Gelidium pteridifolium (Rhodophyceae), a new species from Natal and the eastern Cape

R.E. Norris*, M.H. Hommersand and S. Fredericq

Department of Botany, University of Natal, P.O. Box 375, Pietermaritzburg, 3200 Republic of South Africa and
Department of Biology, Coker Hall 010A, University of North Carolina, Chapel Hill, North Carolina, U.S.A. 27514

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A relatively large, common species of *Gelidium* occurring in lower intertidal to subtidal regions on the east coast of South Africa has been found to be undescribed. Previously this species has gone under two illegitimate names *Gelidium cartilagineum* (L.) Gaillon and *G. versicolor* (S.G. Gmelin) Lamouroux. Female and tetrasporangiate specimens are described from its type locality, Palm Beach, near Port Edward, Natal. Its known range extends from Durban, Natal, to Algoa Bay in the eastern Cape Province. Because of the beautiful *Pteridium*-like branching pattern of the blade, it is given the specific name, *G. pteridifolium* sp. nov.

Dit is bevind dat 'n relatiewe groot bekende *Gelidium*-spesie wat in die laer tussengety- tot subgetysone, aan die ooskus van Suid-Afrika voorkom, onbeskryf is. Die spesie het vroeër onder twee onwettige name nl. *Gelidium cartilagineum* (L.) Gaillon en *G. versicolor* (S.G. Gmelin) Lamouroux bekend gestaan. Vroulike en tetrasporangiate eksemplare, afkomstig van die tipelokaliteit Palm Beach naby Port Edward, Natal, is beskryf. Die bekende verspreiding strek vanaf Durban, Natal tot by Algoabaai in die oostelike Kaapprovinsie. Vanweë die mooi *Pteridium*-agtige vertakkingspatroon van die lamina, is die spesienaam *G. pteridifolium* sp. nov. daaraan toegeken.

Keywords: Gelidiales, *Gelidium*, new species, Rhodophyceae, South Africa

*To whom correspondence should be addressed

Introduction

A common large species of *Gelidium* occurring on the east coast of southern Africa from its northernmost recorded locality, Durban, Natal, to Algoa Bay in the eastern Cape Province has been catalogued in the past either under the name of *G. cartilagineum* (L.) Gaillon or *G. versicolor* (S.G. Gmelin) Lamouroux (Seagrief 1984). The name *G. cartilagineum* is considered to be applicable to *Plocamium* according to Dixon (1967). As Silva *et al.* (1987) have pointed out: 'With the removal of *Fucus cartilagineus* from consideration, Dixon (1967:58) adopted *Gelidium versicolor* (S.G. Gmelin) Lamouroux (1813:129) as the correct name for the South African alga. *Fucus versicolor*, however, is a superfluous name for *F. abrotanifolius* Linnaeus (1753:1161), which Gmelin cited as a synonym, and hence is illegitimate. (*Fucus abrotanifolius* is referable to *Cystoseira*.)'

In earlier years a single species of large *Gelidium* was recognized in southern parts of South Africa but our studies have made it clear that two species of South African *Gelidium* have been included under the illegitimate epithets cited above, one occurring in the Cape of Good Hope as well as in the eastern Cape extending as far north as southern Natal and the second species having a distribution extending from Natal to near Port Elizabeth in the eastern Cape Province and not, apparently, known to occur in the Cape of Good Hope. (Tyson Exsicc. no. 33 includes specimens of the eastern Cape species labelled as collected in Table Bay; however, it is suspected that some eastern Cape materials were distributed as coming from Table Bay by mistake.)

Silva *et al.* (1987) typified *Fucus capensis* Gmelin from the Cape of Good Hope with Gmelin's Fig. 1 of Pl. XVII (1768), a figure showing a plant having curved ultimate branchlets, branching to a fifth order in some cases, and lacking constrictions at the point of major branch emergence from axes. These characters are attributable to the species presently found on shores of the Cape of Good Hope rather than the one found primarily in the eastern Cape. Only the species now known as *G. capense* (S.G. Gmelin) P.C. Silva has been found in the vicinity of Cape Town in recent collections, leaving the second species from Natal and the eastern Cape without a specific name. For this reason, and the fact that no other name in the literature seems to be attributable to this species, we designate it as *Gelidium pteridifolium* sp. nov.

