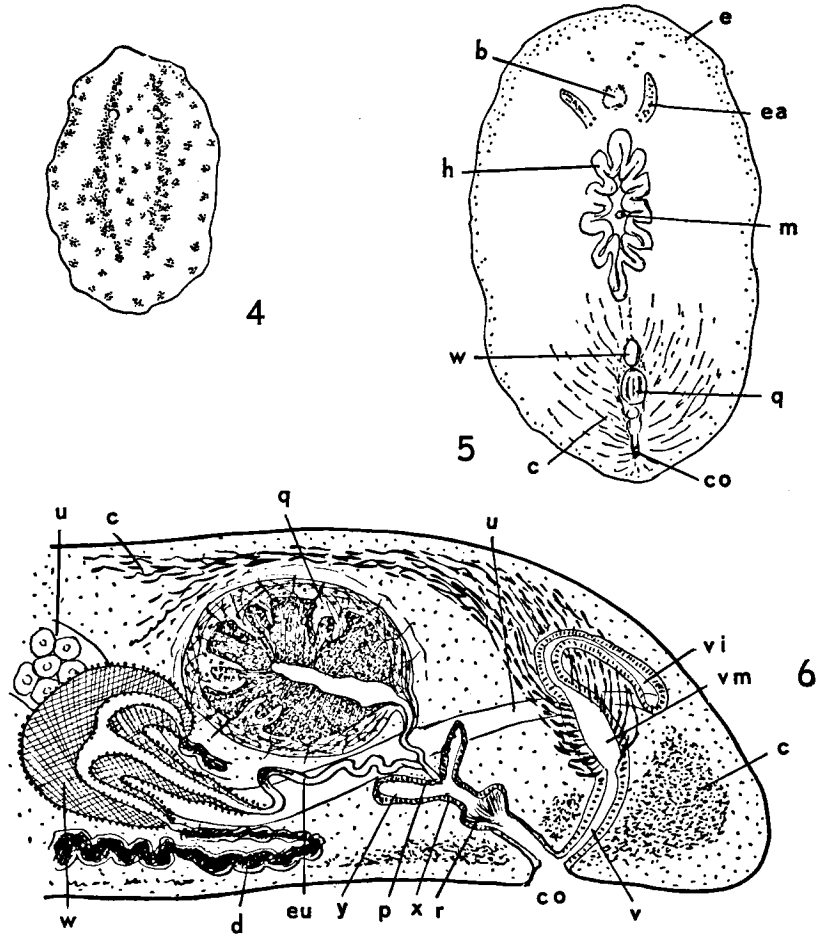


Fig. 4–6. *Stylochus catus* Marc. – 4. Preserved worm. – 5. Clarified worm. – 6. Combined section of reproductive organs. b – brain; c – cement glands; co – common genital pore; d – sperm ducts; e – marginal eyes; ea – tentacular eyes; eu – ejaculatory duct; h – pharynx; m – mouth; p – penial papilla; q – granule vesicle; r – male antrum; u – uteri; v – outer vagina; vi – inner vagina; vm – middle vagina; w – seminal vesicle; x – penial sheath; y – penial pocket.

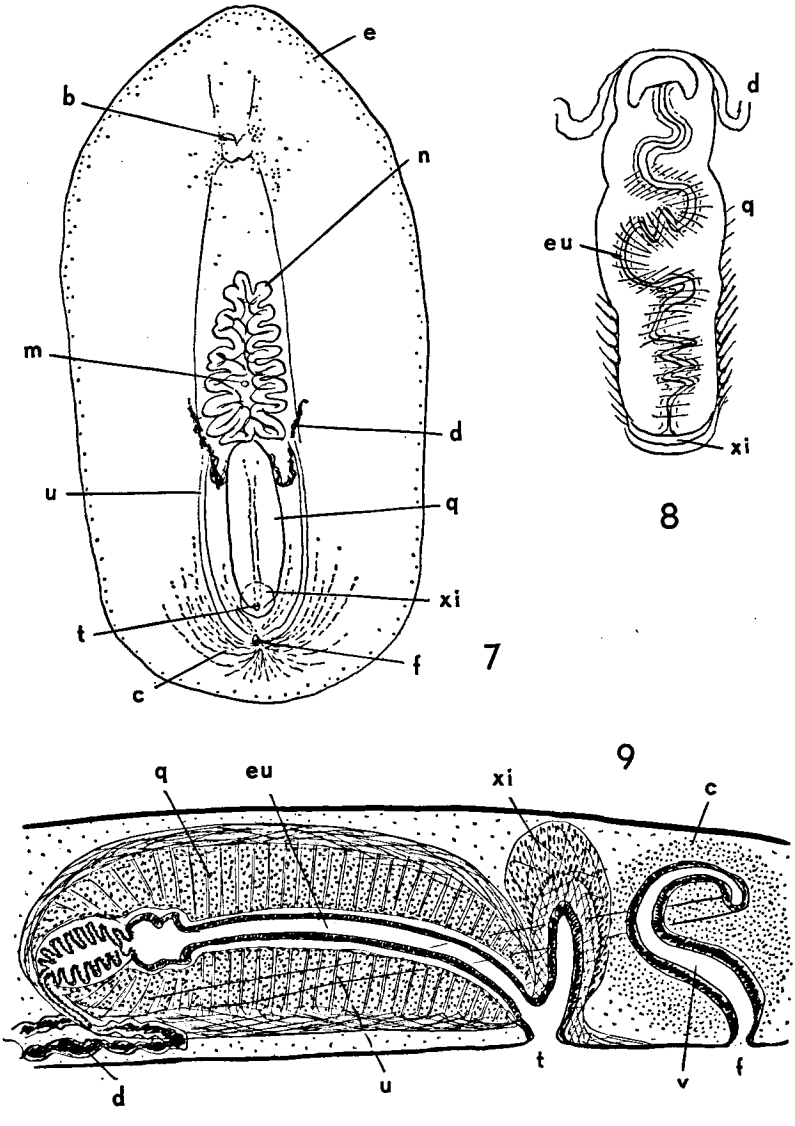
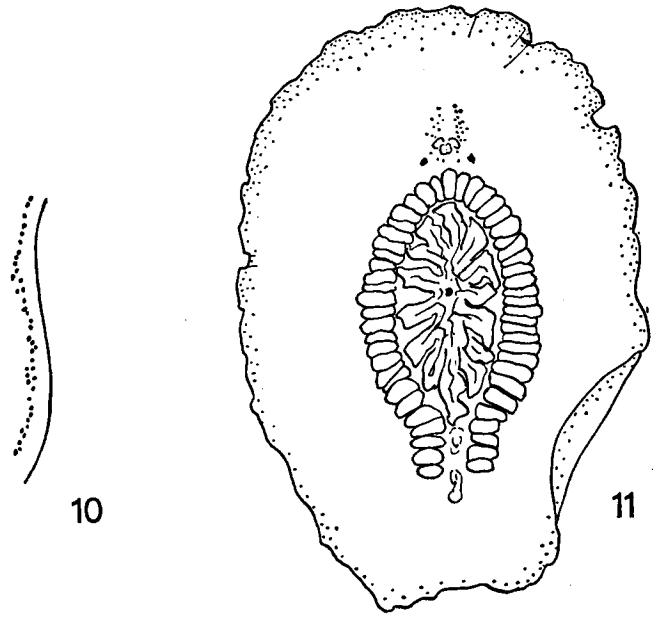


Fig. 7–9. *Cryptocelis lilianae*, spec. nov. – 7. Clarified worm. – 8. Male organ of other specimen. – 9. Combined section of reproductive organs. b – brain; c – cement glands; d – sperm ducts; e – marginal eyes; eu – ejaculatory duct; f – female pore; h – pharynx; m – mouth; q – granule vesicle; t – male pore; u – uteri; v – outer vagina; xi – pouch of ejaculatory duct.



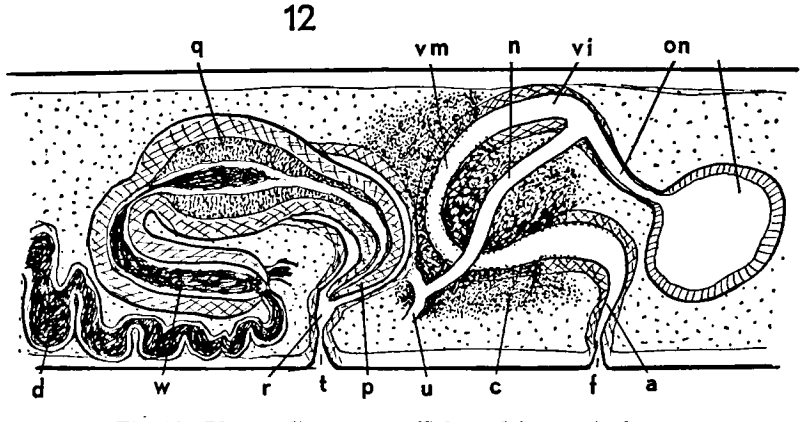
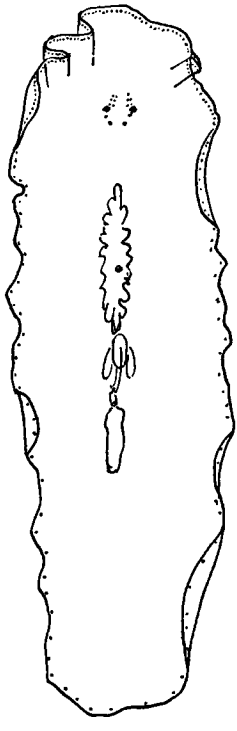


Fig. 10. *Phaenocelis purpurea* (Schmarda); marginal eyes.

Fig. 11–12. *Phaenocelis peleca*, spec. nov. – 11. Clarified worm. – 12. Combined section of reproductive organs. a – female antrum; c – cement glands; d – sperm ducts; f – female pore; l – Lang's vesicle; n – common uterine duct; on – duct of Lang's vesicle; p – penial papilla; q – granule vesicle; r – male antrum; t – male pore; u – uteri; vi – inner vagina; vm – middle vagina; w – seminal vesicle.



