Ceramiales (Rhodophyceae) genera new to South Africa, including new species of *Womersleyella* and *Herposiphonia*

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Diplothamnion, Halydictyon, Tolypiocladia, Lophosiphonia, Womersleyella and *Lophocladia* were found in collections from Natal representing the first report of these genera from South Africa. *Tolypiocladia* and *Lophosiphonia* were previously reported from Tanzania, *Halydictyon* from Mauritius and *Lophocladia* from the Transkei. *Womersleyella* was previously known only from some islands of the Pacific. A new species of *Womersleyella, W. kwazuluensis,* is described from northern Natal, and the genus is emended to include additional species that were previously assigned to *Polysiphonia. Herposiphonia akidoglossa* sp. nov., a distinctive new species, is also described. Structure and reproduction of each species is discussed where new information is available.

Diplothamnion, Halydictyon, Tolypiocladia, Lophosiphonia, Womersleyella en *Lophocladia* is in versamelings van Natal gevind en verteenwoordig die eerste verslag van hierdie genera in Suid-Afrika. *Tolypiocladia* en *Lophosiphonia* is voorheen in Tanzanië gevind, *Halydictyon* in Mauritius en *Lophocladia* in die Transkei. *Womersleyella* is voorheen slegs op sommige eilande in die Stille Oseaan gevind. 'n Nuwe spesie van *Womersleyella, W. kwazuluensis*, van Noord-Natal, word beskryf en die genus word verbeter deur spesies by te voeg wat voorheen aan *Polysiphonia* behoort het. *Herposiphonia akidoglossa* sp. nov., 'n kenmerkende nuwe spesie, word ook beskryf. Struktuur en reproduksie van elke spesie word bespreek waar nuwe inligting beskikbaar is.

Key words: Ceramiaceae, Ceramiales, Rhodomelaceae, South Africa, taxonomy.

Introduction

The Ceramiales, a red algal order containing the largest number of species in its division, is particularly well represented in tropical and subtropical floras of the world, many being an abundant but inconspicuous component of coral reef floras, and often occurring in turf communities. Other species occur as epiphytes or are epizooic, many of them being minute. A microscopic examination of these communities from collections made in Natal, South Africa, has revealed the taxa reported in this communication. The taxa are often considered to be rare, but this impression may be the result of their cryptic habitats and the infrequent attempts to thoroughly sort collections in which they may be present.

Investigations on the Natal benthic algal flora have recently uncovered several genera in the Ceramiales that have not been previously recorded in South Africa: *Diplothamnion* Joly et Yamaguishi (Joly *et al.* 1965), *Halydiction* Zanardini (1843) [according to the index Nominum Genericorum, *Halydictyon* was misspelled as *Halodictyon* by Montagne (1847), a mistake that is often continued to the present time], *Tolypiocladia* Schmitz (Schmitz & Hauptfleisch 1897), *Lophosiphonia* Falkenberg (Schmitz & Hauptfleisch 1897) and *Womersleyella* Hollenberg (1967). A fifth genus, *Lophocladia* (J. Agardh) Schmitz (1893), was reported from the Transkei by Bolton and Stegenga (1987) but a species was not named in their report, nor were specimens cited. The presence of this genus in Natal and South Africa, therefore, is verified and a species identified with cited specimens.

Material and Methods

Material collected in the field was placed in 5% formalin (1.35% formaldehyde) soon after collection and transported to the laboratory where it was sorted. Small species were separated from pieces of turf, host plants or animals and, if enough material was present, some thalli were placed on herbarium sheets and dried for herbarium specimens, other pieces of thalli were placed in small vials containing 5% formalin, and lastly, slides were made mounted in a corn syrup medium containing 1:5 acidified aniline blue. All Natal benthic algal project slides and vial materials are permanently housed in the Department of Botany, University of the Witwatersrand, Johannesburg.

Data for the collections are provided under the discussions of taxa. In these data the number preceded by 'Nat' refers to the collection number in the notebooks on the Natal benthic algal collections.

Results and Discussion

Genera new to South Africa

1. *Diplothamnion Joly et Yamaguishi* (Joly *et al.* 1965).*

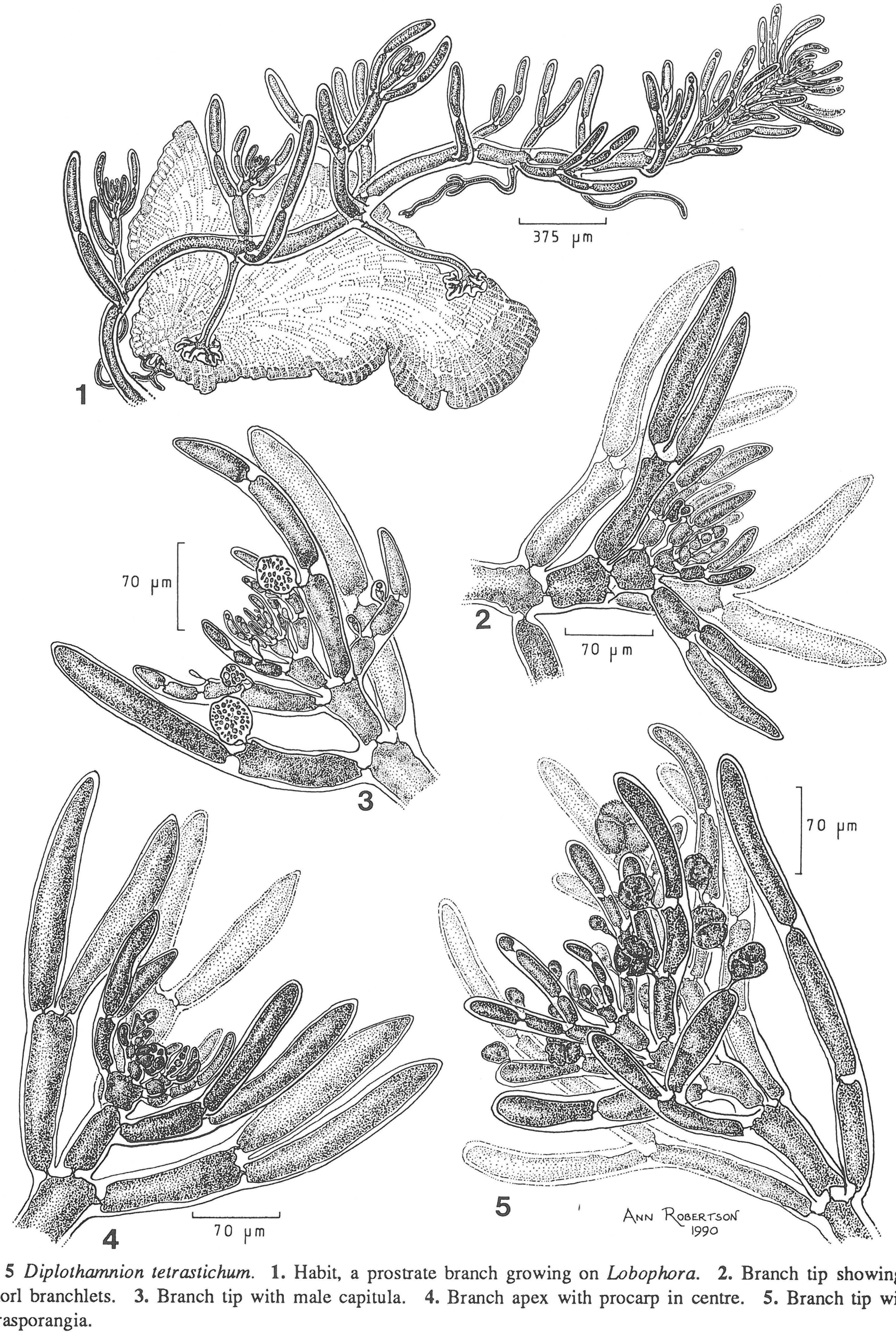
Originally described from the coast of southern Brazil, *Diplothamnion* is a relatively distinctive genus related in some characteristics to the *Spermothamnion* group of the

* During the time that this manuscript was in review, Huisman (1991) mentioned a Natal collection of *Diplothamnion* that I had sent several years ago to Dr Gordon-Mills because of her interest in the genus.