Materials and Methods

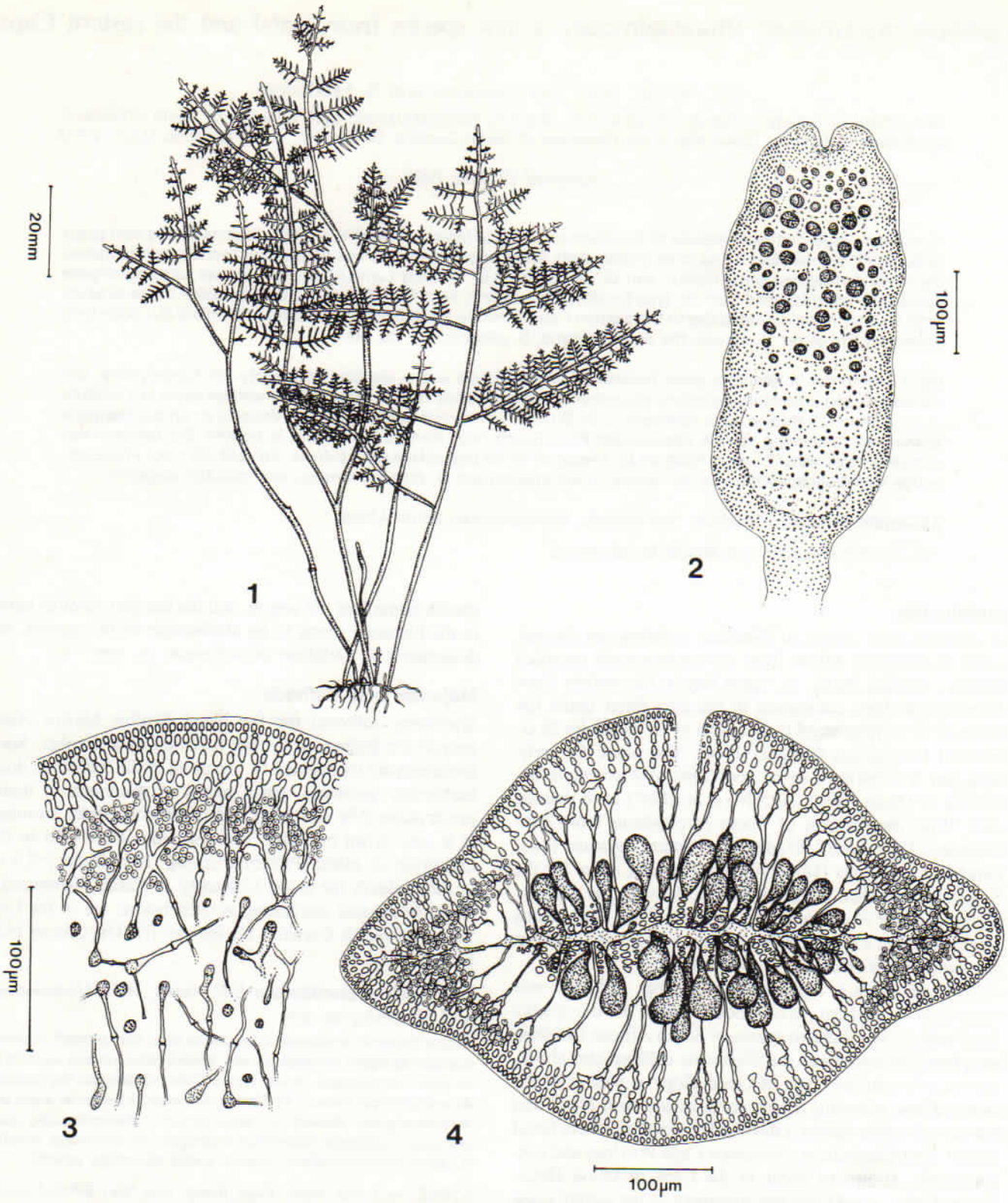
Specimens collected for the Natal Benthic Marine Algal project are designated by *Nat* followed by a number. Such specimens are represented by one or all of the following: dried herbarium specimens, small pieces of specimens in liquid preservative (5% formalin) and microscope slides mounted in a corn syrup medium. These specimens are filed in the University of Natal, Pietermaritzburg, Herbarium (NU) or in the project's file at the University of Natal, Pietermaritzburg. Additional specimens, as cited below, are in the University of North Carolina Herbarium (NCU), Chapel Hill, U.S.A.

