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BALLIELLA SHAMEELII SP. NOV. (CERAMIALES, RHODOPHYCOTA) IN THE COASTAL WATERS OF NORTHERN ARABIAN SEA

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Abstract

The feather-like thalli of the red alga; *Balliella shameelii* Shahnaz sp. nov. were collected as drift material from the seashore waters at Buleji, the coastal area near Karachi (Pakistan) during February and March, 2012. It was investigated in detail morphologically and cytologically including reproduction. This is the first report of occurrence of the genus *Balliella* Itono *et* T. Tanaka in the coastal waters of Pakistan. The new species is characterized by the development of alternate laterals on every 2nd or 3rd axial cell.

Key words: *Balliella shameelii,* Ceramiales, Rhodophycota, *Antithamnion crouanioides*,

Introduction

The genus *Balliella* was erected by Itono & Tanaka (1973) and was based on *Antithamnion crouanioides* H. Itono due to the presence of spherical gland cells borne on the abaxial sides of basal cells of the lateral branches along with the corticated main axes. These unusual features were considered generically distinctive. The genus has so far been recorded from southern Japan, the eastern Pacific Ocean, the Caribbean Sea, Aegan Sea and eastern Australia (Young, 1981; Huisman & Kraft, 1984; Anthanasiadis, 1987, 1996, 2002; Furnari & Cormaci, 1990; Skelton & South, 2007), as well as Western Australia, South Africa, Mozambique and the Maldives in the Indian Ocean (Huisman, 1988; Silva *et al.,* 1996; De Clerck *et al.,* 2002). Only one species has so far been reported from the Arabian Sea, namely, *B. richardsii* described from Sultanate of Oman by Wynne & Schneider (2006). Although *Antithamnion* was observed to grow in the coastal waters of Pakistan (Anand, 1943; Shameel & Tanaka, 1992), *Balliella* has not yet been reported. An ongoing survey of coastal waters near Karachi revealed the occurrence of the genus, and a closer examination demonstrated the presence of a new species, *B. shameelii* Shahnaz.

Materials and Methods

The pink feather-like thalli of *Balliella shameelii* were picked up as drift material from Buleji, a coastal area of Karachi (Pakistan) during February and March, 2012. They were brought to the laboratory, washed thoroughly and preserved in a 4% formaldehyde–seawater solution. Samples were examined under a light microscope (Olympus BX 51), and photographs taken with Olympus UCMAD 3 camera.

Results

General observation and microscopic examination of the collected material indicated the following features.

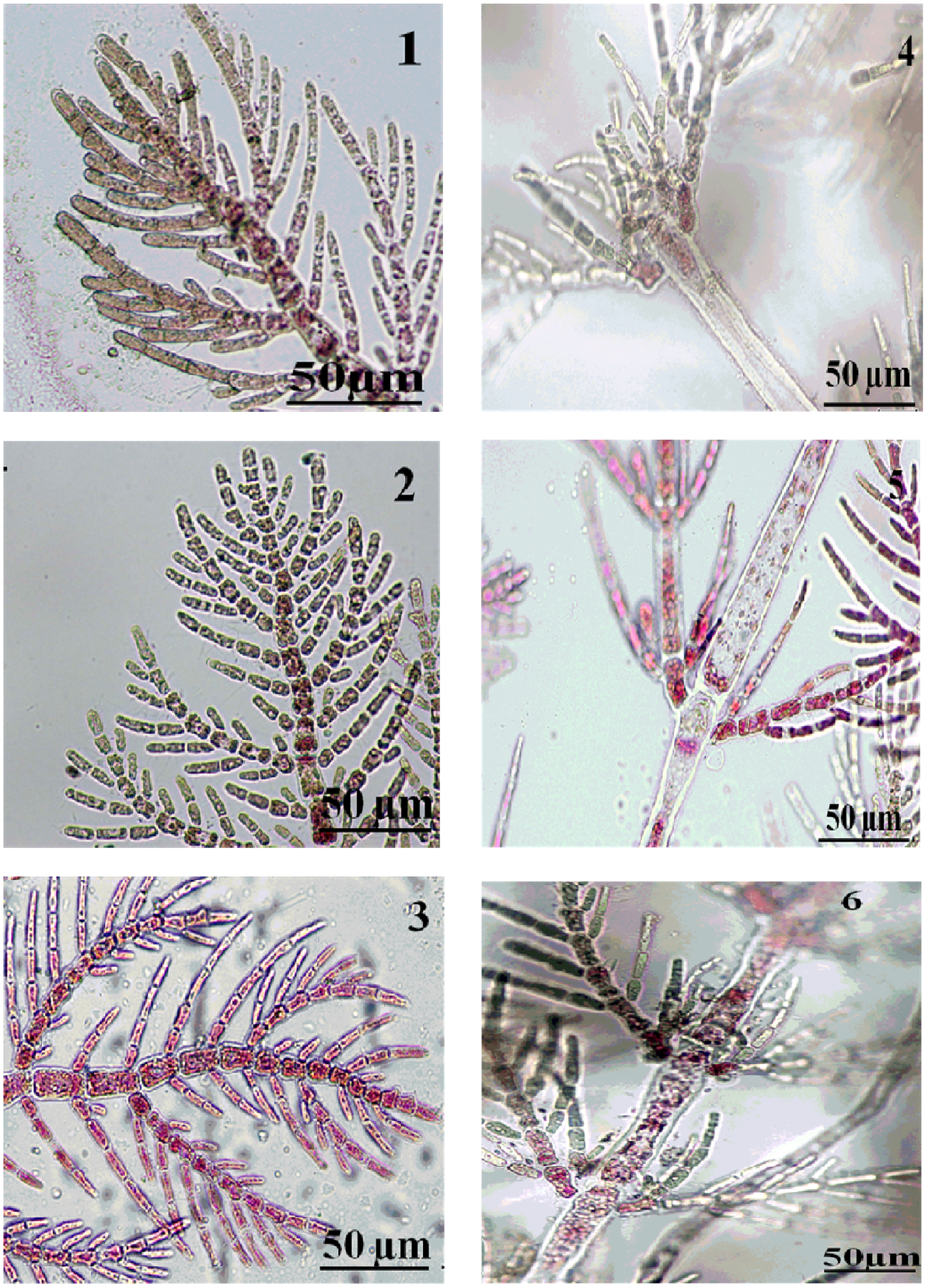
Balliella shameelii L. Shahnaz, sp. nov.

