

THE HYDROZOA OF THE SOUTH AND WEST COASTS OF  
SOUTH AFRICA

PART I. THE PLUMULARIIDAE

By

N. A. H. MILLARD

*Zoology Department, University of Cape Town*

[Accepted April, 1961]

(With 12 figures in the text)

CONTENTS

	PAGE
Introduction . . . .	261
Station list . . . .	263
Remarks on classification . . . .	267
List of species . . . .	273
Systematic section . . . .	274
Summary . . . .	318
References . . . .	318

INTRODUCTION

This paper is the continuation of a series on the systematics of the hydroid coelenterates of the South African coasts. The hydroids of False Bay, near Cape Town, and those of the east coast (Natal and Portuguese East Africa) have already been described (Millard, 1957, 1958, 1959a), as have the hydroids from ships' hulls in Table Bay (Millard, 1959b). This leaves the species from the west and south coasts to be dealt with, the latter including very rich collections from the Agulhas Bank. It was found that it is no easy matter to decide on a line of demarcation between the west and south coasts when one is dealing with material dredged off the shore, and also that the distribution of the species does not justify such a division. These coasts are thus dealt with together. However, the hydroids of False Bay, which effectively separates the two coasts as far as the littoral material is concerned, have already been described. This paper, therefore, deals with the west and south coasts from South West Africa on the west to the southern border of Natal on the east, with the exception of False Bay. In a few instances recently collected specimens from False Bay or Natal have been mentioned when they have something of importance to add to the description. These records are quoted within brackets.

It was also found impracticable to separate littoral and estuarine material from that of deeper waters, as the Hydroida are essentially a sublittoral group and only a very small percentage of the population extends its range upwards into the littoral area. The term 'littoral' is used here in preference to 'inter-

tidal', and is taken to include forms within reach at low water of spring tide even though they are not exposed and thus are not strictly between tide-marks. Since the scope of the paper is thus very large and deals with an enormous amount of material, it is proposed to divide it into parts, this, the first, dealing with the Plumulariidae. *In toto* it should complete the survey of the coast.

An analysis of the geographical distribution is being left to a later date when the descriptions are complete and more records are available, as also keys to the identification of species.

The material described has been obtained from a number of different sources and I am indebted to many bodies and individuals for their co-operation in building up the collection.

Some of the material dates from the time when the late Professor T. A. Stephenson held the chair of Zoology at the University of Cape Town, and was collected by him and his associates during his intertidal survey of the coast. This material is catalogued with a single reference letter.

The bulk of the material has been collected since that date by members of the Zoology Department under the direction of Professor J. H. O. Day, on expeditions to estuaries round the coast, on instructional student camps, and particularly by cruises of the University research vessel, the *John D. Gilchrist*. The Division of Fisheries has contributed material dredged by the R.S. *Africana*, and Messrs. Irvin and Johnson material brought up by commercial trawlers.

Finally there is a fairly bulky collection which was submitted to me for identification by the South African Museum and which was dredged by the S.S. *Pieter Faure* 50-60 years ago. Much of this material has deteriorated during the years, but since most of the Plumulariidae can be identified on their skeletal parts it has proved very useful and provided a number of valuable records, particularly from those regions which were only scantily covered by the *John D. Gilchrist*.

The details of the collecting stations, including date, latitude and longitude, depth, and nature of bottom, are given in the station list in the following section, and only the catalogue numbers are quoted under individual species.

In the description of the species the full synonymy has not been repeated where it has been quoted in previous papers of the series. Instead the latter are referred to.

A visit to the British Museum of Natural History in the latter half of 1960 enabled me to examine many type specimens and confirm identities of various South African species. For this privilege I am most grateful to the director of the museum and to Dr. W. J. Rees and members of his department. It has also made possible the solution of a number of problems of synonymy. I am also indebted to the director of the Munich Museum for the loan of slides of Stechow's collection from South Africa.

Various bodies have contributed either directly or indirectly to the expenses involved, including the South African Council for Scientific and

Industrial Research, the Carnegie Corporation, the Staff Research Fund of the University of Cape Town, and the Publications Fund of the University.

The type specimens of new species will be deposited in the South African Museum, and in these cases the registered museum number is quoted as well as the University catalogue number.

The Trustees of the South African Museum acknowledge with thanks receipt of a grant from the University of Cape Town for this publication.

## STATION LIST

A. Littoral material from Oudekraal on the west coast of the Cape Peninsula.

Date: 13.5.34. Position:  $33^{\circ}58'5''S./18^{\circ}22'2''E.$

AFR. Material dredged by the government research vessel, r.s. *Africana*.

	Date	Position	Depth (m.)	Bottom
AFR 729	15.8.47	$31^{\circ}22'8''S./16^{\circ}20'2''E.$	366	bk M, R
AFR 736	17.8.47	$30^{\circ}42'4''S./15^{\circ}59'2''E.$	201	co gn S, Sh
AFR 865	8.1.48	$34^{\circ}35'5''S./19^{\circ}18'2''E.$	37	R, S
AFR 945	19.3.48	$36^{\circ}25''S./21^{\circ}8''E.$	177	S, R
AFR 994	19.4.48	$34^{\circ}34'5''S./21^{\circ}22'5''E.$	68	co S, Sh

B. Littoral material from Lambert's Bay on the west coast. Date: 30.7.48.

Position:  $32^{\circ}5'S./18^{\circ}14'E.$

BMR. Bushmans River Estuary, on sand and muddy banks. Date: 10.9.50.

Position:  $33^{\circ}41'S./26^{\circ}40'E.$

CP. Littoral material from various localities on the west coast of the Cape Peninsula.

	Date	Locality	Position
CP 17	29.4.38	Kommetje	$34^{\circ}8'5''S./18^{\circ}19'4''E.$
CP 328	31.12.48	Sea Point	$33^{\circ}55'2''S./18^{\circ}22'6''E.$
CP 335	12.9.49	Hout Bay	$34^{\circ}3'S./18^{\circ}21'E.$
CP 646	5.12.60	Oudekraal	$33^{\circ}58'5''S./18^{\circ}22'2''E.$
CP 650	1.2.61	Bakoven	$33^{\circ}57'6''S./18^{\circ}22'3''E.$

CPR. Material from various localities in the Cape Province.

	Date	Locality	Position	Depth (m.)
CPR 1	14.1.49	Cape Agulhas	$34^{\circ}50'S./20^{\circ}1'E.$	littoral
CPR 7	15.1.50	The Haven	$32^{\circ}15'S./28^{\circ}57'E.$	littoral
CPR 9	30.4.50	Glentana Strand	$34^{\circ}4'S./22^{\circ}20'E.$	littoral
CPR 44	-1.58	Port Nolloth	$29^{\circ}15'S./16^{\circ}52'E.$	littoral
CPR 46	20.6.59	Umgazi Bay	$31^{\circ}43'S./29^{\circ}26'E.$	27

E. Littoral material from Port Elizabeth on the south coast. Date: July 1936.

Position:  $33^{\circ}56'S./25^{\circ}36'E.$

FAL. False Bay.

	Date	Position	Depth (m.)	Bottom
FAL 326	10.9.57	$34^{\circ}7'7''S./18^{\circ}26'9''E.$	3-5	R

KNY. Knysna Estuary, on the south coast. Position:  $34^{\circ}5'S./23^{\circ}4'E.$  (average).

	Date	Depth (m.)	Bottom
KNY 22	16.7.47	1-4	M
KNY 28	17.7.47	littoral	wooden pole
KNY 30	16.7.47	5-7	S, M
KNY 57	20.7.47	11-5	R
KNY 70	15.7.47	2-6	S
KNY 71	15.7.47	7	Sh, S, M
KNY 127	15.4.49	0-1	M
KNY 165	9.7.50	littoral	R, Buoy

L. Littoral material from East London, on the south coast. Date: July 1937.

Position:  $33^{\circ}1'S./27^{\circ}54'E.$

LAM. Dredged in Lambert's Bay, west coast.

	<i>Date</i>	<i>Position</i>	<i>Depth (m.)</i>	<i>Bottom</i>
LAM 2	16.1.57	$32^{\circ}4'5'S./18^{\circ}18'3'E.$	17	S, R
LAM 7	18.1.57	$32^{\circ}5'S./18^{\circ}17'9'E.$	23	R, Sh, S
LAM 9	17.1.57	$32^{\circ}4'7'S./18^{\circ}17'7'E.$	23	S, Sh
LAM 13	19.1.57	$32^{\circ}4'S./18^{\circ}18'1'E.$	18	R
LAM 16	17.1.57	$32^{\circ}4'8'S./18^{\circ}18'2'E.$	11	S
LAM 21	17.1.57	$32^{\circ}7'5'S./18^{\circ}17'6'E.$	20	S, R
LAM 26	18.1.57	$32^{\circ}4'9'S./18^{\circ}17'5'E.$	27	S, R, Sh
LAM 27	16.1.57	$32^{\circ}4'1'S./18^{\circ}18'4'E.$	16	R
LAM 30	19.1.57	$32^{\circ}5'1'S./18^{\circ}17'7'E.$	20	R
LAM 35	19.1.57	$32^{\circ}5'5'S./18^{\circ}17'7'E.$	27.5	R, Sh
LAM 43	21.1.57	$32^{\circ}4'9'S./18^{\circ}18'2'E.$	13.5	S, R
LAM 45	21.1.57	$32^{\circ}5'S./18^{\circ}18'2'E.$	8	S, R
LAM 46	22.1.57	$32^{\circ}4'4'S./18^{\circ}17'7'E.$	23	R
LAM 51	23.1.57	$32^{\circ}8'5'S./18^{\circ}17'7'E.$	16.5	S, R
LAM 59	23.1.57	$32^{\circ}9'S./18^{\circ}18'E.$	16	S, R
LAM 62	23.1.57	$32^{\circ}1'5'S./18^{\circ}18'E.$	25	R, Sh

LB. Material from Langebaan Lagoon, on west coast.

	<i>Date</i>	<i>Position</i>	<i>Depth (m.)</i>	<i>Bottom</i>
LB 126	15.7.46	$33^{\circ}7'5'S./18^{\circ}1'9'E.$	4	
LB 152	16.7.46	$33^{\circ}8'3'S./18^{\circ}3'3'E.$	7	
LB 190	26.4.49	$33^{\circ}11'3'S./18^{\circ}5'5'E.$	0-2	f S, M
LB 257	2.5.51	$33^{\circ}7'S./18^{\circ}3'E.$	littoral	S, R
LB 367	7.5.53	$33^{\circ}6'S./18^{\circ}1'5'E.$	littoral	R
LB 378	7.5.53	$33^{\circ}6'S./18^{\circ}2'E.$	0-1	wooden piling
LB 392	8.5.53	$33^{\circ}7'9'S./18^{\circ}2'1'E.$	2.5	S
LB 472	6.5.55	$33^{\circ}7'4'S./18^{\circ}2'5'E.$	3-4	S, Sh
LB 511	23.9.57	$33^{\circ}6'S./18^{\circ}1'5'E.$	littoral	R
LB 513	5.1.58	$33^{\circ}6'5'S./18^{\circ}2'E.$	littoral	R

LIZ. Dredged in Algoa Bay, Port Elizabeth, south coast.

	<i>Date</i>	<i>Position</i>	<i>Depth (m.)</i>	<i>Bottom</i>
LIZ 7	6.4.54	$33^{\circ}58'1'S./25^{\circ}38'9'E.$	9	St, R
LIZ 13	6.4.54	$33^{\circ}58'2'S./25^{\circ}38'8'E.$	7-8	S
LIZ 16-17	7.4.54	$33^{\circ}58'4'S./25^{\circ}40'5'E.$	14	St
LIZ 27	11.4.54	$34^{\circ}0'8'S./25^{\circ}42'4'E.$	5-7	R

MB. Dredged in Mossel Bay, south coast.

	<i>Date</i>	<i>Position</i>	<i>Depth (m.)</i>	<i>Bottom</i>
MB 5	12.1.56	$34^{\circ}8'0'S./22^{\circ}8'5'E.$	21	S
MB 8, 12	12.1.56	$34^{\circ}4'3'S./22^{\circ}13'9'E.$	19	R
MB 15	13.1.56	$34^{\circ}11'1'S./22^{\circ}10'1'E.$	16	S, R
MB 24	13.1.56	$34^{\circ}11'1'S./22^{\circ}9'9'E.$	19	R
MB 26	13.1.56	$34^{\circ}11'1'S./22^{\circ}10'1'E.$	21	S
MB 34	15.1.56	$34^{\circ}8'3'S./22^{\circ}9'4'E.$	31	S
MB 37	16.1.56	$34^{\circ}9'3'S./22^{\circ}10'0'E.$	31	S
MB 39	16.1.56	$34^{\circ}10'1'S./22^{\circ}8'0'E.$	9	R
MB 42	16.1.56	$34^{\circ}8'5'S./22^{\circ}8'8'E.$	25	S, M
MB 47	17.1.56	$34^{\circ}11'3'S./22^{\circ}10'0'E.$	10	R
MB 52	17.1.56	$34^{\circ}11'0'S./22^{\circ}9'9'E.$	14	R, S
MB 55	17.1.56	$34^{\circ}10'7'S./22^{\circ}9'6'E.$	9	R
MB 58	18.1.56	$34^{\circ}4'3'S./22^{\circ}13'5'E.$	12.5	R
MB 59	18.1.56	$34^{\circ}4'1'S./22^{\circ}13'9'E.$	11.5	R
MB 60	18.1.56	$34^{\circ}4'3'S./22^{\circ}14'2'E.$	17-20	co S, Sh, R
MB 70	19.1.56	$34^{\circ}8'9'S./22^{\circ}7'9'E.$	18	S
MB 72	19.1.56	$34^{\circ}9'1'S./22^{\circ}7'2'E.$	12	R, S, Sh
MB 79	20.1.56	$34^{\circ}5'0'S./22^{\circ}11'8'E.$	19	M
MB 81	20.1.56	$34^{\circ}6'2'S./22^{\circ}10'9'E.$	27.5	M



MB 83	21.1.56	34°11'6"S./22°10'2"E.	29	S, Sh, R
MB 84	21.1.56	34°11'4"S./22°10'1"E.	29	R
MB 88	18.1.56	34°4'8"S./22°13'1"E.	26	co S, Sh, R

N. Littoral material from Port Nolloth, west coast. Date: 11.11.35. Position: 29 15'S./16°52'E.

NAD. Dredged off Natal, east coast.

	Date	Position	Depth (m.)	Bottom
NAD 1	17.5.58	30°47'1"S./30°29'1"E.	44	St
NAD 9	23.4.58	29°46'S./31°17'E.	110-130	
NAD 21, 22	12.8.58	29°58'S./31°2'E.	49	

PP. Littoral material from Paternoster, west coast. Date: 24.9.57. Position: 32°43'S./17°55'E.

S. Littoral material from Still Bay, south coast. Date: January, 1932. Position: 34°23'S./21°26'E.

SAMH. Material dredged by the s.s. *Pieter Faure* and lodged in the South African Museum. (The positions were given in the original records as compass bearings off salient points on the coast, and were probably not very accurate. These have been converted into latitude and longitude and given to the nearest minute.)

	Date	Position	Depth (m.)	Bottom
SAMH 148-153	15.7.1898	34°8'S./22°16'E.		St
SAMH 163	28.10.1898	33°54'S./25°47'E.	40	d S
SAMH 165-169	11.11.1898	33°49'S./25°56'E.		
SAMH 190-194	28.12.1898	33°9'S./28°3'E.	86	S, Sh, R
SAMH 195, 196	15.2.1899	33°53'S./25°45'E.	33-42	
SAMH 197-201	7.3.1899	33°59'S./25°51'E.	24-27	
SAMH 210	15.3.1899	33°47'S./26°19'E.	18-29	S, Sh, St
SAMH 212	24.3.1899	33°50'S./26°35'E.	91	M
SAMH 215-225	19.6.1899	34°26'S./21°42'E.		f S
SAMH 238-241	11.10.1900	34°8'S./22°59'5"E.	73	S, Sh, CrI
SAMH 248	24.10.1900	34°22'S./22°9'E.	71	R
SAMH 249	15.7.1901	33°13'5"S./27°58'E.	89	brk Sh
SAMH 254-277	17.7.1901	33°7'S./27°47'5"E.		f S
SAMH 278-280	25.7.1901	32°50'S./28°18'5"E.	86	brk Sh
SAMH 284	6.8.1901	33°5'S./27°50'E.	7	R, brk Sh
SAMH 285-293	13.8.1901	32°45'S./28°26'E.	53	brk Sh, St
SAMH 297-298	13.8.1901	32°47'S./28°28'E.	82	brk Sh
SAMH 299-304	15.8.1901	32°42'S./28°26'E.	31	R
SAMH 305-309	10.9.1901	33°54'S./26°51'E.	120	brk Sh, St
SAMH 319, 320	23.9.1901	34°5'S./26°34'E.	115	S, Sh, bk Spks
SAMH 322-333	22.9.1904	34°12'S./22°15'5"E.	51	f S
SAMH 344-347	19.10.1904	34°15'5"S./22°14'E.	64	M
SAMH 349	15.8.1905	34°8'S./23°32'E.	73	M
SAMH 353	28.8.1906	33°54'5"S./26°28'E.	104	M
SAMH 355	-1.1.1913	29°55'S./31°14'E.		littoral
SAMH 360	25.7.1901	32°50'S./28°18'5"E.	86	brk Sh

SB. Saldanha Bay, west coast.

	Date	Position	Depth (m.)	Bottom
SB 141	2.5.57	33°2'5"S./18°2'E.	littoral	R
SB 150	22.9.57	33°2'5"S./18°2'E.	littoral	R
SB 168	25.9.57	33°2'5"S./18°2'E.	littoral	R
SB 178	28.4.59	33°3'6"S./18°0'4"E.	15	Sh, kh S, R
SB 194	1.5.59	33°3'5"S./17°59'2"E.	20	R, S
SB 196	1.5.59	33°4'4"S./17°56'4"E.	35	R

## SCD. Dredged off the south coast.

	<i>Date</i>	<i>Position</i>	<i>Depth (m.)</i>	<i>Bottom</i>
SCD 5	19.4.58	34°15'S./25°5'E.	11	R, Sh
SCD 20	26.5.58	34°7'3"S./23°23'8"E.	46	R
SCD 22	26.5.58	34°26'7"S./23°26'0"E.	114	Sh
SCD 26	23.5.58	33°47'S./26°4'E.	47	M, Sh
SCD 29	22.6.58	33°38'6"S./26°54'7"E.	56	R
SCD 33	21.5.58	35°3'S./27°56'2"E.	65	S, Sh
SCD 36, 37	19.5.58	32°15'2"S./28°57'7"E.	49.5	R
SCD 50	18.5.58	31°38'8"S./29°34'4"E.	33	R
SCD 52	20.8.58	34°1'S./25°45'5"E.	46	R
SCD 61	15.8.58	32°17'7"S./28°54'5"E.	49	
SCD 67	4.7.59	34°20'S./24°22'E.	120	?S
SCD 69	5.7.59	33°31'S./27°14'5"E.	67	?S
SCD 75	16.7.59	32°33'S./28°38'E.	55	S, M
SCD 79-81	16.7.59	32°43'S./28°28'E.	58	St, Sh
SCD 82	17.7.59	33°3'7"S./27°54'7"E.	51	br S, Sh
SCD 84, 85	17.7.59	33°3'S./27°55'E.	27	R
SCD 94	20.7.59	33°55'5"S./25°51'E.	46	bk M, S
SCD 96	20.7.59	34°21'S./25°41'E.	110	Sh
SCD 103	22.7.59	35°7'S./22°15'E.	119	S
SCD 104	23.7.59	34°33'S./21°28'E.	67	co S, brk Sh
SCD 108	23.7.59	34°35'S./21°11'E.	75	co S, Sh, St
SCD 117	14.2.60	34°24'S./21°46'E.	18	R
SCD 122	14.2.60	34°40'5"S./22°0'E.	93	kh S
SCD 126	3.6.60	34°26'5"S./21°48'E.	67	bk M
SCD 138	28.6.60	34°35'S./21°56'E.	77	co & f Sh
SCD 141	28.8.60	34°46'S./22°5'E.	93	kh S
SCD 152	2.6.60	34°55'S./21°26'E.	91	
SCD 153	25.11.60	34°3'S./25°59'E.	84	R
SCD 169	24.11.60	33°58'9"S./25°41'4"E.	4-11	R
SCD 175	30.11.60	34°20'S./23°31'E.	111	R, kh S
SCD 186-8	30.11.60	34°10'S./23°32'E.	97	gn M
SCD 191	29.11.60	34°4'3"S./23°25'8"E.	47	M
SCD 195	29.11.60	34°7'5"S./23°31'7"E.	79	f S
SCD 199	30.11.60	34°10'S./23°32'E.	97	gn M
SCD 201	29.11.60	34°5'8"S./23°23'2"E.	10	f S
SCD 206	30.11.60	34°51'S./23°41'E.	182	kh S
SCD 219	29.11.60	34°2'0"S./23°28'4"E.	49	S, R, M
SCD 234	30.11.60	34°51'S./23°41'E.	182	kh S
SCD 239	29.11.60	34°2'0"S./23°28'4"E.	49	S, R, M

## SWA. Littoral material from rocky shore at Luderitz, South West Africa.

Date: -.7.57. Position: 26°33'S./15°9'E.

