STUDIES ON THE FAUNA OF CURAÇAO AND OTHER CARIBBEAN ISLANDS: No. 59.

SOME ASCIDIANS FROM THE CARIBBEAN

by

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This paper deals with a small collection of West Indian ascidians (class Ascidiacea: sub-phylum Tunicata) made by Dr. P. WAGENAAR HUMMELINCK in 1930, 1948/49, and 1955, to which several specimens taken by Dr. J. H. STOCK in 1958/59 were added. The material collected by Dr. HUMMELINCK (indicated with Station number) has been deposited in the State Museum, Leiden, and that collected by Dr. STOCK in the Zoölogisch Museum, Amsterdam.

TRAUSTEDT (1882, 1883), SLUITER (1898), and VAN NAME (1902, 1921, 1924, 1945) have already described ascidians from the West Indies, and the following 24 species have been recorded from the Netherlands Antilles, all from Curaçao.

**Aplidium bermudae* (Van Name)	VAN NAME, 1924, p. 25.
Didemnum vanderhorsti Van Name	VAN NAME, 1924, p. 25.
Didemnum conchyliatum (Sluiter)	SLUITER, 1898, p. 29; VAN NAME, 1924, p. 25 (as *D. candidum* Savigny).
Tridemnum solidum (Van Name)	VAN NAME, 1924, p. 25 (as *T. savignii* (Herdman)).
Tridemnum orbiculatum (Van Name)	VAN NAME, 1924, p. 25.
**Diplosoma macdonaldi* Herdman	VAN NAME, 1924, p. 26.
Lissoclinum fragile (Van Name)	VAN NAME, 1924, p. 26.
Eudistoma olivaceum (Van Name)	VAN NAME, 1924, p. 27.
Distaplia bermudensis Van Name	VAN NAME, 1924, p. 27.
Ascidia nigra (Savigny)	VAN NAME, 1924, p. 27.
Ascidia interrupta Heller	VAN NAME, 1924, p. 27.
Ascidia curvata (Traustedt)	VAN NAME, 1924, p. 27.
**Ascidia corelloides* (Van Name)	VAN NAME, 1924, p. 27.
Rhodosoma turcicum (Savigny)	VAN NAME, 1924, p. 29 (as *R. pellucidum* (Stimpson)).
**Corella minuta* Traustedt	VAN NAME, 1924, p. 29.

**Botryllus planus* (Van Name)	VAN NAME, 1924, p. 29.
**Polyandrocarpa sabanillae* Van Name	VAN NAME, 1924, p. 31.
**Polycarpa obtecta* Traustedt	SLUITER, 1898, p. 15 (as *Styela brevi-pedunculata*); VAN NAME, 1924, p. 31.
**Polycarpa circumarata* (Sluiter)	VAN NAME, 1924, p. 31.
**Styela partita* (Stimpson)	VAN NAME, 1924, p. 31.
Pyura vittata (Stimpson)	VAN NAME, 1924, p. 31.
Microcosmus exasperatus Heller	SLUITER, 1898, p. 26 (as *M. biconvolutus*); VAN NAME, 1924, p. 31.
Microcosmus helleri Herdman	VAN NAME, 1924, p. 31.
Molgula occidentalis Traustedt	VAN NAME, 1924, p. 32.

In the present collection 26 species were identified (Table 5). Nine species (indicated by an asterisk) from C. J. VAN DER HORST's collection, studied by VAN NAME, were not in the present material, while 5 species appeared to be new for Curaçao. One species, *Polycarpa crossogonima*, is described as new.

Family POLYCLINIDAE Verrill, 1871

Polyclinum constellatum Savigny

CURAÇAO. Spaanse Baai, sta. 1037A, 21.IV.1949; on *Rhizophora*, sandy beach, tidal and lower zone; 1 colony, doubtful.
BONAIRE. Lagoen, sta. 1070A, 2.XI.1930; on *Rhizophora*, muddy sand, low tide and lower zone; 1 colony.
ST. MARTIN. Great Bay, sta. 1128Aa, 24.VI.1955; on wooden wreck, sandy beach, about 1 m deep; 3 colonies.
JAMAICA. Kingston Harbour, Myrtle Bank Hotel landing, sta. 1148, 15.VIII. 1949; wooden and concrete piles, mud, tidal and lower zone; 2 colonies.

The specimens show the branched cloacal canals which radiate from each common cloacal opening and form a characteristic pattern on the surface of the colony.

Family DIDEMNIDAE Giard, 1872

Didemnum vanderhorsti Van Name

CURAÇAO. St. Joris Baai, 30.XI.1959; on mangrove roots (coll. J. H.Stock).

Didemnum conchyliatum (Sluiter)

CURAÇAO. Piscadera Baai, sta. 1028A, 2.II.1949; on *Rhizophora*, rock debris with soft, blackish mud; tidal and lower zone; several colonies. Piscadera Inner Bay, 6.X.1958; on mangrove roots (coll. J. H. Stock).

