

# FURTHER DESCRIPTIONS OF SOUTH AFRICAN ASCIDIANS

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(With 45 figures in the text)

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## INTRODUCTION

In a previous paper (Millar, 1955) I described a number of ascidians from the coasts of South Africa, collected during an ecological survey carried out by the Zoology Department of the University of Cape Town. A continuation of this survey has produced more ascidian material, which forms a large part of the subject of the present paper. The principal areas from which this new material was collected (fig. 1) are: Langebaan Lagoon, Table Bay, False Bay, Mossel Bay, Algoa Bay, and Mozambique. Small amounts of material were also taken from several other places. The collecting was mainly from sub-littoral areas, and this makes difficult a strict comparison with the faunistic results obtained from the extensive surveys of Stephenson (1939, 1944, 1948), whose studies refer to littoral areas.

Material is also included from the South African Museum, mainly belonging to the *Pieter Faure* collection, and some South African specimens from the British Museum (Natural History), most of these latter being from Mortensen's Java-South Africa Expedition.

Although most of the specimens formed the material of an ecological survey, the present paper deals with systematics. I have had certain difficulties owing to the still unsatisfactory state of the systematics in some ascidian genera; this is particularly true of *Polyclinum*, *Didemnum* and *Eudistoma*. As I have explained when discussing *Didemnum stilense* I believe that certain species will be defined adequately only when a large series of specimens is available from different areas and seasons, and when the biology is studied in addition to

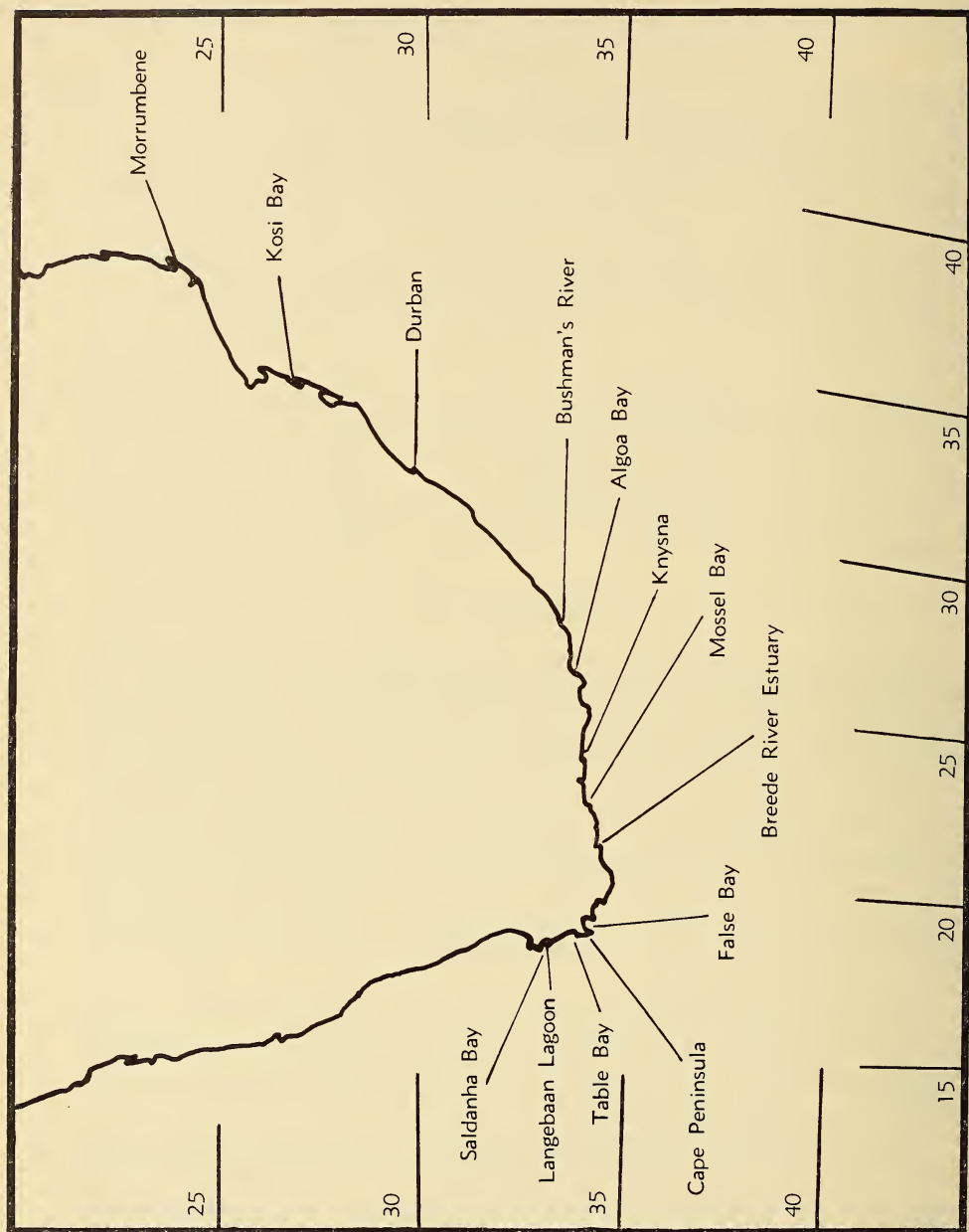


FIG. 1. Sketch map of part of South Africa to show collecting localities.

preserved material. Such needs are, of course, difficult to meet, and impossible in the course of a general ecological survey. For these reasons some of the identifications are provisional, and some material has not been identified even provisionally, as that course might lead to greater confusion.

I am indebted to Professor J. H. Day, of the Zoology Department of the University of Cape Town, and to Dr. J. F. Croil Morgans, formerly of that Department, for information regarding the specimens, and also to the Zoölogisch Museum of Amsterdam for the loan of type specimens of many of Sluiter's South African species.

The Trustees of the Museum gratefully acknowledge the grant in aid of publication of this paper received from the South African Council for Scientific and Industrial Research.

#### STATION LIST

Most of the material belongs to the ecological survey of the University of Cape Town, and to the *Pieter Faure* collection of the South African Museum. Details of stations relating to these two collections are given below. Collecting details of other material mentioned in this report are given in the text.

#### UNIVERSITY OF CAPE TOWN ECOLOGICAL SURVEY

##### SALDANHA BAY

- U.C.T., SB 1, Station 3, 13-7-46.
- U.C.T., SB 91, Station 13, 14-7-46.
- U.C.T., SB 92, Station 8, 14-7-46.
- U.C.T., SB 94, Station 3, 13-7-46.
- U.C.T., SB 128, Salamander Bay, 7 m., 9-4-53, mud weed and sponge.
- U.C.T., SB 130, off Donkergat Point, 7-9 m., 9-4-54.
- U.C.T., SB 134, 4-3-37, from bottom of *Signis*.

##### LANGEBAAN LAGOON

- U.C.T., LB 352, Oosterval, balanoid zone, 4-5-53, rocks.
- U.C.T., LB 367, Skaapen Island, lower balanoid zone, 7-5-53, weed and stones.
- U.C.T., LB 374, south side of Skaapen Island, lower balanoid zone, 7-5-53.
- U.C.T., LB 375, Skaapen Island, upper balanoid zone, 7-5-53.
- U.C.T., LB 378, Langebaan jetty, 0-1 m., 7-5-53, wooden pilings.
- U.C.T., LB 384, Oosterval, L.W.N.T., 7-5-53, sandy limestone.
- U.C.T., LB 472, 6-5-55.

##### TABLE BAY

- U.C.T., TB 171, 33° 49' 5" S., 18° 27' 5" E., 9-18 m., 4-8-46, shells or sand and shells with occasional rocks and mussels.
- U.C.T., TB 172, Station 3, 33° 50' 35" S., 18° 20' E., 15.5 m., 3-7-47.
- U.C.T., TB 173, Station 5, 33° 52' 7" S., 18° 26' 8" E., 20.5 m., 3-7-47.

## CAPE PENINSULA

U.C.T., CP 393, Oatland Point, intertidal, 27-9-54.

U.C.T., CP 425, Oatland Point, 14 inches above low water to below lowest *Pomatoceros*, 12-10-54.

## FALSE BAY

U.C.T., FAL 5, Station 3, just south of Seal Island, 35 m., 22-2-52, sand.

U.C.T., FAL 53, Gordon's Bay, 18 m., 25-6-52.

U.C.T., FAL 108, Gordon's Bay, 34° 09' 3" S., 18° 51' E., 7-11 m., 23-1-53, some sand.

U.C.T., FAL 109, Gordon's Bay, approximately 34° 09' 3" S., 18° 51' E., 7-11 m., 23-1-53.

U.C.T., FAL 117, Simon's Bay, 23.5 m., 12-2-53, broken branched coralline.

U.C.T., FAL 121, Glencairn power station, rock terraces, 6 m., 17-2-53, scattered rocks next to sand.

U.C.T., FAL 130, Oatland Point, 1-2 m. below L.W.S.T., scattered rocks, 26-2-53.

U.C.T., FAL 136, Oatland Point, 0-2 m., 27-2-53, vertical rock faces.

U.C.T., FAL 137, Gordon's Bay quay, 0-4 m., 4-3-53, rock.

U.C.T., FAL 144, Oatland Point, bottom of *Octomeris* zone to 5 m. below, 9-3-53, rock face.

U.C.T., FAL 145, details as FAL 144.

U.C.T., FAL 152, Oatland Point, 4.5-5.5 m., 12-3-53, stones and rocks on sand.

U.C.T., FAL 158, Oatland Point, 0-3 m., 22-4-53, rocks.

U.C.T., FAL 163, Oatland Point, S.W. face of Big Rock, 0-2 m., 23-5-53, area free of *Pyura* community.

U.C.T., FAL 167, Oatland Point, S.W. face of Big Rock, area free of *Pyura* community, 2-4 m. below *Echlonia* zone, 10-6-53.

U.C.T., FAL 175, Oatland Point, S.W. face of Big Rock, 4-6.5 m. below *Echlonia* zone, 10-6-53.

U.C.T., FAL 176, Oatland Point, S.W. face of Big Rock, from top 2 m. of flourishing *Pyura* community, 10-6-53.

U.C.T., FAL 177, Oatland Point, 9-8-53.

U.C.T., FAL 181, from bottom of ship *General Botha*, Simon's Town, 6-3-37.

U.C.T., FAL 182, Oatland Point, lagoon rocks, 7-9-53.

U.C.T., FAL 208, *Africana*, 34° 0' 9" S., 18° 42' 4" E., 36 m., rock, 10-9-53.

U.C.T., FAL 212, *Africana*, 34° 0' 7" 1" S., 18° 35' 6" E., 21 m., 9-9-53, limestone reefs and sand.

U.C.T., FAL 216, *Africana*, 34° 12' 4" S., 18° 43' 5" E., 42 m., 10-9-53, bottom rocky.

U.C.T., FAL 221, *Africana*, N.W. of Seal Island, 34° 0' 7" 0" S., 18° 32' 5" E., 18 m., 9-9-53, limestone reefs and sand.

U.C.T., FAL 225, off Miller's Point, 34° 13' 9" S., 18° 31' 6" E., 40 m., 9-9-53, coarse sand and finely broken shell.



- U.C.T., FAL 229, off Cape Point,  $34^{\circ} 20' 27''$  S.,  $18^{\circ} 31' 8''$  E., 64 m., 9-9-53, coarse sand.
- U.C.T., FAL 232, *Africana*,  $34^{\circ} 17' 35''$  S.,  $18^{\circ} 31' 4''$  E., off Buffels Bay, 50 m., 9-9-53.
- U.C.T., FAL 234, *Africana*, South Kogel Bay,  $34^{\circ} 15' 35''$  S.,  $18^{\circ} 44' 8''$  E., 47 m., 10-9-53, coarse sand with shell, pebbles and stones.
- U.C.T., FAL 256, Oatland Point, 4.0-5.5 m., 17-11-53.
- U.C.T., FAL 259, Oatland Point, about 80 yards E. of Big Rock, 10.5 m., 21-11-53, coarse shelly sand.
- U.C.T., FAL 265, half-way between Seal Island and Strandfontein, 15-25 m., 4-4-54, rock.
- U.C.T., FAL 272, Roman Rock, 100 yards ESE. of lighthouse, 14-17 m., 18-9-54, sloping granite rocks.
- U.C.T., FAL 277, Roman Rock, 14-17 m., 21-9-54, rocks.
- U.C.T., FB 1102, 21-4-47, 0.5 mile east of Seal Island, 27 m., rock.
- U.C.T., FB 1105, 28-4-47,  $34^{\circ} 10'$  S.,  $18^{\circ} 28'$  E., 24 m., sand.
- U.C.T., FB 1106, 20-8-47, off Somerset Strand, 25 m.

#### MOSSEL BAY

- U.C.T., MB 7,  $34^{\circ} 04' 17''$  S.,  $22^{\circ} 13' 53''$  E., 19 m., 12-1-56, rock.
- U.C.T., MB 14,  $34^{\circ} 11' 04''$  S.,  $22^{\circ} 10' 09''$  E., 16 m., 13-1-56, rock.
- U.C.T., MB 18,  $34^{\circ} 08' 45''$  S.,  $22^{\circ} 07' 12''$  E., 13 m., 13-1-56, rock.
- U.C.T., MB 22,  $34^{\circ} 08' 50''$  S.,  $22^{\circ} 07' 20''$  E., 12.5 m., 13-1-56, rock.
- U.C.T., MB 27,  $34^{\circ} 11' 04''$  S.,  $22^{\circ} 09' 55''$  E., 19 m., 13-1-56, rock.
- U.C.T., MB 38,  $34^{\circ} 10' 07''$  S.,  $22^{\circ} 07' 46''$  E., 8.5 m., 16-1-56, sand.
- U.C.T., MB 39,  $34^{\circ} 10' 08''$  S.,  $22^{\circ} 08' 00''$  E., 9 m., 16-1-56, rock.
- U.C.T., MB 48,  $34^{\circ} 11' 19''$  S.,  $22^{\circ} 09' 58''$  E., 10 m., 17-1-56, rock.
- U.C.T., MB 53,  $34^{\circ} 10' 57''$  S.,  $22^{\circ} 09' 55''$  E., 14 m., 17-1-56, rock.
- U.C.T., MB 55,  $34^{\circ} 10' 42''$  S.,  $22^{\circ} 09' 38''$  E., 9 m., 17-1-56, rock.
- U.C.T., MB 58,  $34^{\circ} 04' 18''$  S.,  $22^{\circ} 13' 32''$  E., 12.5 m., 18-1-56, rock.
- U.C.T., MB 59,  $34^{\circ} 04' 08''$  S.,  $22^{\circ} 13' 52''$  E., 11.5 m., 18-1-56, rock.
- U.C.T., MB 60,  $34^{\circ} 04' 18''$  S.,  $22^{\circ} 14' 10''$  E., 17-20 m., 18-1-56.
- U.C.T., MB 65,  $34^{\circ} 04' 47''$  S.,  $22^{\circ} 13' 06''$  E., 26 m., 18-1-56, rock.
- U.C.T., MB 68,  $34^{\circ} 09' 08''$  S.,  $22^{\circ} 07' 19''$  E., 13 m., 19-1-56, rock.
- U.C.T., MB 69,  $34^{\circ} 08' 35''$  S.,  $22^{\circ} 07' 20''$  E., 13.5 m., 19-1-56, rock.
- U.C.T., MB 72,  $34^{\circ} 09' 04''$  S.,  $22^{\circ} 07' 10''$  E., 12 m., 19-1-56, rock.
- U.C.T., MB 84,  $34^{\circ} 11' 26''$  S.,  $22^{\circ} 10' 8''$  E., 29 m., 21-1-56, rock.

#### ALGOA BAY

- U.C.T., LIZ 1, Station 1,  $33^{\circ} 55' 7''$  S.,  $25^{\circ} 37' 2''$  E., 8.5-10.0 m., 5-4-54, mud.
- U.C.T., LIZ 2, details as Station 1.
- U.C.T., LIZ 3, Station 2,  $33^{\circ} 56' 1''$  S.,  $25^{\circ} 40' 0''$  E., 17-18 m., 5-4-54, sand.
- U.C.T., LIZ 9, Station 3,  $33^{\circ} 58' 1''$  S.,  $25^{\circ} 38' 9''$  E., 9 m., 6-4-54, stones and rock.

- U.C.T., LIZ 11, Station 5,  $33^{\circ} 57' 2''$  S.,  $25^{\circ} 38' 0''$  E., 9-10 m., 6-4-54, limestone and grey clay.  
 U.C.T., LIZ 19, Station 8,  $33^{\circ} 58' 5''$  S.,  $25^{\circ} 42' 0''$  E., 27 m., 7-4-54, sand and shell.  
 U.C.T., LIZ 25, Station 12,  $34^{\circ} 00' 4''$  S.,  $25^{\circ} 44' 5''$  E., 39 m., 11-4-54, coarse sand and shell.  
 U.C.T., LIZ 28, Station 13,  $34^{\circ} 00' 8''$  S.,  $25^{\circ} 42' 4''$  E., 5-7 m., 11-4-54, rock.  
 U.C.T., LIZ 32, Station 3,  $33^{\circ} 58' 1''$  S.,  $25^{\circ} 38' 9''$  E., 6-4-54, stones and rock.  
 U.C.T., LIZ 34, Station 7,  $33^{\circ} 58' 4''$  S.,  $25^{\circ} 40' 5''$  E., near charted 'coral' patch, 14 m., 7-4-54, stones.  
 U.C.T., LIZ 38, Station 8,  $33^{\circ} 58' 5''$  S.,  $25^{\circ} 42' 0''$  E., 27 m., 6-4-54, sand and shell.

## MORRUMBENE ESTUARY

- U.C.T., MOR 43, 20-1-54, channel at Linga-linga, 6-9 m.  
 U.C.T., MOR 50, 20-1-54, channel at mouth of Rio Coche, 3-5 m., sand.  
 U.C.T., MOR 76, 23-1-54, sand at L.W.S.T., Mongué.  
 U.C.T., MOR 77, 23-7-53, Linga-linga, 3 m., sand.  
 U.C.T., MOR 91, 12-7-54, channel at Linga-linga.  
 U.C.T., MOR 108, 14-7-54, edge of channel, Linga-linga, 1.5-4 m., sand.  
 U.C.T., MOR 109, 14-7-54, channel at Linga-linga, 4 m., sand.  
 U.C.T., MOR 122, 15-7-54, off Linga-linga.  
 U.C.T., MOR 132, 16-7-54, channel opposite Rio Coche, 2 m., sand and shell.  
 U.C.T., MOR 187, 18-7-54, intertidal mud near L.W., N.W. of Mongué.  
 U.C.T., MOR 188, 18-7-54, stones at L.W.S.T., Mongué.

## OTHER LOCALITIES IN MOZAMBIQUE

- U.C.T., PEA 1, 26-7-53, attached to iron railings in bathing-pool.  
 U.C.T., PEA 3, Linga-Linga, 10 m., 23-7-53, sand and weed.  
 U.C.T., PEA 4, Maxixe, 24-7-53, low water, sandbank and piles.

## COMMERCIAL TRAWLERS

- U.C.T., TRA 60, Kaffirkuils Bay,  $34^{\circ}$  S.,  $21^{\circ}$  E., 62-70 m., 25-11-52.  
 U.C.T., TRA 62,  $4\frac{1}{2}$  miles off Cape Barracouta, 63 m., 25-11-52, covering a dromiid crab.  
 U.C.T., TRA 71,  $32^{\circ} 05'$  S.,  $18^{\circ} 14'$  E., 66 m., 5-2-53, hard Polyzoa and rock.

SOUTH AFRICAN MUSEUM *Pieter Faure* COLLECTION

(denoted in text by PF)

- PF 11, Mossel Bay, 0-55 m.  
 PF 586,  $33^{\circ} 50'$  S.,  $25^{\circ} 54'$  E., 46-92 m.  
 PF 673,  $33^{\circ} 45'$  S.,  $26^{\circ} 44'$  E., near Kowie, 73-79 m.  
 PF 704,  $33^{\circ} 53'$  S.,  $25^{\circ} 51'$  E., 48 m.

- PF 739, between Roman Rock and Cape Recife, 31 m.  
 PF 740, details as PF 739.  
 PF 895, 32° 47' S., 28° 16' E., 50–54 m.  
 PF 1095, between Bird Island and mainland, Algoa Bay, 18–29 m.  
 PF 1711, Cape St. Blaize, N. by E  $\frac{3}{4}$  E., 6 miles, 64 m.  
 PF 1864, Cape St. Blaize, N. 36 miles, 99 m.  
 PF 2326, Lion's Head, N. 67° E., 25 miles, 248 m.  
 PF 2348, details as PF 2326.  
 PF 2361, details as PF 2326.  
 PF 2531, Lion's Head, N. 63° E., 34 miles, 283 m.  
 PF 10165, Cape St. Blaize, N. by W.  $\frac{1}{2}$  W., 5 miles, 62 m.  
 PF 10477, Cape St. Blaize, N. by E., 8 miles, 72 m.  
 PF 10722, Cape Natal, W. by N., 6 miles, 91 m.  
 PF 12393, Itongazi River mouth, Natal, NW.  $\frac{3}{4}$  W., 3 miles, 46 m.  
 PF 12943, East London, low tide.  
 PF 13393, Cape Morgan, NW.  $\frac{1}{4}$  N., 11 miles, 160 m.  
 PF 13432, Sandy Point, NE. by E. 6 miles, 94 m.  
 PF 13481, Sandy Point, N.  $\frac{1}{4}$  E., 10 miles, 175 m.  
 PF 14560, Cape Point, N. 50° E., 18 miles, 341 m.  
 PF 14582, details as PF 14560.  
 PF 15584, Rocky Bank, False Bay, 31 m.  
 PF 15797, off Seal Island, False Bay, 18–19 m.  
 PF 15984, off Zwartklip, False Bay, 18–22 m.  
 PF 18785, Cape Seal, W. by N.  $\frac{1}{2}$  N., 7 miles, 72 m.

## LIST OF NEW SPECIES AND FORMS

- |  |   |
|--|---|
| <i>Synoicum capense</i> sp. n.                     | <i>Botryllus anomalus</i> sp. n.                          |
| <i>S. australe</i> sp. n.                          | <i>Metandrocarpa fascicularis</i> sp. n.                  |
| <i>Polycitorella pallida</i> sp. n.                | <i>Cnemidocarpa psammophora</i> sp. n.                    |
| <i>Tetrazona porrecta</i> sp. n.                   | <i>Styela radicata</i> sp. n.                             |
| <i>Sigillina vasta</i> sp. n.                      | <i>Boltenia africana</i> sp. n.                           |
| <i>Eudistoma digitatum</i> sp. n.                  | <i>Halocynthia spinosa</i> Sluiter f. <i>defectiva</i> n. |
| <i>Didemnum (Polysyncraton) magnilarvum</i> sp. n. | <i>Molgula cryptica</i> sp. n.                            |
| <i>Lissoclinum cavum</i> sp. n.                    | <i>Eugyra myodes</i> sp. n.                               |
| <i>Ascidia stenodes</i> sp. n.                     | <i>Eugyra macrentera</i> sp. n.                           |

## DESCRIPTION OF SPECIES

Family **Polyclinidae** Verrill, 1871Genus **APLIDIUM** Savigny, 1816

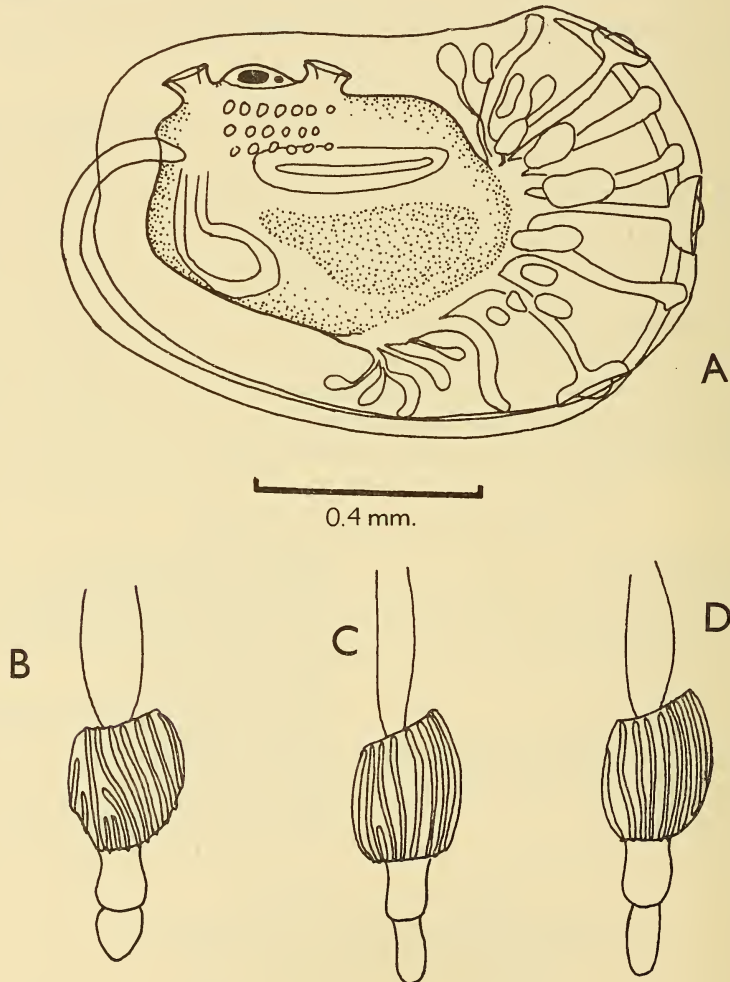
As I have pointed out (Millar, 1960) there seems to be no good reason for separating the genera *Aplidium* Savigny 1816 and *Amaroucium* Milne Edwards 1842, and I am using *Aplidium*, which has priority.

*Aplidium flavo-lineatum* (Sluiter)

(Fig. 2)

*Amaroucium flavo-lineatum* Sluiter, 1898, p. 30, pl. 1, fig. 7; pl. 4, fig. 12.*Amaroucium astraeoides* Sluiter, 1898, p. 33, pl. 1, fig. 9; pl. 5, figs. 2-5. Hartmeyer, 1912, p. 351, pl. 44, fig. 5, text-fig. 10.*Amaroucium simplex* Sluiter, 1898, p. 35, pl. 1, fig. 10; pl. 5, fig. 6.*Amaroucium erythraeum* Michaelsen, 1934, p. 137, pl. 7, fig. 1. Millar, 1955, p. 270, fig. 2.*Known distribution*

Cape Province.

FIG. 2. *Aplidium flavo-lineatum* (Sluiter).

A, larva; B, stomach of type specimen of *Amaroucium flavo-lineatum* Sluiter;  
 C, stomach of type specimen of *Amaroucium astraeoides* Sluiter; D, stomach  
 of type specimen of *Amaroucium simplex* Sluiter.



*Localities*

*Table Bay*: U.C.T., TB 171 B.

*Cape Peninsula*: U.C.T., CP 393 S; U.C.T., CP 425 R.

*False Bay*: U.C.T., FAL 130 Z; U.C.T., FAL 163 N; U.C.T. FAL 167 Y; U.C.T. FAL 175 K; U.C.T. FAL 182 T; PF 15797 A; Mortensen's Java-South Africa Expedition, Station 65, 19-12-29, B.M.(N.H.) reg. no. 34.2.1.4.

*Mossel Bay*: U.C.T., MB 18 P; U.C.T., MB 48 A; U.C.T., MB 60 P; U.C.T., MB 65 C.

*Algoa Bay*: U.C.T., LIZ 28 R; U.C.T., LIZ 32 T; PF 704.

*Description*

This species is often red in life, the collectors of the present material having noted that the specimens were 'red', 'blood orange', or 'scarlet', but occasionally 'colourless'. The variable amount of sand on the surface and within the colony no doubt determines to a large extent its colour in the field. After preservation the colour of the specimens may change, and the material in this collection shows zooids with red, orange-yellow, sulphur-yellow, yellow-green and, in one colony, bright blue colour in the body wall.

Most of the specimens in the present collection have quite conspicuous small round or oval systems, each with a small common cloacal opening in the centre.

I have examined many colonies and find that the number of folds on the wall of the stomach varies from 19 to 33, but is usually between 25 and 30.

*Larva*

Larvae were present in colonies collected in January, February, April, June, September, and December. They generally numbered from 1 to 4 in a breeding zooid. Most larvae measure 0.80-1.00 mm. in length from the end of the papillae to the base of the tail, but some were only 0.64 mm. The anterior papillae have long, slender stalks. There is a variable number, generally 4-6, of finger-like median ampullae, and many short lateral ampullae or large vesicles.

*Remarks*

There has been much confusion in the past over this species, largely owing to the inaccurate description of the type specimens given by Sluiter (1898). Sluiter (1898) also described two other species, *A. astraoides* and *A. simplex*, the type specimens of which I have been able to examine along with those of *A. flavo-lineatum*. In some important points I find Sluiter's descriptions wrong, and I have no doubt that the three species are synonymous, the name *A. flavo-lineatum* having page priority. In particular the number of folds on the wall of the stomach is not that given by Sluiter. Careful examination of the type specimens (fig. 2, B-D), particularly transverse sections of the stomachs,

showed that there are 23–26 narrow folds in each species, although Sluiter gave the following descriptions:—

*A. flavo-lineatum*—10 folds.

*A. astraoides*—areolated stomach.

*A. simplex*—12 folds.

The discrepancy is difficult to understand, even assuming that Sluiter made only a rough estimate of the total number from the number on one side of the stomach.

This species has also appeared in accounts of South African ascidians under the name *A. erythraeum* Michaelsen (Michaelsen, 1934; Millar, 1955), but *A. erythraeum* was originally described from the Red Sea and I am now doubtful if it is the same as the South African species, although anatomically similar. Michaelsen (1934) also considers *A. phortax* (Michaelsen) from New Zealand to be a synonym. If *A. flavo-lineatum*, *A. erythraeum* and *A. phortax* are synonymous, then we are dealing with a species having an apparently very curious and discontinuous distribution, and I think it more likely that the three species are separate but anatomically similar. It might be possible to distinguish them if the larvae of all three were known.

See below for remarks on the possible identity of *A. circulatum* (Hartmeyer) and *A. flavo-lineatum*.

? *Aplidium circulatum* (Hartmeyer)

*Amaroucium circulatum* Hartmeyer, 1912, p. 349, pl. 39, fig. 2; pl. 44, fig. 6. Hartmeyer, 1913, p. 130. Michaelsen, 1934, p. 130. Millar, 1955, p. 171.

*Known distribution*

Cape Province.

*Locality*

False Bay: U.C.T., FAL 234 W.

*Description*

The single colony is approximately mushroom-shaped, about 2.2 cm. across the head, and provided with a short stalk. In the preserved state it is buff-coloured, but in life, according to the collector's note, the zooids are 'brick-red'. There is sand within the colony but not on the surface.

The stomach of zooids in this colony has about 16 longitudinal folds, compared with about 24 in the specimen which I previously described from False Bay (Millar, 1955). In his original account Hartmeyer (1912) described the folds as numerous but did not state the number.

*Remarks*

This specimen agrees in most respects with Hartmeyer's account of *A. circulatum*. But, as Michaelsen (1934) has suggested, that species may be the

same as *A. erythraeum* (Michaelson), and I have accepted *A. erythraeum* as a synonym of *A. flavo-lineatum*.

The distinctions between *A. circulatum* and *A. flavo-lineatum* are not great, the main one being the presence of a stalk on the colony. There may also be fewer stomach folds. A much larger series of specimens will be needed, however, to decide whether *A. circulatum* is a distinct species.

*Aplidium pantherinum* (Sluiter)

(Fig. 3)

*Psammaphidium pantherinum* Sluiter, 1898, p. 26, pl. 2, fig. 3; pl. 4, figs. 8, 9.

*Psammaphidium obesum* Sluiter, 1898, p. 28, pl. 1, fig. 6; pl. 4, figs. 10, 11.

*Amaroucium unilarviferum* Millar, 1955, p. 172, fig. 4.

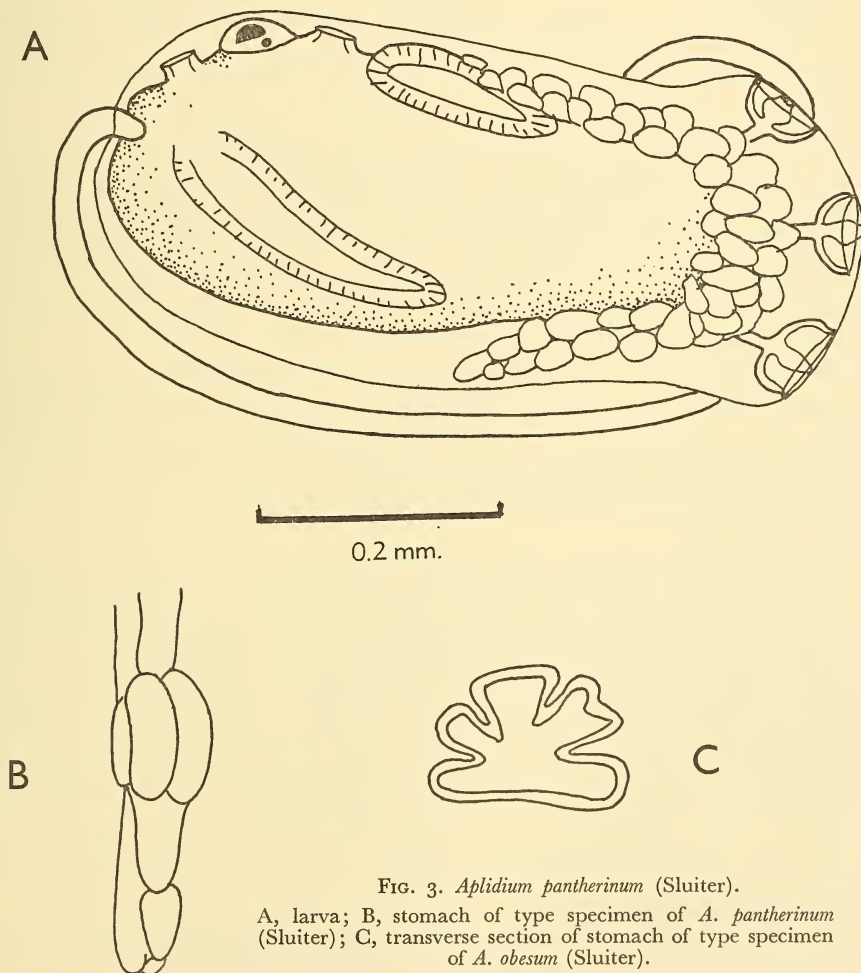


FIG. 3. *Aplidium pantherinum* (Sluiter).  
A, larva; B, stomach of type specimen of *A. pantherinum* (Sluiter); C, transverse section of stomach of type specimen of *A. obesum* (Sluiter).

