

ANATOMICAL STUDIES ON *STOECHOSPERMUM MARGINATUM (PHAEOPHYTA)* FROM THE COAST OF PAKISTAN

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Abstract

Stoechospermum marginatum (C.A. Agardh) Kützing [= *S. maculaum* (J.G. Agardh) J.G. Agardh] a commonly growing sub-littoral brown alga of Pakistan was collected from the coast of Buleji, Karachi and investigated in detail for its morphology, anatomy and reproduction.

Introduction

Stoechospermum marginatum (C.A. Agardh 1824) Kützing 1843 was reported for the first time from the coastal areas of Pakistan by Børgesen (1934). It is a commonly growing brown alga (Phaeophyta, Dictyophyceae, Dictyotales, Dictyotaceae; *fide* Shameel, 2001). It has been taxonomically described from the coast of Karachi (Nizamuddin & Perveen, 1986; Shaikh & Shameel, 1995) and reported to occur at the coasts of Lasbela and Makran, Balochistan (Shameel, 1987; 2000; Shameel *et al.*, 1989, 2000) and other areas of Pakistan (Shameel & Tanaka, 1992). In the present investigation an attempt has been made to describe in detail the internal constitution of the thallus and its reproductive structures.

Materials and Methods

Material was collected from shallow sandy beach at Goth Haji Ali, Buleji, Karachi during March 2007–March 2008. The thalli were fixed in 4 % formaldehyde-sea water solution. For internal details cross sections (C.S.) were obtained by hand cutting with shaving blades, which were stained in aniline blue and mounted in glycerine. Semi permanent slides were sealed with nail polish and examined under microscope (Nikon PFX, Japan). The photographs were taken by Nikon F 601 camera. The herbarium sheets of the material are deposited in the Herbarium (FUU-SWH), Department of Botany, Federal Urdu University of Arts, Science and Technology, Karachi, Pakistan.

Results and Discussion

The collected specimens on general observation and microscopic examination revealed the following characters.

Stoechospermum marginatum (C.A. Agardh) Kützing 1843: 339

Basionym: *Zonaria marginata* C. A. Agardh 1824: 266.

Synonyms: *Dictyota maculata* J. G. Agardh 1841:446, *Stoechospermum maculatum* (J.G. Agardh) J.G. Agardh 1848:99, *Stoechospermum patens* J. G. Agardh 1848: 99.