TABLE 5

List of species treated in this paper, with places where they were collected
(× new localities; + localities previously known; ? uncertain identifications)

Species	Lesser Antilles: mainland (S. Amer.)	Leeward Group: Aruba	Curaçao	Klein Bonaire	Bonaire	Windward Group: Trinidad	Aves Island	Antigua	Barbuda	St. Kitts	St. Martin	St. Croix	Jamaica (Gr. Ant.)	Bimini (Bahamas)	Habitat: tidal & lower zone, down to 1½ m (Rhiz. = *Rhizophora*, mangroves)
Polyclinum constellatum			?		×						×		+		on Rhiz., timber and concrete, in mud and sand
Didemnum vanderhorsti			+												on Rhiz.
Didemnum conchyliatum			+												on Rhiz., in mud
Tridemnum solidum			+												on Rhiz., in sand; sandy reef at 3 m
Tridemnum orbiculatum			?												on Rhiz., in sandy mud
Lissoclinum fragile			+												on Rhiz., in sand
Eudistoma olivaceum			+		×						×	×		×	on Rhiz. and timber, in sandy mud and sand
Eudistoma clarum?					×										on Rhiz., in sandy mud
Distaplia bermudensis			×												on Rhiz., in sand
Clavelina oblonga			×												on Rhiz.?
Perophora bermudensis	×	?		?	×		×	?	?	×		×			among Rhiz. and rock debris, on mud and sand, tidal pools
Ecteinascidia turbinata		×									×	×			on Rhiz. and timber, in mud and sand
Ecteinascidia conklini			×		×				×		×				among Rhiz. and Halimeda, on mud and muddy sand
Ecteinascidia tortugensis					×	×				×				×	among Rhiz., on sandy mud; in cave
Ascidia nigra			+												among Rhiz. and rock debris, on sand and mud; sandy coral debris, 3 m
Ascidia interrupta		×	+												on Rhiz., in mud; sandy coral debris, 2–3 m
Ascidia curvata		×			×										on Rhiz., in mud; sandy reef debris, 1½–2 m
Rhodosoma turcicum			+												
Botrylloides nigrum					×						?				among Rhiz., on mud and sandy mud
Symplegma viride			×												on Rhiz., in sandy mud
Polycarpa crossogonima					×						×				among reef debris, on sand and muddy sand
Polycarpa cartilaginea			×												
Pyura vittata			+	×	×										on Rhiz. and reef debris, in muddy sand and sand, on wire fence and buoy; on dead Gorgonia
Microcosmus exasperatus			+												on Rhiz., in mud and sand; rock debris, 3 m
Microcosmus helleri			+												on Rhiz. and among rock debris, in mud and sandy mud
Molgula occidentalis	×		+		×										among Rhiz. and rock debris, on sandy mud

Table 6

List of localities and species

Localities \ Species	*Polyclinum constellatum*	*Didemnum vanderhorsti*	*Didemnum conchyliatum*	*Trididemnum solidum*	*Trididemnum orbiculatum*	*Lissoclinum fragile*	*Eudistoma olivaceum*	*Eudistoma clarum?*	*Distaplia bermudsnsis*	*Perophora bermudensis*	*Ecteinascidia turbinata*	*Ecteinascidia conklini*	*Ecteinascidia tortugensis*	*Ascidia nigra*	*Ascidia interrupta*	*Ascidia curvata*	*Botrylloides nigrum*	*Symplegma viride*	*Polycarpa crossogonima*	*Pyura vittata*	*Microcosmus exasperatus*	*Microcosmus helleri*	*Molgula occidentalis*	Habitat
Aruba																								
Bucuti (1003, 1006)										×														lagoon, reef flat
Spaans Lagoen (1008)										×	×				×	×								muddy lagoon, *Rhiz.*
Curaçao																								
Plaja Djerimi (1019)																				×				sandy bay, reef debris
Boca Lagoen (1020)															×									sandy bay, limestone
Piscadera, lagoon (1028)			×		×													×			×			muddy lagoon, *Rhiz.*
Piscadera, bay (1029)																				×				sandy bay, fence
Spaanse Water (1036)																						×		muddy lagoon, *Rhiz.*
Spaanse Baai (1037)	×			×		×	×		×					×						×	×			sandy lagoon, *Rhiz.*
Spaanse Lagune (1337)						×						×												muddy lagoon, *Rhiz.*
Fuik Baai (1038, 1039)														×						×		×	×	muddy lagoon, *Rhiz.*
St. Jorisbaai		×				×																		lagoon, *Rhiz.*
Bonaire																								
Klein Bonaire (1049)										×										×				sandy bay, reef debris
Roadstead (1053)																				×				deep water, buoy
Playa Lechi (1056)										×														sandy bay, beach rock
Lac, Poejito (1064)							×	×		×		×	×				×						×	muddy lagoon, *Rhiz.*
Lac (1065)												×												lagoon, *Halimeda* flat
Lac, Boca (1068)																×			×	×				sandy reef
Lagoen (1070)	×						×			×														lagoon, *Rhiz.*
Trinidad																								
Gasparo Grande, cave (655)													×											dark cave (11½ g Cl/l)
Aves																								
Islote Aves (1114)										×														sandy lagoon, beach rock
Antigua																								
Deep Bay (1393)										×														rocky bay, boulders
Barbuda																								
Great Lagoon (1396)										×		×												sandy lagoon, *Rhiz.*
St. Kitts																								
Frigate Bay (1397)										×														rocky bay, boulders
St. Martin																								
Great Bay (1127)																			×					sandy bay, boulders
Great Bay (1128)	×										×													sandy bay, wreck
Simson Bay (1130)											×													lagoon outlet, piling
Simson Lagoon (1131)											×	×												sandy lagoon, *Rhiz.*
Flamingo Pond (1132)							×				×	×					×							muddy lagoon, *Rhiz.*
St. Croix																								
Krausse Lagoon (1404)							×			×	×													sandy lagoon, *Rhiz.*
Krausse Lagoon (1406)										×			×											muddy lagoon, *Rhiz.*
Jamaica																								
Kingston Harbour (1148)	×																							muddy lagoon, piling
Bimini																								
South Bimini (1150)													×											muddy lagoon, *Rhiz.*
North Bimini (1151)							×																	sandy lagoon, piling