*Known distribution*

Cape Province and Isipingo, Natal.

*Localities*

*Table Bay*: U.C.T., TB 172; U.C.T., TB 173 A.

*Off Cape of Good Hope*: PF 2361 A.

*False Bay*: U.C.T., FAL 136 L; U.C.T., FAL 145 A; U.C.T., FAL 152 N; U.C.T., FAL 175 G; U.C.T., FAL 256 Q.

*Mossel Bay*: U.C.T., MB 69 E.

*Remarks*

When I described a new species *Amaroucium unilarviferum* (Millar, 1955) from Cape Province I had not examined Sluiter's type specimens of South African material. Having now done so I find such close agreement between *A. unilarviferum* and two species which Sluiter named *Psammaplidium pantherinum* and *P. obesum* that I must regard the three as synonymous. As *Psammaplidium* is a synonym of *Aplidium*, the specific name becomes *Aplidium pantherinum* which has page priority over *A. obesum*.

Only an examination of Sluiter's type specimens shows the identity of these species, as his descriptions are very misleading with regard to the stomach, a key character in the determination of species of *Aplidium*. Careful examination of isolated stomachs and of transverse sections of stomachs of the type specimens of *A. pantherinum* shows 5 folds (fig. 3, B), although Sluiter stated that there were 12 folds. Five or 6 folds are also present in the stomach of the type specimens of *A. obesum* (fig. 3 C), which Sluiter stated had 8 folds.

The type specimens of *A. pantherinum* and *A. obesum* differ from each other principally in external appearance, owing to the peculiar arrangement of sand grains on the surface of the former. This is a character of little or no systematic significance, and the identity of *A. pantherinum*, *A. obesum* and *A. unilarviferum* is shown by the structure of the zooid and of the larva.

*Larva* (fig. 3 A)

Larvae range in length, measured from the end of the papillae to the base of the tail, from 0.50 mm. (some larvae from type specimens of *A. pantherinum* from Isipingo, Natal) to 0.80 mm. (some larvae from type specimens of *A. obesum* from Sea Point, near Cape Town). The characteristic features of the larva, as shown in all specimens, are the absence of lateral paired ampullae, and the presence of a fringe of small epidermal vesicles round the anterior margin of each side. From 1 to 3 larvae are present in each breeding zooid. The larva which I figured under the name *A. unilarviferum* (Millar, 1955, fig. 4 D) was evidently not fully developed, as the fringe of epidermal vesicles is not shown; I have subsequently found the characteristic arrangement of vesicles in other larvae from the same colony.

The larva can be used to distinguish between *A. pantherinum* and *A. fuegiense* Cunningham, a South American species in which the stomach also has 5 or



6 folds. In *A. fuegiense* the larval trunk is deep, with prominent paired lateral and unpaired median ampullae, but no vesicles (Millar, 1960), and is thus very different from that of *A. pantherinum*.

*Aplidium colelloides* (Herdman)

(Fig. 4)

*Amaroucium colelloides* Herdman, 1886, p. 233, pl. 27, figs. 9-12.

*Known distribution*

Off Cape of Good Hope.

*Locality*

PF 18785 A.

*Description*

There are several colonies in the collection, all of a very characteristic shape. The colony is divided into an oval, rounded, or almost triangular head and a long narrow stalk (fig. 4 A). In one typical colony the head is 1.5 cm. long and the stalk 6.0 cm. The head is smooth, free of sand, and dull orange-grey in colour. The zooids are clearly visible and are arranged in long narrow oval systems orientated so that the zooids appear to be in vertical double rows. Common cloacal openings, which Herdman (1886) failed to find in the type specimen, are narrow slits placed among the rows of zooids. The stalk is sharply marked off from the head and has a uniform coating of sand grains. In most specimens the lower end of the stalk is attached to a narrow stem-like object which may be the tube of a polychaete.

The zooids (fig. 4 B) have a short thorax and abdomen which together measure about 1.5 mm. in an average zooid. The post-abdomen is very long and narrow and extends far down into the stalk of the colony. There are 6 pointed lobes on the oral siphon and the atrial opening is surmounted by a triangular languet of moderate length. The body wall of the thorax is thin and transparent, allowing the 9 rows of stigmata to be seen. Muscles on the thorax are so poorly developed as to be scarcely visible. The abdomen is short and the gut has a correspondingly short loop. There are 12 or 13 entire longitudinal folds on the walls of the stomach. In some zooids the post-abdomen contains an accumulation of reserve material, and in others a long series of testis follicles. Although no ovary was seen several zooids were carrying larvae in the atrial cavity.

*Larva*

The larva (fig. 4 C) measures about 0.70 mm. from the end of the papillae to the base of the tail. The three papillae are borne on long narrow stalks. Large numbers of small epidermal vesicles lie round the anterior end of the

trunk in the region of the papillae. Both ocellus and otolith are present, the ocellus, at least in the preserved state, being red, and the otolith black.

*Remarks*

This is an interesting species and the only previous record is that of Herdman (1886) who described the single type specimen. Herdman's specimen was collected by the *Challenger* from a depth of 150 fathoms, a few miles south of the

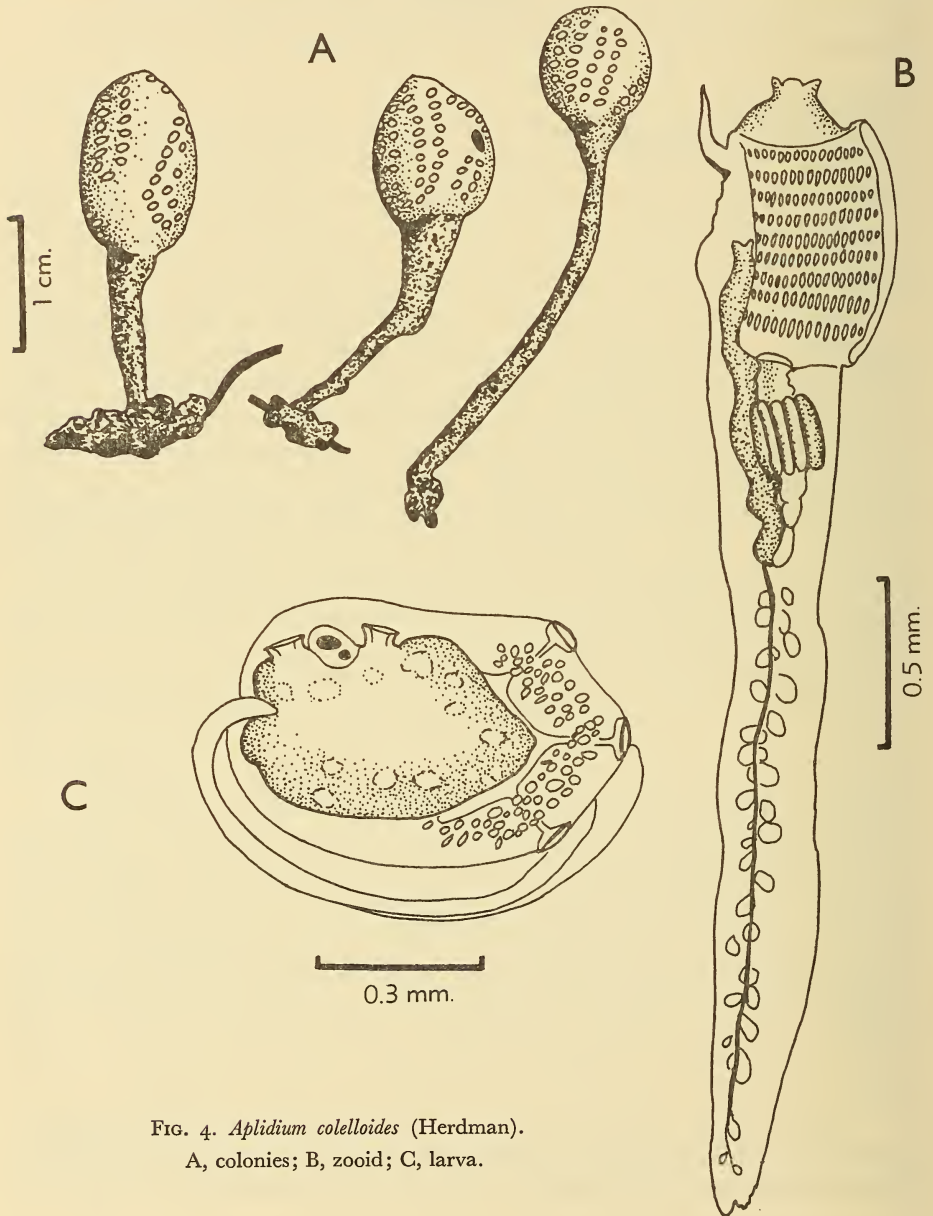


FIG. 4. *Aplidium coelestoides* (Herdman).  
A, colonies; B, zooid; C, larva.

Cape of Good Hope. This colony was incomplete, and gave little idea of the relatively great length of the stalk which apparently is usual. A long stalked colony is exceptional in the genus *Aplidium*.

The present specimens are identified as *A. colelloides* mainly by the shape of the colony, the proportions of the zooid, and the form of the larva, which Herdman illustrated.

*Aplidium retiforme* (Herdman)

(Fig. 5)

*Psammaplidium retiforme* Herdman 1886, pp. 248-9, pl. 32, figs. 8-10.

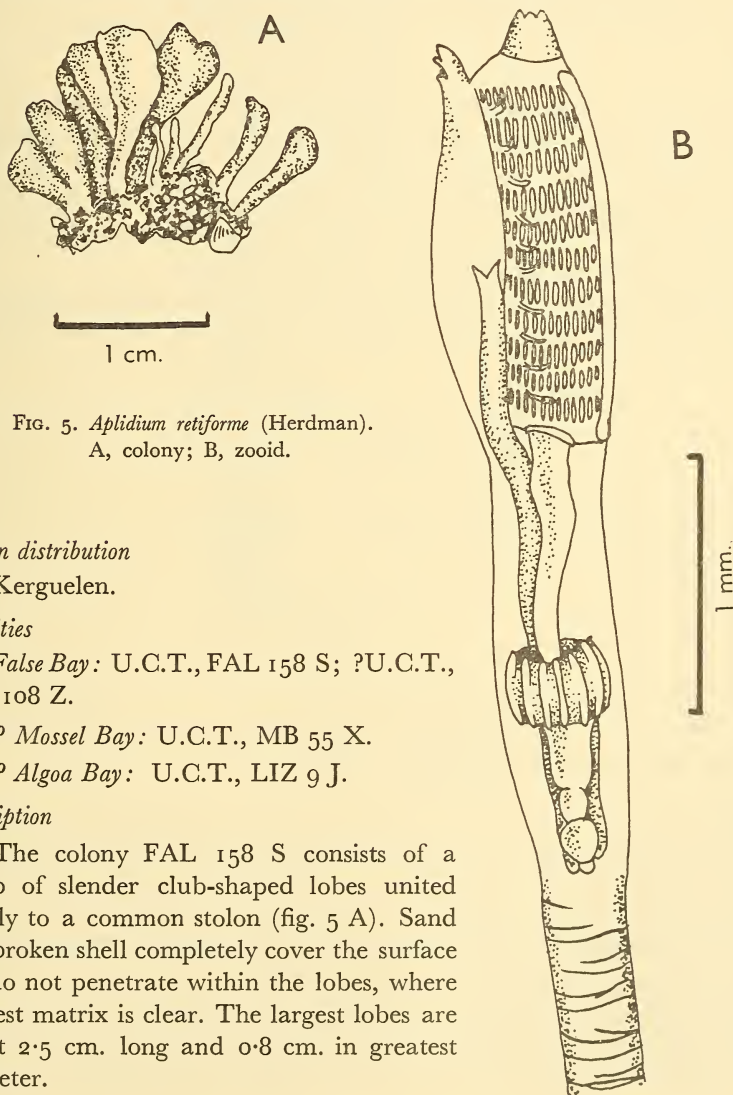


FIG. 5. *Aplidium retiforme* (Herdman).

A, colony; B, zooid.

*Known distribution*

Kerguelen.

*Localities*

*False Bay*: U.C.T., FAL 158 S; ?U.C.T., FAL 108 Z.

? *Mossel Bay*: U.C.T., MB 55 X.

? *Algoa Bay*: U.C.T., LIZ 9 J.

*Description*

The colony FAL 158 S consists of a group of slender club-shaped lobes united basally to a common stolon (fig. 5 A). Sand and broken shell completely cover the surface but do not penetrate within the lobes, where the test matrix is clear. The largest lobes are about 2.5 cm. long and 0.8 cm. in greatest diameter.

Each lobe contains only a few zooids, probably constituting a single system, but common cloacal openings were not seen.

The zooids (fig. 5 B) attain a length of 6 mm., or more if the post-abdomen is very long. A layer of quite strong muscles is present on the thorax, which consequently is usually contracted and bent, in the preserved condition. The atrial opening is small and is surmounted by a short languet which has 3 shallow terminal lobes. There are 9 or 10 rows of stigmata. The stigmata are moderately long and narrow, although Herdman (1886) describes those of his specimens as 'not large' and shows them in his figure to be short. There are about 16 undivided longitudinal folds on the wall of the stomach. The post-abdomen contains neither ovary nor testes in the present specimens.

#### *Remarks*

This is one of those species which present a problem to the systematist. On the one hand there is close agreement between the structure of the specimen from False Bay and the type specimen from Kerguelen as described by Herdman, although it must be said that Herdman's account lacks some important details. On the other hand there is the great difference in temperature which must raise doubts whether one species exists in both localities.

The specimens from the three queried localities have smaller colonies, but otherwise are similar to the above description and may belong to the same species.

#### *Aplidium sarasinorum* (Fiedler) (Fig. 6)

*Heterotrema sarasinorum* Fiedler, 1889, pp. 859-78, pl. 25, figs. 1-14.

#### *Known distribution*

Ceylon.

#### *Localities*

*False Bay*: U.C.T., FAL 208 S.

*Mozambique*: U.C.T., PEA 3 K; U.C.T., MOR 77 K; MOR 108 L.

*Locality unknown*: S.A. Museum.

#### *Description*

Most of the colonies are growing on and round the stems of algae or hydroids.

The specimen from False Bay is 4.2 cm. long, narrow, and flattened to a leaf-like shape and divided for half its length into 2 broad lobes. The consistency is firm and the surface almost smooth, but raised into small round swellings which mark the positions of the zooids. The test is impregnated with sand.

Other colonies are more fleshy and less subdivided into lobes, but the shape seems to depend largely on the form of the object to which the colony is



attached. Sand is generally present in the matrix of the colony, but is sparse or absent on the surface.

In structure the zooids (fig. 6 A) resemble the type specimen described by Fiedler (1889). The thorax is short, stout, and often bent in the preserved state, owing to muscular contraction. The oral siphon is short and 6-lobed. The atrial opening is a transverse slit with a wide 3-lobed languet (fig. 6 B). About 8

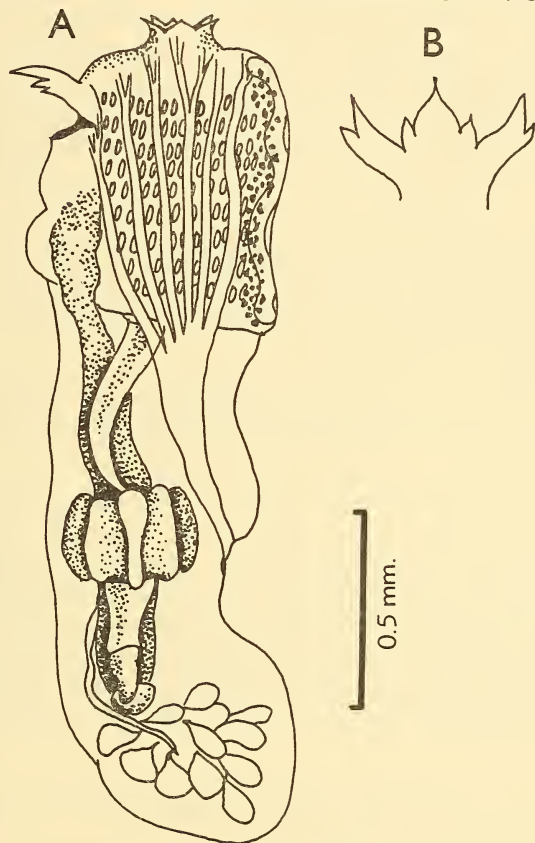


FIG. 6. *Aplidium sarasinorum* (Fiedler).

A, zooid; B, atrial languet.

powerful longitudinal muscles are present on each side of the thorax and converge towards the ventral side of the abdomen. There is a band of shining pale gold cells along each side of the endostyle, and although this feature was not mentioned by Fiedler, it is present in all the South African specimens. The gut has the usual subdivisions found in *Aplidium*. The stomach has 5-8 wide and rather indistinct folds. The post-abdomen is generally short, and only indistinctly marked off from the abdomen. In some zooids there are no gonads and in others a compact group of testis follicles immediately below the lower bend of the intestine.

*Remarks*

Fiedler (1889) founded his genus *Heterotrema* for a colony collected from Ceylon, but Michaelsen (1923, 1924) pointed out the similarity between *Heterotrema* and certain species of *Aplidium* (*Amaroucium*), and Pérès (1952) regarded *H. sarasinorum* as a variety of *A. circumvolutum* (Sluiter).

*A. circumvolutum* was originally taken from New Zealand waters and later Pérès (1952) described specimens from Kerguelen as a variety of the same species, *A. circumvolutum* var. *kerguelenense*. Pérès (1952) also described a new species *A. antarcticum* from Kerguelen, but regarded it as very close to *A. circumvolutum* and possibly identical.

I have no doubt that all the South African specimens listed here under 'Localities' are of the same species as Fiedler's colony, but I do not follow Pérès in identifying *Heterotrema sarasinorum* with *Aplidium circumvolutum*.

*A. sarasinorum* is characterized by the flat, expanded and lobed colony, with zooids on both surfaces, the wide 3-lobed atrial languet, the stomach with about 7 folds, the very compact testis, and the short post-abdomen which is not clearly marked off from the abdomen.

In *A. circumvolutum* the colony is more massive and broadly based, the atrial languet long, the stomach smooth-walled (Sluiter, 1900) or with 5 or 6 folds (Michaelsen, 1934), and the post-abdomen more sharply constricted and longer than in *A. sarasinorum*.

In addition to these distinctions, which are admittedly rather slight, except the different shape of the colony, there is the difference in distribution to separate the species. It seems unlikely that the same species should be found at Ceylon and at Kerguelen, and I believe that we are dealing with two species of similar structure, one distributed from South Africa across the Indian Ocean (*A. sarasinorum*) and the other of wide distribution in southern waters including New Zealand, Kerguelen, and also the Patagonian shelf, Graham Peninsula, and South Georgia (Millar, 1960).

*?Aplidium galeritum* (Hartmeyer)

*Amaroucium galeritum* Hartmeyer, 1912, p. 344.

*Known distribution*

St. Francis Bay, Cape Province.

*Locality*

*False Bay*: U.C.T., FAL 225 P<sub>2</sub>.

*Description*

The specimen is slightly lobed and rather flattened, and measures 9.5 cm. by 2.7 cm. by 1.0 cm. It is heavily encrusted on the surface and impregnated throughout with sand and broken shell, so that the consistency is very firm. There is no division of the colony into a softer head with zooids and firmer base

without zooids, which Hartmeyer (1912) found in his type specimen, but I do not know if this is an important difference.

As regards the zooids, the structure agrees in most points with *A. galeritum*, but in the specimen from False Bay there is no very distinct atrial siphon, and there are only 10 to 12 folds on the stomach, whereas *A. galeritum* has a short atrial siphon and 14 to 18 folds.

#### *Larva*

From 3 to 6 larvae are present in the atrial cavity of breeding zooids. The trunk is about 0.4 mm. long, has the usual 3 papillae of the genus, and a fringe of small epidermal vesicles round the anterior end. Both ocellus and otolith are present.

#### *Remarks*

I am not sure that this specimen agrees well enough with *A. galeritum* to be placed in that species, but it may be within the variation to be expected, and I hesitate to add another doubtful species to the South African list.

### Genus SYNOICUM Phipps, 1774

#### *Synoicum capense* sp. n.

(Fig. 7)

#### *Diagnosis of species*

Colony stalked, with a conical or hemispherical head. Surface of head and stalk coated with sand and shell. Inner test matrix clear, without sand. A few systems of zooids in each head. Zooids with 8–10 rows of stigmata, a very short atrial siphon with moderately wide and long upper lip or languet. Stomach smooth. Post-abdomen of variable length, with a long series of testis follicles.

#### *Holotype*

In the South African Museum, S.A.M. A25608 (U.C.T., FB. 1106C).

#### *Localities*

*False Bay*: U.C.T., FB 1106 C; U.C.T., FAL 53 L.

#### *Description*

The two colonies, which are stalked, are 1.3 cm. and 1.7 cm. long, the head occupying less than half of the total length. The stalk is narrowest at the base and gradually widens towards the upper end (fig. 7 A). The head is almost twice as wide as the upper part of the stalk, and the larger colony is 0.6 cm. in greatest diameter. The head is widest at its junction with the stalk and is either hemispherical or conical. Sand and broken shell fragments cover the whole surface of the colony. Common cloacal openings are not visible, but several must exist on each head, since dissection shows the zooids to be arranged

in several systems. Sand and shell are confined to the surface layer of the common test, the inner test matrix of both head and stalk being clear.

The zooids (fig. 7 B) may reach 12 mm. in length, but some are shorter. Only the thorax and abdomen are contained in the head of the colony and the post-abdomen extends some distance down within the stalk.

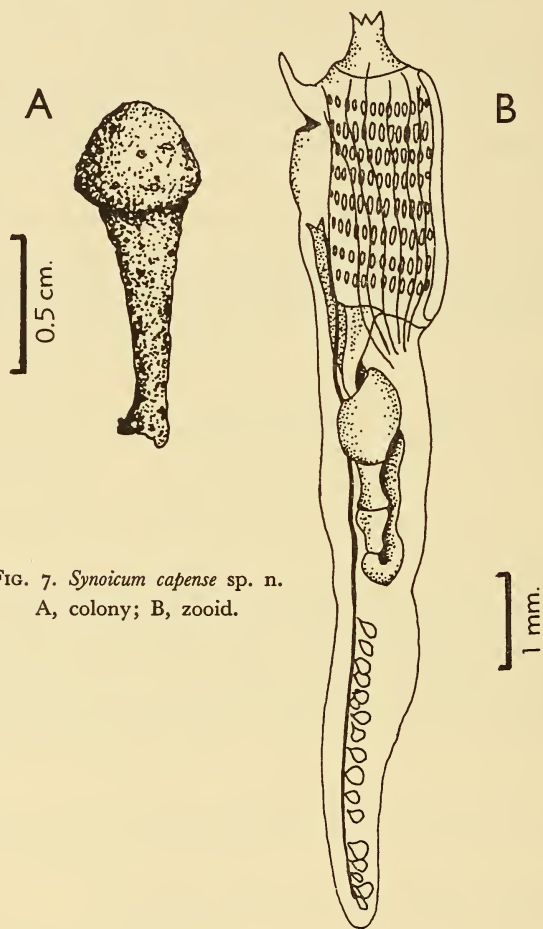


FIG. 7. *Synoicum capense* sp. n.  
A, colony; B, zooid.

There are 6 short pointed lobes on the oral siphon. The atrial siphon is very short with the upper margin drawn out into a short languet, which is either quite simple or has 3 small distal lobes. About 6 slender longitudinal muscles pass down each side of the thorax. Eight to 10 rows of stigmata are present in the branchial sac, each row with about 12 stigmata. The oesophagus is of moderate length, and the stomach is ovoid with smooth walls. The post-stomach and the intestine are well-marked. There is little difference in diameter between the abdomen and the post-abdomen, which may however be slightly



narrower. Some zooids of the larger colony have a fairly long series of testis follicles in the post-abdomen, but none was found with an ovary. In the smaller colony the zooids were without gonads.

#### *Remarks*

This new species perhaps most resembles *S. adareanum* (Herdman), but is distinguished by the more slender club-shaped colony, the complete covering of sand and shell, and the smaller number of rows of stigmata. From *S. arenaceum* (Michaelsen) it differs in having several systems on each head and in lacking a conspicuous rim round the cloacal openings.

*Synoicum australe* sp. n.

(Fig. 8)

#### *Diagnosis of species*

Colony rounded, smooth and moderately firm. Zooids arranged in small round systems. Oral siphon with shallow lobes; atrial siphon tubular with oblique opening and the dorsal margin slightly produced as a short lip. Longitudinal muscles many and narrow. About 20 oral tentacles and 20 rows of stigmata. Dorsal tubercle with a simple transverse oval opening. Oesophagus longer than stomach. Stomach with smooth walls. Anus about half-way along the thorax. Post-abdomen about equal in length to the thorax and abdomen together.

#### *Holotype*

In the South African Museum. S.A.M. A25609 (U.C.T., MB 27 H).

#### *Locality*

*Mossel Bay*: U.C.T., MB 27 H.

#### *Description*

There is only one specimen, a colony measuring 2.3 cm. by 1.6 cm. by 1.0 cm. The colony is slightly lobed, but there is no obvious area of attachment and it is not apparent how the specimen was fixed to the substratum during life. No foreign matter is present on the surface, which is quite smooth, and there is also none within the colony. The colour, in the preserved state, is translucent grey, with the systems of zooids showing through as paler stellate patterns.

The zooids (fig. 8) reach 6 mm. in length and are divided into a thorax and abdomen of about equal length, and the post-abdomen which is as long as the thorax and abdomen together. The thorax is wider than the other two divisions of the body. The oral siphon is short with 6 shallow rounded lobes, and the atrial siphon tubular with an oblique opening. No well developed languet is generally present but the dorsal margin of the atrial opening is produced to form a rounded lip of variable length. Numerous slender longitudinal muscles pass along each side of the thorax, and circular muscle strands surround the

oral siphon. About 20 tentacles stand at the base of the oral siphon. The dorsal tubercle is small with a simple transverse oval opening. There are up to 20 rows of stigmata, but the number in each row is difficult to count owing to contraction of the thorax.

The oesophagus is longer than the stomach, laterally flattened, and slightly curved. It enters the oblique anterior end of the stomach. The stomach is rounded with quite smooth walls. The post-stomach and intestine are together

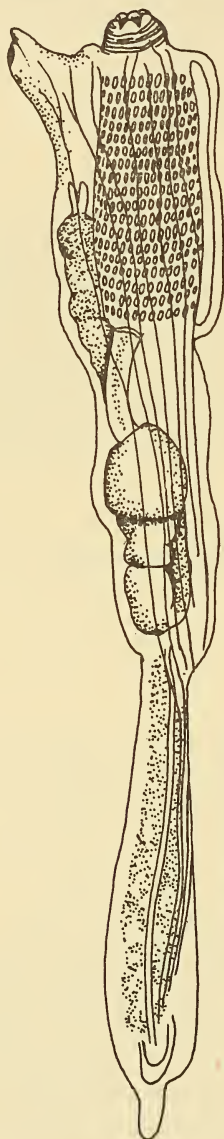


FIG. 8. *Synoicum australe* sp. n. Zoid.

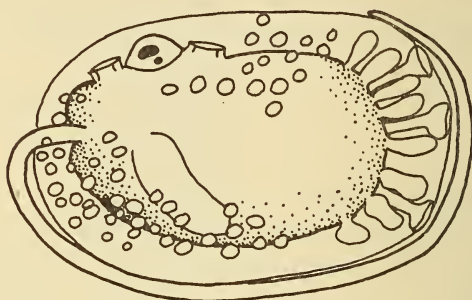


FIG. 9. *Polyclinum arenosum* Sluiter. Larva.

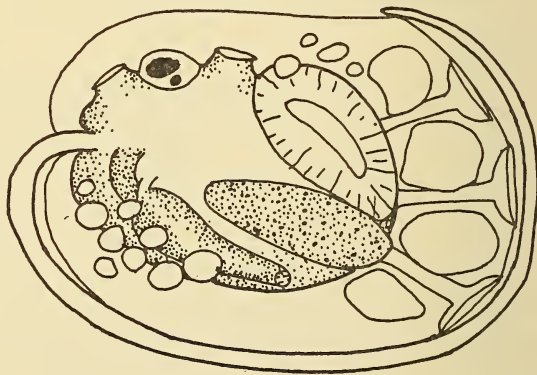


FIG. 10. *Polyclinum isipingense* Sluiter. Larva.

slightly longer than the stomach. The rectum extends about half-way along the thorax, and ends in a 2-lipped anus.

None of the many zooids examined from this colony had any trace of gonads. The post-abdomen contained numerous storage cells.

#### Remarks

Except for *S. capense* just described, no species of *Synoicum* has yet been recorded from the coast of Cape Province. Michaelsen (1914, 1915) has described *Macroclinum angolanum* from Angola, and this species should probably be referred to the genus *Synoicum*. It differs in many respects from *S. australe*, notably in its much smaller number of rows of stigmata, and much more numerous oral tentacles. Two species described by Sluiter (1898) as *Polyclinum arenosum* and *P. insulsum* were recorded respectively from Natal and Mozambique. These were both regarded by Michaelsen (1919) as belonging to the genus *Macroclinum*, which is now recognized as a synonym of *Synoicum*. I have examined the type material and have no doubt that Sluiter was right in placing both species in the genus *Polyclinum*.

In appearance of the colony the present species resembles *S. giardi* (Herdman), an Antarctic species, but the conspicuously areolated stomach of the latter readily distinguishes it. The zooid of *S. australe* is perhaps most like that of *S. adareanum* (Herdman), a species of the high Antarctic, but the colony formation is quite different.

*S. circumvolutum* Kott, from Kerguelen and Heard Island, is like *S. australe*, but the colony is sometimes stalked and the zooids have only 12 rows of stigmata. Another Antarctic species, *S. minutum* (Herdman), has a colony somewhat like that of *S. australe*, but the zooids are irregularly scattered and have usually only 7 or 8 rows of stigmata.

### Genus POLYCLINUM Savigny, 1816

#### *Polyclinum arenosum* Sluiter

(Fig. 9)

*Polyclinum arenosum* Sluiter, 1898, p. 20, pl. 4, figs. 1, 2. Millar, 1955, p. 174.

#### Known distribution

Isipingo, Natal; False Bay, Cape Province.

#### Locality

Algoa Bay: PF 1095 A.

#### Description

The deep division of the colony into long narrow lobes, which the specimen shows, is typical of the species. The colony is considerably more massive than Sluiter's type specimen, as the lobes attain a length of 4 cm., compared with 1.4 cm. in Sluiter's material.

*Larva*

In Sluiter's type specimens, which I have examined, larvae are present in some zooids, but are in such a bad state of preservation that few details are visible. They measure from 0.32 to 0.36 mm. in length, from the end of the papillae to the base of the tail. Larvae (fig. 9) are also present in the new material from Algoa Bay. These vary in length from 0.46 to 0.60 mm. They have the usual 3 anterior papillae, an ocellus and otolith. Small epidermal vesicles are grouped along the dorsal and ventral parts of the trunk. Before the larva is fully developed there are 4 pairs of lateral ampullae flanking the papillae, but later they subdivide to give rise to 8 pairs.

*Polyclinum isipingense* Sluiter

(Fig. 10)

*Polyclinum isipingense* Sluiter, 1898, p. 21, pl. 2, fig. 1, pl. 4, fig. 3. Hartmeyer, 1913, p. 83. Millar, 1955, p. 175.

*Known distribution*

Isipingo, Natal; False Bay, Cape Province.

*Localities*

*Morrumbene Estuary*: U.C.T., MOR 50 J; MOR 76 F; MOR 108 M; MOR 122 F; MOR 132 G; MOR 187 A.

*Description*

The colonies are of a rather solid appearance, and often reach 2-5 cm. in greatest diameter. They are generally dull purple-brown in colour, and some have a coating of sand and broken shell, but the surface of other colonies is bare. Small common cloacal openings are scattered over the colony, but are not raised on swellings as they were in the type material.

The zooids reach 5 mm. in total length. They are therefore shorter than the zooids of the type material which Sluiter (1898) gives as 9 mm. long, but the length of zooids in *Polyclinum*, as in most genera of the family, changes much during the life of a colony and is a character of little systematic value.

*Larva*

Larvae (fig. 10) are present in several colonies, and there are usually 2 in each breeding zooid. They range in length from 0.32 to 0.40 mm., measured from the end of the papillae to the base of the tail. There are 3 anterior papillae, and 4 pairs of lateral ampullae. A dorsal and a ventral group of epidermal vesicles is present on each side of the trunk.

*Polyclinum neptunium* Hartmeyer

(Fig. 11)

*Polyclinum neptunium* Hartmeyer, 1912, p. 331, pl. 38, fig. 9; pl. 44, figs. 2-4.



*Known distribution*

Off Cape of Good Hope.

*Localities*

PF 2326; PF 2428; PF 2531; PF 14560.

*Description*

There are many colonies of this species in the *Pieter Faure* collection, all of a dull purple-brown colour and fleshy appearance. Some are over 7 cm. in greatest diameter and are thus rather larger than Hartmeyer's type specimens. The surface is generally smooth and free of encrusting matter, except on the basal area of attachment where sand or small stones adhere to the test, but a little sand may also be scattered on the surface. The zooids are arranged in oval or elongated systems, but these are only sometimes visible externally.

