The occurrence of *Apoglossum* and *Delesseria* (Ceramiales, Rhodophyta) in South Africa

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Delesseria papenfussii sp. nov., *Apoglossum ruscifolium* (Turn.) J. Ag. and *A. spathulatum* (Sond.) Womers. & Shepl. (Delesseriaceae, Rhodophyta) are recognized as occurring in South Africa. Several differences exist to distinguish *D. papenfussii* from *A. ruscifolium*, although the former has been mistaken for the latter in the past. Both species occur in the same cold water range, *D. papenfussii* apparently being the much more common one of the two. *Apoglossum spathulatum*, originally described from Western Australia, is a warm water species ranging from the central Natal coast southward to Morgan Bay, Cape Province.

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Daar is vasgestel dat *Delesseria papenfussii* sp. nov., *Apoglossum ruscifolium* (Turn.) J. Ag. en *A. spathulatum* (Sond.) Womers & Shepl. (Delesseriaceae, Rhodophyta) in Suid-Afrika voorkom. Verskeie verskille tussen *D. papenfussii* en *A. ruscifolium* bestaan waarmee hulle van mekaar onderskei kan word alhoewel eersgenoemde in die verlede vir laasgenoemde aangesien is. Die water waarin beide spesies voorkom se temperatuur wissel tussen dieselfde lae limiete maar *D. papenfussii* is skynbaar baie algemener as *A. ruscifolium*. *Apoglossum spathulatum* is oorspronklik uit Wes-Australië beskryf. Dit is 'n warmwater spesie wat langs die kus vanaf sentraal Natal suidwaarts tot by Morganbaai in die Kaapprovinsie voorkom.

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Introduction

Some confusion has existed concerning the occurrence of the red algal genera *Apoglossum* and *Delesseria* in South Africa. The European *Apoglossum ruscifolium* (Turn.) J. Ag. was first recorded from the Cape of Good Hope by Harvey (1847) as *Delesseria ruscifolia*. Barton (1893) also indicated the presence of this species at Sea Point on the Cape Peninsula and on the Natal coast. Barton's list added *Delesseria imbricata* Aresch. from Port Alfred and *D. ovifolia* Suhr in Kütz. (Kützing 1866) from the Cape. The former was later interpreted by Kylin (1924) to be *Bartoniella crenata* (J. Ag. ex Mazza) Kyl. rather than the Australian *Phitymophora amansioides* (Sond.) Womersl. [formerly known as *Phitymophora imbricata*], whereas the latter, which was assigned to *Halicnide* with a query by De Toni (1900), is known apparently only from the original collection.

Delf & Michell (1921) included an additional *Delesseria*, *D. bartoniae* Schmitz, which is a *nomen nudum*; this alga is now known as *Bartoniella crenata*. Stephenson (1948) had the following entry:

> '*Apoglossum ruscifolium* (Turn.) J. Ag. [*Delesseria Kylinii* Papenf. ined.] Port Nolloth to the west coast of the Cape Peninsula . . .; probably in the western overlap too.'

This citation indicates that the alga known as *A. ruscifolium* was regarded by Papenfuss as representing a new species of *Delesseria*. Papenfuss, however, never described this alga and the name *D. Kylinii* remains a *nomen nudum*.

Simons (1976) included both *Delesseria* and *Apoglossum* as occurring in southern Africa but did not designate the species. Seagrief (1984) listed *Apoglossum ruscifolium* and the still poorly known *Delesseria ovifolia*, which Papenfuss (*in litt.* to Seagrief) has suggested did not originate in South Africa.

Results

Apoglossum was first used by J. Agardh (1876) as a subgenus of *Delesseria* Lamouroux (1813) and was ultimately established as a distinct genus by J. Agardh (1898) with *A. ruscifolium* as the lectotype (Kylin, 1924). Although the two types of these genera, namely, *D. sanguinea* (Huds.) Lamour. and *A. ruscifolium*, are easily distinguishable from one another, other species belonging to these genera at least superficially are not so readily assigned to a particular genus. For example, certain species currently assigned to *Delesseria*, such as the western North American *D. decipiens* J. Ag. and the Japanese *D. violacea* (Harv.) Kyl. [now known as *D. serrulata* Harv.], have in the past been assigned to *Apoglossum*. Basically, these same problems of identification have occurred in relation to the material present in South Africa.

Apoglossum and *Delesseria*, both placed in the Delesseria group, share a number of characteristics (Wynne 1983). Intercalary cell divisions are absent in the primary cell rows for both genera but do occur in cell rows of higher orders. Blades, except for the midribs and nerves, are monostromatic. Branching occurs from the midrib, very rarely from the blade margins. Tetrasporangia and cystocarps are produced in proliferations arising along the midrib, rarely from lateral nerves.

Kylin (1956) used the organization of the midrib to distinguish the two genera: rhizoids growing in among the large cells at the centre of the midrib in *Delesseria* in contrast to the condition in *Apoglossum* in which rhizoids form a small-celled tissue surrounding the large cells of the midrib. A secondary difference, that of microscopic or macroscopic veins in *Delesseria* versus only microscopic veins in *Apoglossum*, is obviously not a completely exclusive characteristic.

When one refers to Kylin's (1923) earlier, more detailed account of the types of these two genera, it becomes apparent that there are several features that distinguish these two genera. These distinctions, summarized in Table 1, have been most useful in resolving the confusion that has existed in regard to the South African species.

Employing the criteria in Table 1 in an analysis of a number of collections, it is evident that *Apoglossum ruscifolium*, *A. spathulatum*, and *Delesseria papenfussii* sp. nov. are present in South Africa.