## TB. Material dredged from Table Bay.

	<i>Date</i>	<i>Position</i>	<i>Depth (m.)</i>	<i>Bottom</i>
TB 1	11.2.47	33°47'5"S./18°24'3"E.	19-20	S, Sh, St
TB 2	25.10.46	33°52'5"S./18°26'E.	22	S
TB 3	4.8.46	33°49'5"S./18°27'5"E.	9-18	S, Sh
TB 4	11.2.47	33°48'3"S./18°24'E.	10-12.5	S, St
TB 5	11.2.47	33°47'5"S./18°24'3"E.	19-20	S, Sh, St
TB 17	26.6.47	33°52'7"S./18°28'7"E.	9	S, St
TB 18	3.7.47	33°52'7"S./18°26'8"E.	20.5	R
TB 21	15.12.57	33°48'6"S./18°24'6"E.	15	St, brk Sh, S

## TRA. Material collected by commercial trawlers.

	<i>Date</i>	<i>Position</i>	<i>Depth (m.)</i>	<i>Bottom</i>
TRA 35	21.1.50	34°34'S./20°50'E.	70	M, S
TRA 36	21.1.50	34°34'S./20°50'E.	73	St, M
TRA 38	-.7.50	34°30'S./20°56'E.	73	S, M
TRA 42	-.7.51	34°30'S./20°55'E.	70	M, St
TRA 47	24.9.52	31°50'S./16°50'E.	330	gn M

TRA 56	28.11.52	34°40'S./21°35'E.	70-77	R, S
TRA 86	23.3.53	32°41.7'S./17°58.5'E.	9	S
TRA 92	-1.54	35°3'S./21°50'E.	110	S, R
TRA 99	18.1.56	34°25.5'S./21°50.2'E.	60	S
TRA 134	23.2.57	34°19'S./18°30'E.	52	S, Sh, R
TRA 151	6.3.58	34°51'S./19°55'E.	22	R
TRA 156	15.10.58	34°12'S./18°22'E.	18-27	Cable
TRA 159	6.7.58	33°56'S./25°36'E.		Turtle's back

WCD. Dredged off west coast.

	Date	Position	Depth (m.)	Bottom
WCD 7	24.3.59	34°9.3'S./18°17.5'E.	43	R
WCD 12	24.3.59	34°9.4'S./18°16.5'E.	75	R
WCD 18	29.4.59	33°5.6'S./17°54.5'E.	64	kh M
WCD 20	30.4.59	33°7.5'S./17°52.5'E.	86	R
WCD 32	15.12.59	34°10'S./18°16'E.	93	R
WCD 34	15.12.59	34°11.2'S./18°20.2'E.	27	R
WCD 56	21.9.60	32°4.6'S./18°18'E.	18	S, R
WCD 81	15.9.49	34°5'S./18°21'E.	11	S

#### REMARKS ON CLASSIFICATION

In the taxonomy of the Plumulariidae three problems are of recurrent interest, namely:

- (1) The validity of fixed or movable nematothecae as a basis for subdivision;
- (2) the presence or absence of cauline hydrothecae as a useful diagnostic character, and
- (3) the value of the method of branching in the limitation and grouping of genera.

In 1883, Allman, using the type of nematotheca as a basis, divided the Plumulariidae into two large sections: the Eleutheroplea and the Statoplea. However, the presence of certain genera such as *Heteroplion* Allman 1883 and *Heterotheca* Stechow 1921, with two kinds of nematothecae, made this simple division impracticable. In 1923b Stechow made use of 4 sub-families, but also used as his basis the type of nematotheca. Stechow's subfamilies included:

1. Kirchenpaueriinae Stechow 1921. Nematothecae reduced.
2. Plumulariinae Kühn 1913 (= Eleutheroplea). Nematothecae 2-chambered and movable.
3. Acladiinae Stechow 1923b. Intermediate forms.
4. Aglaopheniinae Stechow 1911 (= Statoplea). Nematothecae 1-chambered and immovable.

The Kirchenpaueriinae and the Aglaopheniinae appear to be valid sub-families representing natural assemblies of genera (in fact the latter is raised to family rank by some systematists), but the other subfamilies need further consideration.

The Acladiinae was created for intermediate forms with fixed mesial nematothecae and fixed or movable lateral nematothecae. It was an unsatisfactory group, as Stechow himself realized, for he abandoned it in 1925, adding its genera to the Plumulariinae. It has in fact been increasingly recognized that

in this group the type of nematotheca does not form a good basis for family, or even generic, diagnosis. This was pointed out as early as 1913 by Billard and in 1915 by Bale, and most systematists have dropped the genera *Heteroplou*, *Heterotheca* and *Antennellopsis* Jäderholm 1896 for this reason.

There is, however, a group of genera which are linked by the presence of cauline hydrothecae, including *Thecocalus* Bale 1915, *Halopteris* Allman 1877, *Gattya* Allman 1886 and *Schizotricha* Allman 1883, genera which Stechow distributed between the Plumulariinae and Acladiinae. Bale was the first to realize the importance of cauline hydrothecae as a diagnostic character when he established the genus *Thecocalus* in 1915 for 'forms in which hydrothecae are borne on the rachis as well as on the pinnae'. Such genera possess stem internodes which are essentially similar to those of the hydrocladia, and thus differ from the '*Plumularia*' type where the stem internodes lack hydrothecae and thus differ from those of the hydrocladia. This difference is a fundamental one exhibited in the earliest stages of growth, influencing, as it does, the nature of the first upright stem. It is a sound character for generic diagnosis, and under no circumstances should species with cauline hydrothecae be included in the same genus as species without, as has been done by Billard (1913) (i.e. in the genus *Plumularia*). It is also considered to be a sound character on which to group genera, and a new subfamily, the Halopterinae, is proposed for forms with cauline hydrothecae. (Stechow's Acladiinae cannot be retained since *Acladia* is a synonym for *Halopteris*.) The Plumulariinae can be retained in Stechow's sense, though excluding certain genera dealt with below.

Stechow implies that the Kirchenpauerinae is the most primitive subfamily of the Plumulariidae because of the poorly developed nematothecae, but it is maintained here that the arrangement of hydrothecae and hydranths is of far greater fundamental significance. It is rational to assume that a primitive form would be one in which a functional feeding unit (i.e. a portion of stem and a hydranth) is established as rapidly as possible in early development and before budding commences, as in fact occurs in the sympodial growth of primitive Calyptoblast families such as the 'Campanulinidae' and Haleciidae. This arrangement is possible in the Halopterinae but not in the other Plumulariidae where a stem must develop hydrocladia before the formation of hydranths is possible. The Halopterinae is thus considered to contain the primitive stock of the Plumulariidae.

#### *Genera of Halopterinae*

The genus *Halopteris* was established by Allman in 1877 for *H. carinata*, which is the type species. Totton in 1930 showed that *Plumularia catherina* Johnston 1833 (the type species for *Thecocalus*) is congeneric, and thus sinks *Thecocalus* in the synonymy of *Halopteris*.

Although Allman's conception of *Halopteris* (and also Stechow's) was the presence of fixed nematothecae, its main diagnostic characters are now considered to be the presence of cauline hydrothecae, a pinnate stem with



unbranched hydrocladia and an untoothed thecal margin. The genus as thus envisaged includes the following species:

*Plumularia alternata* Nutting 1900, *P. buski* Bale 1884, *P. campanula* Busk 1852, *Halopteris carinata* Allman 1877, *Plumularia catherina* Johnston 1833, *P. concava* Billard 1911, *Halopteris constricta* Totton 1930, *Plumularia crassa* Billard 1911, *P. diaphana* Heller 1868, *Halopteris gemellipara* n. sp., *Aglaophenia glutinosa* Lamouroux 1816, *Thecocalus heterogona* Bale 1924, *Plumularia liechtensternii* Marktanner-Turneretscher 1890, *Thecocalus minutus* Trebilcock 1928, *Plumularia polymorpha* Billard 1913, *P. sulcata* Lamarck 1816, *P. tuba* Kirchenpauer 1876, *Heteroplton valdiviae* Stechow 1923, *Plumularia zygocladia* Bale 1914b, and possibly also *Plumularia diaphragmatica* Billard 1911 and *P. jedani* Billard 1913.

In addition to the characters mentioned above, these species usually have other features in common. Thus, the colonies as a whole tend to resemble *Aglaophenia* in their general appearance rather than *Plumularia*, with robust stems and close-set hydrocladia and hydrothecae. Most of the species possess hinge-joints near the base of the stem or its branches. There is a tendency towards the production of opposite hydrocladia—in *H. gemellipara*, *H. catherina* and *H. zygocladia* the hydrocladia are opposite throughout all or most of the length, and in practically all other species opposite hydrocladia are borne by the first or second thecate internodes. Internodal and intrathecal septa are typically absent. Each hydrocladial internode typically has one median inferior nematotheca and one or two pairs of laterals, and sometimes one or more supracalycines. The cauline internodes have a similar arrangement, though they may possess supernumerary supracalycines as well. The nematothecae may be 1- or 2-chambered, movable or immovable. The gonothecae, where known, are dimorphic, typically with the female seated on the stem and the male on the hydrocladia of the same colony, and they bear nematothecae, at least in the female.

It is not suggested that all these characters are essential for the inclusion of a species in *Halopteris* (in fact there are exceptions as regards most of the characters listed), but that the common possession of most of them links together a group of species which are closely related and can be considered as constituting a single genus. Few hard and fast rules can be laid down, as many of the species appear to be in a state of flux and show surprising variability of structure, even within a single colony. It has already been demonstrated how the segmentation of the hydrocladia, and the structure and arrangement of nematothecae, may vary in *H. glutinosa* (see Millard, 1958, and also Broch, 1933).

It is proposed to include in the same subfamily (i.e. Halopterinae) the genera *Antennella*, *Schizotricha*, and *Monostaechas*, which are clearly related to *Halopteris*, and differ only in their method of branching.

The genus *Antennella* Allman 1877 was created for *A. gracilis* Allman 1877, a form with simple stems similar to hydrocladia, and this is the type species. *Schizotricha* Allman 1883 was created for forms with pinnate stems and branching hydrocladia, and the type species is *S. unifurcata* Allman 1883 according to Totton 1930. Finally *Monostaechas* Allman 1877 was created for *M. dichotoma* Allman 1877 (= *M. quadridens* (McCrary) 1857) in which the hydrocladia branch sympodially from the posterior surface, the resulting 'stem' being formed from the proximal parts of successive hydrocladia (cf. also Billard, 1913, p. 14).

The type of branching, however, forms no inflexible demarcation between the four genera so far mentioned. It is known, for instance, that many species of *Halopteris* may exist in a simple form, and some species of *Antennella* may produce pinnate stems. Thus Broch (1933) has shown that *Antennella secundaria* can produce pinnate stems although the simple form is the more common, and that *Halopteris diaphana* can exist in the simple form although the pinnate form is more common. *H. campanula*, *H. catherina* and *H. constricta* can all exist in the simple form (Bale, 1913, Hincks, 1868, and Millard, 1957, respectively). Accordingly Broch has sunk *Thecocalus* (= *Halopteris*) in the synonymy of *Antennella*, and this practice has been followed by most Continental systematists. But it has been shown recently (Millard, 1958) that *Monostaechas natalensis*, which has a completely different method of branching, can also exist in the simple form, and Billard 1913 has shown that *A. secundaria* can branch in the *Monostaechas* way. To follow Broch's system we should then sink *Monostaechas* also in the synonymy of *Antennella*. It appears to the present author that within this group of species the simple form is the most primitive type and that from it have led two main evolutionary lines, one leading to *Halopteris* with the tendency towards pinnate branching, and one to *Monostaechas* with branches arising from the posterior surface of the stem, and that since these genera represent grades of evolution it is wise to keep them separate. The placing of intermediate types will always be a matter of opinion, though in general a species should be named according to its dominant form, thus *Antennella secundaria* but *Halopteris diaphana*.

Passing on to forms with branching hydrocladia, these surely represent a further stage of the evolutionary line leading through *Halopteris*, and if we are to retain *Halopteris* as separate from *Antennella* then we must also retain *Schizotricha*, in spite of intermediate forms.

Another genus to be included in the Halopterinae is *Gattya* Allman 1886 (= *Paragattya* Warren 1908, see p. 281), which was created for *Gattya humilis* Allman 1886, a form with a toothed thecal margin. Whether a toothed hydrotheca is a sufficient character to distinguish a genus is a matter of opinion. In most of their characters the species are closely related to the *Antennella-Halopteris* line (for instance, *G. humilis* possesses hinge-joints and occasionally branching hydrocladia, and the first thecate internode of the stem bears a pair of opposite hydrocladia). Possibly they represent a deviation from the *Halopteris* stock, which is already foreshadowed in *H. carinata* and *H. valdiviae* which have

a sinuated hydrothecal margin. At any rate the character is a definite one and useful in distinguishing species, and the genus may be allowed to stand.

*The genera NEMERTESIA and ANTENNOPSIS*

The genus *Antennopsis* was founded by Allman in 1877 for *A. hippuris*, the features distinguishing it from *Nemertesia* Lamouroux 1812 being the 'scattered disposition' of the hydrocladia, and the uncanaliculated coenosarc. The former character has generally been accepted as worthless, and the latter character has also been discredited by many authors (see Bedot, 1921). The

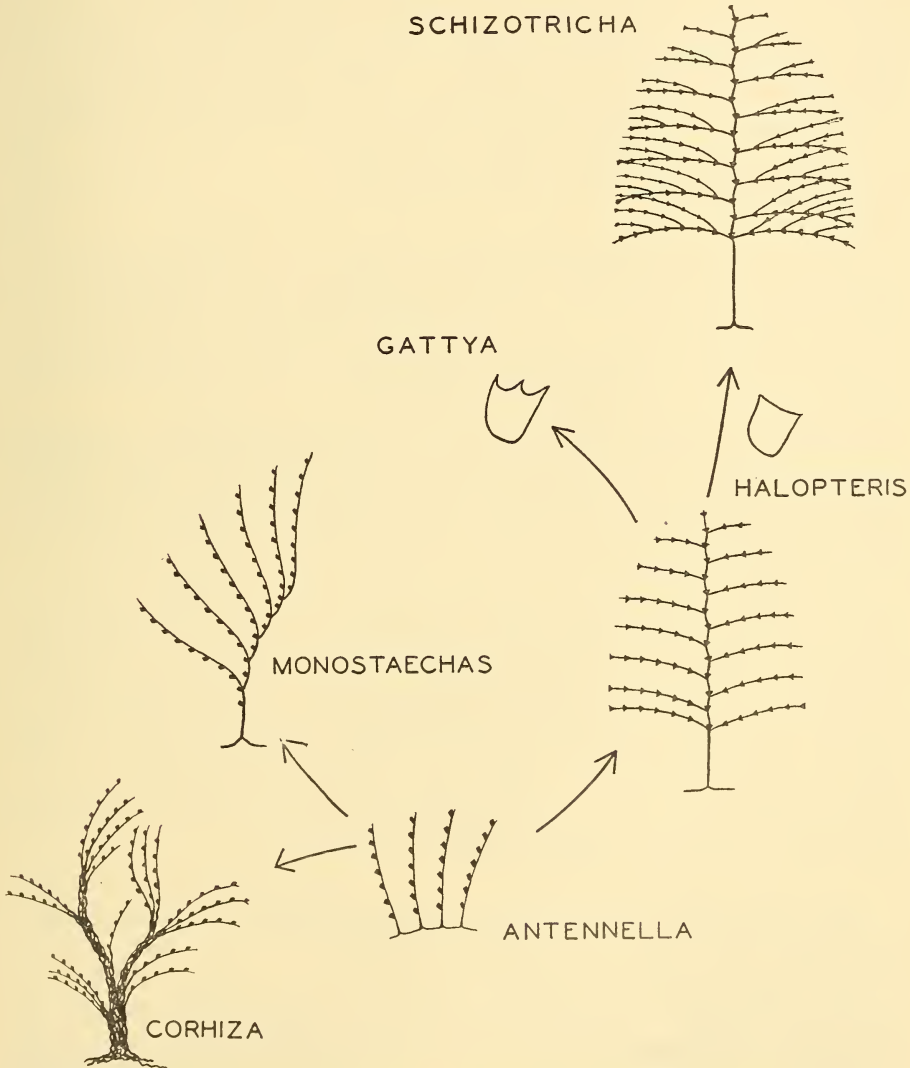


FIG. 1. Diagram showing possible evolutionary trends in the Halopterinae.



author considers that the type species of *Antennopsis* (*A. hippuris* Allman 1877) is congeneric with the type species of *Nemertesia* (*Sertularia antennina* Linnaeus 1758) and consequently sinks *Antennopsis* in the synonymy of *Nemertesia*.

There are, however, certain species (*Antennularia fascicularis* Allman 1883 and *Antennopsis scotiae* Ritchie 1907) included by Bedot in *Antennopsis* which differ markedly from other species of the composite genus *Nemertesia* and from the type species of this genus. In *Nemertesia* the hydrocladia arise from an unfascicled stem, or from the central tube of a fascicled stem, either irregularly or in verticils. In the two species mentioned the hydrocladia arise, quite irregularly, from the *peripheral* tubes of the stem, and there is no recognizable central or main tube. It is just as though the hydrorhizal tubes of a colony of *Antennella* had become bound together to form a fascicled stem, each branching or separating from the others independently to give hydrocladia. This character is, I feel, of generic value, and I propose a new genus *Corhiza* for the reception of the two species mentioned and two new species described below, with *Antennopsis scotiae* Ritchie 1907 as the type species (i.e. *Corhiza scotiae* (Ritchie) 1907).

These four species are also linked by certain less important characters which do not occur in *Nemertesia* and which emphasize the cleavage between the two genera, namely the large hydrothecae, the absence of a mamelon on the base of the hydrocladium, the position of the lateral nematothecae on long supporting processes at the sides of the hydrotheca, and the gonothecae which are borne on the hydrocladia and themselves bear nematothecae.

Further, the author feels that the sum total of the characters of the genus *Corhiza* indicates a closer relationship with the Halopterinae than with the Plumulariinae, and proposes to place it in the former subfamily. The stem of course bears no cauline hydrothecae, but if the stem is considered as a conglomeration of hydrorhizal tubes this becomes understandable.

The genus *Corhiza* appears to be closely related to *Antennella* and *Mono-staechas*. In *A. africana* the hydrorhizal tubes often rise up from the substratum in bunches, giving rise to clumps of simple stems (i.e. hydrocladia). A further development of this process would produce a colony of the *Corhiza* type. A fascicled stem similar to that of *Corhiza* is found in some members of *Mono-staechas* (*M. natalensis* Millard 1958 and *M. faurei* Millard 1958), and *M. natalensis* appears to occupy an intermediate position between the two genera, where the branching of the hydrocladia has not developed to the same extent as in other species of the genus.

The evolutionary relationships between the genera of Halopterinae as visualized by the author are illustrated in figure 1.

The subfamilies of the Plumulariidae are summarized as follows.

Subfamily 1. **Halopterinae** nov. subfam. Hydrocladia arising independently from hydrorhiza, from a pinnate stem, or from the superficial tubes of a



compounded stem. Pinnate stems bearing cauline hydrothecae. Paired lateral nematothecae present, of variable structure.

South African genera: *Antennella* Allman 1877  
*Corhiza* nov. gen.  
*Gattya* Allman 1886  
*Halopteris* Allman 1877  
*Monostaechas* Allman 1877  
*Schizotricha* Allman 1883

Subfamily 2. **Kirchenpauerinae** Stechow 1921. Stem simple or pinnate, the latter without cauline hydrothecae. No paired lateral nematothecae. Median nematothecae poorly developed, seldom 2-chambered, often rudimentary and sometimes represented by naked sarcostyles only.

South African genera: *Kirchenpaueria* Jickeli 1883  
*Oswaldella* Stechow 1919  
*Pycnotheca* Stechow 1919

Subfamily 3. **Plumulariinae** Kühn 1913. Stem upright, giving off hydrocladia pinnately or in verticils. No cauline hydrothecae. Paired lateral or supracalycine nematothecae present. Nematothecae 2-chambered, movable, free from hydrotheca.

South African genera: *Nemertesia* Lamouroux 1812  
*Plumularia* Lamarck 1816

Subfamily 4. **Aglaopheniinae** Stechow 1911. Stem upright and pinnate. No cauline hydrothecae. Hydrocladia with close-set hydrothecae generally facing towards the anterior surface. Paired lateral nematothecae normally present. Nematothecae 1-chambered and immovable, usually adnate to hydrotheca.

South African genera: *Aglaophenia* Lamouroux 1812  
*Cladocarpus* Allman 1874  
*Halicornaria* Allman 1874  
*Lytocarpus* Allman 1883  
*Thecocarpus* Nutting 1900

#### LIST OF SPECIES

##### Subfamily 1 **Halopterinae**

- |   |   |
|---|---|
| <i>Antennella africana</i> Broch 1914           | <i>Halopteris gemellipara</i> n. sp.        |
| <i>Antennella secundaria</i> (Gmelin) 1788-1793 | <i>Halopteris glutinosa</i> (Lamx.) 1816    |
| <i>Corhiza bellicosa</i> n. sp.                 | <i>Halopteris tuba</i> (Kirch.) 1876        |
| <i>Corhiza pannosa</i> n. sp.                   | <i>Halopteris valdiviae</i> (Stechow) 1923  |
| <i>Corhiza scotiae</i> (Ritchie) 1907           | <i>Monostaechas natalensis</i> Millard 1958 |
| <i>Gattya humilis</i> Allman 1886               | <i>Schizotricha simplex</i> Warren 1914     |
| <i>Halopteris constricta</i> Totton 1930        |   |

Subfamily 2 **Kirchenpaueriinae**

- Kirchenpaueria pinnata* (Linn.) 1758                      *Oswaldella nova* (Jarvis) 1922  
*Kirchenpaueria triangulata* (Totton) 1930

Subfamily 3 **Plumulariinae**

- Nemertesia ciliata* Bale 1914b                      *Plumularia pulchella* Bale 1882  
*Nemertesia cymodocea* (Busk) 1851              *Plumularia setacea* (Ell. & Sol.) 1755  
*Nemertesia ramosa* Lamx. 1816                      *Plumularia spinulosa* Bale 1882  
*Plumularia filicaulis* Kirch. 1876                      *Plumularia wasini* Jarvis 1922  
*Plumularia lagenifera* Allman 1886

Subfamily 4 **Aglaopheniinae**

- Aglaophenia late-carinata* Allman 1877              *Halicornaria exserta* n. sp.  
*Aglaophenia pluma* (Linn.) 1758                      *Halicornaria ferlusi* Billard 1901  
*Cladocarpus leloupi* n. nom.                              *Lytocarpus filamentosus* (Lam.) 1816  
*Cladocarpus lignosus* (Kirch.) 1872                      *Thecocarpus flexuosus* (Lamx.) 1816  
*Halicornaria arcuata* (Lamx.) 1816                      *Thecocarpus formosus* (Busk) 1851

## SYSTEMATIC SECTION

Subfamily **Halopterinae***Antennella africana* Broch, 1914

*Antennella africana*. Millard, 1957, p. 226.