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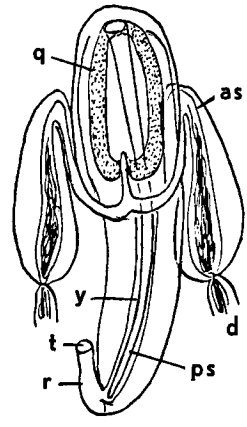

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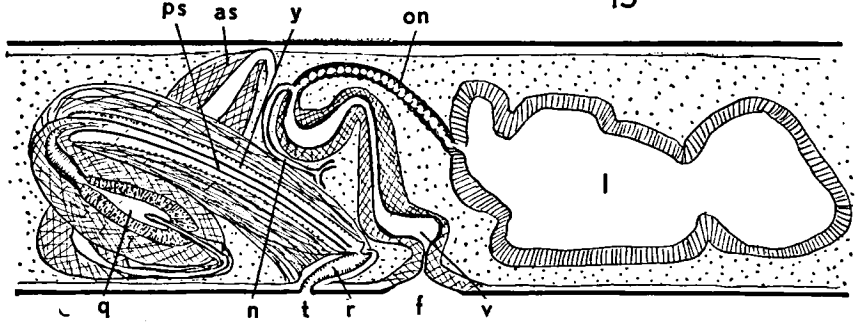
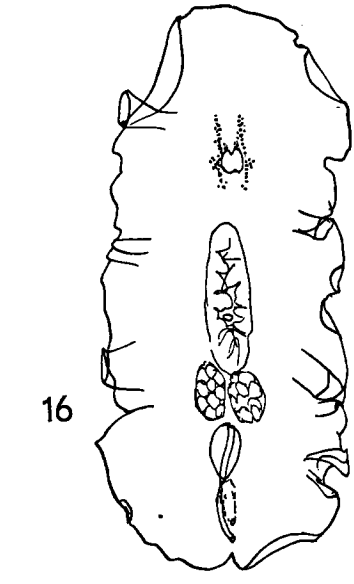
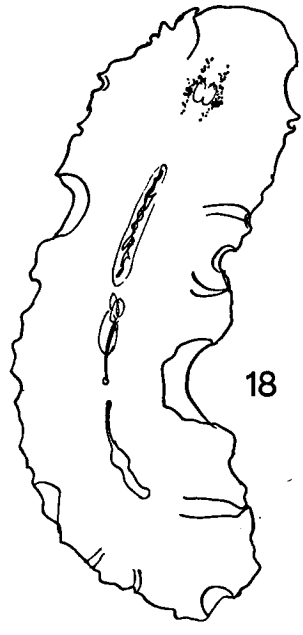


Fig. 13–15. *Igluta tipuca*, gen. nov., spec. nov. – 13. Clarified worm. – 14. Diagram of male organs. – 15. Combined section of reproductive organs. as – accessory seminal vesicles; d – sperm ducts; f – female pore; l – Lang's vesicle; n – common uterine duct; ps – penial stylet; q – granule vesicle; r – male antrum; t – male pore; v – outer vagina; y – penial pocket.





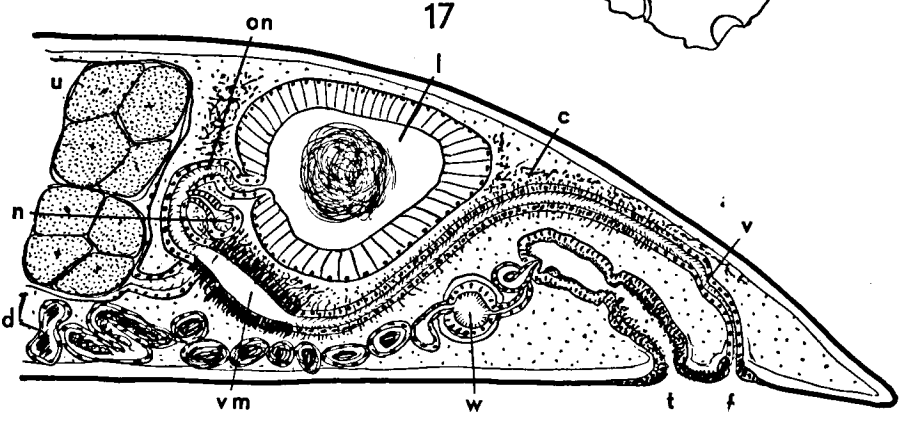
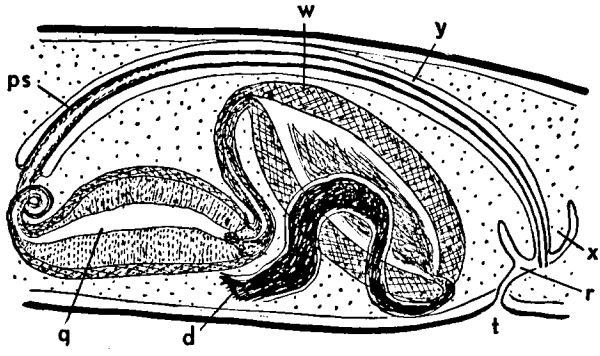


Fig. 16–17. *Zygantroplana yrsa*, spec. nov. – 16. Clarified worm. – 17. Combined section of reproductive organs. c – cement glands; d – sperm ducts; f – female pore; l – Lang's vesicle; n – common uterine duct; on – duct of Lang's vesicle; t – male pore; u – uteri; v – outer vagina; vm – middle vagina; w – seminal vesicle.

Fig. 18. *Stylochoplana leptalea* Marc.; clarified worm from Curaçao.



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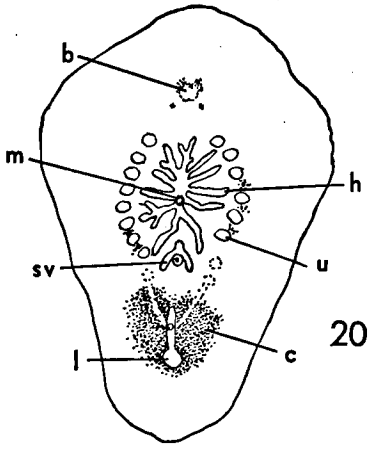

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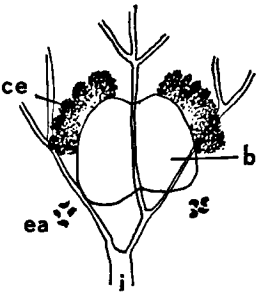

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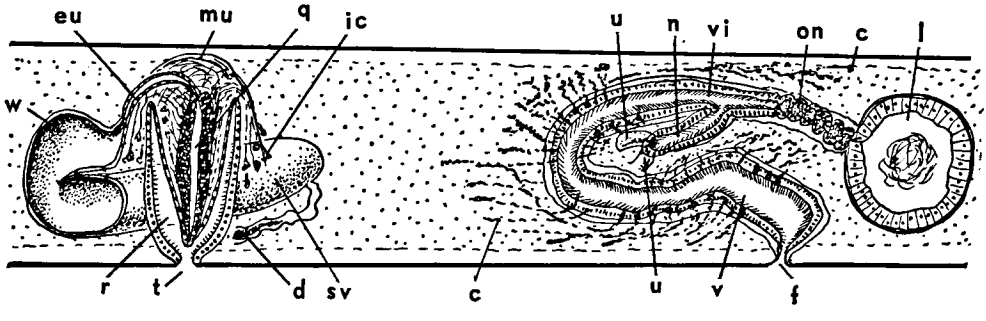
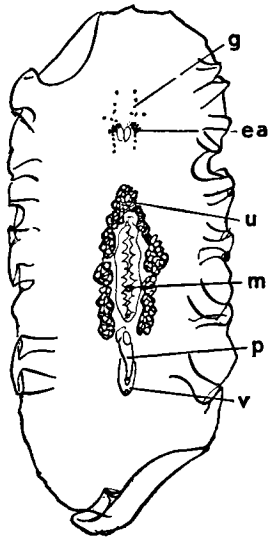


Fig. 19. *Stylochoplana leptalea* Marc.; combined sagittal section of male copulatory organs.

Fig. 20–22. *Stylochoplana walsergia*, spec. nov. – 20. Clarified worm. – 21. Brain of same. – 22. combined section of reproductive organs. b – brain; c – cement glands; ce – extra-capsular ganglion; d – sperm ducts; ea – tentacular eyes; eu – ejaculatory duct; f – female pore; h – pharynx; i – main intestine; ic – extra-capsular glands; l – Lang's vesicle; m – mouth; mu – musculature; n – common uterine duct; on – duct of Lang's vesicle; ps – penial stylet; q – granule vesicle; r – male antrum; sv – spermiducal vesicle; t – male pore; u – uteri; v – outer vagina; vi – inner vagina; w – seminal vesicle; x – penial sheath; y – penial pocket.



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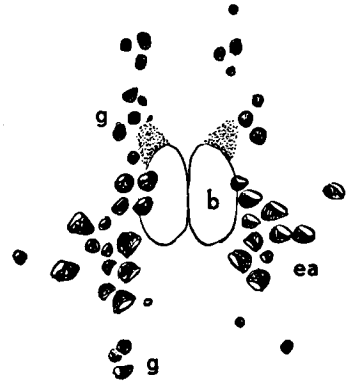

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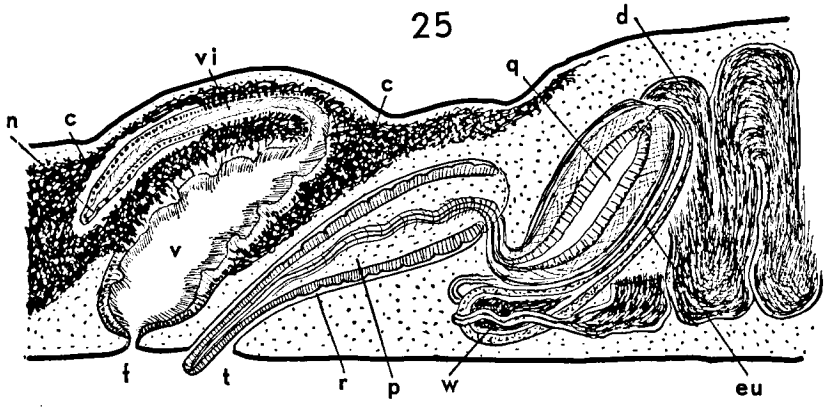


Fig. 23–25. *Stylochoplana bayeri*, spec. nov. – 23. Clarified 9.5 mm-worm. – 24. Eyes of same. – 25. Combined sagittal section of genital region. b – brain; c – cement glands; d – sperm ducts; ea – tentacular eyes; eu – ejaculatory duct; f – female pore; g – cerebral eyes; m – mouth; n – common uterine duct; p – penial papilla; q – granule vesicle; r – male antrum; t – male pore; u – uteri; v – outer vagina; vi – inner vagina; w – seminal vesicle.