Gelidium pteridifolium *R.E. Norris, M.H. Hommersand et S. Fredericq* sp. nov.

Plantae hapteror: prostratum stoloniferum unde rami primarii applanati erectique emergunt habentes; hi rami vicissim ramos distales secondarios ad quaternarios ferunt. Omnes rami distiche pinnatimque disponuntur, sic ordinationem forma folii *Pteridii* efficientes. Cystocarpi atque sori tetrasporangiales distales in ramis tertiariis quaternariisque; rami cystocarpici cacumine rostriformi prolongato sterilique saepe praediti, et ramuli tetrasporangiales incisura apicali plerumque praediti.

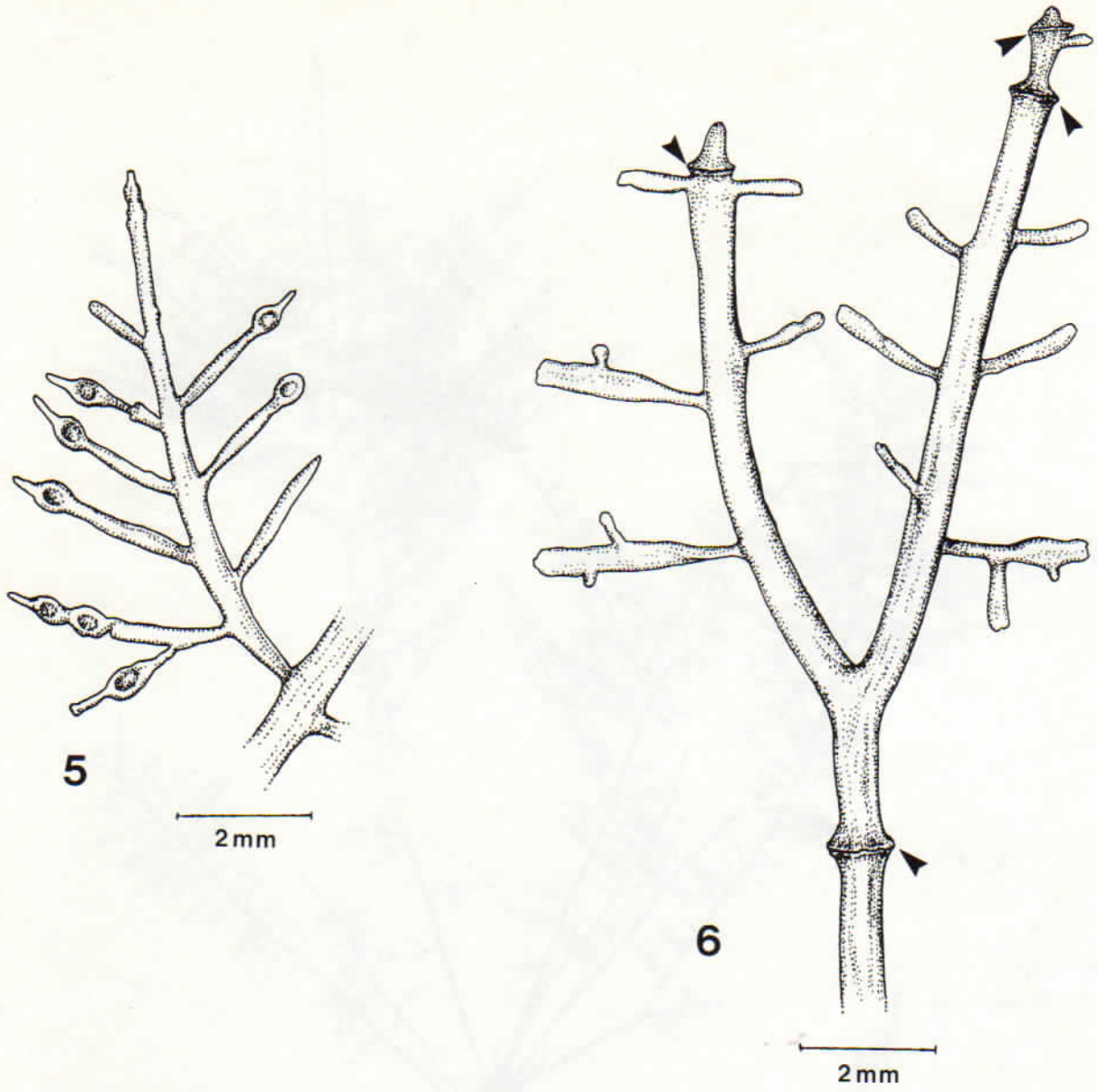
TYPUS. — Locus Natal: Palm Beach, near Port Edward dictus. 4-V-1980, *R.N. Pienaar 634* (NU 00687, holotypus, cystocarpic).

