J. Mar. Biol. Ass. U.K. (2004), **84**, 29–36
Printed in the United Kingdom

Two new Antarctic species of *Schizotricha* (Cnidaria: Hydrozoa: Leptothecata) from US Antarctic expeditions

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Two species of the genus *Schizotricha* new to science (*Schizotricha crassa* sp. nov. and *S. southgeorgiae* sp. nov.) have been studied. Both species are described and figured and their systematic position amongst the remaining species of the genus is discussed. The material was collected during the United States Antarctic Research Programme (USARP) with RV 'Eltanin' and RV 'Islas Orcadas'. A comparative table listing the main features and distribution of the known species of *Schizotricha*, together with an identification key, are presented.

INTRODUCTION

Schizotricha Allman, 1883 is one of the hydroid genera best represented in the Antarctic benthic ecosystem. Though also present outside Antarctic waters (there are four known species in North Atlantic waters), the genus is mainly composed of Antarctic species (nine Antarctic and sub-Antarctic species) (cf. Peña Cantero & Vervoort, 1999). The study carried out during the last few years has made it possible to increase considerably the list of known Antarctic species of the genus (cf. Peña Cantero & Vervoort, 1996; Peña Cantero et al., 1996; Peña Cantero, 1998). In this paper we add to that list by describing two species new to science (*Schizotricha crassa* sp. nov. and *S. southgeorgiae* sp. nov.). These species were present in the huge leptolid material of the United States Antarctic Research Programme (USARP), collected during many years by several United States Antarctic expeditions. The study carried out with this collection has already been the basis for several publications concerning the genera *Oswaldella* Stechow, 1919 and *Staurotheca* Allman, 1888 (cf. Peña Cantero & Vervoort, 1998, 2003, in press).

MATERIALS AND METHODS

The material examined originates from West Antarctic and was collected during the USARP by RV 'Eltanin' and RV 'Islas Orcadas'.

Andriashev (1964) and Picken (1985) are followed in considering the northern limit of the pack ice as the most valid limit for the Antarctic benthic ecosystem.

The type series is preserved in the collections of the National Museum of Natural History, Smithsonian Institution, Washington, DC, USA (USNM) and in the collections of the National Museum of Natural History, Leiden, The Netherlands (RMNH). Additional material has been deposited in the Museo Nacional de Ciencias Naturales (MNCN) of Madrid, Spain. The collection numbers are given in the text.

Station list

12/1003, RV 'Eltanin', 15 March 1964, 62°41′S 54°43′W (north-east of Joinville Island, Antarctic Peninsula), 210–220 m. *Schizotricha crassa* sp. nov.

22/1536, RV 'Eltanin', 8 February 1966, 54°29′–54°31′S 39°22′–39°19′W (off west tip of South Georgia, Scotia Sea), 659–686 m. *Schizotricha southgeorgiae* sp. nov.

575/061, RV 'Islas Orcadas', 30 May 1975, 56°42.3′S 27°00.4′W (Visokoi Island, South Sandwich Islands, Scotia Sea), 93–121 m. *Schizotricha crassa* sp. nov.

575/070, RV 'Islas Orcadas', 2 June 1975, 56°23.8′S 27°24.6′W (Visokoi Island, South Sandwich Islands, Scotia Sea), 161–210 m. *Schizotricha crassa* sp. nov.

575/074, RV 'Islas Orcadas', 3 June 1975, 56°12.0′S 27°23.9′W (Zavodovski Island, South Sandwich Islands, Scotia Sea), 179–238 m. *Schizotricha crassa* sp. nov.

7/499, RV 'Eltanin', 20 February 1963, 62°06′S 45°08′–45°10′W (south of South Orkney Islands), 485 m. *Schizotricha crassa* sp. nov.