Key to South African species of *Delesseria* and *Apoglossum*:

1. Lateral pericentral cells with transverse divisions; cross-section of midrib showing a mixture of large cells and small rhizoidal cells . . . . *Delesseria papenfussii*
1. Lateral pericentral cells without transverse divisions; cross-section of midrib showing a layer of large primary cells and small rhizoidal cells covering the upper and lower sides . . . . 2. *Apoglossum*
    2. Thalli smaller (0,5–1,1 cm tall); tetrasporangial sori discrete, circular in outline, located at the distal ends of blades . . . . *A. spathulatum*
    2. Thalli larger (2,5–4,5 cm tall); tetrasporangial sori linear, running indefinitely along the sides of the midrib . . *A. ruscifolium*

Delesseria papenfussii sp. nov.

Delesseria Kylinii Papenfuss ined. in Stephenson, 1948, p. 301.

Plants consisting of erect, robust, very densely branched axes (Figures 1 & 2) 4–6(9) cm tall; branching from midrib, to five orders, usually alternately but also oppositely arranged; individual blades bright red, 3,0–5,0 mm wide, with microscopic veins, and becoming strongly costate; wings of older blades eroding, leaving a tough, cartilaginous branching axis, 1–2 mm wide, which merges into a basal holdfast system; blade margins entire, undulating; blades monostromatic, but the microscopic veins becoming 3-cells thick near the midrib; veins irregularly anastomosing owing to elongate interconnecting cells; thalli dioecious; male plants with spermatangial sori forming discrete islands separated by sterile cells (Figure 4), the sori present over most of the surface of blades of higher orders (Figure 3); female plants bearing 1–3 cystocarps per blade on both ultimate and penultimate orders of branches (Figure 5); pericarp spherical and smooth; tetrasporangial plants bearing linear sori of sporangia along midrib on both sides of blades of higher orders (Figures 6 & 7); sporangia tetrahedrally divided, 46–56 μm diam.

Table 1 Differences between *Delesseria* and *Apoglossum* (based on Kylin 1923)

	Delesseria	*Apoglossum*
Appearance of midrib cross-section	rhizoidal cells intermingled among large cells in the centre of the axis	rhizoidal cells confined to either side of a central layer of large cells
Lateral nerves	microscopic or macroscopic	microscopic
Lateral pericentral cells in sterile blades	transversely divided (several times)	not transversely divided
Manner of intercalary cell division	new cell cut off either distally or proximally	new cell cut off only distally
Relationship of fourth-order cells to third-order cells	usually on the abaxial side	on the adaxial side
Sterile groups of procarp	both groups with two or more cells	both groups of a single cell

HOLOTYPE: Wynne 7359 male, in MICH, (Figure 1), *leg.* H. Stegenga & J. Bolton, 13.iv.1983, Kommetje, western Cape Peninsula, Cape Prov., S. Africa; attached to rock in lower littoral into sublittoral.

Isotypes deposited in BOL, GRA, MICH, NU, and UC. (BOL = Bolus Herbarium, Cape Town; GRA = Albany Museum, Grahamstown; MICH = University of Michigan, Ann Arbor; NU = University of Natal, Pietermaritzburg; SRI in CT = Seaweed Research Institute, Botany Dept., Univ. of Cape Town; UC = University of California, Berkeley). Named in memory of George F. Papenfuss, who first recognized the distinctiveness of this species.

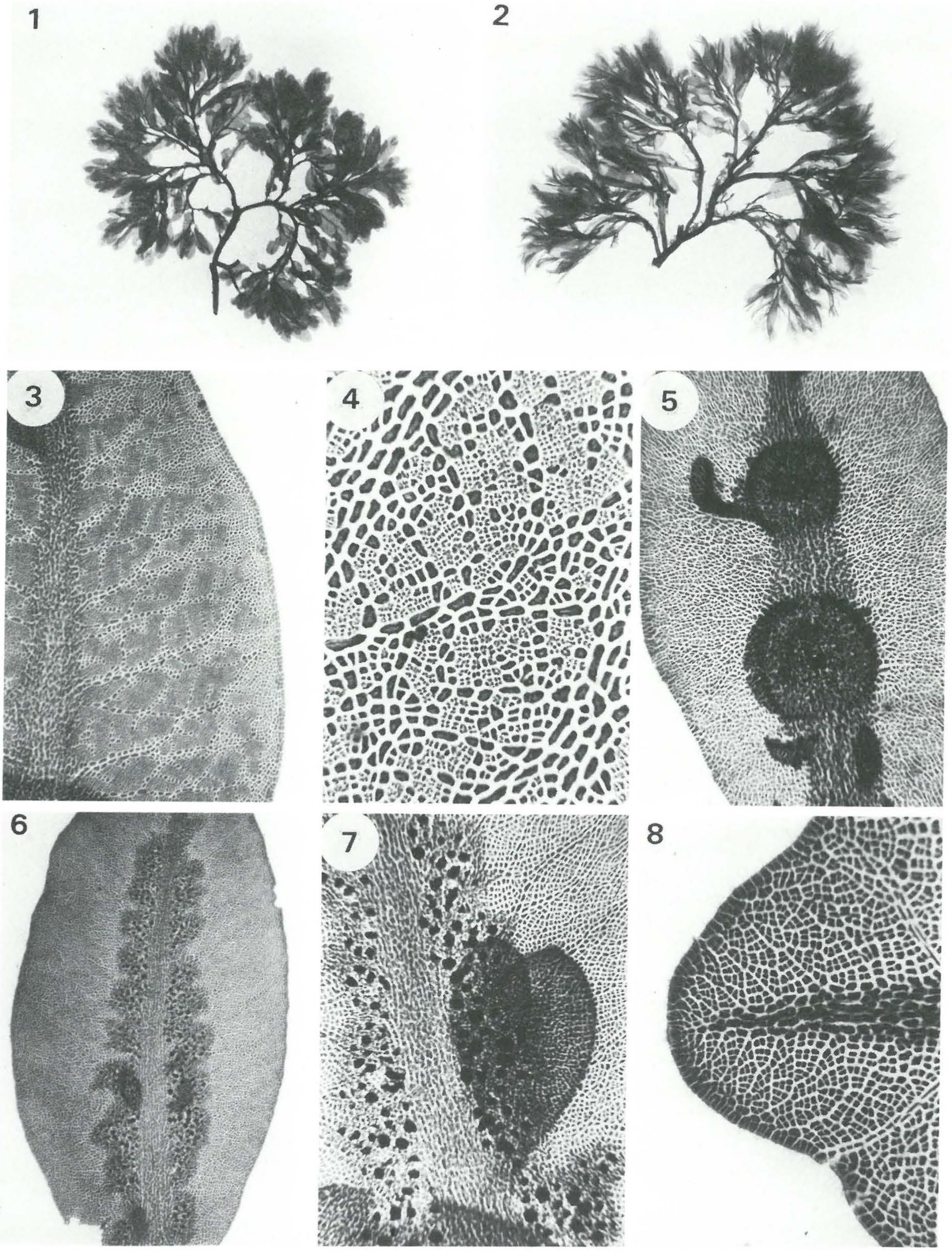
Delesseria papenfussi sp. nov.