*Records*. West coast: TB 1A, 17B. TRA 86N, 156E. LAM 30J, 35D. SB 196L. CP 650F. WCD 56K.

South coast: AFR 994L. TRA 38N. MB 8R (pp), 12X, 47S, 52E, 58D, 59E, 60K. LIZ 7V. SCD 5J, 22B, 36U, 81Q, 96G, 152Y, 153E, 175F. SAMH 241, 279, 293, 309.

*Remarks*. This material includes one specimen (SAMH 309) in which all the dimensions are about double the normal.

The species is common on the west and south coasts of South Africa (from Luderitz Bay on the west (Broch, 1914) to approximately 29°E. on the south) and occurs in the intertidal region down to a depth of 120 m.

*Antennella secundaria* (Gmelin), 1788-1793

*Antennella secundaria*. Millard, 1958, p. 199.

*Records*. South coast: MB 8R (pp), 47S. SAMH 153, 165, 191, 212, 277, 360. LIZ 16G, 27K.

*Description*. Colonies reaching a height of 1.2 cm. Stems and hydrothecae sturdy and of greater dimensions than the material from Inhaca (Millard, 1958). Athecate internodes comparatively short and only rarely exceeding the neighbouring thecate internodes in length, bearing one or two nematothecae.

*Measurements* (mm.)

	* <i>Inhaca</i>	<i>Mossel Bay</i>
Hydrocladium, length of basal part .. ..	0.99-2.75	1.73-3.27
thecate internode, length .. ..	0.26-0.34	0.32-0.43
athecate internode, length .. ..	0.26-0.38	0.22-0.45
athecate internode, maximum diameter ..	0.04-0.05	0.08-0.12
Hydrotheca, length abcauline .. ..	0.15-0.19	0.20-0.225
diameter at margin .. ..	0.15-0.19	0.27-0.32
Gonotheca, male, length (without pedicel) ..		0.32-0.40
maximum diameter .. ..		0.22-0.29
Gonotheca, female, length (without pedicel) ..		0.61-0.66
maximum diameter .. ..		0.41-0.48

*Remarks.* In poor material it is difficult to distinguish *A. secundaria* from *A. africana*. The number of nematothecae on the intermediate internodes and the proportionate length of the latter are no criterion, as both are variable characters. The only sure criterion is the presence of supplementary lateral nematothecae in *A. africana* and of a median supracalycine nematotheca in *A. secundaria*, and these are often lost. There appears to be no difference in the structure of the gonophores of the two species.

In South Africa both species are known only in the simple form. *A. secundaria* occasionally gives off one or two branches, but only from the back of the basal part of the stem, as mentioned also by Billard (1913, p. 8). True pinnate branching never occurs.

*A. secundaria* occurs on the south and east coasts of South Africa (from approximately 19°E. on the south coast (Stechow, 1925) to Inhaca on the east coast), in the littoral region, and down to a depth of 100 m. (Stechow, 1925).

Genus *CORHIZA* nov. gen.

Type species: *Antennopsis scotiae* Ritchie, 1907

*Diagnosis.* Plumulariidae with an upright and fascicled stem composed of a number of interwoven and intercommunicating tubes of equal diameter and importance. Hydrocladia arising from the component tubes in a completely irregular fashion, not rebranching. Hydrotheca with untoothed margin. Nematothecae (so far as is known) all bithalamic and movable, including paired laterals. Gonothecae borne on the hydrocladia, bearing nematothecae.

*Corhiza bellicosa* nov. sp.

(Fig. 2 A-E)

*Types and records.* Holotype: SCD 84S (South African Museum registered number = SAMH 364). Paratype: SCD 153J. (Both from south coast.)

\* Including material described by Millard, 1958.

*Description of holotype.* Several short and thick fascicled stems reaching a maximum height of 5.0 cm., a few of which branch irregularly, giving rise to numerous hydrocladia in an irregular fashion from the component tubes in the distal region. The individual tubes of the stem are connected to one another by communicating pores and branch irregularly. In the distal region the tubes usually separate from one another in clumps (the branches), and each one terminates in a hydrocladium. The hydrocladia of a clump or branch tend to face in the same direction, giving a '*Monostaechas*' appearance to the colony.

Hydrocladia unbranched, with proximal region athecate, divided by an irregular number of transverse internodes and bearing a double series of nematothecae. Remainder divided into thecate internodes by oblique nodes.

Hydrotheca borne on a projection near base of internode, with depth exceeding diameter, swollen in basal half, then narrowed slightly and expanding again to margin. Margin smooth, at right angles to internode. Most of adcauline wall adnate, but a small distal portion free.

Nematothecae generally 13 to an internode, including: 1 median inferior borne close to proximal end of internode and not reaching base of hydrotheca; 1 pair lateral inferior borne on base of internode slightly above level of median inferior and just reaching base of hydrotheca; 1 pair lateral borne on long processes arising at the side of the hydrotheca and not quite reaching thecal margin; 1 pair lateral borne on outer surfaces of bases of above processes; 1 pair lateral borne at the side of the hydrotheca about midway between above-mentioned process and thecal margin, overtopping hydrotheca; generally 2 pairs supracalcine borne above thecal margin (1 pair close to the midline and another pair further to the sides and at a slightly higher level).

There is, however, much variation in the number and position of the supracalcine nematothecae, and as few as 2 and as many as 9 have been observed, generally in pairs but often quite irregularly arranged.

All nematothecae bithalamic and movable. Nematotheca large, expanding towards margin, with sides of distal chamber cut right away to level of diaphragm resulting in a margin of 2 flaps—a high abcauline (i.e. outer) one, and a lower adcauline (i.e. inner) one.

Gonophores absent.

---

A-E. *Corhiza bellicosa* n. sp. →

A. Two stems from the holotype, SCD 84S. There has probably been some distortion of the hydrocladia during preservation.

B-D. Two lateral views and an anterior view of portions of hydrocladia, from the holotype. B is taken from near the proximal end, and C from near the distal end, of hydrocladia.

E. Different views of the lateral nematothecae, the top one from SCD 153J, the other two from the holotype.

F. *Monostaechas natalensis* Millard. Different views of the nematothecae from SCD 153D (large form).



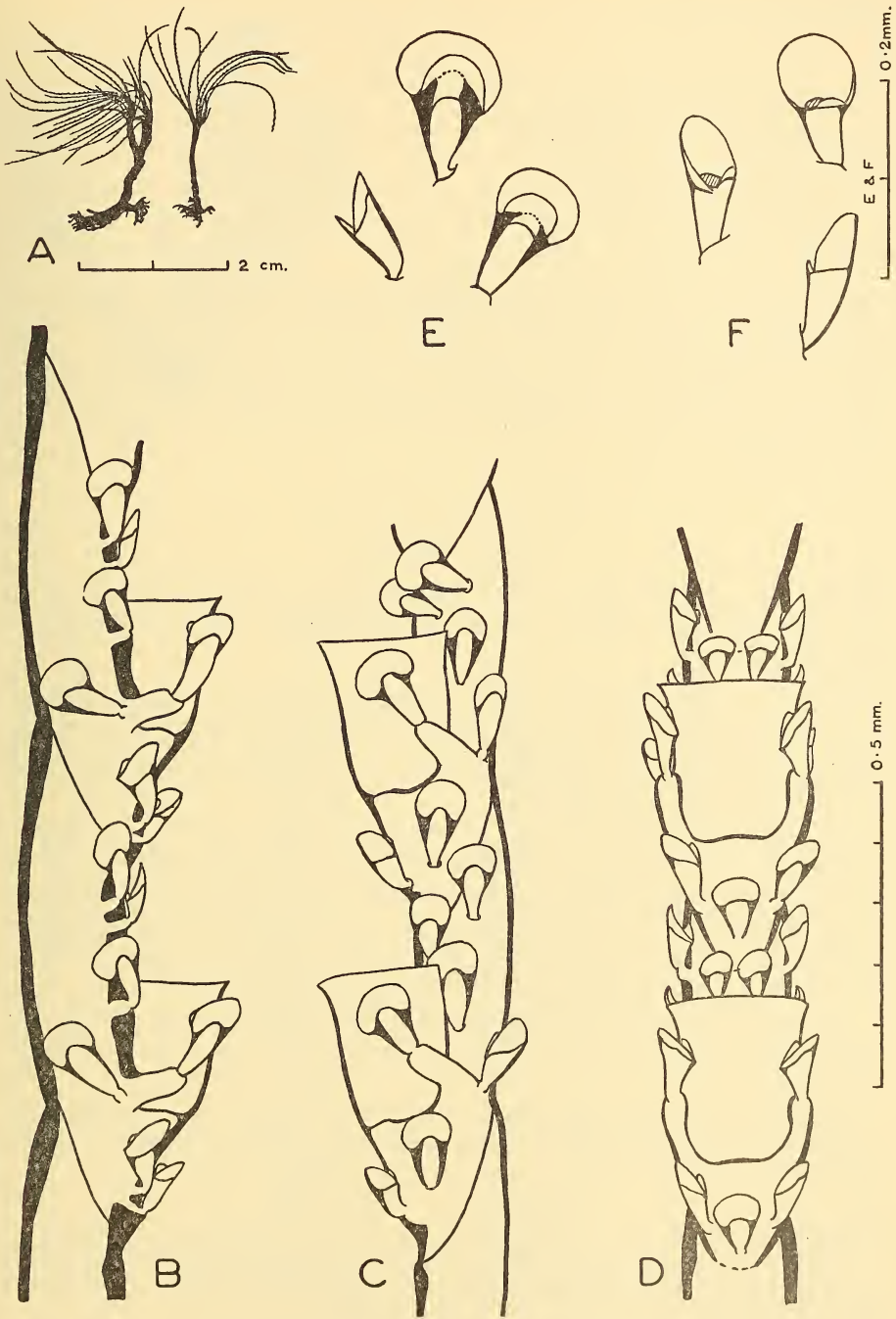


FIG. 2. *Corhiza bellicosa* and *Monostaechas natalensis*.

*Measurements* (mm.)

			SCD 84S (Holotype)	SCD 153J
Internode length (on posterior surface)	..	..	0.49-0.94	0.55-0.80
diameter (above hydrotheca)	..	..	0.13-0.18	0.14-0.20
Hydrotheca, height	..	..	0.22-0.27	0.23-0.31
diameter at margin	..	..	0.17-0.22	0.16-0.24
diameter/height	..	..	0.67-0.85	0.70-0.84
Nematotheca, height	..	..	0.09-0.15	0.11-0.16

*Remarks.* This species is very close to *Monostaechas faurei* Millard 1958, differing from it in the unbranched and longer hydrocladia, in the presence of 2 extra pairs of nematothecae to each internode, in the greater measurements of all individual parts, and in the shape of the hydrotheca where the proportion of diameter/height is greater. The shape of the nematotheca is very characteristic of the species.

*Corhiza pannosa* nov. sp.

(Fig. 3 A-B, D-G)

*Types and records.* Holotype: SCD 5H (South African Museum registered number = SAMH 362). Other records: SCD 61H, 67M, 186X. SAMH 292. WCD 12G.

*Description of holotype.* A bushy colony reaching a height of 5.3 cm. Hydrorhiza a matted reticulum. Stem strongly fascicled, branching irregularly, and giving off hydrocladia from its component tubes in a completely irregular fashion. Tubes of stem not canaliculated.

Hydrocladia borne on short apophyses of stem, reaching a maximum length of 2 cm. and bearing up to 20 hydrothecae. Basal 4 or 5 mm. devoid of hydrothecae, but divided by transverse nodes into 2 or more rather long internodes bearing a double series of nematothecae. Remainder of hydrocladium divided into thecate internodes by oblique nodes, though in some parts the distal end of an internode may be cut off by a transverse node.

Hydrotheca large, with almost parallel sides, standing away from hydrocladium at an angle of about 50°, with about half adcauline wall adnate to internode.

Nematothecae generally 7 to each internode, namely: 1 medial inferior; 2 pairs laterals (1 seated on a process arising next to the hydrotheca and not

→

A-B, D-G. *Corhiza pannosa* n. sp. A, the whole colony, and B, the lateral and supplementary lateral nematothecae in adcauline view, from the holotype SCD 5H. D-G, portions of hydrocladia from different samples to show variation. (D, the holotype. E, WCD 12G. F, SAMH 292. G, SCD 61H). F shows a gonotheca.

C. *Corhiza scotiae* (Ritchie). The lateral and supplementary lateral nematothecae from TRA 35B as a comparison with B.

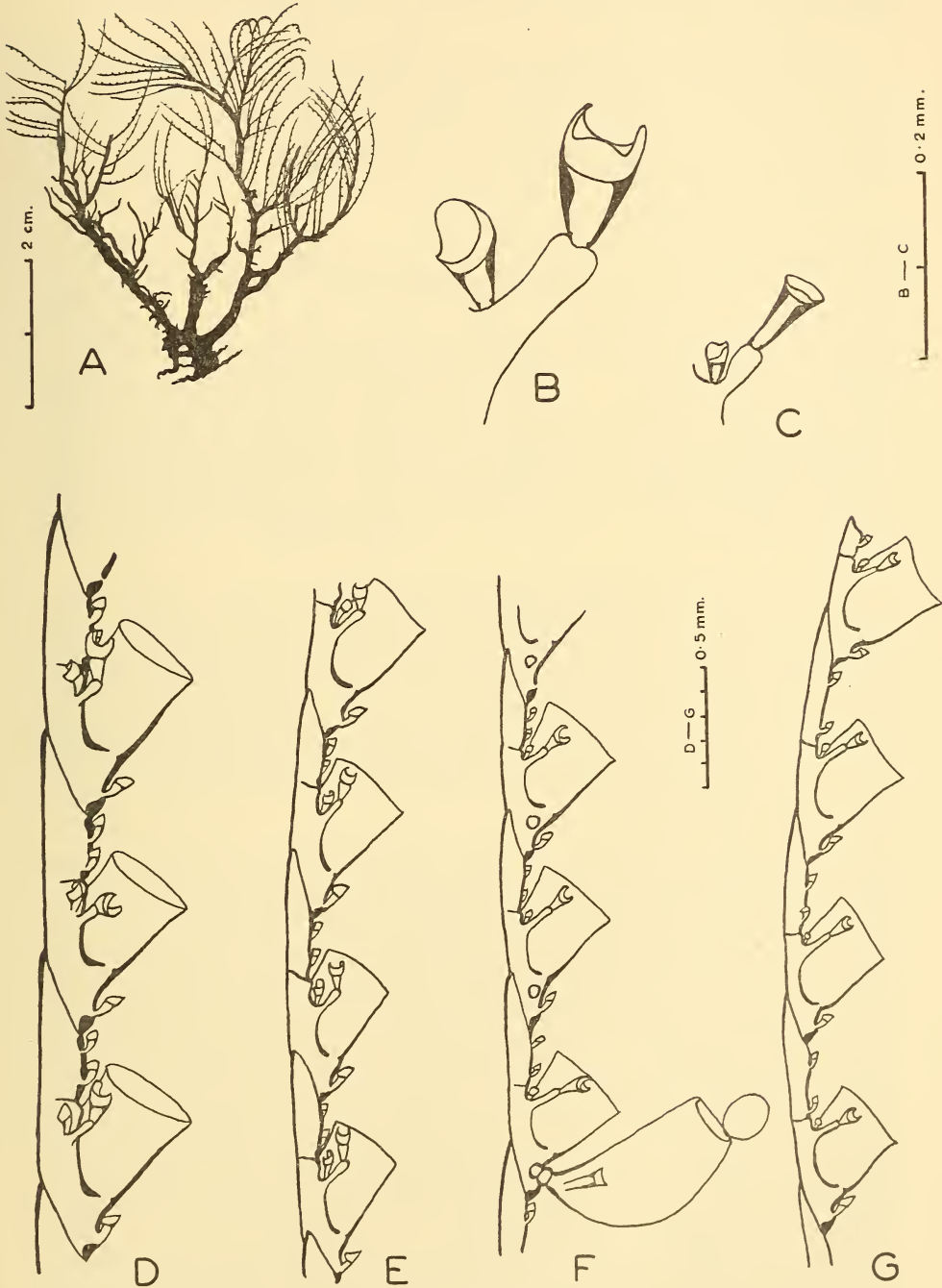


FIG. 3. *Corhiza* spp.

quite reaching margin, and 1 seated in the angle between this process and the internode); 2 (or occasionally 1 or 3) median superior.

Nematothecae all bithalamic and movable. Lateral nematotheca large and of characteristic shape: terminal chamber cup-shaped and deep, and with nearly parallel sides which turn in slightly at margin, with a distinct, deep excavation in adcauline (i.e. mesial) wall. Median nematotheca smaller, with very short adcauline wall.

Gonophores absent.

*Measurements* (mm.)

	SCD 61H SAMH 292	SCD 186X	WCD 12G	SCD 5H (holotype)
Internode length (including distal end when cut off) .. ..	0.62-0.88	0.62-0.68	0.77-0.95	0.80-1.09
diameter, maximum .. ..	0.09-0.12	0.11-0.13	0.09-0.14	0.13-0.17
Hydrotheca, height abcauline .. ..	0.26-0.38	0.34-0.38	0.35-0.46	0.30-0.36
height adcauline, free part .. ..	0.16-0.245	0.20-0.24	0.20-0.22	0.14-0.20
diameter at margin .. ..	0.32-0.34	0.345-0.39	0.31-0.43	0.36-0.39
free part/abcauline height .. ..	0.58-0.71	0.54-0.66	0.50-0.57	0.42-0.58
diameter/abcauline height .. ..	0.84-1.31	0.99-1.15	0.72-1.06	1.00-1.23
Nematotheca height, lateral .. ..	0.10-0.11	0.11-0.14	0.11-0.13	0.11-0.16
supplementary lateral .. ..	0.03-0.08	0.045-0.06	0.07-0.09	0.07-0.12
Gonotheca, height .. ..		0.80	0.96-1.07	0.09-0.15
breadth .. ..		0.33	0.36-0.59	

*Remarks.* In this species the form of the colony resembles closely that of *Corhiza fascicularis* (Allman) 1883 from Tristan da Cunha, the type material of which apparently no longer exists. It can be distinguished from other species of the genus in particular by its distinctive lateral nematothecae, which resemble most those found in *Halopteris glutinosa* (cf. Millard, 1958, figure 10). The details of the hydrocladia resemble those of *Monostaechas natalensis* Millard 1958, from which it is distinguished by its larger hydrothecae which are less adnate, and by the nematothecae.

*Remarks on 'other records'.* I have included with this species one stem fragment bearing hydrocladia (SCD 67M) exactly like the holotype, and 4 samples of solitary hydrocladia which appear to represent simple forms of the same species. The latter agree in all important features and particularly in the shape of the lateral nematothecae which are identical. A few minor differences do, however, occur. Thus the transverse nodes separating off intermediate internodes are better defined and almost invariably present, and in 3 of the samples (SCD 61H and 186X, and SAMH 292) the processes supporting the lateral nematothecae arise at a slightly higher level on the internode. Also in these simple forms most of the individual parts are smaller, particularly the lateral and supplementary lateral nematothecae. Yet the range of variation in the measurements of the different samples, and the overlapping which occurs, make it impossible to distinguish two species on these grounds.

Two of the simple forms (SAMH 292 and SCD 186X) bear male gonothecae. Each gonotheca arises immediately below a hydrotheca, is roughly pear-shaped but curved towards the hydrocladium, and bears a round



operculum at the wide distal end and two large nematothecae near the base.

These simple forms can always be distinguished from South African species of *Antennella* by the characteristic shape of the lateral nematothecae.

*Corhiza scotiae* (Ritchie), 1907

(Fig. 3 C)

*Antennopsis scotiae* Ritchie, 1907, p. 543, pl. 3 (fig. 3). Ritchie, 1909, p. 90, fig. 8. Millard, 1957, p. 235.

*Records.* West coast: WCD 7L, 12F, 18M.

South coast: TRA 35B, 38C, 92D. SCD 26B, 67L, 84R, 153G, 175D, 191Q, 195K. SAMH 307, 323, 331, 345.

*Remarks.* This endemic species has a somewhat restricted distribution round the South African coast, being found between the lines of 17° and 28°E. longitude and in a depth-range of 18–120 m. It has never been found in the littoral area, and is typical of the Agulhas Bank.

*Gattya humilis* Allman, 1886

*Gattya humilis* Allman, 1886, p. 156, pl. 24 (figs. 5–7).

*Paragattya intermedia* Warren, 1908, p. 323, pl. 47 (fig. 27), fig. 16. Millard, 1957, p. 230. Millard, 1958, p. 209.

*Records.* West coast: PP 4Z. LAM 27G, 43H. SB 168D (recorded by Day, 1959, as *Paragattya intermedia*). CP 646D, 650E.

South coast: MB 15D, 52G, 60M, 88K. LIZ 27G. SCD 36R, 84Q. SAMH 275.

*Remarks.* Examination of Allman's type material of *Gattya humilis* in the British Museum of Natural History (reg. no. 86.2.19.41), and a comparison with Warren's cotypes of *Paragattya intermedia*, show that these species are synonymous. The material figured by Allman (pl. 24, fig. 6) includes 3 young stems, but in the same colony branching stems are also present similar to those described by Warren. Allman failed to observe the median superior nematotheca. Allman's material is labelled 'Port Elizabeth (?), Cape of Good Hope', and is almost certainly South African in origin. The genus *Paragattya* Warren 1908 thus becomes sunk in the synonymy of *Gattya* Allman 1886, with *Gattya humilis* Allman 1886 as the type species.

The following points may be added to the published descriptions. Firstly the first two oblique nodes of the stem are extra well defined as hinge-joints, and between them arise not one, but a pair, of opposite hydrocladia. Secondly the hydrocladia occasionally rebranch, the branch being of similar construction to the hydrocladium and bearing 1–3 hydrothecae. Both these features are also characteristic of the closely related genus *Halopteris*.

