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Identification of a New Brown Alga, *Spatoglossum qaiserabbasii,* from the Karachi Coast of North Arabian Sea

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Abstract: A new alga, *Spatoglossum qaiserabbasii* Abbas *et* Shameel, *sp. nov.* (Dictyotales, Phaeophycota) was collected from the coast of Karachi, Pakistan during March 2009 and investigated for its taxonomy, anatomy and reproductive structures. It is characterised by very rough surface of the thallus, small proliferations all over the surface and highly undulate margins. Anatomically there are variable shapes of the peripheral cells, *i.e.,* cubical or rectangular, triangular or polygonal. The sporangial sori are scattered on both surfaces embeded in peripheral layers, and two types of cortical cells in the basal portion of thallus which have a peculiar arrangement.

***Keywords*:** Marine algae, Karachi coast, Phaeophycota, *Spatoglossum,* morphology, anatomy

INTRODUCTION

Spatoglossum Kützing 1843: 339 is a commonly occurring genus of brown seaweeds at the coast of Pakistan. Initially, its growth was observed in 1930s at the coast of Karachi [1, 2], and gradually its five species, *i.e., S. asperum* J. Agardh 1894: 36, *S. australasicum* Kützing 1859: 20, *S. schroederi* Kützing 1859: 21, *S. shameelii* Abbas 2010: 34 and *S. variabile* Figari *et* De Notaris 1853: 158 were reported to occur at Karachi [3-8] and other coastal areas of Pakistan [9-11]. *S. chaudhrianum* P. Anand *in* Salim 1965: 196 is *nom. inval.,* because no taxonomic description and no diagram of this species are available anywhere. It was simply mentioned in a list as "*Spathoglossum chaudhriana"* [2], which is not an appropriate name [12]. During a large collection survey of Karachi Coast, some specimens were found different from all the existing species. On the basis of their characteristics these are being described here as a new species.

MATERIALS AND METHODS

The specimens were collected during March 2009 from Buleji, a coastal area near Karachi, Pakistan. Material was brought to the laboratory, washed thoroughly and preserved in 4 % formalin–seawater solution for further investigations. Some material was preserved in the form of herbarium sheets and kept in the Herbarium, Department of Botany, Federal Urdu University (FUU-SWH-14). Cross sections (C.S.) of the material were obtained by free hands with the help of shaving blades, which were then stained with iodine, mounted in glycerine and sealed with the help of nail-polish. Prepared slides were examined under Nikon PFX microscope, and photographs were taken with F 601 camera.

RESULTS

The general observation and microscopic investigation of the collected specimens indicated the following characters:

Spatoglossum qaiserabbasii Abbas et Shameel, sp. nov.

Diagnosis

Pagina scaber, apice late obtusus, margine laviter undulatus, superficebus ambabus cum parvulus prolificatio, peripheriae cellulare variabilis, pagina cum sporangium sori

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dispersus, thallus basilis cum bimorphis corticalis cellulae.

Morphological characters

Thalli erect, flat, foliaceous, greenish brown in colour, surface rough; sub-dichotomously or irregularly branched; apex broadly obtuse, margins slightly undulated; proliferations do not arise from margins, small outgrowths or proliferations present all over the surface on both sides; thalli 25 cm long, 2 – 5 mm broad at the apex, 2 – 4 cm broad at the middle and 2 – 3 cm broad at the base; from basal portion few small branches or proliferations arise; attached with the help of a small compact holdfast (Fig. 1).

Anatomical features

In surface view: peripheral cells variable in shape *i.e.* cubical or rectangular or triangular or polygonal; small, rounded oil globules arranged near the cell-wall; cells thin-walled, arranged in irregular manner; 20.0 – 55.5 µm in length and 15 – 47.5 µm in breadth; sporangial sori scattered all over the surface, dark brown, variable in shape, rounded to irregular (Fig. 2).

In the apical portion: thalli consist of 4 (-5) layers *i.e.* upper and lower peripheral layers enclosing 2 (-3) cortical layers; peripheral cells large, palisade-like, thin-walled, with dense phaeoplasts, 25 – 50 µm in length and 20 – 30 µm in breadth; 2 – 3 layered cortex composed of large, polygonal or cubical cells, intercellular spaces present, poor in contents, thin-walled, arranged irregularly, 20 – 75 µm in length and 17.5 – 32.5 µm in breadth (Fig. 3).