Ceramiaceae according to Joly and Yamaguishi, but they also suggested that it may be better placed in its own group in the Ceramiaceae. Gordon (1972) removed *Diplothamnion* to the Tribe Sphondylothamnieae, a position that has been supported by the more recent investigations of Huisman (1991).

The genus is particularly identifiable by its typical unicellular haptera attaching the prostrate axes (Figure 1), the erect branches usually being short and having two whorl branchlets per axial cell (Figure 1), and the pseudodichotomously branched whorl branchlets which are decussately arranged on the prostrate axis but distichously arranged on upright branches (Figures 2 – 5); each whorl branchlet usually has one pseudodichotomy, but one or two additional ones are not uncommon.

Specimens of this distinctive genus were previously known only in the Atlantic Ocean (Joly *et al.* 1965; van den Hoek 1978; Price & John 1980, Ballantine & Wynne 1986)



Figures 1 – 5 *Diplothamnion tetrastichum.* **1.** Habit, a prostrate branch growing on *Lobophora.* **2.** Branch tip showing development of young whorl branchlets. **3.** Branch tip with male capitula. **4.** Branch apex with procarp in centre. **5.** Branch tip with mature and immature tetrasporangia.

and in Western Australia (Huisman 1991). Three species have been described, the type species, *D. tetrastichum* Joly et Yamaguishi (Joly *et al.* 1965), *D. jolyi* van den Hoek (1978) and *D. gordoniae* Huisman (1991). The Natal specimens have characteristics in common with the latter species.

Diplothamnion gordoniae Huisman (1991).

This species, originally described as an epiphyte on *Tylotus* at 10 m depth at Rottnest Island, Western Australia, was found in Natal at depths up to 21 m as an epiphyte on various algae (Figure 1) as well as epizooic on small animals. Axial cells of the Natal plants are up to approximately 100 μm in diameter, a figure that is within the limits prescribed for *D. gordoniae*. Female specimens were present in my collections but only with procarpial stages (Figure 4) and no cystocarps. The procarp has two pericentral cells as described for *D. gordoniae* by Huisman (1991). A few male capitula were observed (Figure 3) in which they replace a branchlet on the whorl branchlet. Tetrasporangia (Figure 5) occur mostly singly rather than in pairs as in the Australian plants, but often are on other than basal cells of the whorl branchlet, a character in common with *D. gordoniae*.

Specimens from Natal: Kosi Bay mouth, 26°53′S, 32° 53′E, XI-1984, *legit* D.D. Avery by diving to 20 m (Nat 2326); Black Rock, 27°08′S, 32°50′E, 8-V-1985, *legit* J. Dench by diving to 8 m (Nat 3112); 19-I-1986, *legit* A.J. Phelan, drift (Nat 4035); 21-VIII-1986, *legit* A.J. Phelan, drift (Nat 4293); Hully Point, 27°21′S, 32°45′E, 14-II-1989, *legit* R. Broker, drift (Nat 5952); 9 mile reef, Sordwana Bay, 27°32′S, 32°40′E, 5-II-1989, *legit* R. Broker by diving to 21 m (Nat 5927); Leadsman Shoal, St. Lucia, 27°52′30″S, 32°36′E, 15/16-V-1989, *legit* Members, Durban Underwater Club by diving to 12 – 18 m (Nat 6069); Rocky Bay, Park Rynie, 30°20′S, 30°43′E, 13-V-1984, *legit* R. van der Elst by diving offshore (Nat 1846).

2. ***Halydiction*** *Zanardini* (1843).

A small piece of this easily recognized genus (Figure 6) currently assigned to the Dasyaceae, was collected by diving at 23 m (*legit* R. Broker), 5 mile reef, Sordwana Bay on the north Natal coast (24-I-1989) (27°32′S, 32°40′E) (Nat 5882). It was attached to *Dictyota*, and has dimensions (cells approximately 250 μm in diameter, including the wall, the wall being about 50 μm thick) similar to the species described by Børgesen (1954, as *Halodictyon*) from Mauritius, the only other record for this genus in the western Indian Ocean. The specimen has a tetrasporangial stichidium in an early stage of development and a single region of apical growth (Figure 6). The type species of *Halydictyon*, *H. mirabile* Zanardini (1843), is from the Mediterranean Sea and has smaller cells (Coppejans 1975, as *Halodictyon*). The species of *Halydictyon* from Western Australia (Harvey 1858, 1859) have cells that are not of the same shape or size as the Natal specimen. Until more fertile specimens can be examined, this species must remain unnamed as proposed by Børgesen for the Mauritius specimen.

3. ***Tolypiocladia*** *Schmitz* (Schmitz & Hauptfleisch 1897).

Several collections were made of this genus, all the same species, but all are infertile. In vegetative characters, *Tolypiocladia*, a member of the Rhodomelaceae, is distinguished by its four pericentral cells, its short, branched determinate lateral branchlets that are usually spaced close together on the axis and borne in a one-quarter left-handed spiral, and in the absence of cortication. The structure and reproduction of the species represented in Natal, *T. glomerulata* (C. Agardh) Schmitz (Schmitz & Hauptfleisch 1897) (Figure 7), was discussed and illustrated in detail by Krishnamurthy (1962, as *Roschera glomerulata). Tolypiocladia glomerulata* is widespread in the Indo-Pacific region but has been recorded on the African east coast no further south than Tanzania (Jaasund 1977). Natal specimens were found at the following localities: Hully Point, 27°20′S, 32°45′E, 14-II-1989, *legit* R. Broker, in drift (Nat 6026, on *Padina*); 5 mile reef, Sordwana Bay, 27°32′S, 32°40′E, 24-I-1989, *legit* R. Broker by diving to 23 m (Nat 5876, on *Galaxaura*); Leadsman Shoal, St. Lucia, 27°52′30″S, 32°36′E, 26-XI-1984, *legit* R. Bouwer by diving to 20 m (Nat 2415).

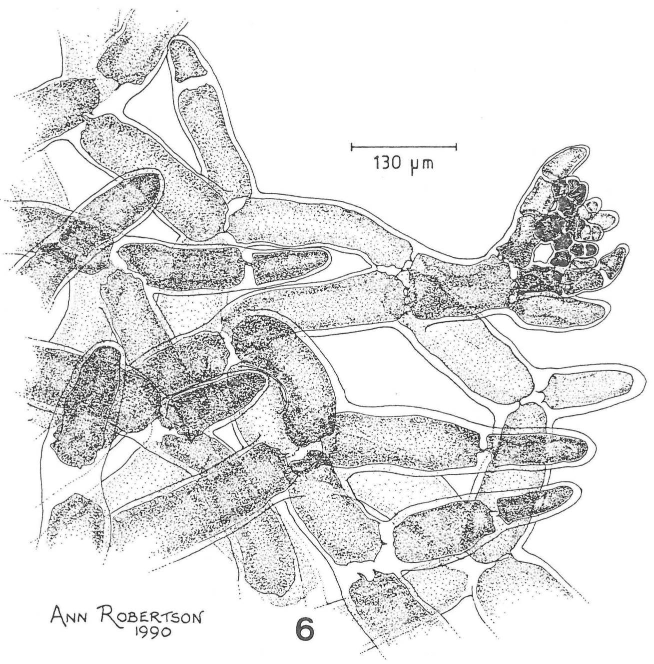


Figure 6 *Halydictyon mirabile*. Part of plant showing a growing branch apex.