Gelidium pteridifolium has a large (up to 50 cm long), cartilaginous thallus arising from a stoloniferous holdfast. The erect axes are broadly flattened (approximately 2 mm in diameter) and produce secondary to quaternary branches of progressively smaller diameters (Figures 1 & 7). Branches of all orders are often opposite one another, especially the tertiary and quaternary branches. In regions of thalli where branching occurs, the proximal to distal secondary branches are progressively shorter, more or less giving these areas the outline of an equilateral triangle. Tertiary and quaternary branches that occupy equivalent positions are often approximately the same length. All branches are quite straight, rarely having a tendency to curve distally. Many branches are slightly constricted



Figures 1 – 4 *Gelidium pteridifolium*. **1.** Habit of a tetrasporangiate plant. **2.** Tetrasporangial sorus. **3.** Partial cross section of a mature part of thallus. **4.** Section of a cystocarp.

where they join the axis (Figures 1, 5 & 6). The primary thallus axis is sometimes pseudodichotomously branched (Figures 6 & 7). Distal ends of thallus primary axes are usually obtuse (Figures 1, 6 & 7). Proximal ends of the thallus primary axes are compressed to flattened and young axes, arising from the horizontal axes, usually do not branch until they are 2 – 3 cm long (Figures 1 & 7). Older thalli have branches only in distal regions, the proximal branches presumably being deciduous as growth continues. A noteworthy characteristic of the thallus axis that is found occasionally in secondary branches is the tendency to form areas of ringed secondary thickenings in irregularly spaced regions (Figure 6). These bamboo-like 'nodal' regions may be caused by injury, such as grazing on meristems, but their tendency to be present in distal regions of thalli, regions having no apparent injury in *G. pteridifolium*, suggests that they are an inherent character. Joint-like thickenings are present in similar positions in some specimens of *G. amansii* Lamouroux. Fewer such thickenings are encountered on thalli of *G. capense* where they are present in more proximal positions and have distal emergent axes that



Figures 5 & 6 *Gelidium pteridifolium*. **5.** Tertiary branch of female plant showing cystocarps. **6.** Distal part of a branch showing dichotomy of the axis, a rare phenomenon, and commonly formed node-like swellings on axes, occurring in irregular positions (arrow heads). Also note constricted bases of branches where they join axes.

are smaller in diameter.

Internally, thallus structure is more or less typical for *Gelidium* (Figures 3 & 10) consisting of a small-celled outer cortex of several layers in mature regions, an inner cortex of cells having stretched arms (in younger regions these cells are more rounded) interspersed with rhizines, and a medulla of narrow-celled filaments but with few to no rhizines.

Female reproductive organs are borne in mid-regions of tertiary and/or quaternary branchlets. The cystocarps often have a narrow distal beak-like protuberance representing the branch tip (Figure 5). They are biloculate (Figure 4) producing ostioles on both sides. Tetrasporangial sori are borne in terminal regions of secondary to quaternary branchlets (Figure 2) or in secondarily formed proliferous branchlets, the branchlet having a distal incision in which the apical cell is seated. Tetrasporangia (up to 30 µm dia.) are borne in a distinct central soral region of the branch outlined by a sterile margin of up to 75 µm wide. Interstitial surface cells in the sorus divide, some becoming vermiform, and many being smaller in diameter (3 µm) than the surface cortical cells in vegetative regions (up to 7 µm). Male plants have not been observed.

Discussion

Characters that may be used to differentiate *G. pteridifolium* from the other large species of *Gelidium* in eastern South Africa are:

(1) angle of divergence of branches — In *G. pteridifolium* branches usually emerge almost at right angles to the axis giving plants a characteristic distichous, triangular-shaped distal group of branches. Each branch in this species is straight with no sign of bending. In *G. capense*, in contrast, the branches emerge at nearly right angles to the axis but then immediately bend toward the distal part of the plant, becoming geniculate (Figure 8). As a result of the strong tendency for distal bending of the branches, adjacent branches strongly overlap in *G. capense* and often obscure the primary distichous branching pattern present in this species. The overall aspect of *G. capense* plants is of a conglomerate of distally tangled branches (Figure 8), whereas in *G. pteridifolium* the branches are straight, neatly spread and their individual form is easily observed (Figure 7). Branches in *G. amansii* diverge at right angles and often remain at that angle (Figure 9);