Plantae ex axibus erectis, robustis ramossissimos, 4,0–6,0 (–9,0) cm alt. constantes; ramificatio e costa, usque ad 5 ordines, plerumque alterne, necnon, autem, ex averso ordinata; laminae singularae nitidorubrae, 3,0–5,0 mm lat., venis microscopicis, et valde constatae factae; alae laminarum vetustiorum erosae factae, axem ramosum cartilagineum durum relinquentes, 1–2 mm lat., qui in systema basale hapteroideum confunditur; margines laminarum integri, undulati; laminae monostromaticae, venae microscopicae, autem, iuxta costam 3-cellulis crassae factae; venae ob cellulas elongatas interconnexas irregulariter anastamosantes; thalli dioicii; plantae masculae soros spermatangiales insulas discretas, cellulis sterilibus seiunctas ferentes, soris per pleramque superficiem laminarum ordinum superiorum repertis; plantae femineae 1–3 cystocarpos in lamina in ordinibus ramosum et ultimis et penultimis ferentes; pericarpus sphericus levisque; plantae tetrasporangiales soros lineares secundum costam utroque in latere laminarum ordinum superiorum ferentes; sporangia tetraedrice divisa, 46–56 μm diam.

HOLOTYPUS: Wynne 7359 in MICH.

Additional records

Cape Prov. Port Nolloth: 25.x.1932, *Isaac N32*, tetrasporic (UC); 1.vii.1958, *Isaac 1181* (SRI in CT). Melkbosch: 25.ix.1935, *Papenfuss*, male (UC); 28.ix.1935, *Papenfuss*, male (UC); 5.ii.1939, *Pocock*, male (UC): Blaauwberg: 3.ii.1939, *Pocock 32*, female (GRA, UC); 22.iii.1962, *Pocock 13201* (GRA). Mouille Point: 27.ix.1935, *Papenfuss*, tetrasporic (UC); 17.ix.1940, *Pocock 3277* (GRA). Three Anchor Bay: 20.x.1935, *Papenfuss*, tetrasporic (UC); 18.vii.1936, *Papenfuss*, female (UC); 9.xi.1938, *Papenfuss*, female (UC); 23.xi.1941, *Pocock 4950* (GRA). Sea Point: no date, *Tyson*, Alg. exsic. austro-Afr. 172 (BOL, SRI in CT); 1894, *Weber-van Bosse*, male, tetrasporic (MICH, UC); 5.x.1935, *Papenfuss*, male, tetrasporic (UC); 7.vii.1936, *Papenfuss*, female, tetrasporic (UC). Oudekraal: 1.ix.1936, *Mrs. Stephenson*,