In structure the zooids agree closely with Hartmeyer's description.

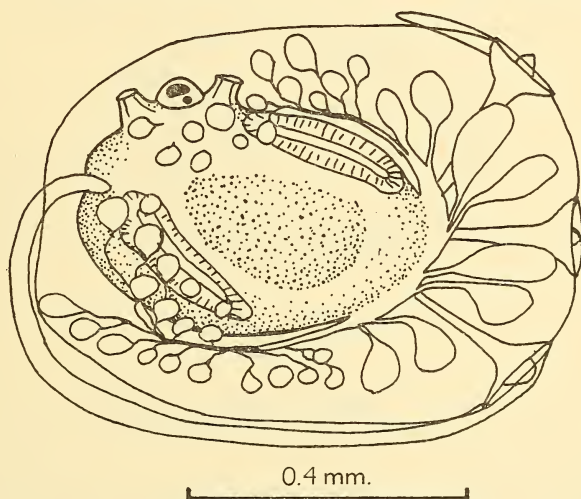


FIG. 11. *Polyclinum neptunium* Hartmeyer. Larva.

*Larva* (fig. 11)

Larvae are present in several colonies. In length, measured from the end of the papillae to the base of the tail, they range from 0.52 mm. to 0.80 mm. The trunk is rather deep, dorsi-ventrally. The larva has the structure usual in *Polyclinum*, with 3 anterior papillae, a sensory vesicle containing ocellus and otolith, and well developed siphonal rudiments. The ampullary tissue well illustrates the structure pointed out by Carlisle (1952) for *Polyclinum aurantium* Milne Edwards; on each side a lateral ridge arises from the anterior end of the trunk and sends one posterior branch dorsally and one ventrally. It is from these ridges and their branches that the larger anterior ampullae and the smaller dorsal and ventral vesicles arise; both ampullae and vesicles retain their connection with the ridges by slender stalks.

Genus *PSEUDODISTOMA* Michaelsen, 1924*Pseudodistoma africanum* Millar

(Fig. 12)

*Pseudodistoma africanum* Millar 1954, p. 128.*Known distribution*

Cape Province.

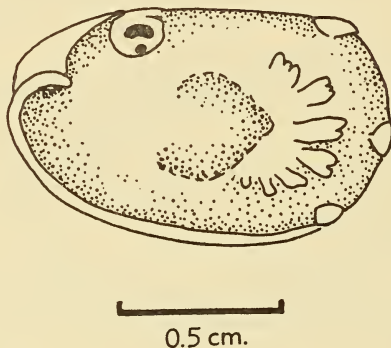
*Localities**False Bay*: U.C.T., FAL 158 L; U.C.T., FAL 175 F; PF 15584.*Mossel Bay*: U.C.T., MB 65 D.*Algoa Bay*: U.C.T., LIZ 28 V.*Natal*: PF 12393 A; off Durban, collection S.S. *Pickle*, B.M. (N.H.) reg. no. 1926. 8.1.4, 29° 31' 07" S., 31° 22' 35" E., 55 m.

FIG. 12. *Pseudodistoma africanum* Millar.  
Larva, possibly not fully developed.

*Description*

Most of the colonies agree well in shape and colour with the type specimens (Millar, 1954). In the present collection the largest specimens are one of 8 cm. length from Mossel Bay (U.C.T., MB 65 D), and a complex colony from Natal (PF 12393 A) in which the head and stalk may reach 8 cm. The colony from Natal is dull purple, unlike the other specimens which are some shade of yellow or grey. The collectors have described the specimens variously as colourless or pink in life.

In structure the zooids are generally typical of the species, and many have a single very large egg in the post-abdomen. The zooids of a colony from Natal (B.M. (N.H.) reg. no. 1926.8.1.4) have up to 20 longitudinal muscles on each side, this being a greater number than in the type specimens.

*Larva*

Only one colony so far collected has larvae (fig. 12) and these were probably not fully developed. This was the colony from Natal (B.M. (N.H.) reg. no.

1926.8.1.4). In some zooids of this colony there was, in the atrial cavity, one very large embryo or larva occupying the whole length of the thorax. The most advanced larvae were about 1 mm. long from the end of the papillae to the base of the tail. Unfortunately details were not clear, but there are 3 anterior papillae in a vertical row, and both ocellus and otolith in the cerebral vesicle. A series of ampullae is also present at the anterior end of the trunk.

#### Remarks

*Pseudodistoma* is somewhat intermediate between the families Polyclinidae and Clavelinidae, having an abdomen and post-abdomen of the *Aplidium*-type and a thorax of the *Eudistoma*-type. Such details of the larva as can be seen suggest *Aplidium* rather than *Eudistoma*, thus confirming the position of the genus in the family Polyclinidae.

### Family **Clavelinidae** Forbes and Hanley, 1848

#### Genus **CLAVELINA** Savigny, 1816

##### *Clavelina roseola* Millar

*Clavelina roseola* Millar, 1955, p. 183.

#### Known distribution

False Bay, Cape Province; Red Sea (as *Stomozoa murrayi*, Kott 1957).

#### Localities

Mossel Bay: U.C.T., MB 60 Q; U.C.T., MB 65 E.

#### Description

One colony was collected at each station. The larger specimen is 5 cm. long, 3.5 cm. wide, and 2.5 cm. high. The base of the colony is coated with sand, but the heads are not. Some details may be added to those seen in the type specimen. The musculature consists of numerous quite strong longitudinal strands passing mainly from the intersiphonal region, down the sides of the thorax to concentrate in two wide bands on the abdomen. In the new specimens the folds on the stomach are few and have the appearance of artefacts. It is, therefore, probable that the 11 or 12 longitudinal folds described in the type material were also artefacts, and that the stomach in its natural state is smooth. The anus is 2-lipped and lies opposite the 12th or 13th row of stigmata. Subdivisions of the gut below the stomach correspond closely to those in Kott's (1957) figure 3 of *Stomozoa murrayi*.

#### Remarks

*Stomozoa murrayi* Kott, collected from the Red Sea by the John Murray Expedition, is evidently the same as *Clavelina roseola* and becomes a synonym. The resemblances are very close, in the general form of the colony and zooid, the gut, and particularly in the peculiar and characteristic siphonal lobes.

The only important difference is the large number of rows of stigmata in *S. murrayi* (26) compared with *C. roseola* (17), but the greater development of the branchial sac in the Red Sea specimens may be due to a more favourable environment in warmer waters.

Kott (1957) accommodated her species in a new subfamily Stomozoinae, but the siphonal lobes constitute the only character differing markedly from the normal structure of *Clavelina*. The species seems to be no more than an aberrant member of the genus *Clavelina*.

*Clavelina steenbrasensis* Millar

*Clavelina steenbrasensis* Millar, 1955, p. 185.

*Known distribution*

False Bay, Cape Province.

*Localities*

False Bay: U.C.T., FAL 175 E.

Mossel Bay: U.C.T., MB 18 Q; U.C.T., MB 38 D.

*Description*

There are several specimens in the collection, and these show that the lateral compression of the colony noted in the type specimen is not a common feature of the species. A well-developed colony is about 4 cm. in greatest diameter and consists of a number of upright lobes, the largest about 2 cm. long. The lobes are widest at the top and narrowest at the base where they are united to a small mass of common test. The test is transparent and firm, the dark blue zooids being visible from the outside. A section through the stomach shows only 5 indistinct longitudinal folds, although in the type specimen there were 8 folds. As in other species of *Clavelina*, however, it is often difficult to decide whether or not some of the folds in fixed material are artefacts. Some zooids have a slender posterior vascular process extending downwards from the end of the abdomen.

*Remarks*

I have already pointed out the general similarity between this species and *C. gigantea* Van Name, but the latter species even if it does not differ in the form of the stomach as I previously believed, is distinguishable by its dark pigmented test and apparently unpigmented zooids, and is recorded from the Gulf of Mexico.

There are other specimens which I include in this species with some hesitation. A single piece of a colony (U.C.T., FB 1106 D, 20-8-47) is solid, smooth, and hyaline, and contains zooids like those of *C. steenbrasensis* but without any pigment. There are also colonies from False Bay (S.A. Museum Pieter Faure collection, no. 17458, 17-22 m.), and from an unknown locality



(S.A. Museum *Pieter Faure* collection), which, although having a form of colony resembling the typical specimens of this species, yet have a much softer and more flexible test, and have no pigment on the zooids. It is possible that the consistency of the test depends on the age of the colony, or the conditions of preservation which may also affect the colour of the zooids.

Genus *CYSTODITES* Von Drasche, 1883

*Cystodites roseolus* Hartmeyer

(Fig. 13)

*Cystodites roseolus* Hartmeyer, 1912, p. 310.

*Known distribution*

Algoa Bay, Cape Province; Gulf of Guinea, west Africa; Seychelles.

*Localities*

*Cape Peninsula*: PF No. 2361 B.

*Algoa Bay*: between Bird Island and mainland, 18–30 m.

*East of Algoa Bay*: near Kowie, 33° 45' S., 26° 44' E., 73–78 m.

*Description*

The largest specimen is one from east of Algoa Bay, and measures 8 cm. high and about 6 cm. across the base. This colony and the other almost as large, from the same station, are roughly conical with a wide base of attachment (fig. 13 A). All specimens are rather soft, with a smooth surface, and of a dull pink or buff-pink colour. No common cloacal openings could be seen, and no definite arrangement of the zooids, except in one colony from east of Algoa Bay, in which the zooids appeared to be arranged in parallel spiral lines round the colony. Hartmeyer (1912) was uncertain of the arrangement of zooids in his type material, but described an apparently linear alignment of marks on the surface of the colony, which may correspond with the appearance of the present colony.

Spicules are generally absent from the most superficial layer of the common test, but form a narrow layer a little below the surface, about the level of the base of the thoraces. Below this there are scattered irregular masses of calcareous matter, probably representing large groups of spicules. The spicules (fig. 13 B) are mainly of a crude stellate shape with few and rather stout rays. Both the central ball and the rays of the spicules are made up of many needle-like rods. The spicules may attain 130  $\mu$  in diameter, and are therefore larger than the spicules of Hartmeyer's type specimen. There are also smaller lozenge-shaped or rod-like spicules.

The zooids (fig. 13 C) are contracted and in this state measure about 2 mm. in length. In structure they are very like those of the type specimen, but

have well-developed testes in the form of a rosette of follicles at the posterior end of the abdomen. The branchial sac has narrow parastigmatic bars across the rows of stigmata.

### Larva

Larvae (fig. 13 D) are present in colonies from Cape Peninsula and Kowie. They measure 0.8–1.2 mm. in length from the end of the papillae to the base of the tail. The 3 vertically arranged papillae arise from within an elliptical band of

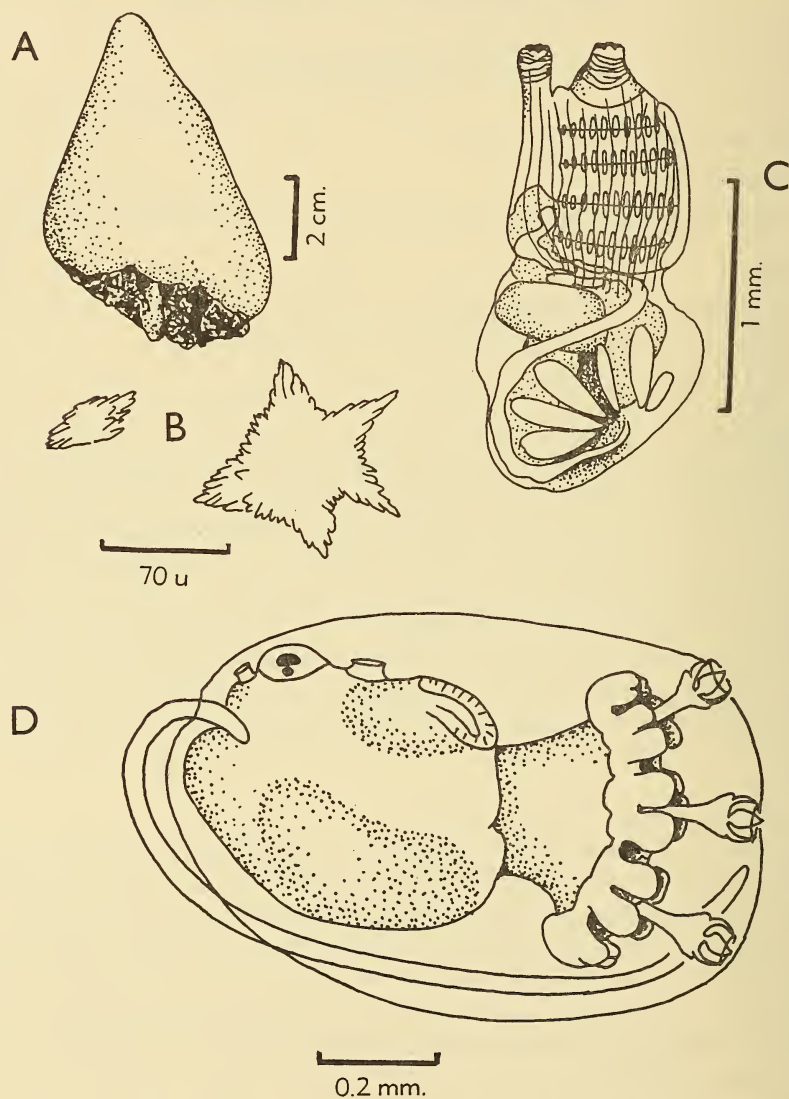


FIG. 13. *Cystodites roseolus* Hartmeyer.  
A, colony; B, spicules; C, zooid; D, larva.

about 20 ampullae. In advanced larvae the rudiments of both oral and atrial siphons are present. The sensory vesicle contains a cup-shaped ocellus which is red in these alcohol-preserved specimens, and a spherical black otolith.

*Remarks*

This species is now known in South African waters from the Cape Peninsula to Algoa Bay. It has also been described from the tropical waters of the Gulf of Guinea and the Seychelles. The distribution thus given is a surprisingly wide one, and the species appears to exist under the very different temperature conditions of Cape Province and the Gulf of Guinea. In cases like this I wonder if we are dealing with two species which are so similar structurally that they cannot be distinguished, at least until many more specimens are available.

*Cystodites dellechiaiei* (Della Valle)

*Distoma dellechiaiei* Della Valle, 1877, p. 40.

*Known distribution*

Very widely distributed in warm waters throughout the world, but apparently not known from the West Indian Ocean.

*Locality*

*Morrumbene Estuary, Mozambique: U.C.T., MOR 43 W.*

*Description*

There are several colonies, each investing a specimen of the crab *Pseudodromia integrifrons*. The spicules form close-fitting capsules round the abdomens of the zooids, but not round the thoraces. The convex disc-shaped overlapping spicules of these capsules are about  $200\mu$  in diameter and quite characteristic of the species.

Genus POLYCITORELLA Michaelsen, 1924

*Polycitorella pallida* sp. n.

(Fig. 14)

*Diagnosis of species*

Colony cushion-like, broadly based, and dull white. Zooids closely spaced and visible on the surface of the colony as small oval areas each with two siphonal openings. Stellate and irregular spicules present in all layers of the test. Zooids divided into thorax and abdomen. No lateral abdominal organs visible. Siphons each with 6 lobes. At least 40 oral tentacles. Dorsal tubercle simple. Thirteen to 15 rows of stigmata. Oesophagus long; stomach smooth-walled; anus 2-lipped.

*Holotype*

In the South African Museum. S.A.M. A25610 (PF 739).

*Locality*

Algoa Bay: PF 739.

*Description*

The single colony is about 12 cm. long, 6.5 cm. wide, and 3.5 cm. thick. It was evidently attached by most of the lower surface. In the preserved state the colour is dirty white. The whole upper surface is marked by many closely spaced low oval swellings, each marking the position of a zooid, and each having the openings of the oral and atrial siphon. There is no encrusting material on the colony.

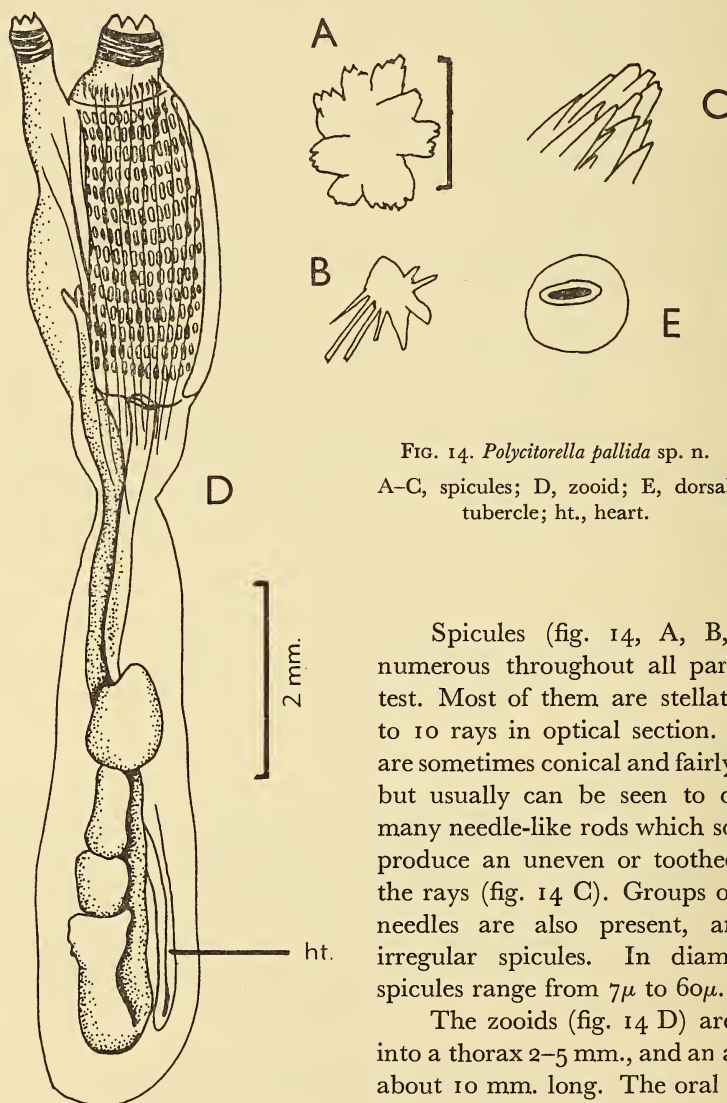


FIG. 14. *Polycitorella pallida* sp. n.  
A-C, spicules; D, zooid; E, dorsal tubercle; ht., heart.

Spicules (fig. 14, A, B, C) are numerous throughout all parts of the test. Most of them are stellate with 5 to 10 rays in optical section. The rays are sometimes conical and fairly smooth, but usually can be seen to consist of many needle-like rods which sometimes produce an uneven or toothed end to the rays (fig. 14 C). Groups of rods or needles are also present, and form irregular spicules. In diameter the spicules range from  $7\mu$  to  $60\mu$ .

The zooids (fig. 14 D) are divided into a thorax 2-5 mm., and an abdomen about 10 mm. long. The oral siphon is



short and 6-lobed, and the atrial siphon, which originates a short distance from the anterior end of the thorax, longer and more slender. Both siphons have powerful circular muscles. Narrow closely-spaced longitudinal muscles cover most of the thoracic region and, grouped together as a single narrower band, continue down each side of the abdomen. Circular muscles are not conspicuous on the thorax or abdomen.

The zooids generally show two constrictions, one between the thorax and abdomen and the other about a quarter of the length of the abdomen behind this. The latter constriction corresponds in position with a specially dense accumulation of spicules and a region of tougher test forming a ring round the abdomen at that point. This is the part of the abdomen where Michaelsen (1924) found a pair of lateral abdominal organs in *P. mariae*, but I can find no similar structures in the present species, although it is likely that this is a region specially active in the formation of spicules.

There are at least 40 simple oral tentacles of different sizes. The tentacles seem to be arranged in a single circle, but this is difficult to see. The dorsal tubercle (fig. 14 E) is small with a narrow oval slit placed transversely. There are 13 to 15 rows of stigmata in the branchial sac, each row with at least 12 rather wide and rectangular stigmata. The transverse bars are tall and narrow. The dorsal languets are triangular and quite large. The oesophagus is narrow and long, generally extending almost half the length of the abdomen. In outline the stomach is ovate or somewhat rectangular. Its walls are smooth. The remaining subdivisions of the gut are obscure, but behind the stomach there is a clearly defined section which is probably the post-stomach, and another one or possibly two indistinct chambers representing the mid-gut. The rectum is of uniform diameter and ends in a 2-lipped anus about the level of the 8th row of stigmata.

None of the zooids examined showed any trace of gonads. The heart is a U-shaped tube beside the lower loop of the gut.

#### *Remarks*

This genus was established by Michaelsen (1924) for a species *P. mariae* from the extreme northern end of North Island, New Zealand, and differs from the genus *Polycitor* in having spicules in the test and lateral abdominal organs on the zooids. Apart from the New Zealand species the genus probably contains only one known species, described by Savigny (1816) as *Eucoelium hospitolum*, from the Gulf of Suez.

Savigny's species differs from *P. pallida* in having few rows of stigmata, a very short abdomen, and spicules confined to the surface of the colony. *P. mariae* is much more like the South African species, but has a different form of colony and has zooids with lateral abdominal organs. The wide geographical separation, with no intervening records, is also a reason for separating the species.

Genus *TETRAZONA* Michaelsen, 1930*Tetrazona porrecta* sp. n.

(Fig. 15)

*Diagnosis of species*

Colony variable but usually long, narrow and lobed. Zooids not in systems. Abdomen about 3 times as long as thorax. Both siphons short and 6-lobed. About 16 oral tentacles. About 30 stigmata in each of the 4 rows. Oesophagus long; stomach rectangular in outline. Testes below gut loop.

*Holotype*

In the South African Museum. S.A.M. A25611 (PF 1095 B).

*Locality*

Algoa Bay: PF 1095 B.

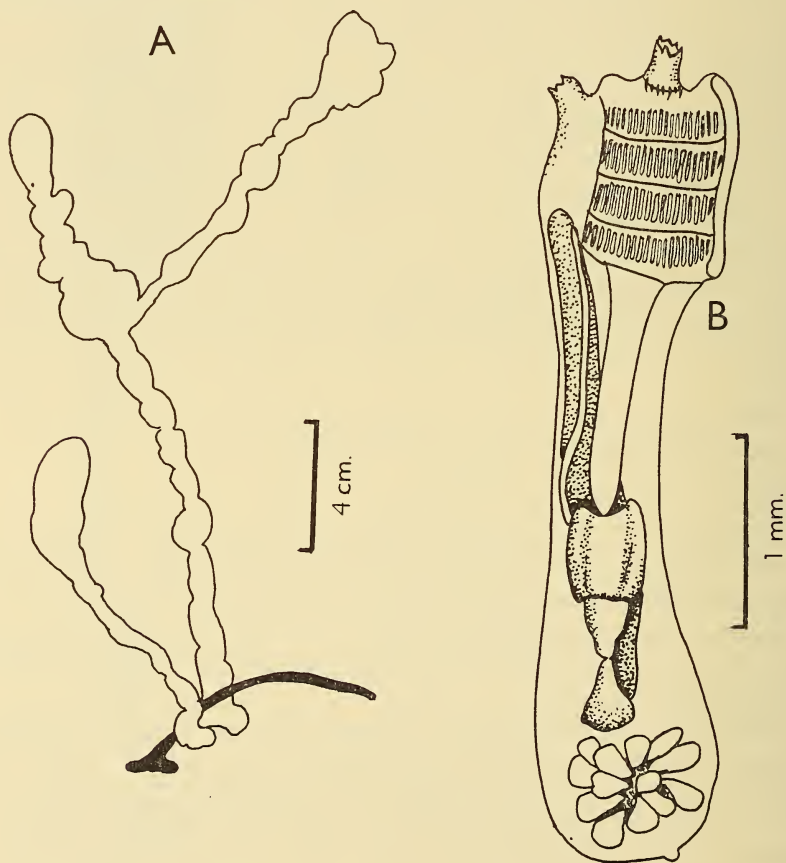


FIG. 15. *Tetrazona porrecta* sp. n.  
A, colony; B, zooid.

*Description*

The colonies vary in size and shape a good deal, but are usually long and relatively narrow with irregular lobes and swellings. As the colony generally seems to have grown on the stem of an alga these swellings give some of the specimens the appearance of a string of beads (fig. 15 A). Specimens of this kind reach a length of at least 24 cm. The colony is firm, and the surface rough owing to the presence of a uniform coating of sand grains. Fewer sand and shell particles are present within the test.

The zooids (fig. 15 B) have an average length of about 4 mm., of which the thorax occupies 1 mm. and the abdomen 3 mm. Both siphons open directly to the surface, and both are short, with 6 sharp lobes. Muscles are not strong on the thoracic wall and the zooids are consequently little contracted. The oral tentacles, about 16 in number, are of moderate length, alternating in size, and arranged in a single circle. Each of the 4 rows of stigmata has about 30 rather narrow slits.

The abdomen is only slightly narrower than the thorax. The oesophagus extends about half the length of the abdomen, and is quite wide, except where it narrows before entering the stomach. In lateral outline the stomach is rectangular and in transverse section there is a suggestion of about 6 indistinct folds, but these, or some of them, may be artefacts. The post-stomach is narrower than the stomach, and the mid-gut, which forms the lower, horizontal part of the gut loop, is wider. The rectum is of nearly uniform diameter.

Of the gonads, only the testis was present in the zooids examined, and this consisted of a quite massive group of pear-shaped follicles lying immediately below the lower bend of the gut loop, with the sperm duct passing straight forwards to the atrial cavity.

*Remarks*

I am following Huus (1937) in accepting Michaelsen's genus *Tetrazona* for a small group of species differing from *Cystodites* essentially in lacking spicules. The type species was described by Sluiter (1906) as *Distoma glareosus*, and the genus evidently also includes *Polycitor vitreus* (Sars) and probably *Polycitor magalhaensis* (Michaelsen). Removal of this well-defined group of species with four rows of stigmata leaves the genus *Polycitor* with those species having a much larger, but variable, number of rows of stigmata, with the type *P. crystallinus* Renier.

Genus SYCOZOA Lesson, 1830

*Sycozoa arborescens* Hartmeyer  
(Fig. 16)

*Sycozoa arborescens* Hartmeyer, 1912, p. 316.

*Known distribution*

Off Cape Town, South Africa.

*Localities*

*False Bay*: U.C.T., FAL 234 S.

*Mossel Bay*: U.C.T., MB 48 B; U.C.T., MB 65 F.

*Algoa Bay*: PF 586 A.

*Description*

The colonies which come closest to Hartmeyer's (1912) description of the type specimen are two from Mossel Bay (MB 48 B). These colonies measure respectively 2.0 and 2.2 cm. in greatest diameter (fig. 16 A, B). They consist of a short basal column from the top of which spring several heads, each incompletely divided into two. The heads are fan-shaped and laterally flattened. In

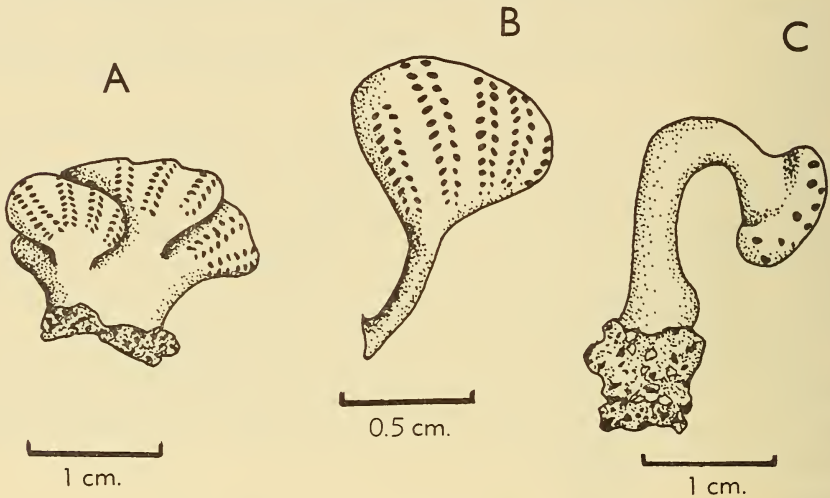


FIG. 16. *Sycosoa arborescens* Hartmeyer.  
A-C, colonies.

colour the colonies are pale grey with the zooids showing as darker marks. The zooids are arranged, as in Hartmeyer's specimen, in vertical double rows. They agree with the description of the type material, and like it, lack gonads.

The three specimens from False Bay do not have the characteristically branched colony. Two of them are single stalked heads (fig. 16 C), and one is a pair of headless stalks joined basally. One of the stalked heads has the flattened fan-shape which is found in the heads of more typical specimens of the species and has the same double linear arrangement of zooids. Some of the zooids of this colony have brood pouches containing a number of developing eggs, but no larvae.

Other specimens, from Mossel Bay (MB 65 F) and Algoa Bay, are less typical, but I am also including them in this species. They are single stalked heads resembling the small specimen shown by Hartmeyer (1912) in his text-figure 5.



*Remarks*

The form of branching, which was more clearly developed in the type specimen than in any of the present specimens, readily distinguishes this species from others of the genus. It is the only *Sycozoa* known from South African waters.

Genus *DISTAPLIA* Della Valle, 1881

*Distaplia capensis* Michaelsen

(Fig. 17)

*Distaplia capensis* Michaelsen, 1934, p. 141.

*Known distribution*

False Bay and Still Bay, Cape Province.

*Localities*

*False Bay*: U.C.T., FAL 136 M; U.C.T., FAL 158 N; U.C.T., FAL 175 N; U.C.T., FAL 182 W.

*?Mossel Bay*: U.C.T., MB 27 I.

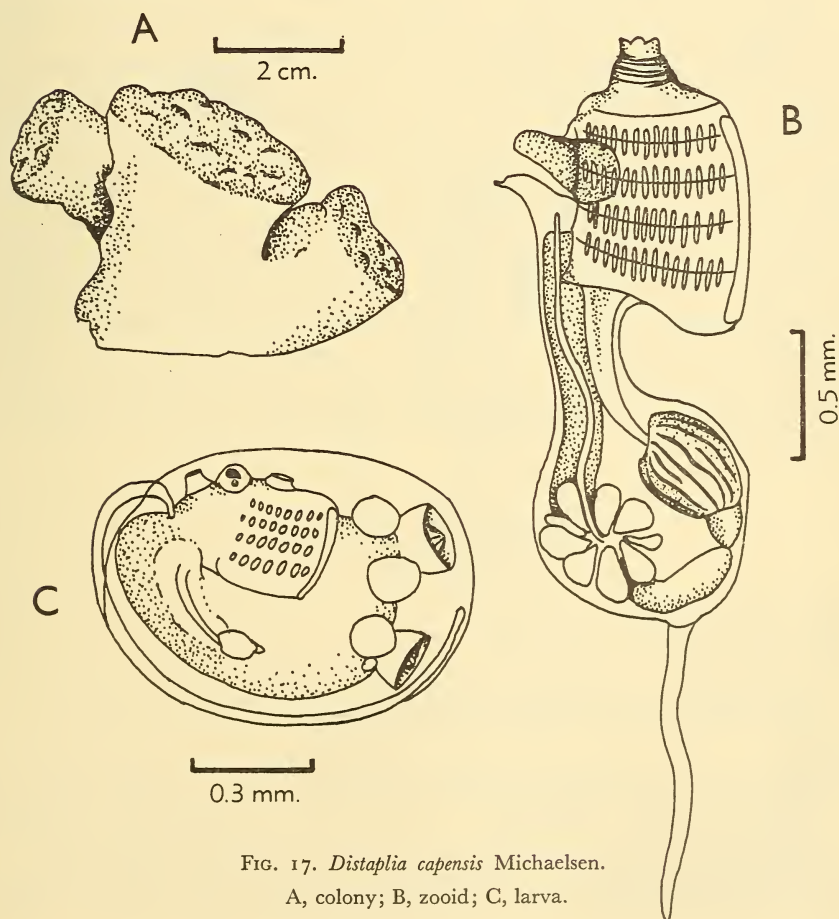


FIG. 17. *Distaplia capensis* Michaelsen.

A, colony; B, zooid; C, larva.

*Description*

The best-developed and most typical colonies are these from FAL 175 N (fig. 17 A). In these the basal part forms a short squat column and the head, which alone contains the zooids, is slightly wider than the column. The basal column, which Michaelsen (1934) designates the stalk, is white and tough, and the head has clear soft gelatinous test but is red-brown owing to the pigmentation of the thoraces. In the collector's notes the colonies are described as 'purplish, sloppy', or 'off-white, gelatinous'.

I can add little to the detailed description of the zooids, as the present material confirms in every respect the structure of the type specimens. In all zooids the folding of the stomach was distinct. In those sexually mature, only the testis was developed; this consisted of a rosette of about 10 follicles and was situated beside the intestinal loop. The position of the gonad, entirely within the abdomen, is an important point of distinction between the present species and *D. skoogi* (see figs. 17 B and 18 B).

There is one specimen from MB 27 I which I include, with some doubt, in *D. capensis*. This is a single colony of soft consistency and pink-brown colour, with small zooids having nothing to identify them, as the gonads are not developed. The thorax is orange in colour, in the preserved state. Many of the zooids have a single larva, and this seems to differ in some respects from that of *D. skoogi*, in which species the specimen otherwise might be placed. The length, from the end of the papillae to the base of the tail, is 0.8 to 0.9 mm. Compared with the larva of *D. skoogi* the trunk is deep. The arrangement of the papillae and their basal ampullae is similar. On each side of the postero-ventral part of the trunk there is a curved flat structure which partly conceals the oesophagus and rectum, only the stomach and part of the intestine being clearly visible. No structures of this kind were seen in the larva of *D. skoogi*. As far as could be determined these structures appear to be the thickened sides of the abdomen. It is therefore likely that this colony is not of *D. skoogi* and may be of *D. capensis*.

*Distaplia skoogi* Michaelsen

(Fig. 18)

*Distaplia domuncula* Michaelsen, 1923, p. 15.*Distaplia skoogi* Michaelsen, 1934, p. 131.*Known distribution*

Walker Bay and False Bay, Cape Province.