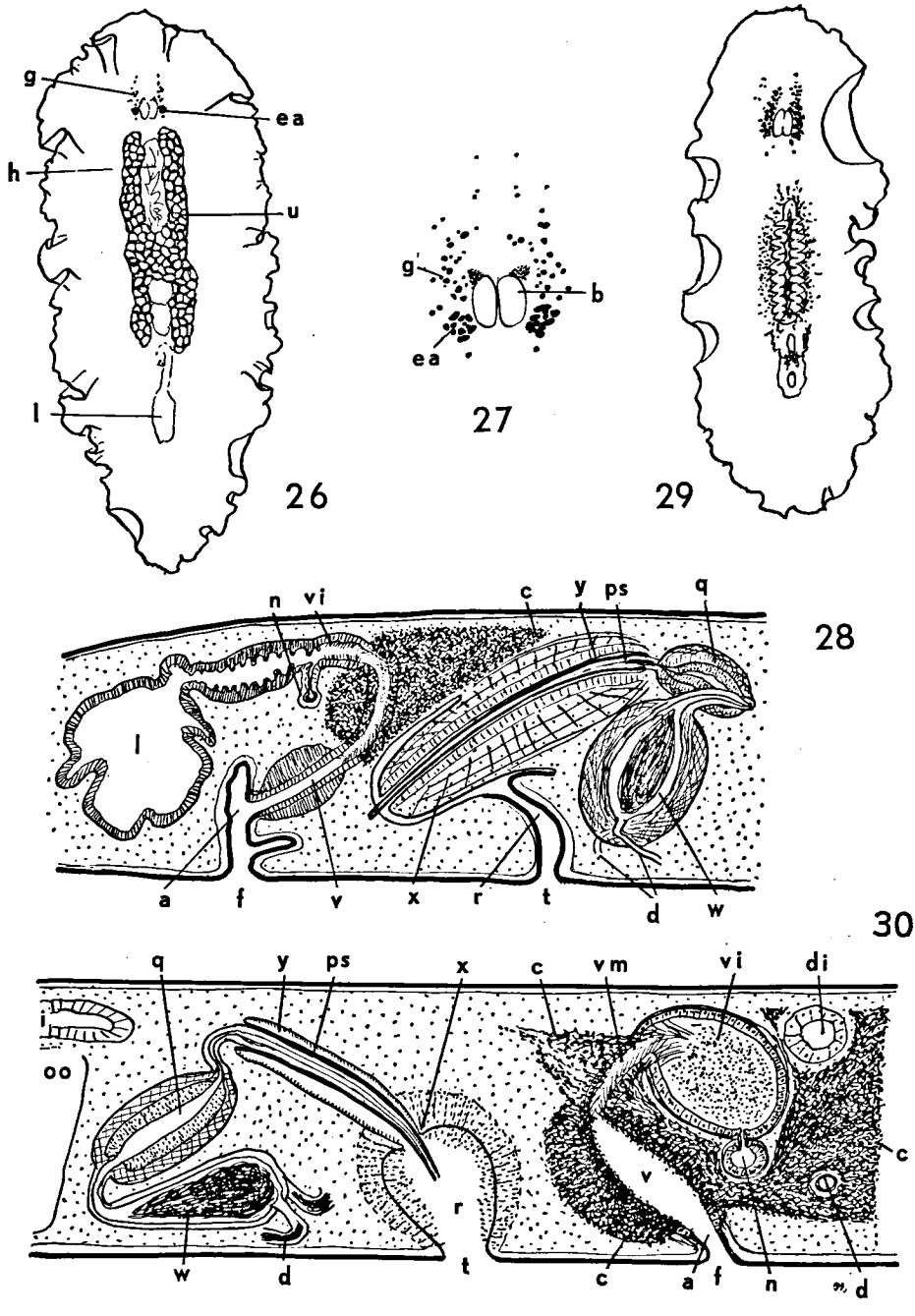


Fig. 26–28. *Stylochoplana snadda*, spec. nov. – 26. Clarified worm from Coral Gables Canal. – 27. Eyes. – 28. Combined sagittal section of genital region.
Fig. 29–30. *Stylochoplana wyona*, spec. nov. – 29. Clarified worm. – 30. Combined sagittal section of reproductive organs. a – female antrum; b – brain; c – cement glands; d – sperm ducts; di – intestinal diverticulum; ea – tentacular eyes; f – female pore; g – cerebral eyes; h – pharynx; l – Lang's vesicle; n – common uterine duct; oo – pharyngeal pocket; ps – penial stylet; q – granule vesicle; r – male antrum; t – male pore; u – uteri; v – outer vagina; vi – inner vagina; vm – middle vagina; w – seminal vesicle; x – penial sheath; y – penial pocket; z – cement pouch.

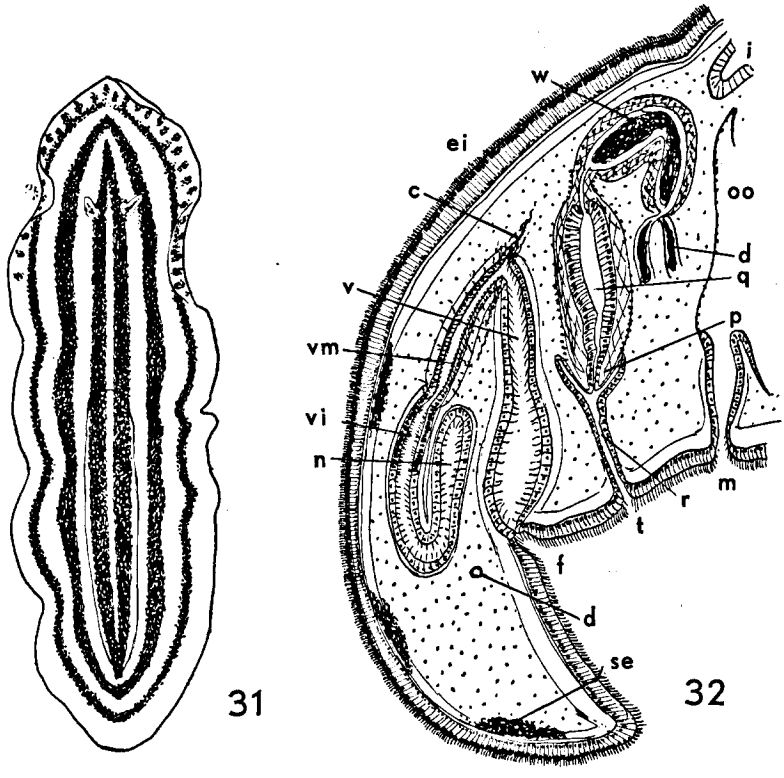


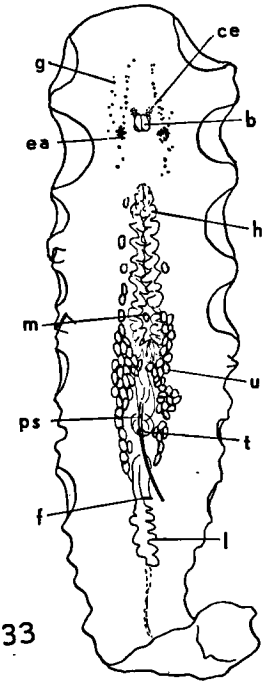
Fig. 31–32. *Notoplanides alcha*, spec. nov. – 31. Clarified worm. – 32. Combined sagittal section of hind end. c – cement glands; d – sperm ducts; ei – epidermal pigment; f – female pore; i – main intestine; m – mouth; n – common uterine duct; oo – pharyngeal pocket; p – penial papilla; q – granule vesicle; r – male antrum; se – submuscular pigment; t – male pore; v – outer vagina; vi – inner vagina; vm – middle vagina; w – seminal vesicle.

Fig. 33. *Notoplana lactoalba* (Verr.); clarified worm. b – brain; ce – extra-capsular ganglion; ea – tentacular eyes; f – female pore; g – cerebral eyes; h – pharynx; l – Lang's vesicle; m – mouth; ps – penial stylet; t – male pore; u – uteri.

Fig. 34. *Candimba rabita*, spec. nov.; clarified worm.

Fig. 35. *Candimba rabita*, spec. nov.; combined section of genital region.