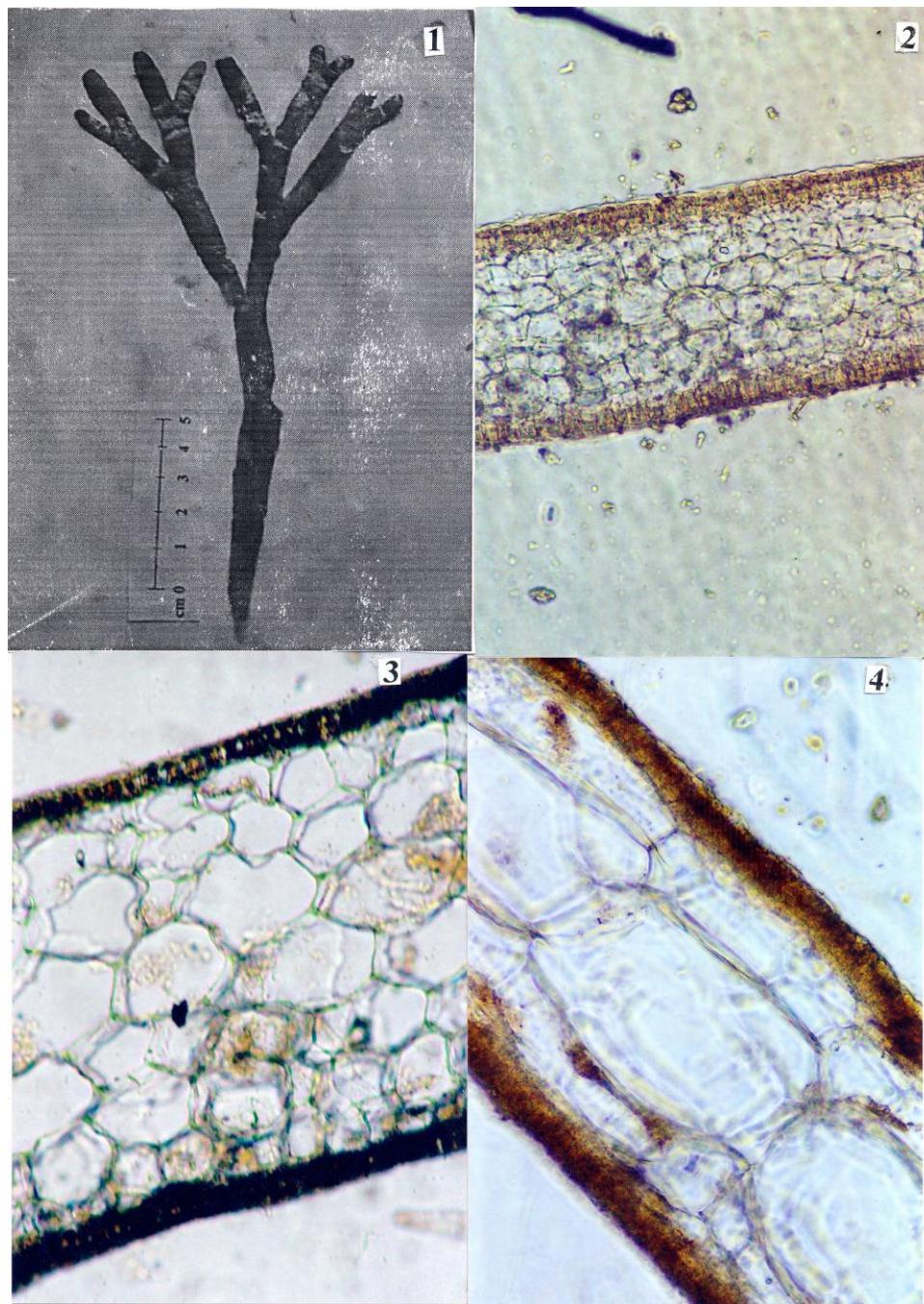
References: Børgesen, 1934: 28; Durairatnam, 1961: 33; Misra, 1966: 161; Nizamuddin & Perveen, 1986: 124; Shameel, 1987: 513, 2000: 52; Shameel & Afaq-Husain, 1987: 295; Begum & Khatoon, 1988: 299; Shameel *et al.*, 1989: 179, 2000: 85; Shaikh *et al.*, 1990: 1; Shameel & Tanaka, 1992: 39; Shaikh & Shameel, 1995: 25; Silva *et al.*, 1996: 610.

Morphological characters: Thalli greenish brown in colour, erect, tufted, linear, ligulate, 7–26 cm in height, attached with rhizoids emerging from holdfast up to 1 cm broad (Fig. 1); fronds flat, 0.3–1.5 cm broad at the apex, 1–2 cm broad at the middle and 0.2–0.5 cm broad at the base, dichotomously branched; dichotomy at 2.0–6.5 cm apart, attenuated, cuneate below; lateral margins of branches entire, apical margin involute, surface smooth; growth of thalli by means of marginal meristem; sporangial sori arranged in longitudinal rows along the margins; distance of sori from margins 0.1–0.2 cm, sori 0.1–0.3 cm broad.