*Localities**False Bay*: U.C.T., FAL 232 E.*Off Cape St. Blaize*: PF 1864.*Algoa Bay*: U.C.T., LIZ 34 H.*?Morrumbene Estuary*: U.C.T., MOR 43 X.

*Description*

Some of the colonies of this species in the present collection invested the carapace of crabs, but others were attached to the stems of algae, and it appears that the association with a crab, although common, is not obligatory. The smallest specimen is one of 1.3 cm. diameter, attached to an algal stem, and the largest specimen is 5.2 cm. in length, and is part only of a colony. The colonies

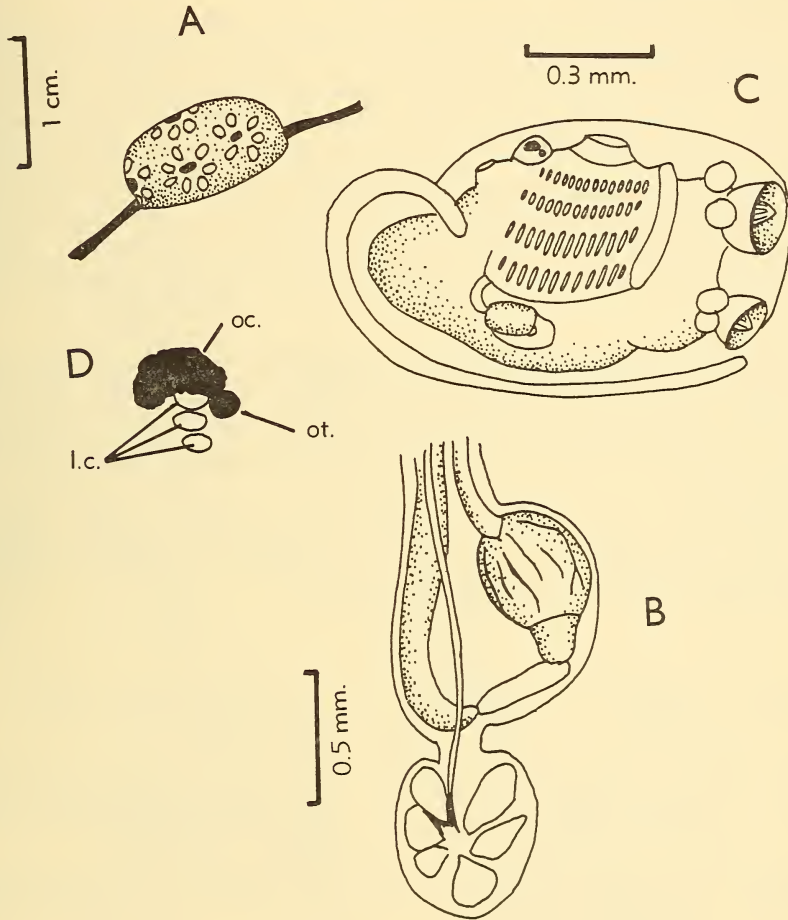


FIG. 18. *Distaplia skoogi* Michaelsen.

A, colony, B, abdomen of zooid; C, larva; D, ocellus and otolith of larva; l.c., lens cells; oc., ocellus; ot., otolith.

are of fairly firm texture and all have clearly visible small round or oval systems of zooids, generally closely crowded together. The common cloacal openings are fairly conspicuous.

The zooids have already been described (Michaelsen, 1923; Millar, 1955). There is rather more variation in the shape of the atrial opening and languet

than the previous accounts suggest. In some zooids of some colonies the atrial opening is relatively small and is surmounted by a long languet which has 3 distal lobes; in other colonies the zooids have a wide opening with a short, broad, undivided languet. The most characteristic feature of the zooid is the position of the gonad, which is accommodated in a small pouch projecting from the end of the abdomen (fig. 18 B). This pouch often projects even farther than is shown in Michaelsen's figure.

The colonies from FAL 232 E and LIZ 34 H had fully developed larvae. Not more than one larva was seen in each breeding zooid. The larva (fig. 18 C) measures 1.0 to 1.1 mm. from the end of the papillae to the base of the tail. There are 3 large papillae, two dorsal and one ventral, the ventral papilla lying to the right of the sagittal plane. Each papilla has two round ampullae at its base. The branchial sac and gut are well developed. Both ocellus and otolith are present in the sensory vesicle, but they are so close together that under low magnification it might be thought that only one pigmented organ is present. The ocellus has 3 lens cells, apparently in linear arrangement (fig. 18 D).

#### Remarks

Michaelsen (1923) described a new species from South Africa and named it *Distaplia domuncula*, and I used the same name for a later record (Millar, 1955). The name, however, was pre-occupied by a species which Hartmeyer (1913) had described, and Michaelsen (1934) gave his own species the new name *Distaplia skoogi*.

Michaelsen (1934) believed *Distaplia skoogi* Michaelsen and *Distaplia domuncula* (Hartmeyer) to be separate. A comparison of the three species recorded from Cape Province is given in Table 1.

TABLE I

|                     | Colony                                | Zooids              | Gonads  | Stomach                                   |
|---------------------|---------------------------------------|---------------------|---|---|
| <i>D. capensis</i>  | Slightly stalked.                     | Unisexual.          | Beside gut loop; 10-14 male follicles.                  | 14-16 folds.                              |
| <i>D. skoogi</i>    | Not stalked; usually investing crabs. | Hermaphrodite.      | In sac projecting from abdomen; about 5 male follicles. | Smooth externally; with lines internally. |
| <i>D. domuncula</i> | Not stalked; investing crabs.         | Probably unisexual. | Incompletely known.                                     | Smooth externally; with lines internally. |

*D. capensis* is evidently distinct from *D. skoogi* and *D. domuncula*, but the latter two species are similar and might eventually have to be united.

#### Genus SIGILLINA Savigny, 1816

I am using the genus *Sigillina* in the wide sense employed by Michaelsen (1930) and Hastings (1931) for the following single species, which does not agree completely with any of the sub-genera which Michaelsen defined.

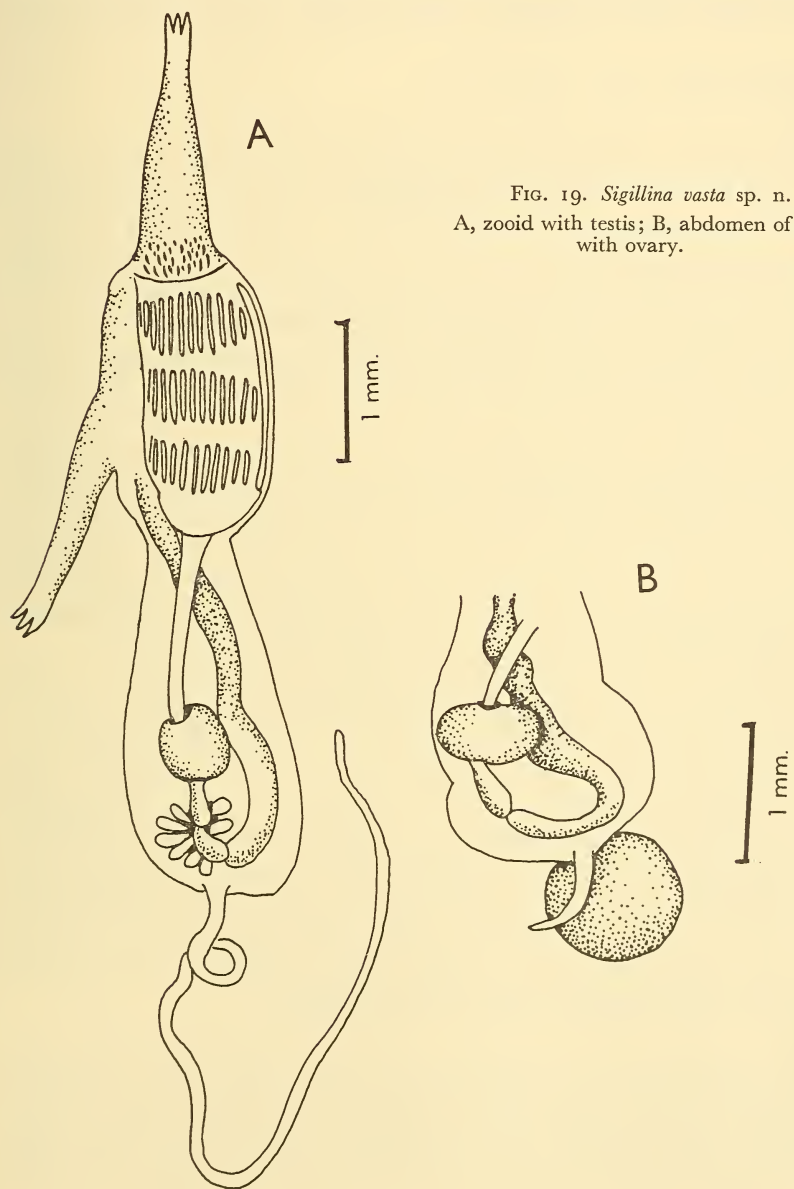


*Sigillina vasta* sp. n.

(Fig. 19)

*Diagnosis of species*

Colony massive, with a system of cloacal canals below the surface, and apparently a few common cloacal openings. Zooids with long oral and atrial

FIG. 19. *Sigillina vasta* sp. n.

A, zooid with testis; B, abdomen of zooid with ovary.

siphons, the latter at the posterior end of the thorax opening into a cloacal canal, and usually backwardly directed. Three rows of stigmata. Abdomen about the same length as thorax, and with a long narrow posterior vascular process. Gonad beside intestinal loop, with the ovary sometimes at the extreme posterior end of the abdomen.

#### *Holotype*

In the South African Museum. S.A.M. A25612 (U.C.T., TRA 60 E).

#### *Locality*

*Kaffirkuils Bay*: U.C.T., TRA 60 E.

#### *Description*

The specimen is part of a colony brought up in the catch of a commercial trawler, and the whole colony was, according to the note accompanying the specimen, a 'large gelatinous mass approximately 3 by 8 by 10 inches (2-3 lbs.)'. In the preserved state the specimen is purple-brown, with a very smooth surface. There is no encrusting material. A few irregular slits were found on the surface, and these are taken to be the external openings of the common cloacal canals which lie a little below the surface. The oral openings are apparently scattered without order and the zooids are therefore apparently not arranged in regular systems.

The zooids (fig. 19 A) are quite large, and may reach 7 mm. in length, with the thorax and abdomen of about equal length. The oral siphon is remarkably long, and may equal or even exceed the thorax in length. Its opening has 6 lobes. The atrial siphon arises from the posterior end of the thorax and is about the same length as the oral siphon. It is generally directed obliquely back, instead of towards the surface of the colony, and leads into one of the common cloacal canals. There are 6 lobes on the opening of the atrial siphon.

At the base of the oral siphon there are about 4 large tentacles and many short ones occupying a zone anterior to the large ones. The dorsal tubercle is small and its opening could not be clearly seen. Three rows of long narrow stigmata are present with at least 12 stigmata per row. The oesophagus is quite long, the stomach almost globular, and the post-stomach and intestine much as in species of *Eudistoma*. Some zooids have a group of about 10 testis follicles arranged in a rosette beside the gut-loop (fig. 19 A), with the sperm duct passing straight forward. In other zooids the ovary is developed, consisting of a small group of oocytes, or sometimes a single large egg projecting from the posterior end of the abdomen (fig. 19, B). There is a posterior vascular process from the end of the abdomen of very variable length.

#### *Remarks*

This remarkable species is difficult to place in its right genus. It would fit *Eudistoma* were it not for the presence of common cloacal canals into which the atrial siphons open. Another species, originally described by Sluiter (1895) under the name *Distoma deerratum* and later by Hastings (1931) as *Sigillina*

*deerrata* also has a long oral siphon, and a posterior atrial siphon opening into a common cloacal canal. This species, however, which Hastings identifies with *Polycitor coalitus* Sluiter, is known only from the tropical waters of Malaya and north and north-eastern Australia, and in spite of structural similarities it is very unlikely that the South African specimen is of that species.

There may be a case for recognizing a new subgenus of *Sigillina* to accommodate the two species *S. deerrata* and *S. vasta* which differ from *Eudistoma* in having the atrial siphon opening to a cloacal system.

#### Genus EUDISTOMA Caullery, 1909

##### *Eudistoma digitatum* sp. n.

(Fig. 20)

##### *Diagnosis of species*

Fully grown colony massive and firm with solid base, and apex divided into a number of finger-like lobes which do not spread, but have a tendency to grow inwards. Test fibrous, with large bladder cells which are few and widely spaced. Zooids with a short wide thorax, a longer but narrower abdomen, and a long posterior process of variable width. Gonads beside intestinal loop.

##### *Holotype*

In the British Museum (Nat. Hist.). Bowerbank, 'Cape of Good Hope'.

##### *Localities*

*Mossel Bay*: PF 11 A; U.C.T., MB 48 C.

*Algoa Bay*: U.C.T., LIZ 32 P; B.M. (N.H.) collection, reg. no. 1852.3.12.

81, collected by J. Bowerbank; B.M. (N.H.) collection, reg. no. 1852.3.12.89, collected by J. Bowerbank.

'*Cape of Good Hope*': B.M. (N.H.) collection, no reg. no., collected by J. Bowerbank.

##### *Description*

The colony, when large, has a very characteristic appearance, best shown by the specimens collected by Bowerbank from 'Cape of Good Hope' (fig. 20 A), and Algoa Bay. The 3 largest specimens have the following dimensions:

|              |      |     |      |
|--------------|------|-----|------|
| height (cm.) | 14.0 | 7.6 | 10.0 |
| width (cm.)  | 12.5 | 6.3 | 5.0  |

From a solid base there arises an upright portion which is usually stout and columnar, but may be very short. The apex of this portion is divided into a number, up to 12, of characteristic finger-like or wide tongue-like lobes. These lobes are grouped close together and instead of spreading outwards have a tendency to grow inwards at the top, towards the vertical axis of the colony. The whole colony is very massive and firm, and the surface smooth without

any encrusting matter. There is no sand within the colony and the common test is fairly homogeneous, except for fibres and a few scattered bladder cells. In well-preserved colonies the zooids are sometimes visible externally; they are mainly confined to the lobes.

The zooids (fig. 20 B) consist of a short wide thorax often about 1 mm. long, and a narrower abdomen about 2 mm. long. A long vascular process

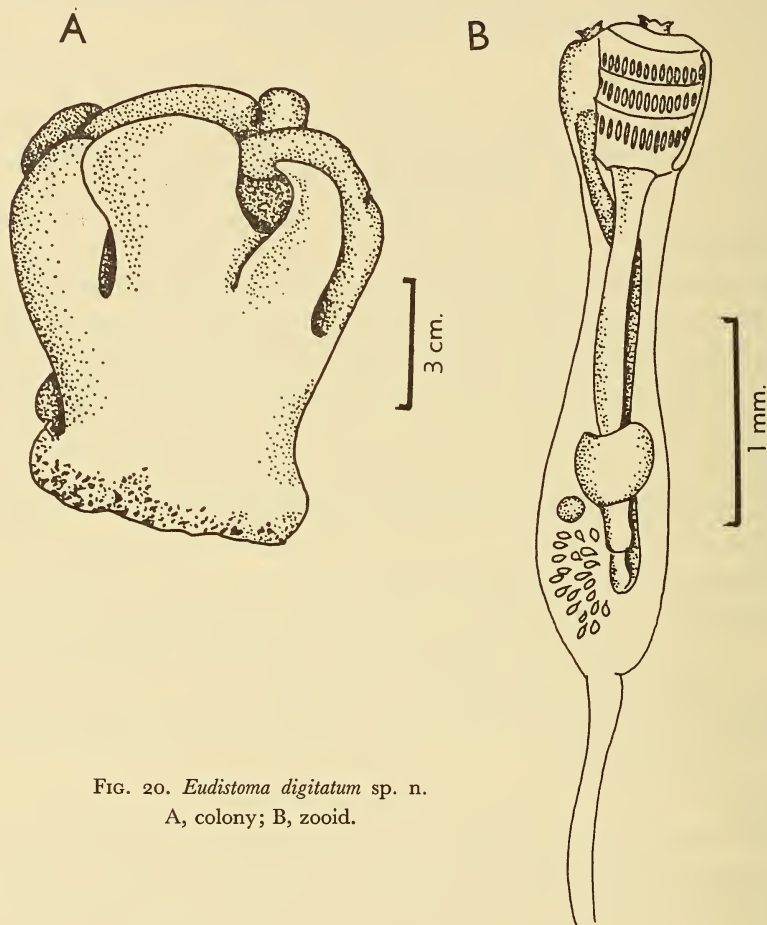


FIG. 20. *Eudistoma digitatum* sp. n.  
A, colony; B, zooid.

projects from the end of the abdomen and extends, often for many mm., downwards towards the base of the colony. Generally this process is very slender, but in some colonies it is almost as wide as the abdomen and contains large quantities of opaque tissue, probably consisting of reserve food cells. The siphons are both short, with 6 indistinct lobes, and open close together on the surface of the colony. The thorax is usually widest at its anterior end. About 16 oral tentacles were counted, but others were present spread over a zone at



the base of the siphon. There are about 16 stigmata in each of the 3 rows. The length of the oesophagus varies, but is usually greater than that of the thorax. It is tapered at the lower end where it enters the round or wide smooth-walled stomach. A narrow post-stomach leads to the curved intestine. The rectum is of uniform diameter. In mature zooids there is a group of many small testis follicles situated beside the lower part of the gut loop and sometimes projecting slightly posterior to it. The ovary is represented by one large oocyte, no doubt with other smaller ones not visible.

#### Remarks

This species, which should not have been mistaken for others, does not seem to have been described, although several species of *Eudistoma* are known from South African waters. It is remarkable for the large and massive appearance of the colonies.

#### *Eudistoma coeruleum* (Sluiter)

(Fig. 21)

*Distoma coeruleum* Sluiter, 1898, p. 14.

#### Known distribution

Natal; ?Still Bay, Cape Province; Mozambique.

#### Localities

Natal: Bluff, M.S. *Evans*, British Museum (N.H.) reg. no. 1876.9.3.4;  
Scottburgh, S.A. Museum, low water level.

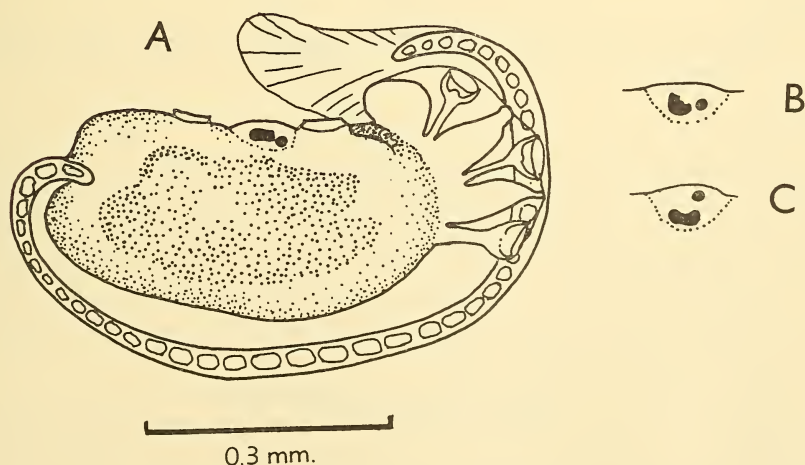


FIG. 21. *Eudistoma coeruleum* (Sluiter).

A, larva; B, C, sensory vesicle of different larvae to show variation in position of ocellus and otolith.

*Description*

This species is easily recognized by the club-shaped colonies of dark slate-blue or purple colour. Zooids are confined to the expanded head of the colony, and in the present material measured from 1.5 to 2.5 mm. in length; Sluiter (1898) gives 4.5 mm. as the maximum length of zooids. In some of the new material and especially that from Scottburgh, there are moderately powerful longitudinal and transverse muscles on the thorax and the longitudinal ones pass down towards the ventral side of the abdomen. In the branchial sac at least 10 stigmata were counted in each row. The dorsal languets are long and slender.

*Larva*

Colonies from both stations had larvae, only one to three in the atrial cavity of each breeding zooid. The larva (fig. 21 A) measures 0.5 to 0.6 mm. from the end of the papillae to the base of the tail. The trunk is rather long and narrow, with the sensory vesicle about the middle of the dorsal side. Both a black otolith and a paler ocellus are present, but their relative position varies (fig. 21 B, C). There are three anterior papillae.

*Eudistoma modestum* (Sluiter)

(Fig. 22)

*Distoma modestum* Sluiter, 1898, p. 18.

*Known distribution*

Durban, Natal.

*Localities*

*Algoa Bay*: U.C.T., LIZ 1 Z; U.C.T., LIZ 9 M; U.C.T., LIZ 34 M, N; PF 895.

*Description*

The colonies vary a good deal in appearance, but most are rather soft and gelatinous in texture, and flattened, the flattening perhaps being an artefact. The specimens do not have a definite stalk, as in Sluiter's type material. As Sluiter's specimens did not exceed 1 cm. in diameter, however, they may not have reached the full size of the species; it is possible that further growth would have brought about a change in shape. The colour is brown or semi-transparent with brown zooids showing through.

The zooids (fig. 22) are 2-4 mm. in length, and have a shorter waist than is common in the genus. Although Sluiter described the waist as long and thin, I have found, on examining the type specimens, that in many zooids it is only slightly longer than the thorax. The longitudinal thoracic muscles in the present material are slender and number up to 18. In some colonies the siphons and the anterior end of the thorax are chocolate coloured, and brown spots also

mark the rest of the thorax. Zooids of the type material, which I have examined, have the same parts marked with pink. The difference in colour may be due to a difference in the method of preservation. In most other respects the structure of the zooids is like that of the type specimens, but the oral tentacles number at least 30, whereas Sluiter recorded only 16.

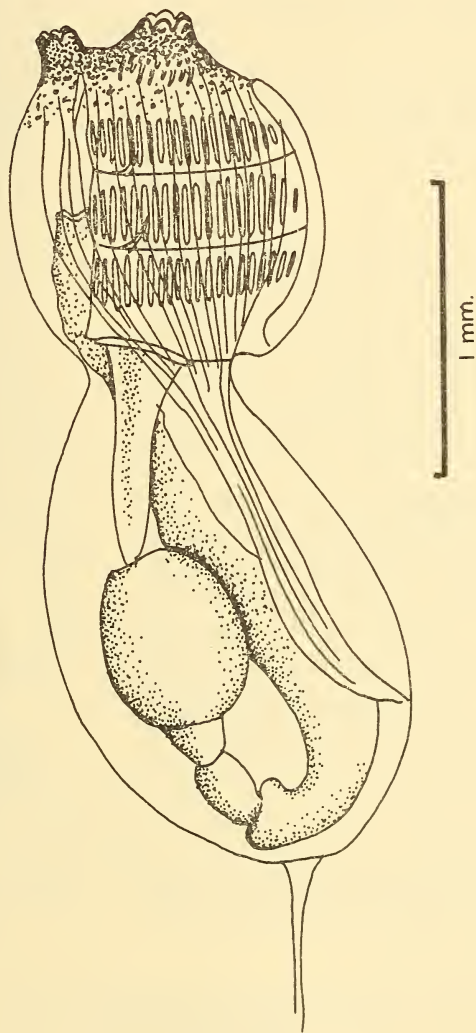


FIG. 22. *Eudistoma modestum* (Sluiter).  
Zooid.

#### Remarks

This is one of those cases in which the new specimens agree fairly closely with type material but show such differences as might be expected to result from their having been collected at a different age, or stage of maturity.

*Eudistoma renieri* (Hartmeyer)

(Fig. 23)

*Polycitor* (*Distoma*) *renieri* Hartmeyer 1912, p. 309.*Known distribution*

St. Francis Bay, Cape Province.

*Localities*

North of Durban 29° 37' S., 31° 16' E.,  
60 m., 'Gilchrist Collection', British Museum  
(N.H.) reg. no. 1926.8.1.5.

*Description*

The single example of this species is a colony of roughly cylindrical form, about 7.5 cm. long and 3.0 cm. in diameter. It is very firm in consistency, partly owing to the sand which encrusts and impregnates the test. There is a small area round each zooid free of sand, and the surface of the colony consequently has a mottled appearance.

The zooids (fig. 23) are about 5 mm. long, and are similar in proportions to those described by Hartmeyer (1912). According to Hartmeyer the lower part of the gut has a twisted loop characteristic of the species. This feature was also noticeable in the material from the British Museum (N.H.). A narrow process of variable length arises from the lower end of the abdomen, but Hartmeyer did not find a similar process in his material.

*Remarks*

The present record extends the known range of this species into the warmer south-eastern waters off the coast of Natal.

*Eudistoma illotum* (Sluiter)

(Fig. 24)

*Distoma illotum* Sluiter, 1898, p. 16.*Polycitor* (*Distoma*) *illotus* (Sluiter). Hartmeyer, 1912, p. 303.*Known distribution*

Cape Town and Simon's Bay, Cape Province.



FIG. 23. *Eudistoma renieri*  
(Hartmeyer).  
Zooid.



*Localities*

*False Bay*: FAL 175 L.

*Mossel Bay*: ?MB 7 Q; ?MB 22 F; ?MB 27 J; ?MB 48 D.

*Description*

Colonies are of rounded, lobed, upright or even slightly stalked, shape. No sand is present either on the surface or within the colony. The test is of a milky or semi-transparent appearance. Large vesicular cells are present in the test and these were noted by Sluiter (1898) as a distinguishing feature of the species.

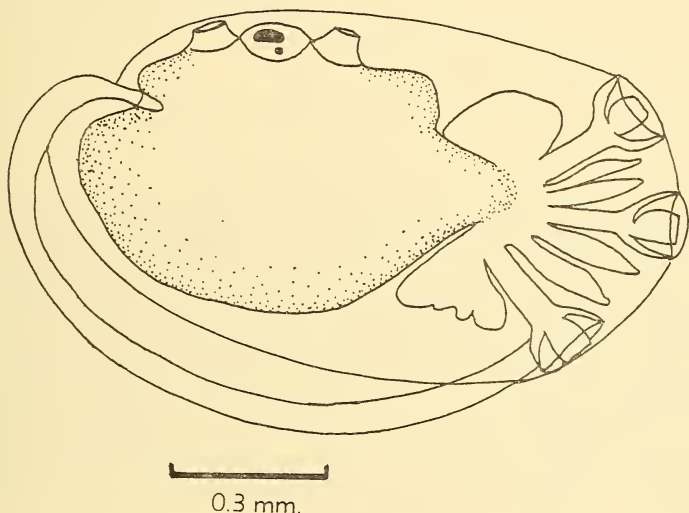


FIG. 24. *Eudistoma illotum* (Sluiter).  
Larva.

In the colonies from False Bay the zooids are 3–4 mm. in length, and slender with a long waist as in the type specimens. The zooids in the colonies collected from Mossel Bay range from 2 to 6 mm. in length and have only a short waist. I am therefore a little doubtful of the identification of the material from Mossel Bay.

*Larva*

No larvae were found in the present material, but Sluiter's type specimens, which I have been able to examine, have larvae (fig. 24). These range from 0.96 to 1.20 mm. in length, from the end of the papillae to the base of the tail. There are 3 anterior papillae with a pair of narrow lateral ampullae between each two adjacent papillae, on each side. Both ocellus and otolith are present. Only one larva was found in each breeding zooid, perhaps owing to the large size of the larvae.

Reliable characters in the genus *Eudistoma* are few, there is considerable

similarity in the zooids of different species, and the colony is often variable. For these reasons the identification of a number of specimens is doubtful and I include the following two species with hesitation.

*?Eudistoma angolatum* Michaelsen

*Polycitor (Eudistoma) paesslerioides* var. *angolana* Michaelsen, 1914, p. 430.

*Known distribution*

Gulf of Guinea (W. Africa); NW. and W. Australia.

*Localities*

*False Bay*: FAL 158 Q; FAL 208 T.

*Mossel Bay*: MB 7 P; MB 60 R.

*Algoa Bay*: LIZ 34 F.

*Description*

The colonies are usually pillow-shaped, rounded, or slightly lobed. They are coated and impregnated with sand and are consequently hard.

The zooids seldom exceed 6 mm. in length, of which the thorax generally occupies 1.0–1.5 mm. Muscles are well developed, consisting principally of about 10 longitudinal strands on each side of the thorax, and a powerful ring of muscles on each siphon. The waist of the zooids is long, containing the correspondingly long oesophagus and rectum. A short vascular process sometimes extends below the abdomen. Gonads, present in specimens collected in January 1958, consist of a group of 11–20 or more testis follicles beside the lower part of the intestinal loop, and a small ovary.

*Remarks*

*E. angolatum* has not been recorded from closer than tropical west Africa, but I can find no important differences between that species and the present specimens. The identification remains doubtful, however, owing to the difficulty of separating species of *Eudistoma*, and to the wide geographical separation of previous records.

*?Eudistoma mobiusi* (Hartmeyer)

*Colella mobiusii* Hartmeyer, 1905, p. 396.

*Polycitor mobiusi* Hartmeyer, 1912, p. 305.

*Known distribution*

Cape Province and Madagascar.

*Localities*

*False Bay*: FAL 208 R.

*Algoa Bay*: LIZ 19 Z 1.

*Description*

The single colony from False Bay and the two from Algoa Bay are all about the same size, 1.2–1.4 cm. long. There is a rounded or flattened head, and a narrower but slightly longer stalk. Both head and stalk are firm and pale grey to dull yellow in colour. Zooids are visible on the head.

The zooids usually attain a length of up to 7 mm. The oral tentacles are very small and arranged in several circles. There are at least 15 stigmata in each of the three rows. The waist of the zooid is rather short, so that the oesophagus and rectum are not so long as in some species of *Eudistoma*. This is a feature, however, which might change at different periods in the life of the colony. No gonads were present.

Family **Didemnidae** Giard, 1871Genus **DIDEMNUM** Savigny, 1816

The genus *Didemnum* has given systematists great trouble and even the most experienced workers have hesitated in deciding specific distinctions. Thus Van Name (1945, p. 80) wrote in his account of the American species 'The treatment of the species that is possible with present information is necessarily somewhat provisional and will doubtless require future revision, but the evidence seems to be that instead of *Didemnum* being one of the largest genera of ascidians, the species are in reality rather few, though in some cases widely distributed geographically.' And again in treating *Didemnum candidum* Savigny he states (p. 86) that 'This is the most difficult of all the American ascidians to deal with from a taxonomic point of view. I am far from being able to overcome the fear that I am confusing more than one species, but after the examination of a large amount of material from various American localities I am at a loss to find a reliable basis for dividing it by studying museum specimens.' The situation is similar with regard to the South African species. Michaelsen (1934, p. 147), in his description of *D. stilense* from Still Bay, Cape Province, had to admit that 'Because of our uncertainty as to the limits of variability and because of the occurrence of so many species insufficiently described, it is hardly possible to say whether *D. stilensis* is indeed a new species, or whether it should be identified with any older species.'

I believe that to try to identify preserved specimens, usually few in number, collected at different seasons and states of their annual cycle, and generally without any biological data, would only add further confusion. A proper taxonomic study of the genus should involve regular collection of specimens throughout the year, in large numbers, together with observation of biological characters such as breeding season. For these reasons I have made a very tentative identification of a number of specimens of the genus *Didemnum*, as *D. stilense*.

*?Didemnum stilense* Michaelsen

*Didemnum stilense* Michaelsen 1934, p. 146. Millar, 1955, p. 176.

*Known distribution*

Cape Province.

*Localities*

*Langebaan Lagoon*: U.C.T., LB 367 V.

*False Bay*: U.C.T., FAL 121 B; U.C.T., FAL 136 N; U.C.T., FAL 152 M;  
U.C.T., FAL 158 X; U.C.T., FAL 163 P; U.C.T., FAL 175 B;  
U.C.T., FAL 176 R; U.C.T., FAL 182 U; U.C.T., FAL 216 A;  
U.C.T., FAL 232 E; U.C.T., FAL 272 F; U.C.T., FAL 277 K;  
U.C.T., FB 1106 B.

*Mossel Bay*: U.C.T., MB 18 R.

*Algoa Bay*: U.C.T., LIZ 9 K; U.C.T., LIZ 28 S; U.C.T., LIZ 34 B;  
PF 586 B.

*Description*

Colonies are generally thin and encrusting but otherwise are of very variable appearance. In the preserved state the colour is white, grey, buff, pink or blue, and the collector's notes show that living material is also of various colours, but that these may change considerably on preservation. Spicules are usually many, closely crowded, and present throughout the whole test. They are generally of a regular stellate form with 6-10 conical rays as seen in optical section. Sometimes the rays are more numerous, or small and rounded, or with blunt ends. The larger spicules are generally 20-30 $\mu$  in diameter and occasionally as large as 40 $\mu$  or even 70 $\mu$ .

The thorax of the zooids is rather smaller than the abdomen, and possesses a slender retractor process which may be almost as long as the abdomen. The atrial opening varies in size and depends at least partly on the degree of contraction of the thorax. The gut is divided as usual in the genus. A single large egg generally represents the ovary when this is well developed. The testis has a single large follicle with the proximal part of the sperm duct forming 8-10 coils on its surface.

*Larva*

Larvae were present in colonies from the following collections:

False Bay, 17-2-53, 20-8-47, 18-9-53.

Mossel Bay, 13-1-51.

Algoa Bay, 7-4-54.

The larva has the general structure commonly found in the family. There are 3 anterior adhesive papillae, 4 lateral ampullae on each side, and a sensory vesicle with ocellus and otolith. Larvae varied considerably in size, the smallest having a length of 0.4 mm. (False Bay, 18-9-53) and the largest a length of



0.95 mm. (Algoa Bay, 7-4-54). This is a large range within one species, but Carlisle (1954*a*, 1954*b*) has shown that didemnid larvae vary in size according to the size of the zooids, which itself is variable.

#### Remarks

It must be emphasized that the identification of the above specimens as *D. stilense* is tentative.

#### Subgenus POLYSYNCRATON Nott 1891

*Didemnum (Polysyncraton) magnilarvum* sp. n.