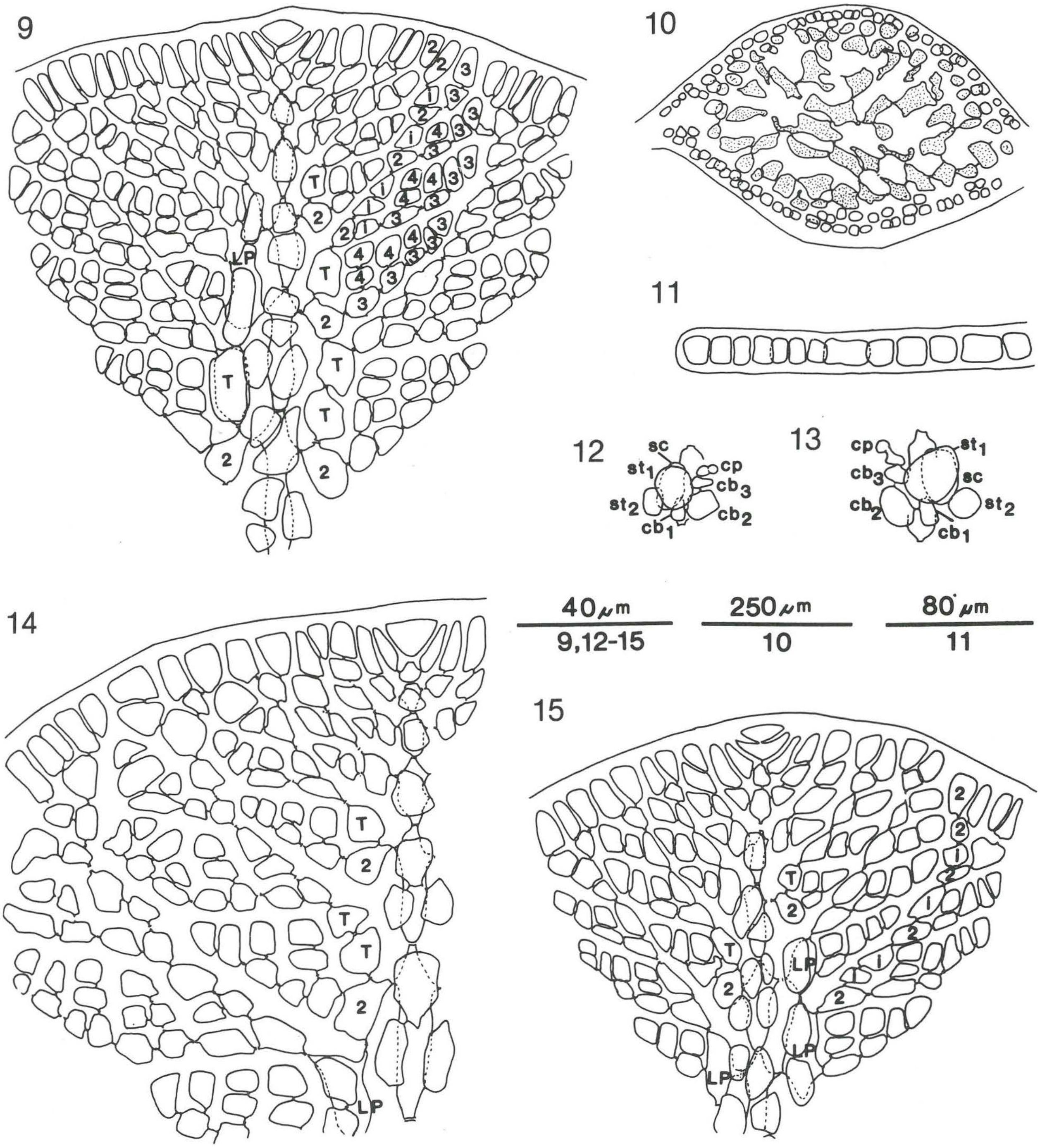
Figures 1–8 *Delesseria papenfussii*. **1.** Holotype specimen (MICH). ×0,83. **2.** General habit, showing density of branching. ×0,91. **3.** Spermatangial blade. ×36. **4.** Spermatangial sori. ×192. **5.** Single blade with two maturing cystocarps. ×81. **6.** Tetrasporangial blade. ×32. **7.** Tetrasporangial sorus. ×192. **8.** Apical region, showing the early onset of cortication along the midrib. ×192.

tetrasporic (UC); 11.iv.1983, *Anderson* (=*Wynne 7560*), tetrasporic (MICH). Kommetje: 13.x.1935, *Papenfuss*, tetrasporic (UC). Simonsbank: 14.v.1983, *Stegenga* (=*Wynne 7467*), female (MICH). Cape Olifantsbosch: 14.v.1968, *Simons 2551* (SRI in CT). Maclear's Beach: 17.vi.1939, *Pocock 1558*, tetrasporic (GRA, UC). Strandfontein: 24.xi.1938, *Papenfuss*, female (UC). Cape of Good Hope: 9.ix.1938, *Pocock 880*, female, tetrasporic (GRA); 4.vi.1939, *Pocock* 1474 (GRA).

Distribution

This species inhabits the South African coast influenced by the cold waters of the Benguela Current. It occurs from the Cape of Good Hope northward to Port Nolloth. It is possible that the '*Delesseria* sp.' recorded from two sites on the Angolan coast by Lawson *et al*. (1975) is also this species, but it was not possible to examine their material. They did list a few species in Angola that are also present in South Africa.

A study of the anatomy of an apex and the patterns in which the various orders of cell rows are developed reveals that this plant conforms to the genus *Delesseria* rather than *Apoglossum*. Lateral pericentral cells typically undergo transverse cell divisions (Figures 9, 14 & 15). In some instances it would appear that occasional lateral pericentral



Figures 9 – 15 *Delesseria papenfussii*. **9, 14 & 15.** *Camera lucida* figures of apical regions. *2*, cells of second-order rows; *3*, cells of third-order rows; *4*, cells of fourth-order rows; *i*, cell resulting from intercalary cell division; *LP*, undivided lateral pericentral cell; *T*, cell resulting from transverse division of lateral pericentral cell. **10.** *Camera lucida* representation of midrib in cross-section. **11.** Monostromatic portion of blade. **12 & 13.** Carpogonial branches on supporting cells. cb_1, cb_2, cb_3, first, second and third cells, respectively, of carpogonial branch; *cp*, carpogonium; *sc*, supporting cell; st_1, st_2, sterile-cell groups.

cells do not undergo such divisions, as indicated in Figures 9 & 15. Cortication typically appears close to the apex (Figure 8) and a strong midrib is characteristic of this species. A cross-section of the well developed midrib shows a composition of larger cells mixed with narrow rhizoidal cells (Figure 10). The wings of the blades are monostromatic (Figure 11), except for the thicker areas of lateral nerves close to the midrib.