RESULTS AND DISCUSSION

Family HALOPTERIDIDAE Millard, 1962
Genus *Schizotricha* Allman, 1883

Remarks

We have here adopted the diagnosis of the genus presented by Peña Cantero & Vervoort (1999). The genus presently includes the following species:

Schizotricha anderssoni Jäderholm, 1904
Schizotricha crassa sp. nov.
Schizotricha dichotoma Nutting, 1900
Schizotricha falcata Peña Cantero, 1998
Schizotricha frutescens (Ellis & Solander, 1786) (=*Sertularia frutescens* Ellis & Solander, 1786)
Schizotricha glacialis (Hickson & Gravely, 1907) (=*Plumularia glacialis* Hickson & Gravely, 1907)
Schizotricha jaederholmi Peña Cantero & Vervoort, 1996

Schizotricha multifurcata Allman, 1883
Schizotricha nana Peña Cantero, Svoboda & Vervoort, 1996
Schizotricha profunda (Nutting, 1900) (=*Plumularia profunda* Nutting, 1900)
Schizotricha southgeorgiae sp. nov.
Schizotricha turqueti Billard, 1906
Schizotricha unifurcata Allman, 1883
Schizotricha variabilis (Bonnevie, 1899) (=*Plumularia variabilis* Bonnevie, 1899)
Schizotricha vervoorti Peña Cantero, 1998

Schizotricha crassa sp. nov.
(Figure 1, Tables 1 & 2)

Material examined

Type material: 575/070, two broken stems (largest fragment ~130 mm long), with gonothecae (holotype, USNM 1012900; paratype, RMNH-Coel. 30916).

Other material: 12/1003, one stem fragment ~50 mm long, with gonothecae (USNM 1012901); 575/061, numerous unbranched stems up to 220 mm high, with gonothecae (USNM 1012902, RMNH-Coel. 30915, MNCN 2.03/313); 575/074, one basally truncated stem ~150 mm high (USNM 1012903); 7/499, several stem fragments up to 105 mm long, with gonothecae (USNM 1012904, RMNH-Coel. 30917).

Description

Colonies composed of polysiphonic, unbranched stems up to 220 mm high. Stems consisting of eccentric main tube divided into internodes provided with hydro- and nematothecae, and several undivided tubes carrying only nematothecae.

Each stem internode provided with an apophysis, a small hydrotheca at axil between apophysis and internode and four to seven nematothecae: two flanking hydrothecal apertures and two to five infrathecal nematothecae; occasionally with extra suprathecal nematotheca (Figure 1B).

Cauline apophyses alternately arranged in two planes forming an acute angle (up to 90°). Cauline apophyses supporting hydrocladia. Without node between cauline apophyses and hydrocladia (Figure 1B); occasionally, however, with distinct separation and then cauline apophyses with 2–3 nematothecae and first hydrocladial internode with two infrathecal nematothecae.

Hydrocladia divided into internodes with strong development of perisarc (Figure 1A). Up to 12th order hydrocladia present. Branching taking place at first internode of successive hydrocladia (Figure 1A). Hydrocladial apophyses forming a wide angle with internode, initially of ~90° (Figure 1C) and slightly decreasing in the lower-order hydrocladia (Figure 1A). Consequently, hydrocladial structure strongly arched (Figure 1A); direction of curvature contrary to that present in other species of the genus (e.g. *S. turqueti*). Hydrocladia overlapping and standing on the same side of stem because of the acute angle formed by cauline apophyses and because the hydrocladial arching is to the same point. Hydrocladia with up to 20 hydrothecae.

Forked hydrocladial internodes (Figure 1C) provided with apophysis, supporting lower-order hydrocladium and with two to three nematothecae, a small hydrotheca at axil of branching, and from four to five additional nematothecae of which two flanking hydrothecal apertures and two to three under hydrotheca (occasionally reduced to a single infrathecal nematotheca).

Without intermediate ahydrothecate internode following cauline or hydrocladial apophyses (Figure 1A).

Unforked hydrocladial internodes (Figure 1D,E) with hydrotheca at half its length and three to four nematothecae: two flanking hydrothecal apertures and one (12/1003 and 7/499) or two at approximately same level (575/061 and 575/070) under hydrotheca (in 575/74 one or two such nematothecae present). Sometimes, as in the material from 12/1003, double internodes present (Figure 1F), provided with two hydrothecae, each with the typical set of nematothecae: two flanking hydrothecal apertures and one infrathecal nematotheca.

