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OCCURRENCE OF *PADINA GYMNOSPORA* (PHAEOPHYCOTA) AT THE COAST OF KARACHI

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Abstract

Padina gymnospora (Kützing) Sonder was collected from the coast of Karachi during January 2009. This is the first report of its occurrence at the coast of Pakistan and its first detailed study from this area regarding the taxonomy and anatomy. It showed *in situ* germination on its sporangial lines within the sporangial walls, which may be due to syntagmatic germination *i.e.,* all the spores dividing and merging into one single outgrowth.

Introduction

Recently a detailed taxonomic study on the taxonomy of various species of *Padina* (Adanson) was carried out, based on a large collection survey from Karachi, Pakistan (Aisha & Shameel, 2010). During present investigation, some specimens were collected from this area which differed from all the species described in the previous study. They are identified as *Padina gymnospora* (Kützing) Sonder and are described here.

Materials and Methods

The specimens were collected during January 2009 from mid-littoral rocks and rocky edges of sandy pools at Buleji, a coastal area of Karachi (Pakistan). The specimens were brought to the laboratory and preserved in 4% formaldehyde-seawater solution after thorough washing. Some of them were used for herbarium preparations, which are deposited in the Herbarium (FUU-SWH), Department of Botany, Federal Urdu University of Arts, Science and Technology, Karachi. Rest of the specimens were used for general study, where cross sections (C. S.) of the algal material were obtained free hand with the help of shaving blades, stained in aniline blue and mounted in glycerine. The semi-permanent slides were sealed with nail polish (Cutex) and examined under a Nikon PFX binocular microscope, the seaweed sections were photographed with the help of a Nikon F601 camera.

Results and Discussion

The collected specimens were identified as *Padina gymnospora*, an alga of the family Dictyotaceae, order Dictyotales, class Dictyophyceae, phylum Phaeophycota (*fide* Shameel, 2008). The following taxonomic characters and anatomical features of this species were observed on general investigation and microscopic examination of the material.

***Padina gymnospora* (Kützing) Sonder 1871: 47**

Basionym: *Zonaria gymnospora* Kützing 1859: 29.
Synonyms: *Padina vickersiae* Hoyt *in* Howe 1920: 595, *P. crassa* Yamada 1931: 67.