One discrepancy with the type, *D. sanguinea*, is that cells of 4th-order rows are more frequently cut off adaxially than abaxially, in contrast to their usually being cut off abaxially in *D. sanguinea* (Kylin 1923). Yet another feature which again shows the similarity to *Delesseria* is that intercalary cell divisions can cut off cells both distally and proximally, unlike the strictly distal manner in *Apoglossum* (*cf.* Table 1).

A mature procarp consists of a four-celled carpogonial branch and a pair of sterile-cell groups, all associated with a supporting cell, which is a transverse pericentral cell. The two procarps illustrated (Figures 12 & 13) were positioned on the 9th and 10th segment from apical cells, respectively. The fact that each sterile-cell group consists of a single cell is unlike the condition in *D. sanguinea*, in which the sterile-cell groups are composed of several cells (*cf.* Table 1).

Distinctive features of *D. papenfussii* are the congested nature of the branching system (Figure 2), the branching to five orders, and the tough, cartilaginous midrib extending about half the height of the plant. Approximately 16 species are currently recognized as members of the genus. The microscopic venation present in *D. papenfussii* eliminates a number of species from consideration, such as those completely lacking venation [*D. crassinervia* Mont., *D. crozetii* Levr., and *D. serrulata* Harv.] and those with heavily prominent lateral nerves [*D. hancockii* Tayl., *D. lancifolia* (Hook. f. & Harv.) J. Ag., and *D. sanguinea* (Huds.) Lamour.].

Other species can be separated individually. Branching not only from the midrib but also from the blade surface and margin characterizes *D. minor* (Baardseth 1941). The occurrence of bush-like tufts of tetrasporophylls along the midrib and relatively wide blades separate *D. uschakovii* (Zinova 1963). The distinctive serrate margins of the small fertile bladelets and the elaborate spiny pericarp are features of *D. salicifolia* Reinsch (Wynne 1982). Thalli of *D. nereifolia* Harv., which includes *D. laurifolia* (J. Ag.) Kyl. according to Adams *et al.* (1974), consist of axes with only occasional branching and to two orders. The blades are relatively broad with lateral nerves that are macroscopic in their lower portions (Kylin 1924, 1929). Some agreement exists between the new species and *D. decipiens* J. Ag., such as the branching to four or five orders and the microscopic venation (Smith 1944). Thalli of that species, however, are commonly 15–25(–50) cm tall, and the midrib is succulent rather than the hard, cartilaginous texture of *D. papenfussii*. Examination of apices of *D. decipiens* reveals that cells of the second-order rows produce a large number of cells adaxially in addition to the usual abaxial third-order rows, whereas such abaxially produced cells from second-order cell rows are not observed to be produced in the new species. One, two or three cystocarps per blade can also be produced in *D. belayevii* Zin., but the lateral veins in that species are macroscopic and branch off into nerves that are also corticated (Zinova 1963).

The simple, microscopic lateral nerves present in *D. fuegiensis* Skottsb. and the arrangement of numerous small bladelets as the final order of branching bear some resemblance to these features in *D. papenfussii*. Thalli of the former species, however, are significantly larger and spermatangial sori are continuous over the blade surface (Mendoza 1974), not in the mottled pattern expressed in the South African species. Discrete spermatangial sori do occur in *D. macloviana* Skottsb., but the blades bear an anastomosing system of microscopic venation over most of their surface, solitary cystocarps occur on final orders of blades, and a small, final order of bladelets is absent (Mendoza 1974).

Thalli of *D. epiglossum* range from 5 to 18 cm in height (Skottsberg 1923; Taylor 1939; Levring 1944). Axes are freely proliferous from the midrib and special sporophylls are lacking. The description of tetrasporangial sori and one or more cystocarps per blade by Skottsberg (1923) agrees with these features in *D. papenfussii*. However, Skottsberg's statement that the spermatangial sori form lines along the costae does not agree with the mottled arrangement of sori on the male plants of the new species, nor does the branching have the congested appearance, reaching four or five orders as demonstrated in *D. papenfussii*. The conclusion of this discussion of the known species of *Delesseria* is that the South African representative cannot be comfortably assigned to any known species.

Apoglossum spathulatum (Sond.) Womers. & Shepl.
1982, p. 329.

Basionym: *Delesseria spathulata* Sonder 1845, p. 57; 1848, p. 194. Additional refs. (as *D. spathulata*): Agardh 1852, p. 698; Harvey 1855, p. 548; 1863, p. xxxi; Kützing 1859, p. 5, pl. 12, fig. c (*non* figs. d, e = *Hypoglossum heterocystideum*).