In the middle part: thalli 5 layered *i.e.* upper and lower peripheral layers and 3 cortical layers; peripheral cells palisade like, large, thin-walled with dense phaeoplasts, 25.0 – 47.5 µm in length and 20.0 – 37.5 µm in breadth; cortical cells vertically elongated, large and thin-walled, intercellular spaces absent, poor in contents, some cells cubical and small but other cells very large, 50.0 – 112.5 µm in length and 25.0 – 37.5 µm in breadth (Fig. 4).

In the basal portion: thalli consist of 5 – 6 (-7) layers *i.e.* upper and lower peripheral layers enclosing 4 – 5 central layers; peripheral cells large, broad and thin-walled, cubical with dense phaeoplasts, edges of cells slightly rounded, 25.0 – 62.5 µm in length and 25 – 60 µm in breadth; central portion divided into two types of cells: in the center 2 layers composed of large, polygonal or cubical, thick-walled cells, cell-wall thickness 7.5 – 10.0 µm, poor in contents, intercellular spaces absent, 25 – 75 µm in length and 25.0 – 37.5 µm in breadth; on both sides of these large cells 1 – 2 layers are present, which consist of small, vertically elongated cells, in some places only one but usually two layers, intercellular spaces present, cells thin-walled, 25 – 50 µm in length and 17.5 – 30.0 µm in breath (Fig. 5).

Margin composed of 4 – 5 cells, arranged in regular tiers, thin-walled, dark-coloured, 20 – 50 µm in length and 22.5 – 30.0 µm in breadth (Fig. 6); phaeophycotean hairs arise from hair cavities, present on the peripheral layer; hairs multicellular, dark brown, found in groups, 25 – 75 µm in length and 10.0 – 17.5 µm in breadth (Fig. 7).

Reproductive structures

Sporangia present in the form of sori, scattered on both surfaces of the thallus (Fig. 2); sporangia dark brown, cubical or rounded or squarish, embeded in peripheral layers (Fig. 8).

Type locality

Buleji, Karachi, Pakistan (FUU-SWH-14).

Habitat

Collected as drift material at Goth Haji Ali, Buleji (*Leg*. Alia Abbas 31-3-2009).

DISCUSSION

Spatoglossum is a genus of brown algae (family Dictyotaceae, order Dictyotales, class Dictyophyceae, phylum Phaeophycota; *fide* [13, 14], which is represented by four species in the Indian Ocean [12], while *S. chaudhrianum* does not exist being a misidentification. The present species resembles the five species described from the coast of Karachi *i.e. S. asperum, S. australasicum, S. schroederi, S. shameelii,* and *S. variabile* in the general appearance such as foliaceous thalli with sub-dichotomous or irregular branching. It is smaller in height than *S. asperum* and *S. variabile* but longer than other three species [3-8]. The basal part of thallus of the present species contains 5-7 layers, in this way it resembles *S. asperum* and *S. schroederi* but differs from *S. australasicum* which contains only 4 layers and the other two species contain 9-20 layers (Table 1).