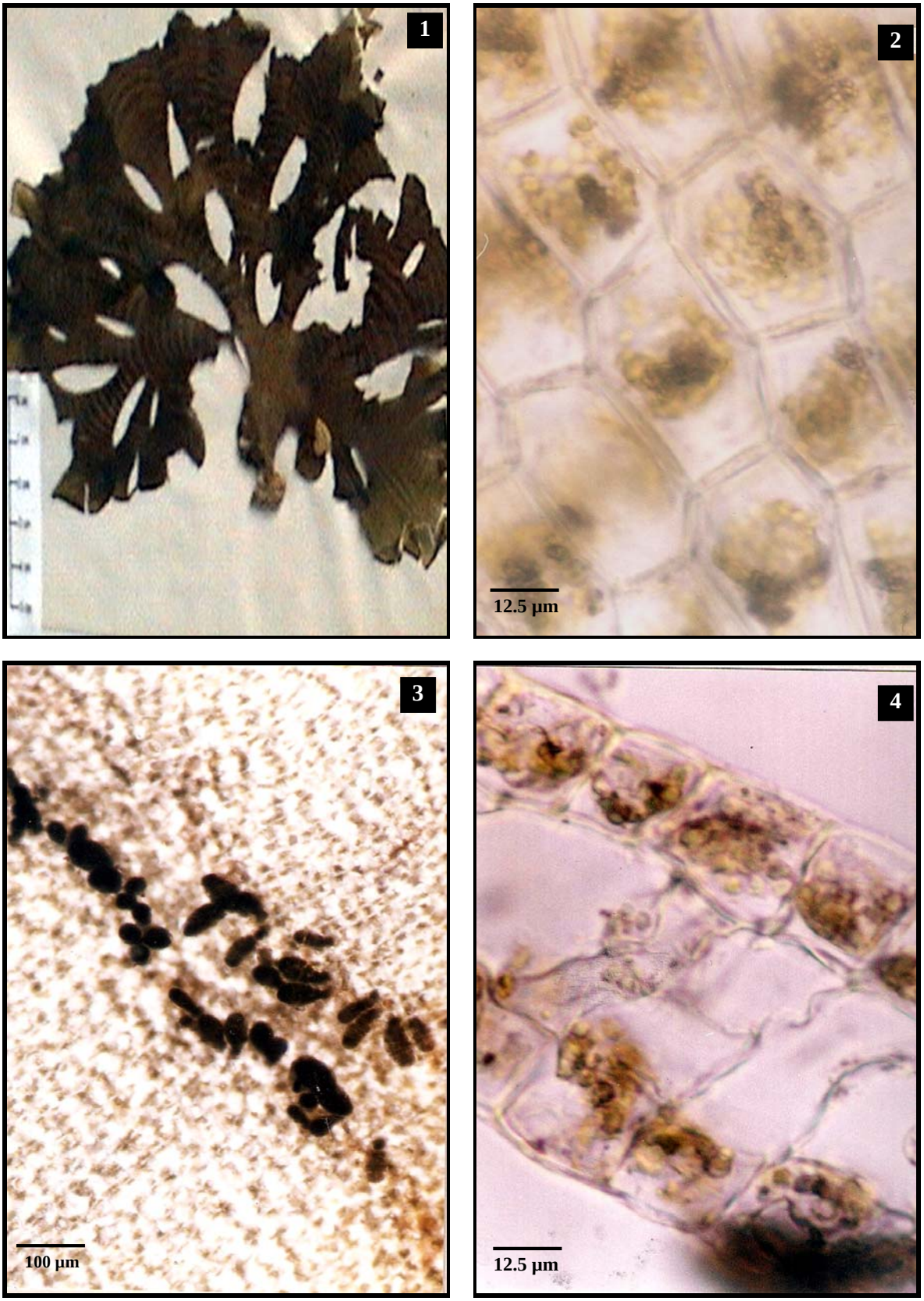
References: Taylor, 1960: 236; Misra, 1966: 156, 1967: 233; Earle, 1969: 172; Krishnamurthy & Joshi, 1970: 11; Nizamuddin & Gessner, 1970: 6; Islam, 1976: 40; Jaasund, 1976: 45; Basson, 1979: 55; Silva *et al.,* 1987: 78, 1996: 604; Womersley, 1987: 217; Ormond & Banaimoon, 1994: 117; Nizamuddin & Begum, 2006: 225; Aisha & Shameel, 2010: 334; Begum, 2010; 248; Abbas & Shameel, 2010: 101.

Morphological characters: Thalli fan-shaped, greenish brown in upper portion and brown in the basal portion, splitting into lobes; 4-15cm long, 4 .0-6.5cm broad at the apex, 10-13cm broad in the middle and 7-11cm broad at the base; attached with the help of a small, compact, rhizomatous holdfast, 0.8-1.2cm long and 5-8mm broad; surface smooth, margins slightly undulate, apex enrolled, sporangial lines present on both surfaces of the thalli; sporangial lines 3-4mm apart and concentric; hair lines absent, not prominent; on sporangial lines *in situ* syntagmatic germination presenting a velvety look (Fig. 1).