4. ***Lophosiphonia*** *Falkenberg* (Schmitz & Hauptfleisch 1897).

A genus in the Rhodomelaceae that closely resembles *Polysiphonia* Greville (1824), *Lophosiphonia* differs mainly in having a prominent prostrate system of dorsiventral axes, including the apical region, and, excepting trichoblasts, only endogenously derived branches produced throughout the thallus (Hollenberg 1968a,b). Dorsiventrality in both *Polysiphonia* and *Lophosiphonia* prostrate systems is probably caused by tactile response, some of the cells next to the substratum developing rhizoidal attachment forming the ventral side, and the axis sometimes developing upright branches that emerge between the dorsal pericentral cells. Species of *Polysiphonia* having a prostrate system of branches from which erect branches are derived may have only endogenously derived branches in the prostrate system, but erect branches in *Polysiphonia* have at least a few exogenously

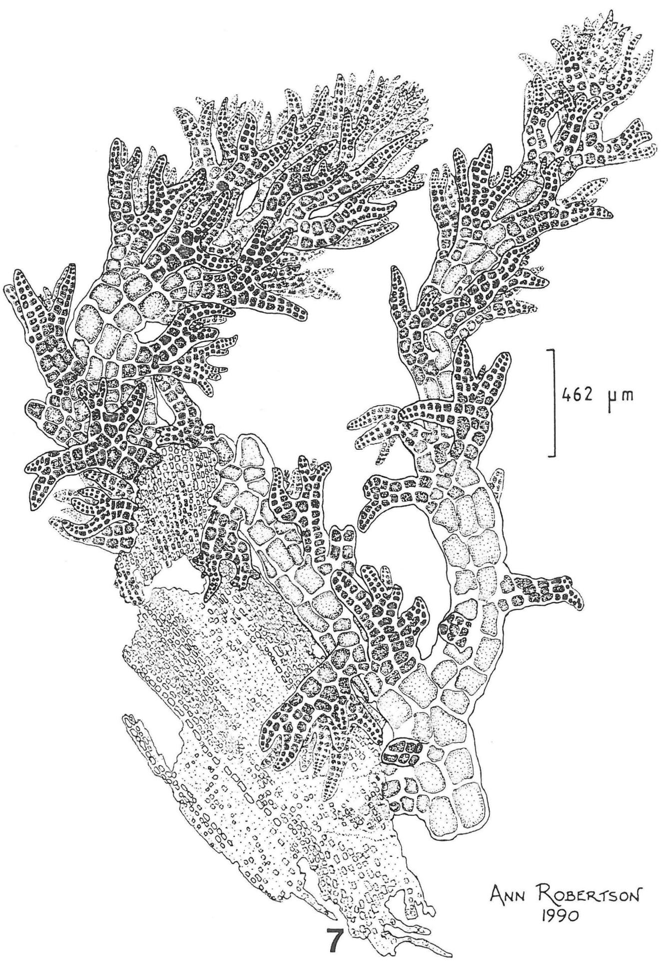


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Figure 7 *Tolypiocladia glomerulata.* A young plant growing on *Dictyota.*

derived polysiphonous branches. Erect polysiphonous branches in *Lophosiphonia* are all endogenously derived, this being a main character on which the two genera are separated (Børgesen 1945; Hollenberg 1968a,b). Trichoblasts in *Lophosiphonia* are borne only on erect branches and may be produced in either a spiral sequence or unilaterally on the branch.

Falkenbergiella Kylin (1938) also has only endogenously derived branches, but the practical separation of *Falkenbergiella* from *Lophosiphonia* is unreliable, if not impossible to employ (Hollenberg 1968b). *Falkenbergiella* does not produce trichoblasts and, according to Kylin (1956), *Lophosiphonia* separates the first pericentral cell dorsally in a segment on the prostrate axis, whereas it is ventrally cut off in *Falkenbergiella.* As Hollenberg (1968b) emphasized, the prostrate axes in these species cannot be relied upon to retain the same rows of cells in dorsal or ventral positions throughout the length of the axes and, presumably, the position of the first cut off pericentral cell in each segment could change with a rotation of the apical end of the axis. This is particularly difficult to analyse in species that grow epiphytically between close branches of hosts, as in *L. prostrata* as described below, the epiphyte often attaching to branches on several sides without twisting of the filament to maintain the same dorsal aspect. Experimental studies on cultures may be necessary to establish the reliability of these characters, but even if they show that a basic difference exists, it will be difficult for me to support the maintenance of a genus on this trivial character. I suggest, therefore, that *Falkenbergiella* be reduced to synonymy under *Lophosiphonia*, and the following new combination is proposed:

Lophosiphonia capensis (Kylin) R.E. Norris comb. nov.

[Basionym: *Falkenbergiella capensis* Kylin, 1938, *Lunds Universitets Årsskrift, Ny Föld, Andra Afdelningen,* 2. 34(8), p.21, Figs. 10A–F].

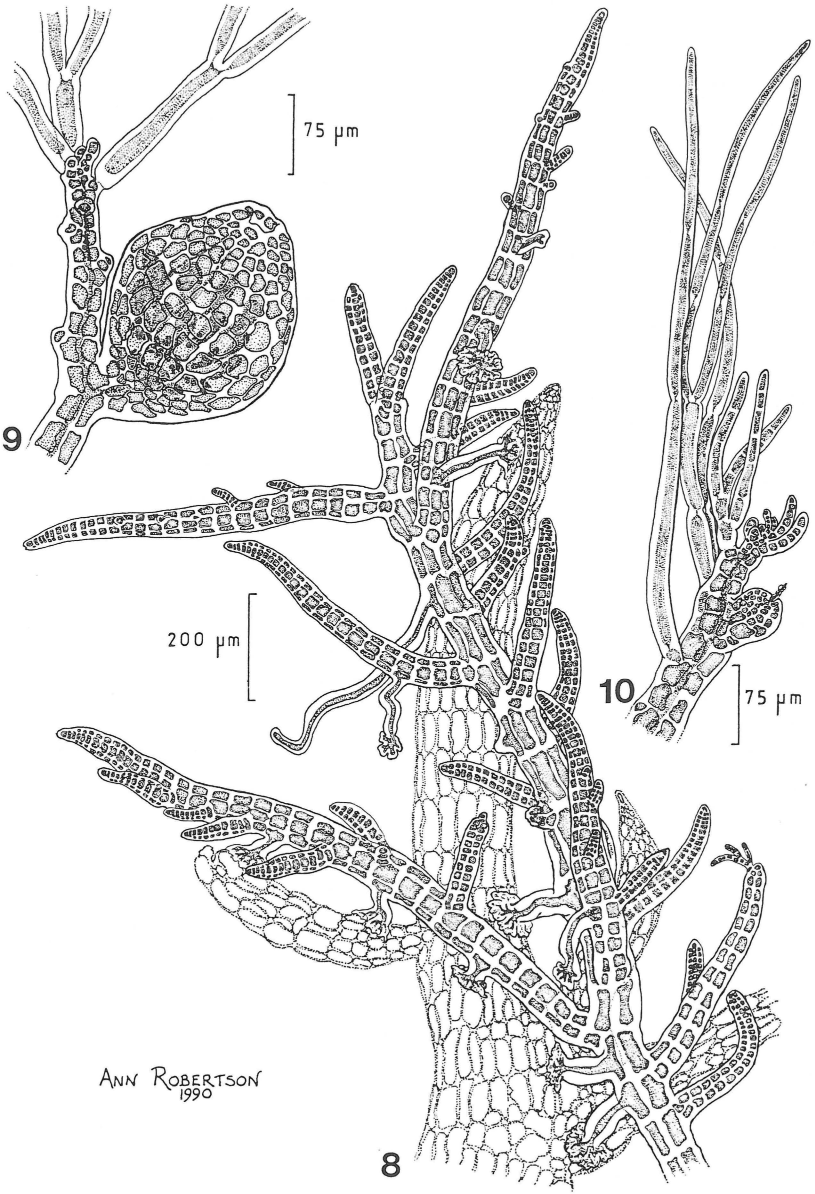
The only other species of *Falkenbergiella,* also previously reported in South Africa, *F. caespitosa* Pocock (1953), was transferred to *Polysiphonia caespitosa* (Pocock) Hollenberg (1968b) because upright branches often have exogenously produced polysiphonous branches.