(Fig. 25)

#### Diagnosis of species

Colony flat but rather fleshy. Spicules few, stellate, up to  $75\mu$  in diameter. Common cloacal openings numerous. Zooids with wide atrial opening, short atrial languet, slender retractor process, testis of 8 to 10 follicles, and sperm duct of 2 to 3 coils. Larva with trunk about 1.3 mm. long, having a collar of about 30 narrow ampullae surrounding the 3 papillae. Budding is precocious, advanced larvae each having 2 buds.

#### Holotype

In the South African Museum. S.A.M. A25613 (PF 12393 B).

#### Locality

Natal: PF 12393 B.

#### Description

The single colony is 6 cm. by 3.7 cm. in diameter and 0.7 cm. thick. It is flat but of a rather fleshy appearance. In the preserved state the colour is greyish-pink. The upper surface is smooth without any encrusting matter, and the whole colony is soft and flexible. Certain areas of the colony are paler owing to the presence of greater numbers of spicules, which, however, are scarce in most places. The common cloacal openings are numerous and scattered irregularly over the surface. Spicules are nowhere numerous in the common test, but are most plentiful near the upper and lower surfaces and scarcest in the central layers. They are stellate and the largest ones reach  $75\mu$  in diameter, but most are smaller.

The zooids (fig. 25 A, B) do not show any obvious arrangement in systems. They are generally about 1 mm. long, the thorax being only slightly longer than the abdomen. The oral siphon is tubular, with 6 rather shallow lobes. The atrial opening is wide and exposes quite a large part of the branchial sac. A short atrial languet is present; it has a narrow base and slightly wider free end which is sometimes indented, giving the languet two shallow lobes. No trace was found of lateral thoracic organs, and there were no accumulations of spicules beside

the thorax such as generally mark the position of these organs in species which possess them.

There are 4 rows of stigmata, and a long slender retractor process from the base of the thorax. The oesophagus is of moderate length, leading to the ovate or almost globular stomach. There is a short post-stomach, and simple intestinal loop. The testis consists of a rosette of 8 to 10 follicles, and the sperm duct makes about  $2\frac{1}{2}$  spiral turns before passing forward towards the rectum.

#### Larva

Numerous larvae (fig. 25 C) were embedded in the common test. When fully developed these have a trunk about 1.3 mm. long, measured from the end of the papillae to the base of the tail. The 3 papillae project from the centre of a

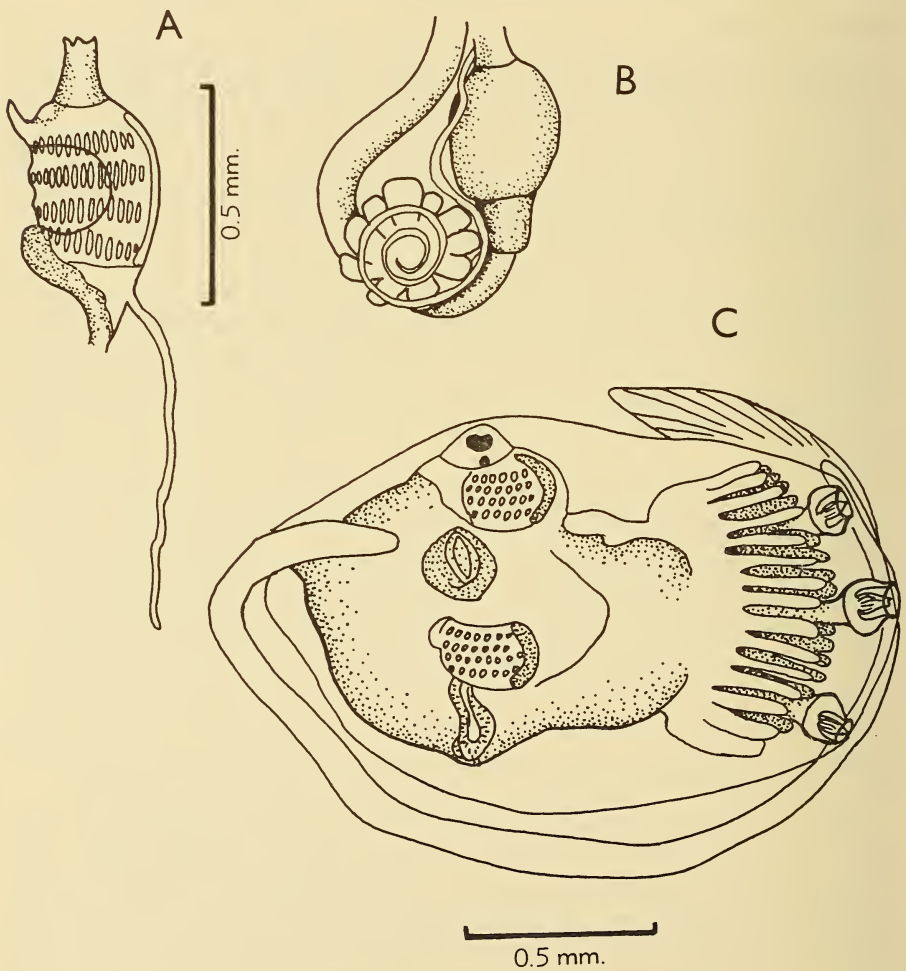


FIG. 25. *Didemnum (Polysyncraton) magnilarvum* sp. n.  
A, thorax of zooid; B, abdomen of zooid; C, larva.

collar of about 30 narrow finger-like ampullae, formed by the subdivision of the paired ampullae generally present in didemnid larvae. The sensory vesicle has both ocellus and otolith. In addition to the branchial sac and gut of the oozoid there is, on each side of the larval trunk, an equally well developed branchial sac and gut representing the first two blastozooids. A similar precocious development was noted by Lahille (1890) in *Didemnum (Polysyncraton) lacazii*. In the Didemnidae this is characteristic of *Diplosoma* but I do not know of other references to the phenomenon in *Polysyncraton*. The larvae of only a few species are known, however, and I believe that the precocious appearance of blastozooids, together with the subdivided anterior collar, may be found characteristic of larvae in the sub-genus *Polysyncraton*.

#### Remarks

Few species of the sub-genus are known from the waters of South Africa or the western Indian Ocean. *D. (Polysyncraton) spongiioides* (Hartmeyer) and *D. (Polysyncraton) chuni* (Hartmeyer), both from 318 m. off Cape of Good Hope, appear to be very closely related to each other, if distinct, but they are clearly distinguished from *D. (Polysyncraton) magnilarvum* by their small number (3 or 4) of testis follicles. *D. (Polysyncraton) tubiporae* (Michaelsen) from Zanzibar is distinguished by its characteristic lateral thoracic organs with adjacent masses of spicules. *D. (Polysyncraton) paradoxum* Nott var. *mahenum* Michaelsen is described from the Seychelles and the species originally from New Zealand. The variety seems to be rather like the present species, but has much smaller spicules and usually only 4 testis follicles. *D. (Polysyncraton) amethysteum* (Van Name) is known from tropical Atlantic America, tropical west Africa and the eastern Mediterranean; it is therefore a species of widespread occurrence in warm waters and might be expected to occur in the Indian Ocean. It resembles the new species but has smaller spicules, fewer testis follicles and a larva only half as large.

### GENUS LEPTOCLINIDES Bjerkan, 1905

#### *Leptoclinides capensis* Michaelsen

*Leptoclinides capensis* Michaelsen 1934, p. 151.

#### Known distribution

Preekstoel, near Still Bay, Cape Province.

#### Localities

Table Bay: U.C.T., TB 171 A.

False Bay: U.C.T., FAL 117 B.

#### Description

The specimen from False Bay is a colony 1 cm. in diameter, which had been growing on the carapace of a small dromiid crab, according to the

collector's note, but the specimen from Table Bay is incomplete and the substratum unknown. In the colony from False Bay there is a single central common cloacal opening; Michaelsen (1934) also apparently found only one opening in his type specimen. I have found the structure of the common test to agree in general with Michaelsen's description, except in the absence of bladder cells from the whole superficial layer, the type specimen having a narrow subcortical layer without bladder cells. Spicules are few, being concentrated almost entirely near the opening of the oral siphon and at the lateral thoracic organs. The zooids agree well with those of the type specimen, but have rather larger lateral thoracic organs. Six spiral turns of the sperm duct lie over the single testis follicle.

The colony from Table Bay, collected on 8-4-1946, had developing larvae in the common test, but none fully formed.

Genus *LISSOCLINUM* Verrill, 1871

*Lissoclinum cavum* sp. n.

(Fig. 26)

*Diagnosis of species*

Colony consisting of an upper and a lower layer of common test, separated by a large common cloacal space across which the zooids are stretched. Spicules up to  $40\mu$  in diameter. Zooids with a very large atrial opening, and two groups of spicules over the postero-ventral corners of the thorax. Testis with about 5 follicles. Sperm duct not coiled.

*Holotype*

In the South African Museum. S.A.M. A 25614 (U.C.T., LIZ 32 V).

*Localities*

*False Bay:* U.C.T., FAL 234 U1.

*Algoa Bay:* U.C.T., LIZ 32 V.

*Description*

The specimens from both stations are thin irregular sheets, of a dirty yellow or brown colour. Small darker spots on the surface mark the oral openings. The quite numerous round or oval common cloacal openings are scattered over the surface. The colony consists of an upper thin layer of common test and a lower rather thicker layer. Between these layers is the very large common cloacal cavity. Spicules (fig. 26 A) are numerous and closely packed in the upper and lower layers of the colony, and are also present in the test which covers the abdomen. They are stellate but somewhat irregular with a tendency for the rays to be arranged in pairs, or to be reduced to round swellings. The maximum diameter found was  $40\mu$ . In addition there is an ovoid mass of spicules at the postero-ventral corners of the thorax, presumably marking the position of the



lateral thoracic organs. The zooids (fig. 26 B), each enclosed in a thin sheath of test material, are suspended between the two layers of test. Most zooids are between 1 and 2 mm. in length. The thorax is generally slightly longer than the abdomen. The oral siphon is tubular, of variable length, and ends in 6 indistinct lobes. Much of the dorsal surface and sides of the thorax are exposed

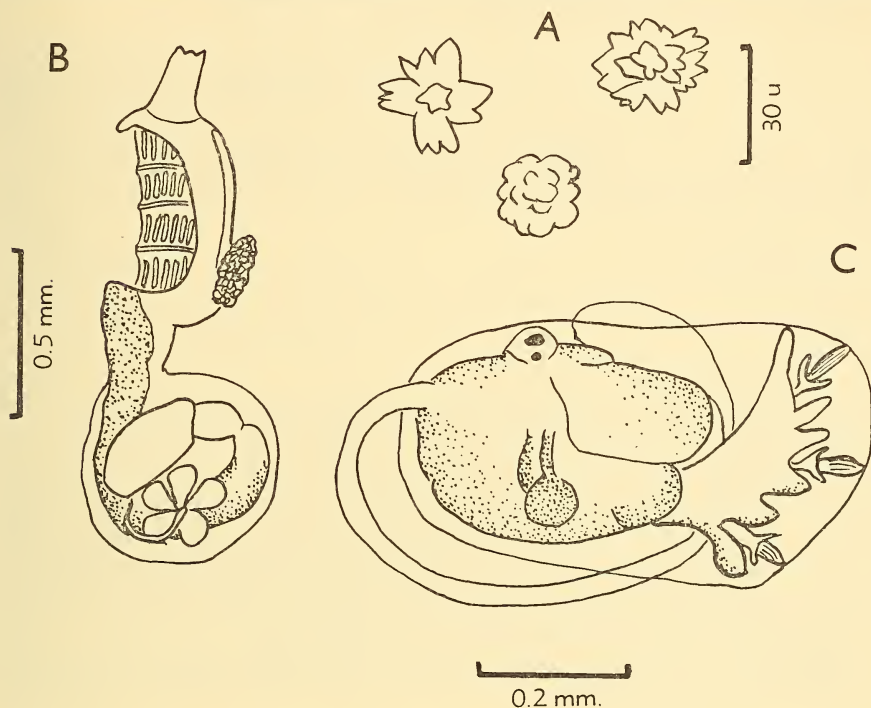


FIG. 26. *Lissoclinum cavum* sp. n.

A, spicules; B, zooid; C, larva.

by the very large atrial opening, the anterior border of which has a short projecting lip or languet. There are about 24 long slender oral tentacles which meet across the base of the oral siphon. Each of the four rows has about 14 stigmata. The abdomen lies almost at right angles to the thorax, thus displacing the gut from the attitude normal in didemnids. The stomach, which is ovoid or cylindrical, is followed by a short post-stomach, and an intestine and rectum of almost uniform diameter. No ovary was present in any of the zooids examined. The testis consists of a rosette of 5 or 6 wedge-shaped follicles, and the sperm duct, originating from the centre of the rosette, does not make any spiral turns, but is gently curved near its point of origin.

#### Larva

The specimen from Algoa Bay, taken on 6-4-1954, contained larvae (fig. 26 C). The trunk of the larva is about 0.6 mm. long from the end of the papillae

to the base of the tail. The papillae project from the centre of a group of irregular ampullae. Both ocellus and otolith are present in the sensory vesicle.

#### Remarks

*Lissoclinum bilobatum* Millar is perhaps the South African species most like *L. cavum*, but is distinguished by having only 2 testis follicles.

### Genus TRIDIDEMNUM Della Valle, 1881

#### *Trididemnum cerebriforme* Hartmeyer

*Trididemnum cerebriforme* Hartmeyer, 1913, p. 139.

#### Known distribution

Cape Province.

#### Localities

*Saldanha Bay*: U.C.T., SB 130 U.

*Langebaan Lagoon*: U.C.T., LB 352 U; U.C.T., LB 374 F; U.C.T., LB 378 R; U.C.T., LB 384 Y; U.C.T., LB 472 G.

*False Bay*: U.C.T., FAL 136 S; U.C.T., FAL 144 Z; U.C.T., FAL 216 E; U.C.T., FAL 225 P; U.C.T., FAL 234 U<sub>2</sub>; U.C.T., FAL 272 G; Mortensen's Java-South Africa Expedition 1929-30. Station 61, B.M. (N.H.) reg. no. 34.2.1.3; Mortensen's Java-South Africa Expedition, 1929-30. Station 65, 19.12.29, B.M. (N.H.) reg. no. 34.2.1.5.

*Mossel Bay*: U.C.T., MB 59 K; U.C.T. MB 84 S.

*Algoa Bay*: U.C.T., LIZ 9 L; U.C.T., LIZ 28 T; U.C.T., LIZ 32 U; U.C.T., LIZ 34 E.

*Commercial trawlers*: U.C.T., TRA 71 F.

#### Description

The largest of the three specimens on which Hartmeyer (1913) based this species had a much-folded surface but in the smallest the surface was almost plain. The brain-like folding cannot therefore be regarded as a diagnostic character. Among the numerous specimens in the South African collections that I have examined there are many colonies with a smooth surface and only a few which are much convoluted. One of the latter kind, taken by Mortensen's expedition, is folded over so that the anatomically lower surfaces are almost in contact, leaving an extensive but narrow space into which open slits which I take to be the common cloacal openings. These openings are therefore on the under surface of the colony, a condition thought to exist (Michaelsen, 1930) in *Leptoclinides brasiliensis*, but otherwise very rare in the Didemnidae. In all other respects this South African specimen agrees with more typical examples of *T. cerebriforme*. The zooids of various colonies show much variation in the

amount of pigment on the thorax. In some there is no pigment, in others a small dark spot over the anterior end of the endostyle, and in many specimens the thorax has a great quantity of dark blue pigment.

Genus DIPLOSOMA Macdonald, 1859

*Diplosoma listerianum* Milne Edwards

*Leptoclinum listerianum* Milne Edwards, 1841, p. 84.

*Diplosoma listerianum* Michaelsen, 1919, p. 42.

*Known distribution*

West coast of Europe; Mediterranean; Adriatic; Sargasso Sea; west Africa; Luderitz Bay, South West Africa to Durban, Natal.

*Localities*

*Saldanha Bay*: U.C.T., SB 92.

*False Bay*: U.C.T., FAL 109 Y; U.C.T., FAL 272 F.

*Algoa Bay*: U.C.T., LIZ 1 Y.

*Remarks*

I can find no constant differences between these specimens and colonies of *D. listerianum* from British waters. There is some doubt, however, regarding the validity of certain species of *Diplosoma*, and it may prove that *D. modestum* described by Michaelsen (1920) from the Seychelles and Zanzibar is identical to *D. listerianum*. The Atlantic American *D. macdonaldi* Herdman also appears to be very similar anatomically, but Van Name (1945) was unwilling to identify it with *D. listerianum* without having examined European material. This is a genus in which anatomical features of colony and zooid are very uniform and specific differences may have to be sought in larval or biological characters.

Family **Cionidae** Lahille, 1887

Genus CIONA Fleming, 1822

*Ciona intestinalis* (Linnaeus)

*Ascidia intestinalis* Linnaeus, 1767, vol. 1, pp. 2, 1087.

*Ciona intestinalis* Fleming, 1822, p. 512.

*Known distribution*

West coast of Europe, Mediterranean, tropical west Africa, east and west coasts of north America, Malay Archipelago, Japan, Australia, South Africa.

*Localities*

*Saldanha Bay*: U.C.T., SB 94; U.C.T., SB 134 A.

*Description*

The South African specimens are typical of the species as found in European waters. I was able to confirm the distribution of the longitudinal muscles to the siphons, as previously described (Millar, 1953).

Family **Asciidiidae** Adams, 1858Genus *ASCIDIA* Linnaeus, 1767*Ascidia stenodes* sp. n.

(Fig. 27)

*Diagnosis of species*

Anterior part of body narrow and elongated, with terminal oral siphon. Atrial siphon posterior to middle of body. Body wall with a sharply defined band of transverse muscles along the dorsal side. Gut small, mainly in the posterior part of the body, and forming a single narrow loop with the anus near the oesophagus.

*Holotype*

In the South African Museum. S.A.M. A25615 (U.C.T., FAL 259 Q).

*Localities*

*False Bay*: U.C.T., FAL 5 J; U.C.T., FAL 259 Q; U.C.T., FB 1102.

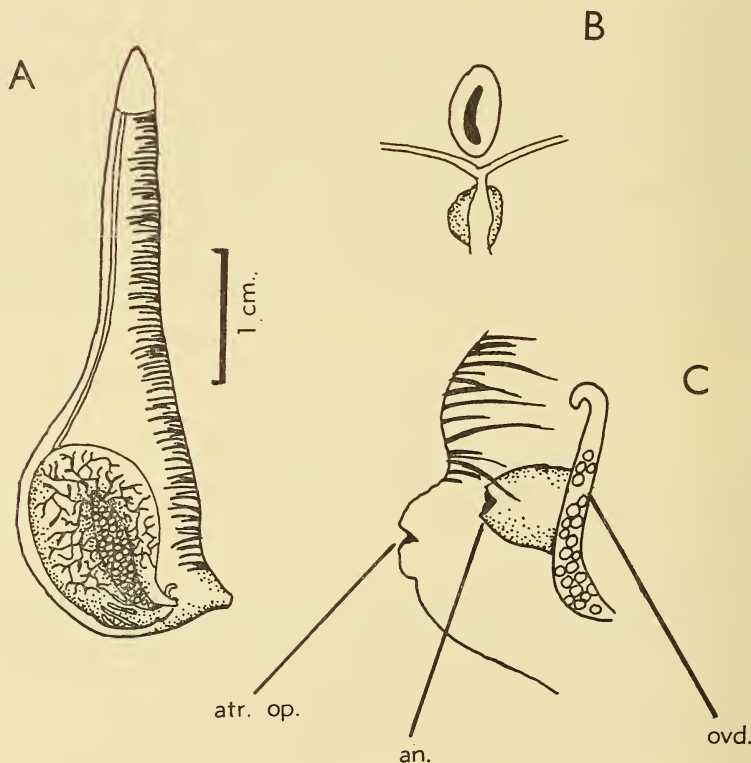


FIG. 27. *Ascidia stenodes* sp. n.

A, specimen with test removed, seen from the left; B, dorsal tubercle; C, region of atrial opening, an., anus; atr.op., atrial opening; ovd., oviduct.



*Description*

There are 6 specimens in the collections, the largest being about 5.5 cm. long, and the smallest 1.0 cm. long. The surface of all specimens is thickly coated with small stones, pieces of shell and sand which obscure the shape of the body. The test, when freed from adhering particles, is transparent and not very thick. When the body is removed from the test it is seen to consist of a long tapering anterior part terminating in a short narrow oral siphon, and a wider posterior part which accommodates the gut (fig. 27 A). The short inconspicuous atrial siphon is near the posterior end of the body and in young specimens very near it. Most of the body wall of the left side is thin and transparent, without muscles, but a thick narrow band of transverse muscles runs along the dorsal side and extends only a short distance on to the left and right sides; the margins of this band are sharply defined. The left side of large specimens also has a ventral band of transverse muscles, but this is absent in small specimens.

The oral tentacles number about 30 in a specimen of body length 1.3 cm., about 40 in one of 1.7 cm. and 60 in one of 5.5 cm. In two small specimens examined, the opening of the dorsal tubercle is a slightly curved longitudinal slit with the concavity to the left (fig. 27 B). In large specimens it is an irregular C-shaped slit. The small ovoid ganglion is immediately posterior to the tubercle. The branchial sac extends back to the posterior end of the body. The dorsal lamina is a moderately wide smooth-edged membrane. The longitudinal bars are of uniform thickness and number about 40 in the specimen 1.7 cm. long. There are 2-7 stigmata in each mesh according to the size of the specimen. Rather small papillae are present at the intersections of transverse and longitudinal bars, but no intermediate papillae.

The gut is rather small. It starts with the short curved oesophagus lying across the body and leading to the ovoid stomach which passes obliquely forward. A few longitudinal folds are present on the wall of the stomach. The intestine makes a simple loop and the rectum ends near the base of the atrial siphon, in a small two-lipped or simple anus.

The gonad, as usual in the genus, is spread over a large part of the intestinal wall, and the ducts lie beside the intestine and rectum (fig. 27 C).

*Remarks*

The diagnostic features of this species have already been noted. To them might be added the covering of shell fragments or stones, which was found on all specimens, but this is a character which may depend on the nature of the substratum.

According to the collector's note the specimens FAL 259 Q were lying unattached on the bottom and this may be the usual condition in the species.

*Ascidia sydneyensis* Stimpson

*Ascidia sydneyensis* Stimpson, 1855, p. 387.

For synonymy see Kott 1952, pp. 310, 311.

*Known distribution*

West Indies; Hawaii; Malay Archipelago; Amboina; Japan; Australia; South Africa.

*Localities*

*False Bay*: U.C.T., FAL 158 V; U.C.T., FAL 175 Q; U.C.T., FAL 181 A; from catch of a trawler, S.A. Museum, April 1904.

*Mossel Bay*: U.C.T., MB 18 S.

*East London*: S.A. Museum no. 12943, low tide.

*Algoa Bay*: U.C.T., LIZ 32 S.  
S.A. Museum (no details).

*Description*

These specimens agree closely with those which I have already described from South African waters (Millar, 1955). The largest of the present animals is 13 cm. long.

*Remarks*

Except for the South African records *A. sydneyensis* is known only from warm waters where, however, it is very widely distributed throughout the world.

I am not sure that *A. sydneyensis*, *A. incrassata* Heller, and possibly *A. multi-tentaculata* Hartmeyer, all recorded from South African waters, might not prove to represent a single species.

Family **Corellidae** Lahille, 1887Genus **CORELLA** Alder & Hancock, 1870*Corella eumyota* Traustedt

*Corella eumyota* Traustedt, 1882, pp. 271, 273.

For synonymy see Kott, 1952, pp. 318, 319.

*Known distribution*

Antarctic; Subantarctic; South Africa; St. Paul (Indian Ocean); New Zealand; Australia.

*Localities*

*Langebaan Lagoon*: U.C.T., LB 367 U; U.C.T., LB 374 E; U.C.T., LB 375 X.

Family **Agnesiidae** Huntsman, 1912Genus **AGNESIA** Michaelsen, 1898*Agnesia glaciata* Michaelsen

*Agnesia glaciata* Michaelsen, 1898, p. 370.

*Agnesia krausei* Michaelsen, 1912, p. 181, figs. 24, 25.

*Agnesia capensis* Millar, 1955, p. 191, fig. 19.

*Remarks*

No specimens of *A. glaciata* are present in this collection, but material which I previously examined from South Africa contained one specimen of a species which I described as a new species *A. capensis* (Millar, 1955). During examination of the *Discovery* collections I found another specimen, also from False Bay, the same locality as that of the type specimen of *A. capensis*. The *Discovery* specimen was intermediate between *A. capensis* and *A. glaciata*, and I have given reasons (Millar, 1960) for regarding *A. capensis* as a synonym of *A. glaciata*.

Family **Styelidae** Sluiter, 1895

Subfamily **Botryllinae** Adams, 1858

Genus **BOTRYLLUS** Gaertner, 1774

*Botryllus magnicoecus* (Hartmeyer)

*Botrylloides nigrum* var. *magnicoecum* Hartmeyer, 1912, p. 271.

*Botryllus magnicoecus* (Hartmeyer). Michaelsen and Hartmeyer, 1928, p. 331.

*Known distribution*

South Africa; Australia; New Zealand.

*Localities*

*False Bay*: U.C.T., FAL 109 Z; U.C.T., FAL 158 U; U.C.T., FAL 175 C;  
U.C.T., FAL 225 M; PF 15797 B; PF 14582.

*Table Bay*: Woodstock Beach, S.A. Museum, 19-6-14, washed up on beach, collected by K. H. Barnard.

*Saldanha Bay*: U.C.T., SB 128 P.

*Algoa Bay*: U.C.T., LIZ 9 H.

*Botryllus anomalus* sp. n.

(Fig. 28)

*Diagnosis of species*

Atrial openings of the zooids lead directly to the surface of the colony, instead of into common cloacal chambers. Zooids with 8 rows of stigmata, 5 or 6 folds on the stomach, and a short straight pyloric caecum. A gonad on each side of the body, each gonad consisting of a group of 6 or 7 testis follicles and a single large ovum.

*Holotype*

In the South African Museum. S.A.M. A25616 (Saldanha Bay, 5-9-12).

*Localities*

*Saldanha Bay*: S.A. Museum, level of low water, 5-9-12, collected by K. H. Barnard.

*Table Bay, Woodstock Beach*: S.A. Museum, washed up on beach, 19-6-14 collected K. H. Barnard.

*Description*

There are several colonies of this species in the collection. A large specimen is 9 cm. long, 3 cm. wide, and less than 1 mm. thick. All specimens have been growing on thin flat algal fronds. The surface of the colony is smooth and even, without any foreign matter, and the colour of the specimens, in the preserved state, a dull pink. There are no common cloacal cavities in the test and the

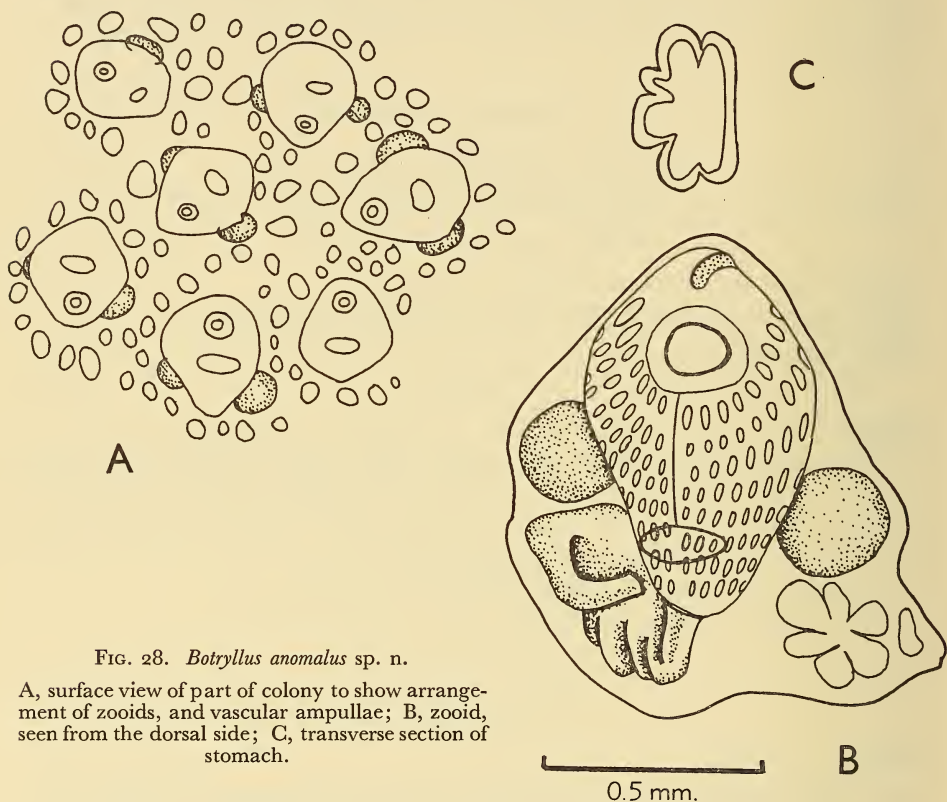


FIG. 28. *Botryllus anomalus* sp. n.

A, surface view of part of colony to show arrangement of zooids, and vascular ampullae; B, zooid, seen from the dorsal side; C, transverse section of stomach.

zooids are not arranged in systems, but are closely and regularly spaced over the colony (fig. 28 A). Each zooid (fig. 28 B) has a pair of small openings on the dorsal side, marking the oral and atrial siphons, both of which open directly on the surface of the colony. Rounded vascular ampullae are present between the zooids.

The zooids are small, rarely exceeding 1 mm. in length. Near the anterior end of the branchial sac is the round oral opening, through which can be seen the 8 tentacles. The branchial sac has 3 inner longitudinal bars on each side, and 8 rows of stigmata along the length of the sac. The digestive system consists of a short oesophagus leading from the posterior end of the branchial sac to the short barrel-shaped stomach. This has 5 or 6 complete folds on the walls



(fig. 28 C), and a short straight pyloric caecum with slightly swollen distal end. The intestine makes a sharp bend to the left and upwards to the short rectum which ends in the simple anus below the atrial opening. On each side of the body is a single gonad, each gonad consisting of a group of 6 or 7 pear-shaped testis follicles and one large dark brown ovum. The left gonad is slightly anterior to the right one. No larvae were present in the colonies.

*Remarks*

This species is chiefly remarkable for the opening of the individual atrial siphons of the zooids directly on the surface of the colony, and the corresponding absence of common cloacal chambers. The same features characterize *Botryllus primigenus* Oka which, however, is distinguished by the presence of only 4 rows of stigmata in the branchial sac, and the rather larger, curved pyloric caecum.

Genus *BOTRYLLOIDES* Milne Edwards, 1841

?*Botrylloides leachi* (Savigny)

*Botryllus leachii* Savigny 1816, p. 199.

*Known distribution*

Western Europe; Mediterranean; Australia; New Zealand; South Africa.

*Localities:*

*Saldanha Bay*: U.C.T., SB 91.

*Remarks*

This species has already been recorded by Michaelsen (1934) from Table Bay and False Bay. No gonads are developed in the present specimen, and I am identifying it as *B. leachi* because it agrees with that species in other characters. It must be admitted, however, that the distinctions are not entirely satisfactory in a number of species in both *Botrylloides* and *Botryllus*.

A single colony (U.C.T., SB 89, 13-7-46) from the same area is similar but has more circular systems and I am not sure if it is of this species, or possibly *Botryllus schlosseri* (Pallas).

*Botrylloides nigrum* Herdman var. *giganteum* Pérès

*Metrocarpa nigrum* var. *giganteum* Pérès, 1949, p. 205.

*Known distribution*

(Of variety) Senegal, west Africa; Durban, Natal and Knysna, Cape Province.

*Locality*

*Morrumbene Estuary*: U.C.T., MOR 122 G.

*Description*

The colony is dark purple in the preserved state. The zooids are large, with a long narrow thorax containing about 16 rows of stigmata. There is a small pyloric caecum. The gonad consists of an anterior testis with about 12 follicles, and a posterior ovary containing one large ovum.

Subfamily **Polyzoinae** Hartmeyer, 1903

Genus GYNANDROCARPA Michaelsen, 1900

*Gynandrocarpa unilateralis* (Michaelsen)

(Fig. 29)

*Gynandrocarpa placenta* (Herdman) var. *unilateralis* Michaelsen 1900, p. 29.

*Gynandrocarpa placenta* (Herdman). Michaelsen 1904*b*, p. 30.

[*non*] *Goodsiria placenta* Herdman, 1886, p. 328.

*Gynandrocarpa domuncula* Michaelsen, 1904*a*, p. 247.

*Known distribution*

South Africa; south-east Africa.

*Localities*

*False Bay*: U.C.T., FAL 265 B; U.C.T., TRA 62 J.

*Mossel Bay*: U.C.T., MB 53 Q; U.C.T., MB 65 G; PF 1711; PF 10165.

*Algoa Bay*: PF 1095 C; Port Elizabeth, B.M. (N.H.) registered no. 1871-5-12-1; U.C.T., LIZ 28 N.

*Description*

The colonies are of two types: (1) a flattened upright disc with basal stalk attached to one edge of the disc (fig. 29 A), and (2) a hollow dome-shaped plate with no stalk (fig. 29 B). The stalked type of colony appears to have been attached, during life, to a firm object on the bottom of the sea, but the dome-shaped specimens were taken from the carapace of crabs. These latter colonies were originally considered to be a separate species, *G. domuncula* Michaelsen, but Michaelsen (1934) later regarded them merely as colonies which are modified in shape by their attachment to the crab. Having examined several specimens of both types I entirely agree with this view, as I find no differences in the zooids or larvae of the two types.

Preserved specimens are generally dull buff, grey, or pink-grey in colour, but in some colonies the zooids are quite bright pink, which may have been the colour of the colony in life. One specimen is described in the collector's note as 'strawberry red'.