Hydrotheca deep, cup-shaped, with strongly developed perisarc (Figure 1A,D–F). Length increasing along hydrocladium; for example, length of abcauline wall may be 280 μm in first unforked hydrocladial internode and ~416 μm in ninth. Adcauline wall completely adnate to internode.

Gonothecae inserted on small apophyses (~100 μm long) between hydrotheca and infrathecal nematothecae of hydrocladial internodes. Presumed female gonothecae (Station 12/1003) fusiform and provided with a subterminal, kidney-shaped aperture and a basal chamber, delimited by a circular diaphragm and provided with three nematothecae (Figure 1H). Presumed male gonothecae scarce; gonotheca also fusiform, long and thin, provided with a subterminal, circular aperture and a basal chamber also delimited by a circular diaphragm and provided with two nematothecae (Figure 1I).

Remarks

Schizotricha crassa sp. nov. is clearly distinguishable from the remaining species of the genus by the absence (usually) of a node between cauline apophyses and hydrocladia, the strong development of perisarc, the angle of ~90° formed by the cauline apophyses, the high degree of hydrocladial branching, the strongly arched structure of the hydrocladia which, due also to the acute angle formed by the cauline apophyses, stand on the same side of the stem, and the shape of the male gonothecae.

Schizotricha frutescens, a non-Antarctic species of the genus, is the single known species also lacking a node between cauline apophyses and hydrocladia. This species, however, is completely different in many features, such as the presence of up to five hydrothecae per internode, the branched stems, and the presence of up to third-order hydrocladia.

Concerning the development of the perisarc, and the angle formed by the cauline apophyses, no other species of the genus presents such a degree of perisarc thickening, or such an acute angle.

In the degree of branching of the hydrocladia only *S. falcata*, *S. multifurcata*, *S. turqueti* and *S. unifurcata* approach *S. crassa* sp. nov., though in those species only up to seventh-order hydrocladia have been noticed.

The hydrocladial branching present in *S. crassa* sp. nov. is also unique amongst the species of the genus. The forked hydrocladial internodes constitute an almost straight series in most of the species, whereas in *S. crassa* sp. nov. they form a strongly curved succession.

By the presence of unbranched stems, *S. crassa* sp. nov. also differs from *S. anderssoni*, *S. multifurcata*, *S. nana*,

