

## MORPHO-ANATOMICAL STUDIES OF *STYPOPODIUM SHAMEELII* (PHAEOPHYCOTA) FROM THE COAST OF KARACHI, PAKISTAN

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### Abstract

A brown alga, *Stypopodium shameelii* Nizamuddin *et al.* Aisha (Dictyotales) was collected from Buleji, a coastal area near Karachi (Pakistan) during March 2007-March 2009 and investigated for its morphology, anatomy and reproductive structures. This is the first detailed study of this species from these respects, where presence or absence of intercellular spaces, size and shape of peripheral cells, thickness of cell-wall of different cells and size and structure of surface cells were examined. In this connection the apical, middle and basal parts of the thallus were investigated anatomically.

### Introduction

*Stypopodium shameelii* is a dark brown, fan-shaped and flabellate, deep water alga has been never found growing in littoral region. Its growth was first noticed at the coast of Karachi by Nizamuddin & Aisha (1996) and later on others (Shameel, 2000; Shameel *et al.*, 2000; Begum, 2010). Only preliminary studies were made on this seaweed by these workers. Therefore, detailed morpho- anatomical studies has been carried out in the present paper.

### Materials and Methods

The specimens were collected from Manora and Buleji, the coastal areas of Karachi (Pakistan) during March 2006 to April 2009 and preserved in 4 % formaldehyde-seawater solution. In order to study internal structures, cross sections (C. S.) were obtained by free hand cutting with shaving blades, which were stained with aniline blue and mounted in glycerine. The semi-permanent slides were sealed with nail polish and examined under microscope (Nikon PFX, Japan). The photographs were taken by Nikon F 601 camera and developed in a photolab with *hp* scanner. The photographic plates were prepared in Adobe photoshop 7.0 with the help of a computer. The herbarium sheets of the materials were deposited in the herbarium (FUU-SWH). Department of Botany, Federal Urdu University of Arts, Science & Technology, Karachi, Pakistan.

### Results

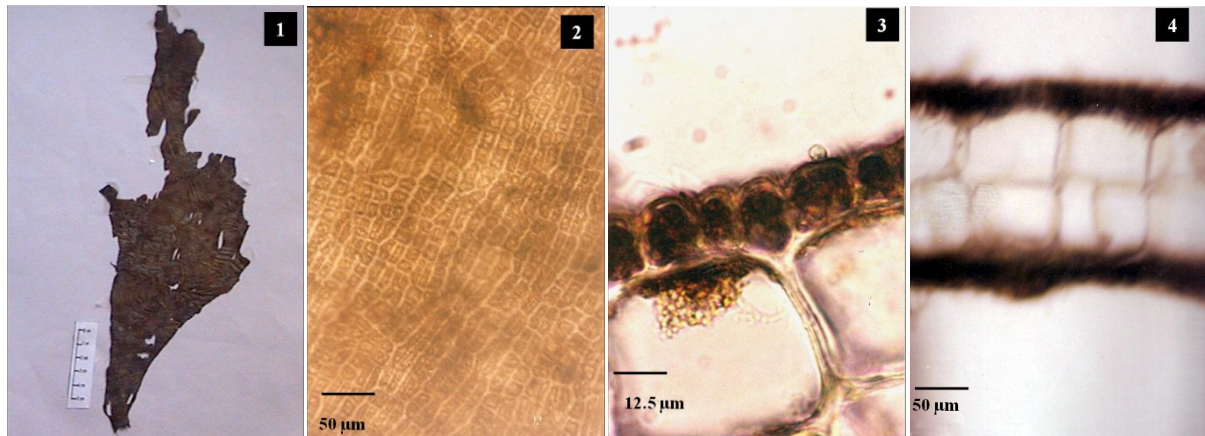
The study of collected specimens and their microscopic examination revealed the following taxonomic characters.