*Halopteris constricta* Totton, 1930

(Fig. 4 G)

*Halopteris constricta*. Millard, 1957, p. 227, fig. 14 A.

Records. South coast: LIZ 27J. MB 55H.

(Additional from False Bay: FAL 326D.)

*Description.* Two small colonies including simple and pinnate forms. Structure as previously described, except that in some stems the first (and sometimes also the second) segment after the hinge-joint gives rise to a pair of hydrocladia arising one on each side of the cauline hydrotheca.

Female gonothecae (not previously described) borne on thecate internodes of stem, each on a very short pedicel which arises on one side of the internodal projection which supports the hydrotheca. Gonotheca strongly curved towards the stem, with a wide distal aperture facing the stem, bearing 2 bithalamic nematothecae on basal part. (These gonothecae were not present in the samples from the south coast, but on new material from False Bay.)

*Halopteris gemellipara* nov. sp.

(Fig. 4 A-F)

*Types and records.* Holotype: SAMH 308. Other records: (NAD 22B). SCD 36P, 153L.

*Description.* Stem unfascicled, reaching a maximum height of 5.5 cm., bearing pinnately arranged hydrocladia. Basal part without hydrothecae or hydrocladia, divided by irregular transverse nodes, and bearing a median series of nematothecae on the anterior surface. No hinge-joints. Remainder divided into rather long internodes by oblique nodes; each internode bearing a hydrotheca near the base on the anterior surface, and a pair of opposite hydrocladia arising one on each side of the hydrotheca.

Hydrocladium borne on a short apophysis of the stem and separated from it by a transverse node, which, however, is often not clearly visible. Remaining nodes oblique. First internode athecate, bearing one median nematotheca near distal end. Remaining internodes thecate, but with the distal end sometimes cut off by a transverse node situated just above the attachment of the hydrotheca. Hydrothecae not exactly on the distal surface of the hydrocladium, but shifted slightly towards the anterior surface.

- 
- 
- A-F. *Halopteris gemellipara* n. sp. A and B, two hydrocladial internodes from SAMH 308 (the holotype) and NAD 22B respectively. C, the whole stem; D, a cauline internode in anterior view; E, a lateral nematotheca; F, the median inferior nematotheca, all from the holotype. G. *Halopteris constricta* Totton. A portion of the stem in lateral view showing female gonothecae, from FAL 326 D.  
 H, J. *Halopteris valdiviae* (Stechow). H, part of a hydrocladium with 2 male gonothecae; J, a female gonotheca. Both from SAMH 349.  
 K. *Halopteris glutinosa* (Lamx.), female gonotheca, from SAMH 278.

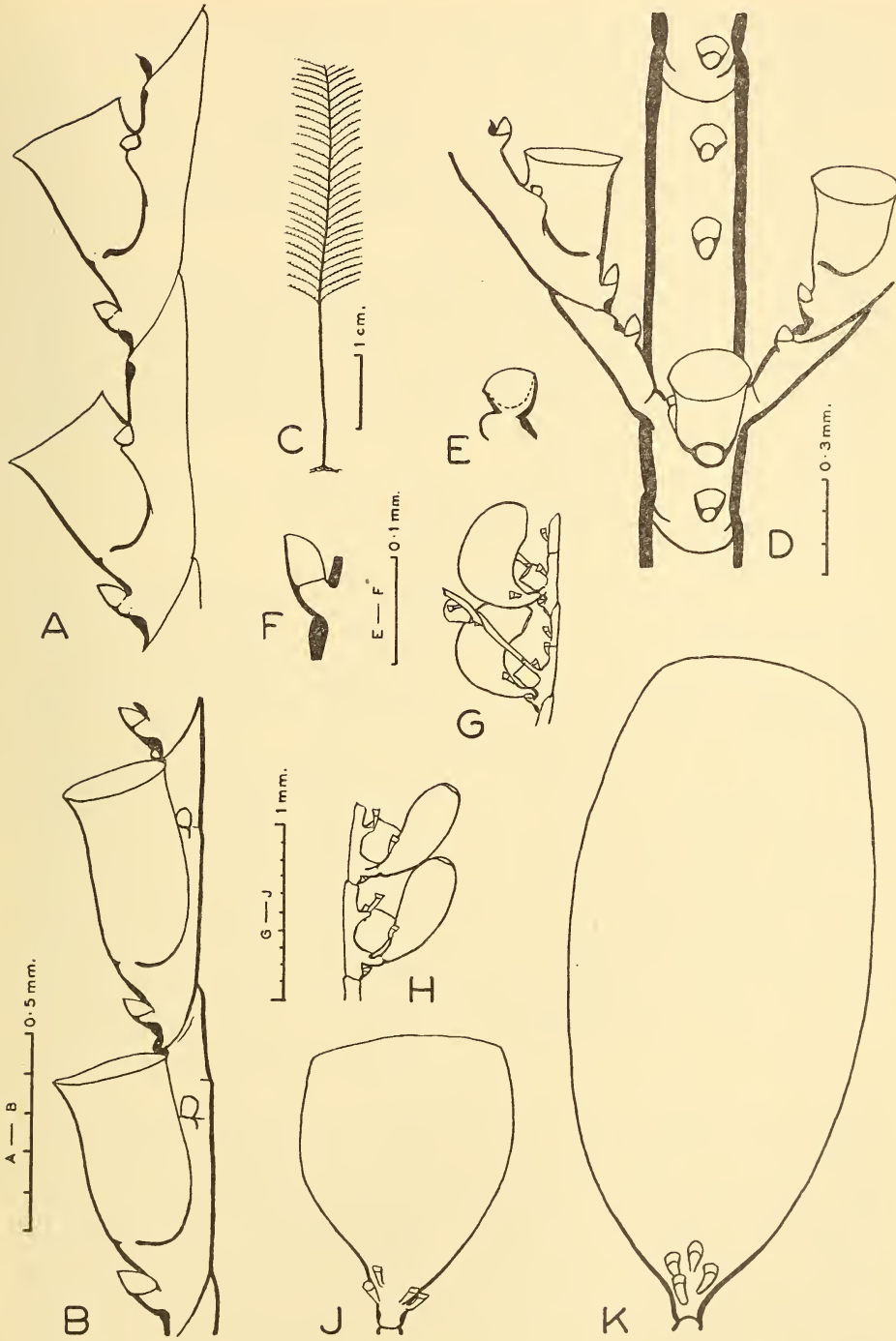


FIG. 4. *Halopteris* spp.

Hydrotheca cylindrical, expanding towards margin; adnate for about  $\frac{2}{3}$  height, then free; abcauline height exceeding (or rarely equal to or less than) width at margin; margin forming an angle of  $55^\circ$  or more with internode.

Each thecate internode bearing 3 nematothecae, one median inferior seated well below the base of the hydrotheca, and 2 laterals seated on short processes one on each side of the hydrotheca and not reaching margin. A single median supracalcine nematotheca sometimes present on hydrocladial internodes, and 2-4 on cauline internodes.

Median nematotheca short and broad, probably immovable, 2-chambered; with small basal chamber and larger distal chamber separated by transverse septum; with distal chamber cut away on adcauline side and margin facing towards internode. Abcauline wall strongly convex in supracalcine nematothecae, the nematotheca of the first hydrocladial internode, and the median inferior nematothecae on the stem; only slightly convex in the median inferior nematothecae on the hydrocladia.

Lateral nematotheca minute, 1-chambered, immovable, with adcauline wall cut away and margin facing towards internode.

Gonothecae absent.

*Measurements* (mm.)

	SAMH 308	NAD 22B	SCD 36P
Stem, internode length .. .. .	1.24-1.69	1.18-1.96	1.00-1.63
diameter .. .. .	0.28-0.41	0.21-0.32	0.27-0.365
Hydrocladium, internode length, first			
athecate .. .. .	0.34-0.55	0.43-0.48	0.39-0.53
normal thecate .. .. .	0.55-0.71	0.66-0.80	0.53-0.70
Hydrotheca, height abcauline .. .. .	0.29-0.38	0.40-0.50	0.24-0.50
height, adcauline, free part .. .. .	0.10-0.16	0.13-0.18	0.08-0.15
diameter at margin .. .. .	0.29-0.33	0.24-0.29	0.26-0.295
free part/abcauline height .. .. .	0.29-0.46	0.30-0.36	0.24-0.47
diameter/abcauline height .. .. .	0.82-1.02	0.51-0.60	0.54-1.17
Nematotheca, height, median cauline .. .. .	0.095-0.18	0.13-0.16	0.12-0.16
hydrocladial, median inferior .. .. .	0.09-0.11	0.115-0.135	0.09-0.13
lateral .. .. .	0.035-0.05	0.05-0.06	0.03-0.06

*Remarks.* In the measurements and the figure a sample from Natal (NAD 22B) is included, as it illustrates the variation possible in the species. It differs from the holotype in several particulars, mainly in the proportions of the hydrothecae, which are deeper and narrower. As a result the diameter at the margin is little more than half the abcauline height, whereas in the holotype the diameter is practically equal to the height. Further, the axis of the hydrotheca is more nearly parallel to the hydrocladium so that the margin forms an angle of about  $70^\circ$  with it as against about  $55^\circ$  in the holotype (fig. 4B). Intermediate internodes are also more common on the hydrocladia, especially towards their



distal ends. Sample SCD 36P contains both forms, though on separate stems. Since the points mentioned are all differences of proportion and degree, and all structural details are exactly the same, and bearing in mind the tendency towards variation in *Halopteris*, I hesitate to separate these two forms as separate species, at least until more material is available.

One stem of the holotype shows a rather unusual abnormality and bears a pair of hydrocladia on the posterior surface in addition to those on the anterior surface.

*H. gemellipara* resembles *H. catherina* (Johnston) 1833 and *H. zygocladia* Bale 1914a in the possession of opposite hydrocladia, but differs from both in the monothalamic lateral nematothecae. In this respect, and in other structural details, it is very similar to *Antennellopsis integerrima* Jäderholm 1896, from Japan, differing from it in the longer free part of the hydrotheca and the oblique hydrocladial internodes.

*Halopteris glutinosa* (Lamx.), 1816

(Fig. 4 K)

*Heteroplon pluma* Allman, 1883, p. 32, pl. 8 (figs. 1-3).

*Plumularia glutinosa*. Billard, 1910, p. 36, fig. 16. Stechow, 1925, p. 502.

*Plumularia alternata* (Nutting), 1900. Jarvis, 1922 (pp), p. 345, pl. 25 (fig. 16).

*Halopteris glutinosa*. Millard, 1958, p. 200, fig. 10 A-D.

*Records*. South coast: LIZ 16E, 27H. MB 8S, 15E, 24V, 47M, 52D, 60J. SCD 36Q, 84P, 153K, 169U. SAMH 193, 197, 225, 276, 278, 298. TRA 92G.

*Description*. Colonies altogether more robust than those on the Natal coast (Millard, 1958), most of them reaching a height of 2-3 cm., but three large colonies reaching 10, 12 and 18 cm. (TRA 92G, SCD 84P, and SAMH 278 respectively), thus resembling more closely the colonies described by Allman and Stechow. In the larger colonies the lower regions of the stem have no visible nodes, the hydrocladia are usually lost, and the hydrothecae tend to be eroded and shallow. All measurements exceed those of the east coast material, though the proportions and appearance of the hydrothecae are similar. Hydrocladia may bear up to 15 hydrothecae. Lateral nematothecae with terminal chamber deeply cut away on adcauline (i.e. inner) side.

Stem internodes may bear as many as 3 extra pairs of nematothecae above the margin of the hydrotheca, and occasionally the 1-chambered supracalcine nematotheca is paired in the lower part of the hydrocladium.

Female gonothecae (not previously described) borne on the stem, each on a short pedicel of one segment arising next to a hydrotheca. Very large, flattened, bluntly rounded at distal end, bearing 2-5 2-chambered nematothecae near base, reaching a length of 3.74 mm. and a diameter of 1.70 mm.

*Remarks*. The material described by Jarvis (1922) from East Africa, and assigned by her to *Plumularia alternata* Nutting, is present in the British Museum of Natural History. On examination the samples from Zanzibar and Wasin

both proved to be mixed, with some plumes (those illustrated in pl. 25, fig. 16, of Jarvis) resembling exactly *Halopteris glutinosa* and attributable to this species. In other plumes, however, the stems were more slender and geniculate and possessed athecate intermediate internodes, and the hydrothecae had sinuated margins, each with one distinct anterior lobe and 2 lateral lobes. It was undoubtedly these plumes which led Jarvis to assign the material to *P. alternata*, although the stems do not possess the delicacy of Nutting's material. They possibly represent a separate variety of *H. glutinosa* or a separate species altogether.

*Halopteris tuba* (Kirch.), 1876

(Fig. 5)

- Plumularia tuba* Kirchenpauer, 1876, p. 44, pl. 1 (fig. 2), pl. 4 (fig. 2).  
*Acladia africana* Marktanner-Turneretscher, 1890, p. 261, pl. 5 (figs. 11, 11a).  
*Heteroplon jaederholmi* Stechow, 1912, p. 366, figs. F, G.  
*Plumularia (Heteroplon) africana*. Stechow, 1925, p. 500, figs. 44, 45.  
*Thecocalus tuba*. Leloup, 1939, p. 12, fig. 8.

*Records*. South coast: SCD 5M, 52L, 79F, 82K, 84N, 117S, 153F, 175A, 186W, 219U, 234Q, 239A. SAMH 194, 238, 249. AFR 865.O.G.

*Description*. Colonies of unfascicled, unbranched stems reaching a maximum height of 22 cm.

Basal part of stem without hydrothecae or hydrocladia, with a few irregular transverse nodes and a double row of movable nematothecae on the anterior face. This part usually terminated by 1 or 2 oblique hinge-joints. Where 2 hinge-joints occur the segment between them bears a single median hydrotheca on the anterior face and a pair of hydrocladia arising one on each side of it, also 1 medial inferior nematotheca and 4-8 movable nematothecae rather irregularly arranged above the hydrotheca.

Remainder of stem bearing hydrothecae and hydrocladia on anterior surface, unsegmented except for extreme distal end, where regular, slightly oblique nodes may occur. The first hydrotheca is median, and from the same level arises a pair of hydrocladia, one on each side of it. Thereafter the hydrothecae are displaced alternately to the right and left of the mid-line and the hydrocladia arise singly, alternately from the right and left sides of the hydrothecae (from the right side of a hydrotheca displaced to the right and vice versa). The hydrothecae and hydrocladial origins thus form 2 longitudinal rows on the anterior surface of the stem. Very rarely a pair of hydrocladia arises from the same level. Corresponding to each hydrotheca are 5 cauline nematothecae: 1 inferior, 2 lateral, and 2 minute supracalcine. Of these the inferior nematotheca is not situated immediately below its hydrotheca, but is displaced towards the opposite side of the stem.

Hydrocladia borne on short apophyses of the stem arising next to the cauline hydrothecae (the hydrothecae thus appear to be seated on the apophyses), divided into internodes by distinct oblique nodes. Apophysis without nematothecae. First internode short, athecate, with 1 median movable nematotheca.

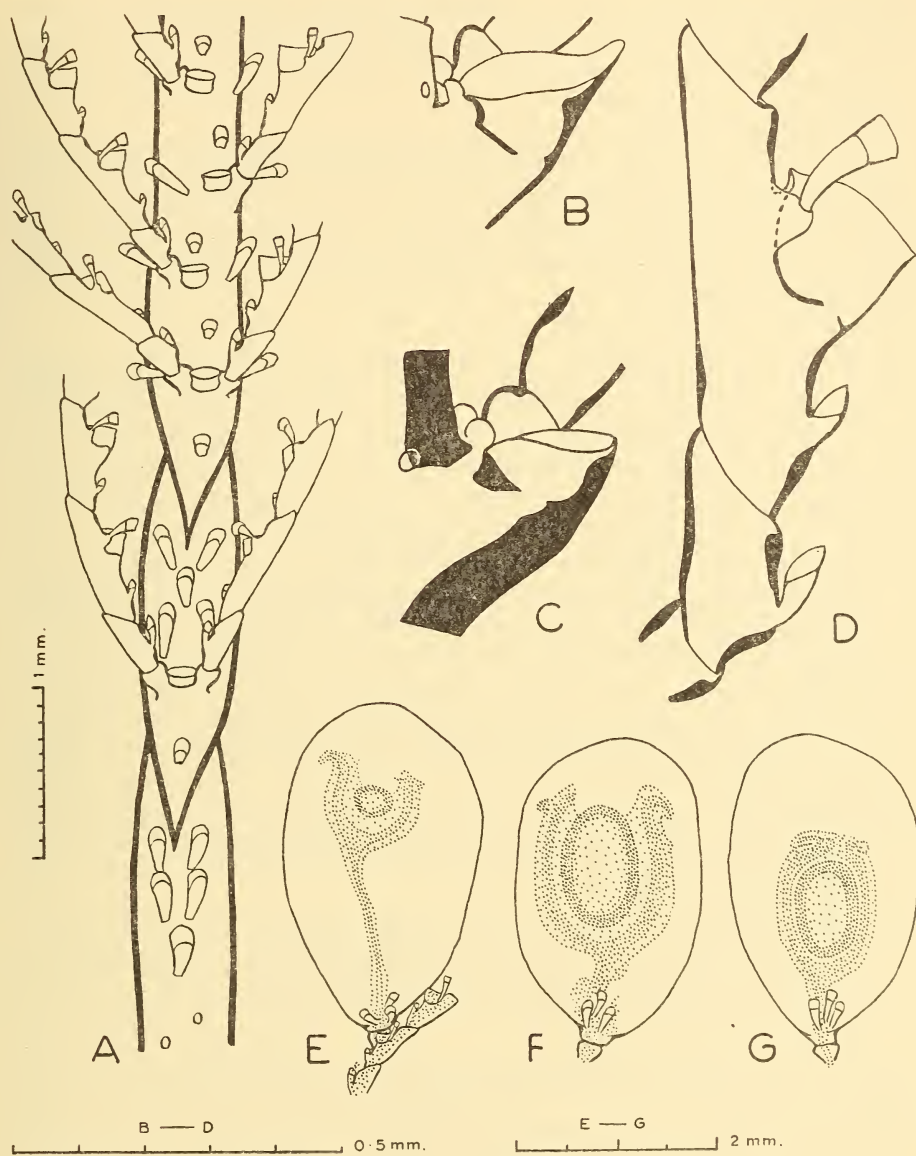


FIG. 5. *Halopteris tuba* (Kirch.).

- A. The lower part of the stem in anterior view, showing hinge-joints and arrangement of hydrocladia and cauline nematothecae. From SAMH 238.
- B, C. Cauline hydrothecae from SCD 5M to show shape of hydrotheca and supracalycine nematothecae—B from upper region, and C from lower region, of stem. Aperture for lateral nematotheca shown on left of diagram.
- D. The first 2 hydrocladial internodes, from SCD 5M.
- E-G. Stages in the development of the female gonophore, from SCD 5M.



Remaining internodes (up to 12 in number) each with 1 hydrotheca, 1 median inferior nematotheca, 2 lateral nematothecae, and 1 supracalycine naked sarcophore. Old colonies may have weak internodal septa at the proximal and distal ends of the internodes.

Hydrotheca shallow, with width exceeding (or, rarely, equal to) depth, and with untoothed margin. Hydrocladial hydrotheca adnate to internode to within a short distance of margin, then free. Cauline hydrotheca with abcauline wall greatly thickened, and margin eroded, particularly on adcauline and lateral sides, so that no free part remains. Hydropore very small, circular, close to abcauline side.

Nematophores of 4 types:

- (i) Lateral nematothecae: slender, elongated, and movable. Bithalamic, with funnel-shaped distal chamber which is not cut away on adcauline (i.e. inner) side. Those on the hydrocladia arise from short processes of the internodes next to the hydrotheca and usually reach well above the margin. Those on the stem are much larger, and are not seated on processes, but emerge directly from oval openings in the perisarc. They are not contiguous to the hydrotheca but separated from it by a distance equal to about half the thecal width. The median nematotheca of the first hydrocladial internode is very similar, but smaller and with a wider base—it appears to be intermediate between this and the following type.
- (ii) Median nematothecae: short, hook-shaped and immovable. With a transverse septum and thus bithalamic. Distal chamber with adcauline wall completely cut away. Situated well below hydrotheca and not reaching to base.
- (iii) Supracalycine nematothecae: immovable, hook-shaped, minute, monothalamic. Situated immediately above the eroded adcauline wall of the cauline hydrothecae.
- (iv) Naked sarcophores: situated in the angle behind the free part of the adcauline wall of the hydrocladial hydrothecae. It is possible that a nematotheca may be present and fused with the thecal wall, but it is not visible as a separate entity.

Male and female gonothecae (not previously described) borne on the same colony and often on the same hydrocladium with the male more distal than the female.

Female gonotheca arising from a small triangular pedicel attached to the first thecate internode of hydrocladium just below the hydrotheca and slightly to one side. Very large, flattened, rounded distally and tapering proximally. Bearing 3 nematothecae near base on surface facing hydrocladium, these being similar in size and appearance to the laterals of the stem. Containing a single embryo between the arms of a bifurcating blastostyle.

Male gonothecae borne on internodes of hydrocladia other than the first. Smaller than female, elongated-oval, with abcauline side more convex than





A full description of the species has been given, since none of the published descriptions is quite complete. The arrangement of the cauline nematothecae was found to be exactly similar in Stechow's material.

It is evident that, as in all typical species of *Halopteris*, the arrangement of the cauline segments is essentially the same as that of the hydrocladia, differing only in the tendency for nodes to disappear, the lateral displacement of the hydrothecae and the nature of the supracalcine nematophores.

This endemic South African species occurs on the Agulhas Bank east of 19°E., extending round the coast to Natal waters. It is found in depths of 11-130 m.

*Halopteris valdiviae* (Stechow), 1923

(Fig. 4 H, J)

*Thecocalus(?) valdiviae*. Stechow, 1925, p. 495, figs. 42-43.