The number of Atlantic American species of *Didemnum* and their diagnostic characters are not yet certain. VAN NAME (1945) recognised two species in the West Indian region: *D. vanderhorsti* Van Name and *D. candidum* Savigny. *D. vanderhorsti*, characterised by its brown colour and by the scarcity and very small size of its spicules, has been noted above in the present collection. Under the name *D. candidum* VAN NAME grouped many specimens showing a rather wide variety of characters (see VAN NAME, 1945, p. 83–89). The colonies in the present collection from sta. 1028A agree in most respects with VAN NAME's account of specimens which he assigned to *D. candidum*, but show two interesting features: (1) the testis is divided into two follicles; (2) the larva has three anterior papillae.

Some colonies examined by VAN NAME also had two follicles, but most had only one. The larva was not described by him, but CARLISLE (1954), who examined material from SAVIGNY's type locality (the Red Sea), found two papillae to be characteristic of *D. candidum*, and I have found Scottish specimens, identified as the synonym *D. maculosum* (Milne Edwards) (MILLAR, 1949), also to have two papillae. The specimens from sta. 1028A therefore cannot be *D. candidum*.

By courtesy of the American Museum of Natural History I have examined material from Florida identified by VAN NAME as *D. candidum*. Amongst this material were two colonies containing many fully developed larvae, all with three papillae, and zooids with a single testis follicle. These specimens therefore cannot be *D. candidum*. There were also colonies with two follicles, and containing no larvae; these colonies were in other respects, including the spicules, indistinguishable from those with one follicle. The colonies with two follicles appear to represent the same species as the specimens from sta. 1028A. It is evident that much of the West Indian material does not belong to *D. candidum*, as was hitherto thought, and that this species must now be regarded as of doubtful occurrence in the region.

SLUITER (1898) described *D. conchyliatum* (Sluiter) from the West Indies, and through the courtesy of the Zoölogisch Museum, Amsterdam, I have examined SLUITER's type specimens from Curaçao. These are very like the specimens from sta. 1028A in external

appearance. Other characters, although obscured by the state of preservation of the type material, are shown on Table 7, which also summarises data from the other material examined.

TABLE 7

Some characters in Didemnum

	Curaçao sta. 1028A	Amer. Mus. group *a*	Nat. Hist. group *b*	*D. conchyliatum* Sluiter's types	*D. candidum* Carlisle 1954	*D. candidum* Millar 1949
Diameter of large spicules (μ)	20	26	37	45	45	25
Testis follicles	2	2	1	apparently 1	1	1
Coils of sperm duct	6–7	7–8	7–9	6–7	7–10	8–10
Length of larval trunk (mm)	0.77	?	0.40–0.46	0.43–0.50	0.23	0.35
No. of larval papillae	3	?	3	3	2	2

It appears that some of the specimens from the American Museum of Natural History (designated group *b* in Table 7) represent *D. conchyliatum* (Sluiter). The specimens in group *a*, and the new material from sta. 1028A may belong to the same species if it is a rather variable one, or may represent a different and unidentified species, but not *D. candidum*.

Tridemnum solidum (Van Name)

CURAÇAO. Spaanse Baai, sta. 1037A, 21.IV.1949; sandy beach with *Rhizophora*, lower zone; 2 colonies. — Valentijn Baai, reefs, about 3 m deep (coll. J. H. Stock).

These specimens appear to belong to the species assigned by VAN NAME (1921, 1945) to *T. savignii* (Herdman). But the locality of the type specimen of *T. savignii* was doubtful, according to HERDMAN (1886) who stated that it was probably off Cape of Good Hope, South Africa. VAN NAME (1945), however, thought it likely that the type locality was Bermuda, because of (1) the resemblance between HERDMAN's description and the specimens which VAN NAME

examined, and (2) the fact that the 'Challenger' expedition made collections from Bermuda. These do not seem strong enough reasons for assigning West Indian specimens to *T. savignii*, since, although they resemble HERDMAN's species, good diagnostic characters are lacking. Moreover, VAN NAME (1902, 1945) has described *T. solidum*, a species from Bermuda and the West Indies regarding which he admits (1945, p. 103) "I am far from satisfied in regard to the validity of this species; perhaps the specimens on which it is based may be old colonies of *T. savignii* which are no longer in an actively growing condition." There is insufficient reason for separating *T. solidum* from West Indian specimens assigned to *T. savignii*, and I consequently suggest that *T. solidum* (Van Name) be the name used for all the West Indian specimens hitherto called *T. savignii*, together with those separated as *T. solidum*.

Tridemnum orbiculatum (Van Name)

CURAÇAO. Piscadera Inner Bay, 6.X.1958, on mangrove roots (coll. J. H. Stock). Doubtful.

