

OCCURRENCE OF THE GENUS *LOBOPHORA* (DICTYOPHYCEAE, PHAEOPHYCOTA) IN THE COASTAL WATERS OF KARACHI

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Abstract

Fan-shaped, flabellate and rosette like fronds of a brown alga *Lobophora* J. Agardh were collected from various coastal areas of Karachi (Pakistan) and taxonomically investigated. This study revealed the presence of two species *i.e.* *L. variegata* (Lamouroux) Womersley *ex* Oliveira and a new species *L. prostrata* Aisha *et* Shameel. The black brown coloured specimens of the new species were found prostrately attached with the rocks by their lower surface. They contained a central layer of large rectangular cells in cortical region, peripheral part in the upper surface having small squarish cells but lower surface without any peripheral cells. In lower part of the thallus, each cell produced rhizoidal filaments, which were globular and contained rectangular cells.

Introduction

Occurrence of the genus *Lobophora* J. Agardh was recognized for the first time by Nizamuddin & Perveen (1986) from the coast of Karachi, when they described the species *L. variegata*. It is a rarely growing brown alga of the family Dictyotaceae (order Dictyotales, class Dictyophyceae, phylum Phaeophycota; *fide* Shameel, 2001, 2008). Later on this species was reported to occur at the coasts of Lasbela (Shameel, 1987; Shameel & Afaq-Husain, 1987), Makran (Shameel, 2000; Shameel *et al.*, 2000) and the other areas of Pakistan (Shameel & Tanaka, 1992). But there was no composite taxonomic study of this genus made from this area. Therefore, a survey was carried out from various coastal areas of Karachi, as a result of that two species were found to grow which are being described here in detail.

Materials and Methods

Algal thalli were detached from the rocks at lower littoral zones and collected as drift material from the coast of Karachi, Pakistan. They were brought to the laboratory and preserved in 4% formaldehyde. Different parts of thalli were cut into thin slices with the help of shaving blade by free hand section cutting technique. Sections were stained in 1% aniline blue for 5-10 minutes, one or two drops of 1M hydrochloric acid were added for 30 seconds and washed with seawater. The sections were then mounted in a solution of 75%

glycerin with aniline blue (75 mL Gly + 20 mL aniline blue + 5 mL distilled water). Finally the slides were sealed with the sealing material (Cutex) and observed under microscope (Nikon, Japan).

Results and Discussion

The specimens of *Lobophora* J. Agardh 1894:21, collected from various coastal areas of (Karachi, Pakistan), were taxonomically investigated. They revealed the following characters, of the genus.

Thallus procumbent, decumbent or erect, forming a cluster of fronds, sometimes appears as rosette; fronds broad at apex but gradually taper towards the base, fan-shaped, flabellate, lobed; surface smooth, concentric rings forming zones; thallus divided and gives rise to irregular branches; attached with the help of matted rhizoids, rhizoids may be filamentous or moniliform; margin entire, fronds 6-9 layered in thickness, middle portion with large squarish to rectangular cells; central single layer of cells surrounded by rows of cells of uniform size at cortical portion, a pair of peripheral cells per cortical cell is present; sori scattered on both surfaces, lacking paraphyses, arranged in concentric zones.

Early studies described only one species of this genus from the coast of Pakistan (Nizamuddin & Perveen, 1986). The present study included one more species, which is a new addition to the genus. Both the species are distinguished from one another as given below.

Thallus forming golden brown rosette cluster *Lobophora variegata* (2)
Thallus forming black brown patches on rocks *Lobophora prostrata* (1)

1. *Lobophora prostrata* Aisha *et* Shameel, sp. nov. Figs. 1, 2a-e

Diagnosis: *Prosterno suggero per suum summitto superficies quod erant niger frons colour. Suum transverse section pluo central layer amplius rectangular cells cortical tellus peripheral ecui summus superficies vegrandis quadratus cells tamen summitto superficies vacuus ullus eripheral cell procul summitto secui thallus*

sulum cell product produxi productum rhizoidal filaments quod es globular vel postulo rectangular cells.