Fig. 36. *Notoplana ferruginea* (Schmarda); combined section of reproductive organs. a – female antrum; bu – copulatory bursa; c – cement glands; d – sperm ducts; f – female pore; l – Lang's vesicle; n – common uterine duct; on – duct of Lang's vesicle; p – penial papilla; ps – penial stylet; q – granule vesicle; r – male antrum; t – male pore; uv – uterine vesicle; v – outer vagina; vi – inner vagina; w – seminal vesicle; x – penial sheath; y – penial pocket.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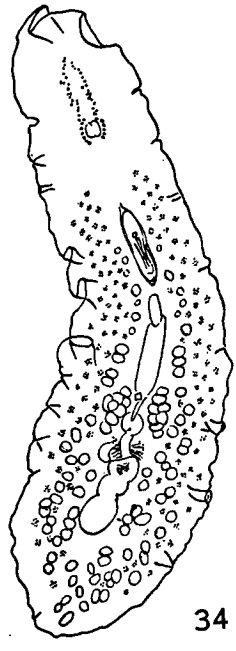

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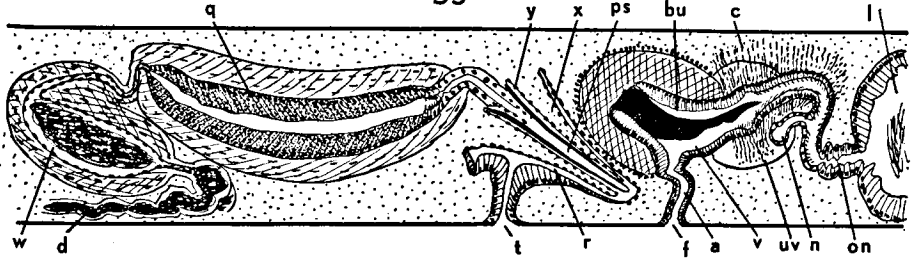
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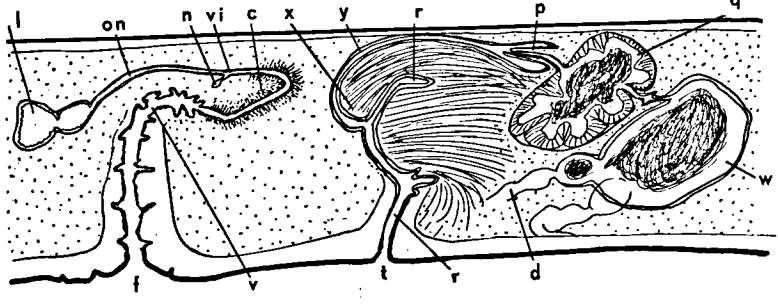
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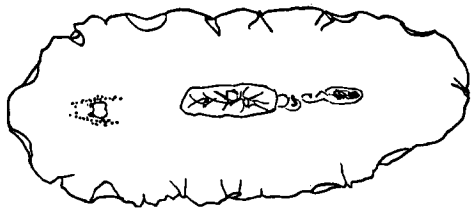

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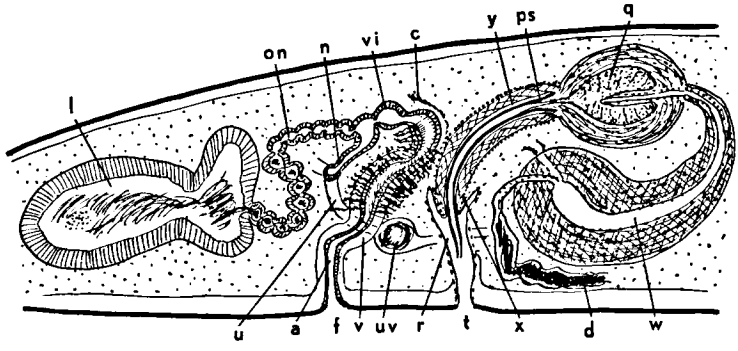

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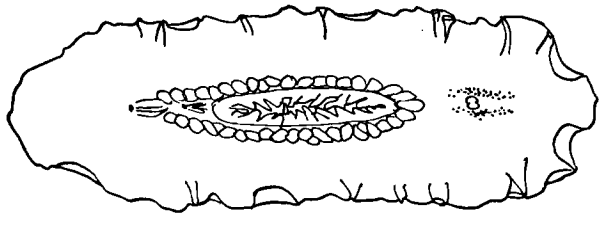

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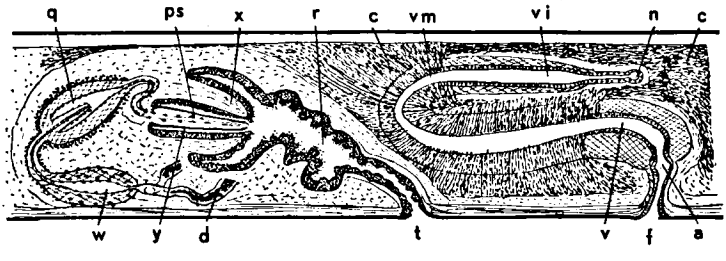

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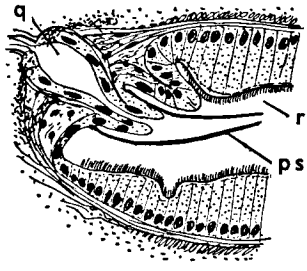
Fig. 37–38. *Notoplana annula*, spec. nov. – 37. Clarified worm. – 38. Combined section of reproductive organs. a – female antrum; c – cement glands; d – sperm ducts; f – female pore; l – Lang's vesicle; n – common uterine duct; on – duct of Lang's vesicle; ps – penial stylet; q – granule vesicle; r – male antrum; t – male pore; u – uteri; uv – uterine vesicle; v – outer vagina; vi – inner vagina; w – seminal vesicle; x – penial sheath; y – penial pocket.

Fig. 39–40. *Notoplana queruca*, spec. nov. – 39. Clarified worm. – 40. Combined section of genital region. a – female antrum; c – cement glands; d – sperm ducts; f – female pore; n – common uterine duct; ps – penial stylet; q – granule vesicle; r – male antrum; t – male pore; v – outer vagina; vi – inner vagina; vm – middle vagina; w – seminal vesicle; x – penial sheath; y – penial pocket.



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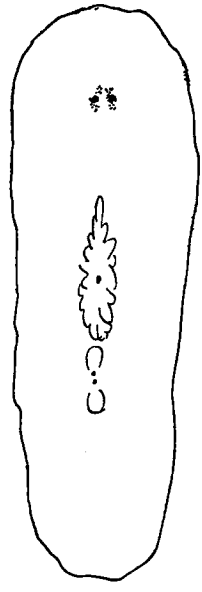

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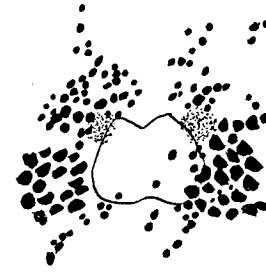

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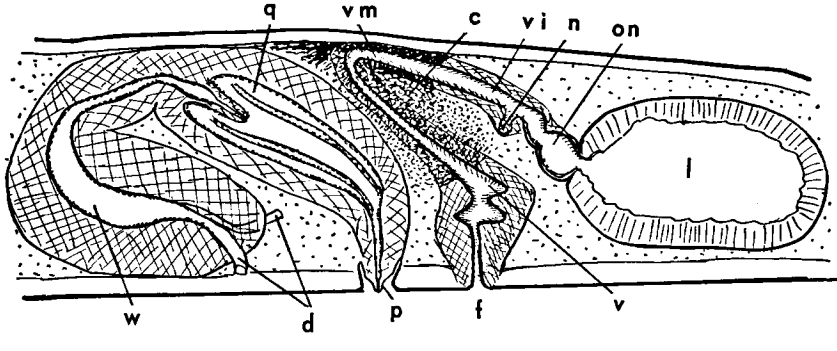

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Fig. 41. *Hoploplana divae* Marc., from São Paulo; male copulatory organ. ps – penial stylet; q – granule vesicle; r – male antrum.

Fig. 42–44. *Notoplana lapunda,* spec. nov. – 42. Clarified worm. – 43. Eyes. – 44. Combined section of reproductive organs. c – cement glands; d – sperm ducts; f – female pore; l – Lang's vesicle; n – common uterine duct; on – duct of Lang's vesicle; p – penial papilla; q – granule vesicle; v – outer vagina; vi – inner vagina; vm – middle vagina; w – seminal vesicle.

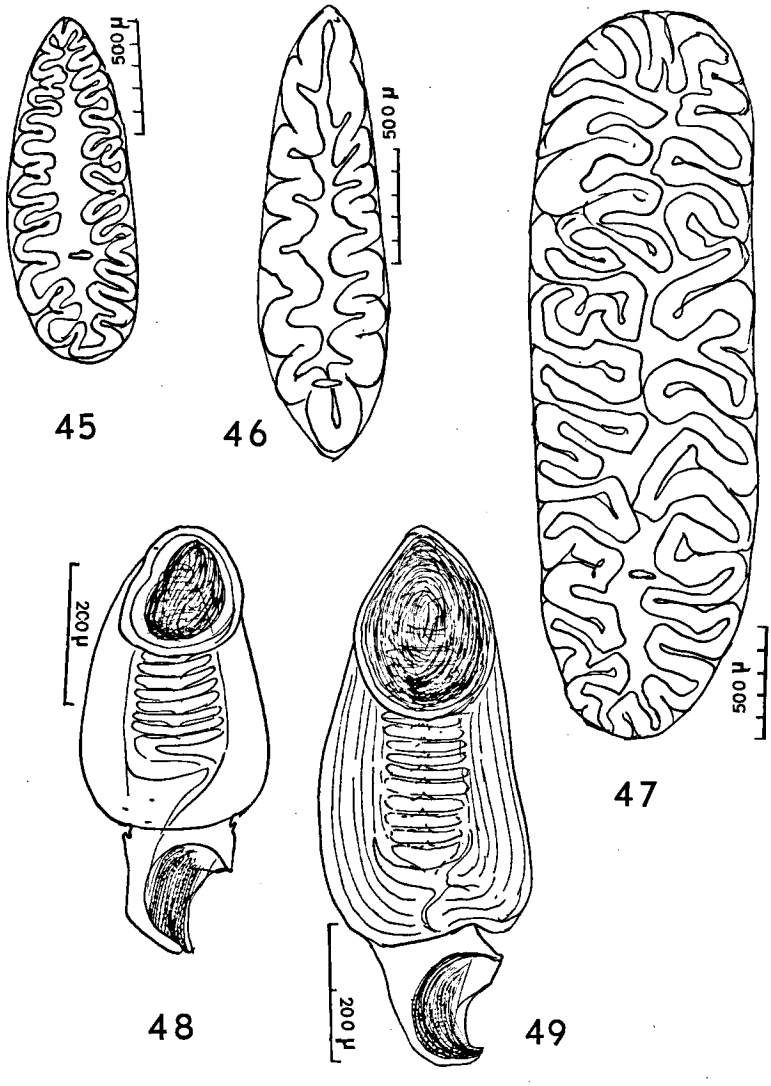
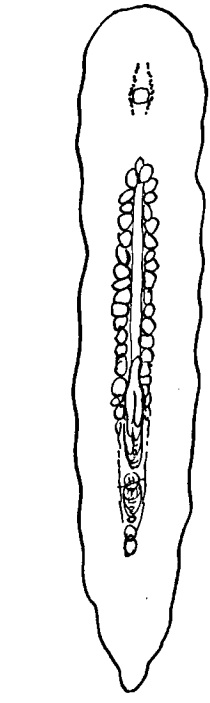
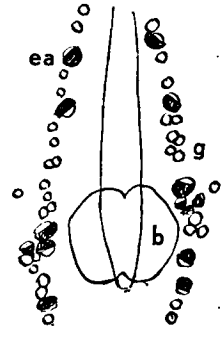


Fig. 45–49. *Gnesioceros sargassicola* (Graff). – 45. Pharynx of a 5.7 mm long pelagic specimen. – 46. Pharynx of an 8.4 mm long littoral specimen. – 47. Pharynx of a 9 mm long littoral specimen. – 48. Male efferent organs of a 5 mm long pelagic specimen. – 49. Male efferent organs of a 8.4 mm long littoral specimen.





