

GLOSSOPHORELLA, A NEW GENUS OF THE FAMILY DICTYOTACEAE (DICTYOTALES-PHAEOPHYTA) AND ITS ECOLOGY FROM THE COAST OF THE SULTANATE OF OMAN

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Abstract

The new genus *Glossophorella* Nizam. et Campbell is described which comprises two species viz., *G. coriacea* (Holmes) Nizam. Comb. nov. from Japan and the Pacific coast of U.S.A. and *G. dhofarensis* Nizam. et Campbell sp. nov. from the coast of the Sultanate of Oman. The genus is characterized by distromatic or polystromatic cortex and distromatic medulla throughout the thallus near the margins.

Introduction

A number of algal collections were made by one of us (A.C.C.) from the coasts of Dhofar between the villages of Marbat and Sadh, in the Southern Region of the Sultanate of Oman. A new taxon, belonging to the family Dictyotaceae, was recognized amongst them. This taxon appears to be closely related either to *Glossophora* J. Ag., or to *Pachydietyon* J. Ag., and also to *Dilophus* J. Ag., in marginal thickening of the thallus. However the Omani taxon differs completely from *Dilophus* in habit as the latter is stoloniferous. The genus *Glossophora* is characterized by numerous ramelli or folioles on the surface of the thallus, monostromatic medullary and cortical layers, with distromatic medulla or cortex in older parts (at the margin near the thallus base). On the other hand, the genus *Pachydietyon* possesses a monostromatic large celled medulla throughout, with a small celled monostromatic cortex (when young), and a polystromatic (2-4 celled cortex on the lower older axes. Structurally, the Omani taxon does not belong either to *Pachydietyon* or to *Glossophora* because of the occurrence of the distromatic medulla and cortex at the margins and the polystromatic cortex throughout the thallus. There is therefore, a need to describe a new genus, *Glossophorella* gen. nov., to accommodate the Omani taxon and *P. coriaceum* (Holmes) Okamura. The new genus comprises two species viz., *G. dhofarensis* Nizam. et Campbell sp. nov. and *G. coriacea* (Holmes) Nizam. Comb. nov.

Materials and Methods

Herbarium material was soaked in sea-water for an hour and was then fixed in 4% formaldehyde sea-water solution or in 50% ethyl alcohol. Hand sections were cut for anatomical study and stained in 1% aniline blue and mounted in 50% karo syrup.

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Results

Glossophorella Nizam. et Campbell Gen. nov.

Discriptio: *Thallus erectus, complanatus, dichotome vel lateraliter ramosus, e haptero discoideo rhizoidali ortus, e cellula apicali lenticulari evolutus; segments lineari-cuneatis planis, superficie laevi, margine integro. Structure frondis vel thalli, in centro tristrate praeter medullam corticemque unistrata, in margine corticis bistrata vel cortice utroque medullae 3-4 (-5) strate; in margine medullae ubique bistrata. Thallus in superficie pilis irregulariter dispersis vestitus vel glaber; soris sporangiferise oogonia dispersis instructus. Antheridia ignota.*

Typus generis: *Glossophorella dhofarensis* Nizam. et Campbell sp. nov.

Diagnose: *Glossophorella* ab *Pachydictyo* differt in duplicatione medullae usque ad marginem et ab *Glossophora* in absentia completa ramello reum vel foliolorum in superficie thalli.

Description: Thallus erect, complanate, dichotomously branched; discoid rhizoidal holdfast. Growth by a single lenticular apical cell. Segments linear-cuneate, flat, surface smooth, margin mostly entire. Structure 3-layered thick in the middle; medulla and cortex 1-layered thick throughout in the middle; cortex 2-layered thick at the margins or 3-4 (-5) layered thick throughout on either side of the medulla; medulla double layered thick at the margins throughout. Phyaeophyceean hairs scattered or lacking on the surface. Oogonial sori or sporangial sori scattered on both surfaces of the thallus. Antheridial sori unknown.

Holotype: *Glossophorella dhofarensis* Nizam. et Campbell sp. nov.

Diagnosis: *Glossophorella* Gen. nov. differs from *Pachydictyon* J. Ag., in duplication of medulla throughout at the margins and also from *Glossophora* J. Ag., in complete absence of ramelli or folioles on both surfaces of the thallus.

Key to the species

1. Polystromatic cortex and distromatic medulla throughout The Thallus ----- *G. dhofarensis*
2. Distromatic cortex and distromatic medulla at the margins near the base of the thallus ----- *G. coriacea*

Descriptio: *Glossophorella dhofarensis* Nizam. et Campbell Sp. nov.

(Figs.1-2)

Thallus ferrugineus vel brunneus, coriaceus, ligulatus, dichotome ramosus, usque ad 40 cm altus. Hapteron discoideum, usque ad 2 mm diametro. Axis erectus, divisus in segments linear-cuneata, plana et ligulata, seu rami axillas rotundatus, margine integro et superficie laevi gerens. Apices acuti vel lati, usque ad 1.7 cm lati et 235-410 μ m crassi, raro prolificans.