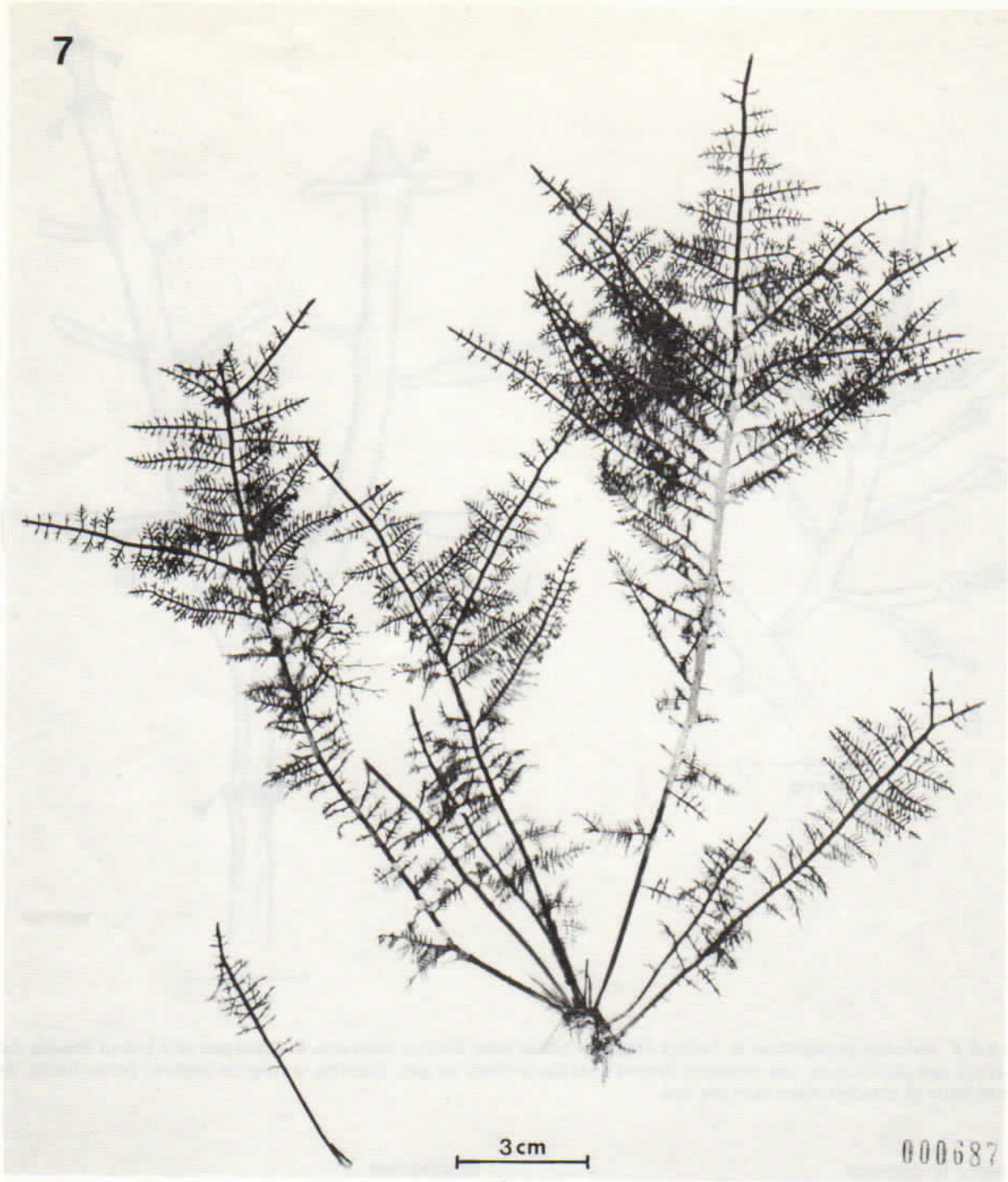


Figure 7 Holotype specimen of *Gelidium pteridifolium* (NU 687), a female plant from Palm Beach, near Port Edward, Natal.

however, fertile branches near distal ends of primary branches are often geniculate. In many plants of *G. amansii* long secondary branches become reflexed toward the proximal part of the plant, a condition that does not occur in the other large species.