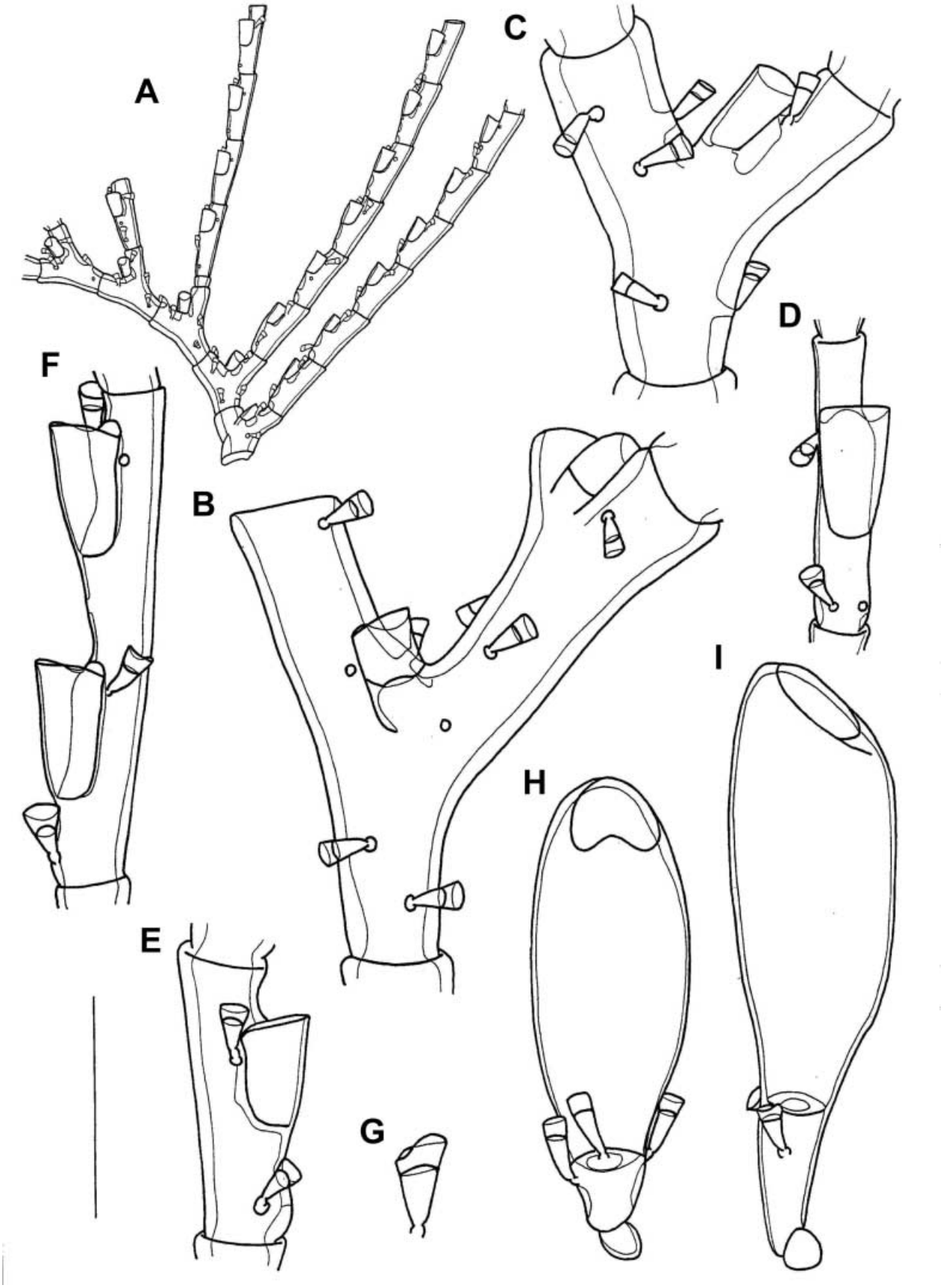

Figure 1. *Schizotricha crassa* sp. nov. (A) Hydrocladial branching and hydrothecal disposition; (B) cauline internode and first hydrocladial internode, showing hydrotheca and nematothecae (note the absence of separation between cauline apophysis and hydrocladium); (C) forked hydrocladial internode with apophysis supporting lower-order hydrocladium, hydrotheca and nematothecae; (D & E) single unforked hydrocladial internodes with hydrothecae and nematothecae; (F) double hydrocladial internode; (G) nematotheca; (H) female gonotheca; (I) male gonotheca. (A, F–H from 12/1003, B, D, E, I from 575/70, C from 575/61). Scale bar: A, 3 mm; B–F, H–I, 700 μm; G, 350 μm.

https://doi.org/10.1017/S0025315404008872h Published online by Cambridge University Press

Table 1. *Measurements of* Schizotricha crassa *sp. nov. and* S. southgeorgiae *sp. nov. (in μm).*

	S. crassa sp. nov.	*S. southgeorgiae* sp. nov.
Hydrothecae		
Length abcauline wall (lateral view)	280–416	312–384
Diameter at rim (frontal view)	200–232	200–232
Cauline internodes		
Length	1480–2020	1240–2040
Diameter under apophysis	300–320	220–300
Cauline apophyses		
Length	—	184–240
Diameter	—	160–240
Hydrocladial internodes		
Length	800–920	880–920
Diameter under hydrotheca	200–320	200–220
Nematothecae flanking hydrothecal rim		
Length	128–136	128–144
Maximum diameter	72–80	72
Diameter at diaphragm	56	48
Female gonothecae		
Length	1200–1400	1360–1500
Maximum diameter	440–460	460–500
Diameter at aperture	240–248	232–240
Diameter at diaphragm	208–240	192–216
Length basal chamber	216–232	184–232
Male gonothecae		
Length	1660–1680	—
Maximum diameter	440–500	—
Diameter at aperture	216	—
Diameter at diaphragm	200–216	—
Length basal chamber	336–344	—
Nematocysts		
Larger size group	20–22.5×4.5–5	21–23×5

S. profunda, *S. unifurcata* and *S. vervoorti*. It also differs from all those species, with the exception of *S. profunda* and *S. vervoorti*, by the absence of ahydrothecate intermediate hydrocladial internodes.