Collections of a plant identified as *L. prostrata* (Harvey) Falkenberg (1901) (Figures 8 – 12) occur on a variety of hosts in Natal. Our specimens have characters that generally agree with those illustrated for this species by Cribb (1956). *Lophosiphonia prostrata* resembles *Polysiphonia scopulorum* Harvey in having slender prostrate branches and rhizoids that are not cut off by septa from the pericentral cells. The tendency in *L. prostrata* for upright branches to be mostly reproductive, and any branching of the upright system to always be endogenously derived, the latter a basic character of *Lophosiphonia,* separates the two species. In addition, I find the segments of Natalian specimens of *L. prostrata* mostly isodiametric and usually with very thick walls in contrast to the thinner walled filaments of *P. scopulorum.*

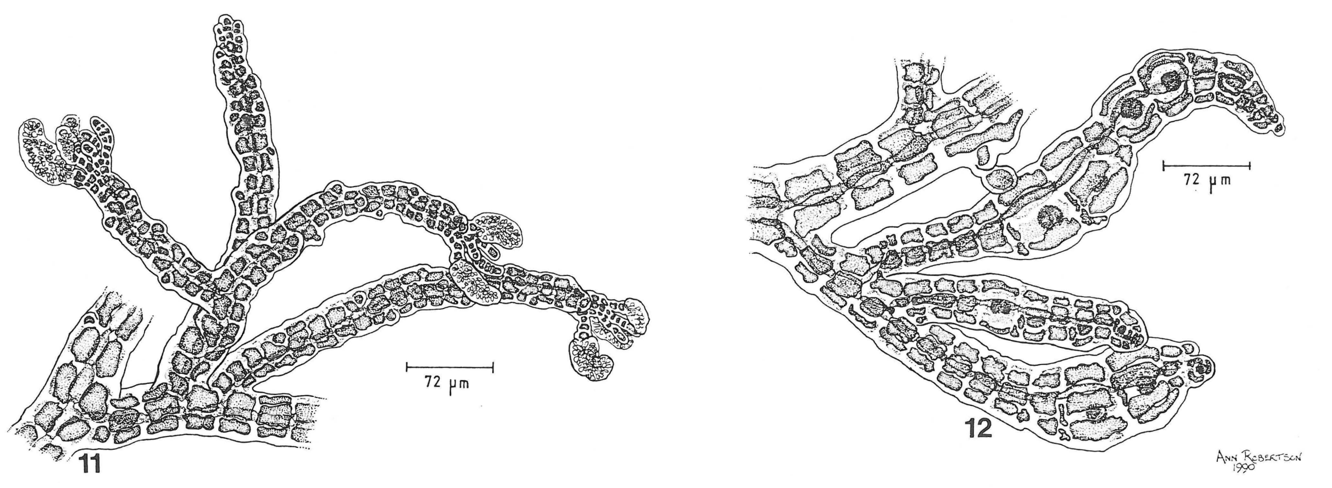
Specimens from Natal assigned to *L. prostrata* are from: Black Rock, 27°08′S, 32°50′E, 19-I-1986, *legit* A.J. Phelan (Nat 3711 & 4093, on *Phacelocarpus, Spyridia* & *Bryocladia*); Lala Nek, 27°13′S, 32°47′E, no date, *legit* A.J. Phelan (Nat 4949, on *Bryocladia*); Sordwana Bay, 27°32′S, 32°40′E, 14-X-1989, *legit* R.E. Norris (Nat 5254, 6287, 6322, on *Chamaedoris, Jania* & ascidians); Rocky Bay, Park Rynie, 30°20′S, 30°43′E, 18-IX-1982, *legit* R.E. Norris & B.P. Emanuel (Nat 0252); Trafalgar, 30°57′S, 30°18′E, 28-IX-1985, *legit* R.E. Norris (Nat 3622, on *Metamastophora*); Palm Beach, 30°58′S, 30°17′E, 24-V-1986, *legit* R.E. Norris (Nat 4004, on *Gymnogongrus*).

5. ***Womersleyella*** *Hollenberg* (1967).

Having a system of prostrate polysiphonous axes as well as upright branches, as are found in *Lophosiphonia* and some species of *Polysiphonia, Womersleyella* differs from these genera in producing exogenously derived polysiphonous branches in the prostrate as well as in the upright system, the branches being formed by 'branch primordia' that are formed in a spiral pattern on the axis in a way similar to trichoblasts. Indeed, some of them may represent trichoblasts rather than polysiphonous branch primordia and, for this reason, I refer to them as non-emergent branches while they are unicellular. The primordia, formed before initiation of pericentral cells by derivatives of the apical cell, may divide to form several cells and remain dormant in a unicellular or multicellular condition for a considerable time before forming an erect branch. Hollenberg (1967) described the erect determinate branches as being produced in a 'delayed exogenous, or falsely cicatrigenous manner', but, in my estimation, this process is no different from cicatrigenous branching except that the unicellular trichoblasts or 'branch primorida' are non-emergent. Nevertheless, the



Figures 8 – 10 *Lophosiphonia prostrata.* **8.** Habit of plant growing on *Bryocladia.* **9.** Cystocarp near branch tip bearing trichoblasts. **10.** Upright branch tip bearing trichoblasts and a single immature cystocarp.



Figures 11, 12 *Lophosiphonia prostrata.* **11.** Male branches bearing male capitula near branch tips. **12.** Tetrasporangial branches.

structure of the species assigned to *Womersleyella* is significantly different from typical *Polysiphonia* or *Lophosiphonia* and there seems to be reason enough to support recognition of this genus. I believe that two other species of *Polysiphonia* described by Hollenberg (1968a) should be transferred to *Womersleyella*: *Womersleyella herpa* (Hollenberg) R.E. Norris comb. nov. [Basionym: *Polysiphonia herpa* Hollenberg 1968a, *Pacific Science* 22, p.68, Figs. 1I, 2G], and *Womersleyella setacea* (Hollenberg) R.E. Norris comb. nov. [Basionym: *Polysiphonia setacea* Hollenberg 1968a, *Pacific Science* 22, p.85, Figs. 5A,B,C].