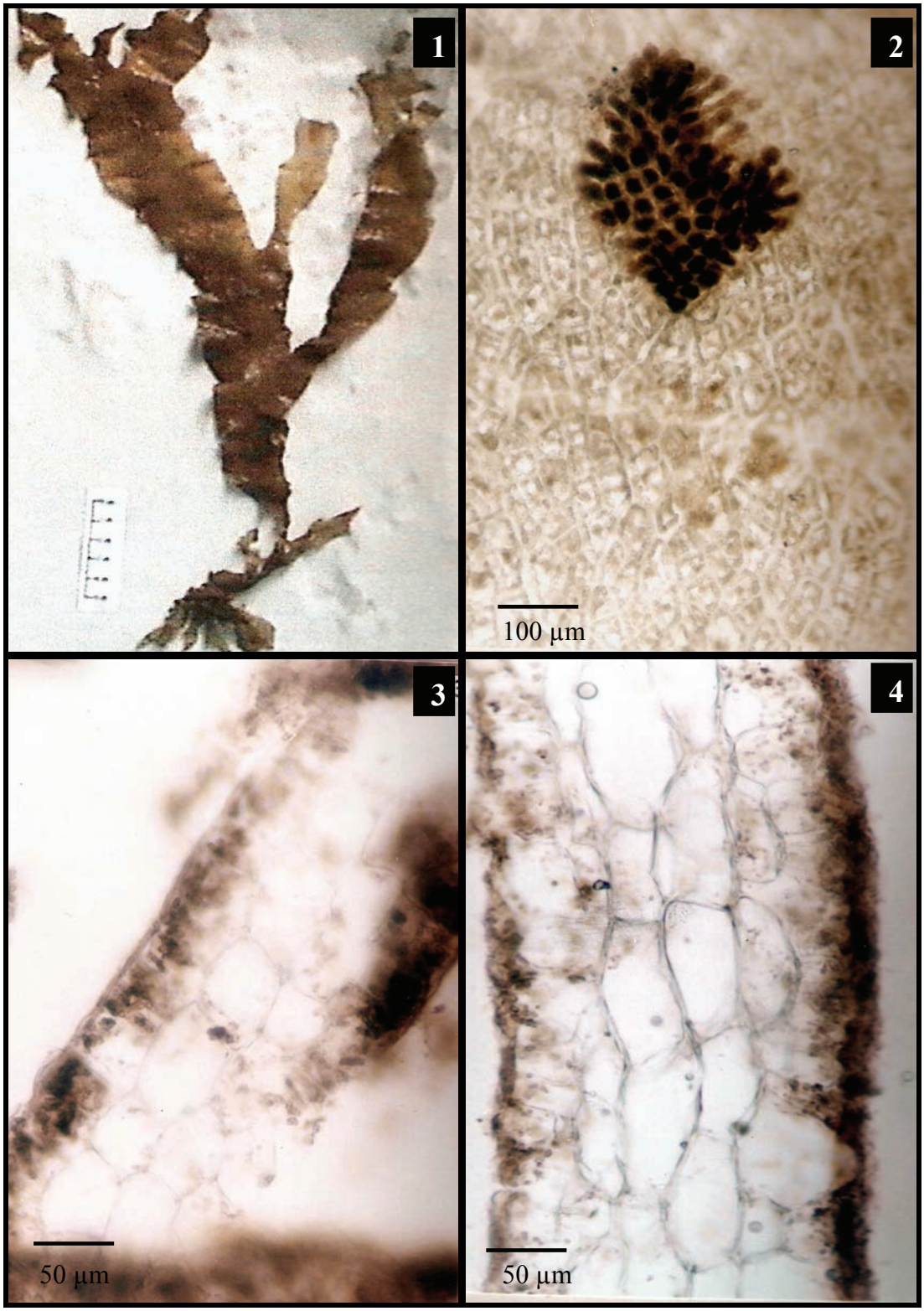

Fig. 1-4. *Spatoglossum qaiserabbasii*: **1.** Habit of the thallus, **2.** Surface view of thallus with sporangial sori, **3.** C.S. of apical portion, **4.** C.S. of middle part.