### *Stypopodium shameelii* Nizamuddin *et al.* Aisha 1996:128

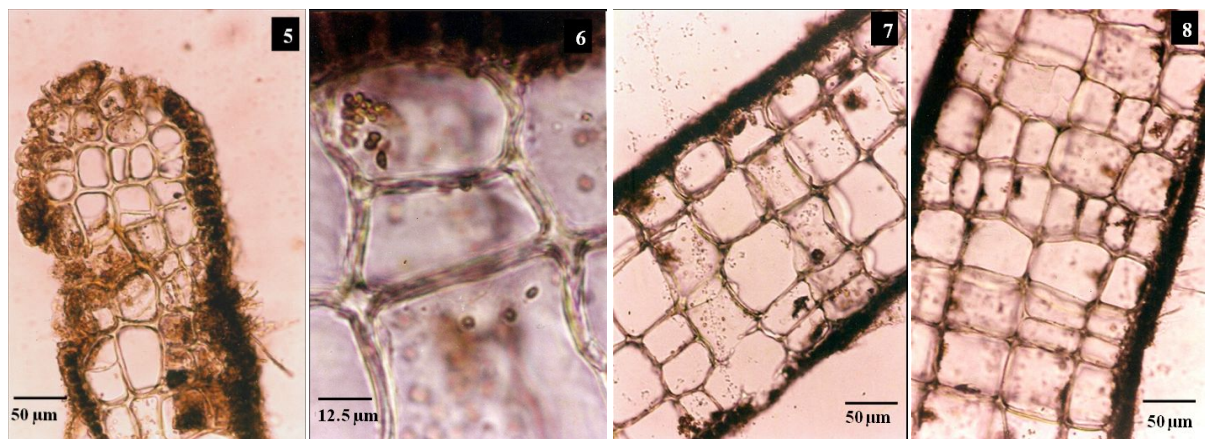
#### References

Nizamuddin & Aisha 1996: 128, Shameel 2000: 52; Shameel, 2012: 19; Shameel *et al.* 2000: 85, Begum 2010: 279.

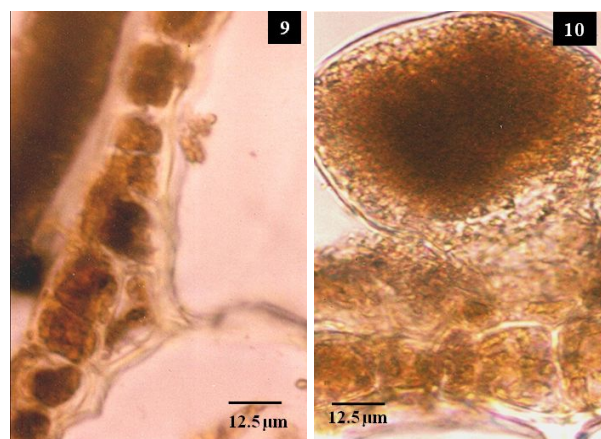
**Morphological characters:** Thalli reddish brown to dark brown in colour, erect; dichotomously, sub-dichotomously or irregularly branched, surface rough (Fig. 1); stipitate, stupose, up to 50 cm long; palmate flabellate, fan-shaped, broadly expanded, lobed, irregularly cleft, variously divided; vegetative growth occurs by simultaneous transverse and longitudinal segmentations of a series of apical cells; sporangial lines present on the surface of thallus or sporangia scattered irregularly from the apex to the base, sporangial lines 1.0 – 2.5 cm apart; small portion near the holdfast is smooth, dark brown and lack sporangial lines; apex broadly obtuse or sometimes flat, margins undulate; base attenuate, branches 1.2 – 17.0 cm apart; attached with the help of a small, compact, rhizomatous holdfast, 1 – 2 cm long and 0.5 – 1.0 cm broad; surface of thallus shrunken or wrinkled throughout or in the middle and basal portions, upper part smooth, surface of young thalli more or less smooth; thallus 2 – 5 cm broad at the apex, 3 – 10 cm broad at the middle portion and 0.6 – 1.5 cm broad at the base, 10 – 30 cm long (Fig. 1).



**Figs. 1-4.** *Stypopodium shameelii*: 1. Habit of the thallus, 2. Surface view of thallus, 3. Peripheral cells, 4. C.S. of apical portion of thallus.



**Figs. 5-8.** *Stypopodium shameelii*: 5. C.S. of thallus with margin, 6. C.S. of middle part showing inter-cellular spaces in cortex, 7. C.S. of middle portion of thallus, 8. C.S. of basal part of the thallus.



**Figs. 9-10.** *Stypopodium shameelii*: 9. C.S. of thallus with double peripheral layers, 10. Sporangium arising from a peripheral cell.

**Anatomical features:** In surface view: thalli dark brown; surface cells cubical and rectangular, small, arranged in different vertical rows, cells of different sizes, 12.5 – 40.0  $\mu\text{m}$  in length and 12.5 – 25.0  $\mu\text{m}$  in breadth (Fig. 2).