Ecology and distribution

Schizotricha crassa sp. nov. has been collected at depths from 93 to 485 m. Fertile colonies were found in March, May and June. It is used as a substratum by *Sertularella* sp. At present, *S. crassa* sp. nov. must be considered endemic in West Antarctica, having been found north-east of Joinville Island, in the region of the Antarctic Peninsula, south off the South Orkney Islands, and off Visokoi and Zavodovski Islands, in the South Sandwich Islands area.

Etymology

The specific name *crassa* refers to the thick, strongly developed perisarc of the colony.

Schizotricha southgeorgiae sp. nov.
(Figure 2, Tables 1 & 2)

Material examined

Type material: 22/1536, five stem fragments (largest ~380 mm long); maybe belonging to two stems (holotype, USNM 1012905; paratype, RMNH-Coel. 30918).

Description

Colonies composed of polysiphonic, apparently unbranched stems at least 380 mm high. Stems consisting of a main tube divided into internodes provided with hydro- and nematothecae, and several undivided accessory tubes carrying only nematothecae and running parallel to the main tube.

Each stem internode (Figure 2B) provided with short apophysis, a small hydrotheca at axil between apophysis and internode, and from four to seven nematothecae: two flanking hydrothecal aperture and from two to five infrathecal nematothecae.

Cauline apophyses alternately arranged in two planes making an obtuse angle, deprived of nematothecae, and supporting hydrocladia. With distinct separation between cauline apophyses and hydrocladia (Figure 2A,B).

Hydrocladia divided into heteromerous internodes (Figure 2A–C). Up to fourth-order hydrocladia observed (Figure 2A). Branching taking place at first hydrothecate internode of successive hydrocladia. First hydrocladial internode deprived of hydrotheca, but provided with one nematotheca (Figure 2A,B).

Forked hydrocladial internodes (Figure 2C) provided with short apophysis, supporting lower-order hydrocladium and deprived of nematothecae, a small hydrotheca at axil of branching, and four nematothecae: two flanking hydrothecal aperture and two under hydrotheca.

Apophyses of forked hydrocladial internodes followed by an intermediate ahydrothecate internode, provided with one nematotheca (Figure 2C). Sometimes two intermediate ahydrothecate internodes present, each with one nematotheca; second intermediate internode slightly longer (Figure 2A).

Unforked hydrocladial internode with hydrotheca at half its length and three nematothecae: two flanking hydrothecal aperture and a single infrathecal nematotheca (Figure 2D–F).

Hydrotheca deep, cup-shaped (Figure 2A,D–F). Length increasing along hydrocladia; for example, length of abcauline wall may be 312 μm in first unforked hydrocladial internode and ~384 μm in seventh. Adcauline wall completely adnate to internode.

Gonothecae inserted on small apophyses between hydrotheca and infrathecal nematotheca of hydrocladial internodes (Figure 2A). Presumed female gonotheca fusiform, provided with a subterminal, slightly kidney-shaped aperture and a basal chamber delimited by a circular diaphragm and provided with two nematothecae (Figure 2H).