Morphological characters: Thallus 1-4 (-8) cm high, 1-3 cm wide, epilithic, producing dark black brown patches on the sandy rocks forming crust; fan-shaped fronds lobed, attached to the substratum by their lower surface; thalli semi-circular or semi-spherical in shape, margins entire, undulate, smooth; concentric zones found on the expanded fronds.

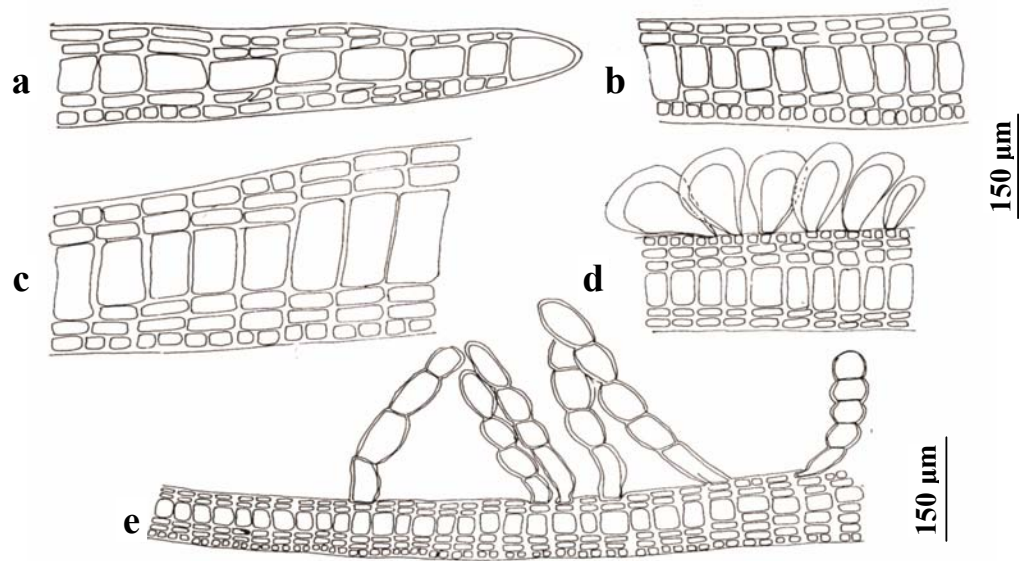


Fig. 1. *Lobophora prostrata* Aisha et Shameel: a. Transverse section of thallus with a single apical cell, b & c. transverse sections of old thalli, d. Transverse section of thallus with oogonia, e. transverse section of thallus with paraphyses.