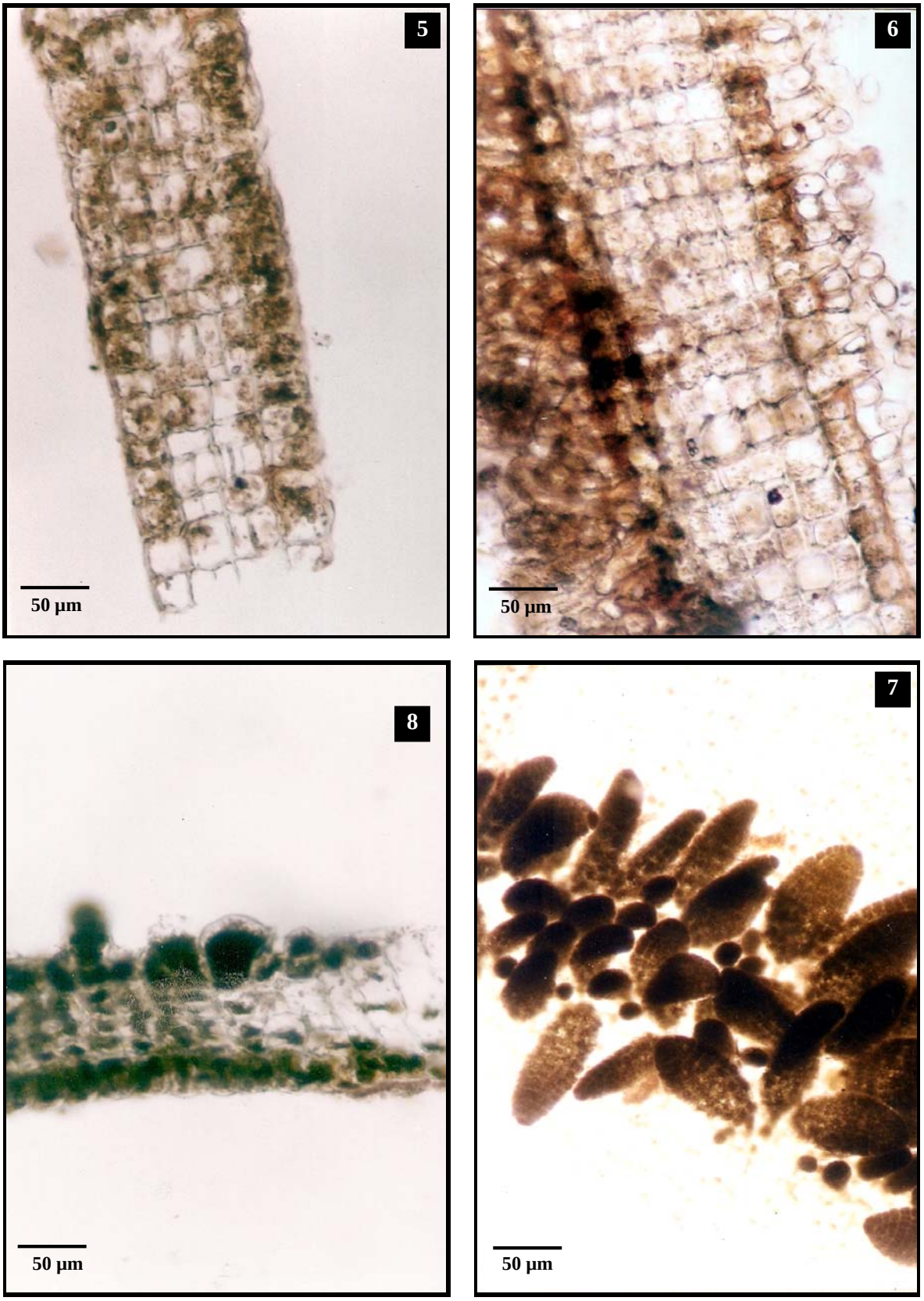
Anatomical features: In surface view: horizontal rows of cells, peripheral cells variable in size, hexagonal, rectangular, a large dense phaeoplast present in the center of the cells, 23.5-80.0µm in length and 25.0-32.5µm in breadth (Fig. 2); sporangial lines present at specific intervals (Fig. 3).

In the apical portion: thalli consists of 3(-4) layers *i.e.* upper and lower peripheral layers enclosing 1 (-2) cortical layers, peripheral layers slightly unequal, dorsal layer consists of small, cubical cells and ventral layer composed of comparatively large cells, thin-walled with dense phaeoplasts, 20-30µm in length and 17.5-25.0µm in breadth; cortical cells large, rectangular, palisade like, poor in contents, thin-walled, 25-50µm in length and 20-30µm in breadth (Fig. 4).