Inclusion of these species in *Womersleyella* expands the definition of this genus to include species with four pericentral cells, erect branches arising in a one-fourth spiral sequence, chloroplasts that are not arranged in transverse bands, erect branches sometimes branched and bearing trichoblasts that may be in a spiral instead of always borne abaxially. Although trichoblasts on the erect branches may be abaxially produced in young branches in species of *Womersleyella*, they often are produced on all sides of older erect branches. Erect branches probably are always determinate at a fairly early stage of development, whereas prostrate axes seem to be indeterminate for indefinite periods. Experimental studies on growth need to be carried out on species of *Womersleyella*.

My expanded understanding of *Womersleyella* is summarized in the following emended description of the genus:

Womersleyella Hollenberg (1967) emend. R.E. Norris.

Mostly prostrate polysiphonous, indeterminate axes, with four or five pericentral cells, usually attached by multicellular rhizoids; prostrate axes producing non-emergent branches (exogenous) on every segment except a few proximal ones; upright polysiphonous branches determinate, often produced from dorsal primordia on every fourth or fifth segment, depending on spiral sequence of initials, sometimes formed in pairs on adjacent segments, upright branches having non-emergent or emergent branches or 'scar cells' from deciduous trichoblasts on all but a few proximal segments; trichoblasts borne abaxially in young, often distally bent, erect branches but produced on all sides of more erect older branches; erect branches unbranched or with a few short branches which are also sometimes branched; one tetrasporangium produced per segment; cystocarps and spermatangial capitula produced near distal ends of erect branches or their branches.

The most important characters in defining *Womersleyella* are: (i) the indeterminate prostrate branching system; (ii) absence of emergent trichoblasts on prostrate axes and presence of non-emergent branches (exogenous branch primordia) on most segments of the prostrate axes; (iii) upright branches determinate, unbranched or branched only a few times, usually having emergent or non-emergent trichoblasts or polysiphonous branches on every segment except for a few proximal ones; (iv) rhizoids usually multicellular in the expanded area at the tactile end; (v) four or five pericentral cells; (vi) scar cells (from broken-off trichoblasts) or non-emergent primordia of trichoblasts or polysiphonous branches or branches arranged in a one-fourth or one-fifth spiral sequence, usually in agreement with the number of pericentral cells; (vii) tetrasporangia one per segment in a distal series on erect branches.

Polysiphonia species having prostrate systems with short determinate upright branches may be confused with *Womersleyella*, but species of the former genus have no scar cells (from deciduous trichoblasts) on the prostrate system. Care must be taken in analysis of this character, however, because of the decumbent habit of some *Polysiphonia* species in which erect branches, having become decumbent, may appear to be prostrate. Rhizoids of most species of *Polysiphonia* remain unicellular in the distal expanded tips, whereas they are multicellular in at least some species of *Womersleyella*. The irregular and adventitious endogenous development of polysiphonous branches on both prostrate and erect branches of *Lophosiphonia* separates that genus from both *Polysiphonia* and *Womersleyella*. Multicellular primorida derived from scar cells (derived from deciduous trichoblasts) often are present in *Womersleyella*, but these may also be present in *Polysiphonia*.

Two species of *Womersleyella* were found in Natal. One of the collections (Figures 13 – 16), often an epiphyte on larger algae in northern Natal, is probably *W. pacifica* Hollenberg var. *minor* Hollenberg (1967). It was collected at Leadsman Shoal, St. Lucia, 27°52′30″S, 32°36′E, 27-XI-1984, *legit* M. Bouwer from a 10 m dive (Nat 2386). The other represents an undescribed species:

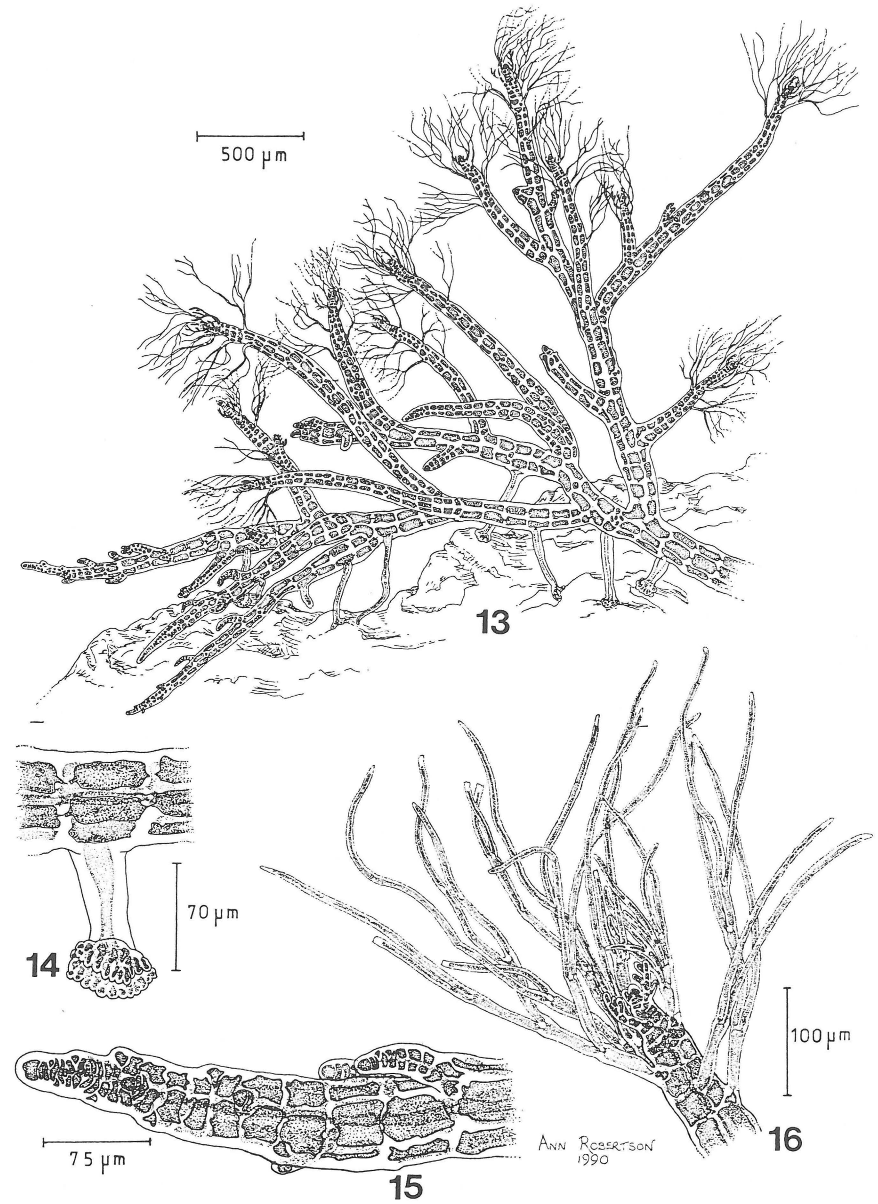
Womersleyella kwazuluensis R.E. Norris sp. nov. (Figures 17-22)

Thalli ramis prostratis et erectis; rami prostrati indeterminati, cylindrici, trichoblasto non emergente, in spiram $^1/_4$ depositi in plurimis segmentis. Rami erecti determinati, cylindrici, positi in serie irregulare et separati segmentis 4 – 5; usque ad 2 mm altitudini et trichoblastis emergentibus in plurimis segmentis. Omnes rami usque ad 50 μm diametro et cellulis 4 pericentralibus. Tetrasporangia usque ad 12 in serie in segmentis distalibus ramorum rectorum.