Michaelsen (1904*a*) has dealt thoroughly with the structure of the zooids of this species under the name *G. domuncula*. The most interesting feature is the gonad (fig. 29 C), which is single and on the right side. Many zooids of the new material had a well-developed gonad. This consists of a sac-like ovary flanked

on each side by a rounded or ovoid testis. The oviduct is short and has its distal part expanded to form a brood pouch which lies against the outer surface of the branchial wall. The brood pouch opens into the cavity of the branchial sac by means of an oval slit in the branchial wall, which at this place is devoid of stigmata. In the present material the brood pouch of breeding zooids never contained more than 2 or 3 embryos or larvae. One zooid contained a straight-tailed fully developed larva in the branchial sac, thus confirming that larvae pass from the brood pouch into the branchial sac before escaping to the exterior.

Each testis has many small pear-shaped follicles, the ducts from which unite to form one duct from each follicle, and these join the single sperm duct. The

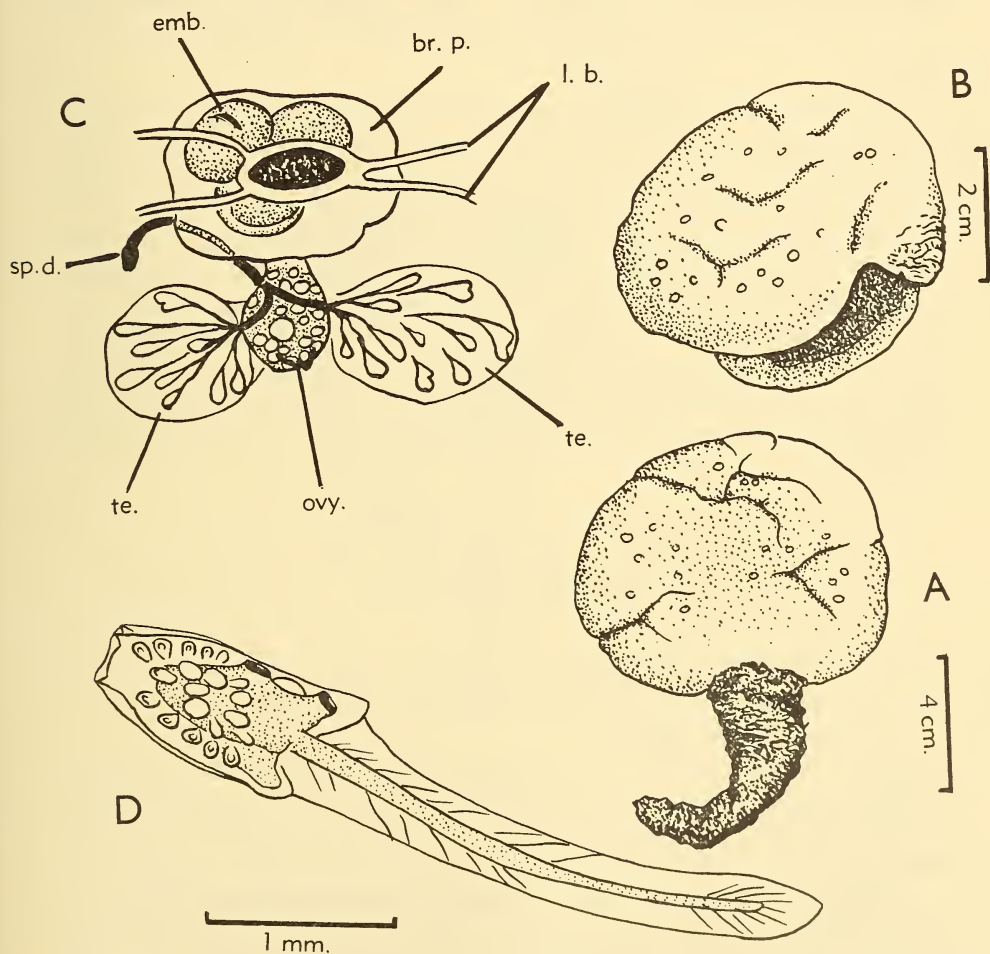


FIG. 29. *Gynandrocarpa unilateralis* (Michaelsen).

A, stalked colony; B, stalkless colony; C, gonad; br.p., brood pouch; emb., embryo; l.b., longitudinal branchial bars; ovy., ovary; sp.d., sperm duct; te., testis; D, larva.

sperm duct opens into the peribranchial cavity. Michaelsen has pointed out that, with the oviduct opening to the branchial sac and the sperm duct to the atrial cavity, there may be obligatory cross-fertilization between zooids.

#### *Larva*

The larva (fig. 29 D) is large, having a trunk 1.0 to 1.1 mm. long and a tail of 2.0 to 2.1 mm. Epidermal ampullae almost completely cover the anterior two-thirds of the trunk. There are 2 dorsal and one ventral papillae. The rudiments of the oral and atrial siphons are already present in the larva. A sensory vesicle is present but contains neither ocellus nor otolith. In shape and organization this larva is very similar to that of *Dextrocarpa solitaris* (Millar, 1955), but is more than twice the size. Larvae obtained from the stalked type of colony and from the stalkless ('domuncula') type are indistinguishable.

#### *Remarks*

There has been confusion between this species and another South African species of similar shape, *Polyandrocarpa placenta* (Herdman), as I have already pointed out (Millar, 1955). Both the form of the colony and the general structure of the zooids are alike in the two species, which are most clearly separated by the gonads. In *P. placenta* there are several polycarp-type gonads, a condition very different from that described above in *G. unilateralis*. It is remarkable, however, that the larvae of *P. placenta* have, according to Herdman (1886), an 'arrow shaped' trunk about 1.0 mm. long and a tail 2.5 mm. long. They therefore agree well with the larvae of *G. unilateralis*, and also appear to lack both a pigmented ocellus and otolith. But the larvae of *P. placenta* were present in the peribranchial cavities and not, as in *G. unilateralis*, in the brood pouch or branchial sac.

### Genus DEXTROCARPA Millar, 1955

#### *Dextrocarpa solitaris* Millar

(Fig. 30)

*Dextrocarpa solitaris* Millar, 1955, p. 200.

#### *Known distribution*

False Bay, Cape Province.

#### *Localities*

PF 18785 B.

#### *Description*

Each specimen consists of a group of pear-shaped individuals joined by a narrow stalk to a basal stolon (fig. 30 A). They therefore have a social rather than a colonial or solitary organization. The whole test is heavily coated with sand and shell fragments. The stalk uniting the individuals with the stolon varies in length, being in some cases much shorter, and in others longer, than



the body. Within the stalk there is a short extension of the innermost layer of test which surrounds the body (fig. 30 B, t), but no extension of the body wall, and the individuals therefore do not appear to be in organic connection with each other. In the type specimens I found no connexion between individuals, which were therefore regarded as quite solitary. The present specimens show a

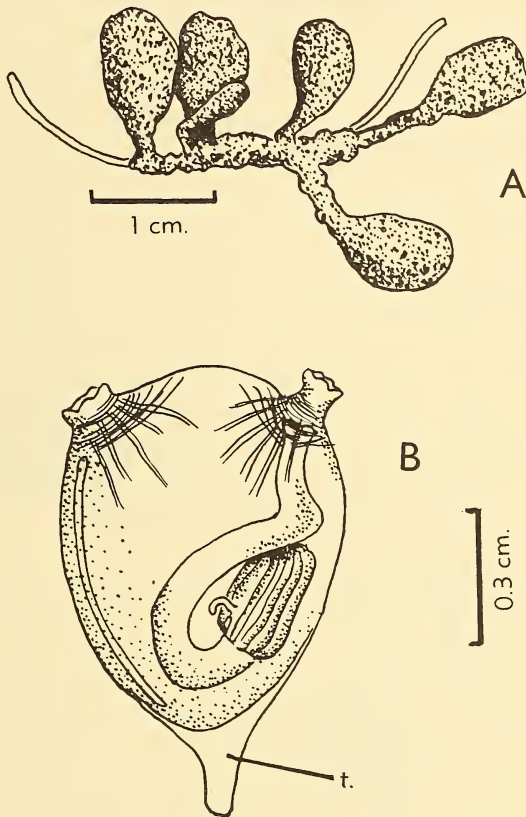


FIG. 30. *Dextrocarpa solitaris* Millar.

A, a group of individuals; B, specimen with test removed, seen from the left; t., test.

condition intermediate between a fully social organization with zooids in organic connexion, and a quite independent organization. It may be that in this species budding is confined to relatively young individuals, and in older ones complete separation may occur, or the apparently social organization may result from the fusion of the test of neighbouring but separate individuals.

I have little to add to my earlier account of the species. A large individual dissected had about 38 oral tentacles, 19 folds on the stomach, and the following arrangement of longitudinal bars in the branchial sac:

dorsal line 0 (8) 2 (7) 3 (8) 3 endostyle.

Breeding individuals had up to 110 eggs each, in various stages of development, contained in the brood pouch. The larvae are as previously described.

Genus ALLOEOCARPA Michaelsen 1900

*Alloeocarpa capensis* Hartmeyer

(Fig. 31)

*Alloeocarpa capensis* Hartmeyer, 1912, p. 261.

*Known distribution*

St. Francis Bay, Cape Province.

*Localities*

Algoa Bay: PF 740; PF 2348.

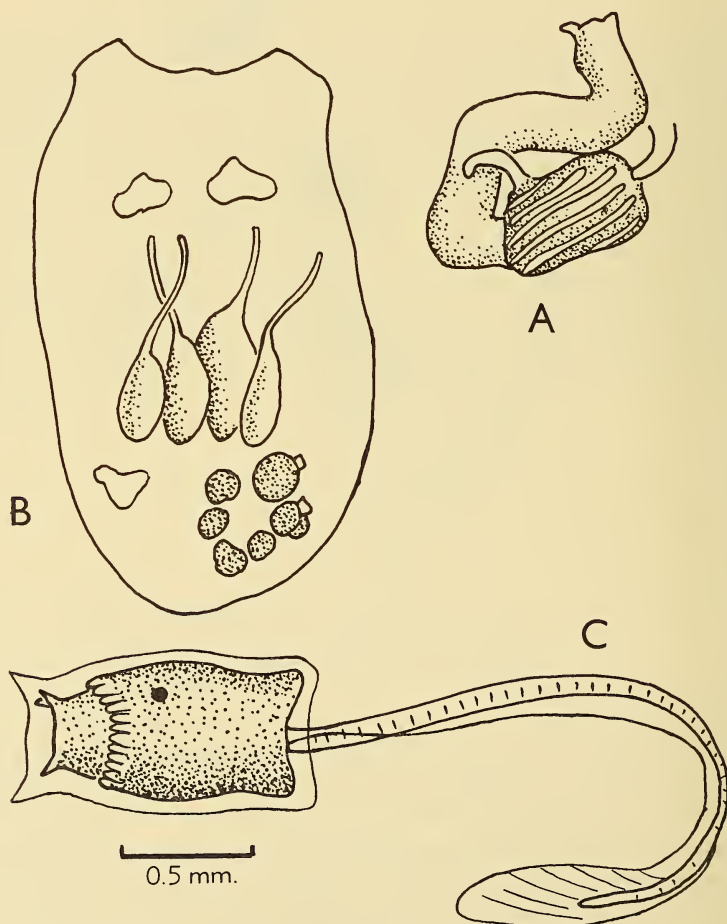


FIG. 31. *Alloeocarpa capensis* Hartmeyer.

A, gut; B, gonads; C, larva.

*Description*

The collection contains 4 colonies, or pieces of colonies, from Algoa Bay, the largest of which is 10 cm. by 4.5 cm. in diameter. In external appearance these specimens are very like the type material illustrated by Hartmeyer (1912, plate 38, fig. 7). The colonies are attached to shells or algal stems. They are of a dirty grey-brown colour and the surface has low but conspicuous swellings over the zooids.

The specimen collected off Lion's Head has zooids which are more or less free, being united only to a basal sheet of test by their narrow posterior ends.

The zooids, when extracted from the common test, are dull red.

Hartmeyer's (1912) description of the zooids leaves little to be added, but I have found the arrangement of the gonads to be different. According to Hartmeyer the male gonads are on the left half of the body and the female on the right. In all the mature zooids which I have examined, from colonies at both collecting stations, the testes and ovaries were on the left, the testes in the anterior part and the ovaries far back in the posterior part (fig. 31 B). It is a little difficult to determine the exact position of the ovaries relative to the middle line of the body, but careful examination shows them to lie to the left of the membrane which unites the endostyle to the ventral body wall. I have seen no gonads male or female to the right of this membrane, in any of the many zooids dissected. The position of the ovaries is confirmed by the location of larvae, which are in the left peribranchial cavity.

*Larva*

Only a few zooids had larvae (fig. 31 C), and there were never more than two in a breeding zooid. The larva is large, the trunk being 0.9 to 1.0 mm. long, and the tail about 1.3 mm. long. The trunk is brick-red. There are 3 anterior papillae and, a short distance behind these, a complete ring of about 24 narrow ampullae round the trunk. When the larva has been dehydrated and cleared a single spherical black body is seen, in the sensory vesicle, but is quite hidden by the red pigment of the trunk in the untreated larva. This body is presumably a 'photolith', the compound sensory structure of larvae in several genera of the subfamily Polyzoinae.

Genus *METANDROCARPA* Michaelsen, 1904a

*Metandrocarpa fascicularis* sp. n.

(Fig. 32)

*Diagnosis of species*

Zooids separate, with a narrow stalk joining them to the basal common test. About 30 oral tentacles in two circles. Dorsal tubercle with a straight oblique slit. Branchial sac with 7-9 longitudinal bars on each side. Stomach with about 16 folds and a hooked pyloric caecum. Ten to 20 testes on each side, on the posterior part of the body wall. Two to 5 ovaries on each side, on the anterior part of the body wall.

*Holotype*

In the South African Museum. S.A.M. A25617 (PF 10477).

*Locality*

Near Mossel Bay: PF 10477.

*Description*

There are 4 colonies the largest of which is 3.5 cm. by 2.0 cm. in diameter and 1.0 cm. thick. The colonies are attached to pieces of sand-encrusted tubes

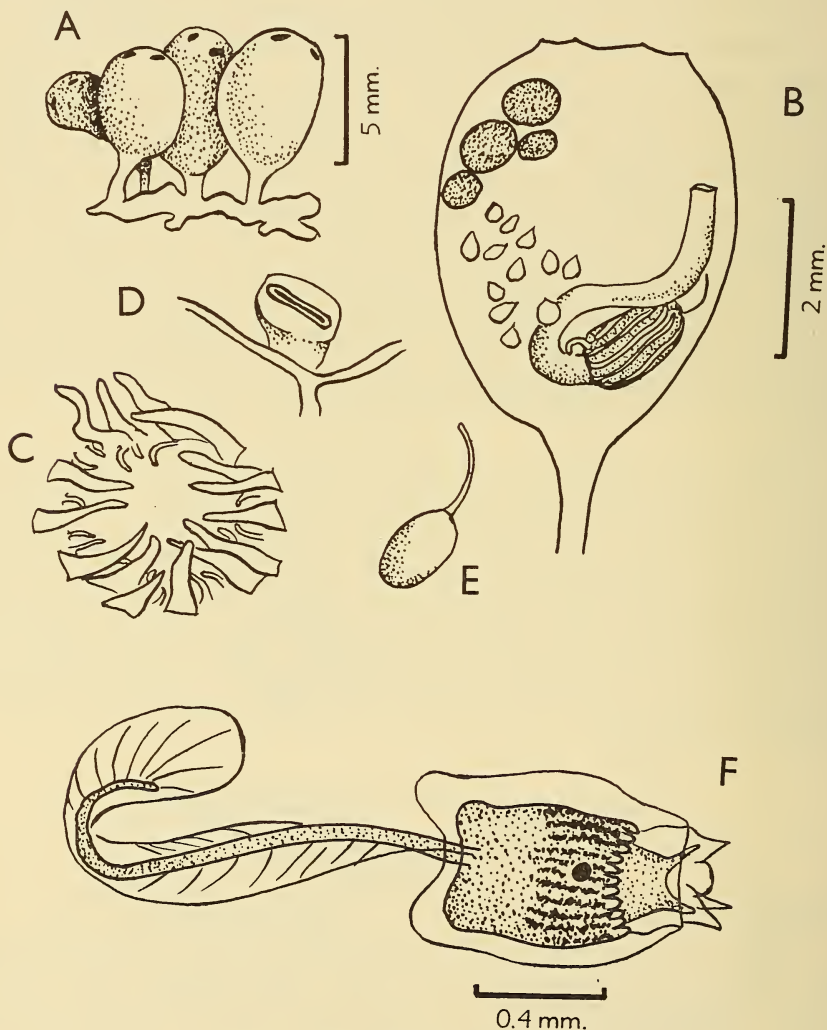


FIG. 32. *Metandrocarpa fascicularis* sp. n.

A, colony; B, zooid, with test removed, seen from the left; C, oral tentacles; D, dorsal tubercle; E, a testis; F, larva.



probably the tubes of polychaete worms. The zooids of a colony are closely crowded together, giving the appearance of a bunch of grapes (fig. 32 A). Large zooids (fig. 32 B) reach a length of 4 or 5 mm. The body of the zooid is pear-shaped, with the lower narrow end produced into a short slender stalk which unites the zooid with the basal creeping stolon of the colony. In some zooids the body is almost sessile on the stolon and in others the stalk is well developed. The oral and atrial openings are small and inconspicuous, situated quite close together on the upper end of the body. In the preserved state the specimens are pale brown, and have no encrusting material, except on the stolon.

The test is thin but semi-opaque. The body wall is dull red, but sufficiently thin and transparent to allow the internal organs to show through. Muscles are poorly developed. The oral and atrial siphons are very short and end in simple round openings. There are about 30 oral tentacles arranged in two circles, the outer one consisting of about 16 large tentacles and the inner one of smaller tentacles (fig. 32 C). The dorsal tubercle is small and has a narrow straight slit-like opening which is obliquely placed (fig. 32 D).

In the branchial sac of large zooids there are 9 longitudinal bars on each side and smaller zooids have 7 or 8. There are no folds. The dorsal lamina is a narrow plain-edged membrane. The oesophagus is narrow. The stomach is of a long barrel-shape, with about 16 longitudinal folds and a narrow, hooked pyloric caecum. The intestine forms a flat bend parallel to the stomach, and the rectum ends in a smooth-edged anus.

The female gonads are confined to the anterior part of the body and the male gonads to the posterior part. On each side of the endostyle there are 2 to 5 large spherical ovaries of a dark brown colour. These seem to produce only one mature egg at a time, since ovaries are often seen with a single developing embryo. Embryonic development takes place within the ovary or oviduct instead of freely in the atrial cavity.

The testes are 10 to 20 small pear-shaped glands on the left and right sides of the posterior part of the body, each testis with a very slender sperm duct (fig. 32 E).

#### *Larva*

Zooids were never found with more than two larvae. The larva (fig. 32 F) is reddish brown and has a trunk 0.7 to 0.8 mm. long and a tail of about 2.0 mm. There are 3 anterior papillae arranged in a triangle, and a circle of about 24 narrow ampullae round the trunk. From each of these ampullae a line of dark pigment extends back along the trunk. The single black sensory spot ('photolith') can be seen only after dehydration and clearing.

#### *Remarks*

No species of *Metandrocarpa* has yet been described from the waters of South Africa or the western Indian Ocean.

There are other specimens in the collection which I cannot definitely identify, but which may belong to this species (e.g. PF 2348).

Genus *POLYANDROCARPA* Michaelsen, 1904a

*Polyandrocarpa anguinea* (Sluiter)

*Styela* (*Polycarpa*) *anguinea* Sluiter, 1898, p. 52.

*Known distribution*

Knysna and False Bay, Cape Province.

*Localities*

*Mossel Bay*: U.C.T., MB 18 T; U.C.T., MB 22 G; U.C.T., MB 53 R;  
U.C.T., MB 55 U; U.C.T., MB 60 S.

*Algoa Bay*: U.C.T., LIZ 28 Q.

*Morrumbene Estuary*: U.C.T., MOR 108 N; U.C.T., MOR 132 H.

*Remarks*

This species has hitherto been placed in the genus *Polycarpa* and was considered as a simple form which grows in close aggregations of individuals. A study of the more numerous specimens now available in the present collection makes it clear that the species is a colonial styelid, to be placed in the genus *Polyandrocarpa*. It is very similar to *P. lapidosa* (Herdman) from south-eastern Australia, but appears to be specifically distinct, and I shall compare the two species in another publication.

Subfamily **Styelinae** Herdman, 1881

Genus *POLYCARPA* Heller, 1877

*Polycarpa rubida* (Sluiter)

(Fig. 33)

*Styela* (*Polycarpa*) *rubida* Sluiter, 1898, p. 53.

*Polycarpa rubida* (Sluiter). Hartmeyer 1909, p. 1364. Michaelsen, 1918, p. 37.

*Known distribution*

Mozambique.

*Locality*

*Morrumbene Estuary*: U.C.T., MOR 132 1.

*Description*

The single specimen is 2.3 cm. long and 1.4 cm. wide. It had been basally attached, and is upright with the oral opening terminal and the atrial opening about one-third of the body length from it. Both openings are almost sessile, the siphons being very short. The test is grey with a pink-brown tinge, and has irregular furrows and mounds, but is not further divided into small fields as in the type specimen described by Sluiter (1898). Small rose-coloured marks on the surface of the test may indicate the colour in life; Sluiter's specimen was

evidently red and the preserving alcohol had extracted this colour. The test is moderately thick and is tough. Within, it is pearly white. The body wall is dull red-grey, the red colour being most marked round the oral and atrial openings. Circular muscles form a continuous sheet and below these is a layer of longitudinal muscles, the whole set of muscles rendering the body wall thick and opaque.

There are 24 oral tentacles of alternating lengths. The dorsal tubercle is a fairly prominent pad with an angular U-shaped opening facing obliquely forward and to the left (Fig. 33A). Four well-developed folds are present on each side of the branchial sac, with the following arrangement of longitudinal bars:

dorsal line 2 (15) 2 (10) 2 (10) 1 (9)  
1 endostyle.

The dorsal lamina is a plain membrane.

Most of the gut is situated in the posterior part of the body (fig. 33 B). The oesophagus is curved and the stomach barrel-shaped with about 20 indistinct longitudinal or slightly oblique folds and a hooked pyloric caecum. The intestine and rectum form an S-shaped bend and the anus has about 15 shallow lobes. In Sluiter's specimen the anus was some distance behind the atrial opening, but in the present specimen it lies close to it.

The gonads are small and numerous, about 40 being present on the left side of the body. They are of the type usual in the genus and are scattered over the inner surface of the body wall. Between them are numerous transparent flattened endocarps. A few endocarps are also present within the intestinal loop.

#### Remarks

This new specimen differs from the type specimen principally in having fewer longitudinal bars between the branchial folds, a character which may be related to the much smaller size of the specimen. The opening of the dorsal tubercle is also different, but as Sluiter remarked, the S-shaped slit of the type specimen is easily derived from a horse-shoe-shaped slit.

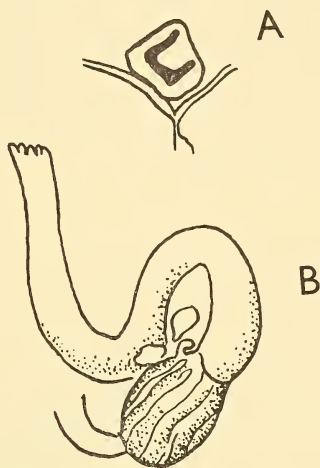


FIG. 33. *Polycarpa rubida* (Sluiter).  
A, dorsal tubercle; B, gut.

#### Genus CNEMIDOCARPA Huntsman, 1913

##### *Cnemidocarpa asymmetra* (Hartmeyer)

*Tethyum* (*Styela*) *asymmetron* Hartmeyer, 1912, pp. 253-257.

*Styela asymmetra* (Hartmeyer). Michaelsen, 1915, pp. 394-398.

*Cnemidocarpa asymmetra* Hartmeyer, 1926, pp. 180-183.

[non] *Styela asymmetrica* Sluiter, 1904, p. 87.

*Known distribution*

Cape Town, Cape Province and Luderitz Bay, South West Africa.

*Locality*

*Langebaan Lagoon*: U.C.T., LB 378 Q.

*Description*

The larger of the 2 specimens in the collection is 5.2 cm. high and 3.0 cm. wide, and the smaller specimen 4.0 cm. high and 3.0 cm. wide. The body is erect with both siphons projecting from the upper end. The test is slightly wrinkled, rather thin but tough, and semi-transparent. In the larger specimen the opening of the tubercle is horse-shoe-shaped with both horns turned outwards, and in the smaller specimen similar but with only the right horn turned outwards. The following is the arrangement of longitudinal bars on one side of the smaller specimen:

dorsal lamina 0 (8) 3 (11) 3 (10) 2 (8) 2 endostyle.

There are 10-14 stigmata per mesh. The gonads form the most characteristic feature of the species. In the present specimens the shape of the gonads does not differ much from Hartmeyer's (1912) original description. It is remarkable, however, that in the new specimens the testis lobes occupy a central position, being largely embedded within the ovary, whereas Hartmeyer (1912) gives the opposite arrangement ('die innere Partie wird vom Ovarium, die aussere von den Hoden gebildet'). The gonoducts are arranged in pairs and are distributed over the inner surface of the gonads. The larger specimen from Langebaan has a total of 7 of these pairs.

*Cnemidocarpa psammophora* sp. n.

(Fig. 34)

*Diagnosis*

Surface coated with sand or shell. Test with short hair-like processes over most of the surface and one or a few long root-like basal processes. Many closely spaced flat oral tentacles. Dorsal tubercle with a C-shaped or simple longitudinal slit. Branchial sac with 4 rather low folds. Stomach with about 20 folds and a short, curved pyloric caecum. Five to 8 gonads on the left side and 10 or 11 on the right.

*Holotype*

In the South African Museum. S.A.M. A25618 (U.C.T., LIZ 25 L).

*Localities*

*Algoa Bay*: U.C.T., LIZ 19 Z 2; U.C.T., LIZ 25 L.

*Description*

All three specimens in the collection have an almost globular body (fig. 34 A, B). In two the diameter is 10 mm. and in the third the body is



15 mm. long and 12 mm. wide. These measurements were made over the coating of sand grains and broken shell which completely covers the body. Two simple openings fairly close together on the upper side mark the positions of the oral and atrial siphons which do not project from the outline of the body. Among the sand grains and broken shell are many short tag-like processes of the test, which are generally distributed over the surface. At the base of the

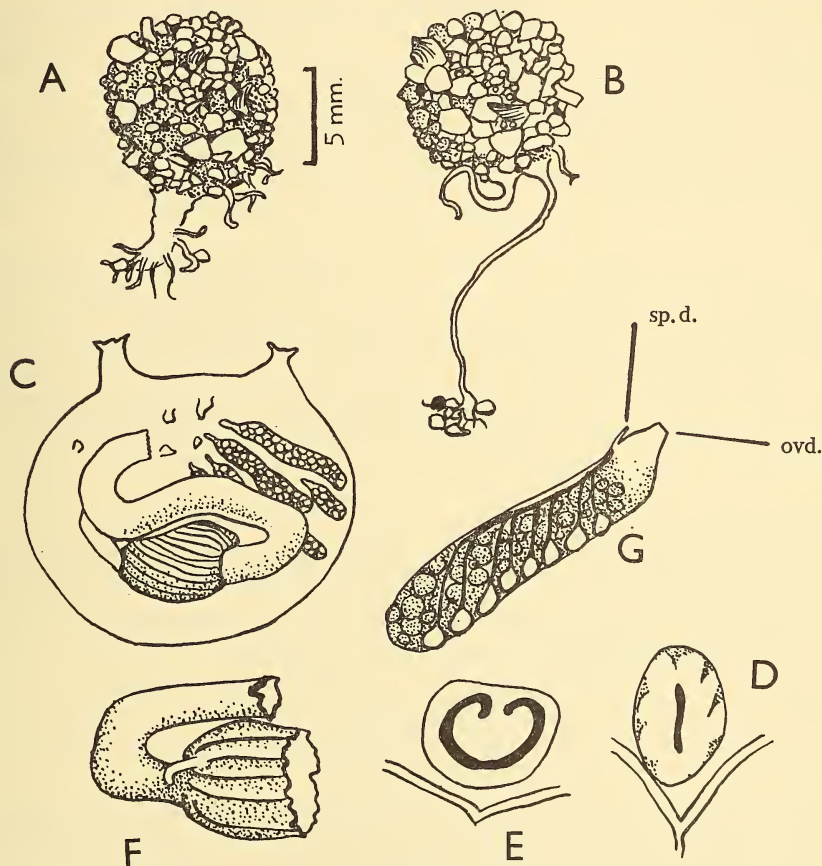


FIG. 34. *Cnemidocarpa psammophora* sp. n.

A, B, two intact specimens; C, specimen with test removed, seen from the right; D, E, dorsal tubercles of two specimens; F, part of stomach and intestine, to show pyloric caecum; G, gonads; ovd., oviduct; sp.d., sperm duct.

body a few of these tags have been greatly developed as stout rooting processes. Generally about 6 of these are present, and one of them is longer and thicker than the rest. In the largest individual the main process is 24 mm. long.

When the test is removed the body is seen to be almost globular or a little elongated, with the siphons projecting as short conical tubes with shallow terminal lobes (fig. 34 C). The body wall is semi-opaque although the muscles

are rather poorly developed. On the inner surface of the body wall are quite numerous small endocarps. The base of the oral siphon is provided with many closely spaced slender and flattened tentacles. In two specimens these numbered at least 60 and 80 respectively. The opening of the dorsal tubercle in the largest specimen is a simple narrow longitudinal slit (fig. 34 D), and in one of the smaller specimens dissected a C-shaped slit facing forward, with slightly inrolled horns (fig. 34 E). The dorsal lamina is a moderately wide membrane with smooth margin. There are 4 rather low folds on each side of the branchial sac with the following arrangement of longitudinal bars in the largest specimen:

dorsal lamina 1 (18) 2 (9) 3 (20) 3 (16) 2 endostyle.

The gut consists of the curved oesophagus, the barrel-shaped stomach with about 20 folds and a short pyloric caecum (fig. 34 F), and the S-shaped intestine and rectum. The border of the anus is cut into a large number of very small lobes.

Gonads are present on each side of the body and number on the left from 5 to 8, and on the right 10 or 11. The gonads are tubular and nearly straight, of the kind that characterizes the genus (fig. 34 G). Most of the gonad is occupied by a long tubular ovary, and closely applied to each side of this is a series of small pear-shaped testis follicles. The individual sperm ducts join the common sperm duct which passes along the mesial surface of the gonad. Both the sperm duct and the oviduct project slightly from the end of the gonad.

#### Remarks

There is no west African or South African species with which *C. psammophora* is likely to be confused. The only species of the genus recorded from the western Indian Ocean is *C. madagascariensis* Hartmeyer, a species incompletely described as the only specimen was damaged. From what is known, however, it is evident that several characters distinguish it from *C. psammophora*. *C. madagascariensis* has a test divided into areas separated by furrows, and lacks the coating of sand and the tags and rooting processes of *C. psammophora*. Hartmeyer's species also has many fewer oral tentacles and fewer gonads.

Several species of *Cnemidocarpa* are adapted to life on sandy bottoms. *C. psammophora* is one of these and shows the adaptive features of this ecological group, namely, small size, spherical form, and rooting processes of the test.

#### Genus *STYELA* Fleming, 1822

##### *Styela angularis* (Stimpson)

*Cynthia angularis* Stimpson, 1855, p. 387.

*Tethyum costatum* Hartmeyer, 1911, p. 564.

#### Known distribution

South Africa.

*Localities*

*False Bay*: U.C.T., FAL 158 W; U.C.T., FAL 216 G; U.C.T., FAL 225 L; U.C.T., FAL 229 M.

*Mossel Bay*: U.C.T., MB 7 R; U.C.T., MB 14 Y; U.C.T., MB 18 U; U.C.T., MB 48 E; U.C.T., MB 53 S; U.C.T., MB 55 V; U.C.T., MB 68 F; U.C.T., MB 72 U.

*Cape Morgan*: PF 13393; PF 13432; PF 13481.

*Description*

The characteristic shape of this species renders it unmistakable (see Hartmeyer, 1911, Millar, 1955). In the present collections specimens range from a very small size up to 9.5 cm. long.

*Styela marquesana* Michaelsen

*Styela marquesana* Michaelsen, 1918, p. 27.

*Known distribution*

Lourenço Marques, Mozambique and Durban, Natal.

*Localities*

*Morrumbene Estuary*: U.C.T., MOR 132 K.

*Cape Natal*: PF 10722.

*Description*

Michaelsen's (1918) detailed description leaves little to be added. In the present material specimens have from 22 to 26 folds on the stomach, and the branchial bars vary between the following limits:

dorsal lamina 4 (10) 1 (10) 1 (10) 2 (6) 3 endostyle, and  
dorsal lamina 10 (12) 13 (16) 15 (15) 10 (9) 3 endostyle.

*Styela radicata* sp. n.

(Fig. 35)

*Diagnosis of species*

Surface coated with sand or shell. Test with one or a few basal processes. Dorsal tubercle with a simple transverse slit. Stomach with about 15 folds, and a small pyloric caecum. One gonad on each side, with tubular ovary and lobed testis follicles close to the sides of the ovary.

*Holotype*

In the South African Museum. S.A.M. A25619 (U.C.T., MOR 132 J).

*Locality*

*Morrumbene Estuary*: U.C.T., MOR 132 J.

*Description*

The single specimen (fig. 35 A) is almost spherical, but slightly narrowed at the base, and measures 1.1 cm. in height and 1.0 cm. in width. It is com-



pletely covered with sand grains and fragments of shell. The oral and atrial openings are on the upper side and not very far apart. They scarcely project from the surface. On the lower side there is a root-like process of the test about 4 mm. long, and a few much shorter tags. The test is thin, but very firm perhaps owing to the closely adhering sand and shell.