Remarks

By the presence of intermediate ahydrothecate internodes following cauline and hydrocladial apophyses *Schizotricha southgeorgiae* sp. nov. is allied to *S. anderssoni*, *S. multifurcata*, *S. nana* and *S. unifurcata*. *Schizotricha southgeorgiae* sp. nov. also shares with *S. nana* the presence of a single

Table 2. *Major features and geographical distribution of the known species of* Schizotricha *Allman, 1883.*

Distribution	Branched stem	Hydrotheca	Hydrothecae per internode	Intermediate internode	Nematothecae on intermediate internode	Infrathecal nematothecae on unforked hydrocladial internode	Suprathecal nematothecae on unforked hydrocladial internode	Infrathecal nematothecae on forked hydrocladial internode	Infrathecal nematothecae on cauline internode	Maximal order of hydrocladia	Nematothecae on cauline apophyses	Nematothecae on hydrocladial apophyses	Node between apophysis and hydrocladia
S. anderssoni CA	Yes	High	1	Yes	2	3–6	0–2	3–4	2–5	2nd	1	1	Yes
S. crassa sp. nov. WA	No	High	1[1]	No	—	1–2	0	2–3[2]	2–5	12th	—[3]	1–3	No
S. dichotoma TWA	No	High	—	No[4]	1	—	—	—	1–2	4th	1	—	Yes
S. falcata WA	No	Low	1	No	—	1	0	2–3	2–3	7th	1	1	Yes
S. frutescens NEA	Yes	High	1–5	No	—	1	0	1–2	1–2	3rd	—	1	No
S. glacialis CA	No	High	1–2	No	—	1	0	1–2	1–2	2nd	1	1	Yes
S. jaederholmi WA	No	High	1	No	—	2	0	2–3	3–4	5th	2	2	Yes
S. multifurcata SA	Yes	High	1	Yes	2	2	0	4–5	4–5	7th	0	—	Yes
S. nana CA	Yes	Low	1	Yes	1	1	0	1	1–2	2nd	0	0	Yes
S. profunda TWA	Yes	High	1–2	No	—	1	0	—	?	1st	1	—	Yes
S. southgeorgiae sp. nov. WA	No	High	1	Yes	1	1	0	2	2–5	4th	0	0	Yes
S. turqueti WA	No	High	1	No	—	1	0	1–2	1–2	6th	1	1–2	Yes
S. unifurcata AK	Yes	High	1	Yes	2	1	0	2–4	2–3	7th	0	0	Yes
S. variabilis BA	Yes	High	1	No	—	1	0	1	1	3rd	1	1	Yes
S. vervoorti WA	Yes	High	1	No	—	1–2	0	2–4	3	4th	2	2–3	Yes

[1], occasionally with double hydrothecate internodes; [2], occasionally with a single infrathecal nematotheca; [3], only occasionally there is a node between cauline apophyses and hydrocladia and then, cauline apophyses are provided with 2–3 nematothecae; [4], the situation may be contrary. AK, Antarctic-Kerguélen; CA, circum-Antarctic; BA, boreal Atlantic; NEA, north-east Atlantic; SA, sub-Antarctic; TWA, tropical west Atlantic; WA, west Antarctic.