TYPUS:— Holotype: slide 3831, Natal, 2 mile reef off Sordwana Bay, 27°32′S, 32°40′E, 5-V-1985, *legit* J. Dench by diving from 12 – 15 m (Nat 3186, on the surface of a colonial ascidian) (deposited in the slide collection at the Botany Department, University of the Witwatersrand, Johannesburg, South Africa). Tetrasporophyte.

ETYMOLOGY:— This species is named for the Zulu homeland, KwaZulu, in which it was found.

Thalli with prostrate and erect branches (Figure 17), the erect branches up to 2 mm high; all branches cylindrical and with four pericentral cells; prostrate branches indeterminate, with a non-emergent trichoblast or polysiphonous branch primordium on most segments (Figure 21), arranged in a $^1/_4$ spiral. Erect branches determinate, developing in an irregular series, occasionally in a series of 2 – 3, but usually with 4 – 5 segments between them (Figure 17). Upright branches producing trichoblasts that are soon deciduous leaving large scar cells (10 μm in diameter) on every segment except on a few proximal ones. Upright and prostrate branches all approximately 50 μm in diameter, but the erect branches narrow to approximately 30 μm where they join the prostrate branch. Prostrate and erect branches are abruptly terminated in obtuse apices (Figures 17, 21).

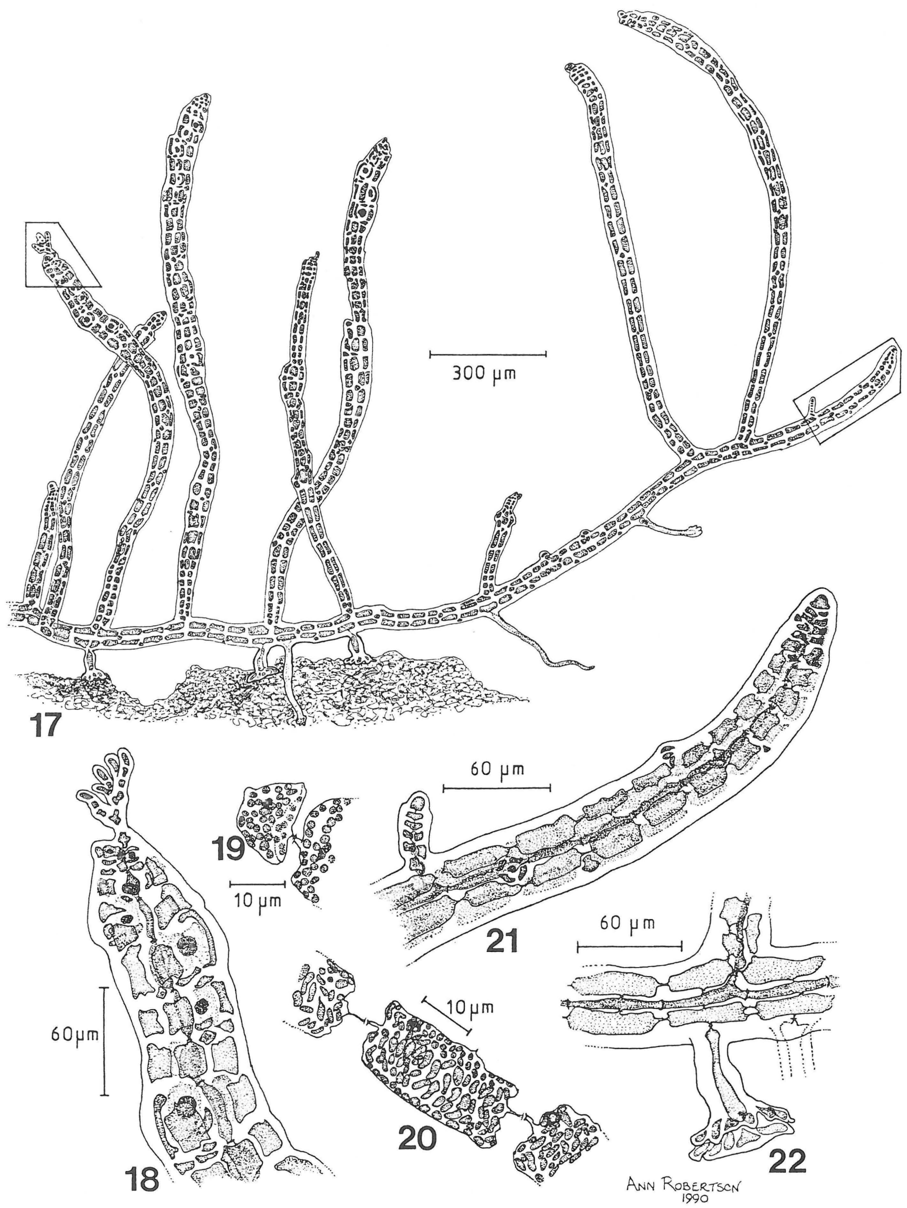


Figures 13 – 16 *Womersleyella pacifica* var. *minor*. **13.** Habit of sterile plant. Note prostrate axis tips to the left, without trichoblasts, and numerous branched upright determinate branches with trichoblasts. **14.** Multicellular rhizoid from ventral side of prostrate axis. **15.** Apex of prostrate axis showing non-emergent trichoblasts and branch primordia in a spiral pattern on the axis. **16.** Tip of erect determinate branch bearing trichoblasts in a spiral pattern on the axis.

Rhizoids are irregularly placed on the prostrate axes and have expanded and branched distal ends that become separated into single cells or short filaments of cells (Figure 22). Axial pit connections in mature segments of upright filaments are 5 – 6 µm in diameter, but they are approximately twice that diameter in prostrate axes. Chloroplasts in pericentral cells are discoid and approximately 2 µm in diameter in young cells (Figure 19), but they often expand into ribbon shapes of similar diameter, and these types may be arranged transversely in the cells (Figure 20). Tetrasporangia are produced in distal segments of erect branches (Figure 17), often in a long series of up to 12. Tetrasporangia divide tetrahedrally but remain small, up to 20 µm in diameter. It is possible that they are immature in my samples, even though divided, and may abort (Figures 17, 18). Two cover cells are formed on the bearing segment which is adjacent to the segment's scar cell.

6. *Lophocladia* (J. Agardh) Schmitz (1893).

A genus containing six species that are difficult to separate from one another, *Lophocladia* has been recorded from a wide range of tropical and sub-tropical regions including the Indo-Pacific. Four of the species are comparatively large plants, the thalli being up to approximately 100 mm long. *Lophocladia minima* Itono (1973) grows to only about 15 mm high, and *L. kipukaia* Schlech (1990) may be up to 20 mm long. *Lophocladia minima* also differs from two of the other species in which cystocarps are known, *L. lallemandii* (Montagne) Schmitz and *L. trichoclados* (C. Agardh) Schmitz, in having only a rudimentary trichoblast on the cystocarpic branch (Itono 1973). Well-developed and branched trichoblasts are on cystocarpic branches of *L. lallemandii* and *L. trichoclados*. Branching of the polysiphonous axis is endogenously derived in *L. trichoclados* whereas these branches replace trichoblasts in an exogenously derived manner in *L. lallemandii*.



Figures 17 – 22 *Womersleyella kwazuluensis* sp. nov. **17.** Habit of plant. Note boxed-in prostrate axis tip on the far right, shown in higher magnification in Figure 21, and boxed-in erect branch tip on the left, shown in more detail in Figure 18. **18.** Erect determinate branch tip with a small trichoblast and several apparently aborting tetrasporangia in a spiral series. **19.** Young pericentral cells with discoid chloroplasts. **20.** Mature pericentral cells having short band-shaped chloroplasts, some of which are transversely oriented. **21.** Apex of the prostrate axis shown in Figure 17. Note the non-emergent trichoblasts or branch primordia arranged in a spiral pattern on the axis, all exogenously produced. **22.** A mature rhizoid on the ventral side of a prostrate branch. Note the multicellular thigmotactic apex of the rhizoid.