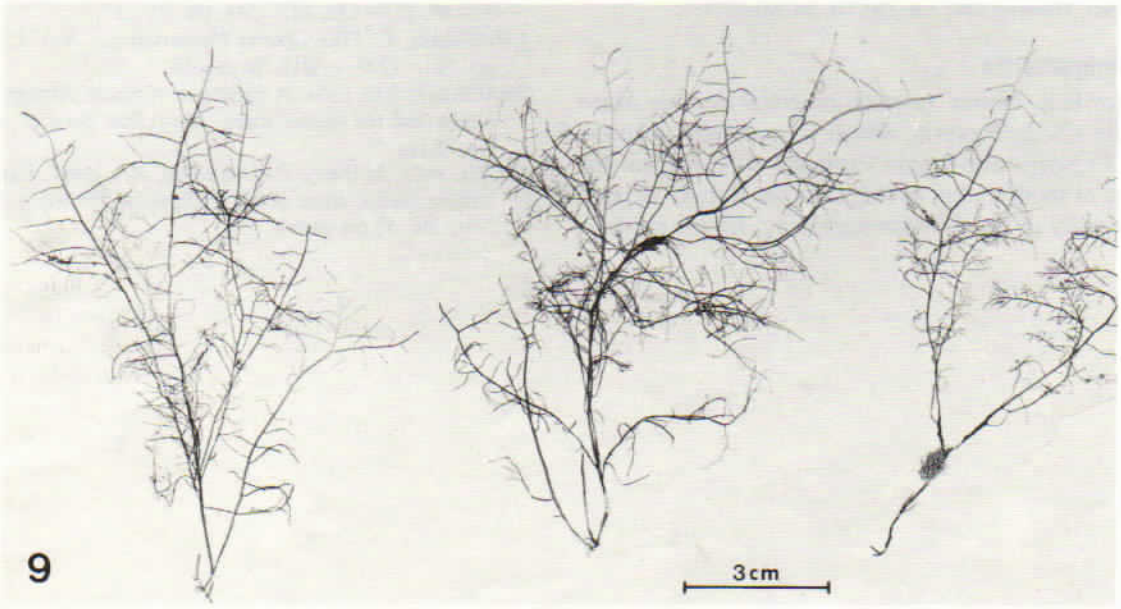
(2) Diameter of the axis — Thallus diameter rarely exceeds 1 mm in *G. capense* and is usually narrower in *G. amansii*. In *G. pteridifolium* the axis is flattened and usually more than 1 mm broad.

(3) Constriction at base of branches — Branches in *G. pteridifolium* and *G. amansiis* are slightly constricted where they join the axis whereas similar branches in *G. capense* often do not have a clearly constricted point of emergence and may even be broader at that region.