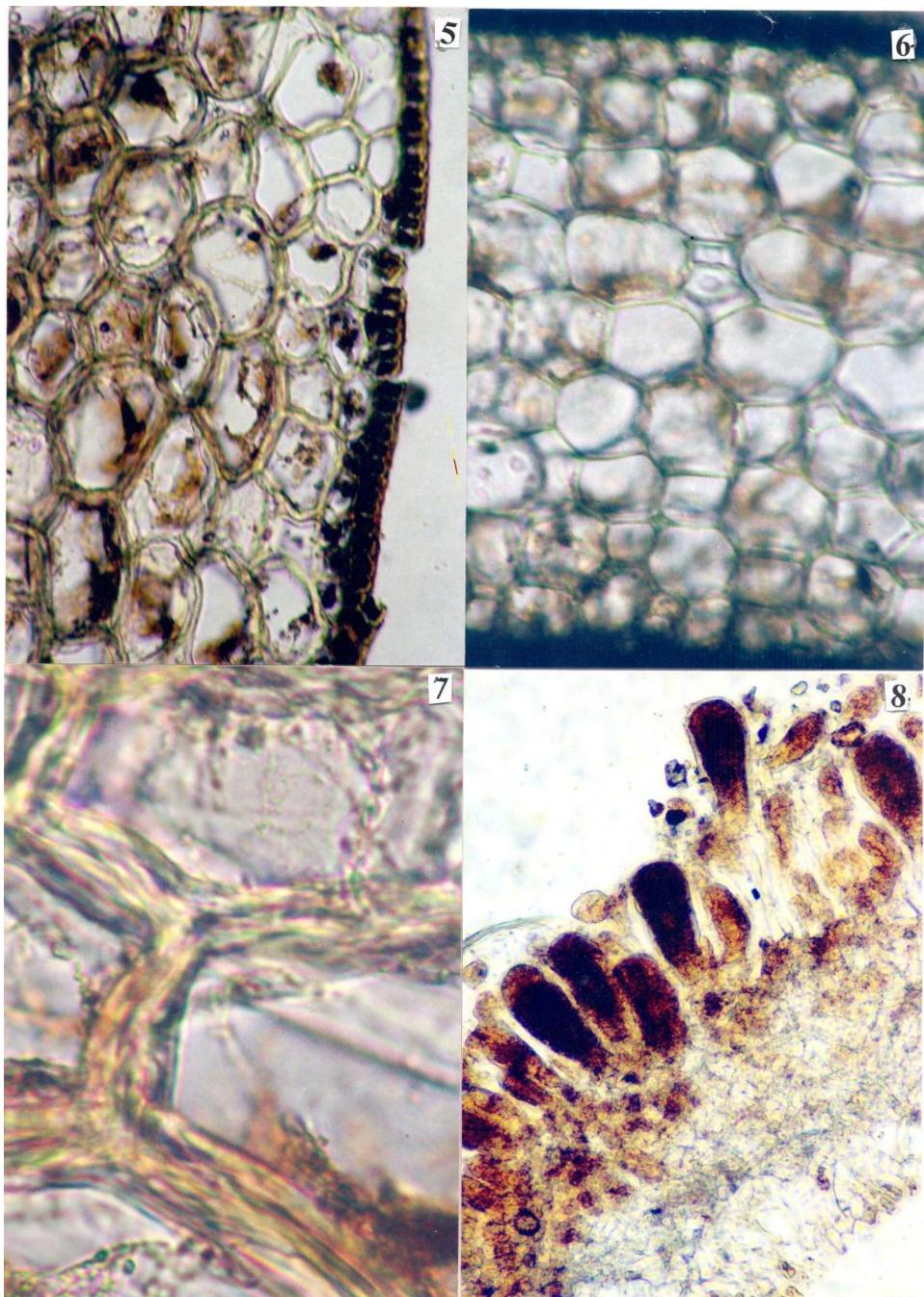
Anatomical features: Thallus composed of single layer of peripheral cells, enclosing many layered cortical cells. In apical portion: thallus consists of 6–7 layers including upper and lower peripheral layers; peripheral cells are small, quadratic with dense phaeoplasts, enclosing 4–5 layered cortical cells. Cortical cells are more or less isodiametric and equal in size, poor in contents, thin walled, 12.5–47.5 μm in length and 10.5–40.5 μm in breadth (Fig. 2). In the middle portion: thallus consists of 11–12 layers, cells of peripheral layers are small, rectangular, compact, have no intercellular space with dense phaeoplasts, 12.5–25.0 μm in length and 12.5–25.0 μm in breadth; the 9–10 layered cortical cells are present at the central portion of the thallus; in central region of cortical cells 9–10 layers are large, polygonal or rectangular with intercellular spaces, poor in contents, 75.0–87.5 μm in length and 25.0–42.5 μm in breadth (Fig. 3). Number of layers gradually decreases from centre to margins; only 3 layered cortex is present at the dichotomy, the cortical cells present at the dichotomy are divided into two portions: central portion with large, elongated cells, 150–200 μm in length and 67.5–100 μm in breadth, and on either side of central cells are narrow, elongated cells, 75–130 μm in length and 25–62 μm in breadth (Fig. 4). In the lower portion: 10–12 layers are present including single layered peripheral cells, peripheral cells are small, slightly elongated or quadratic, with dense chromatophores, 15–25 μm in length and 10.0–17.5 μm in breadth (Fig. 5); they enclose 8–10 layered cortical cells, polygonal, large, phaeoplasts, poor in contents, 25–125 μm in length and 25–75 μm in breadth, thick walled (Fig. 6); cell-wall thickness is 7.5–17.5 μm (Fig. 7).