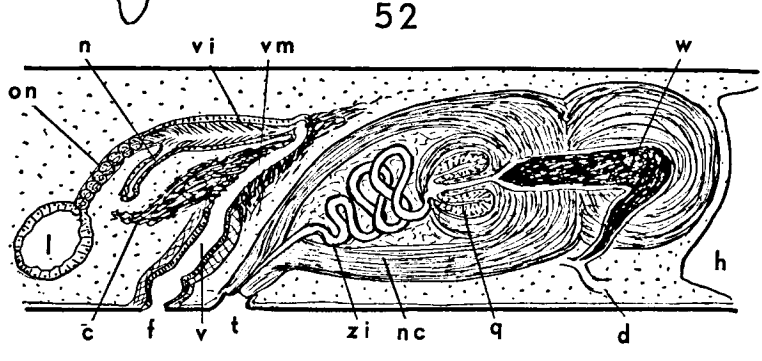


Fig. 50–52. *Amyris hummelincki*, gen. nov., spec. nov. – 50. Clarified worm. – 51. Eyes. – 52. Sagittal section of reproductive organs. b – brain; c – cement glands; d – sperm ducts; ea – tentacular eyes; f – female pore; g – cerebral eyes; h – pharynx; l – Lang's vesicle; n – common uterine duct; nc – sac of cirrus; on – duct of Lang's vesicle; q – granule vesicle; t – male pore; v – outer vagina; vi – inner vagina; vm – middle vagina; w – seminal vesicle; zi – cirrus.

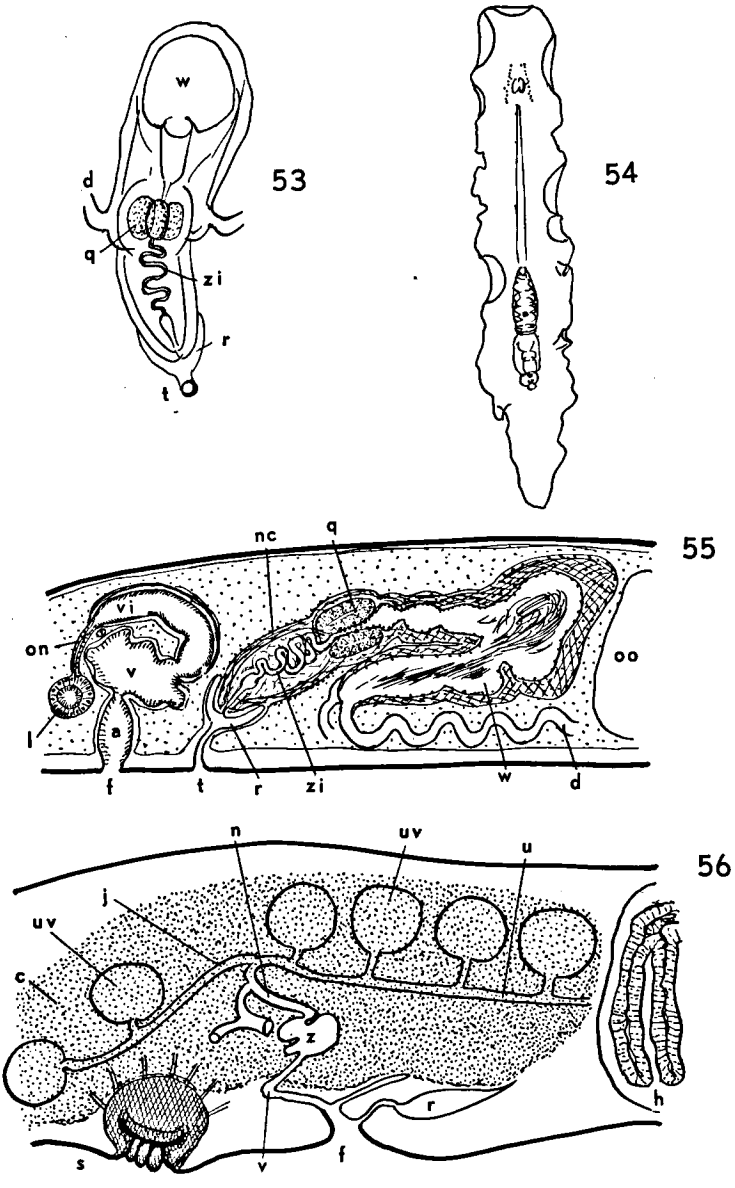


Fig. 53–55. *Amyris ujara*, spec. nov. – 53. Sketch of male organs in whole mount. – 54. Clarified worm. – 55. Sagittal section of reproductive organs. a – female antrum; d – sperm ducts; f – female pore; l – Lang's vesicle; on – duct of Lang's vesicle; oo – pharyngeal pocket; q – granule vesicle; r – male antrum; t – male pore; v – outer vagina; vi – inner vagina; w – seminal vesicle; zi – cirrus.

Fig. 56. *Pericelis orbicularis* (Schmarda); diagram of reproductive organs. c – cement glands; f – female pore; h – pharynx; j – posterior branch of uterus; n – common uterine duct; r – male antrum; s – sucker; u – uteri; uv – uterine vesicles; v – outer vagina; z – cement pouch.

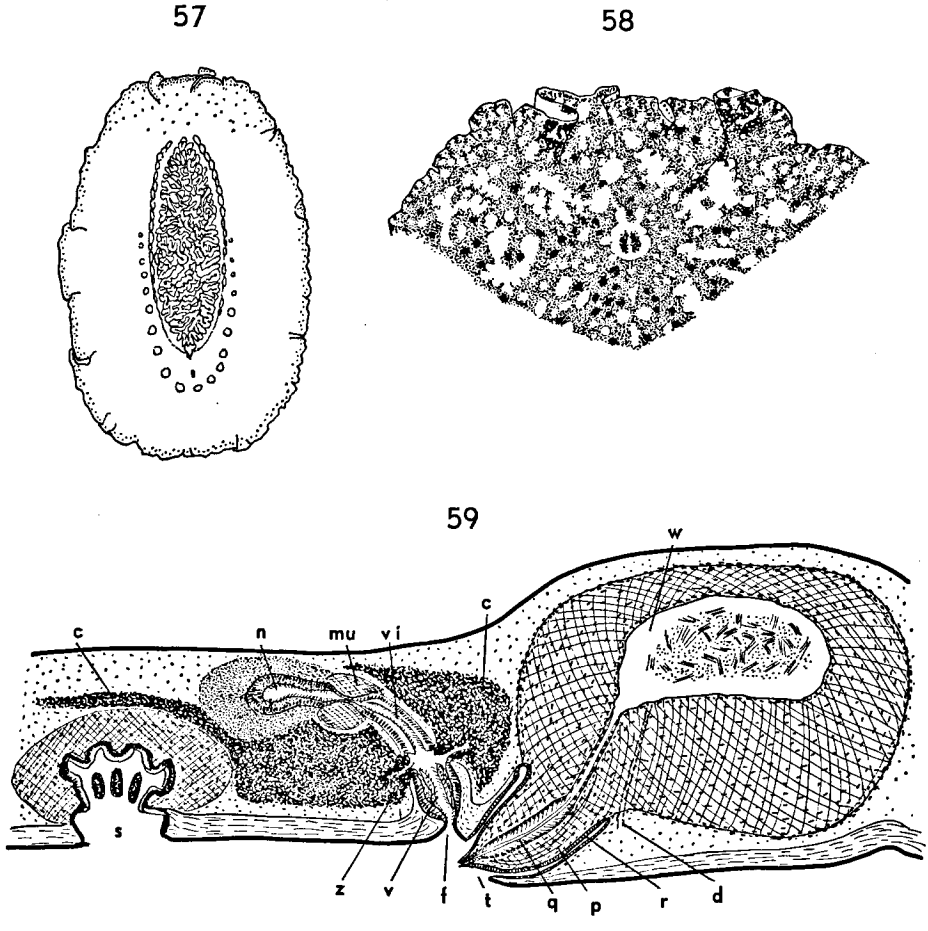


Fig. 57–59. *Pericelis cata*, spec. nov. – 57. Clarified worm. – 58. Colour pattern of fore end. – 59. Combined section of reproductive organs. c – cement glands; d – sperm ducts; f – female pore; mu – musculature; n – common uterine duct; p – penial papilla; q – granule vesicle; r – male antrum; s – sucker; t – male pore; v – outer vagina; vi – inner vagina; w – seminal vesicle; z – cement pouch.