Thallus media in parte monostromaticus, constatus e cellulis planis grandibus, rectangulatis, medullosis, sed bistratus ad marginem (e apice ad basin); 3-4 (-5) -stratus in parte corticale utrinque medullae, cellulae 20-36 μ m late (longitudo/latitudo: 1.5-3.7), strata peripheriam versus cellulis elongatis radiantibus, chromatophoriis praebentibus. Oogonia dispersa, fasciculata vel maculata (sori in superficiem ambabus

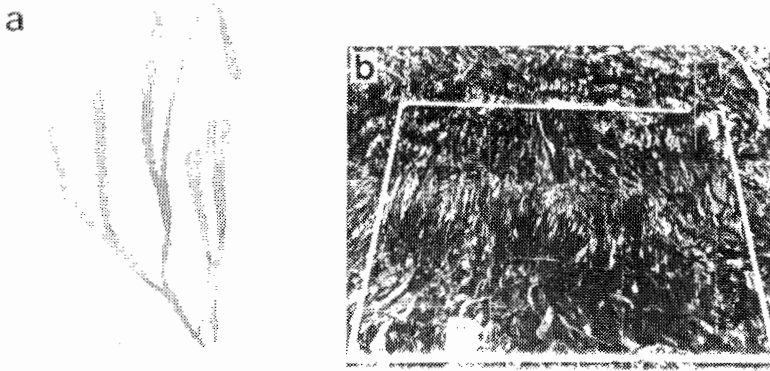


Fig. 1. *Glossophorella dhofarensis* Nizam. et Campbell *sp. nov.*

- (a) Holotype - KU-SW 0001 - Habit of the plant.
 (b) Plants growing in natural habitat (sub-littoral fringe).

thalli 36-60 x 18-30 μm sori juniores pyriformes cum cellula basalis in statu adulti; pili phaeophycearum desunt.

Holotypus: KU-SW 0001, Wadi Haart Q8 ad oras dhofarenses maris arabici collectus at sub numero in herbaria KU-SW depositus (Leg. Andrew C. Campbell 17-9-1989).

Thallus dark brown, coriaceous, erect up to 40 cm high, dichotomously branched (Fig. 1 a,b). Holdfast discoid (Fig. 1a). Segments linear-cuneate, flat, ligulate, rounded axils, entire margin, smooth surface; apices pointed or lobed, up to 17 mm broad, 235-410 μm thick, rarely proliferated. Structurally composed of monostromatic, large, flat, rectangular cells of medulla in the centre; distromatic at the margins (from apex to base), cortical region 3-4 (-5) layers of cells on either side of the medulla, 20-35 μm broad, L/B 1.5-2.7 inner cortical region of flat rectangular cells whereas outer cortical cells small and squarish; peripheral layer of radially elongated cells containing phaeoplasts. Medullary cells contain dense, compact reddish brown phaeoplasts occupying the entire lumen and the cell walls strongly thickened. Cortical cells contain little phaeoplasts. Periclinal division occurs in the medullary cells (Figs. 2a,c,e). Oogonial sori scattered in clusters or in patches on both surfaces, Oogonia pyriform, 35-60 x 18-30 μm, with a basal cell. Phaeophyceyan hairs lacking (Figs. 2, b,d).

Specimens examined:

Wadi Haart, near Sadh, Dhofar, Southern Region, Sultanate of Oman 23-10-1987; A.C. Campbell; Quadrats 9 and 10 of fixed transect. Wadi Haart, Quadrat 8, 17-9-1989, A.C. Campbell.

Glossophorella dhofarensis Nizam. et Campbell *sp. nov.* exhibits 3-4 (-5) layers of cortical cells throughout the thallus and distromatic medulla throughout at the margins and medullary cells contain dense phaeoplasts occupying the entire lumen whereas *G. coriacea* Nizam. *Comb. nov.* shows a distromatic cortex and medulla at the margins.

Glossophorella coriacea (Holmes) Nizam. *Comb. nov.* (Fig. 3).

Basionym: *Glossophora coriacea* Holmes, J. Linn. Soc. Bot. 1896, 251. Synonym: *Pachydictyon coriaceum* (Holmes) Okamura, Bot. Mag. Tokyo, 1899, 39: Icon. Jap.

Algae. 1907, 105-107; Abbott, 1976, 209; Segawa, 1970, 127.

Type: Enoura (Saida no.1) in BM.

Distribution: From Cape Arago, Oregon to Baja California.

Panama. Japan. Grows on intertidal rocks.