Diagnosis: Thallus erect, to 5 cm high, consisting of indeterminate axes and erect indeterminate branches; erect axes consisting of subspherical or elongated cells, 13-26 µm long and 6-9 µm broad; erect axes with opposite and distichously arranged branches, composed of cells in the distal parts 70-170 µm long and 18-29 µm wide, in the proximal portions 369-920 µm long and 80-122 µm broad; cells of the lateral branches in the distal parts 12-19 µm long and 6-9 µm wide, in the proximal portions 18-22 µm long and 5-8 µm broad; determinate branches arise usually from every second segment in an alternating pattern at indeterminate branches; gland cells spherical, 5-15 µm in diameter, abaxial to a basal cell of a lateral branch; tetrasporangia oblong to spherical, divide cruciately 176-205 µm long and 140-164 µm broad, arising laterally on the 1st or 2nd cell of lateral branches; attached by simple, uniseriate rhizoids, 574-1513 µm long and 23-46 µm wide, arising distally from axial cells.

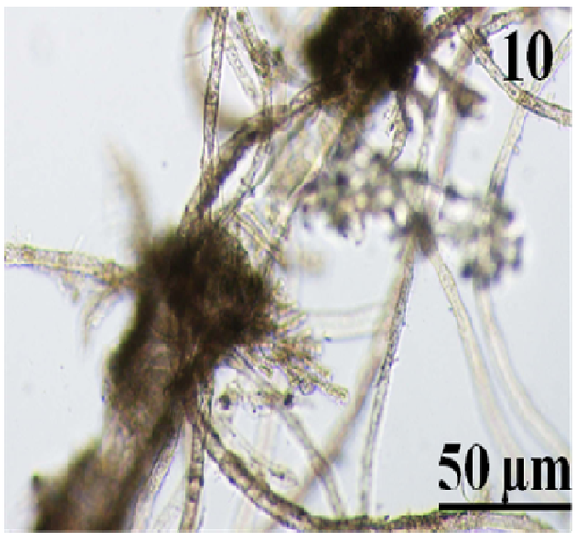
A Latin diagnosis is no more required now according to the recent version of ICBN.

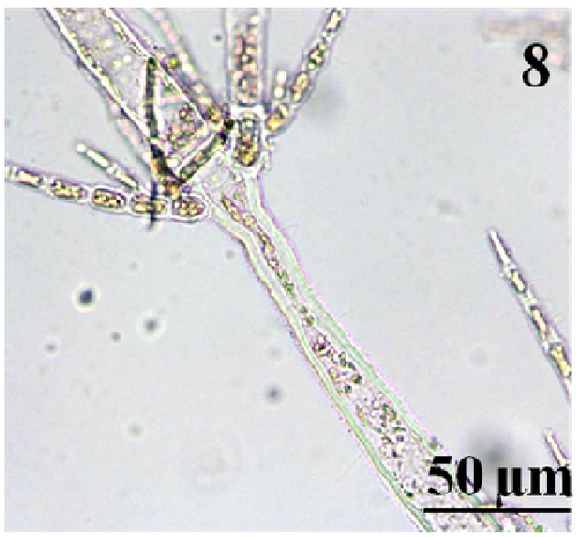
Morphology: Thallus erect, pink in colour, 1.5-4 (-5) cm high, 2-4 (-5) cm wide, free floating (collected as drift), and making feather appearance on the surface of seawater (Fig. 1), composed of uniseriate filaments, lateral branches arranged in two rows on opposite side of the main axes (Fig. 2). Lateral branches slightly curved at the main axes with tapering ends, further divided in branchlets in an irregular pattern, finally appearing in tuft-like structure enveloping the main axes (Fig. 3). From lateral branches, branchlets are produced, arranged closely to each other particularly in the younger parts of the thallus (Figs. 5-7). Apex of the main axis straight or slightly curved. Prostrate axes attached to the substratum by rhizoids developed from the base, 574-1513 µm long, 23-46 µm wide (Figs. 8-12).