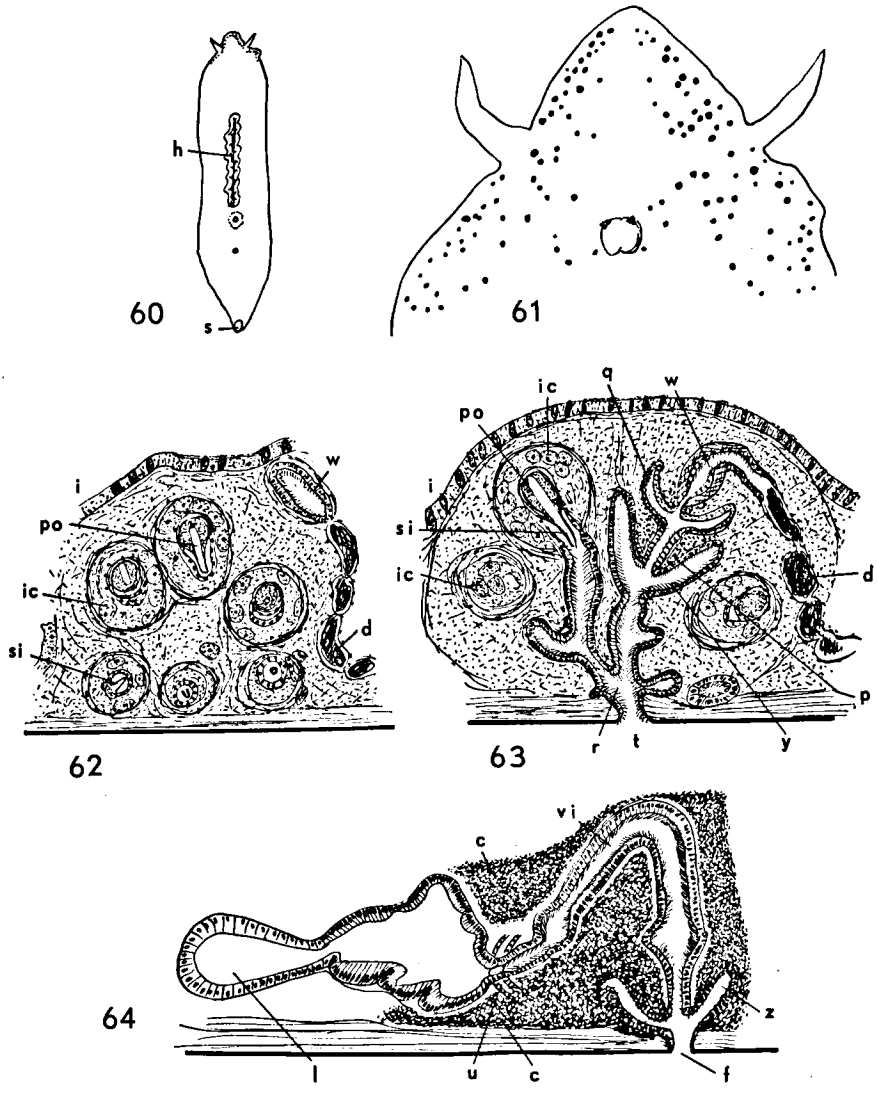


Fig. 60–64. *Boninia antillarum* (Hym.). – 60. Preserved worm. – 61. Fore end. – 62. Tangential section of male organ. – 63. Median section of same. – 64. Median section of female organs. c – cement glands; d – sperm ducts; f – female pore; h – pharynx; i – main intestine; ic – extra-capsular glands; l – Lang's vesicle; p - penial papilla; po – prostatoid; q – granule vesicle; r – male antrum; s – sucker; si – stylet of prostatoid; t – male pore; u – uteri; vi – inner vagina; w – seminal vesicle; y – penial pocket; z – cement pouch.

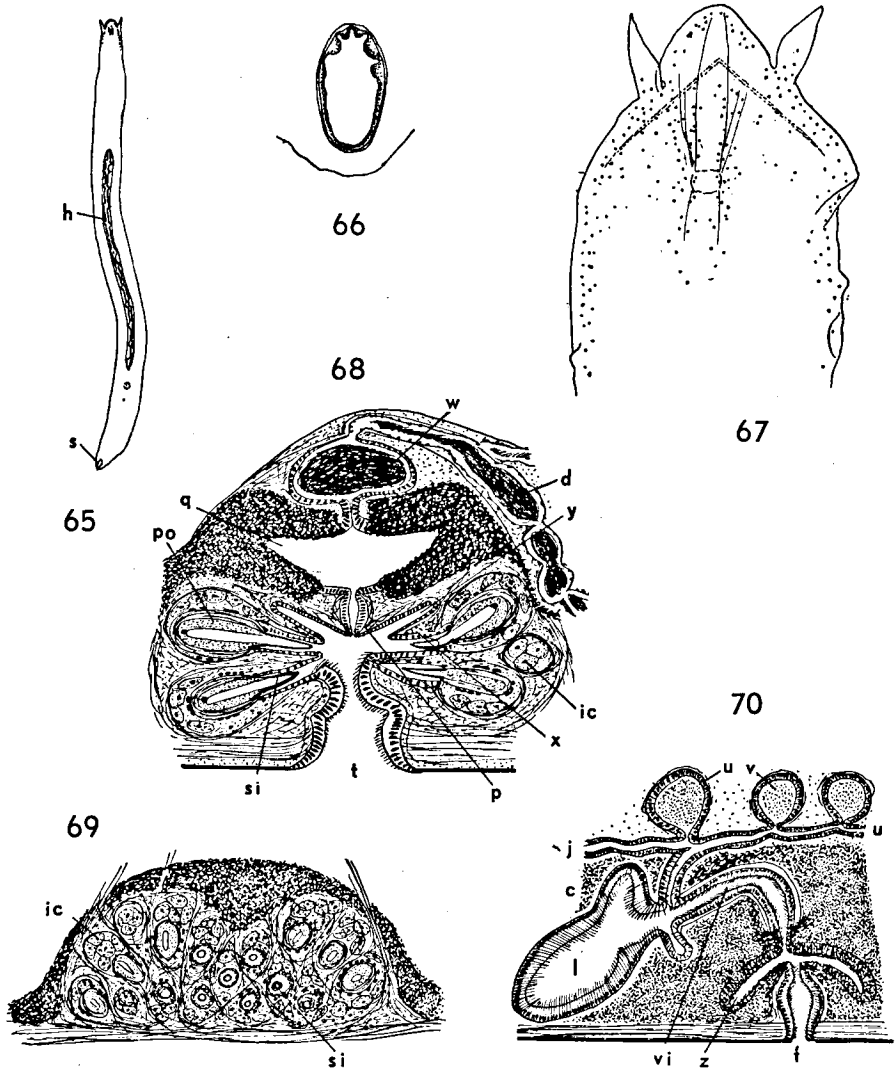


Fig. 65–70. *Boninia divae*, spec. nov. – 65. Whole worm. – 66. Sucker. – 67. Fore end. – 68. Median section of male organs. – 69. Tangential section of same. – 70. Combined section of female organs. c – cement glands; d – sperm ducts; f – female pore; h – pharynx; ic – extra-capsular glands; j – posterior branch of uterus; l – Lang's vesicle; p – penial papilla; po – prostatoid; q – granule vesicle; s – sucker; si – stylet of prostatoid; t – male pore; u - uteri; uv – uterine vesicles; vi – inner vagina; w – seminal vesicle; x – penial sheath; y – penial pocket; z – cement pouch.

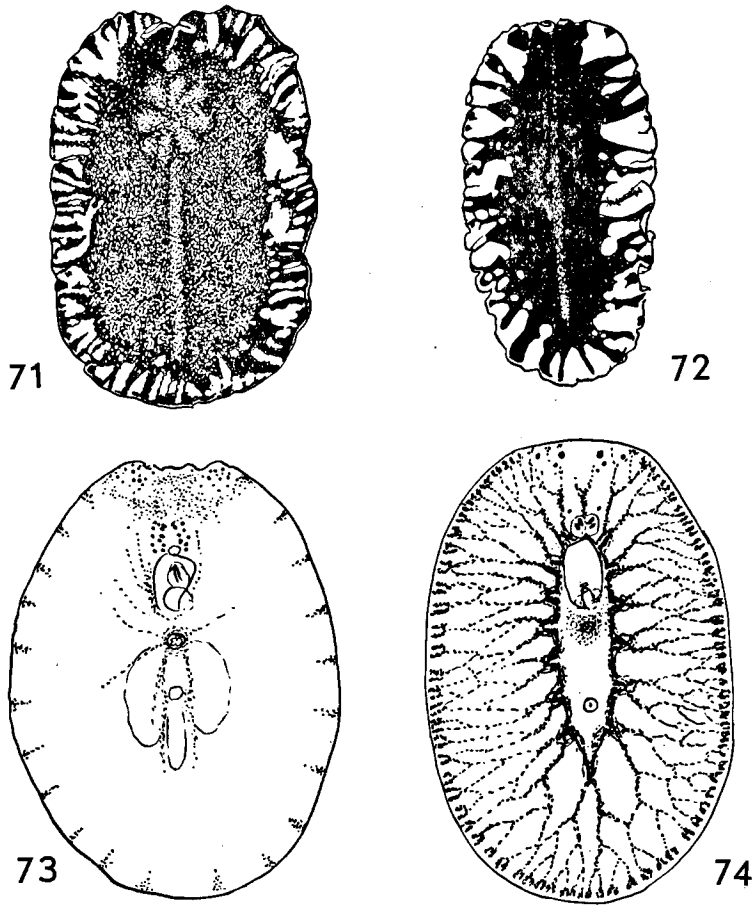
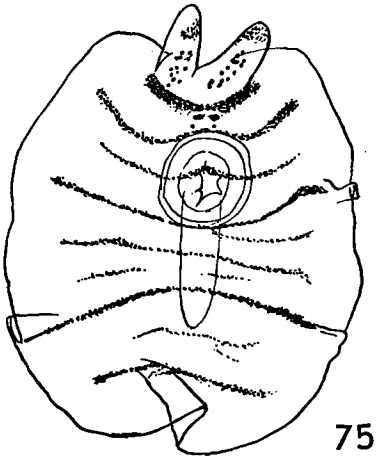


Fig. 71–72. *Pseudoceros bicolor* Verr. – 71. Colour pattern of 16 mm-worm. – 72. Same of 10 mm-worm.
Fig. 73. *Acerotisa piscatoria* Marc.; clarified worm.
Fig. 74. *Acerotisa bituna* Marc.; clarified worm.