*Halopteris valdiviae*. Millard, 1957, p. 228, fig. 14 B.

*Records*. South coast: SAMH 196, 248, 324, 332, 346, 349. SCD 79G, 169W.

West coast: AFR 736X. WCD 7M.

*Description*. Two magnificent tree-like colonies reaching 35 and 37 cm. in height (SAMH 248 and 349), and a number of smaller colonies and detached portions. A few details may be added to previous descriptions.

Hydrorhiza forming a dense mat 5 cm. wide by 3 cm. high. Stem strongly fascicled, reaching 1 cm. in diameter near base, branching irregularly. Stem and branches giving off hydrocladia-bearing pinnae from the deeper tubes in an irregular fashion and from all surfaces.

Pinnae unfascicled, or very lightly fascicled near base, with basal part terminated by 2 oblique hinge-joints, but occasionally as many as 4, possibly due to regeneration. Segment between hinge-joints bearing 1 median cauline hydrotheca, and 1 pair of opposite hydrocladia on anterior surface. First segment beyond hinge-joints similar, with median hydrotheca and 1 pair of hydrocladia. Remaining segments each bearing 1 cauline hydrotheca, and 1 hydrocladium arising alternately from the right and left of the hydrotheca. Hydrocladia as described by Stechow (1925) and Millard (1957), bearing up to 9 hydrothecae.

Nematothecae as previously described, except that it is now possible to distinguish a pair of minute, monothalamic supracalcine nematothecae behind the free part of the adcauline wall of each cauline hydrotheca.

Gonothecae (not previously described) dimorphic, male and female on same colony, each borne on a small triangular pedicel of 1 segment which arises immediately below a hydrotheca and slightly to one side.

Male gonothecae borne on thecate internodes of hydrocladia, pear-shaped but slightly asymmetrical with the greatest curvature on side away from hydrocladium, with flattened distal end, bearing 2 bithalamic nematothecae near base on side facing hydrocladium.

Female gonothecae borne on internodes of pinnae, very much larger than male, flattened in a plane at right angles to pinna, expanding distally to a wide aperture, bearing 3 or 4 bithalamic nematothecae on side facing pinna.

*Measurements* (mm.)

Gonotheca, male, length	..	..	..	..	..	..	0.58–0.83
maximum diameter	..	..	..	..	..	..	0.20–0.39
Gonotheca, female, length	..	..	..	..	..	..	1.24–1.55
maximum diameter	..	..	..	..	..	..	1.01–1.22

The measurements of the trophosome agree well with those given by Millard (1957), except that the range is in some cases greater.

*Remarks.* It is now obvious that the material described by Millard (1957) consisted of 2 detached pinnae bearing hydrocladia.

This endemic South African species occurs on the west and south coasts as far east as 29°E., and in depths of 33–201 m. It is remarkably similar to *H. tuba* in the arrangement and structure of its hydrocladia, differing from it in its fascicled stem, and proportions of hydrotheca in which the depth is almost invariably greater than the width.

*Monostaechas natalensis* Millard, 1958

(Fig. 2 F)

*Monostaechas natalensis* Millard, 1958, p. 206, fig. 12.

*Records.* South coast: CPR 46J. SCD 153D.

*Description.* The first colony is of small size and similar to the holotype in its appearance and measurements, but the second colony (SCD 153D) is altogether of larger proportions. The fascicled stems branch irregularly and reach a maximum height of 7.6 cm., and individual hydrocladia reach a length of 3–4 cm. All the minute measurements are larger. The proportions of the parts are the same except that a greater part of the adcauline thecal wall is free from the internode. Towards the ends of the hydrocladia there is a tendency for the distal parts of the internodes to be cut off by transverse nodes. No branching hydrocladia were observed—any branching which may occur is obscured in the fasciculation of the stem. The general appearance of the colony is very similar to that of *Corhiza pannosa* n. sp., but it is clearly distinguished from it by the nature of the lateral nematothecae. With the larger size the structure of the latter could be more exactly ascertained. Each nematotheca has the sides deeply cut away to the level of the diaphragm, with a high, bonnet-shaped abcauline (i.e. outer) wall and practically no adcauline (i.e. inner) wall at all. It resembles that of *Corhiza bellicosa* n. sp., except that the adcauline wall is more reduced. In the holotype the structure of the nematothecae was not easy to determine because of the small size and the opacity of the contents, but a re-examination of the material with a phase-contrast

microscope shows that they are of a similar nature and that the diagram given by Millard in 1958 (fig. 12E) was not strictly accurate. The measurements of the larger colony are given for comparison with the holotype.

<i>Measurements</i> (mm.)	SCD 153D
Internode length (on posterior surface) .. .. .	0·71-1·05
diameter (above hydrotheca) .. .. .	0·14-0·19
Hydrotheca, height .. .. .	0·34-0·45
height of free part .. .. .	0·19-0·24
free part/total length .. .. .	0·44-0·65
diameter at margin .. .. .	0·27-0·34
Nematotheca, length .. .. .	0·09-0·17

*Remarks.* In view of the larger measurements sample SCD 153D might well be included in a separate variety, but one is reluctant to establish a new variety on size alone when little is known about the variation within the species.

*Schizotricha simplex* Warren, 1914

*Schizotricha simplex* Warren, 1914, p. 83, pl. 6 (figs. 1-19), figs. 1-4.

*Records.* S 65B (recorded by Stephenson, Stephenson and du Toit, 1937). L 430. CPR 9A.

*Description.* Colonies reaching a maximum height of 1·4 cm., agreeing exactly with the beautiful description by Warren, bearing male and female gonophores. In the larger stems practically all the 'pinnae' bear 3 thecate internodes and sometimes even 4, and many of the 'pinnules' bear 2.

Subfamily **Kirchenpaueriinae**

*Kirchenpaueria pinnata* (Linn.), 1758

*Kirchenpaueria pinnata.* Millard, 1957, p. 233. Millard, 1959b, p. 252.

*Records.* West coast: CPR 44A. SB 141U. LB 126, 190Q, 257P, 367X, 378E, 392R, 472H, 513J (recorded by Day, 1959). WCD 18N.

South coast: S 65A (recorded by Stephenson, Stephenson and du Toit (1937) as *K. unilateralis*). KNY 71C, 165A (recorded by Day, Millard and Harrison, 1952). E 83. LIZ 7X, 27F. L 54, 317, 336. CPR 7D, 9B.

*Kirchenpaueria triangulata* (Totton), 1930

(Fig. 6 E-J)

*Plumularia triangulata* Totton, 1930, p. 225, fig. 61.

*Records.* South coast: SCD 175G.

*Description.* Colony growing on the stems of *Nemertesia ciliata* Bale, and including both simple and pinnate forms.



Pinnate stem reaching a length of 1 cm., and consisting of long internodes separated by transverse nodes which may be indistinct in the lower region. Each internode giving rise to a hydrocladium-bearing apophysis from its distal end. Each internode bearing a well-developed mamelon on the upper surface of the apophysis, and 2-4 cauline nematothecae. The latter including 1 on proximal end immediately above apophysis of last internode, rarely 1 near distal end below the apophysis, and 1 (or rarely 2) on upper surface of apophysis distal to the mamelon.

Hydrocladia alternate, the two rows in one plane or shifted very slightly to one side of the stem. Hydrocladium normally homomerous and consisting of long thecate internodes separated by transverse nodes, but intermediate athecate internodes commonly occur and in quite an irregular fashion. Thus there may be 1-4 or none at all before the first thecate internode, and 1 or 2 of irregular length between successive thecate internodes.

Hydrotheca borne on the proximal half of the internode, which thus has a long distal region; flaring slightly to margin, completely adnate or with a very short free portion, with diameter exceeding depth.

Nematothecae: 1 median inferior and one median supracalycine; with convex abcauline wall and practically straight adcauline wall and oblique margin; movable; monothalamic, or with a very thin septum close to base.

Simple stem reaching a length of about 4 mm., similar to hydrocladium, borne on a long apophysis of hydrorhiza. Measurements of parts slightly smaller than corresponding ones of pinnate stem.

Gonothecae (male) borne by pinnate stem on hydrocladial apophyses to one side of mamelon, elongated, tapering below, truncated above, triangular in section. Pedicel of 2 segments.

*Measurements* (mm.)

					<i>Pinnate stem</i>	<i>Simple stem</i>
Stem internode, length	..	..	..	..	0.48-0.75	
diameter	..	..	..	..	0.07-0.16	
Hydrocladium, thecate internode, length	..			..	0.66-0.85	0.59-0.81
diameter at distal end	..	..	..	..	0.055-0.075	0.05-0.07
Hydrotheca, height abcauline	..	..	..	..	0.07-0.095	0.07-0.08
height of free part	..	..	..	..	0.00-0.01	0.00-0.01
diameter at mouth	..	..	..	..	0.10-0.12	0.095-0.11
Nematotheca, length	..	..	..	..	0.05-0.08	0.05-0.07
Gonotheca, male, length	..	..	..	..	1.74-2.46	
maximum diameter	..	..	..	..	0.80-0.85	

*Remarks.* The author agrees with Bedot (1923) that the main diagnostic character separating *Kirchenpaueria* from *Plumularia* should be the absence of paired nematothecae. Although the nematothecae in *Kirchenpaueria* as a whole are characteristically reduced, any attempt to separate the two genera on the

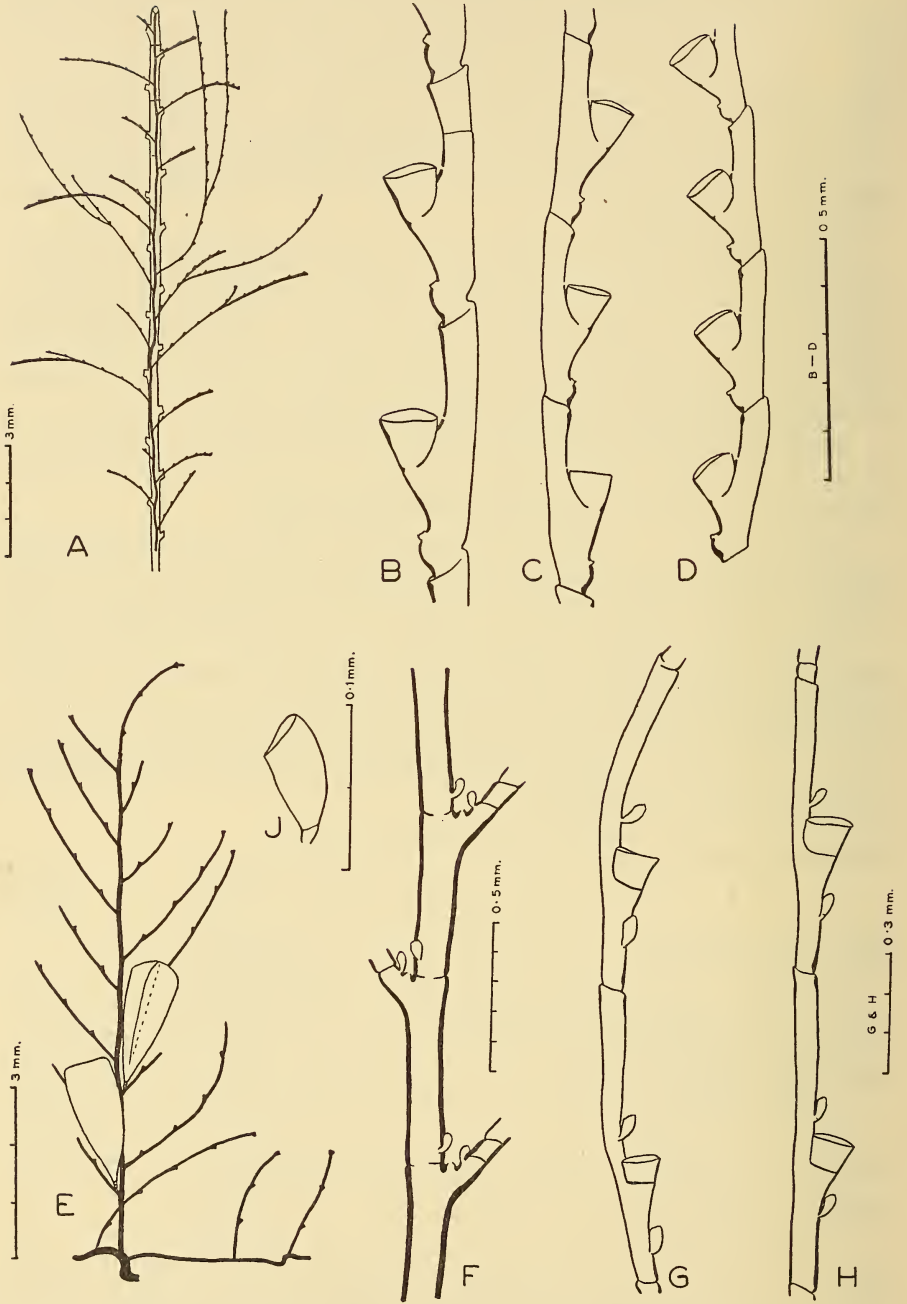


FIG. 6. *Oswaldella nova* (Jarvis) and *Kirchenpaueria triangulata* (Totton).

structure of the nematothecae alone will fail because of the presence of intermediate forms. Thus a group of species with but one superior nematotheca (including *P. halecioides* Alder 1859, *P. bonneviae* Billard 1906, *P. inermis* Nutting 1900, and others) has been assigned by Bedot (1923) to *Kirchenpaueria*, by Stechow (1923b) to a new genus *Ventromma*, and by most other authors to *Plumularia*. To this category also belong *Plumularia irregularis* Millard 1958 and *P. triangulata* Totton. Most of these species have monothalamic superior nematothecae, and are thus intermediate between a typical *Plumularia* and a typical *Kirchenpaueria*. In *K. triangulata*, however, a poorly developed septum is often visible in the nematotheca, and in *K. irregularis* it is quite distinct, so that in these genera the nematothecae are strictly speaking bithalamic and verging on the *Plumularia* type.

The South African material of *K. triangulata* agrees closely with Totton's description and resembles it in the epizootic habit of growth. The material shows much evidence of regeneration after injury, and this probably accounts for the presence of the many intermediate internodes, which were not mentioned by Totton. In one case the end of a stem has regenerated as a hydrocladium.

The species is closely related to *K. irregularis* (Millard) 1958, differing from it in the longer distal part to the hydrocladial internode and in the arrangement of the cauline nematothecae.

It is the first record of the species from South Africa.

*Oswaldella nova* (Jarvis), 1922

(Fig. 6 A-D)

*Plumularia nova* Jarvis, 1922, p. 347, pl. 26 (fig. 20).

*Kirchenpaueria adhaerens* Millard, 1958, p. 203, fig. 13 F, G.

*Records.* South coast: MB 47Z. SCD 84T. TRA 92H.

West coast: WCD 7N.

(Additional from Natal: NAD 1P.)

*Description.* A number of samples of epizootic colonies growing on other hydroids (*Halopteris glutinosa* (Lamx.)), *H. valdiviae* (Stechow) and *Gattya humilis* Allman).

←

A-D. *Oswaldella nova* Jarvis.

A. Part of colony on back of stem of *Halopteris glutinosa*, from TRA 92H (hydrocladia of host cut off short).

B-D. Portions of hydrocladia from different colonies to show variation in size and shape: B from TRA 92H, C from NAD 1P, and D from MB 47Z.

E-J. *Kirchenpaueria triangulata* (Totton), from SCD 175G.

E. A colony including a pinnate stem bearing gonothecae, and several simple stems, removed from host.

F. A portion of a pinnate stem showing arrangement of nematothecae.

G, H. Hydrocladial internodes from a simple stem and a pinnate stem respectively.

J. A single nematotheca with diaphragm.

Hydrocladia arising direct from adherent stem, usually unbranched, but in one sample (TRA 92H) often forked. The division occurs immediately above the origin of a hydrotheca; both limbs are of equal thickness, and their hydrothecae do not face one another, but lie in the same plane as those of the original hydrocladium. Unbranched hydrocladia bearing up to 14 hydrothecae.

Hydrotheca variable in size and shape, with diameter generally exceeding, but occasionally equal to, height; usually free from internode for a small proportion of its length, but occasionally completely adnate.

Gonothecae absent, but scars probably of old ones present below hydrothecae and slightly to one side.

*Measurements* (mm.)

	MB 47Z	NAD 1P	TRA 92H	<i>Type material</i>
Internode length (posterior surface) .. ..	0.29-0.31	0.35-0.41	0.42-0.57	0.39-0.48
diameter near distal end .. ..	0.06-0.07	0.065-0.08	0.08-0.11	0.04-0.05
Hydrotheca, length abcauline .. ..	0.05-0.08	0.075-0.10	0.08-0.12	0.06-0.075
length of free part ..	0.01-0.03	0.00-0.02	0.01-0.04	*0.01
free part/abcauline length .. ..	0.125-0.43	0.00-0.25	0.10-0.40	*0.125
diameter at mouth ..	0.105-0.135	0.10-0.11	0.11-0.13	0.07-0.08

*Remarks.* Examination of the type material of Jarvis's species *Plumularia nova* in the British Museum of Natural History (slide no. 23.2.15.283 from Zanzibar) has established the fact that this species is synonymous with *Kirchenpaueria adhaerens* Millard. The correct measurements are quoted above and replace the incorrectly calculated ones given in 1958. The type material is scanty and damaged, and no hydrocladia bear more than 2 hydrothecae. The median inferior nematothecae are missing, though their orifices remain. In the only hydrotheca lying in a suitable position there is a short free part to the adcauline wall. The remains of one very damaged gonotheca are present, but it is impossible to determine the shape.

The discovery of forked hydrocladia in the new material necessitates the transfer of the species from *Kirchenpaueria* to *Oswaldella*, to which genus all its structural details indicate a closer affinity. Further knowledge of the growth-habits may indicate that it is merely an epizootic form of *O. bifurca* (Hartlaub) or *O. antarctica* (Jäderholm).

\* One measurement only.



Subfamily **Plumulariinae***Nemertesia ciliata* Bale, 1914b

(Fig. 7 E-G)

*Nemertesia ciliata* Bale, 1914b, p. 170, pl. 36 (fig. 1). Bale, 1915, p. 298. Briggs, 1914, p. 307, pl. 10 (fig. 3). Jäderholm, 1919, p. 23.

*Records.* West coast: TRA 47N. AFR 729H.

South coast: TRA 92F. AFR 945L. SCD 5N, 175C. SAMH 329.

*Description.* Several colonies, the largest reaching a height of 24.5 cm. Stem and larger branches fascicled, smaller branches unfascicled, branching always in one plane. Hydrocladia given off in whorls of 2, 3, or 4, but irregular in lower parts of branches; consisting of alternate thecate and athecate internodes, of which the first is always thecate.

Appearance and structure as described by Bale and Briggs, with the following minor points of difference.

The branching is not so luxuriant as in the specimen figured by Briggs and the branches are more widely spaced, with intervals in the neighbourhood of 5-10 mm. between them. In branches with two hydrocladia to a whorl it sometimes happens that the alternate pairs are not set at right angles to each other but compressed in one plane, forming angles of 40-60/120-140° with each other, and giving a flattened appearance to the branch. The same tendency may be found in stems with 3 hydrocladia to a whorl, as in *N. japonica* (Stechow) 1909, but it is not constant within a colony. The hydrocladia are often longer than in the type material, reaching 5-7 mm., and the internodes are in general somewhat longer, but the measurements of the hydrothecae are very similar.

Gonothecae as described by Bale.

*Measurements* (mm.)

Hydrocladium, internode length, thecate	..	..	..	0.29-0.51
athecate	..	..	..	0.14-0.28
diameter at distal end of internode	..	..	..	0.04-0.095
Hydrotheca, height abcauline	..	..	..	0.02-0.07
diameter at margin	..	..	..	0.06-0.085
Nematotheca, lateral, height	..	..	..	0.05-0.10
Gonotheca, length	..	..	..	reaching 0.49
maximum diameter	..	..	..	reaching 0.24

*Remarks.* This is the first record of the species from South Africa. So far it is known only from Tasmania and Japan.

I have not separated a var. *cruciata* as was done by Bale (1915), although both this and the normal form are present, as the tendency to produce different numbers of hydrocladia to a whorl almost certainly depends on the growth and age of the colony as has been shown for other species of the genus.