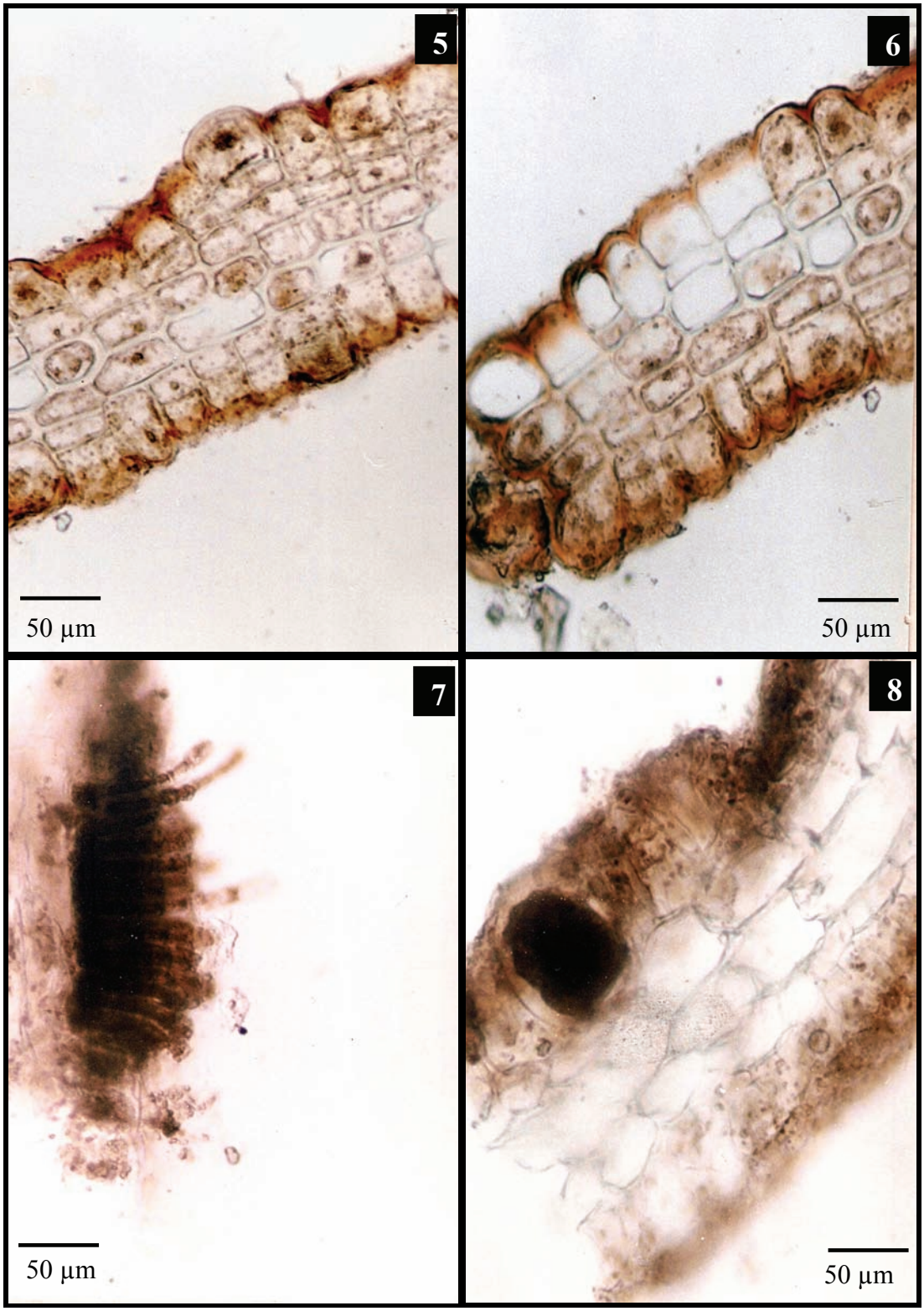

Fig. 5-8. *Spatoglossum qaiserabbasii*: **5. C.**S. of basal portion of the thallus, **6.** C.S. of basal part with margin, **7.** C.S. of thallus showing phaeophycotean hairs, **8.** C.S. of thallus with sporangium.

Table 1. Comparative account of the species of *Spatoglossum* growing at the coast of Karachi with *S. qaiserabbasii.*

Characters	*S. asperum*	*S. australasicum*	*S. schroederi*	*S. shameelii*	*S. variabile*	*S. qaiserabbasii*
Thallus colour	Olive brown	Olive green	Golden brown	Dark green	Dark brown	**Greenish brown**
Surface	Smooth	Rough	Smooth	Smooth	Rough	**Rough**
Margin	Entire	Slightly undulate	Very few dentations	Dentate	Entire-crenate	**Slightly undulate**
Tip	Palmate	Broadly obtuse	Palmate	Slightly pointed	Oblong	**Broadly obtuse**
Proliferations	From margin	From surface	Rarely proliferated	From margins	From margins	**From surface**
Height (cm)	5-40	7-20	10-14	18	10-35	**25**
Breadth (cm)						
upper	2-5	1.5-5.0	2-4	k0.2-0.8	0.2-1.5	**0.2-0.5**
middle	2-12	2.0-4.5	3-4	2.0-3.5	2-5	**2-4**
lower	1-7	0.3-1.0	1-2	0.5-1.0	1-2	**2-3**
Basal part (layers)	6	4	5-7	20	9-12	**5-7**

The present species is characterised by variable shape of peripheral cells *i.e.* cubical or rectangular or triangular or polygonal. Presence of sporangial sori on the surface, very rough surface of the thallus, small proliferations all over the surface, highly undulate margins, two types of cortical cells in the basal portion of thallus and their peculiar arrangement are those characters in which it differs from all other species of *Spatoglossum* described so far [15-26]. Therefore, it has been considered as a new species and is named after Prof. Dr. Syed Qaiser Abbas for his valuable contributions in the field of marine mycology.

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