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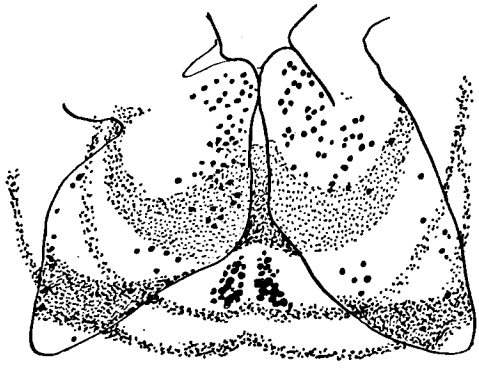

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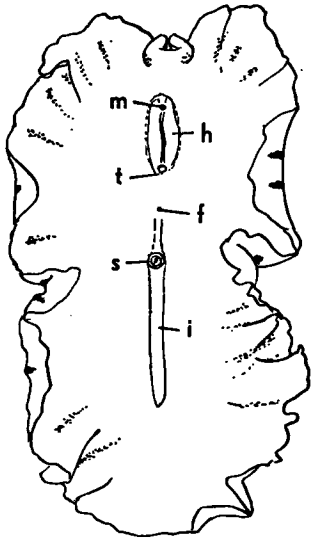

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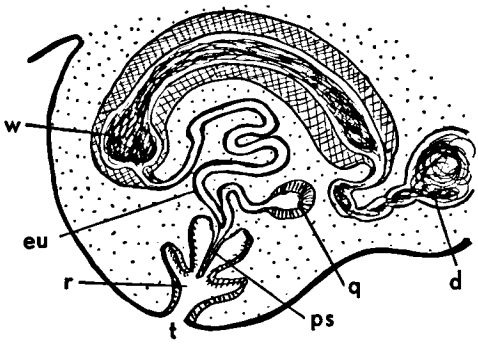

Fig. 75–77. *Pseudoceros crozieri* Hym. – 75. 2.6 mm long animal. – 76. Head of 10 mm-worm. – 77. Ventral view of 11 mm long worm. f – female pore; h – pharynx; i – main intestine; m – mouth; s – sucker; t – male pore.

Fig. 78. *Thysanozoon nigrum* Gir.; section of male copulatory organ. d – sperm duct; eu – ejaculatory duct; ps – penial stylet; q – granule vesicle; r – male antrum; t – male pore; w – seminal vesicle.

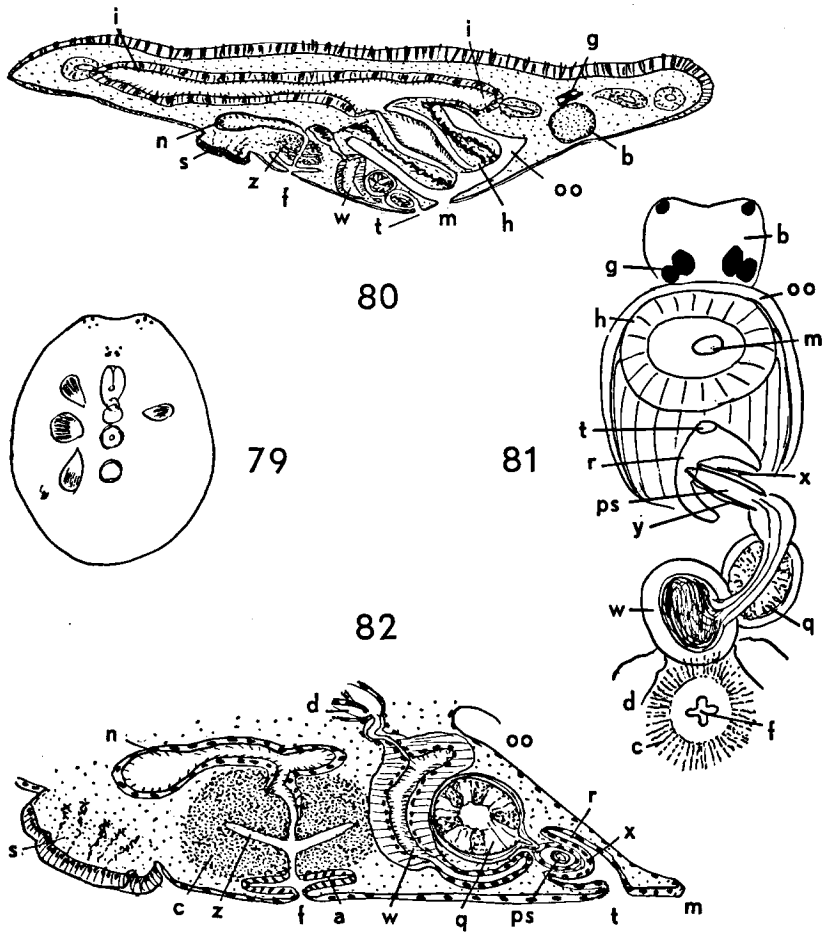

Fig. 79–82. *Acerotisa notulata* (Bosc). – 79. Clarified worm. – 80. Sagittal section of worm. – 81. Central region of clarified worm. – 82. Section of reproductive organs. a – female antrum; b – brain; c – cement glands; f – female pore; g – cerebral eyes; h – pharynx; i – main intestine; m – mouth; n – common uterine duct; oo – pharyngeal pocket; ps – penial stylet; q – granule vesicle; r – male antrum; s – sucker; t – male pore; w – seminal vesicle; x – penial sheath; y – penial pocket; z – cement pouch.

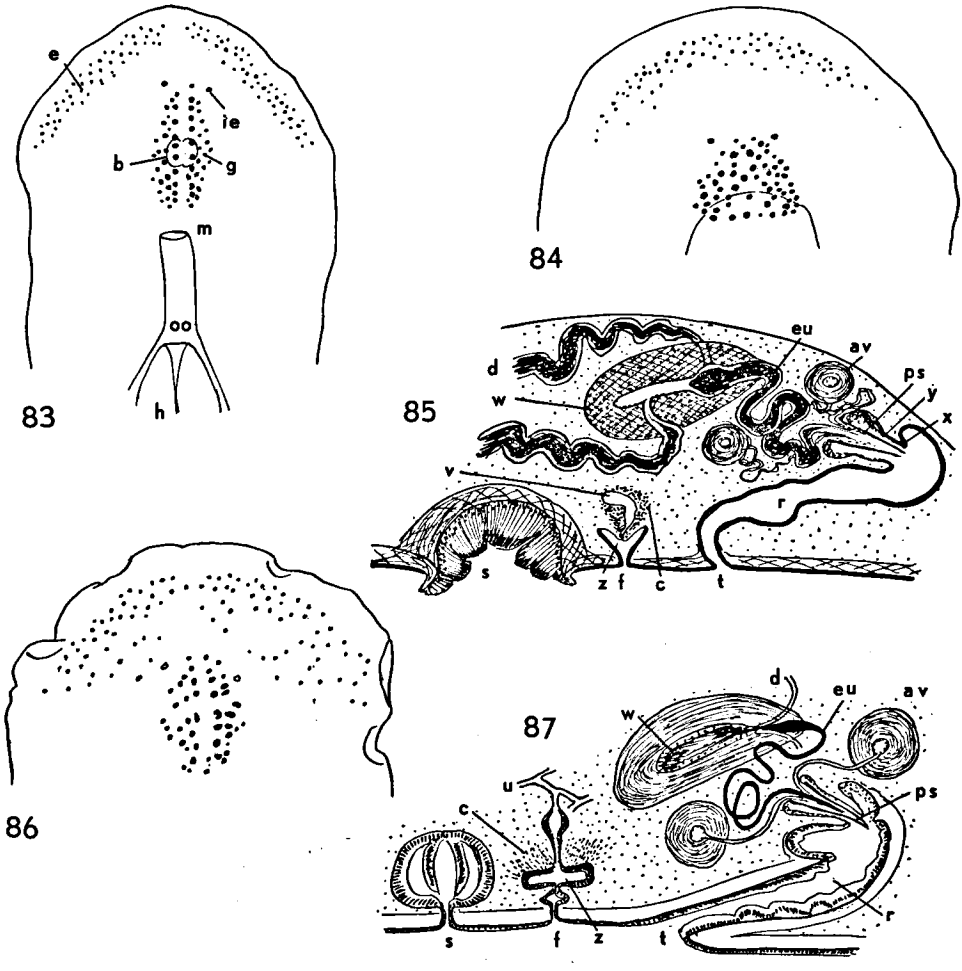

Fig. 83 and 85. *Prosthiostomum cyclops* (Verr.). – 83. Anterior end of clarified worm with pharynx in regeneration. – 85. Combined section of copulatory organs.

Fig. 84. *Prosthiostomum pulchrum* Bock; fore end with eyes.

Fig. 86–87. *Prosthiostomum milcum*, spec. nov. – 86. Fore end of clarified worm. – 87. Combined section of reproductive organs. av – accessory vesicles; b – brain; c – cement glands; d – sperm ducts; e – marginal eyes; eu – ejaculatory duct; f – female pore; g – cerebral eyes; h – pharynx; ie – ventral eyes; m – mouth; oo – pharyngeal pocket; ps – penial stylet; r – male antrum; s – sucker; t – male pore; u – uteri; v – vagina; w – seminal vesicle; x – penial sheath; z – cement pouch.