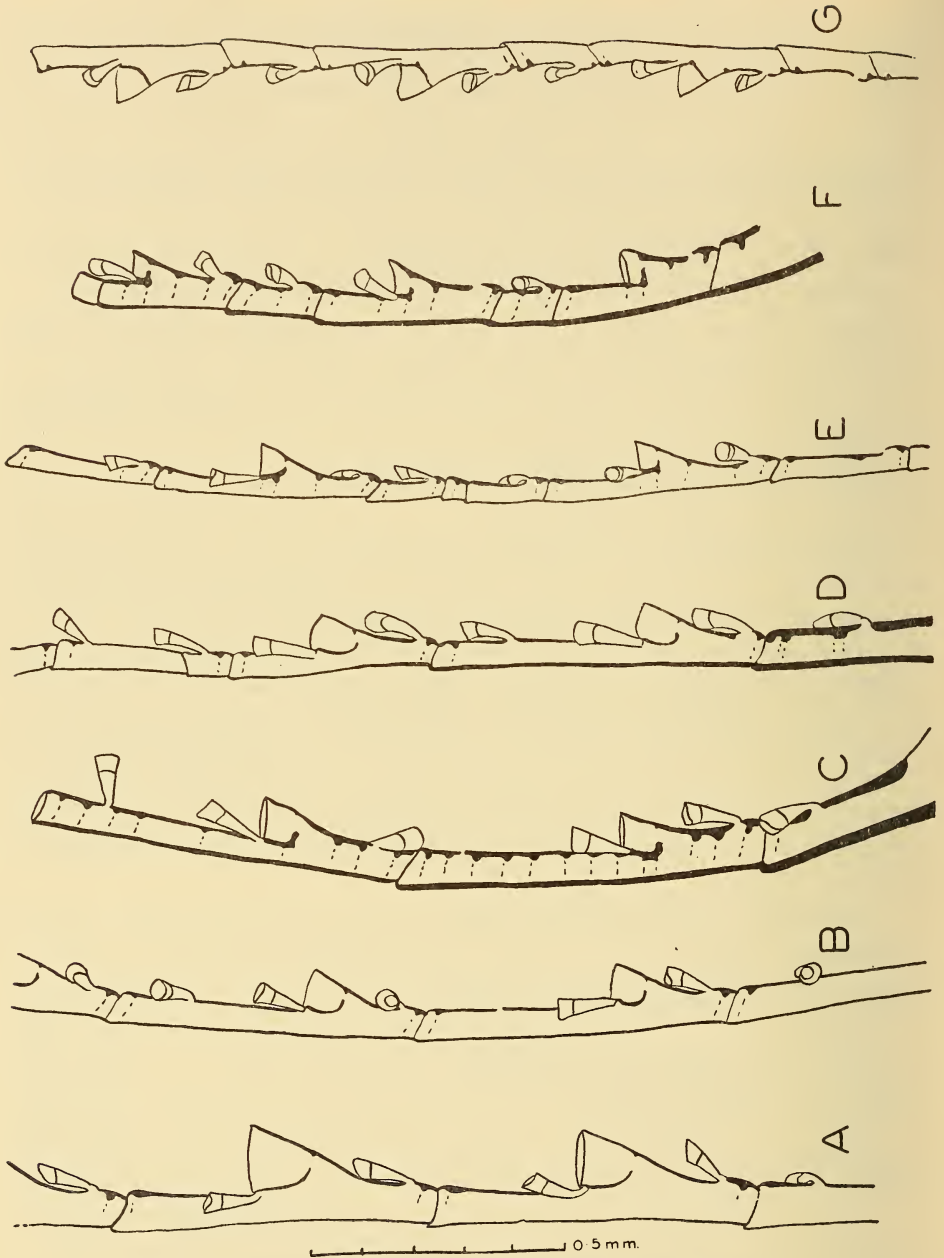


FIG. 7. *Nemertesia* spp., portions of hydrocladia showing variation.

A-D. *Nemertesia ramosa* Lamx.

A. The typical appearance from TRA 125K. No superior medial nematothecae.

B. An example with smaller hydrothecae, longer internodes, and superior medial nematothecae, from NAD 9K.

C, D. Hydrocladial internodes from old and young regions respectively of the same colony, from TRA 134S. C with internodal septa and thickened perisarc.

E-G. *Nemertesia ciliata* Bale.

E. The typical appearance, from TRA 47N.

F, G. Hydrocladial internodes from old and young regions respectively of the same colony, from SAMH 329.

*Nemertesia cymodocea* (Busk), 1851

*Nemertesia cymodocea*. Billard, 1910, p. 39. Millard, 1957, p. 234. Millard, 1961, p. 207.

*Records*. West coast: SB 178B. TB 3, 4, 5, 18, 21A. TRA 156A.

South coast: MB 81N. AFR 865R. TRA 92K. SCD 26C, 36T, 52M, 153H, 175E, 219V. SAMH 148, 240, 347.

*Description*. The length of the hydrocladial internodes is variable, sometimes being almost double that quoted by Billard (1910, p. 40), though the size of the hydrotheca remains fairly constant.

Observations suggest that during the growth of a colony the stems first produce alternate hydrocladia, one to an internode, and that later the decussate arrangement develops at the tip of the stem, and still later the hexastichous arrangement. Thus young colonies bear only alternate hydrocladia and stems may reach a length of 10 cm. (and bear gonophores) before the decussate arrangement starts. The hexastichous arrangement is characteristic of the distal ends of old colonies, though by this time the proximal hydrocladia may be lost or buried by the peripheral tubes of the stem. In young colonies, too, the peripheral tubes bear a thick coating of nematothecae, which appear to fall off with age.

*Nemertesia ramosa* Lamouroux, 1816

(Fig. 7 A-D)

*Antennularia ramosa*, var. *plumularioides* Billard, 1906, p. 215.

*Nemertesia ramosa*. Millard, 1957, p. 235. Millard, 1961, p. 206.

*Nemertesia ramosa*, var. *plumularioides* (Billard), 1906. Vervoort, 1959, p. 293, figs. 46 b, 47.

*Records*. West coast: WCD 12D, 32H.

South Coast: TRA 92E. SAMH 333. SCD 5P, 96A, 153N, 175B.  
(Natal: NAD 9K.)

(Additional from False Bay: TRA 134S.)

*Description*. A number of colonies of varying size, the largest reaching 28.2 cm. Considerable variation in appearance and structure occurs, much of which is probably due to growth and ageing of the colony.

The number of hydrocladia produced in a verticil appears to increase with age. In young colonies the hydrocladia have an alternate arrangement, 1 or 2 pairs to an internode. As growth proceeds the young shoots produce 2, 3, 4, or even 5 hydrocladia to a verticil, members of one verticil alternating with those of the next resulting in as many as 10 longitudinal rows. In old colonies only the verticillate arrangement is visible since the lower hydrocladia with alternate arrangement tend to fall off and their apophyses to be buried by the peripheral tubes of the stem.

The thickness of the perisarc also appears to increase with age and is possibly influenced by other factors as well. In young colonies the perisarc is thin, with the hydrocladia white and the stem a pale yellow or straw colour.

In old colonies the thickened perisarc gives to the stem and bases of the hydrocladia a dark brown colour. Associated with the thickening of the perisarc the nodes of the stem become indistinguishable and the hydrocladial apophyses very thick and long, atecate internodes become more numerous in the hydrocladia, and in the apophyses and basal parts of the hydrocladia appear internodal septa (up to 12 to an internode). The appearance of these regions is thus very different from that in the growing tips of the stems and the distal ends of the hydrocladia where the structure is similar to that usually described for the species.

*Measurements* (mm.)

Hydrocladium, internode length, thecate	..	..	..	0.34-0.86
diameter at distal end of internode	..	..	..	0.06-0.13
Hydrotheca, height abcauline	..	..	..	0.06-0.14
diameter at margin	..	..	..	0.07-0.14
Nematotheca, lateral, height	..	..	..	0.07-0.135
Gonotheca, length	..	..	..	reaching 0.94
maximum diameter	..	..	..	reaching 0.43

*Remarks.* Billard (1906) has created a var. *plumularioides* for forms of *N. ramosa* with alternate hydrocladia, but if, as seems practically certain, the arrangement of hydrocladia is a matter of age, the retention of this variety is unnecessary. Vervoort (1959) has described specimens with alternate hydrocladia reaching lengths of up to 25 cm. from tropical west Africa, but he himself mentions that the hydrocladia may be arranged in whorls of 3 in the upper parts of the larger colonies.

*Plumularia filicaulis* Kirchenpauer, 1876

*Plumularia filicaulis.* Millard, 1958, p. 209, fig. 13 D, E.

*Records.* West coast: WCD 34D, 81K.

*Plumularia lagenifera* Allman, 1886

*Plumularia lagenifera.* Millard, 1957, p. 230.

*Records.* West coast: TRA 156D. LAM 2J, 7L, 9V, 13H, 26Q, 46N, 59A, 62T. PP 1W. LB 511E (recorded by Day, 1959). A 382. WCD 34C, 81H. CP 650C.

South coast: KNY 30O (recorded by Day, Millard and Harrison (1952) as *P. setacea*).

*Plumularia pulchella* Bale, 1882

*Plumularia pulchella.* Millard, 1957, p. 232.

*Records.* South coast: SCD 37S. SAMH 290, 302. MB 8Q, 47Q, 52F, 55G, 60L. KNY 71B, 165B (recorded by Day, Millard and Harrison, 1952). LIZ 27C.



*Description.* Colonies reaching a maximum height of 1.1 cm. (KNY 71B), but usually between 0.3 and 0.7 cm.

Gonothecae ovate, truncated distally, with wide distal aperture, 5–5½ times height of hydrotheca.

*Plumularia setacea* (Ellis and Solander), 1755

*Plumularia setacea.* Millard, 1957, p. 232. Millard, 1958, p. 212. Millard, 1959b, p. 252.

*Records.* West coast: WCD 18R, 20F, 34E. TRA 156B. B 114D. LAM 21T, 27Z, 35C, 45X. SB 150A. LB 152, 367W (recorded by Day, 1959). TB 2, 21H. CP 640C.

South coast: SCD 5K, 52S, 169V. TRA 159A. SAMH 198, 224. CPR 1, 46H. MB 8T, 24X, 47R, 55F. E 170 (recorded by Stephenson, Stephenson and Bright, 1938). LIZ 17H, 27E. L 57, 145 (recorded by Eyre, Broekhuysen and Crichton, 1938).

*Plumularia spinulosa* Bale, 1882

*Plumularia spinulosa.* Bale, 1884, p. 139, pl. 12 (figs. 11–12). Bale, 1888, p. 783, pl. 19 (figs. 11–13). Warren, 1908, p. 320.

*Monothecha spinulosa* var. *obtusa* Stechow, 1923b, p. 224.

*Plumularia spinulosa* var. *obtusa.* Millard, 1957, p. 232.

*Plumularia spinulosa* var. *typica* Stechow, 1923b. Millard, 1958, p. 212.

*Records.* South coast: SCD 29G, 36W, 75G, 85A. SAMH 199, 291, 303. MB 47P, 58C. LIZ 13D, 27D. L 111 (reported by Eyre, Broekhuysen and Crichton, 1938).

*Remarks.* I have no longer attempted to distinguish var. *obtusa* from var. *typica* as I have found that the length of the terminal spine of the hydrocladium varies not only in different samples but also within the same colony. The origin of the hydrocladium, whether from the middle or distal end of a stem internode, is also a variable feature.

*Plumularia wasini* Jarvis, 1922

(Fig. 8)

*Plumularia wasini* Jarvis, 1922, p. 349, pl. 26 (fig. 23), fig. 1.

*Records.* South coast: CPR 46G.

*Description.* Stem reaching a height of 1.6 cm., unfascicled, unbranched, divided into internodes of irregular length by transverse nodes; basal part short and without hydrocladia; no hinge-joints; distal part giving rise to alternate hydrocladia, 1–3 per internode, the 2 rows in the same plane. Intervals between hydrocladia not regular, some being short and others long. Stem bearing 2 rows of cauline nematothecae (2–14 per internode), sometimes on the lateral sides but often shifted on to the anterior or even the posterior surface.

Hydrocladia borne on very short apophyses of stem, divided into alternate

athecate and thecate internodes terminated by oblique and straight nodes respectively. Apophysis without nematothecae or mamelon.

Hydrotheca large, with even or slightly sinuated margin; free from internode for more than half height; with diameter always exceeding depth. Hydrothecae not strictly on upper surface of hydrocladium but shifted slightly onto anterior surface.

Nematothecae: 1 (or occasionally 2) on each athecate internode; 4 on each thecate internode, including 1 median inferior not quite reaching base of hydrotheca, 1 pair of laterals seated on processes next to hydrotheca and not quite reaching its margin, and 1 superior in angle behind adcauline thecal wall. All bithalamic and movable except superior which is monothalamic.

Gonothecae borne on thecate hydrocladial internodes, each on a short pedicel of 2 segments, and each bearing 2 or 3 large nematothecae on basal region. Two types present: the larger (probably female, but empty) on first thecate internode of hydrocladium only, pear-shaped, with large operculum at distal end; the smaller (male) usually on thecate internodes other than the first, more rounded and without operculum.

*Measurements* (mm.)

Stem internode, length	..	..	..	..	..	..	0.34-0.99
diameter	..	..	..	..	..	..	0.145-0.24
Hydrocladium, internode length (on posterior surface), thecate							0.16-0.21
athecate	..	..	..	..	..	..	0.17-0.25
Hydrotheca, height abcauline	..	..	..	..	..	..	0.12-0.185
height adcauline, free part	..	..	..	..	..	..	0.10-0.13
free part/abcauline height	..	..	..	..	..	..	0.65-1.00
diameter at margin	..	..	..	..	..	..	0.20-0.24
Nematotheca, lateral	..	..	..	..	..	..	0.06-0.085
inferior median	..	..	..	..	..	..	0.07-0.09
superior	..	..	..	..	..	..	0.03-0.045
cauline	..	..	..	..	..	..	0.09-0.11
Gonotheca, female?, length without pedicel				..	reaching		0.69
maximum diameter	..	..	..	..	reaching		0.61
male, length without pedicel,				..	reaching		0.35
maximum diameter	..	..	..	..	reaching		0.24

*Remarks.* This material was compared with a slide of Jarvis's type in the British Museum of Natural History. In the latter the athecate internodes normally bear 2 nematothecae, but the number is variable and some have only one. In the present material 1 is the normal condition and 2 occur only rarely. In the type material the superior median nematotheca is 1-chambered and not 2-chambered as figured by Jarvis (1922, pl. 26, fig. 23 A).

Certain minor variations sometimes occur. Thus in CPR 46G one hydrocladium bears a branch arising from its first thecate internode and bearing one hydrotheca.

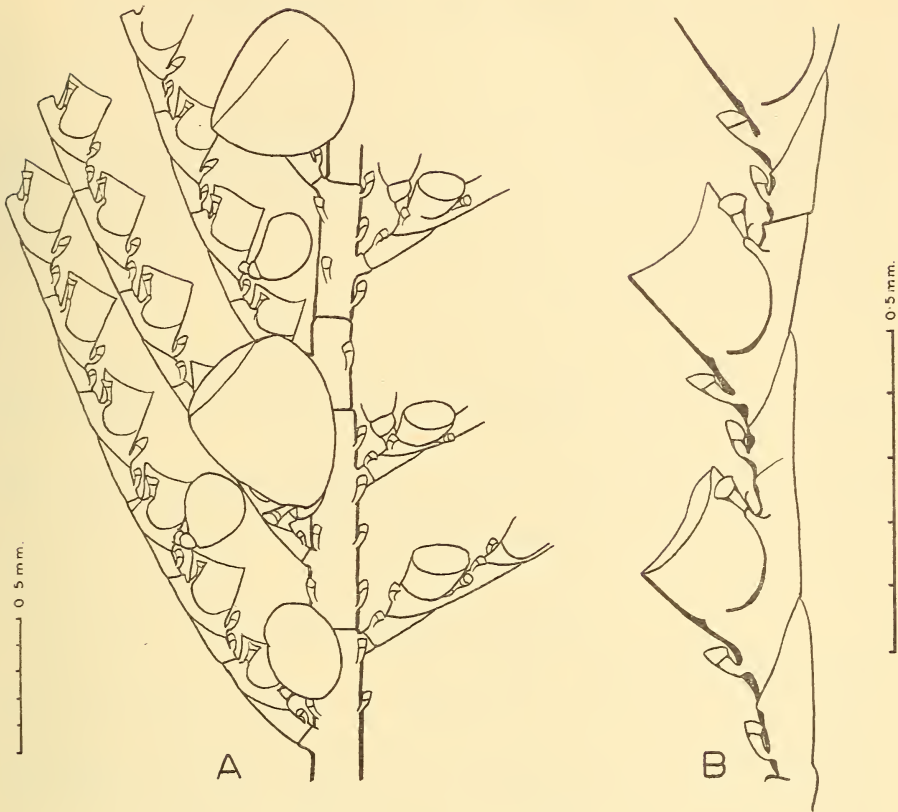


FIG. 8. *Plumularia wasini* Jarvis.

- A. A portion of stem in anterior view showing male (small) and female (large) gonothecae and origins of hydrocladia. Gonothecae removed on right side.  
 B. A portion of a hydrocladium.  
 Both from CPR 46G.

This species is in some ways reminiscent of *Halopteris*, as instance the large hydrothecae which are not completely adnate, the shape and arrangement of the gonothecae, and the presence of nematothecae on them.

The species is so far only known from Wasin, East Africa. It is a new record from South Africa.

#### Subfamily **Aglaopheniinae**

##### *Aglaophenia late-carinata* Allman, 1877

*Aglaophenia late-carinata*. Millard, 1958, p. 213, fig. 14. Vervoort, 1959, p. 309, fig. 54.

Records. South coast: CPR 46F.

*Aglaophenia pluma* (Linn.) 1758, subsp. *dichotoma* (M. Sars), 1857

*Aglaophenia pluma*, var. *dichotoma*. Millard, 1957, p. 239, fig. 15 B, C. Vervoort, 1959, p. 308, fig. 52 b.

*Records*. West coast: LAM 16W, 35B, 51A. WCD 32G.

South coast: MB 5E, 34F, 37C, 42A, 79E, 81M, 84A. KNY 22F, 28C, 70B, 71D, 127A (recorded by Day, Millard and Harrison (1952) as *A. ?dichotoma*). TRA 35C, 36A, 38A, 42A, 56W, 99M. SAMH 149, 163, 195, 215, 322, 330, 344. SCD 20C, 26A, 29D, 69A, 94C, 103D, 104F, 108J, 126J, 133H, 152X, 153B, 191P, 195J, 199U, 239B.

*Aglaophenia pluma* (Linn.) 1758, subsp. *parvula* Bale, 1882

*Aglaophenia pluma*, var. *parvula*. Millard, 1957, p. 239, fig. 15 D-F. Millard, 1958, p. 215. Vervoort, 1959, p. 307, figs. 52 a, 53 b.

*Records*. West coast: SWA 5Y. N 116. LAM 45Z. B 114A. SB 141T, 194J. LB 511D. CP 17, 328, 335, 650G. TRA 156K. WCD 34F, 81A.

South coast: E 133. L 149. SAMH 201, 304.

*Cladocarpus leloupi* nov. nom.

*Cladocarpus flexilis* Leloup, 1939, p. 14, fig. 10.

*Records*. South coast: TRA 92J. SCD 96B, 122V, 141K, 145A, 153M, 188R.

*Description*. A number of colonies and fragments without root-stock, the longest stem reaching 22 cm. Stem fascicled but unbranched, bearing alternate hydrocladia. Stem internodes each bearing 3-6 median nematothecae, one in the axil of the hydrocladium and the rest below it. Cauline nematotheca with 1, 2 or 3 openings.

Hydrocladium and hydrotheca as described by Leloup, but intrathecal ridges tending to disappear towards the distal ends of the hydrocladia. Lateral nematotheca usually with 3 distal openings (but occasionally with 1, 2 or 4) and 1 lateral opening on mesial surface.

Gonophores absent.

*Measurements* (mm.)

Hydrocladial internode, length	..	..	..	..	..	0.70-0.87
diameter at distal end	..	..	..	..	..	0.08-0.13
Hydrotheca, depth to median tooth	..	..	..	..	..	0.45-0.62
diameter at margin	..	..	..	..	..	0.19-0.26

*Remarks*. In view of the fact that the name *Cladocarpus flexilis* is preoccupied by an American species, *C. flexilis* Verrill 1883, I assign to Leloup's species the new name *C. leloupi*.

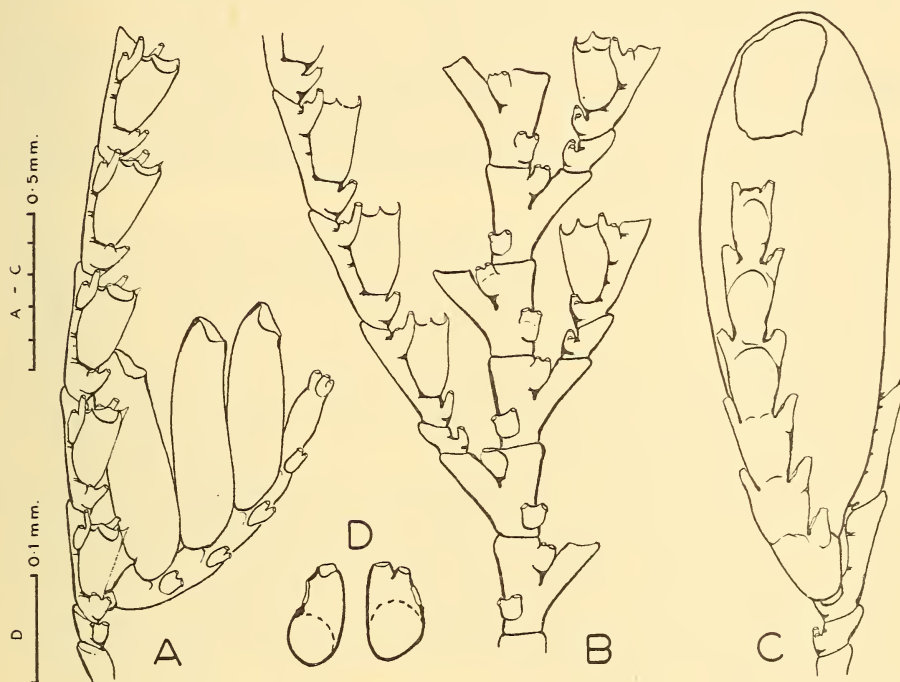


*Cladocarpus lignosus* (Kirchenpauer), 1872

(Fig. 9)

*Cladocarpus lignosus*. Stechow, 1923b, p. 243, fig. J<sup>1</sup>. Stechow, 1925, p. 505. Millard, 1961, p. 206.*Records*. South coast: TRA 38H, 56S, 151E. SAMH 167, 280, 284, 297, 306. SCD 36J, 52H, 84A, 153A, 201X.

(Natal: NAD 21F.)

FIG. 9. *Cladocarpus lignosus* (Kirch.).

- A, C. Phylactocarps bearing gonothecae, from NAD 21F and TRA 38H respectively.  
 B. The distal part of the hydrocladium-bearing tube of the stem to show segmentation and cauline nematothecae, from NAD 21F.  
 D. Two nematothecae from a phylactocarp, one with 2 apertures and the other with 3.

*Description*. Colonies large, reaching a maximum height of 34.5 cm., easily recognizable by the woody nature of the stem and the branching, which is always in one plane.

Stem dividing and subdividing in a very irregular fashion, some of the smaller branches showing a tendency towards an alternate arrangement, but frequently opposite or unilateral—the final result is a fan-shaped colony with well-dispersed branches.