Reproductive structures: Thalli monoecious, reproductive bodies occurring in the form of marginal sori; antheridia cylindrical, dark brown, 17.5–12.0 μm in length and 12.5–37.5 μm in breadth (Fig. 8); oogonia club-shaped, dark brown, 25–75 μm in length and 12.5–30.0 μm in breadth, associated with hairs; hairs distributed among oogonia, 75.0–137.5 μm in length and 12.5–50.0 μm in breadth, tips of hairs in 3–4 different shapes: swollen, curved tips and bifurcated (Fig. 9); tetrasporangia dark brown, globular, stalked, large, 22.5–37.5 μm in length and 17.5–30.0 μm in breadth; hairs also distributed among tetrasporangia (Fig. 10).

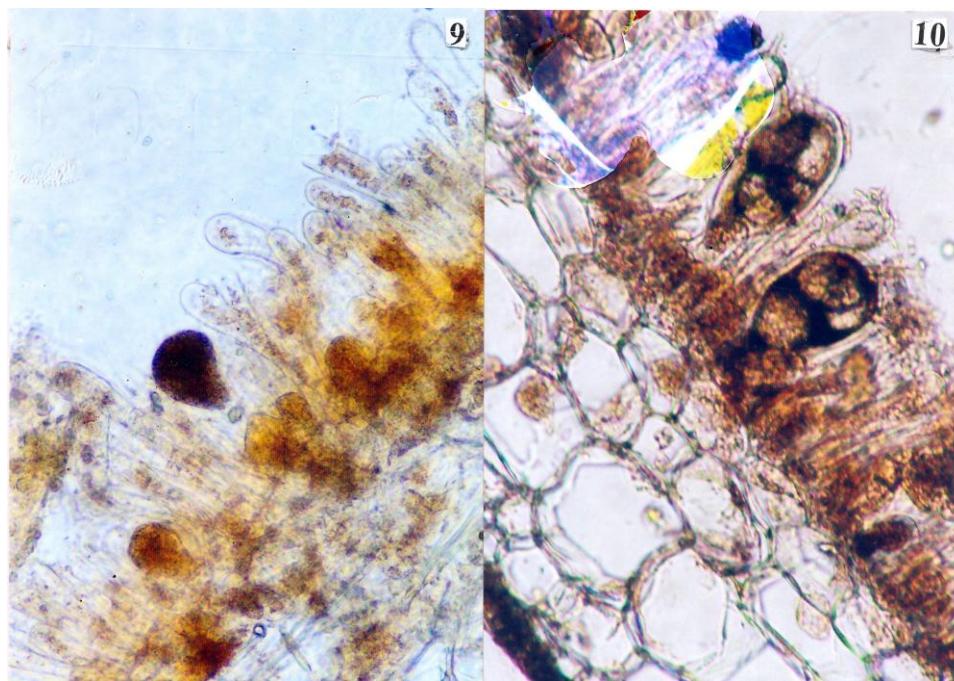
Habitat: Collected as drift material in the sandy beach at Goth Haji Ali, Buleji (*Leg. Alia Abbas 17-3-2007, 15-3-2008*).



Figs. 1-4. *Stoechospermum marginatum*: 1. General morphology, 2. C. S. of apical portion (x 200), 3. C. S. of middle portion (x 400), 4. C. S. at 3- layered dichotomy (x 400).



Figs. 5-8. *Stoechospermum marginatum*: 5. C. S. of basal portion showing peripheral cells (x 400), 6. C. S. of basal portion showing 12-layered thallus (x 400), 7. Cell-wall thickness at basal portion (x 1000), 8. C. S. showing antheridia (x 400).



Figs. 9-10. *Stoechospermum marginatum*: 9. Oogonia associated with hairs (x 400), 10. Tetrasporangia associated with hairs (x 400).

Type locality: Red Sea.

Local distribution: Manora, Buleji, Gadani, Miani Hor, Sur Bunder, Gawader and Jiwani.

Distribution in the Arabian Sea: South- East Arabian Coast, India, Oman, Pakistan, Somalia, Sri Lanka and Yemen.

Remarks: Durairatnam (1961) reported absence of hairs in the sporangial sori in the specimens from Sri Lanka, whereas Misra (1966) described the occurrence of hairs only in the oogonial sori in the Indian specimens. In the specimens from Pakistan the hairs were present among both oogonia and tetrasporangia. Our specimens are characterized by the presence of hairs of 3-4 different shapes in the reproductive organs, 9-10 layered and very thick-walled cortical region in the basal portion of the thallus and a 3-layered cortex of very large central cells at dichotomy. These characters were not observed previously (Nizamuddin & Perveen, 1986; Shaikh & Shameel, 2001).

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