Identification is doubtful because the spicules are small (about 20 μ in diameter) and irregular, compared with the regular stellate spicules of 35–40 μ described by VAN NAME (1945). Also the testis of *T. orbiculatum* is of unknown form; in the present specimens it consists of two follicles and a spiral duct having 7 coils.

Lissoclinum fragile (Van Name)

CURAÇAO. Spaanse Baai, sta. 1037A, 21.IV.1949; on *Rhizophora*, sandy beach, low-tide zone; 1 colony. Spaanse Baai, Kabrietenberg lagoon, sta. 1337a, 6.VIII.1955; on *Rhiz.* in muddy lagoon, about 1 m deep; 1 colony. — St. Joris Baai, 30.XI.1959; on mangrove roots (coll. J. H. Stock).

The colonies are typical of the species, except that they are less fragile than VAN NAME (1945) found living specimens to be.

Family CLAVELINIDAE Forbes & Hanley, 1848

Eudistoma olivaceum (Van Name)

CURAÇAO. Spaanse Baai, sta. 1037A, 21.IV.1949; on *Rhizophora*, sandy beach, about ½ m deep; 1 colony. No. data; 1949; 1 colony.
BONAIRE. Lac, Poejito, sta. 1064a, 18.XI.1930; on *Rhiz.*, in mud, tidal & lower zone; several colonies. Sta. 1064b, 17.IX.1948; same; several col. Sta. 1064c, 17.IV.1955; same; a few col. — Lagoen, sta. 1070A, 28.X. & 2.XI.1930; on *Rhiz.*, muddy sand, low-tide & lower zone; several colonies.

ST. MARTIN. Simson Bay Lagoon, Flamingo Pond, sta. 1132, 8.VI.1949; on *Rhiz.* and *Avicennia*, mud, tidal & lower zone; several colonies.
ST. CROIX. Near entrance of Krausse Lagoon, sta. 1404, 15.VI.1955; on *Rhiz.*, sandy mud, about ½ m deep; 1 colony.
BIMINI. North Bimini, Laboratory Dock, sta. 1151, 20.VIII.1949; wooden piles in sandy mud, low-tide zone; 1 colony.

In some specimens the heads are almost finger-shaped, and therefore longer and narrower than those described by VAN NAME (1945). They are, however, typical in other respects.

Eudistoma clarum (Van Name)

BONAIRE. Lac, Poejito, sta. 1064a, 18.XI.1930; on *Rhizophora* in muddy lagoon, low-tide & lower zone; 2 pieces. Doubtful.

The specimens, which are too small to allow certain identification, appear to agree better with *E. clarum* than with *E. olivaceum*, particularly in the colourless test and the absence of a peduncle.

Distaplia bermudensis Van Name

CURAÇAO. Spaanse Baai, sta. 1037A, 21.IV.1949; on *Rhizophora*, sandy beach about 1 m deep; 1 colony.

Clavelina oblonga Herdman

CURAÇAO. No details available, I.1905; ? on mangrove roots; several colonies (coll. J. Boeke; Zoöl. Lab. Utrecht).

Family PEROPHORIDAE Giard, 1872

Perophora bermudensis Berrill

SOUTH AMERICAN MAINLAND (Colombia): Puerto López (La Goajira), sta. 1201, 28.I.1937; muddy lagoen with *Rhizophora*, tidal zone; 1 colony.
ARUBA. Lagoen Boekoeti (Bucuti Lagoon), sta. 1003, 18.VI.1930; rocky shore of lagoon with *Thalassia*, sandy mud; low-tide & lower zone; a few colonies. Doubtful. — Rif Boekoeti (Bucuti Reef), sta. 1006, 25.VI.1930; among reef debris with muddy sand, small pools, some *Thal.*; a few zooids. Doubtful. Sta. 1006a, 17.I.1949; same; a few zooids. Doubtful. — Spaans Lagoen, sta. 1008A, 1.I.1949; rocky shore of muddy lagoon, near *Rhiz.*, tidal & lower zone; a few zooids. Doubtful.
KLEIN BONAIRE. East coast at landing, sta. 1049B, 13.IX.1948; among reef debris on sandy beach, low-tide zone; a few zooids. Doubtful.
BONAIRE. Paloe Lechi (Playa Lechi), sta. 1056Ba, 27.II.1949; beach rock with tidal pools, low-tide zone; a few zooids. Doubtful. — Lac, Poejito, sta. 1064A, 12.X.1930; muddy lagoon near *Rhiz.*, about 1 m deep; a few colonies. Sta. 1064c, 17.IV.1955; muddy lagoon with *Rhiz.*; a few col. Lac, Cay, sta. 1066b, 19.III.

1937; shallow part of muddy lagoon with *Rhiz.* and *Avicennia*, tidal zone; several col. — Lagoen, sta. 1070c, 9.IV.1955; among *Rhiz.*, tidal zone; several col.

ISLOTE AVES. Northern lagoon, sta. 1114, 12.V.1949; among debris of beach rock on sandy shore, low-tide zone; a few zooids.

ANTIGUA. Deep Bay at Fort Barrington, sta. 1393, 17.VII.1955; among rock debris; 1 col. Doubtful.

BARBUDA. Lagoon S. of village, sta. 1396, 4.VII.1955; sandy shore, near *Rhiz.*, ½ m; 1 col. Doubtful.

ST. KITTS. Frigate Bay, sta. 1397, 20.VII.1955; between boulders on rocky shore, about 1 m; 1 col.