Hydrocladia borne on the smaller and medium-sized branches, absent

on the larger ones. Hydrocladia arising alternately from a single tube of the fascicled branch, this tube, where it is free from the peripheral tubes at the extremity, being regularly segmented, each internode giving rise to a long hydrocladium-bearing apophysis at about the middle of its length. Hydrocladium with first internode short and athecate, with 1 median nematotheca and 2 internodal septa; remaining internodes longer and thecate, each with a median and 2 lateral nematothecae, and 3 or 5 internodal septa. Three of the internodal septa situated as described by Stechow, but frequently an additional one at the extreme proximal and another at the extreme distal end.

Hydrotheca with depth about  $1\frac{1}{2}$  times width at mouth, slightly compressed laterally, with 1 anterior and 2 lateral marginal teeth, which may all be of equal size or with the anterior tooth slightly exceeding the laterals in length.

Median nematotheca arising from the basal swelling of the internode on which the hydrotheca is seated, very short, quite free from hydrotheca, with 2 distal, tubular apertures.

Lateral nematotheca with 3 apertures, one on the mesial surface, and 2 distal and tubular, of which the anterior one is long and reaches beyond thecal margin, and the other is shorter and reaches to the margin or just below it.

Two cauline nematothecae on one surface of each internode of the hydrocladia-bearing tube, 1 near base on opposite side to apophysis, and 1 in axil of apophysis, both with 2 distal apertures. Two rows of small, single nematothecae on each peripheral tube.

Phylactocarps present in the older parts of the colony, 1 or a pair, on each hydrocladium arising one on each side of the median nematotheca of the first thecate internode. Phylactocarp unbranched, curving towards hydrocladium, bearing up to 8 pairs of nematothecae. Nematothecae decreasing in size from base to tip, basal ones stout and with 3 apertures—2 terminal and 1 on mesial surface, distal ones more slender and generally with 2 apertures—1 terminal and 1 on mesial surface.

One to four gonothecae (not previously described) borne on each phylactocarp, 1 between the members of each pair of nematothecae on surface facing hydrocladium. Gonotheca elongated, with more or less rectangular aperture near distal end facing towards phylactocarp.

*Measurements* (mm.)

Hydrocladium, first internode, length on posterior surface	..	0.13-0.18
remaining internodes, length on posterior surface	.. ..	0.33-0.42
Hydrotheca, depth to lateral tooth	.. .. .	0.23-0.29
width at mouth	.. .. .	0.15-0.19
Median nematotheca, length of free part	.. .. .	0.025-0.05
Lateral nematotheca, length	.. .. .	0.12-0.16
Gonotheca, length	.. .. . reaching	1.78
width	.. .. . reaching	0.68

*Remarks.* This endemic South African species occurs on the Agulhas Bank from 19°E. eastwards, extending round into Natal waters as far as 31°E. It occurs in depths ranging from 22 to 120 metres.

The plentiful material available makes possible the amplification of Stechow's description.

*Halicornaria arcuata* (Lamouroux), 1816

(Fig. 10 E)

*Halicornaria arcuata.* Millard, 1958, p. 218, fig. 15 D, E.

*Records.* South coast: MB 24U, 47G. KNY 30T, 71F. CPR 46A. SAMH 257, 300. SCD 20B, 84C, 117P, 169R.

*Description.* Rich colonies of unbranched stems reaching a maximum height of 12.8 cm.

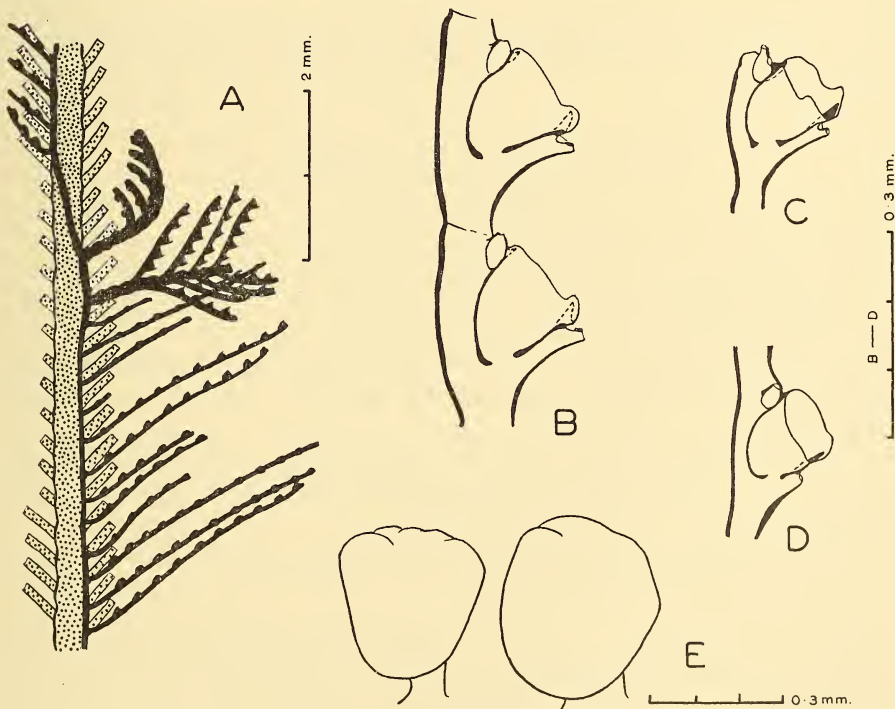


FIG. 10. *Halicornaria arcuata* (Lamx.).

A-D. Subsp. *epizootica* Millard.

A. Part of a colony from SCD 84D growing on the back of the stem of the normal subspecies. Hydrocladia of host cut off short.

B-D. Examples of reduced hydrothecae, B from SAMH 255, C and D from the upper and lower parts respectively of the same hydrocladium, from SAMH 355.

E. Subsp. *arcuata*, two gonothecae from MB 47G.

Hydrothecal margin with an anterior tooth, a posterior tooth and usually 3 pairs of lateral teeth. Of the latter the posterior pair is often poorly defined in the proximal region of the hydrocladium, and the middle pair in the distal region.

Median nematotheca usually closed at the tip, but often open in the proximal regions of the hydrocladia. Lateral nematothecae with 2 openings, of which 1 may be produced into a tube or into a long closed spine near the distal ends of the hydrocladia.

One stem bears several branching hydrocladia, possibly the result of injury. Each branch arises from the posterior surface of the hydrocladium and bears hydrothecae on the surface facing it.

Female gonothecae borne on the hydrocladial apophyses, 1 to each, and forming a double row on the anterior surface of the stem. Each is rounded below and truncated above, with the width slightly exceeding the height.

*Remarks.* Female gonophores are said to have been mentioned by Krauss (1837) as occurring in the axils of the hydrocladia, but this is the first description of these structures.

*Halicornaria arcuata epizootica* Millard, 1958

(Fig. 10 A-D)

*Halicornaria arcuata* var. *epizootica* Millard, 1958, p. 218, fig. 15 F.

*Records.* South coast: CPR 46C. SAMH 255. SCD 75B, 84D.

(Natal: SAMH 355.)

*Description.* Colonies epizootic on *Thecocarpus formosus* (Busk) and *Halicornaria arcuata* (n nominate subspecies); consisting of solitary hydrocladia and upright pinnate stems.

Pinnate stems reaching 12.5 mm. in length and bearing hydrocladia with as many as 14 hydrothecae. Solitary hydrocladia bearing as many as 13 hydrothecae.

The hydrothecae and nematothecae are very variable in structure, those on the distal ends of the hydrocladia of pinnate stems resembling those of the nominate subspecies (see Millard, 1958, fig. 15 F), but those on the proximal ends of the same hydrocladia and those on solitary hydrocladia being successively reduced towards the base of the colony (fig. 10 B-D). This reduction affects: (a) the paired lateral and the posterior thecal teeth which become 'smoothed out' until the margin is merely sinuated; (b) the median inferior nematotheca, which becomes shorter and no longer reaches the level of the thecal margin; thus it may have no free portion and only one opening; and (c) the lateral nematothecae which become reduced, with the two apertures combined into one.

Gonophores absent.



*Remarks.* The same modifications were present in the holotype (Millard, 1958), but owing to the poor condition of the colony and the covering of silt it was not possible to determine whether the condition was normal or due to damage.

*Halicornaria exserta* nov. sp.

(Fig. 11 A-E)

*Types and records.* Holotype: SAMH 169 (South African Museum registered number). Additional records: SCD 36N, 153Y. All from the south coast.

*Description* (holotype). One upright stem 8.3 cm. in length and bearing gonophores. Hydrorhiza of same diameter as stem, with thick perisarc. Stem un fascicled and unbranched. Proximal region (about 1.5 cm.) unsegmented and without hydrocladia or nematothecae. Middel region (about 1 cm.) divided by transverse nodes into rather irregular internodes which tend to become progressively shorter, and which bear 1 or 2 median nematothecae each. Distal region divided into short hydrocladia-bearing internodes by slightly oblique nodes which slope in opposite directions so that the side of an internode bearing the hydrocladium is longer than the other.

Hydrocladia alternate, borne on short apophyses of the stem, one to an internode, reaching a maximum length of 1.75 cm. Each divided into thecate internodes by transverse nodes. No internodal septa.

Hydrotheca expanding to margin, with adcauline wall free from internode for a short region distally, and with abcauline wall bent strongly forwards. Margin with 1 prominent anterior tooth, 3 pairs of well-defined lateral teeth, and a low, rounded, posterior tooth. Hydropore with margin inturned.

Median inferior nematotheca short (about  $\frac{1}{3}$  length of hydrotheca), adnate to hydrotheca for most of its length, with the terminal opening extending along all of the short free part, with no communication with thecal cavity. Lateral nematotheca ovoid, not reaching thecal margin or even beginning of free part, with 1 broad distal aperture. Cauline nematothecae similar to laterals: 1 inferior, 1 axillary anterior, and 1 axillary posterior.

Gonophores borne on hydrocladial apophyses and forming a double row down front of stem, bowl-shaped, with very short pedicels and broad, truncated, distal ends.

*Measurements.* See subspecies *epizootica*.

*Remarks.* This species is related to *H. sibogae* Billard 1918 and *H. expansa* Jäderholm 1903, but differs in the unbranched stem, shorter hydrothecae, the presence of a posterior marginal thecal tooth, and other minor details.

*Halicornaria exserta epizootica* nov. subsp.

(Fig. 11 F-H)

*Holotype:* SAMH 320 (South African Museum registered number). From south coast.

*Description.* Hydrorhiza epizootic on back of stem and hydrocladia of *Thecocarpus flexuosus* (Lamx.) *umbellatus*, giving off solitary hydrocladia and upright pinnate stems. Solitary hydrocladia arising alternately, reaching a maximum height of 0.5 cm. and bearing up to 10 hydrothecae, forming an angle of about 45° with hydrorhiza. The two rows of hydrocladia not in the same plane but shifted towards posterior surface of host. All hydrothecae facing same direction as those of host. Pinnate stems reaching a maximum height of 0.9 cm. and bearing alternate hydrocladia as in nominate subspecies.

Structural details similar to those of normal form except that the hydrocladial internodes tend to be longer and narrower and the hydrothecae are not so strongly bent forwards. Median and lateral nematothecae tending to be reduced in size towards the proximal region of solitary hydrocladia, so much so that the median nematotheca may not even reach the base of the hydrotheca.

Gonophores absent.

*Measurements* (mm.)

	<i>Halicornaria</i>		subsp.
	<i>exserta</i>		<i>epizootica</i>
	SAMH 169	SCD 36N	SAMH 320
Hydrocladium, internode length ..	0.24-0.39	0.29-0.37	0.33-0.45
diameter at distal end ..	0.15-0.23	0.19-0.26	0.09-0.15
Hydrotheca, length adcauline ..	0.24-0.34	0.30-0.36	0.25-0.35
length adcauline, free part ..	0.03-0.06	0.03-0.06	0.04-0.08
length abcauline ..	0.28-0.34	0.34-0.36	0.22-0.33
diameter at margin ..	0.22-0.27	0.22-0.25	0.18-0.26
Median nematotheca, length ..	0.10-0.12	0.10-0.12	0.06-0.09
Lateral nematotheca, length ..	0.09-0.12	0.10-0.12	0.05-0.09
Gonotheca, length ..	0.26		
maximum diameter ..	0.42		

*Remarks.* This subspecies has a similar growth-form to that of *H. arcuata epizootica*, and shows the same tendency for reduction of nematothecae in solitary hydrocladia.

→

A-E. Subsp. *arcuata*.

A, B. The stem, and the gonotheca, from the holotype, SAMH 169.

C. Anterior view of stem showing the cauline nematothecae and scars for gonothecae (striped), from SCD 36N.

D, E. Anterior and lateral views respectively of part of a hydrocladium from the holotype.

F-H. Subsp. *epizootica*, from the holotype SAMH 320.

F. Part of a colony on the back of a stem of *Thecocarpus flexuosus umbellatus* showing solitary hydrocladia and 2 pinnate stems. Hydrocladia of host cut off short.

G, H. Anterior and lateral views respectively of part of a hydrocladium.

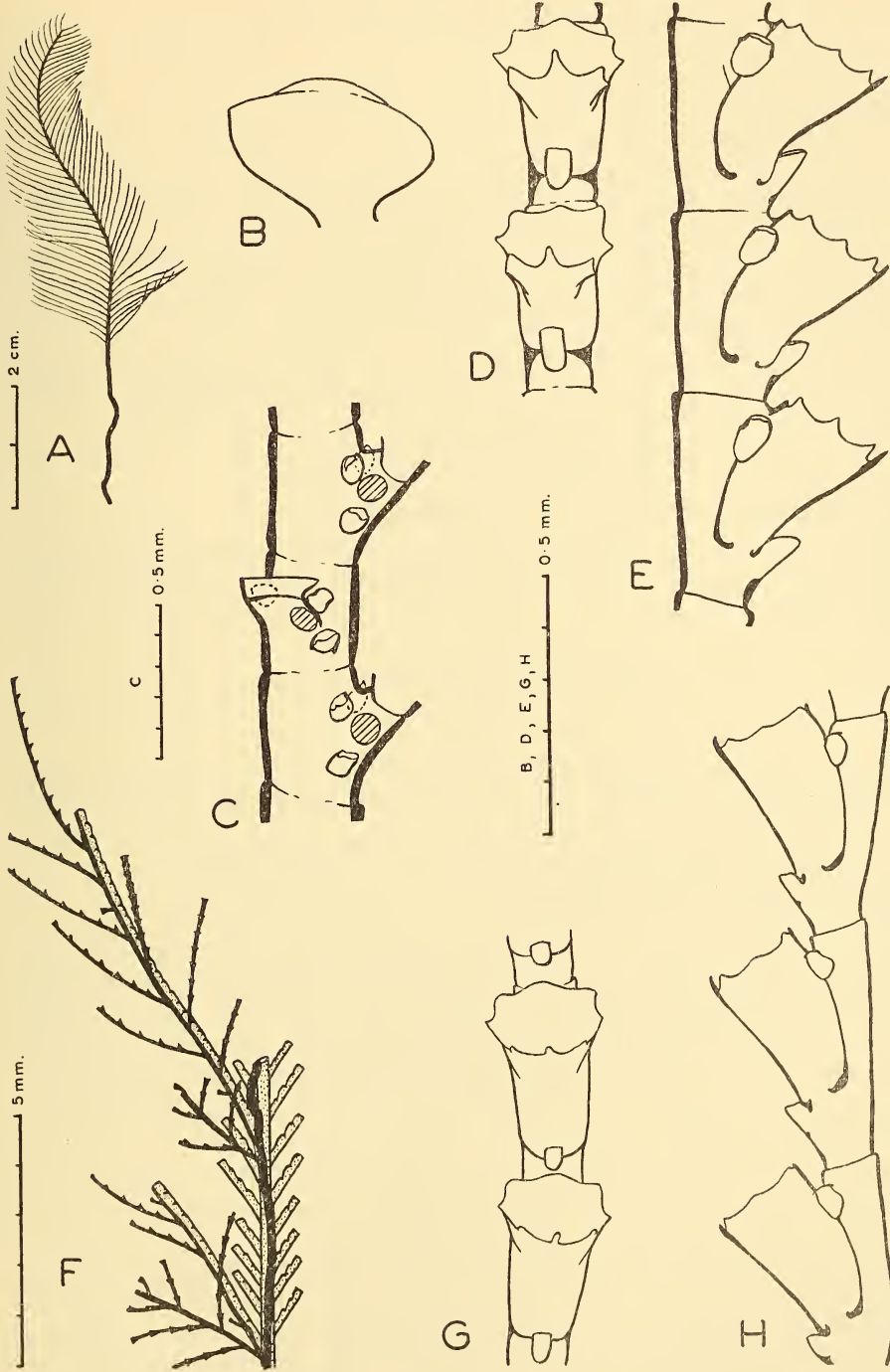


FIG. 11. *Halicornaria exserta* n. sp.

*Halicornaria ferlusi* Billard, 1901

*Halicornaria Ferlusi*. Billard, 1907, p. 370, pl. 25 (fig. 8), fig. 14.

*Records*. South coast: CPR 46B.

(Additional from Natal: NAD 1R.)

*Description*. Stem reaching a maximum height of 3 cm. Structural details exactly similar to those described by Billard.

Male gonothecae present (in NAD 1R only), similar to those described by Jarvis (1922) for var. *brevis*, except that there is no aperture, and no 'refractive discs' are visible. Each containing one gonophore.

*Remarks*. This species is known only from Madagascar, and var. *brevis* Jarvis from Wasin, East Africa. This is the first record from South Africa.

*Lytocarpus filamentosus* (Lamarck), 1816

*Lytocarpus filamentosus*. Millard, 1957, p. 241. Millard, 1958, p. 220.

*Records*. South coast: MB 15A, 24S, 26D, 39V, 47J, 52B, 55E, 58B, 70F, 72F, 83A. LIZ 7M, 13B, 27B. CPR 46E. TRA 42B. SAMH 150, 259. SCD 84F, 94E, 117Q, 169T.

*Thecocarpus flexuosus* (Lamx.), 1816

(Fig. 12)

*Aglaophenia flexuosa* Lamouroux, 1816, p. 167. Kirchenpauer, 1872, p. 25.

*Aglaophenia plumifera* Kirchenpauer, 1872, p. 31, pl. 1 (fig. 6), pl. 3 (fig. 6). Stechow, 1923b, p. 255, fig. K<sup>1</sup>.

*Thecocarpus giardi* Billard, 1907, p. 381, pl. 25 (figs. 9-10), pl. 26 (figs. 11-17), fig. 21. Vervoort, 1946, p. 335. Millard, 1957, p. 240. Millard, 1958, p. 221, fig. 16 A-C.

*Thecocarpus flexuosus*. Billard, 1909, p. 330.

? *Aglaophenia* (?) *bifida* Stechow, 1923a, p. 117. Stechow, 1925, p. 515, fig. 53.

*Diagnosis*. Stem thick, woody and fascicled, subdividing and giving rise to 'branches' formed from sympodially branching pinnae. Each pinna giving rise to a subsequent one from its anterior surface, the whole 'branch' twisted in a spiral manner and with a geniculate main axis formed from the proximal parts of successive pinnae. Each pinna consisting of a basal part bearing 1 large median nematotheca on each internode, and a distal part bearing 1 hydrocladium and 3 nematothecae on each internode. Hydrocladia alternately arranged, divided into internodes by slightly oblique nodes, each internode typically with 2 internodal septa. Hydrotheca adnate, deep, expanding to margin, with an intrathecal septum near base, and with 9 marginal teeth (1 median and 4 pairs lateral). Median nematotheca short, reaching approximately to level of intrathecal septum, with about  $\frac{1}{4}$  length free. Lateral nematotheca reaching to thecal margin. Corbula replacing hydrocladium, with pedicel of 1-6 thecate internodes, elongated, closed. Each rib of corbula bearing a series of nematothecae along outer edge, a hydrotheca near the base, and a crested



process of variable length below it. Base of corbula with a rounded projection facing towards pedicel.

*Remarks.* This species is endemic to southern Africa, where it appears to be widely distributed around the coast extending as far north as Madagascar on the east. It is extremely variable in its growth form and in its microscopic structure, necessitating the establishment of a number of subspecies. The characters of a subspecies are generally constant in a sample from a particular locality, though the occurrence of occasional intergrading specimens shows that all the material is conspecific. The species can always be recognized by the spiral arrangement of the pinnae, by the method of branching (described in detail by Billard (1907), and Millard (1958) under the name of *T. giardi*) and by the structure of the corbula.

It has already been shown (Millard, 1958) that the keel-like ridge along the abcauline wall of the hydrotheca (i.e. the outer point of the median tooth) may be hollow or solid. Material from the Agulhas Bank now shows that this ridge may be very poorly developed (so that the outer point of the median tooth may be shorter than the inner one), or absent altogether. Material with the latter arrangement has been placed in a separate subspecies, but amongst its rare hydrothecae occur showing the beginnings of a ridge, i.e. the first bifurcation of the median tooth. A series of hydrothecae can thus be arranged (fig. 12, C–M) showing the progressive development of this structure culminating in the large hollow spine of subsp. *flexuosus* and subsp. *umbellatus*.

The structure of the hydrotheca in the 'keelless' variety (fig. 12 C) closely resembles Stechow's diagram (1923b, fig. K<sup>1</sup>) of Kirchenpauer's type material of *Aglaophenia plumifera*. The preserved material of the type of *A. plumifera* has unfortunately been lost, but Stechow states that the pinnae arise alternately and Kirchenpauer that they arise irregularly. Probably both are correct, for a series of alternate pinnae twisted in a spiral manner would give an irregular appearance. I have seen whole mounts of *A. plumifera* prepared by Stechow (loaned from the Munich Museum) including a complete pinna, and this shows absolute agreement with the 'keelless' variety including the presence of hinge-joints and the large median nematothecae on the internodes below them. The two are thus considered to be synonymous, and are given the status of a subspecies, under Kirchenpauer's name *plumiferus*.

*Thecocarpus flexuosus plumiferus* (Kirch.), 1872

(Fig. 12 C, D)

*Aglaophenia plumifera* Kirchenpauer, 1872, p. 31, pl. 1 (fig. 6), pl. 3 (fig. 6). Stechow, 1923b, p. 255, fig. K<sup>1</sup>.