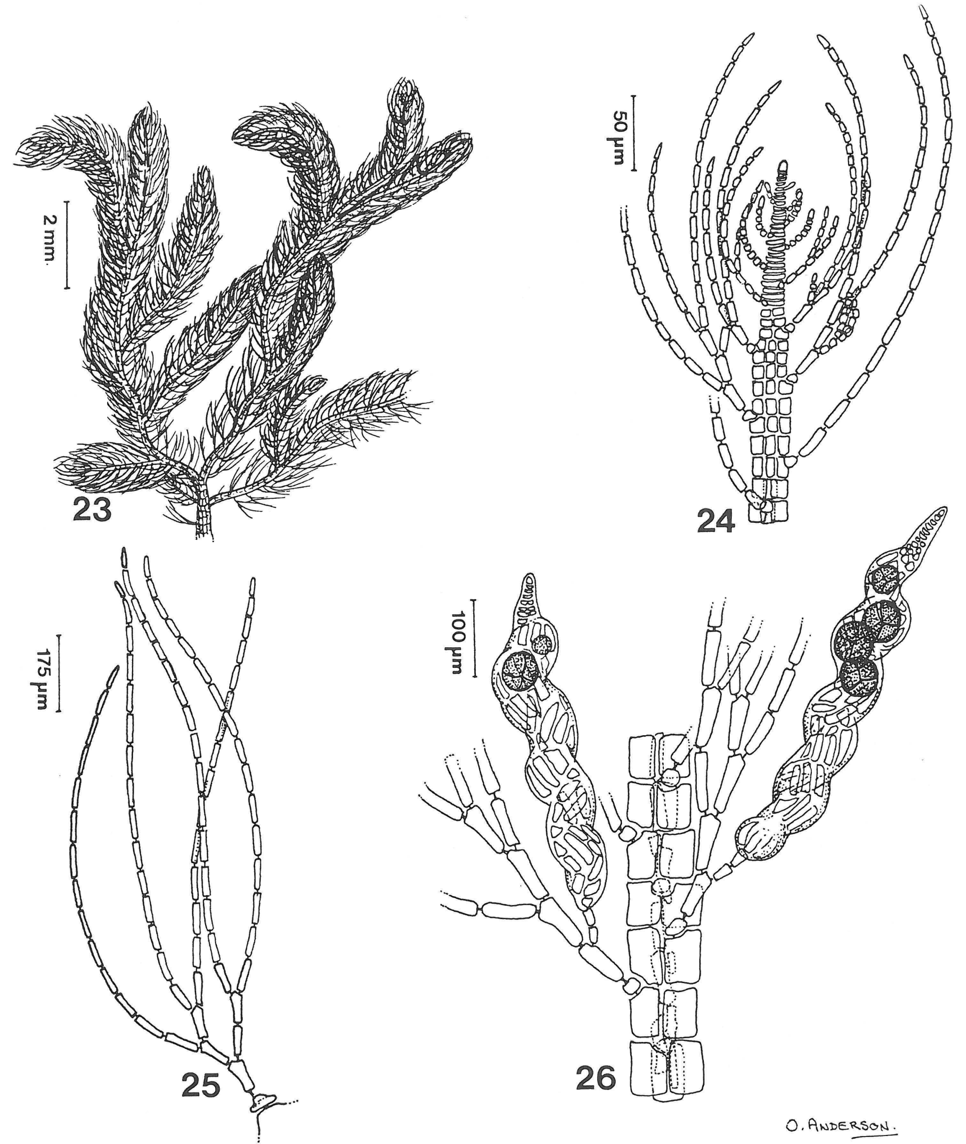
The Natal specimens (Figures 23 – 26) range up to 13 mm long, several of them being reproductive, producing tetrasporangiate stichidia (Figure 26), and one thallus has a single badly broken cystocarp that has no sign of a trichoblast. Because of these characters, the Natal plants are considered to be the same species that Itono (1973) described as *L. minima* from the Ryukyu Islands. Exogenous branching of the polysiphonous axis occurs in the Natal specimens, the branches replacing trichoblasts.

The first southern African record of this genus was reported by Bolton and Stegenga (1987) on specimens that were found in the Transkei. Unfortunately, they did not name the species, nor did they cite specimens that could be re-examined for verification.

The Natal specimens were found in the intertidal region at the mouth of Kosi Bay, 26°53′S, 32°53′E, 16-XI-1982, *legit* K. Balkwill & B. Emanuel (Nat 0493, NU 003808, tetrasporangiate and sterile); and 4-mile reef, Sordwana Bay, 27°32′S, 32°40′E, 5-II-1989, *legit* R. Broker (Nat 5945 in old coral at 21 m, female).

7. *Herposiphonia* Naegeli.

Although species of *Herposiphonia* are known to occur in South Africa (Seagrief 1984; Wynne 1984), a remarkable new species was found in Natal that is distinct from any others in this region as well as from species described from other parts of the world.



Figures 23 – 26 *Lophocladia minima*. **23**. Part of branch showing habit. **24**. Apex of growing branch showing development of trichoblasts. **25**. A single mature pigmented trichoblast. **26**. Two trichoblasts bearing tetrasporangial stichidia on their proximal branches.

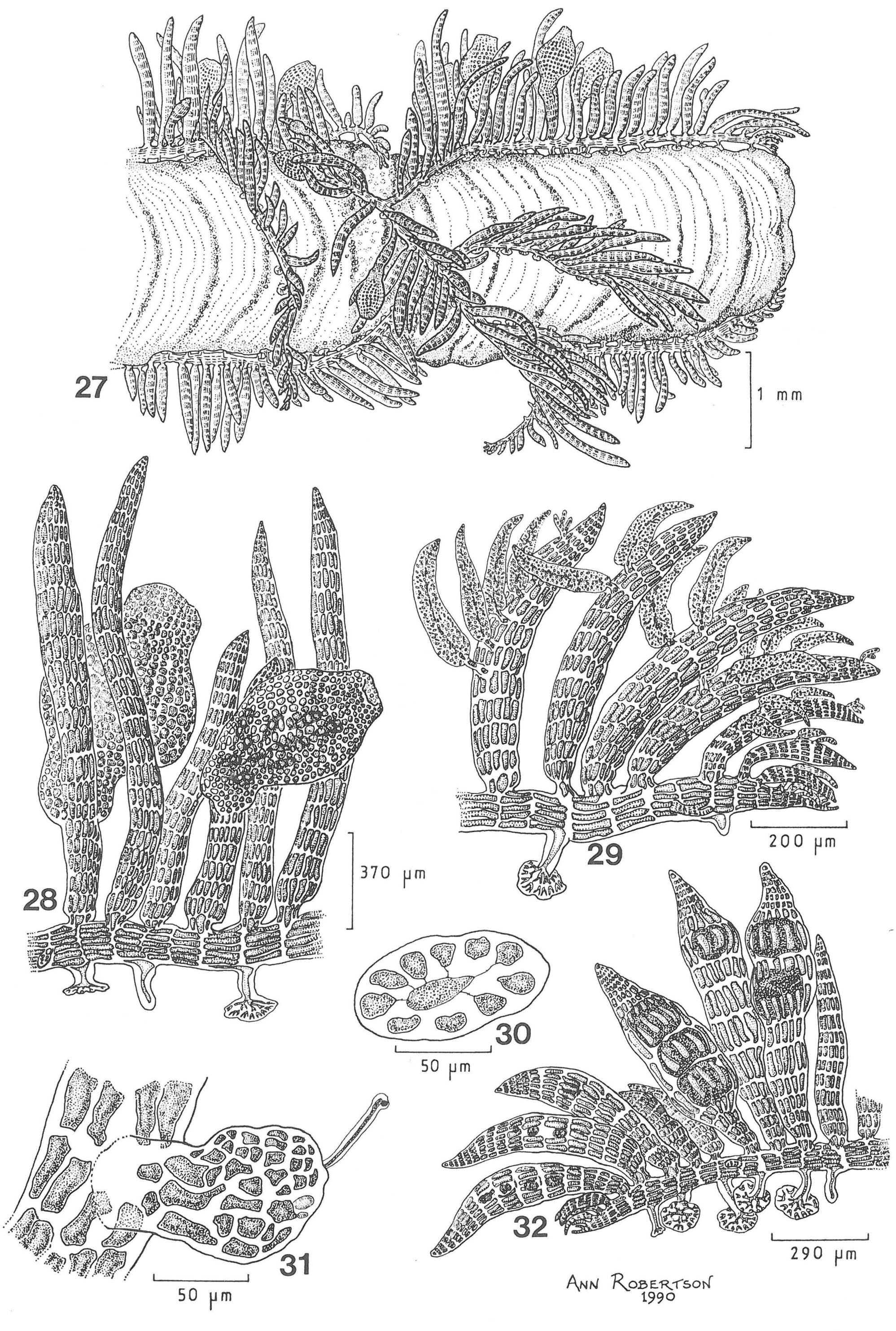
Herposiphonia akidoglossa R.E. Norris sp. nov. (Figures 27 – 32)