ST. CROIX. Near entrance of Krausse Lagoon, sta. 1404, 15.VI.1955; sandy mud with *Rhiz.*, about ½ m; 1 col. Krausse Lagoon, sta. 1406, 15.VI.1955; shallow lagoon with *Rhiz.*, soft mud; a few zooids.

Ecteinascidia turbinata Herdman

ARUBA. Spaans Lagoen (Spanish Lagoon), sta. 1008A, 1.I.1949; on *Rhizophora*, rocky shore of muddy lagoon, tidal & lower zone; several colonies.

ST. MARTIN. Great Bay, sta. 1128A, 26.V.1949; on wooden wreck on sandy beach, low-tide zone; 1 col. — Simson Bay Lagoon, outlet, sta. 1130, 27.V.1949; on piling in tidal flow from sandy lagoon, tidal & lower zone; 2 col. Simson Bay Lagoon, W. shore of Little Key, sta. 1131, 2.VIII.1949; muddy sand with *Rhiz.*, about ½ m; 1 col. Simson Bay, Flamingo Pond, sta. 1132, 8.VI.1949; *Rhiz.* and *Avicennia* in muddy lagoon, ½–1 m; several col.

ST. CROIX. Near entrance of Krausse Lagoon, sta. 1404, 15.VI.1955; sandy mud with *Rhiz.*, tidal & lower zone; several col. Entrance of Krausse Lagoon, sta. 1405, 15.VI.1955; among mangroves in tidal flow, muddy sand, about 1 m; 1 col.

Ecteinascidia conklini Berrill

CURAÇAO. Spaanse Baai, sta. 1337a, 6.VIII.1955; muddy *Rhizophora* lagoon, ½–1 m; several colonies.

BONAIRE. Lac, Poejito, sta. 1064b, 17.IX.1948; on *Rhiz.* in muddy lagoon, low-tide zone; 1 col. Lac, entrance to Poejito, sta. 1065, 17.IX.1948; mudflat with *Halimeda* and *Thalassia*, about ½ m; a few zooids. Lac, Cay, sta. 1066b, 19.III.1937, shallow part of muddy lagoon with *Rhiz.* and *Avicennia*, about ½ m; several col.

BARBUDA. Lagoon S. of village, sta. 1396, 4.VII.1955; among *Rhiz.*, muddy sand, about ½ m; 1 col.

ST. MARTIN. Simson Bay Lagoon, W. shore of Little Key, sta. 1131, 2.VIII.1949; muddy sand with *Rhiz.*, about ½ m; 1 col. Simson Bay Lagoon, Flamingo Pond, sta. 1132, 8.VI.1949; *Rhiz.* and *Avic.* in muddy lagoon, about ½ m; 1 col.

Ecteinascidia tortugensis Plough & Jones

BONAIRE. Lac, Poejito, sta. 1064, 12.X.1930; on *Rhizophora* in muddy lagoon, about ½ m; 1 colony. Sta. 1064c, 17.IV.1955; same; 1 col.

TRINIDAD. Gasparo Grande island, sta. 655, 11.I.1955; on wood decay in almost dark limestone cave, water containing 11460 mg Cl/l only, 1 m; 6 zooids.

ST. CROIX. Krausse Lagoon, sta. 1406, 15.VI.1955; among *Rhiz.* in shallow and muddy lagoon, ½ m; several zooids.

BIMINI. Northern lagoon of South Bimini, sta. 1150, 17.VIII.1949; on *Rhiz.*, mud, about ½ m. Doubtful. Sta. 1150A, 17.VIII.1949; same mangrove lagoon with sandy mud, 1 m; 2 zooids.

This species is readily distinguished by a number of characters (PLOUGH & JONES, 1939; VAN NAME, 1945), which are well shown by the present specimens. All the records in this collection represent an extension of the known range, as the species has hitherto been recorded only from the Tortugas, Florida.

Family ASCIDIIDAE Adams, 1858

Ascidia nigra (Savigny)

CURAÇAO. Spaanse Baai, sta. 1037A, 21.IV.1949; on *Rhizophora*, sandy beach, tidal & lower zone; 2 specimens. Spaanse Water, 1.I.1955, about 3 m deep; 1 spec. (coll. J. S. Zaneveld). — Fuik Baai, sta. 1038Aa, 17.IV.1949, among rock debris near *Rhiz.*, sandy mud, about 1 m; 1 spec. Fuik Baai, 1948; 2 spec. — Curaçao, 1949; 1 spec.

Ascidia interrupta Heller

ARUBA. Spaans Lagoen, sta. 1008A, 1.I.1949; on *Rhizophora* in muddy lagoon, about 1 m; 1 specimen.
CURAÇAO. Boca Lagoen, S. side, sta. 1020C, 27.XI.1948; rock debris on sand, 2–3 m; 1 spec.

Ascidia curvata (Traustedt)

ARUBA. Spaans Lagoen, sta. 1008A, 1.I.1949, on *Rhizophora* in muddy lagoon, tidal & lower zone; several specimens.
BONAIRE. Lac, Boca, behind reef, sta. 1068a, 1.X.1948; sandy reef debris, subject to continuous wave action, 1½–2 m; 1 spec.

In some of the present specimens the opening of the dorsal tubercle is C-shaped or U-shaped as described by VAN NAME (1945), but in others it is apparently reduced to a narrow longitudinal slit which may be scarcely visible.