*Diagnosis.* Pinnae arranged in a loose to tight spiral around a 'main axis' which is seldom definitely geniculate. Intervals between pinnae regular and approximately equal. Basal and distal regions of pinnae separated by hinge-joints.

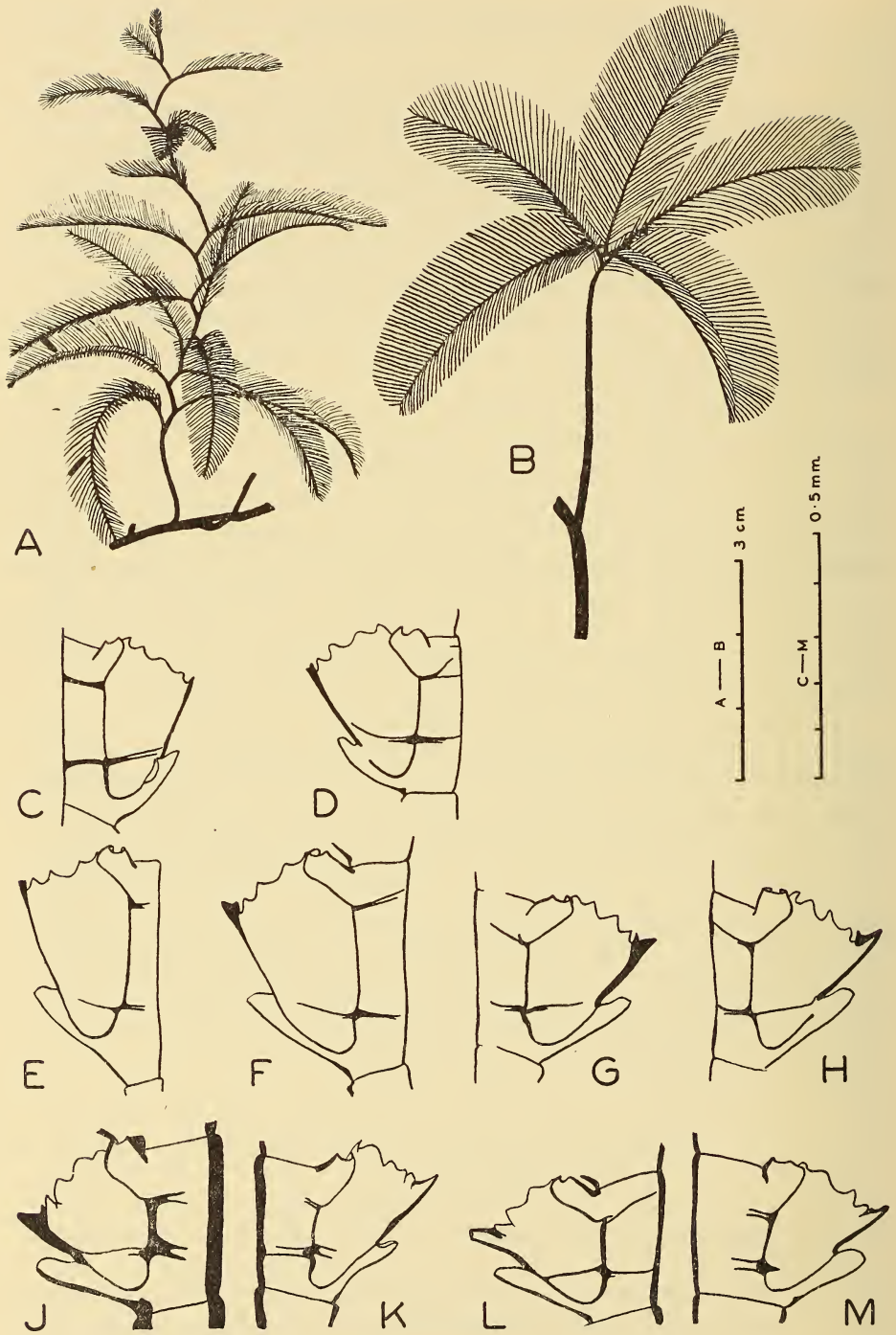


FIG. 12. *Thecocarpus flexuosus* (Lamx.).

Hydrocladia short, 3–6 mm. in length. Hydrotheca with no abcauline ‘keel’, but abcauline wall somewhat thickened near margin. First and second pairs of marginal thecal teeth not bifid.

*Records.* South coast: SCD 36L, 79H, 104G. SAMH 353.

*Description.* One of the colonies (SAMH 353) very large, reaching 46 cm., and with base of stem 12 mm. thick. The spiral twisting of the ‘branches’ is sometimes difficult to recognize in the lower, heavily fascicled regions of the colony, where also the geniculate appearance is lost. It is, however, quite distinct in the distal regions.

Unlike other subspecies a number of internodes below the hinge-joints may bear hydrocladia. Hinge-joints distal to origin of next pinna.

Corbulae sometimes very long, reaching a maximum length of 20 mm. and bearing up to 39 pairs of ribs.

See also p. 313.

*Measurements.* See under subsp. *umbellatus*.

*Thecocarpus flexuosus flexuosus* (Lamx.) 1816

(Fig. 12 A, J–L)

*Thecocarpus giardi* Billard, 1907, pp. 381–385, pl. 25 (fig. 9), pl. 26 (figs. 11–16), fig. 21. Vervoort, 1946, p. 335. Millard, 1957, p. 240. Millard, 1958, p. 221, fig. 16 A.  
? *Aglaophenia*(?) *bifida* Stechow, 1923a, p. 117. Stechow, 1925, p. 515, fig. 53.

*Diagnosis.* Pinnae arranged in a loose to tight spiral, around a geniculate ‘main axis’. Intervals between pinnae regular and approximately equal. No hinge-joints. Hydrocladia short, about 6 mm. in length. Hydrotheca with abcauline ‘keel’ extended beyond median tooth as a hollow spine. First and second pairs of marginal thecal teeth typically bifid.

*Records.* South coast: KNY 30R.

←

A. Subsp. *flexuosus*. Part of colony showing a spirally twisted ‘branch’ and its pinnae, from KNY 30R.

B. Subsp. *umbellatus* n. subsp. Part of colony showing one ‘branch’, from the holotype SCD 36M. C–M. Selected hydrothecae showing variations, particularly of the anterior ‘keel’.

C, D. Subsp. *plumiferus* (Kirch.), a typical hydrotheca with no ‘keel’ from SCD 36L, and a rare hydrotheca with a slight indication of a ‘keel’, from SAMH 353.

E–H. Subsp. *solidus* Millard, a rare terminal hydrotheca with the ‘keel’ barely distinct from the median tooth, from TRA 92C; a hydrotheca with well-developed ‘keel’ but restricted abcauline thickening, from TRA 92C; a typical hydrotheca with abcauline thickening reaching to base, from AFR 1028A (described by Millard 1958); and a rare hydrotheca with a hollow ‘keel’, from AFR 1028A (described by Millard, 1958).

J–L. Subsp. *flexuosus*, a rare hydrotheca with a solid ‘keel’, from PF 396A (described by Millard, 1957); a typical hydrotheca with a hollow ‘keel’ and a bifid lateral tooth, from PF 12308B (described by Millard, 1958); and a hydrotheca with an extra long ‘keel’ pierced at distal end, from KNY 30R.

M. Subsp. *umbellatus* n. subsp., a typical hydrotheca, very similar to K except that the lateral teeth are not bifid, from the holotype SCD 36M.



*Thecocarpus flexuosus solidus* Millard, 1958

(Fig. 12 E-H)

*Thecocarpus giardi* Billard, var. *solidus* Millard, 1958, p. 222, fig. 16 B, C.

*Diagnosis.* Pinnae arranged in a loose to tight spiral around a geniculate 'main axis'. Intervals between pinnae regular and approximately equal. Basal and distal regions of pinnae separated by hinge-joints. Hydrocladia short, about 6 mm. in length. Hydrotheca with abcauline 'keel' forming a solid spine. First and second pairs of marginal thecal teeth not bifid.

*Records.* South coast: TRA 92C. SCD 29F, 36K, 84E. SAMH 190.

*Remarks.* One of these samples (TRA 92C) shows characters tending towards subsp. *plumiferus* (fig. 12 E, F). The abcauline 'keel' of the hydrotheca is poorly developed and restricted to the margin, the typical chitinous thickening which usually extends down to the junction of the median nematotheca being absent.

In the same sample there is a number of branching hydrocladia. A hydrocladium may produce as many as 7 subsidiary hydrocladia, and in rare cases the subsidiary hydrocladia branch too. The hydrocladial internodes which give rise to branches are without hydrothecae and similar in every respect to those of the distal region of the pinna.

*Thecocarpus flexuosus umbellatus* nov. subsp.

(Fig. 12 B, M)

*Diagnosis.* Pinnae (usually 5) arranged in a very close spiral forming an umbel-like cluster at the end of a long 'stem' formed by the proximal region of the first pinna. Hinge-joints present on first pinna only. Hydrocladia long (reaching 15 mm.). Hydrotheca with abcauline 'keel' extending beyond median tooth as a hollow spine. First and second pairs of marginal thecal teeth not bifid.

*Types and records.* Holotype: SCD 36M (South African Museum registered number = SAMH 363).

Further records, south coast: SCD 33B, 117M, 153C. SAMH 168, 258, 286, 305, 319.

*Description of holotype.* Colony reaching a height of 12.3 cm. Stem fascicled and dividing near base to give the branching pinnae or 'branches'.

First pinna with basal part long (several cm.), usually lightly fascicled (though the peripheral tubes do not extend on to the distal part), divided into internodes each with 1 large median nematotheca with several (3-6) openings. This part terminated by 2 oblique hinge-joints, the internode between them bearing 2 large median nematothecae. Distal part bearing 2 hydrocladia on the first internode and 1 on each of the rest, and giving origin to the next pinna from the anterior surface of the first to fifth internode.



Second pinna facing towards the first, seated on a short apophysis, with no basal part and no hinge-joints, consisting only of hydrocladia-bearing internodes, and giving rise to the third pinna from its second internode.

Subsequent pinnae (usually 3) as second, and the 'main axis' (formed by the origins of consecutive pinnae) twisted in a spiral manner.

Hydrocladia alternate, long, reaching 15 mm. Hydrotheca similar in structure to subsp. *flexuosus* except that the first and second lateral teeth are not bifid. Hydrothecal depth and hydrocladial internode length varying from that found in subsp. *flexuosus* to that in subsp. *perarmatus* Billard 1907.

Corbula (not from holotype) with up to 20 ribs and reaching 12 mm. in length. In some cases there is an enormous development of the terminal parts of the ribs and the 'crests' arising from their bases, giving to the whole a spidery appearance similar to that sometimes encountered in *T. formosus*.

*Measurements* (mm.)

	subsp. <i>umbellatus</i>	subsp. <i>plumiferus</i>	<i>Aglaophenia</i> <i>plumifera</i> *
Hydrocladium, internode length ..	0.19-0.32	0.28-0.37	0.28-0.30
Hydrotheca, height (to tip of inner point of median tooth) .. .. .	0.22-0.30	0.23-0.31	0.24-0.27
diameter at margin (inside) ..	0.16-0.21	0.14-0.205	0.13-0.18
Median nematotheca, length .. .. .	0.14-0.24	0.13-0.21	0.15-0.18
length of free part .. .. .	0.03-0.06	0.03-0.04	0.03-0.04
Corbula, length .. .. . reaching	8.50	20.00	
diameter .. .. . reaching	1.40	1.32	

*Remarks.* Although the arrangement described above is remarkably constant, variations do occur (e.g. longer intervals between origins of pinnae) which show that this form is not worthy of specific rank. The top part of the colony breaks easily at the hinge-joints and many specimens brought up by the dredge consist of crowns only. The pinnae often terminate in long tendrils.

*Thecocarpus formosus* (Busk), 1851

*Thecocarpus formosus.* Millard, 1958, p. 221. Millard, 1961, p. 206.

*Records.* South coast: MB 24Y, 47F. KNY 30S, 57K, 71A (recorded by Day, Millard and Harrison, 1952). LIZ 7N, 27A. BMR 12K. L 55. CPR 46D. SCD 20A, 29E, 36H, 50B, 75A, 84B, 94D, 117N, 169S. SAMH 200, 210, 254, 285, 299.

\* Measurements from Stechow's slides borrowed from the Munich Museum.

## SUMMARY

A total of 35 species of plumularian hydroids is described from the south and west coasts of South Africa. Among these are 4 new species and 4 new records from South Africa.

A new subfamily, the Halopterinae, is created for genera with cauline hydrothecae and related forms, and possible evolutionary trends within it discussed.

The genus *Antennopsis* is sunk in the synonymy of *Nemertesia*, and a new genus, *Corhiza*, created. The genus *Paragattya* is sunk in the synonymy of *Gattya*.

Various problems of nomenclature are dealt with, including that of *Thecocarpus flexuosus*, and the subspecies of the latter are revised.

## REFERENCES

- ALLMAN, G. J. 1877. Report on the Hydroida collected during the exploration of the Gulf Stream by L. F. De Pourtalès, assistant United States Coast Survey. *Mem. Mus. comp. Zool. Harv.* **5**, 1-66.
- ALLMAN, G. J. 1883. Report on the Hydroida dredged by H.M.S. *Challenger* during the years 1873-76. Part I. Plumularidae. *Challenger Rep. Zool.* **7**, 1-54.
- ALLMAN, G. J. 1886. Description of Australian, Cape and other Hydroida, mostly new, from the collection of Miss H. Gatty. *J. Linn. Soc. (Zool.)* **19**, 132-161.
- BALE, W. M. 1884. Catalogue of the Australian hydroid zoophytes. Sydney: Australian Museum.
- BALE, W. M. 1888. On some new and rare Hydroida in the Australian Museum collection. *Proc. Linn. Soc. N.S.W. (2)*, **3**, 745-799.
- BALE, W. M. 1914a. Report on the Hydroida collected in the Great Australian Bight and other localities. *Zool. Res. Fish. Exp. 'Endeavour'* **2**, 3-62.
- BALE, W. M. 1914b. Report on the Hydroida collected in the Great Australian Bight and other localities. Part II. *Zool. Res. Fish. Exp. 'Endeavour'* **2**, 166-188.
- BALE, W. M. 1915. Report on the Hydroida collected in the Great Australian Bight and other localities. Part III. *Zool. Res. Fish. Exp. 'Endeavour'* **3**, 241-336.
- BEDOT, M. 1921. Notes systématiques sur les plumularides. 2me Partie. *Rev. suisse Zool.* **29**, 1-40.
- BEDOT, M. 1923. Notes systématiques sur les plumularides. 3me Partie. *Rev. suisse Zool.* **30**, 213-243.
- BILLARD, A. 1906. Hydroïdes. *Expéd. sci. 'Travailleur' et du 'Talisman'* **8**, 153-244.
- BILLARD, A. 1907. Hydroïdes de Madagascar et du sud-est de l'Afrique. *Arch. Zool. exp. gén.* (4), **7**, 335-396.
- BILLARD, A. 1909. Revision des espèces types d'hydroïdes de la collection Lamouroux, conservée à l'Institut botanique de Caen. *Ann. Sci. nat. zool.* (9), **9**, 307-336.
- BILLARD, A. 1910. Revision d'une partie de la collection des hydroides du British Museum. *Ann. Sci. nat. zool.* (9), **11**, 1-67.
- BILLARD, A. 1913. Les hydroïdes de l'expédition du Siboga. I. Plumulariidae. *Siboga Exped. monogr.* **7a**, 1-115.
- BILLARD, A. 1918. Notes sur quelques espèces d'hydroïdes de l'expédition du 'Siboga'. *Arch. Zool. exp. gén.* **57**, 21-27.
- BRIGGS, E. A. 1914. Notes on Tasmanian Hydrozoa. *J. roy. Soc. N.S.W.* **48**, 302-318.
- BROCH, H. 1914. Hydrozoa benthonica. *Beitr. Meeresfauna Westafri.* **1**, 19-50.
- BROCH, H. 1933. Zur Kenntnis der adriatischen Hydroïdenfauna von Split. *Skr. norske Vidensk.-Akad., Mat.-natur. Kl.* **1933**, no. 4, 1-115.
- DAY, J. H., MILLARD, N. A. H. & HARRISON, A. D. 1952. The ecology of South African estuaries. Part III. Knysna: a clear, open estuary. *Trans. roy. Soc. S. Afr.* **33**, 367-413.
- DAY, J. H. 1959. The biology of Langebaan Lagoon: a study of the effect of shelter from wave action. *Trans. roy. Soc. S. Afr.* **35**, 475-547.

- EYRE, J., BROEKHUYSEN, G. J. & CRICHTON, M. I. 1938. The South African intertidal zone and its relation to ocean currents. VI. The East London district. *Ann. Natal Mus.* **9**, 83-111.
- HINCKS, T. 1868. *A history of the British hydroid zoophytes*. 2 vols. London.
- JÄDERHOLM, E. 1896. Ueber aussereuropäische Hydroiden des zoologischen Museums der Universität Upsala. *Bih. svensk. VetenskAkad. Handl.* **21**, 3-20.
- JÄDERHOLM, E. 1903. Aussereuropäische Hydroiden im schwedischen Reichsmuseum. *Ark. Zool.* **1**, 259-312.
- JÄDERHOLM, E. 1919. Zur Kenntnis der Hydroidenfauna Japans. *Ark. Zool.* **12**, no. 9, 1-34.
- JARVIS, F. E. 1922. The hydroids from the Chagos, Seychelles and other islands and from the coasts of British East Africa and Zanzibar. *Trans. Linn. Soc. Lond. Zool.* (2), **18**, 331-360.
- KIRCHENPAUER, G. H. 1872. Ueber die Hydroidenfamilie Plumularidae, einzelne Gruppen derselben und ihre Fruchthälter. I. *Aglaophenia* Lx. *Abh. Naturw. Hamburg* **5**, 1-52.
- KIRCHENPAUER, G. H. 1876. Ueber die Hydroidenfamilie Plumularidae, einzelne Gruppen derselben und ihre Fruchthälter. II. *Plumularia* und *Nemertesia*. *Abh. Naturw. Hamburg* **6**, 1-59.
- Lamouroux, J. V. F. 1816. *Histoire des polypiers coralligènes flexibles, vulgairement nommés zoophytes*. Caen.
- Leloup, E. 1939. Notes sur quelques hydrozoaires exotiques. *Bull. Mus. Hist. nat. Belg.* **15**, 1-19.
- MARKTANNER-TURNERETSCHER, G. 1890. Die Hydroiden des k.k. naturhistorischen Hofmuseums. *Ann. naturh. (Mus.) Hofmus. Wien* **5**, 195-286.
- MILLARD, N. A. H. 1957. The Hydrozoa of False Bay, South Africa. *Ann. S. Afr. Mus.* **43**, 173-243.
- MILLARD, N. A. H. 1958. Hydrozoa from the coasts of Natal and Portuguese East Africa. Part I. Calyptoblastea. *Ann. S. Afr. Mus.* **44**, 165-226.
- MILLARD, N. A. H. 1959a. Hydrozoa from the coasts of Natal and Portuguese East Africa. Part II. Gymnoblastea. *Ann. S. Afr. Mus.* **44**, 297-313.
- MILLARD, N. A. H. 1959b. Hydrozoa from ships' hulls and experimental plates in Cape Town docks. *Ann. S. Afr. Mus.* **45**, 239-256.
- MILLARD, N. A. H. 1961. A report on Busk's collection of South African hydroids. *Ann. Mag. nat. Hist.* (13), **4**, 203-208.
- NUTTING, C. C. 1900. American hydroids. Part I. The Plumularidae. *Spec. Bull. U.S. nat. Mus.* **4**, 1-285.
- RITCHIE, J. 1907. The hydroids of the Scottish National Antarctic Expedition. *Trans. roy. Soc. Edinb.* **45**, 519-545.
- RITCHIE, J. 1909. Supplementary report on the hydroids of the Scottish National Antarctic Expedition. *Trans. roy. Soc. Edinb.* **47**, 65-101.
- STECHOW, E. 1912. Hydroiden der Münchener zoologischen Staatssammlung. *Zool. Jb.* **32**, 333-378.
- STECHOW, E. 1923a. Ueber Hydroiden der deutschen Tiefsee-Expedition, nebst Bemerkungen über einige andre Formen. *Zool. Anz.* **56**, 97-119.
- STECHOW, E. 1923b. Zur Kenntnis der Hydroidenfauna des Mittelmeeres, Amerikas und anderer Gebiete. II Teil. *Zool. Jb.* **47**, 29-270.
- STECHOW, E. 1925. Hydroiden der deutschen Tiefsee-Expedition. *Wiss. Ergebn. 'Valdivia'* **17**, 383-546.
- STEPHENSON, T. A., STEPHENSON, A. & DU TOIT, C. A. 1937. The South African intertidal zone and its relation to ocean currents. I. A temperate Indian Ocean shore. *Trans. roy. Soc. S. Afr.* **24**, 341-382.
- STEPHENSON, T. A., STEPHENSON, A. & BRIGHT, K. M. F. 1938. The South African intertidal zone and its relation to ocean currents. IV. The Port Elizabeth district. *Ann. Natal Mus.* **9**, 1-19.
- TOTTON, A. K. 1930. Coelenterata. Part V. Hydroida. *Nat. Hist. Rep. Terra Nova Exped.* **5**, 131-252.
- VERVOORT, W. 1946. Exotic hydroids in the collections of the Rijksmuseum van Natuurlijke Historie and the Zoological Museum at Amsterdam. *Zool. Meded.* **26**, 287-351.
- VERVOORT, W. 1959. The Hydroida of the tropical west coast of Africa. *Atlantide Rep.* **5**, 211-325.
- WARREN, E. 1908. On a collection of hydroids, mostly from the Natal coast. *Ann. Natal Mus.* **1**, 269-355.
- WARREN, E. 1914. On the development of the planula in a certain species of plumularian hydroid. *Ann. Natal Mus.* **3**, 83-102.