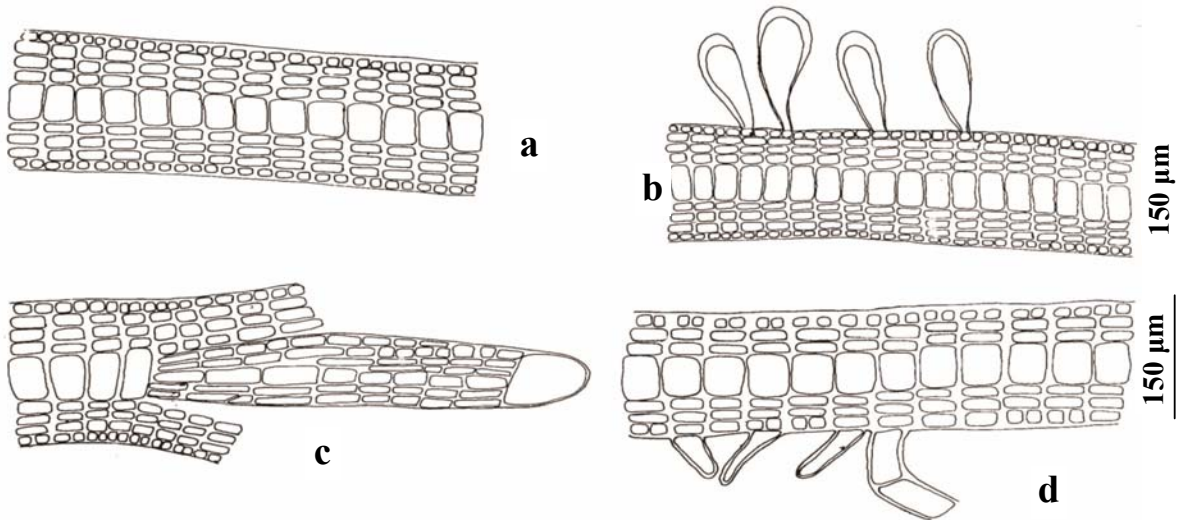


Fig. 2. *Lobophora variegata* (Lamouroux) Womersley: a. Transverse section of thallus, b. transverse section of thallus with oogonia, c. transverse section of thallus showing growth taking place through a single apical cell, d. transverse section of thallus with phaeophycotean hairs.

Cytological features: Thallus consists of 4-6 layers of cells; peripheral layer with small squarish cells, containing dense phaeoplasts, 11 μm in length as well as in breadth; central region with large, radial, rectangular to squarish cells, having discoid phaeoplasts which fill the cavity of cells, 34-45 μm long, 23-34 μm broad; cortical cells iso-diametric in size, rectangular in shape, arranged side by side, 1-2 layers of such cells present on both sides of the central layer, cells 11 μm high, 23 μm wide; lower surface without any peripheral layer; thallus attached with the help of uniseriate rhizoidal filaments which are formed by bead-shaped cells, arise from every cell where they are present.

Reproductive structures: The asexual reproductive organs were not observed in these specimens. Sexual reproductive organs were present in the form of sori, each

oogonium oval in shape, 65-117 μm in length, 39-91 μm in breadth.

Growth: The growth in this genus takes place through apical marginal meristem containing large, radial rectangular cells, the meristematic zone at dichotomy produces other lobed fronds of the thallus.

Type locality: Buleji, Karachi, Pakistan.

Habitat ecology: Thallus grows epilithic on the rocks exposed to low tides and also at shady places. It is also found in drifted condition along with other members of the order Dictyotales.

Local distribution: Buleji (Leg. Aisha 1-12-1990, 14-11-1992, 30-10- & 30-11-1993).

Remarks: These specimens were prostrately attached by their lower surface and were black brown in colour. Their transverse section showed central layer of large rectangular cells in cortical region, peripheral part in upper surface having small squarish cells but lower surface without any peripheral cell. At lower part of the thallus each cell produced rhizoidal filaments, which were globular or contained rectangular cells. Such characters made these specimens distinct from other species of *Lobophora* (Børgesen, 1930, 1934, 1936, 1937, 1939; Durairatnam, 1961; Misra, 1966; Islam, 1976; Allender & Kraft, 1983; Womersley, 1987; Littler & Littler, 2000, 2003; Abbott & Huisman, 2004; Kraft, 2009). Therefore, it is considered as a new species of the genus *Lobophora* and has been named as *Lobophora prostrata* Aisha et Shameel. The specimens differed from *Pocockiella dichotoma* Simons 1966 in morphology as well as in the anatomy. It has already been mentioned by Allender &



Fig. 3. *Lobophora prostrata* Aisha et Shameel; Type specimen.

References: Weber-van Bosse, 1913:175; Børgesen, 1930:169, 1934:28, 1936:77, 1937: 314, 1939:82; Durairatnam, 1961:34; Misra, 1966:164, 1967:233; Womersley, 1967:221, 1987:253; Krishnamurthy & Joshi, 1970:11; Islam, 1976:38; Jaasund, 1976:43; Papenfuss, 1977:463; Allender & Kraft, 1983:81; Nizamuddin & Perveen, 1986:131; Shameel, 1987:513; 2000:51; Shameel & Afaq-Husain, 1987:295; Silva et al., 1987:77, 1996:598; Shameel & Tanaka, 1992:35; Shameel et al., 2000:84.