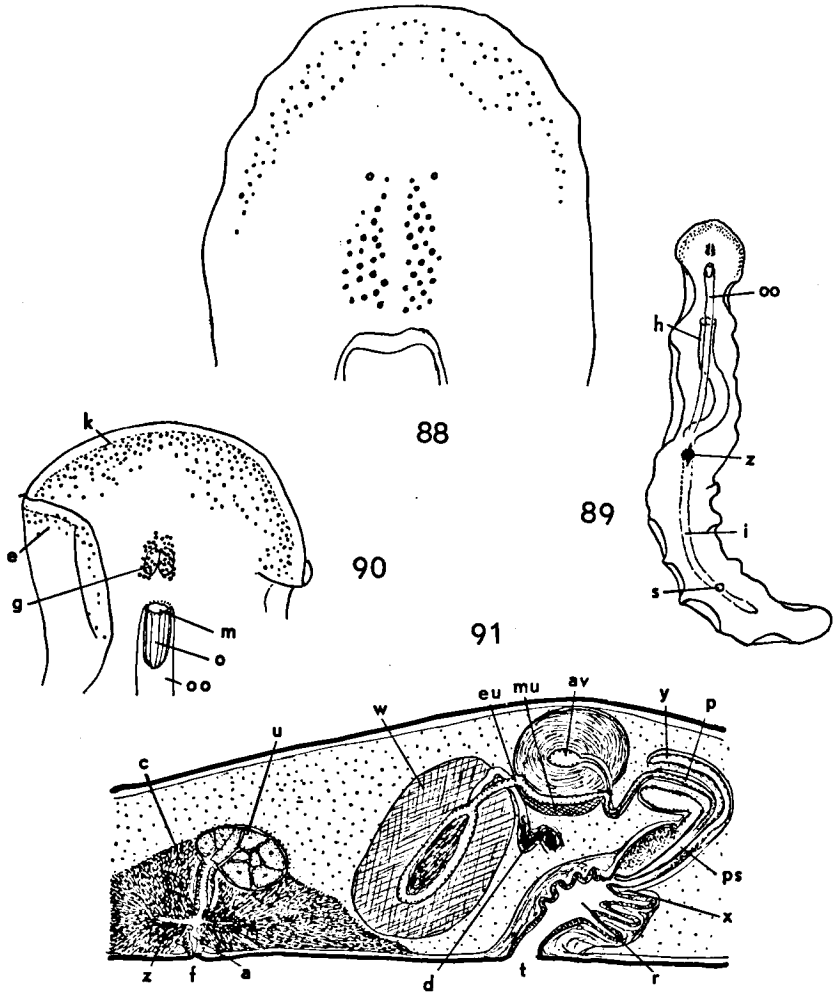

Fig. 88. *Lurymare matarazzoi* Marc. Fore end with eyes.

Fig. 89–90. *Euprosthiostomum pakium*, spec. nov. – 89. Clarified worm. – 90. Fore end of same. e – marginal eyes; g – cerebral eyes; h – pharynx; i – main intestine; k – sensorial furrow; m – mouth; o – oral tube; oo – pharyngeal pocket; s – sucker; z – cement pouch.

Fig. 91. *Enchiridium evelinae* Marc.; combined section of reproductive organs; only one of the accessory vesicles (av) is drawn. a – female antrum; av – accessory vesicle; c – cement glands; d – sperm duct; eu – ejaculatory duct; f – female pore; mu – musculature; p – penial papilla; ps – penial stylet; r – male antrum; t – male pore; u – uteri; w – seminal vesicle; x – penial sheath; y – penial pocket; z – cement pouch.

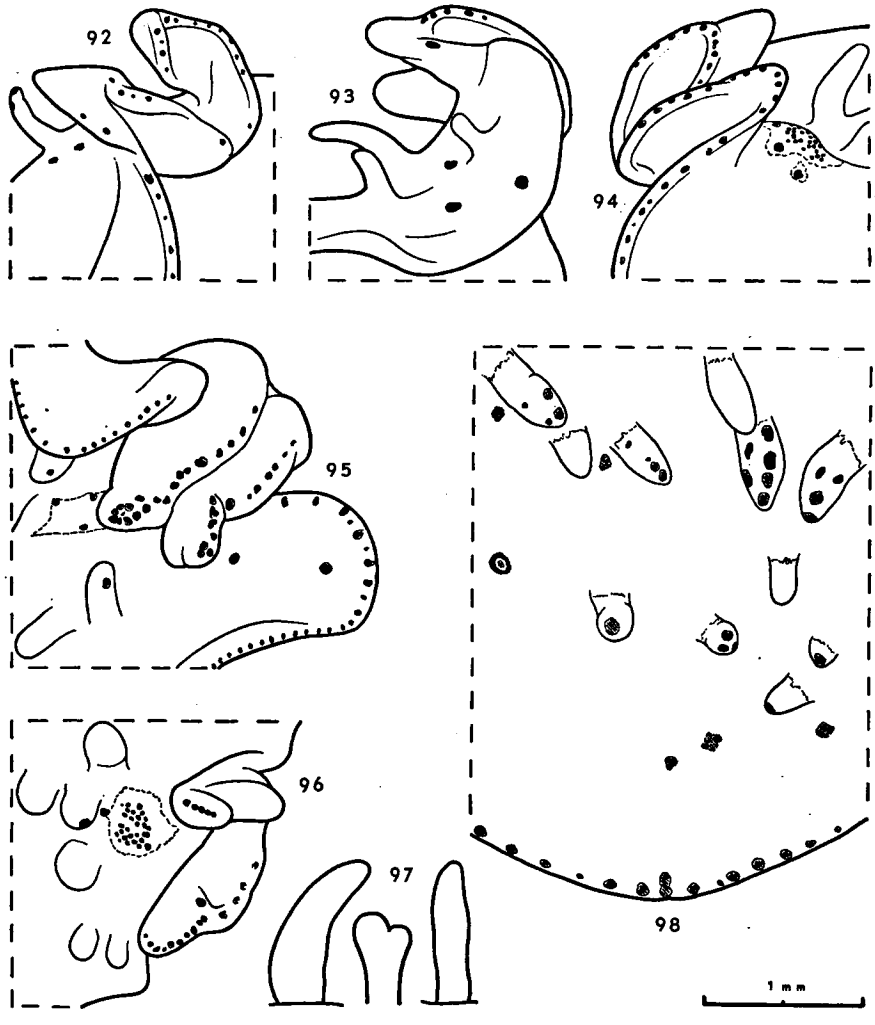

Fig. 92–98. *Thysanozoon nigrum* Girard. – 92–94. Head of same living specimen. – 95. Head somewhat raised. Some marginal dots are more or less oblong. – 96. Head seen from above. Heartshaped area not pigmented except for black granules. – 97. Dorsal papillae are always subconical, never flattened; once they were almost bifurcate. – 98. Distal end of large specimen: vague, creamy dots along outer margin; background at irregular places with vague cream-coloured spots; one very small dot in diffuse black circle. The cream-coloured agglomerates on the papillae clearly contrast with the black background; some papillae are completely black.

Fig. 99. Sketch map of the Caribbean, showing the following island-localities of Polycladida treated in this paper: Puerto Rico, St. Croix, St. Martin, St. Barts, St. Kitts, Barbuda, Antigua, Islote Aves, Grenada, Los Frailes, Bonaire, Curaçao, and Aruba.

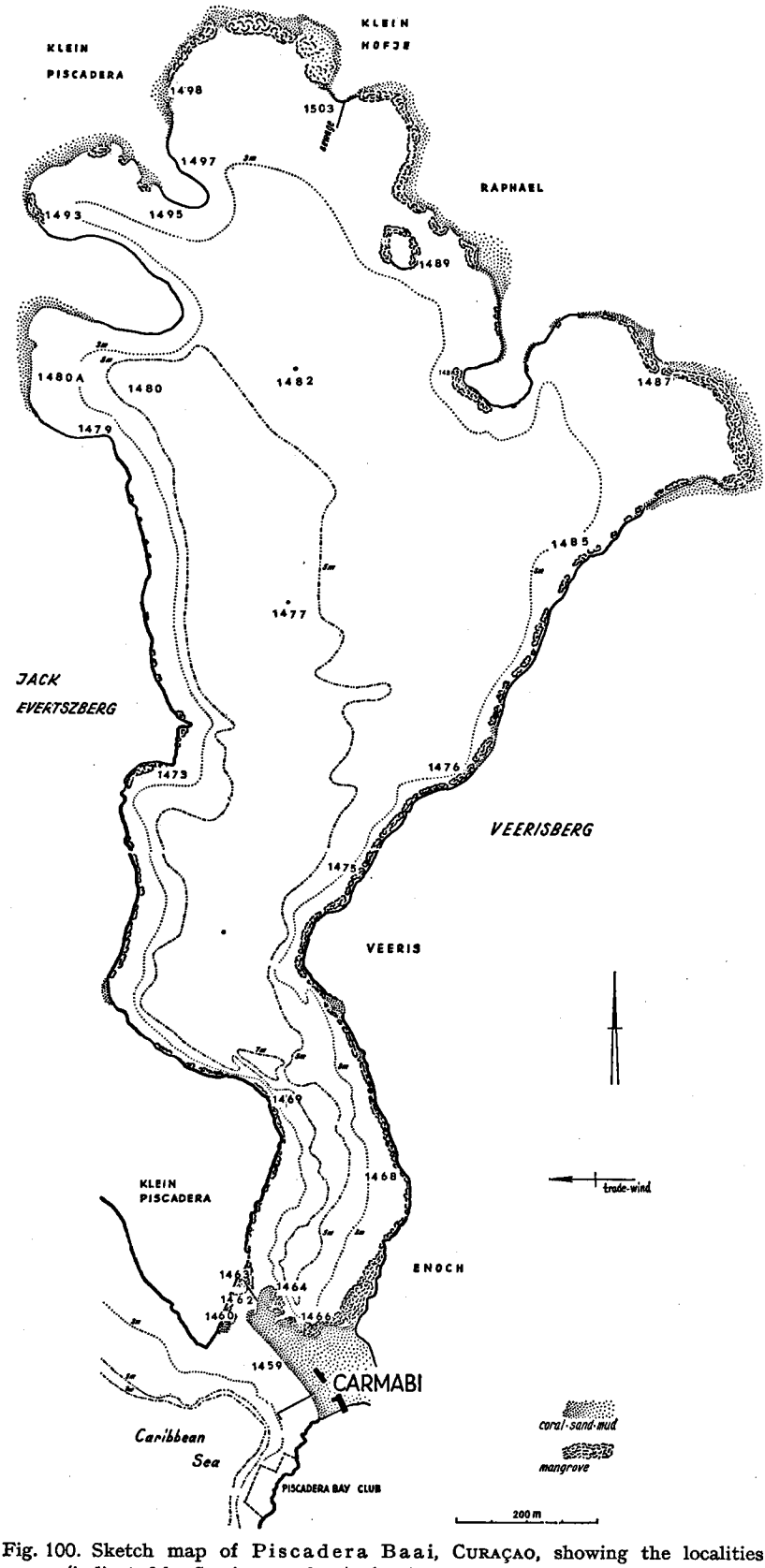

Fig. 100. Sketch map of Piscadera Baai, Curaçao, showing the localities (indicated by Station numbers) of Polycladida, treated in this paper.