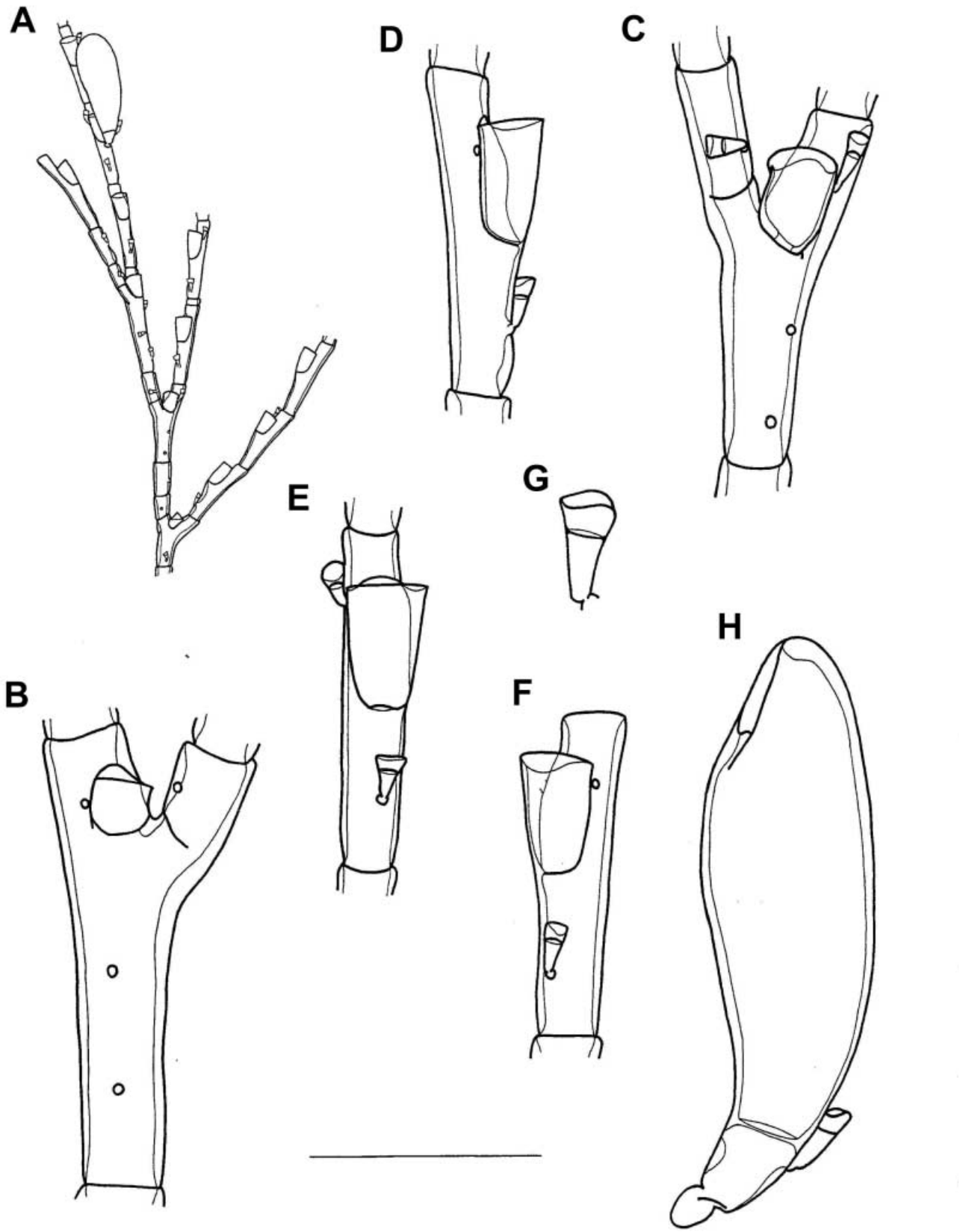

Figure 2. *Schizotricha southgeorgiae* sp. nov. (A) Hydrocladial branching and hydrothecal disposition, with one gonotheca; (B) cauline internode showing apophysis, hydrotheca, nematothecae and intermediate ahydrothecate internode; (C) forked hydrocladial internode showing apophysis supporting lower-order hydrocladium, hydrotheca, nematothecae and intermediate ahydrothecate internode; (D–F) unforked hydrocladial internodes with hydrothecae and nematothecae; (G) nematotheca; (H) presumed female gonotheca. (All drawings from the holotype). Scale bar: A, 3 mm; B–F,H, 700 μm; G, 350 μm.

https://doi.org/10.1017/S0025315404008872h Published online by Cambridge University Press

nematotheca on the ahydrothecate intermediate internodes, whereas in the remaining species those internodes are provided with two nematothecae. *Schizotricha southgeorgiae* sp. nov., however, clearly differs from *S. nana* in the shape of the hydrotheca which is low in the latter and high in *S. southgeorgiae* sp. nov. (as occurs in the remaining species with ahydrothecate intermediate internodes). *Schizotricha southgeorgiae* sp. nov. also differs from all those species because it has an unbranched stem, whereas the stem is profusely branched in the above mentioned species. *Schizotricha southgeorgiae* sp. nov. differs from *S. anderssoni* and *S. multifurcata* in the number of infrathecal nematothecae in the unforked hydrocladial internodes, since there are three to six in the former and two in the latter, whereas in *S. southgeorgiae* sp. nov. there is a single infrathecal nematotheca. *Schizotricha southgeorgiae* sp. nov. also differs from *S. anderssoni* and *S. nana* in the hydrocladial branching pattern since in the last two species only secondary hydrocladia are present, whereas in *S. southgeorgiae* sp. nov. up to fourth-order hydrocladia have been observed.