Morphological characters: Thallus fan-shaped, 2-4 (-5) cm high, 1-3 (-4) cm broad, epilithic, forming yellow brown clumps; frond divided into lobes, basal portion attached with the help of matted rhizoidal filaments; margins smooth, entire, undulate, not enrolled; concentric zones present on the flabellated fronds.

Cytological features: Thallus in transverse section composed of 8-9 layers of cells; central layer of large,

Kraft (1983) that two distinct forms of *P. dichotoma* i.e. prostrate and erect forms require sectioning for certain diagnosis. Kraft (2009) mentions that *Lobophora dichotoma* (Simons) P.C. Silva appears not to have been investigated since its original description.

2. *Lobophora variegata* (Lamouroux) Womersley ex Oliveira 1977: 217

Figs. 3, 4a-d

Basionym: *Dictyota variegata* Lamouroux 1809:40.

Synonyms: *Zonaria variegata* (Lamouroux) C. Agardh 1817:20, *Gymnosorus variegata* (Lamouroux) J. Agardh 1894:11, *Pocockiella variegata* (Lamouroux) Papenfuss 1943: 463, *Lobophora variegata* (Lamouroux) Womersley 1967:221, *nom. inval.*



Fig. 4. *Lobophora variegata* (Lamouroux) Womersley ex Oliveria; Herbarium specimen.

radial and rectangular cells, containing discoid phaeoplasts almost filling the cavity of cells; upper and lower peripheral layers with small squarish cells and containing dense phaeoplasts, 11 μ m high and 11 μ m wide; cortical cells rectangular in shape and have less amount of phaeoplasts, all cells similar in size and arranged side by side, 11 μ m long; have uniseriate rhizoidal filaments which contain discoid phaeoplasts.

Reproductive structures: The asexual reproductive bodies are scattered on the surface of the thallus in the form of sori; sporangia club-shaped, arising from the peripheral layer, 80-102 μ m in length, 34-57 μ m in breadth, sexual reproductive organs were not observed in these specimens.

Growth: The growth takes place through apical marginal meristem, central layer of thallus comprises of large radial, rectangular cells, the meristematic zone at dichotomy produces other lobed fronds of the thallus.

Type locality: Antilles, West Indies.

Habitat ecology: Thallus grows epilithic on the rocks exposed to low tides and also occurs in shady places, rarely found in drift condition.

Local distribution: Buleji (*Leg.* Aisha 2-10-1989, 30-10- & 14-11-1993); Nathiagali (*Leg.* Aisha 14-11-1989); Dhodha (*Leg.* Aisha 16-10-1989); Cape Monze (*Leg.* Nizamuddin 28-12-1963, 13-4-1964, 21-11-1964).

Geographical distribution: Aldabra Islands, Andaman Islands, Bahrain, Bangladesh, Chagos Archipelago, Diego Garcia Atoll, India, Indonesia, Iran, Japan, Kenya, Laccadive Islands, Madagascar, Maldives, Mauritius, Mozambique, Nicobar Islands, Omam, Pakistan, Réunion, Rodrigueaz Island, Saudi Arabia, Saya de Malha Bank, Seychelles, Somalia, South Africa, Sri Lanka, Tanzania and The Philippines.

Remarks: The thalli are fan-shaped, margin is smooth not enrolled, anatomically shows central large rectangular cells arranged radially, along with small iso-diametric, small, rectangular cortical cells, which are transversely arranged. These characters made these specimens to place them under the species *Lobophora variegata*. It was reported earlier from Karachi coast by Nizamuddin & Perveen (1986). Børgesen (1939) and Misra (1966) described it from the Indian coast, Durairatnam (1961) from Sri Lanka, Womersley (1987), Allender & Kraft (1983) and Kraft (2009) from Southern Australia, Islam (1976) from Bangladesh, Jaasund (1976) from Tanzania & Papenfuss (1977) from Mediterranean Sea. In these studies it was described under different genera like *Pocockiella* Papenfuss and *Lobophora* J. Agardh, but all these specimens belong to the species *Lobophora variegata*.

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