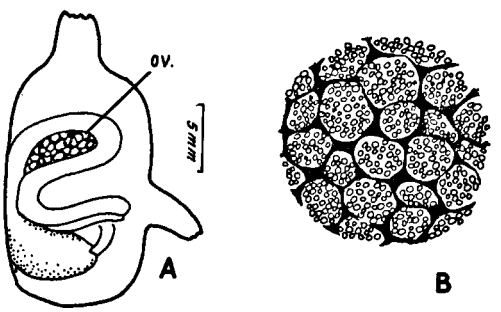

Fig. 54. *Ascidia curvata* (Traustedt). A, from the left, showing ovary (ov.). B, enlarged view of part of ovary, showing group of oocytes.

The surface of the ovary is divided into small regular dome-like swellings (Fig. 54), each with a number of oocytes.

Family RHODOSOMATIDAE Hartmeyer, 1908

Rhodosoma turcicum (Savigny)

CURAÇAO. No details available; 1949; 1 specimen.

Family STYELIDAE Sluiter, 1895

Botrylloides nigrum Herdman

BONAIRE. Lac, Poejito, sta. 1064, 12, 16 & 19.X.1930; on *Rhizophora* in muddy lagoon, tidal & lower zone; several colonies. Sta. 1064A, 12 & 19.X.1930; muddy lagoon, near *Rhiz.*, lower zone, 1–2 m; several col. Sta. 1064Ab, 17.IX.1948; same; several col.
ST. MARTIN. Simson Bay Lagoon, Flamingo Pond, sta. 1132, 8.VI.1949; *Rhiz.* and *Avicennia*, muddy lagoon, about ½ m; 1 col. Doubtful.

Symplegma viride Herdman

CURAÇAO. Piscadera Inner Bay, 6.X.1958; on mangrove roots (coll. J. H. Stock).

Polycarpa crossogonima sp. n.

BONAIRE. Lac, Boca, sta. 1068a, 1.X.1948; sandy reef with debris, subject to continuous wave action, about 1½ m deep; 1 specimen (holotype).
ST. MARTIN. Great Bay, N.E. shore, sta. 1127, 16.V.1949; among limestone debris with muddy sand, *Thalassia*, ½–1 m; 1 spec. (paratype).

Holotype. The specimen from Bonaire is 1.8 cm long and 1.8 cm tall, with a somewhat flattened base, where it is attached, and with the short stout siphons on the upper side (Fig. 55A). The body is dull greyish ochre in colour, marked with white where broken shell is adhering.

The test is semi-opaque, fairly soft, and of moderate thickness. The body wall is red-brown, not very thick, and sufficiently transparent to reveal the gonads. Muscles are rather poorly developed, and consist of circular muscles round the siphons and to some extent on the upper part of the body, and longitudinal muscles passing down the siphons and across the body. No endocarps are present on the inner surface of the body wall.

About 50 long slender oral tentacles, of alternating sizes, are present. The dorsal tubercle (Fig. 55B) has a C-shaped slit with the open interval forwards. The dorsal lamina is a tall transparent

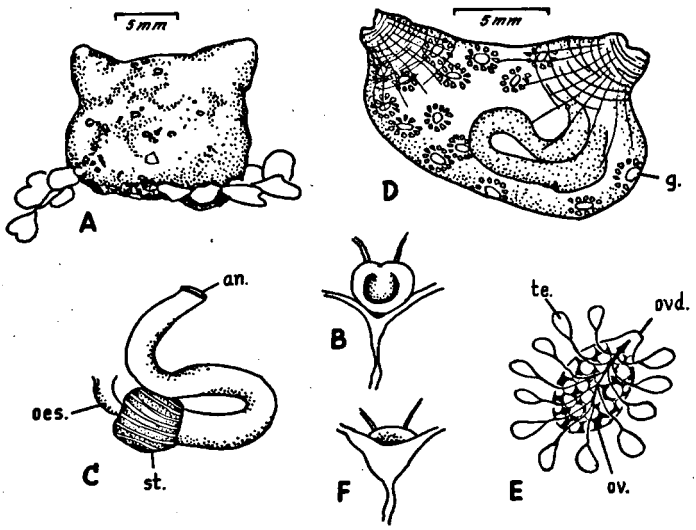

Fig. 55. *Polycarpa crossogonima* sp. n. A, holotype from the right. B, dorsal tubercle of holotype. C, gut of holotype, from left. D, holotype, with test removed, seen from left, to show gonads (g.). E, gonad (ov., ovary; ovd., oviduct; te., testis follicle). F, dorsal tubercle of paratype.

membrane with the free margin slightly rolled over, and the endostyle is also tall, narrow and prominent. The four well-developed curved branchial folds have the following arrangement of longitudinal bars:

dorsal line 1 (10) 3 (12) 3 (13) 3 (12) 4 endostyle.

The gut (Fig. 55 C) forms a compact mass in the posterior half of the body. It consists of the short slightly curved oesophagus, short wide barrel-shaped stomach with about 18 distinct folds and no pyloric caecum, the intestine which bends back on to the stomach, and the short curved rectum ending in a smooth-edged anus. Two narrow ligaments attach the stomach to the body wall.