In the middle part: thallus consists of 4-5 layers *i.e.* upper and lower peripheral layers enclosing 2-3 cortical layers; upper peripheral cells small, cubical, thin-walled with dense phaeoplast, 25-30µm in length and 25-30µm in breadth, lower peripheral cells large, elongated, thin-walled, with dense phaeoplasts, 30.0-42.5µm in length and 20-25µm in breadth; cortical cells cubical, small, inter-cellular spaces absent, poor in contents, arranged in regular tiers, 15-45µm in length and 12.5-40.0µm in breadth (Fig. 5).



Figs. 1-4. *Padina gymnospora*: 1. Habit of the thallus, 2. Surface view of the thallus, 3. Surface view with sporangia, 4. C.S. of apical portion of the thallus.



Figs. 4-8. *Padina gymnospora*: 5. C.S. of middle part of the thallus, 6. C.S. of basal portion of the thallus, 7. Sporangia arising from peripheral cells, 8. Surface view with syntagmatic *in situ* germination on sporangial line.

In the basal portion: thalli consists of 6-7 (-8) layers *i.e.,* upper and lower peripheral layers enclosing 4-5 (-6) cortical layers; peripheral cells slightly unequal in size, comparatively large than the cortical cells, cubical or slightly elongated, thin-walled, with dense phaeoplasts, 17.5-32.5µm in length and 17.5-22.5µm in breadth; cortex consists of small, cubical, or squarish cells, poor in contents with thin-walls, 25-30µm in length and 15-25µm in breadth (Fig. 6).

Reproductive structures: Sporangial lines present on both surfaces of the thallus, sporangia non- indusiate, globular or oval, arise from peripheral cells, dark brown in colour, sessile, 20-45µm in length and 17.5-32.5µm in breadth (Fig. 7); from each sporangial line tetra-sporophytes start growing (Fig. 8).

Habitat: Benthic on rocks and rocky edges of sandy pools at Goth Haji Ali, Buleji (*Leg*. Alia Abbas 24-1-2009).

Type locality: St. Thomas, Virgin Islands.
Local distribution: Karachi: Manora, Buleji and Nathiagali.

Distribution in the Indian Ocean: Andaman Island, Australia, Bahrain, Bangladesh, India, Indonesia, Kenya, Kuwait, Madagascar, Mauritius, Nicobar Island, Qatar, Réunion, Saudi Arabia, Seychelles, Singapore, Somalia, Tanzania and Yemen.

Remarks: This is the first report of its occurrence from the coast of Pakistan. The specimens recently described by Begum (2010) and Aisha & Shameel (2010) under the name *Padina vickersiae* may be referred to this species, its synonymy to *Padina gymnospora* was determined by Allender & Kraft (1983) and verified by several others (Silva *et al.,* 1996; Kraft, 2009). This is the first detailed study of this species from the coast of Pakistan regarding its taxonomy and anatomy. It showed on sporangial lines *in situ* germination within the sporangial walls (Fig. 8). This is due to syntagmatic *in situ* germination *i.e.* all the spores dividing and merging into one single outgrowth. In this way it resembled *P. pavonica* (L.) Thivy, as reported by Aisha & Shameel (2010).

Allender & Kraft (1983) suggested that many records of *P. gymnospora* from the Indo-Pacific region, including those from India, may be referable to *P. boergesenii* Allender *et* Kraft, which is the tristromatic species erroneously associated with the former name (Silva *et al*., 1996). Nizamuddin & Begum (2006) described *P. gymnospora* as 3-layered thick which may be 4-layered thick at the basal part. The Karachi specimens are 3-4 layered thick at the upper part, 4-5 layered in the middle and 6-8 layered at the basal portion of thallus, therefore they resemble more the type specimens (in MEL 583380).

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