In the apical portion: thalli consist of upper and lower peripheral layers enclosing 2 – 3 layered cortex; peripheral cells small, thin-walled, cubical or squarish, dark brown with dense phaeoplasts, 15.0 – 32.5  $\mu\text{m}$  in length and 12.5 – 20.0  $\mu\text{m}$  in breadth (Fig. 3); cortical cells large, cubical or rectangular, thick-walled, cell-wall 2.5 – 5.0  $\mu\text{m}$  thick, intercellular spaces present, poor in contents, regularly arranged, 50 – 125  $\mu\text{m}$  in length and 50.0 – 62.5  $\mu\text{m}$  in breadth (Fig. 4); marginal region consists of many irregularly arranged, thick-walled cells, with intercellular spaces, of cubical or rounded or irregular shapes, 25.0 – 42.5  $\mu\text{m}$  in length and 22.5 – 40.0  $\mu\text{m}$  in breadth (Fig. 5).

In the middle part: thalli consist of 4 – 5 layered cortex surrounded by upper and lower peripheral layers; peripheral cells small, thin-walled, cubical or squarish or slightly elongated, with dense phaeoplasts, 12.5 – 25.0  $\mu\text{m}$  in length and 12.5 – 17.5  $\mu\text{m}$  in breadth; cortical cells large, thick-walled, cell-wall 5  $\mu\text{m}$  thick, intercellular spaces present (Fig. 6); cubical or rectangular, poor in contents, arranged in regular rows (Fig. 7); marginal region consists of irregular shaped cells, arranged irregularly, thick-walled with intercellular spaces, 50 – 100  $\mu\text{m}$  in length and 25.0 – 32.5  $\mu\text{m}$  in breadth.

In the basal portion: thallus consists of 8 – 10 layers *i.e.* upper and lower peripheral layers enclosing 6 – 8 cortical layers; peripheral cells small, cubical or slightly elongated, thin-walled, with dense phaeoplasts, 12.5 – 25.0  $\mu\text{m}$  in length and 17.5 – 20.0  $\mu\text{m}$  in breadth; cortical cells large, thick-walled, cell-wall 5  $\mu\text{m}$  thick, cubical or squarish or rectangular, cell-division occurs vertically as well as horizontally, cells arranged in regular manner, variable in size, poor in contents, with intercellular spaces, 25 – 75  $\mu\text{m}$  in length and 40 – 75  $\mu\text{m}$  in breadth (Fig. 8); in some places, double peripheral cells present, cells small in size, thin-walled, with dense phaeoplasts, squarish or slightly elongated 10 – 20  $\mu\text{m}$  in length and 10 – 15 in breadth (Fig. 9).

**Reproductive structures:** Tetrasporangia present on both surfaces of the thallus, present singly or in a group; dark brown, rounded or slightly oval in shape, arise from epidermal cells, 50 – 100  $\mu\text{m}$  in length and 50 – 90  $\mu\text{m}$  in breadth (Fig. 10).

**Type locality:** Hawkes Bay, Karachi, Pakistan.

**Habitat:** Collected as drift material at Manora (*Leg.* Alia Abbas 6-4-2009); Goth Haji Ali, Buleji (*Leg.* Alia Abbas 17-3-2007, 15-3-2008, 4-3- & 31-3-2009).

**Local distribution:** Karachi: Manora, Sandspit, Hawkes Bay and Buleji; Balochistan: Gwader.

**Distribution around Arabian Sea:** Reported only from Pakistan.

**Remarks:** Previously surface of the thallus was not investigated, cell measurements and shape of peripheral cells were not described by the previous workers (Nizamuddin & Aisha 1996). The cortical cells were measured as 20 – 70  $\mu\text{m}$  in length and 45 – 115  $\mu\text{m}$  in breadth and tetrasporangia as 112 – 125  $\mu\text{m}$  long and 45 – 115  $\mu\text{m}$  broad.

In the present study surface view of the thallus was investigated in detail. Structure of the surface cells was studied and measurement of peripheral cells were also carried out. The cortical cells were measured as 25 – 75  $\mu\text{m}$  in length and 40 – 75  $\mu\text{m}$  in breadth. These measurements agree in length found by the previous workers but with are slight differences in the breadth of cortical cells. The tetrasporangia were measured as 50 – 100  $\mu\text{m}$  long and 50 – 90  $\mu\text{m}$  broad, they appear to be smaller than those described by Nizamuddin & Aisha (1996).

## References

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