One of the most distinctive features of the species is the form of the gonads (Fig. 55 D, E), which number 15 on the left and 24 on the right side of the holotype. Each gonad is small, and is circular or oval in outline. The ovoid or hemispherical ovary is surrounded by a fringe of about 12 small pear-shaped testis follicles which lie on the

surface of the body wall at a slight distance from the margin of the ovary. The slender individual sperm ducts unite on the upper, free surface of the ovary to form a short common sperm duct which projects slightly, above the short wide oviduct.

Paratype. The specimen from St. Martin measures about 1.0 cm long and 1.0 cm tall and is somewhat greyer than the holotype, with less distinct siphons. Some minor internal differences were found. The dorsal tubercle (Fig. 55 F) is somewhat indistinct, but appears to have a small simple opening partly hidden by the junction of the dorsal lamina and the peripharyngeal bands. The gonads number 14 on the left side and 22 on the right, but are structurally similar to those of the holotype.

The holotype has been deposited in the British Museum (Natural History), and has been given the registered number 1960.11.4.1. The paratype is in the State Museum, Leiden.

Polycarpa crossogonima is not only quite distinct from any species recorded in American waters, but is unlike all known species of *Polycarpa*, being distinguished by the peculiar form of the gonads. This is intermediate between the condition in *Polycarpa* and *Styela*, resembling *Styela* in the separation of testis follicles from ovary. It is, nevertheless, closer to form of gonad in *Polycarpa* and the new species is best placed in that genus.

Polycarpa cartilaginea (Sluiter)

CURAÇAO. No details available; 1949; 2 specimens.

The two specimens agree closely with the type specimen of *P. cartilaginea* (Sluiter). In particular the long narrow plicate stomach (Fig. 56 A) and the attachment of the gonads only by their base (Fig. 56 B) are notable similarities. These characters distinguish the species from *P. obtecta* Traustedt, which it otherwise resembles. VAN NAME (1945), however, considered *P. cartilaginea* as probably identical to *P. obtecta*, and also listed as likely synonyms the following species described by SLUITER (1898): *P. appropinquata*, *P. asiphonica*, *P. brevipedunculata*, *P. friabilis*, *P. fuliginea*, *P. insulsa*, *P. nivosa*, and *P. seminuda*.

I have been able to examine SLUITER's type specimens through the courtesy of Dr. J. H. STOCK and the Zoölogisch Museum, Amsterdam, and to compare them with specimens of *P. obtecta* from the Dry Tortugas, kindly supplied by the British Museum (Natural History). It appears that the following species should be recognised, and that they can be distinguished as shown in Table 8 and Fig. 56.

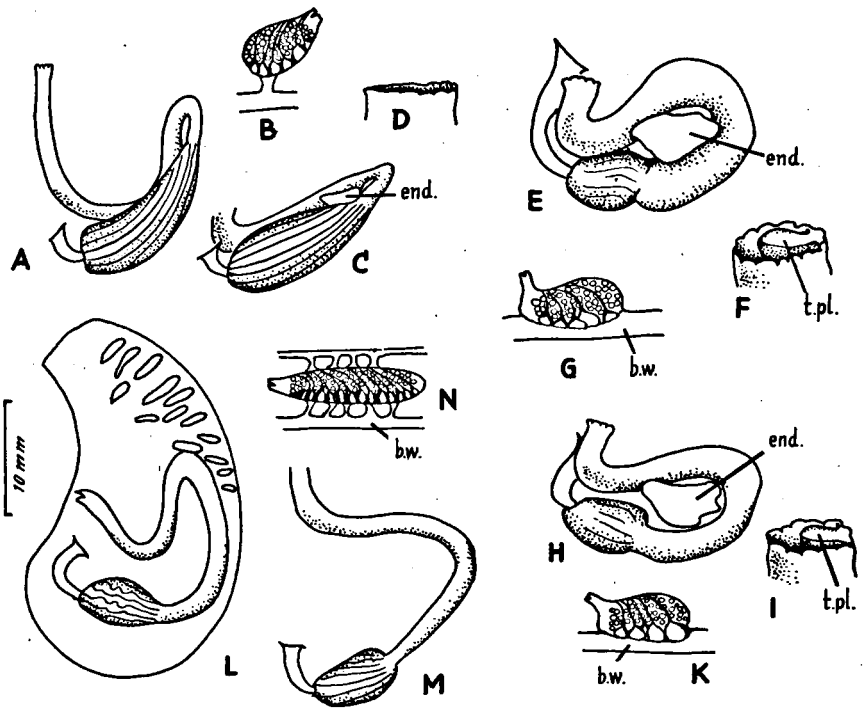

Fig. 56. A–D, *Polycarpa cartilaginea* (Sluiter). A, gut and B, a gonad, of specimen from Curaçao; C, gut and D, anus of SLUITER's type specimen. E–G, *Polycarpa obtecta* Traustedt, British Museum specimen from Dry Tortugas, registered No. 31.12.25.10. E, gut with endocarp (end.); F, anus, with typhlosole plug (t. pl.); G, a gonad, showing attachment to body wall (b.w.). H–K, *Polycarpa obtecta* Traustedt (SLUITER's type specimen of *"P. friabilis"*). H, gut with endocarp (end.); I, anus, with typhlosole plug (t. pl.); K, a gonad, showing attachment to body wall (b. w.). L–N, *Polycarpa nivosa* (Sluiter). L, part of SLUITER's type specimen to show gut, and gonads of left side; M, part of gut, and N, a gonad, of SLUITER's type specimen of *"P. appropinquata"*, showing attachment of gonad to body wall (b. w.) and branchial wall.