Schizotricha dichotoma, a non-Antarctic species, may occasionally have intermediate ahydrothecate internodes provided with one nematothecae. However, in this species the hydrocladia are not divided into internodes, the hydrocladial structure is completely different and the hydrothecae are much larger.

Ecology and distribution

Schizotricha southgeorgiae sp. nov. was collected in February between 659 and 686 m depth off South Georgia (Scotia Sea); the fertile colony was collected in February.

Etymology

The specific name *southgeorgiae* refers to South Georgia, the place where it has been found.

Key for the species of Schizotricha

1. Stem branched 2
— Stem unbranched 9

2. Hydrotheca low, approximately as long as wide . . . . . *S. nana* Peña Cantero et al., 1996
— Hydrotheca large, longer than wide 3

3. Hydrocladia without intermediate ahydrothecate internodes 4
— Hydrocladia with intermediate ahydrothecate internodes 7

4. With node separating cauline apophyses and hydrocladia 5
— Without node separating cauline apophyses and hydrocladia . . . . *S. frutescens* (Ellis & Solander, 1786)

5. Forked hydrocladia. One hydrotheca per internode . . 6
— Unforked hydrocladia. One or two hydrothecae per internode . . . . . *S. profunda* (Nutting, 1900)

6. Usually with two infrathecal nematothecae at the same level on unforked hydrocladial internodes . . . . . *S. vervoorti* Peña Cantero, 1998
— Only one infrathecal nematotheca on unforked hydrocladial internodes . . . . . *S. variabilis* (Bonnevie, 1899)

7. One infrathecal nematotheca on unforked hydrocladial internodes . . . . . *S. unifurcata* Allman, 1883
— At least two infrathecal nematothecae on unforked hydrocladial internodes 8

8. Two infrathecal nematothecae arranged at different levels on unforked hydrocladial internodes . . . . . *S. multifurcata* Allman, 1883
— Three to six infrathecal nematothecae on unforked hydrocladial internodes. Intermediate ahydrothecate internodes only present in hydrocladia becoming lower-order branches. Only secondary hydrocladia present . . . . . *S. anderssoni* Jäderholm, 1904

9. Hydrotheca low, length approximately equal to breadth at rim . . . . . *S. falcata* Peña Cantero, 1998
— Hydrotheca large, longer than wide 10

10. Hydrocladia with intermediate ahydrothecate internodes . . . . . *S. southgeorgiae* sp. nov.
— Hydrocladia without intermediate ahydrothecate internodes. 11

11. Without node separating cauline apophyses and hydrocladia . . . . . *S. crassa* sp. nov.
— With node separating cauline apophyses and hydrocladia 12

12. Two infrathecal nematothecae on unforked hydroladial internodes . . . . . *S. jaederholmi* Peña Cantero & Vervoort, 1996
— A single infrathecal nematothecae on unforked hydrocladial internodes 13

13. Hydrocladia not divided into internodes. . . . . *S. dichotoma* Nutting, 1900
— Hydrocladia divided into internodes 14

14. One or two hydrothecae per internode. Only secondary hydrocladia present. . . . . *S. glacialis* (Hickson & Gravely, 1907).
— Only one hydrotheca per internode. Hydrocladia much branched . . . . . *S. turqueti* Billard, 1906

This study was supported by a research contract funded by the Ministerio de Ciencia y Tecnología and the Universidad de Valencia, Spain (Ramón y Cajal Program). Visits to the National Museum of Natural History, Leiden, the Netherlands, were made possible by financial support of the Jan Joost ter Pelkwijkfund of the National Museum of Natural History of Leiden. The authors express their gratitude to the authorities of the National Museum of Natural History, Washington DC, USA for the loan of material.

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Submitted 25 July 2003. Accepted 21 November 2003.