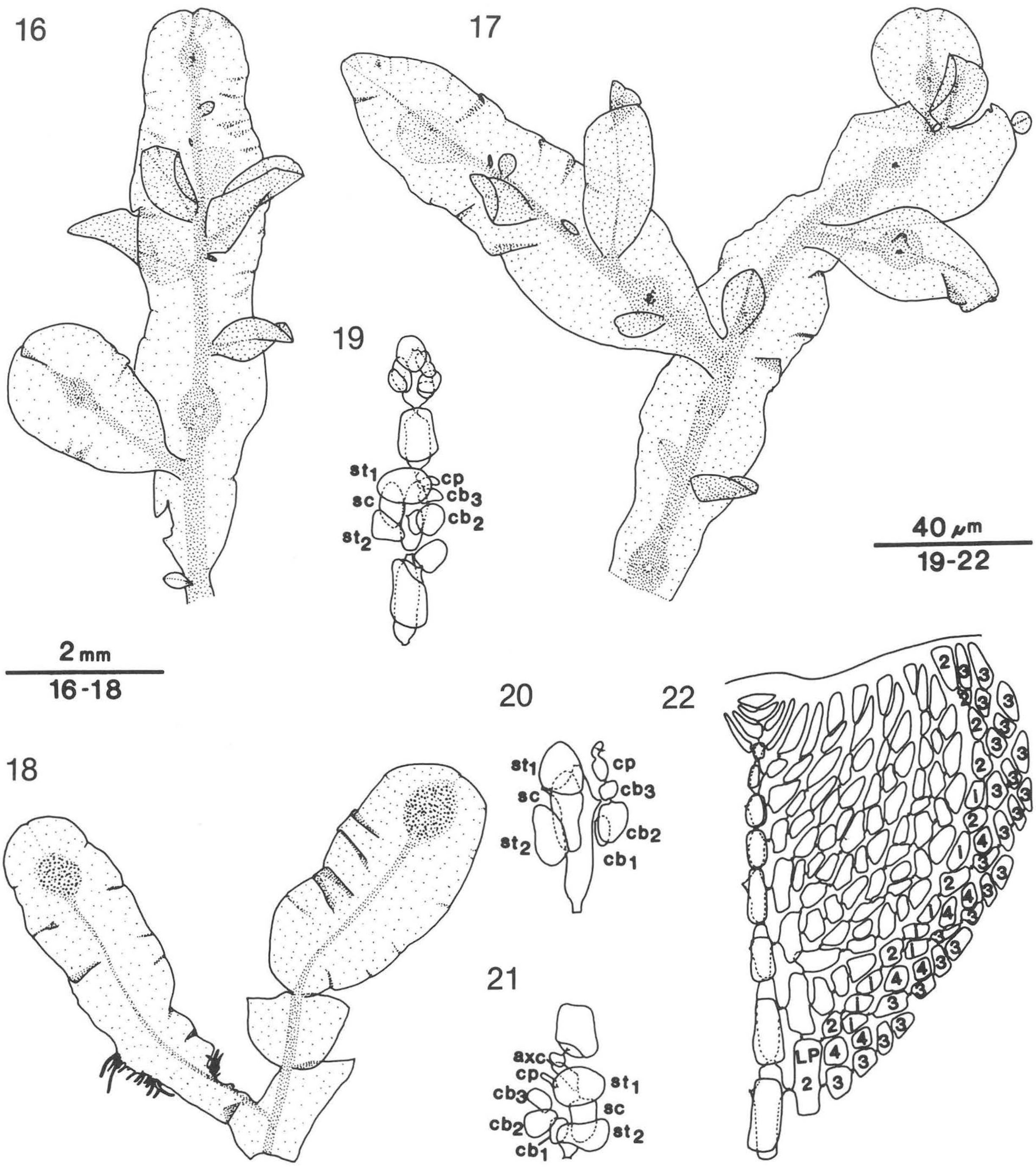
Collections

Natal Prov., Mdloti Beach, north of Durban: 14.ii.1983, *R. Norris NAT-1066* (cystocarpic) (MICH, NU); 16.iii.1983, *M. Wynne 7297* cystocarpic, tetrasporic) (MICH). Cape Prov., Morgan Bay, north of East London: 26.i.1983, *M. Wynne 7109* (MICH).

In Sonder's (1845) brief description of this species collected from Western Australia by Preiss, he referred to the frond as dwarf, substipitate, with linear-spatulate, entire blades with an obtuse or subemarginate apex and proliferating from the midrib. In a later expanded account Sonder (1848) indicated that the blades were 3,0 mm wide and marked by pellucid transverse striae, i.e. microscopic veins. This latter feature was confirmed by Womersley and Shepley (1982) in their examination of the type in MEL, resulting in the transfer of the species from *Hypoglossum*, where it had come to reside, to *Apoglossum*.

Kützing's (1869, pl. 12, fig. c) only figure based on a Preiss collection shows a single lateral spatulate blade arising from the midrib of the linear, basally attenuate parent blade. The present material from South Africa conforms well to the above description. In addition, the South African material was found to closely agree with a collection determined to be *A. spathulatum* originating from Western Australia [North Beach, 31.viii.1962, *leg. R.F. Scagel, R-LXVII-15*, female (UC)].

Figures 16–18 represent mature, reproductive specimens. The length of thalli ranges from 5 to 11 mm; range of blade



Figures 16–22 *Apoglossum spathulatum*. **16 & 17.** Cystocarpic plants. **18.** Tetrasporic plant. **19 & 20.** Procarps on primary axial row. See Figures 12 & 13 for explanation of symbols. **21.** Apparent formation of auxiliary cell (*axc*) from supporting cell. **22.** *Camera lucida* figure of half of apical region. (*cf.* Figures 9, 14 & 15 for explanation of symbols.)

width is 1,1–1,8 mm. Branches arise from the midrib, usually alternately, from either side of the blade. The degree of branching is variable, but often it is sparse. Occasional marginal branching was observed, resulting in a pseudodichotomy (Figure 26). Such an anomalous type of branching, also recorded in *Delesseria* by Rosenvinge (1923–1924), is caused by a secondary initial becoming converted into a primary initial.