TABLE 8

Comparison of Polycarpa spp.

Species	Synonyms	Diagnostic characters
P. obtecta Traustedt	*P. friabilis* (Sluiter) *P. fuliginea* (Sluiter) *P. asiphonica* (Sluiter) *P. brevipedunculata* (Sluiter)	Stomach short, indistinctly plicate or smooth. Anus lobed and with typhlosole plug. One or two fleshy endocarps in gut loop. Gonads short, closely applied to, or embedded in, body wall.
P. cartilaginea (Sluiter)	None	Stomach long, tapered, plicate. Anus indistinctly lobed, with no typhlosole plug. One small endocarp, or none, in gut loop. Gonads short, loosely attached to body wall, by base only.
P. nivosa (Sluiter)	*P. appropinquata* (Sluiter)	Stomach moderately long, with folds sometimes sinuous. Anus with 2 lips? No typhlosole plug. No endocarps in gut loop. Gonads long, loosely attached along their length to body wall and branchial sac.

The identity of the two other Caribbean species described by SLUITER (1898) (*P. seminuda* and *P. insulsa*) remains doubtful.

The type specimen of *P. seminuda* is now in such a poor state of preservation that further study cannot reveal whether or not the species is a good one.

P. insulsa is represented by two similar specimens. The four branchial folds are almost flat, consisting of crowded brown longitudinal bars, and the dorsal lamina is represented by a flat strip on the roof on the branchial sac. The stigmata are very wide and rectangular, giving the branchial wall a delicate appearance, but the wide, white transverse bars are exceptionally strong and tough. As these branchial features are present in both specimens, either they characterise a well-defined species *P. insulsa*, or have resulted from some abnormal treatment of specimens of *P. obtecta*.

Family PYURIDAE Hartmeyer, 1908

Pyura vittata (Stimpson)

CURAÇAO. Plaja Djerimi, sta. 1019, 11.XII.1948; rock and sand, about 1 m; 1 specimen. — Piscadera Bay, sta. 1029A, 29.I.1949; on wire fence of swimming pool, 1–1½ m; 1 spec. — Spaanse Baai, sta. 1037A, 21.IV.1949; on *Rhizophora*, sandy beach, about 1 m; 1 spec. — Fuik Baai, near Newport Bath, sta. 1039, 20.XI.1948; rocky shore of lagoon, muddy sand with some *Thalassia*, about ½ m; 1 spec. Sta. 1039A, 20.XI.1948; sandy mud with rock debris, few *Thalassia*, *Sargassum*, about 1½ m; 1 spec. — Curaçao, 1949; 1 spec.
KLEIN BONAIRE. East coast at landing, sta. 1049B, 13.IX.1948; among reef debris on sandy beach, ½–1 m; 2 spec.
BONAIRE. Kralendijk, roadstead, sta. 1053, 21.IX.1948; on covered buoy, about ½ m; 1 spec. — Oranjepan, 7.IX.1930; on *Gorgonia ventalina*, cast ashore; 1 spec. — Lac, Boca, sta. 1068a, 1.X.1948; sandy reef, about 1½ m; 1 spec.

Microcosmus exasperatus Heller

CURAÇAO. Piscadera Baai, Enoch, sta. 1028A, 2.II.1949; on *Rhizophora* in muddy lagoon, tidal & lower zone; 2 specimens. Piscadera inner bay, 6.X.1958; on mangrove roots; (coll. J. H. Stock). Piscadera inner bay, 17.XII.1959; sand, stones and shells, about 3 m; (coll. J. H. Stock). — Spaanse Baai, sta. 1037A, 21.IV.1949; on *Rhiz.*, sandy beach, about ½ m; 1 spec. — Curaçao, 1949; 1 spec.

Microcosmus helleri Herdman

CURAÇAO. Spaanse Water, New Haven, sta. 1036A, 10.IV.1949; on *Rhizophora*, in very muddy lagoon, about 1 m; 1 specimen. — Fuik Baai, sta. 1039A, 20.11.1948; rock debris in sandy mud, few *Thalassia*, *Sargassum*, 1–1½ m; 2 spec.

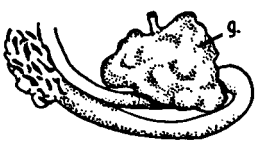

Fig. 57. *Microcosmus helleri* Herdman. Gut and gonad (g.) from the right.

KOTT (1952), in her account of Australian specimens, describes three gonads on the left, but these are probably three more or less distinct masses into which the single left gonad is divided, united by one common oviduct and one common sperm duct. In the present specimens from Curaçao the left and the right gonad each consists of an undivided mass (Fig. 57).

Family MOLGULIDAE Lacaze-Duthiers, 1877

Molgula occidentalis Traustedt

CURAÇAO. Fuik Baai, Newport Bath, sta. 1039A, 20.XI.1948; rock debris in sandy mud, few *Thalassia*, *Sargassum*, 1–1½ m; 2 specimens.
BONAIRE. Lac, Poejito, sta. 1064b, 17.IX.1948; on *Rhizophora* in muddy lagoon, about 1 m; 1 spec.
SOUTH AMERICAN MAINLAND (Venezuela): Chacopata bay, Araya, Sucre, 25.VI. 1936; on *Rhiz.*; 1 spec.

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