Ecological notes

The new taxon was discovered growing on a fixed transect established on an exposed rocky shore in order to monitor the effects of the S.W. monsoon on intertidal organisms. Two monsoon gyres affect the seas off southern Arabia. From November to April a north east wind blows from the land mass of Arabia producing a north easterly monsoon current. This flows along the coast of Oman from east to west at about 1 knot. It has little effect beyond stabilising the marine system with elevated surface temperatures and relatively depressed nutrient levels. The south west monsoon builds up from April and lasts until October. It is a period of great contrast. Strong south

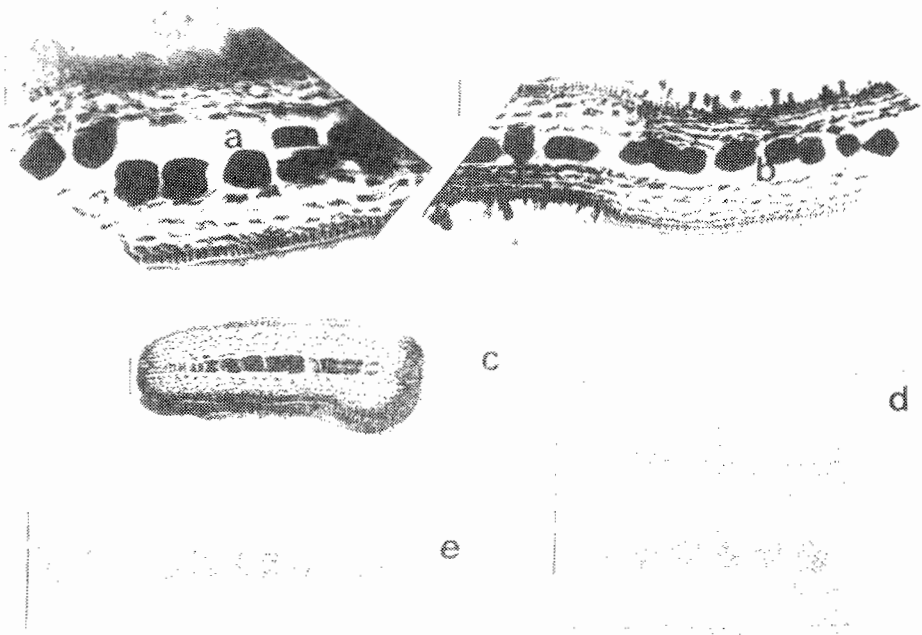


Fig.2. *Glossophorella dhofarensis* Nizam. et Campbell sp. nov.

- (a) C.S. through the segment showing internal structure (magnified). Scale bar = 100 μm .
- (b) L.S. through the segment showing oogonal sori on either surface. Scale bar = 100 μm .
- (c) C.S. through the segment showing internal structure. Scale bar = 100 μm
- (d) L.S. of the segment showing details of oogonia (diagrammatic). Scale bar = 240 μm .
- (e) C.S. through the segment showing internal structure (diagrammatic). Scale bar = 350 μm .

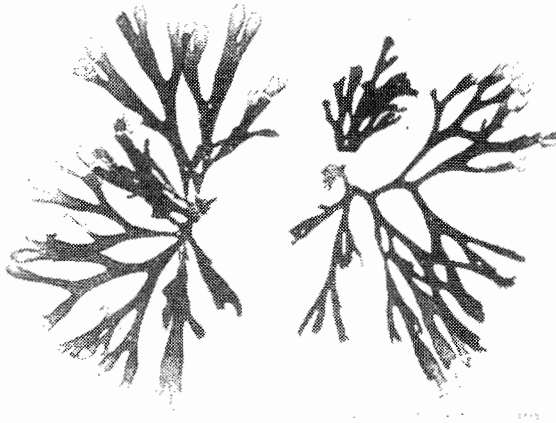


Fig.3. Habit of *Glossophorella coriacea* (Holmes) Nizam. *Comb. nov.*

westerly winds blow parallel to the coast, particularly in July and August, reaching up to force 6.5. These create currents of 2 to 3 knots which drive the surface waters away from the land due to the interactions of Coriolis's Force. Because of the Ekman effect the surface water is replaced by deeper water richer in nutrients, welling up over the narrow continental shelf. Various observations suggest that one of the centres of upwelling may lie near Sadh, extending about 20 km south west and north east from this village.

According to the reports of several expeditions (e.g. Royal Society 1963 and 1965) which identified upwelling centres, these areas are characterized by much colder, clearer water, rich in nutrients. The higher nutrient levels and lower temperatures associated with the south west monsoon increase primary productivity. Krey (1973) noted two areas of high fertility (chlorophyll concentrations above 0.5 mg m^{-3}) in the Indian Ocean, one on the east coast of South Africa and one off South East Arabia. Even during the December to March period he cited the latter as being the most fertile area of the Indian Ocean with chlorophyll concentrations still exceeding 0.5 mg m^{-3} . One of us (A.C.C.) recorded temperatures as high as 29.5°C on 14-5-87 before the upwelling effect had begun, but by 9-7-87 the surface temperature had fallen to 18°C .

The new taxon appears on the sub-littoral fringe (Fig.1b) during the monsoon period and established plants are present completely covering the rocks in that zone by mid October. The late monsoon and early post monsoon period show the most rapid growth of macroalgae, before the water temperatures rise too high, and while the seas are still rough enough to keep the intertidal rocks damp and cool with spray, even at low water. After the monsoon period is over the plants shrivel and die off, being greatly reduced in appearance by December and entirely burnt off by March. More details of the environmental conditions in Dhofar are given by Campbell & Morrison (1988) and Miller & Morris (1988).

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