Thalli ramis prostratis et erectis; rami prostrati cylindrici et indeterminati dum rami erecti determinati et compressi usque ad complanatos et plerumque cellulis 10 pericentralibus. Segmenta rami prostrati ramos facientia, ramulis 3 erectis determinatis et ramo indeterminato alternantibus. Ramuli recti determinatique usque ad 1500 µm longitudine et 200 µm latitudine, e 20 segmentis consistantes, quorum illa distalia cellulas pericentrales deminutas habent atque in singulam cellulam acuminatam terminant. Gametangia mascula et feminea plerumque in latere abaxiali facta; capitula mascula cylindrica et usque at 700 µm longitudine, 100 µm latitudine; cystocarpia in segmento sexto ad actavum a base rami, usque ad 1 mm latitudine. Tetrasporangia usque ad 300 µm diametro, in ramulis determinatis saepe brevioribus et abaxiliter tumidis, portata.

TYPUS:— Slide No. 2069, Natal, Blood Reef, off the old whaling station at Bluff, Durban, 23-XII-1984, *legit* S.R. John by diving to an unknown depth (Nat 2253, tetrasporophyte, on *Amphiroa*) (slide deposited in the slide collection at the Botany Department, University of the Witwatersrand, Johannesburg, South Africa). Isotype slides deposited at BISH.

ETYMOLOGY:— The name describes the pointed, tongue-like shape of the determinate branches (*akidos* = pointed, *glossa* = tongue).

Dorsiventral polysiphonous thalli (Figure 27), 9 – 10 pericentral cells (Figure 30), indeterminate branch tips straight or curved upward; mature segments up to 200 µm long, 120 µm wide, each pericentral cell approximately 20 µm broad, axial cells 25 µm wide. Each segment with a branch, 3 segments in a series with determinate branches alternating with a single segment having an indeterminate branch; the latter branches directed on alternate sides of the axis in subsequent series. Determinate branches erect, compressed, on the dorsal side of the cylindrical prostrate axis, up to 1500 µm long (800 – 1500 µm) and 140 – 200 µm wide; with up to approximately 20 segments, the proximal one narrow, with 4 pericentral cells, but most segments in the distal direction having 10 pericentral cells; the distal-most



Figures 27 – 32 *Herposiphonia akidoglossa* sp. nov. **27.** Habit of female plant growing on *Amphiroa*. **28.** Part of a prostrate branch having erect branches bearing mature cystocarps. Note the more proximal position of cystocarps and bulging base of cystocarp. **29.** Prostrate branch tip bearing male determinate branches. Note the abaxial position of the male capitula. **30.** Cross-section of a determinate branch having ten pericentral cells. Note the compressed nature of the branch. **31.** An immature cystocarp bearing a trichogyne with an attached spermatium. **32.** Tetrasporophyte prostrate branch tip. Note the short stichidia and the tetrasporangia in a few middle segments, and the multicellular rhizoids.

few segments reduced from 10 to as few as 1 pericentral cell in some branches with approximately 4 – 5 segments, the branch ending in a sharp point consisting of a single cell. Axial cells in determinate branches are compressed-cuboidal, each side approximately 75 μm long. The abaxial side of the determinate branch is curved whereas the adaxial side is almost straight. Determinate branches curve towards the prostrate apex in young stages of development. Indeterminate branches often consist of a few cells that remain dormant, but actively growing branches of the axis sometimes occur in fairly regular sequences, often every 7 segments. Rhizoids are produced toward the distal end of the pericentral cell on the ventral side of a prostrate axis and often occur every second or third cell and opposite a determinate branch (Figures 28, 29, 32). Rhizoids are multicellular, cut off from the pericentral cell and sometimes with a 2-celled stalk. The expanded digitate thigmotactic disk consists of a branched cell terminating in bifurcate cells (Figures 28 – 30).

Male capitula (Figure 29) are cylindrical, up to 700 μm long, 100 μm wide, usually replace trichoblasts, and occur mostly on the abaxial side of the branch; 1 – 5 may be present on each branch in middle to distal positions. A single sterile cell may or may not be present at the tip of the male capitulum. One branched trichoblast was observed bearing 3 male capitula, one replacing each of its proximal branches. Cystocarps (Figure 28) terminate lateral branches of the erect determinate branches, usually borne on the second segment (Figure 31), the branch produced on the abaxial side by the 6th to 8th segment from the base of a determinate branch. Cystocarps may be up to 1 mm in diameter.

Tetrasporangial branches, stichidia (Figure 32), are often smaller than vegetative determinate branches, up to 800 μm long, and bear from 1 to 4 tetrahedrally divided large tetrasporangia that may be up to 300 μm in diameter. Fertile segments of stichidia are swollen, mostly on the abaxial side.

Additional collections: Palm Beach, near Port Edward, Natal, 30°58′S, 30°17′E, 14/15-V-1983, *legit* R.E. Norris & M.E. Aken (Nat 1528, on *Amphiroa bowerbankii*).

A Japanese species of *Herposiphonia, H. fissidentoides* (Holmes) Okamura (1900) also has expanded, compressed determinate branches with acute tips. The number of pericentral cells in branches of this species, however, is over 20 in the widest row, twice the number usually found in *H. akidoglossa*. Furthermore, the determinate branches of the Natal species are borne erect on the dorsal side of the prostrate axis, whereas in *H. fissidentoides* they project laterally. Determinate branches of the latter species usually do not have a more noticeably swollen abaxial side as in *H. akidoglossa*. It seems that the relationship of the two species, however, must be close, and both grow on the surface of articulated coralline red algae. The stichidia of *H. fissidentoides* are narrower than its vegetative determinate branches and are structurally similar to the determinate vegetative branches of *H. akidoglossa*.

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