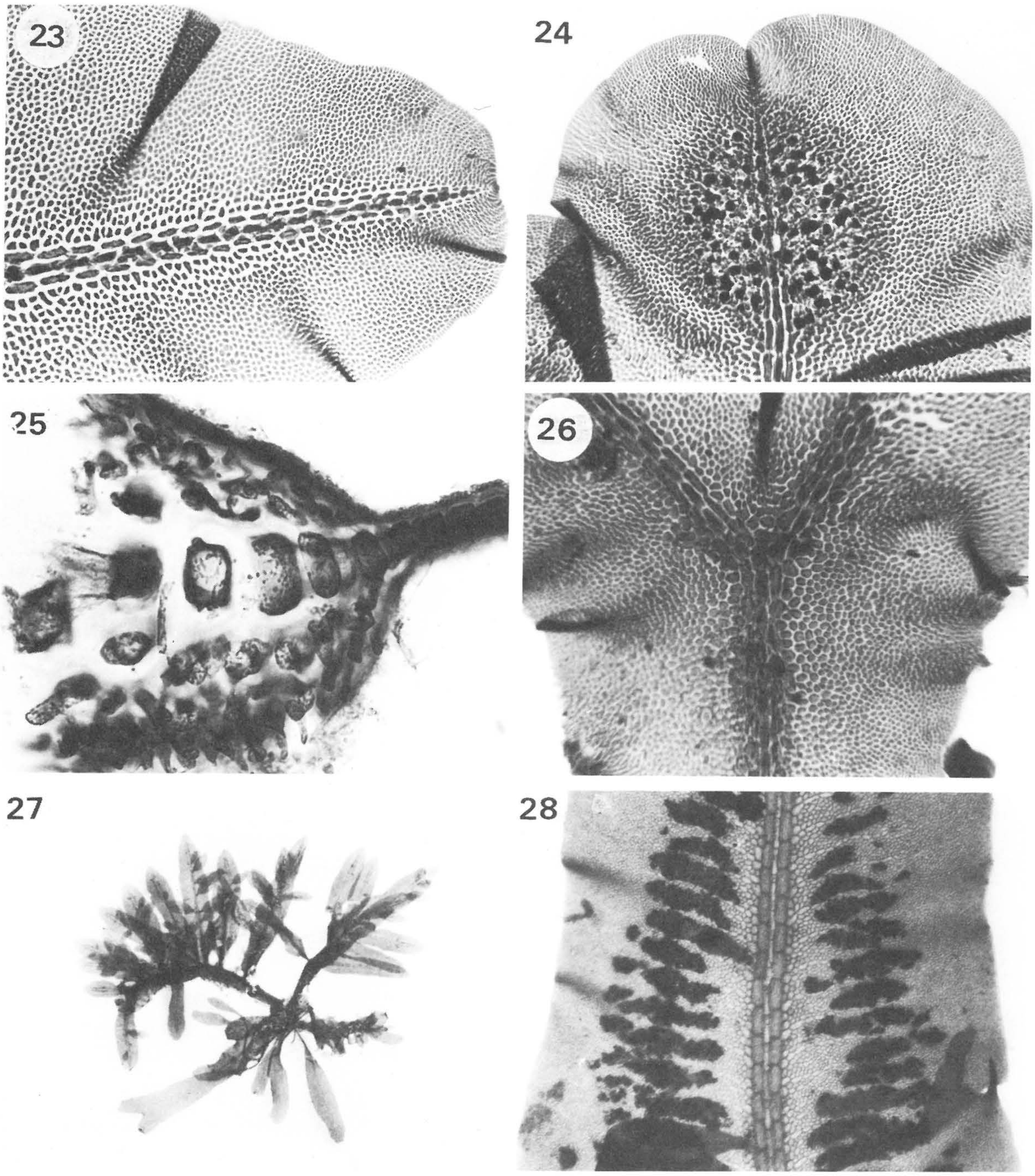
Older blades become basally eroded, only the midrib persisting. Blades can become secondarily attached by the production of rhizoids from marginal cells (Figure 18). The relatively elongate cells in second-order rows give a pellucid appearance, resulting in the microscopic veins as noted by Sonder (1848) and Womersley & Shepley (1982).

An analysis of Figure 22 showing a portion of an apex verifies that we are dealing with a genuine *Apoglossum* on the basis of the following criteria: lateral pericentral cells (*lp*) do not divide transversely; new cells resulting from intercalary cell divisions (*i*) are always budded off in a distal direction, since the proximal cell retains the lateral pit connection; and fourth-order cell rows (*4*) are always aligned adaxially in relationship to third-order cell rows (*3*).

Cortication in this species does not set in as close to the apex as in *Delesseria papenfussii*. (Compare Figure 23 with Figure 8). The first sign of the development of cortication is the budding off of small cells from the outer proximal corners of transverse pericentral cells. These two cells grow apically as downward coursing filaments, making secondary attachments with adjacent transverse pericentral cells. They branch laterally, forming additional corticating rhizoidal filaments and fairly soon this cortication system becomes very elaborate, extending both laterally and anticlinally to the blade, producing a thickened midrib. I was unable to detect any production of corticating filaments by the lateral pericentral cells. The new blades are produced as outgrowths from this midrib cortication.

The tetrasporangial sori arise at the distal ends of blades in a median position and have a circular to oval configuration (Figures 18 & 24) rather than the pair of elongate sori characteristic of *A. ruscifolium*. Sori are ovate, measuring 560–640 μm in width and 600–690 μm in length. Tetrasporangia are about 24–28 μm in diameter when mature. They are cut off at various levels within the sorus.