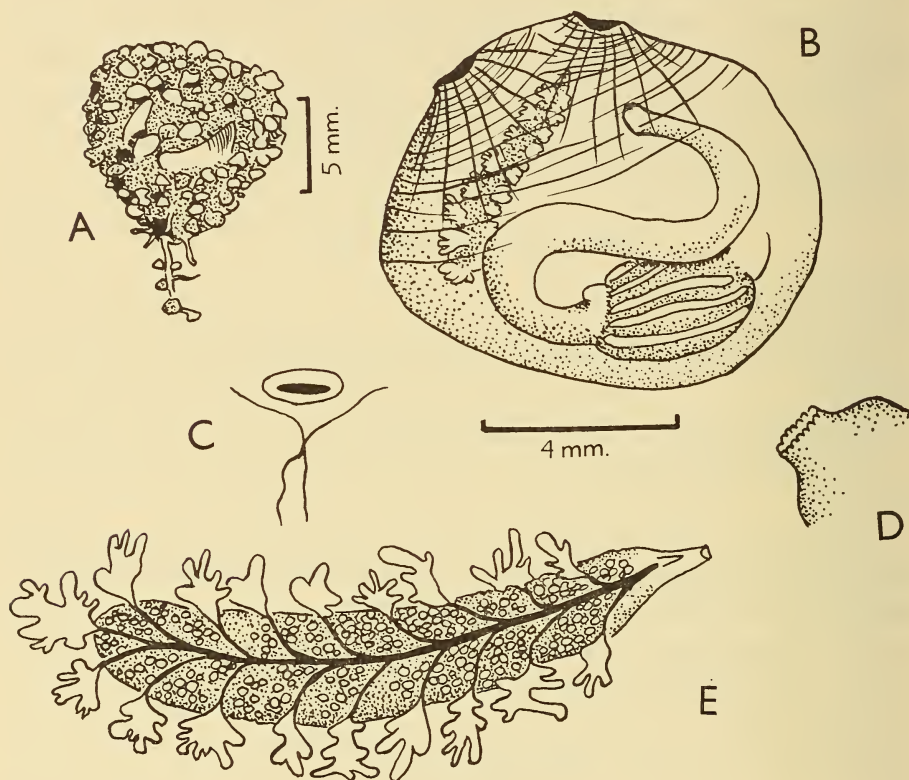


FIG. 35. *Styela radicata* sp. n.

A, intact specimen; B, specimen with test removed, seen from the left; C, dorsal tubercle; D, anus; E, gonad.

Muscles are not strong and consist of radial strands surrounding the two siphons, and a series of circular muscles mainly round the siphons but also spreading downwards over the upper half of the body (fig. 35 B). The body wall is thin and delicate. The internal siphons are very short, and are not lobed. There are 32 oral tentacles, of which about 16 are quite small. The dorsal tubercle is small, with a simple transverse slit (fig. 35 C). The branchial sac is delicate, with 4 well developed folds having the following arrangement of longitudinal bars:

dorsal lamina 2 (16) 4 (7) 4 (11) 5 (7) 2 endostyle.



The dorsal lamina is narrow, with a plain margin. Each mesh of the branchial wall contains an average of 4 stigmata, which are long, narrow and regular.

The short curved oesophagus leads to the barrel-shaped stomach which has about 15 undivided longitudinal folds and a very short rounded caecum. The intestine and rectum make a simple S-shaped bend ending in a narrow anus with minutely lobed margin (fig. 35 D).

One gonad is present on each side of the body. On the left side it is anterior to the intestinal loop and directed obliquely back towards the atrial opening. The right gonad occupies a corresponding position. Each gonad (fig. 35 E) consists of an almost straight tubular ovary ending in a short simple oviduct, and a series of 8 to 10 lobed testis follicles along the whole length of each side of the ovary.

No endocarps are visible on the inner surface of the body wall.

#### Remarks

This species is quite unlike any other known from the waters of west, South or east Africa. Its closest resemblance is to *S. schmitti* van Name from the southern part of the east coast of South America. The small size, the shape, the coating of foreign particles, and the basal process are similar in the two species, but *S. radicata* differs from *S. schmitti* in having only one gonad on each side and in the structure of the branchial sac. The external similarities probably indicate adaptive convergence rather than systematic affinity.

### Family **Pyuridae** Hartmeyer, 1908

#### Genus **PYURA** Molina, 1782

#### *Pyura stolonifera* (Heller)

(Fig. 36)

*Cynthia stolonifera* Heller, 1878, p. 92.

*Pyura stolonifera* (Heller) Hartmeyer, 1911, p. 554.

#### Known distribution

South Africa;? east and south Australia.

#### Localities

*False Bay*: U.C.T., FAL 144 Y; U.C.T., FAL 163 R; U.C.T., FAL 177 N;  
U.C.T., FAL 221 S; PF 15984 A.

*Mossel Bay*: U.C.T., MB 18 V; U.C.T., MB 53 T; PF 11 B.

*Algoa Bay*: U.C.T., LIZ 1 Y; U.C.T., LIZ 2 B; PF 1095 D.

*East London*: S.A. Museum (no details).

#### Description

*P. stolonifera* is a species which may have to be split, if a critical examination is made of enough material from different places. Most of the specimens

listed above are undoubtedly of this species, and have the dorsal tubercle basically in the form of a C opening posteriorly, but with the horns spirally inrolled and contorted to an extent that increases with the size of the animal (fig. 36 A-D). This is the arrangement found by Hartmeyer (1911) both in the specimens taken by the German South-polar Expedition in Simon's Bay, and in Heller's type specimens which Hartmeyer re-examined. Specimens from

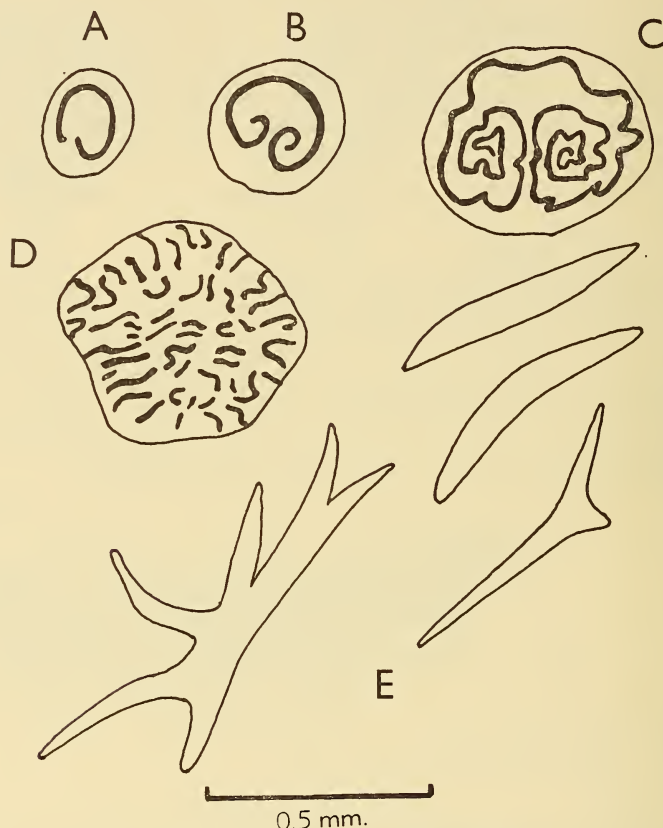


FIG. 36. *Pyura stolonifera* (Heller).

A-D, dorsal tubercles respectively of small (A, B), medium-sized (C) and large (D) specimens; E, spicules.

Australia, however, which have been assigned to this species (Hartmeyer and Michaelsen, 1928) have a dorsal tubercle facing forward. I believe that we may be dealing with two species which are structurally similar except in some characters like the dorsal tubercle. It would be surprising if *P. stolonifera* occurred in Cape Province, South Africa, and on the south coast of Australia but not between these places. Kott (1952), in dealing with the Australian records of the species, admits that 'the nomenclature of the group is still very confused'.

Some, but not all, of the specimens from False Bay and Mossel Bay have

spicules (fig. 36 E) in various body tissues, but not in the test. The spicules are most abundant in one large specimen from Mossel Bay (MB 18 V), in which the walls of the endostyle, the branchial folds, the oral tentacles and the dorsal tubercle have many closely packed simple or branched spicules. Spicules of this kind have been recorded in certain tissues of *Cynthiopsis valdiviae* Michaelsen and spicules of a simple shape in *C. herdmanni* (v. Drasche), and both of these species are regarded as representing *P. stolonifera* (Heller) (Hartmeyer, 1911).

*Pyura capensis* Hartmeyer  
(Fig. 37)

*Pyura capensis* Hartmeyer, 1911, p. 561.

*Known distribution*

False Bay, Cape Province.

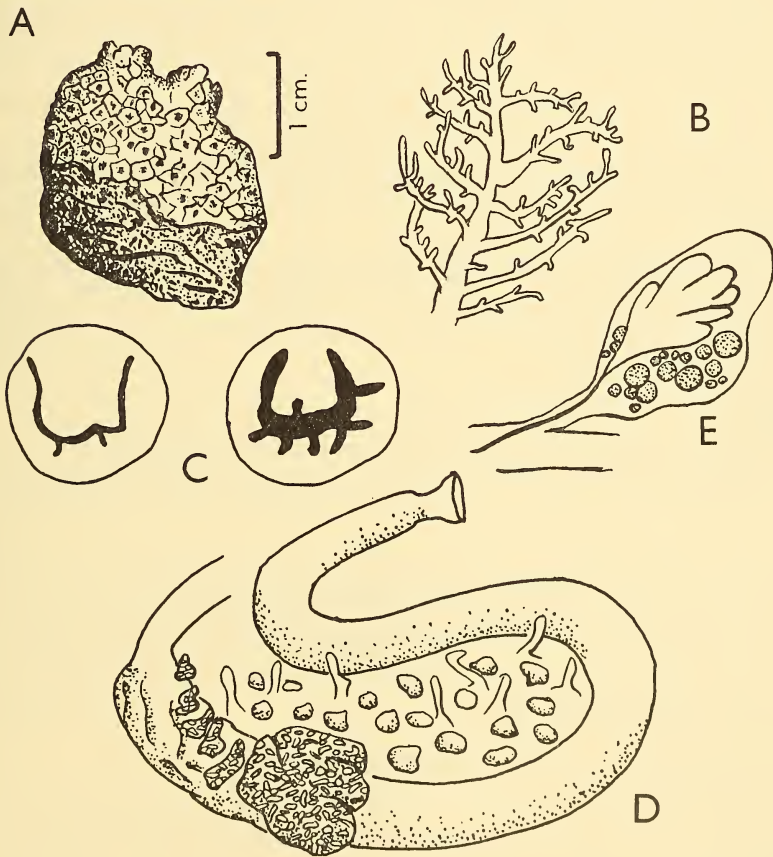


FIG. 37. *Pyura capensis* Hartmeyer.

A, intact specimen; B, oral tentacle; C, dorsal tubercles of two specimens;  
D, gut; E, one of the gonadal sacs.

*Locality*

*Mossel Bay*: U.C.T., MB 18 W.

*Description*

The largest of the 3 specimens is 2.5 cm. long and 1.6 cm. wide, and the smallest is 1.4 cm. long and 1.3 cm. wide. In all 3 the body is upright and the siphons fairly close together at the upper end. One of the characteristic features of this species, which readily distinguishes it from *P. stolonifera*, is the subdivision of the test into hexagonal or irregular plates, each plate having a red or brown central mark (fig. 37 A). This feature was noted by Hartmeyer (1911) and is distinct in the new specimens. The test is thin but tough.

The oral tentacles (fig. 37 B) number about 16 in the largest specimen. They have slender primary branches with few and small secondary branches. In the two specimens dissected the opening of the dorsal tubercle is a U-shaped slit with a few short straight branches (fig. 37 C). The tubercle illustrated by Hartmeyer (Taf. 57, fig. 8) is more complex but has the same essential features. The 7 branchial folds have the following arrangement of longitudinal bars:

dorsal line 1 (10) 3 (10) 2 (15) 2 (14) 2 (16) 2 (12) 3 (9) 2 endostyle.

A long row of dorsal languets is present.

The gut of the new specimens agrees closely with Hartmeyer's description. The margin of the anus, which Hartmeyer appears not to have seen clearly, is smooth.

In most species of *Pyura* each gonad consists of a compact double row of sacs with central common ducts, but in *P. capensis* the individual gonadial sacs are numerous and scattered so that the gonads have a more diffuse appearance than is usual in the genus.

*Remarks*

This is a distinctive species, and the present material, the first since the type specimens were described, confirms the account given by Hartmeyer.

Genus MICROCOSMUS Heller, 1878

*Microcosmus oligophyllus* Heller

(Fig. 38)

*Microcosmus oligophyllus* Heller, 1878, p. 101.

*Known distribution*

Cape Province.

*Localities*

*Mossel Bay*: U.C.T., MB 22 H.

*Saldanha Bay*: Hoedjies Bay, low water, S.A. Museum.



*Description*

This species has already been adequately described (Heller, 1878; Hartmeyer, 1912; Millar, 1955), and only a few points about the new specimens need be noted.

There are many specimens, 17 having been collected at low water from Hoedjies Bay alone. The dorsal tubercle shows some variation in the shape of its opening. In the type specimen re-examined by Hartmeyer (1912) the opening was U-shaped with the right limb longer than the left and slightly inrolled. Another specimen from the same collection as the type had the right limb more markedly inrolled and the left one only slightly so. In the new material this difference in the limbs is sometimes even more obvious, and in some specimens results in the two limbs having well-formed spirals in opposite directions, giving the opening a modified horizontal S-shape (fig. 38).

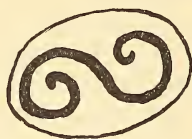


FIG. 38. *Microcosmus oligophyllus* Heller.  
Dorsal tubercle.

*Microcosmus exasperatus* Heller

*Microcosmus exasperatus* Heller, 1878, p. 99.

For synonymy see Van Name, 1945, pp. 346, 347.

*Known distribution*

Formosa; China Sea; Malay Archipelago; West Indies; Venezuela; Colombia; Natal; Mozambique.

*Localities*

Natal: PF 11001.

Mozambique: U.C.T., PEA 1 B; U.C.T., PEA 4 Z; U.C.T., MOR 43 M;  
U.C.T., MOR 108 O; U.C.T., MOR 109 R; U.C.T., MOR 122 H;  
U.C.T., MOR 188 M.

?Mossel Bay: U.C.T., MB 22 I.

*Remarks*

This is a well-known species in many warm areas throughout the world. It seems to be common in coastal waters of Mozambique. There is one doubtful record from Mossel Bay; this specimen is covered with sand, and has only 7 folds on each branchial wall, but in other respects it agrees well with *M. exasperatus*.

*Microcosmus pedunculatus* Pérès

(Fig. 39)

*Microcosmus pedunculatus* Pérès, 1951, p. 1062.

*Known distribution*

Senegal and Sierra Leone, west Africa.

*Localities*

*Mossel Bay*: U.C.T., MB 72 V.

*Morrumbene Estuary*: U.C.T., MOR 91 R; U.C.T., MOR 132 L.

*Description*

A specimen of average size is 1.6 cm. long and 1.4 cm. across, slightly compressed laterally and triangular in outline with the lower, narrow end produced into one or several root-like processes (fig. 39 A). These processes are whitish and free of sand but the rest of the body is completely coated with sand grains. A narrow ridge which joins the siphons is continued down the sides of the body towards the base.

The internal structure (fig. 39 B) is in complete agreement with the descriptions already published of this species (Pérès, 1951; Millar, 1956).

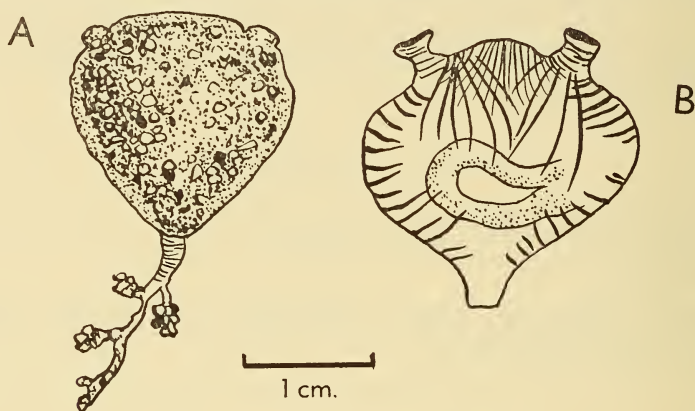


FIG. 39. *Microcosmus pedunculatus* Pérès.

A, intact specimen; B, specimen with test removed, seen from the left.

*Remarks*

This species apparently presents a remarkable case of discontinuous distribution, since the only previous records are from tropical west Africa north of the equator. The identification of the South African specimens, however, can scarcely be doubted on anatomical grounds. This is either a case of structural convergence of two species, or true discontinuous distribution, or continuous distribution of *M. pedunculatus* masked by the accidental absence of specimens from collections in intermediate areas.

Genus *BOLTENIA* Savigny, 1816

*Boltenia africana* sp. n.

(Fig. 40)

*Diagnosis of species*

Body erect, not stalked, completely covered with sand and shell. About 12 compound oral tentacles. Dorsal tubercle with a straight, C-shaped or

S-shaped slit. Branchial sac with transverse stigmata, and with 6 folds on each side. Stomach with longitudinal folds, and a compact lobed mass of glandular tubules. Intestine and rectum of uniform diameter. Anus with a plain margin. One gonad on each side, the left one in the secondary intestinal loop.

### *Holotype*

In the South African Museum. S.A.M. A25620 (PF 15984 B).

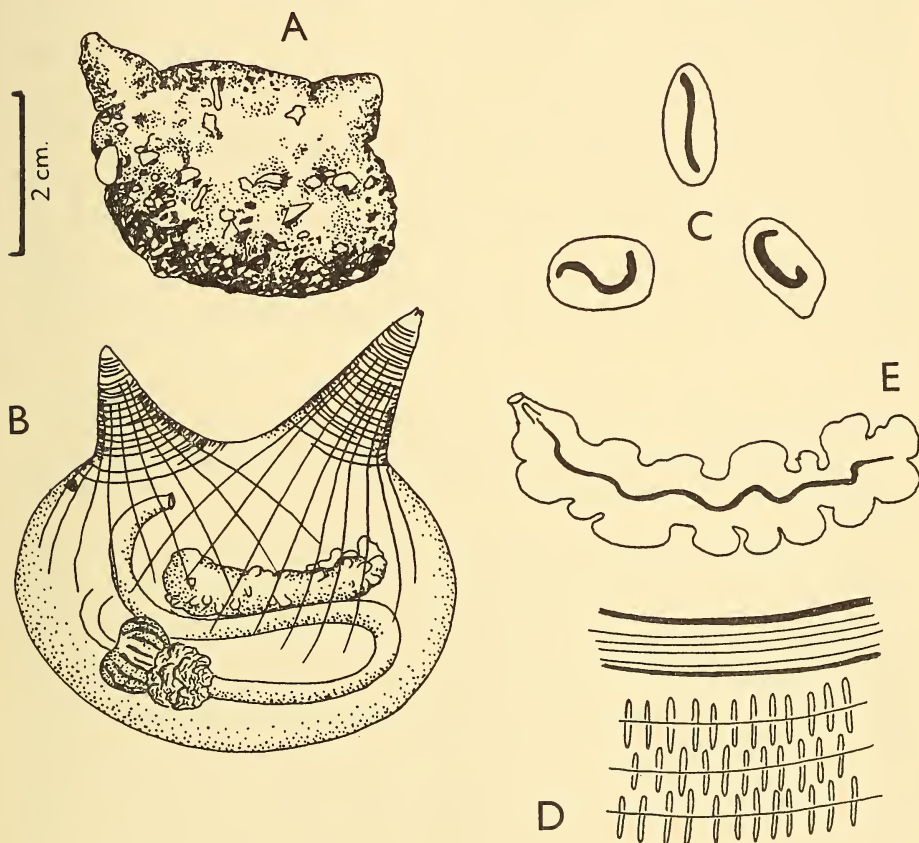


FIG. 40. *Boltenia africana* sp. n.

A, intact specimen; B, specimen with test removed, seen from the right; C, dorsal tubercles of three specimens; D, part of branchial wall; E, gonad.

### *Localities*

*False Bay*: U.C.T., FAL 212 T; PF 15984 B.

*Mossel Bay*: U.C.T., MB 55 Y.

*Algoa Bay*: U.C.T., LIZ 38 G.

### *Description*

A number of the specimens collected from False Bay and from Mossel Bay had been growing closely together and formed compact masses. Large indivi-



duals reach 4 cm. in length and 3.5 cm. in breadth. The shape is variable, being cylindrical, squat or irregular (fig. 40 A). The two siphons generally project from the upper end but are sometimes scarcely visible. Sand, broken shell and other debris completely cover the surface and no doubt render the animals very inconspicuous in nature. This may explain why the species has not previously been described. The test is only moderately thick, but is tough. When removed from the test the body is seen to be red-brown. The siphons are quite long, and conical. A set of strong muscles radiates from each siphon over the sides of the body, and circular muscles pass round the siphons. The body wall is rather thin, so that the gut and gonads are visible (fig. 40 B).

There are 11-14 oral tentacles, of alternating sizes. The largest of these are tri-pinnate. The dorsal tubercle varies a good deal, the opening being a simple, almost straight longitudinal slit, or C-shaped, or in the form of a horizontal S (fig. 40 C). On each side of the branchial sac there are 6 folds, of which the ventral 2 or 3 are smaller than the more dorsal ones. A long row of dorsal languets is present. In a specimen of moderate size, and in a large one, the longitudinal bars of the branchial sac had respectively the following arrangement:

dorsal line 4 (8) 1 (14) 3 (15) 3 (12) 4 (6) 5 (3) 2 endostyle.

dorsal line 15 (15) 10 (33) 8 (26) 12 (23) 12 (20) 12 (5) 12 endostyle

The stigmata, as usual in the genus, are transversely placed in longitudinal rows (fig. 40 D). A longitudinal bar passes across the centre of each row of stigmata.

The oesophagus is narrow, curved, and rather short. The stomach is wide at the oesophageal end and tapers towards its junction with the intestine, where there is a conspicuous lobed mass of glandular tubules. Numerous longitudinal folds are present on the walls of the stomach. The intestine forms a flat, horizontal, almost closed loop and the rectum bends upwards and forwards towards the base of the atrial siphon, where it ends in the plain-edged anus. There is little variation in diameter along the whole length of the intestine and rectum.

One gonad is present on each side of the body, that of the left side lying just above the dorsal limb of the intestine, that is in the secondary gut loop (fig. 40 B). On the right side the gonad is in a corresponding position. Each gonad is a long, rather bulky, and slightly curved body (fig. 40 E). The ovary occupies the mesial side and the testis is confined to the parietal side, next to the body wall. Indentations on the margins of the ovary give it a slightly lobed appearance. The testis follicles are round bodies which form a white mass visible from the outside, through the body wall. Both the sperm duct and the oviduct are at the posterior end of the gonads, from which they project only very slightly.

#### *Remarks*

No species of *Boltenia*, as characterized by the transverse arrangement of stigmata, has been known hitherto from west, south, or east Africa.



## Genus HALOCYNTHIA Verrill, 1879

*Halocynthia spinosa* Sluiter f. *defectiva* n.

(Fig. 41)

Species *Halocynthia spinosa* Sluiter, 1905, p. 16.*Diagnosis of form*

As the typical form of the species, but having 2 gonads on the left side and none on the right.

*Holotype*

In the South African Museum. S.A.M. A25621 (U.C.T., MB 55 W).

*Known distribution*

(Of species) Gulf of Aden; Red Sea.

*Localities*

*False Bay*: U.C.T., FAL 137 N.

*Mossel Bay*: U.C.T., MB 55 W; U.C.T., MB 68 G.

*Description*

The largest specimen in the collection is 4.5 cm. long and 5.0 cm. across. The body is rounded with a narrow base, or roughly hemispherical and broadly based (fig. 41 A). On the upper side the two siphons project prominently. In colour the specimens vary from pale grey to brown and generally have a pink tinge or quite bright red suffusion, especially on and near the siphons. Spines are present on almost all parts of the test usually in groups of one long central spine and several short encircling spines (fig. 41 B). The spines are larger on the siphons than elsewhere, but not so large as those shown by Sluiter (1905) in his figure of the species. The test is fairly thick and is tough. Stout longitudinal and circular muscles render the body wall thick and opaque.

The oral tentacles number 12 to 14 in these specimens, and are tri-pinnate. In form the dorsal tubercle is constant, having a C-shaped slit facing forward and with the horns spirally inrolled (fig. 41 D). The dorsal languets form a long series of slender projections from the roof of the branchial sac. Nine or 10 tall narrow folds are present on each side of the branchial sac, with up to 26 longitudinal bars on the largest folds.

The gut forms a wide loop of almost uniform diameter, except for the stomach which is short and wide with longitudinally pleated walls and a lobed mass of glandular tubules (fig. 41 E).

The gonads constitute the main peculiarity of these specimens. There are two on the left side (fig. 41 C) and none on the right. The gonads are large, and, instead of being parallel are curved so that they meet and fuse at their dorsal and ventral ends, forming what appears to be one ring-shaped body with two pairs of gonoducts.

*Remarks*

In the type material Sluiter (1905) described the gonads as a lobed mass on each side, but Michaelsen (1919) noted, as an abnormality, the complete absence of gonads on the right side. It is interesting that Van Name (1921) found a similar condition in a specimen of *H. pyriformis* (Rathke) from the Bahamas, although that species normally has 4-7 gonads on each side. There

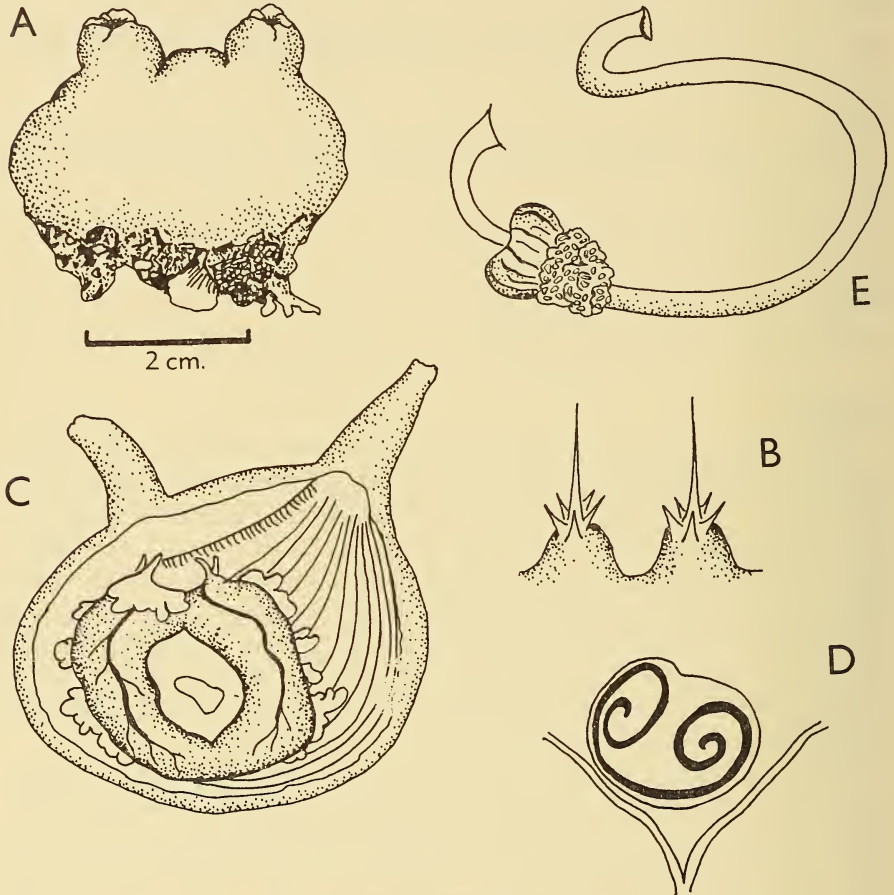


FIG. 41. *Halocynthia spinosa* Sluiter f. *defectiva* n.

A, intact specimen; B, spines of test; C, specimen with test and right body wall removed, seen from the right; D, dorsal tubercle; E, gut.

seems to be a tendency to eliminate the gonads of the right side in *Halocynthia*. This tendency has apparently become fixed in the population of *H. spinosa* inhabiting the waters of the Cape Province, and it is perhaps best to recognize the situation by describing that population as a *forma* of the species. Nevertheless, if further collections from intervening waters of the western Indian Ocean make it clear that there is discontinuous distribution of the species, it may be necessary to recognize *f. defectiva* as a new species.

Family **Molgulidae** Lacaze-Duthiers, 1877Genus **MOLGULA** Forbes and Hanley, 1848*Molgula falsensis* Millar

*Molgula falsensis* Millar, 1955, p. 217.

*Known distribution*

False Bay, Cape Province.

*Localities*

*False Bay*: U.C.T., FAL 136 R; U.C.T., FAL 158 Q; U.C.T., FB 1105.

*Description*

A few specimens of this species are present in the collections. They all confirm the characters which I have described in the type material (Millar, 1955). In some of the new specimens, however, the oviduct although turned up at right angles to the gonad, is quite short and in others it is not bent up from the gonad. In the type specimens I could not see the sperm duct, but in the new specimens it is situated about half-way along the gonad and is a distinct, free, finger-like projection.

The test of some of the new specimens is thicker and much firmer than in the original specimens and approaches in appearance and consistency the condition found in many species of *Ascidia*. Short test projections or hairs are, however, present.

*Molgula conchata* Sluiter

*Molgula conchata*, Sluiter, 1898, p. 58.

*Ctenicella conchata* (Sluiter). Hartmeyer, 1913, p. 128.

*Known distribution*

Knysna, Cape Province.

*Localities*

*Mossel Bay*: U.C.T., MB 7 S; U.C.T., MB 39 M; U.C.T., MB 58 M;  
U.C.T., MB 60 T; U.C.T., MB 72 W.

*Algoa Bay*: U.C.T., LIZ 11 Z 1.

*Description*

Many specimens are contained in the collection, including large ones over 4 cm. long. All of them show the characters which readily distinguish this from other South African species of *Molgula*, namely: the coating of sand, slight lateral compression of the body, horizontal S-shaped slit of the dorsal tubercle, and the form of the gonad and its position relative to the intestinal loop.

*Remarks*

The present records extend the known range of this species westwards to Mossel Bay and eastwards to Algoa Bay. The geographical distribution never-

theless seems to be very restricted, and *M. conchata* is replaced by allied species in neighbouring areas.

*Molgula scutata* Millar

*Molgula scutata* Millar, 1955, p. 215.

*Known distribution*

Langebaan, Cape Province.

*Localities*

*Saldanha Bay*: U.C.T., SB 1.

*?Algoa Bay*: U.C.T., LIZ 28 U.

*Description*

The dorsal tubercle of this specimen has an oblique and almost straight slit; the previous examples had a C-shaped or an S-shaped slit.

One specimen from Algoa Bay, which I have provisionally included in this species, is similar in all respects to typical specimens except that each gonad is bent downwards at its dorsal end. This may be an individual peculiarity.

*Remarks*

This, the second record of the species, scarcely extends its known range.

*Molgula cryptica* sp. n.

(Fig. 42)

*Diagnosis of species*

Surface covered with sand. About 18 oral tentacles. Dorsal tubercle with C-shaped opening usually facing to the right. Seven branchial folds, each with 3 longitudinal bars. Primary intestinal loop closed; secondary loop semi-circular. Left gonad in secondary loop. Each gonad consisting of a sausage-shaped ovary and a testis of radially disposed follicles surrounding the blind end of the ovary.

*Holotype*

In the South African Museum. S.A.M. A25622 (U.C.T., FAL 158 R).

*Locality*

*False Bay*: U.C.T., FAL 158 R.

*Description*

The body is generally ovoid, with the short siphons close together at the upper end. Most of the surface is covered with a thin layer of adhering sand grains. The largest specimens in the collection are about 3 cm. long, including the siphons. The test is rather thin and, but for the coating of sand, would be transparent.



When the test is removed the body is seen to be elliptical or almost round in outline, and the tubular siphons close together (fig. 42 A, B). Each of the 6 oral lobes and the 4 atrial lobes has a series of narrow projecting teeth forming a fringe round the openings. The body wall in the preserved state is pale brown but is sufficiently transparent to allow the gut and gonads to be seen. Muscles are mainly confined to the siphons, where circular and longitudinal ones exist, and to the dorsal half of the body which has one set of longitudinal muscles radiating from the base of each siphon.

The oral tentacles generally number about 18 and are of alternating sizes. They are tri-pinnate, but are not particularly bulky (fig. 42 C). The dorsal tubercle is small, with a C-shaped or V-shaped opening. The C-shaped slit is more common and usually faces to the right (fig. 42 D).

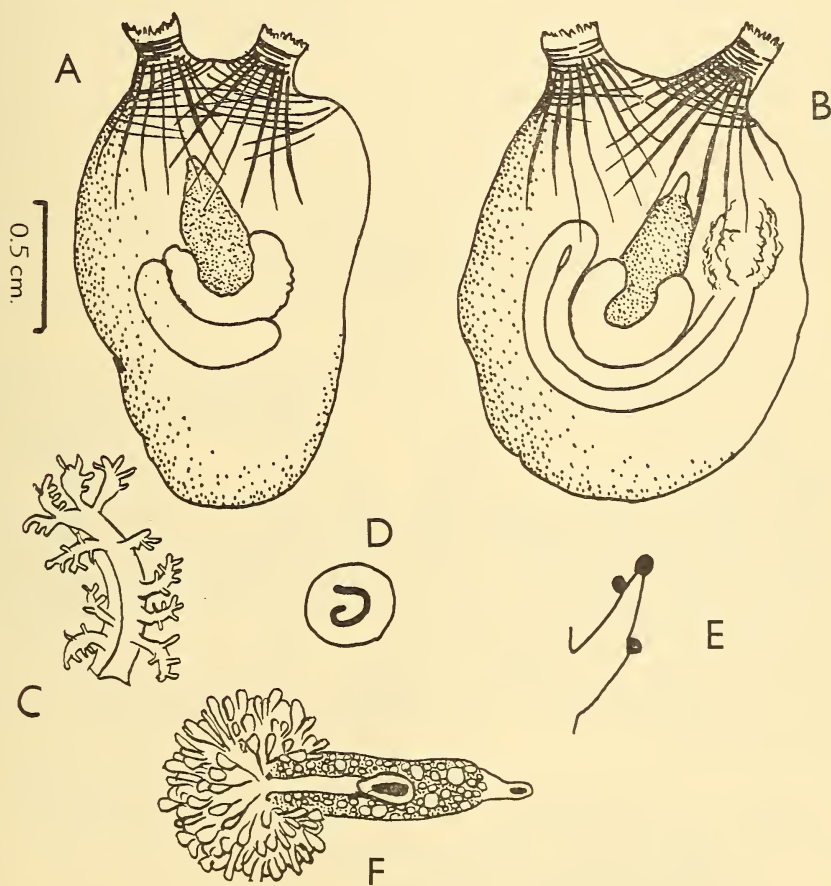


FIG. 42. *Molgula cryptica* sp. n.