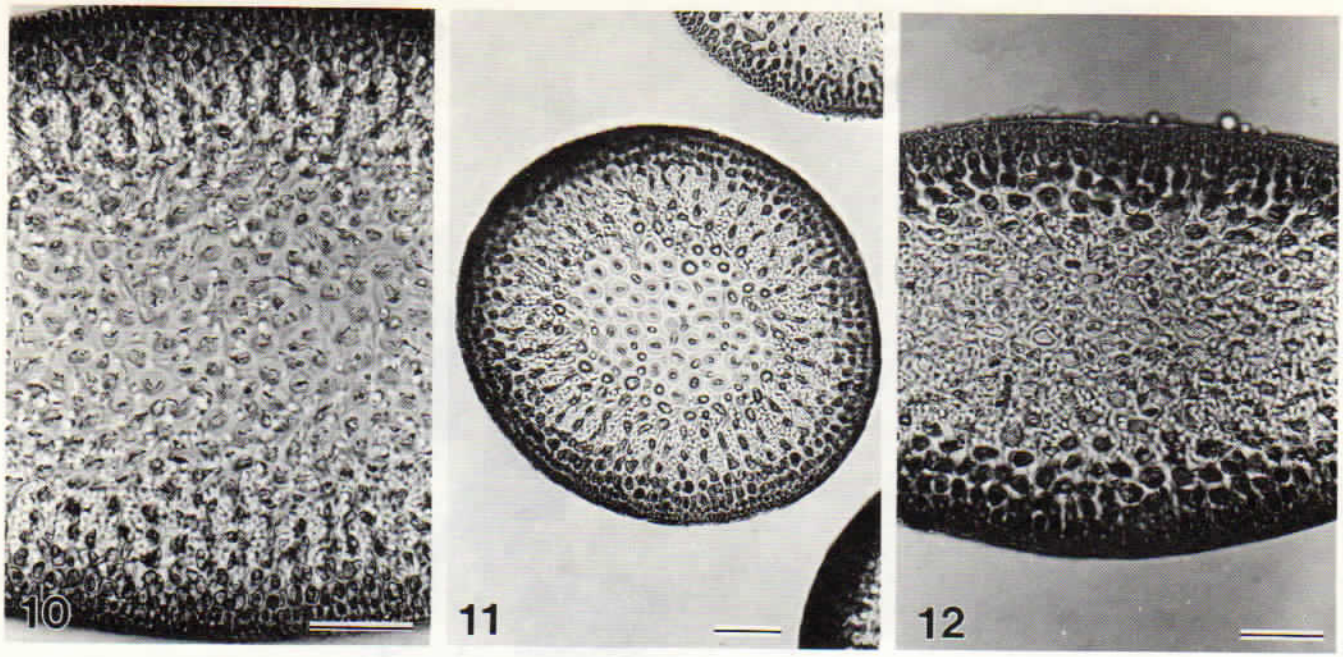
(4) Orders of branching — In *G. pteridifolium*, branching beyond the fourth order does not commonly occur, whereas in *G. amansii* and *G. capense*, particularly in tetrasporophytes, branchlets or lobes of the fifth order are often present.

(5) Margin of proximal axis — Many specimens of *G. capense* have proximal axes with serrations caused by dehiscence of secondary branches a short distance from the axis margin (Figure 8). The proximal axes of *G. pteridifolium* and *G. amansii* have smooth margins (Figures 7 & 9).

(6) Location of rhizines in third-order branchlets — Location of rhizines in first- and second-order branches in the three species is in the inner cortex (the region between the cortex and medulla). Third-order branchlets, however, have rhizines mostly in the medulla in *G. capense* (Figure 12) but they are in the inner cortex in third-order branchlets of *G. pteridifolium* (Figure 10) and *G. amansii* (Figure 11).



Figures 8 & 9 Habits of the two other large species of *Gelidium* occurring in South Africa. **8.** *Gelidium capense* (NU 9727), tetrasporangiate (left) and female (right) plants from Dalebrook, False Bay, Cape Peninsula. **9.** *Gelidium amansii* (NU 9048), tetrasporangiate specimens from Cape Vidal, northern Natal.



Figures 10 – 12 Cross sections of third-order branchlets in the three large *Gelidium* species occurring on the eastern South African coast. Scale bars all = 50 µm. **10.** *G. pteridifolium*. Note rhizines located mostly in inner cortex. **11.** *G. amansii*. Rhizines located almost entirely in inner cortex. **12.** *G. capense*. Rhizines located mostly in the medulla.

Specimens examined

Gelidium pteridifolium

—2930 (Pietermaritzburg): Reunion Rocks, Durban (– DD), *Nat 1831*, 16-IV-1984 (NU 9726); *Hommersand s.n.* (NCU).

—3030 (Port Shepstone): Isipingo Beach (– BB), *Thomson 66*, 21-II-1952 (NU 6354); *Ward 813*, II-1949 (NU 8512); *Ward 814*, III-1949 (NU 8513); Marina Beach (– CD), *Nat 1375*, 24-VII-1983 (NU 7333); Palm Beach (– CD), *Pienaar 633*, VI-1979 (NU 685); *Pienaar 637*, 21-I-1980 (NU 688); *Nat 1143*, 15-V-1983 (NU 7109, 7113, 7117, 7121); *Nat 3387*, 29-IX-1985 (NU 9445).

—3129 (Port St. Johns): Attached specimens in tide pools, 1 km S. of Umngazi River mouth (– CB), *Hommersand s.n.* (NCU), 16-XII-1977.

—3318 (Cape Town): Table Bay (– CD), *Tyson exsicc. no. 33*, no date (NU 30) — This specimen's locality is probably inaccurate because no collections of this species have subsequently been found in the vicinity of Cape Town.

—3326 (Grahamstown): Drift specimen, Sharks Cove, Kowie, Port Alfred (– DB), *Hommersand s.n.* (NCU), 14-XII-1977.

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