Carpogonial branches occur on the primary cell row on both sides of the blades, the transverse pericentral cells acting as supporting cells. The supporting cell cuts off a four-celled carpogonial branch (Figures 19 & 20) and a pair of sterile cells, the distal sterile cell usually being larger than the proximal sterile cell. In the mature procarps, which usually appear on the sixth to the ninth segment from the apical cell, the sterile-cell groups still remain as single cells, which is characteristic of the type of the genus (*cf.* Table 1).



Figures 23–28 **23–26.** *Apoglossum spathulatum.* **27–29.** *Apoglossum ruscifolium.* **23.** Apical region showing that midrib cortication is initiated at a distance from the apex. ×174. **24.** Circular shape of tetrasporangial sorus. ×93. **25.** Cross-section of midrib with large primary cells. ×427. **26.** A rare instance of a pseudodichotomy, the result of marginal branching. ×100. **27.** Habit. Herbarium specimen. ×1,4. **28.** Spermatangial blade. ×50.

Not every consecutive segment bears procarps. Sterile pericentral cells may occur commonly in a series of fertile segments. One example of an apparent auxiliary cell being cut off from a supporting cell was observed (Figure 21). The transverse pericentral cell of the distal segment had cut off a cell close to the apparent auxiliary cell, but the function of this cell was not understood.

Cystocarps are not restricted to the ultimate orders of branches but can be present on lower orders. There may be a single or a pair of mature cystocarps on a single blade, always borne on the midrib. In some cases a well developed pericarp lip around the ostiole of the cystocarp was observed. Male thalli were not observed.

Womersley & Shepley (1982) placed *Apoglossum tasmanicum* (F. Mueller ex Harv.) J. Ag. in synonymy with *A. spathulatum*, regarding the latter as a small form of the former. Harvey (1860) and Kützing (1869, pl. 11a) depict this alga as a very robust plant, the compound frond reaching up to 30,5 cms in length. Kützing showed it as a predominantly oppositely branched alga; Harvey reported that the 'leaves are frequently opposite', although his pl. 190B showed alternate branching almost entirely. Another feature suggesting that these are not the same species is that in *A. tasmanicum* the cystocarps and tetrasporangia are borne on 'minute, accessory' leaflets, whereas in *A. spathulatum* they are borne on the primary axes.

Although this species has been recorded from the Red Sea (Nasr 1947), the Persian Gulf (Nizamuddin & Gessner 1970), India (Børgesen 1932) and from four stations in the Malaysian Archipelago (Weber-van Bosse 1923), it is not certain whether these workers were dealing with an *Apoglossum* or a *Hypoglossum*. The figure given by Nasr, showing an attenuate apex, seems to represent a species of *Hypoglossum*.

Apoglossum ruscifolium (Turn.) J. Ag. (Figure 27)

Records for S. Africa

Cape Prov. Oudekraal: 21.v.1972, *leg. Sinton (Simons 4490)*, – 8 m (SRI in CT). Strandfontein: 23.xi.1938, *leg. G. Papenfuss*, female, tetrasporic; cast up (UC); 24.xi.1938, *leg. M.A. Pocock 1129 & G. Papenfuss*, male, tetrasporic; cast up (UC).

Record with a query — Eastern Cape Prov. Riet River Rocks: 9.xii.1962, *leg. G. Papenfuss & R. Scagel* XLVIII-86 (UC). This collection is of sterile fragmentary blades without any additional branching and with midrib cortication starting close to the apex. It is included with some reservation.

This species was first recognized in British waters by Turner (1802) and distinguished from the otherwise similar *Hypoglossum hypoglossoides* (originally *Fucus hypoglossum*) by the occurrence of microscopic veins running from the midrib to the blade margins, the blunt (not attenuate) shape of the blades, darker colour, stronger axes, and the more prominent midrib. In addition, it is a perennial, being fertile in the winter, whereas the *Hypoglossum* is a summer annual.

These so-called veins in *Apoglossum* have also been referred to as 'pellucid striae' and are merely the conspicuously elongated and relatively enlarged cells of the second-order cell rows. All species of *Apoglossum* and most species of the related genus *Delesseria* have such microscopic veins. One of the most useful differences between *Apoglossum* and *Delesseria*, as pointed out by Kylin (1956), is that a cross-section of the midrib in *Apoglossum ruscifolium* shows a single layer of large primary cells and small cortical cells restricted to the upper and lower surfaces. This feature was confirmed in the present material. The cross-section of the midrib in *Delesseria*, on the other hand, shows a mixture of variously sized cells, large and small being interspersed.

A distinctive characteristic of *A. ruscifolium* is that male plants have spermatangial sori in a series of narrow striae running diagonally from the midrib toward both blade margins (Kylin 1923; Funk 1955). A single male plant was noted in the South African collections and this pattern was observed (Figure 28).

This species is known from European waters, the Mediterranean and northwest Africa (Dangeard 1949; Ardre 1970). Jadin's (1935) record from Mauritius was later changed to *Chauviniella jadinii* (Børges.) Papenf. (Børgesen 1945), but Askenasy's (1888) record of *A. ruscifolium* from St. Paul I. in the western Indian Ocean remains. I have confirmed the occurrence of this species in the western North Atlantic, on the Florida coast (UC 1462538; off Singer I., Palm Beach County, Florida, U.S.A. (26°50,0′N, 80°00,5′W); 17.xi.1977; 58 m depth; *leg. Hall & Eiseman*; det. Eiseman.). It has previously been reported from South Carolina (Wiseman & Schneider 1976).

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