A, B, specimens with test removed, seen from the right and left respectively; C, oral tentacle; D, dorsal tubercle; E, branchial fold in transverse section to show the three longitudinal bars (in black); F, gonad.

Seven low folds are present on each branchial wall, with a constant arrangement of 3 longitudinal bars on the folds; this appears to be characteristic of the species. On the ventral face of each fold near the base, there is a single bar, and two bars are present at the summit of the fold (fig. 42 E). The dorsal lamina is quite long and wide with a plain margin which is sometimes inrolled. The stigmata are subdivided into oval or long narrow straight slits which, as they tend to be arranged in regular transverse rows, obscure the spiral pattern.

The oesophagus is short, and it narrows towards its junction with the stomach. A large mass of tubular glandular tissue surrounds and hides the stomach. The intestine and rectum are narrow throughout their length. The primary loop is quite closed and the secondary loop forms a semicircle (fig. 42 B). No incisions are present on the margin of the anus.

On the left side the gonad lies in the secondary intestinal loop, which it largely fills, and on the right side it is immediately dorsal to the renal sac (fig. 42 A, B). The ovary is sausage-shaped or somewhat pear-shaped, with a rather short narrow oviduct directed towards the atrial siphon. Round the ventral, blind end of the ovary the many small testis follicles are radially arranged to form a compact crescentic or rosette-like testis (fig. 42 F). The common sperm duct is wide and extends about half-way along the inner face of the ovary to end in a remarkably large opening. The opening of the sperm duct is, in fact, wider than that of the oviduct.

The renal sac is a large curved body in the lower half of the right side.

#### *Larva*

Larvae are present in the atrial cavity of some specimens. The larvae have a trunk about 0.2 mm. long and a tail of about 0.7 mm. There is a single black sensory pigment spot.

#### *Remarks*

*M. cryptica* is most like *M. pulchra*, which has been recorded from sub-Antarctic South America and adjacent parts of the Antarctic. *M. pulchra*, however, has a large number of oral tentacles, and the sperm duct has a characteristic convoluted shape. It seems likely that these two species have diverged from a common ancestral stock.

I have brought together, in fig. 43, those characters of gut and gonad which best distinguish the four species of *Molgula* found in the present South African collections.

Genus EUGYRA Alder and Hancock, 1870

*Eugyra myodes* sp. n.

(Fig. 44)

#### *Diagnosis of species*

Test provided with fine processes, and covered with sand grains. Body wall thin and transparent. Muscles consisting mainly of (1) short transverse bands

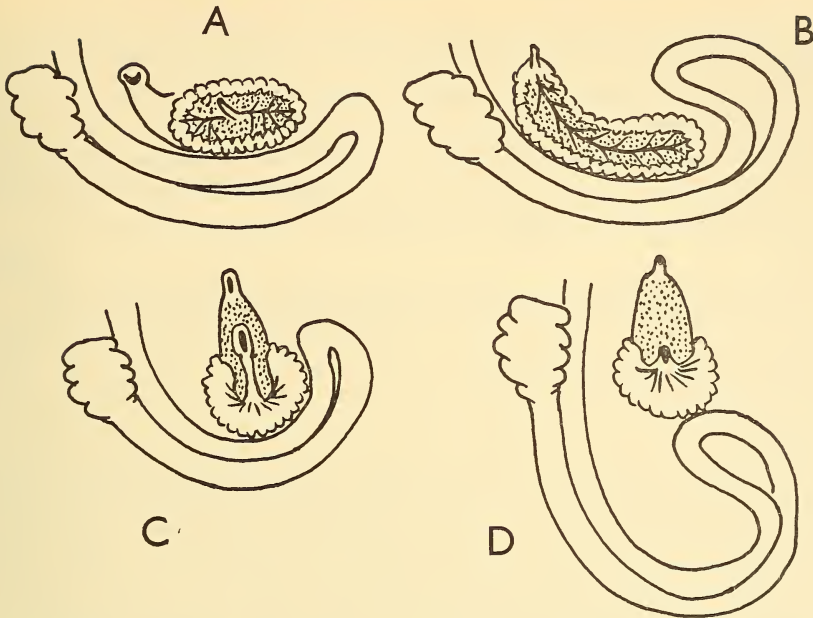


FIG. 43. Comparison of gut loop and gonads of A, *Molgula falsensis*; B, *Molgula scutata*; C, *Molgula cryptica*; and D, *Molgula conchata*.

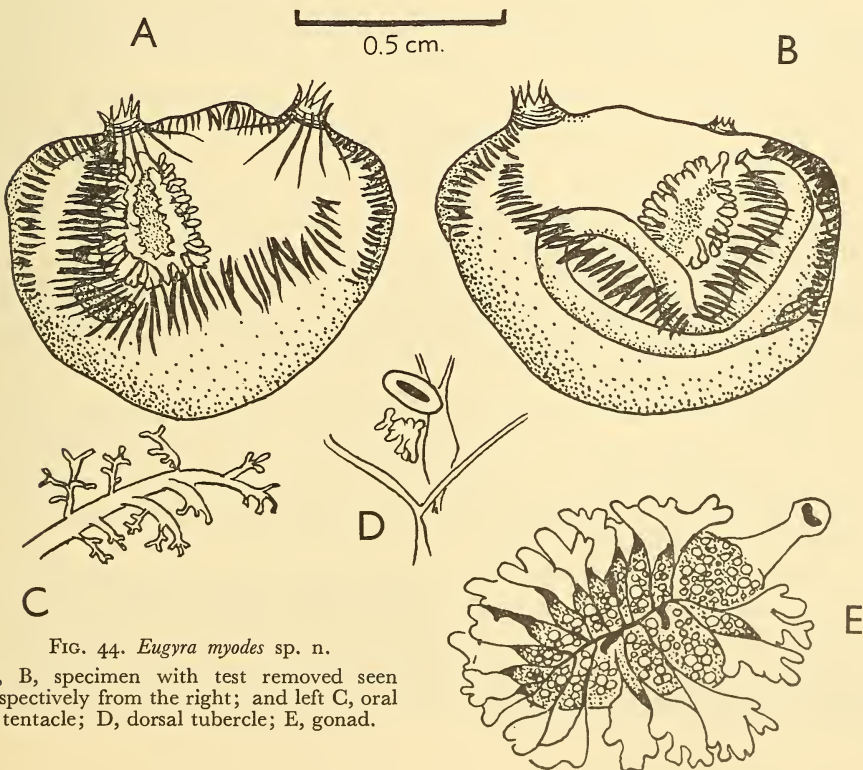


FIG. 44. *Eugyra myodes* sp. n.  
A, B, specimen with test removed seen respectively from the right; and left C, oral tentacle; D, dorsal tubercle; E, gonad.



in a line between the siphons and extending down the anterior and posterior margins of the body, and (2) a V-shaped series of bands on each side of the body. About 8 tri-pinnate oral tentacles. Dorsal tubercle with an almost straight oblique slit. Branchial sac with 7 longitudinal bars and regular double spiral stigmata. Primary intestinal loop open at the bend. Right gonad above renal sac. Left gonad in secondary intestinal loop. Gonad consisting of a central sac-like ovary surrounded by lobed testis follicles.

#### *Holotype*

In the South African Museum. S.A.M. A25623 (U.C.T., LIZ 3 Q).

#### *Locality*

*Algoa Bay*: U.C.T., LIZ 3 Q.

#### *Description*

The larger of the two specimens is about 1.5 cm. in greatest diameter, and the smaller specimen about 1.1 cm. In outline both are almost circular, and at least in the preserved state the body is laterally compressed to some extent. The siphons are not visible externally and the whole body is covered with sand grains. Numerous fine hair-like processes project from the surface of the test. The test, when freed of adhering sand grains, is thin, flexible and transparent.

The internal siphons are separated by a distance equal to about half of the body diameter (fig. 44 A, B). They are short and their margins bear narrow teeth, which on the oral siphon number about 24 and on the atrial siphon about 20. Circular muscles surround each siphon but do not extend beyond their bases. The remaining muscles of the body wall consist of 2 sets. The first set is of short transverse fibres arranged in a line which runs between the siphons and extends in the median plane down the anterior and posterior sides of the body (fig. 44 A, B). The second set is a V-shaped line, on each side of the body, of longer fibres. The body wall is very thin and transparent.

There are 8 or 9 tri-pinnate oral tentacles of alternating sizes (fig. 44 C). The dorsal tubercle is small, with a straight or very slightly curved slit (fig. 44 D). Behind the dorsal tubercle and to the right of the ganglion lies the small branched neural gland.

The branchial sac is delicate. There is quite a long dorsal lamina which increases in width towards the posterior end, and has the margin rolled in. Seven longitudinal bars, only slightly curved, are present on each side, and below each bar a row of stigmata in double spirals. Each component slit of the double spiral makes about 3 coils.

The oesophagus is curved. The stomach is not large and has on its right wall a glandular diverticulum with longitudinally folded walls. The primary loop of the intestine is open in its anterior part but closed in the middle region. The rectum bends up and forward and ends near the base of the atrial siphon in the plain-edged anus (fig. 44 B).



The left gonad lies in the secondary intestinal loop and the right one above the renal sac. In each the ovary is sac-like with a short terminal oviduct. Round the whole margin of the ovary and applied to its mesial face is a series of about 20 lobed testis follicles (fig. 44 E). The ducts of these lead to a main duct which passes along the face of the ovary, to open by a few short slender sperm ducts projecting into the atrial cavity.

On the posterior part of the right side is the small straight renal sac.

#### Remarks

Few species of *Eugyra* have been recorded from west, South or east African waters, and of those few none is likely to be confused with the present species. From Walvis Bay, South West Africa, Michaelsen (1914, 1915) has described *E. woermanni* which, having a gonad only on the right side, properly belongs to the sub-genus *Gamaster*, and is very distinct from *E. myodes*. No species of *Eugyra* is known from Cape Province or the African waters of the eastern Indian Ocean. *E. kerguelensis* Herdman is known from Kerguelen, the coastal waters of Argentina, and also the Patagonian Shelf and South Georgia (Millar, 1960). That species bears the closest resemblance to *E. myodes*. It also has bands of short muscles on the body wall but these are differently arranged. The position of left gonad mainly within the primary intestinal loop also distinguishes *E. kerguelensis*, as does the C-shaped opening of the dorsal tubercle. Nevertheless the similarities are enough to suggest a close relationship between the two species.

#### *Eugyra macreintera* sp. n.

(Fig. 45)

#### Diagnosis of species

Test with hair-like processes, and covered with sand grains. Muscles confined to the siphons, which have circular and radial strands. Eight bipinnate oral tentacles. Dorsal tubercle with a C-shaped opening. Branchial sac with 7 longitudinal bars. Stigmata in uninterrupted double spirals. Gut long, with the primary loop almost completely closed, and the secondary loop also very narrow. Left gonad in secondary intestinal loop. Right gonad oblique. Renal sac small.

#### Holotype

In the South African Museum. S.A.M. A25624 (U.C.T., LIZ 11 Z2).

#### Locality

Algoa Bay: U.C.T., LIZ 11 Z 2.

#### Description

There is only one specimen and this measures 1.2 cm. by 0.6 cm. The body is oval and is covered with a rather thick layer of sand grains. It appears

to have been attached to the frond of an alga, part of which is still adhering to the specimen. The test is thin and its surface has numerous fine hair-like processes.

The body wall, in spite of some brown pigmentation, is sufficiently transparent to allow the gut and gonads to be seen when the test is removed. Narrow, closely spaced circular muscles surround the siphons and stouter radial muscles spread out for a short distance from their bases (fig. 45 A, B). The remainder of the body wall, however, lacks muscles. Narrow teeth form a fringe round the margins of both siphons.

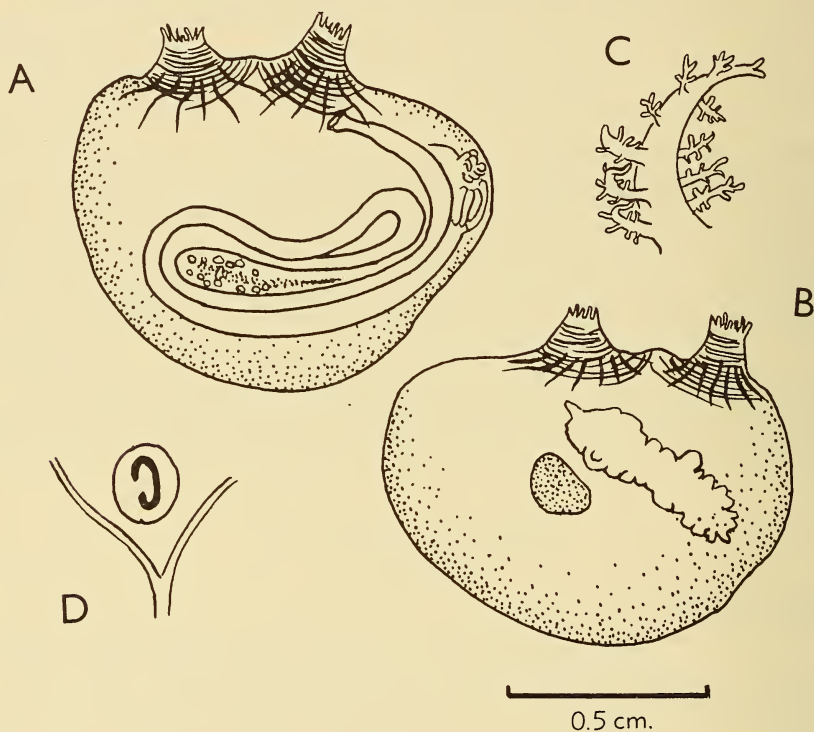


FIG. 45. *Eugyra macrentera* sp. n.

A, B, specimen with test removed, seen respectively from the left and right; C, oral tentacle; D, dorsal tubercle.

Eight bipinnate tentacles are situated at the base of the oral siphon (fig. 45 C). The dorsal tubercle is small, with a C-shaped opening facing towards the right (fig. 45 D). The dorsal lamina is rather narrow but long, and has a plain margin. Seven tall longitudinal bars are situated on each side of the branchial sac. They are less curved than in many species of *Eugyra*. Below each of these bars is a row of infundibula, each with a pair of spiral stigmata. There are, in addition, some smaller accessory infundibula in the spaces between the main ones. Narrow transverse bars separate adjacent transverse rows of infundibula,

The oesophagus is short, narrow and curved, and the small stomach bears a lobed glandular diverticulum. The intestine is long and folded into a flat double loop, making an almost closed primary loop and a narrow secondary loop. The rectum bends forward and upward, to end in a plain anus near the base of the atrial siphon.

In this specimen the gonads are not well developed, and seem to be in a post-spawning state. They are long and rather narrow, consisting of a central tubular ovary fringed by testis lobes. No further details of the gonads could be seen. The left gonad is in the secondary intestinal loop and the right gonad lies obliquely across the centre of the right side, pointing towards the atrial siphon.

The renal sac is a small semi-circular body about the middle of the right side.

#### *Remarks*

*E. macrentera* is remarkable for the length of the intestine and the way in which it is folded. A few species of *Molgula*, notably *M. platei* Hartmeyer and *M. contorta* Sluiter, have a somewhat similar intestinal loop, an arrangement which allows a long intestine to be accommodated in a small space.

TABLE 2

|                                | Saldanha Bay | Langebaan Lagoon | Table Bay | Cape Peninsula | False Bay | Brede River Estuary | Mossel Bay | Knysna | Algoa Bay | Bushman's River | Durban | Kosi Bay | Portuguese East (Morrumbene) | Other localities (if in South Africa, * indicates nearest collecting station) |
|--------------------------------|--------------|------------------|-----------|----------------|-----------|---------------------|------------|--------|-----------|-----------------|--------|----------|------------------------------|---|
| <i>Aplidium flavo-lineatum</i> | .            | .                | +         |                | +         |                     | +          |        | +         |                 |        |          |                              |   |
| <i>A. pantherinum</i>          | .            | .                | +         | +              | +         |                     | +          |        |           |                 | +      |          |                              |   |
| <i>A. colloidoides</i>         | .            | .                |           | +              |           |                     |            | +      |           |                 |        |          |                              |   |
| <i>A. circulatum</i>           | .            | .                |           |                | +         |                     |            |        | *         |                 |        |          |                              | St. Francis Bay.*   |
| <i>A. retiforme</i>            | .            | .                |           |                | +         |                     | ?          |        | ?         |                 |        |          |                              | Kerguelen.  |
| <i>A. sarasinorum</i>          | .            | .                |           |                | +         |                     |            |        |           |                 |        |          | +                            | Ceylon.   |
| ? <i>A. galeritum</i>          | .            | .                |           |                | +         |                     |            |        | *         |                 |        |          |                              | St. Francis Bay.*   |
| <i>Synoicum capense</i>        | .            | .                |           |                | +         |                     |            |        |           |                 |        |          |                              |   |
| <i>S. australe</i>             | .            | .                |           |                |           |                     | +          |        |           |                 |        |          |                              |   |
| <i>Polyclinum arenosum</i>     | .            | .                |           |                | +         |                     |            |        | +         |                 | +      |          | +                            |   |
| <i>P. isipingense</i>          | .            | .                |           |                | +         |                     |            |        |           |                 | +      |          |                              |   |
| <i>P. neptunium</i>            | .            | .                |           | +              |           |                     |            |        |           |                 |        |          |                              |   |
| <i>Pseudodistoma africanum</i> | .            | .                |           |                | +         |                     | +          |        | +         |                 | *      |          |                              | Itongazi River.*  |
| <i>Clavelina roseola</i>       | .            | .                |           |                | +         |                     | +          |        |           |                 |        |          |                              |   |
| <i>C. steenbrasensis</i>       | .            | .                |           |                | +         |                     | +          |        |           |                 |        |          |                              |   |



|                              | Saldanha Bay | Langebaan Lagoon | Table Bay | Cape Peninsula | False Bay | Breede River Estuary | Mossel Bay | Knysna | Algoa Bay | Bushman's River | Durban | Kosi Bay | Portuguese East Africa (including Morrumbene) | Other localities (if in South Africa, * indicates nearest collecting station) |
|------------------------------|--------------|------------------|-----------|----------------|-----------|----------------------|------------|--------|-----------|-----------------|--------|----------|---|---|
| <i>Cystodites rosolus</i>    | .            | .                | .         | +              |           |                      |            |        | +         |                 |        |          |   | Gulf of Guinea; Seychelles.   |
| <i>C. dellechiaiei</i>       | .            | .                | .         |                |           |                      |            |        |           |                 |        | +        | +   | Widespread in warm waters.  |
| <i>Polycitorella pallida</i> | .            | .                | .         |                |           |                      |            |        | +         |                 |        |          |   |   |
| <i>Tetra zona porrecta</i>   | .            | .                | .         |                |           |                      |            |        | +         |                 |        |          |   |   |
| <i>Sycozoa arborecens</i>    | .            | .                | .         |                | +         |                      | +          |        | +         |                 |        |          |   |   |
| <i>Distaplia capensis</i>    | .            | .                | .         |                | +         | *                    | ?          |        |           |                 |        |          |   | Still Bay.*   |
| <i>D. skoogi</i>             | .            | .                | .         |                | +         |                      |            |        | +         |                 |        |          | ?   | Walker Bay*; off Cape St. Blaize.   |
| <i>Sigillina vasta</i>       | .            | .                | .         |                |           | *                    | *          |        |           |                 |        |          |   | Kafirkulls Bay.*  |
| <i>Eudistoma digitatum</i>   | .            | .                | .         |                |           |                      | +          |        | +         |                 |        |          |   |   |
| <i>E. coeruleum</i>          | .            | .                | .         |                |           |                      |            |        |           |                 | *      |          | +   | Scottburgh*; ?Still Bay.  |
| <i>E. modestum</i>           | .            | .                | .         |                |           |                      |            |        | +         |                 | +      |          |   | East London.*   |
| <i>E. renieri</i>            | .            | .                | .         |                |           |                      |            |        | *         |                 | +      |          |   | St. Francis Bay.*   |
| <i>E. illotum</i>            | .            | .                | .         | +              | +         |                      |            |        |           |                 |        |          |   |   |
| ? <i>E. angolanum</i>        | .            | .                | .         | *              | +         |                      | +          |        | +         |                 |        |          |   | Agulhas Bank;* Gulf of Guinea; N.W. & W. Australia.                           |
| ? <i>E. mobiisi</i>          | .            | .                | .         | +              | +         |                      |            |        | +         |                 |        |          |   | Madagascar.   |
| ? <i>Didemnum stilense</i>   | .            | .                | .         |                | +         | *                    | +          |        | +         |                 |        |          |   | Still Bay.*   |

|  | Saldanha Bay | Langebaan Lagoon | Table Bay | Cape Peninsula | False Bay | Brede River Estuary | Mossel Bay | Knysna | Algoa Bay | Bushman's River | Durban | Kosi Bay | Portuguese East Africa (including Morrumbene) | Other localities (if in South Africa. * indicates nearest collecting station) |
|--|--------------|------------------|-----------|----------------|-----------|---------------------|------------|--------|-----------|-----------------|--------|----------|---|---|
| <i>D. (Polysyncrator) magnilarum</i> .   |              |                  |           |                |           |                     |            |        |           |                 | *      |          |   | Itongazi River.*  |
| <i>Leptoclinides capensis</i> .          |              |                  | +         |                |           | *                   | *          |        |           |                 |        |          |   | Still Bay.*   |
| <i>Lissoclinum cavum</i> .               |              |                  |           |                | +         |                     |            |        | +         |                 |        |          |   |   |
| <i>Trididemnum cerebriforme</i> .        | +            | +                |           |                | +         |                     | +          |        | +         |                 |        |          |   |   |
| <i>Diplosoma listerianum</i> .           | +            |                  |           |                | +         |                     |            |        | +         |                 |        |          |   | Europe; W. Africa.  |
| <i>Ciona intestinalis</i> .              | +            |                  |           |                |           |                     |            |        |           |                 |        |          |   | Europe; America, etc.   |
| <i>Ascidia stenodes</i> .                |              |                  |           |                |           |                     |            |        |           |                 |        |          |   |   |
| <i>A. sydneyensis</i> .                  |              |                  |           |                | +         |                     | +          |        | +         |                 |        |          |   | W. Indies; Australia, etc.; East London.*                                     |
| <i>Corella eumyota</i> .                 |              | +                |           |                |           |                     |            |        |           |                 |        |          |   | Antarctic; Subantarctic; New Zealand, etc.                                    |
| <i>Botryllus magnicoecus</i> .           | +            |                  | +         |                | +         |                     |            |        | +         |                 |        |          |   | Australia; New Zealand.   |
| <i>B. anomalus</i> .                     | +            |                  | +         |                |           |                     |            |        |           |                 |        |          |   |   |
| ? <i>Botryllodes leachi</i> .            | +            |                  |           |                |           |                     |            |        |           |                 |        |          |   | Europe; Australia; New Zealand.   |
| <i>B. nigrum</i> var. <i>giganteum</i> . |              |                  |           |                |           |                     |            | +      |           |                 | +      |          | +   | W. Africa.  |
| <i>Gynandrocarpa unilateralis</i> .      |              |                  |           |                | +         |                     | +          |        | +         |                 |        |          |   | Agulhas Bank.*  |
| <i>Dextrocarpa solitaria</i> .           |              |                  |           |                | +         |                     |            | *      |           |                 |        |          |   | Cape Seal.*   |

|  | Saldanha Bay | Langebaan Lagoon | Table Bay | Cape Peninsula | False Bay | Brede River Estuary | Mossel Bay | Knysna | Algoa Bay | Bushman's River | Durban | Kosi Bay | Portuguese East Africa (including Morrumbene) | Other localities (if in South Africa, * indicates nearest collecting station) |
|--|--------------|------------------|-----------|----------------|-----------|---------------------|------------|--------|-----------|-----------------|--------|----------|---|---|
| <i>Alloeocarpa capensis</i> . . .                | .            |                  |           |                |           |                     |            |        | +         |                 |        |          |   | St. Francis Bay. *  |
| <i>Metandrocarpa fascicularis</i> . .            | .            |                  |           |                |           |                     | +          |        |           |                 |        |          |   |   |
| <i>Polyandrocarpa anguinea</i> . . .             | .            |                  |           |                | +         |                     | +          | +      | +         |                 |        |          | +   |   |
| <i>Polycarpa rubida</i> . . .                    | .            |                  |           |                |           |                     |            |        |           |                 |        |          | +   |   |
| <i>Chenidocarpa asymmetra</i> . . .              | .            | +                | +         |                |           |                     |            |        |           |                 |        |          |   | Luderitz Bay.   |
| <i>G. psammophora</i> . . .                      | .            |                  |           |                |           |                     |            |        | +         |                 |        |          |   | Luderitz Bay.   |
| <i>Styela angularis</i> . . .                    | .            |                  |           |                | +         |                     |            | +      |           |                 |        |          |   | Cape Natal.   |
| <i>S. marquesana</i> . . .                       | .            |                  |           |                |           |                     |            |        |           |                 | +      |          | +   |   |
| <i>S. radicata</i> . . .                         | .            |                  |           |                |           |                     |            |        |           |                 |        |          | +   |   |
| <i>Pyura stolonifera</i> . . .                   | .            |                  | +         |                | +         |                     | +          | +      | +         |                 |        |          |   | Natal; Port Nolloth; Australia.   |
| <i>P. capensis</i> . . .                         | .            |                  |           |                | +         |                     | +          |        |           |                 |        |          |   |   |
| <i>Microcosmus oligophyllus</i> . .              | +            |                  |           |                |           |                     | +          |        |           |                 |        |          |   |   |
| <i>M. exasperatus</i> . . .                      | .            |                  |           |                |           |                     | ?          |        |           |                 |        |          | +   | Many warm regions; Natal.   |
| <i>M. pedunculatus</i> . . .                     | .            |                  |           |                |           |                     | +          |        |           |                 |        |          | +   | West Africa.  |
| <i>Boltenia africana</i> . . .                   | .            |                  |           |                | +         |                     | +          |        | +         |                 |        |          |   |   |
| <i>Halocynthia spinosa</i> f. <i>defectiva</i> . | .            |                  |           |                | +         |                     | +          |        | +         |                 |        |          |   |   |

|                          | Saldanha Bay | Langebaan Lagoon | Table Bay | Cape Peninsula | False Bay | Bredde River Estuary | Mossel Bay | Knysna | Algoa Bay | Bushman's River | Durban | Kosi Bay | Portuguese East Africa (including Murrumbene) | Other localities<br>* indicates nearest<br>(if in South Africa,<br>collecting station) |
|--------------------------|--------------|------------------|-----------|----------------|-----------|----------------------|------------|--------|-----------|-----------------|--------|----------|---|--|
| <i>Molgula falsensis</i> | .            | .                | .         | .              | .         | .                    | .          | .      | +         | .               | .      | .        | .   | .  |
| <i>M. conchata</i>       | .            | .                | .         | .              | .         | .                    | +          | +      | +         | .               | .      | .        | .   | .  |
| <i>M. scutata</i>        | .            | .                | .         | .              | .         | .                    | .          | .      | u         | .               | .      | .        | .   | .  |
| <i>M. cryptica</i>       | .            | .                | .         | .              | +         | .                    | .          | .      | .         | .               | .      | .        | .   | .  |
| <i>Eugyra myodes</i>     | .            | .                | .         | .              | .         | .                    | .          | .      | .         | .               | .      | .        | .   | .  |
| <i>E. macrentera</i>     | .            | .                | .         | .              | .         | .                    | .          | .      | +         | .               | .      | .        | .   | .  |



## DISTRIBUTION OF SPECIES

*Geographical components of the ascidian fauna*

Stephenson (1944) has analysed the littoral fauna and flora of the South African coast between Port Nolloth on the west and Durban on the east, and recognizes the following components:

- (1) the warm-water component,
- (2) the cold-water component,
- (3) the ubiquitous component,
- (4) the south coast component,
- (5) the more local components.

The ascidians described in the present paper (Table 2) and in a previous one (Millar, 1955) can be grouped into the first four components defined by Stephenson. Excluding doubtful records and insufficiently known species, the ascidians can be divided as follows:

The warm water component:

*Aplidium sarasinorum*  
*Polyclinum isipingense*  
*P. arenosum*  
*P. constellatum*  
*Pseudodistoma africanum*  
*Cystodites dellechiaiei*  
*Eudistoma coeruleum*  
*E. modestum*  
*E. renieri*  
*Ascidia pygmaea*  
*Botrylloides nigrum* var. *giganteum*  
*Symplegma viride*  
*Polyandrocarpa anguinea*  
*Polycarpa rubida*  
*Styela plicata*  
*S. aequatorialis*  
*S. marquesana*  
*Microcosmus exasperatus*  
*M. pedunculatus*

The cold water component:

*Aplidium flavo-lineatum*  
*A. pantherinum*  
*Polyclinum neptunium*  
*Cystodites roseolus*  
*Trididemnum cerebriforme*  
*Leptoclinides capensis*

*Corella eumyota*  
*Botryllus magnicoecus*  
*Cnemidocarpa asymmetra*  
*Microcosmus oligophyllus*  
*Molgula scutata*

The ubiquitous component:

*Diplosoma listerianum*  
*Ciona intestinalis*

The south coast component:

*Aplidium circulatum*  
*A. retiforme*  
*Clavelina roseola*  
*Sycozoa arborescens*  
*Distaplia capensis*  
*Ascidia sydneiensis*  
*Agnesia glaciata*  
*Gynandrocarpa unilateralis*  
*Dextrocarpa solitaria*  
*Alloeocarpa capensis*  
*Styela angularis*  
*S. pupa*  
*Pyura capensis*  
*P. stolonifera*  
*Boltenia africana*  
*Molgula falsensis*  
*M. conchata*

Table 3 shows the number of species in each of the four main components, as a percentage of the total number of ascidian species collected, and also shows the comparable percentages obtained from Stephenson's (1944) figures of all species of littoral animals.

TABLE 3

|                       | Percentage of total species |                             |
|-----------------------|-----------------------------|-----------------------------|
|                       | <i>Ascidians</i>            | <i>All littoral animals</i> |
| Warm water component  | 39                          | 52                          |
| Cold water component  | 22                          | 18                          |
| Ubiquitous component  | 4                           | 8                           |
| South Coast component | 35                          | 13                          |

It should be pointed out that the figures are not strictly comparable because the ascidians include both littoral and sublittoral material.

The ascidian fauna compared with the littoral animals as a whole, shows a warm water component almost as important, and a relatively more important south coast component. The cold water component and the ubiquitous component are about the same relative size in ascidians as in the total of littoral animal species in South Africa. There is therefore quite good agreement between ascidians and other groups.

The distribution of South African species in other regions shows some interesting features. Particularly notable is the high proportion of the ascidian fauna which appears to be endemic. Care must be used in comparing the results in the present paper with those of other authors dealing with different areas, owing to the persisting difficulties of ascidian systematics, and the consequent possibility of confusion of species. Nevertheless it appears that more than half of the species described in the present account are endemic. As pointed out by Ekman (1953), however, the faunas of the neighbouring regions, South West and south-east Africa, are very imperfectly known; it is therefore likely that the list of endemic species will shorten as knowledge of these areas increases.

The wider affinities of the South African ascidian fauna appear to be with the adjacent areas of the warmer Indian Ocean. Only *Aplidium retiforme*, *Corella eumyota*, and *Agnesia glaciata* are found also in any of the cooler waters of more southerly regions. In this respect the South African ascidian fauna contrasts markedly with that of southern South America where many species are shared with the Subantarctic and Antarctic regions (Millar, 1960). The temperature regimes of southern South America and southern South Africa are, of course, very different, but it seems likely that the greater geographical isolation of the latter may also have been important in preventing fusion of the faunas of South Africa and more southerly areas.

In other respects also the ascidians of South Africa and South America are dissimilar. Several South American ascidians reach a very great size, as for instance *Distaplia cylindrica* (Lesson), and the molgulids *Ascopera gigantea* Herdman and *Paramolgula gregaria* (Lesson). No species of a comparable size is known from South Africa, except *Sigillina vasta* sp. n., which is known only from the incomplete type specimen. Differences in the abundance of phytoplankton may be responsible for the different sizes of the ascidians in the two areas.

#### SUMMARY

1. A systematic account is given of the ascidians from South African waters contained in several collections.
2. Sixty-four species are identified, and five are given provisional identifications. Of the total, seventeen are described as new species, and one as a new form of a known species.
3. The distribution of the species is briefly discussed.

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'I. *Synonymy arranged according to chronology of names.*—All published scientific names by which a species has been previously designated (subsequent to 1758) are listed in chronological order, with bibliographical references to all descriptions or descriptive citations following in chronological order after each name. . . .

B. *Form of bibliographic references to synonymic names.*—The first reference following any name in the synonymy should be to the earliest citation of that name. This should be followed by references to all subsequent citations of the same name, arranged in chronological order. . . .'

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*Example:—*

*Eulalia (Steggoa) capensis* Schmarda

*Eulalia capensis* Schmarda 1861, p. 86, pl. 29, fig. 231. Willey 1904, p. 259.

*Eulalia viridis* var. *capensis* McIntosh 1903, p. 34. Day 1953, p. 30.

*Eulalia viridis* (non Muller) Ehlers 1913, p. 455. Day 1934, p. 30.

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