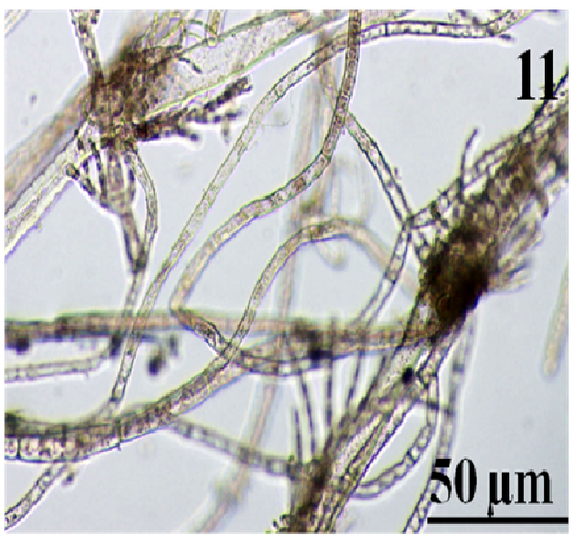
Cell dimensions: Apical cells of main axes in the erect system 13-26 µm long, 6-9 µm broad (Fig. 1 & 2); cells of the main branch: in the upper portion 70-170 (-256) µm long and 18-29 (-36) µm wide (Fig. 3), in the middle part 369-920 µm long and 80-122 µm broad (Figs. 4-6); lateral branches: apical cells 12-19 µm long and 6-9 (-12) µm wide, basal cells 18-22 (-29) µm long and 5-8 (-11) µm wide, other cells 17-28 (-33) µm long and 5-8 µm broad (Fig. 7).

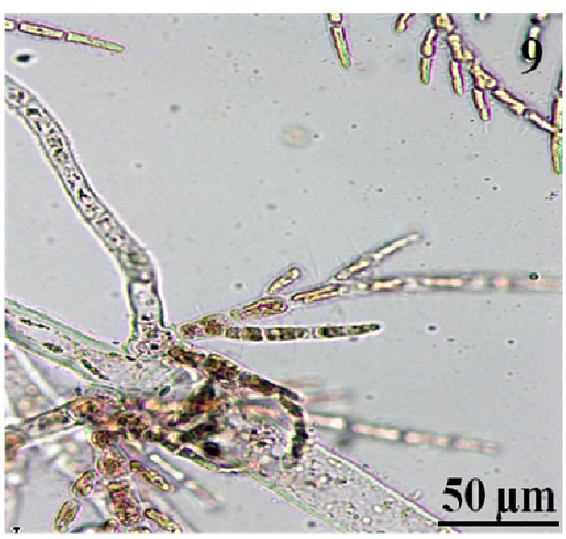


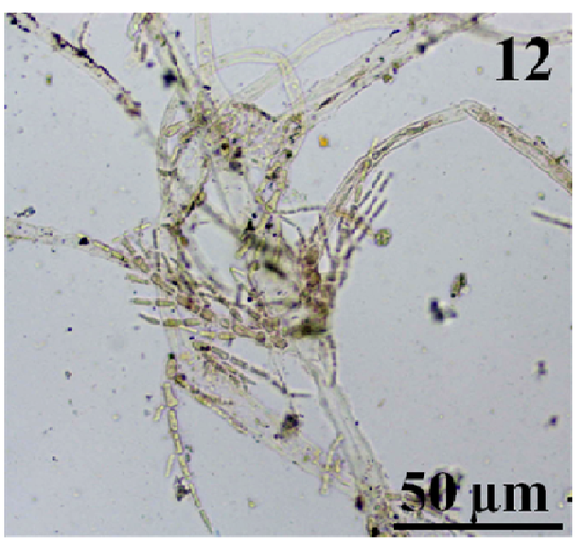
Figs. 1-6. *Balliella shameelii*: **1-3.** Showing apical parts of thalli with rounded end of apical cells. **4-6.** Middle portions of the thallus showing large cells of main axes and very small cells of lateral branches.



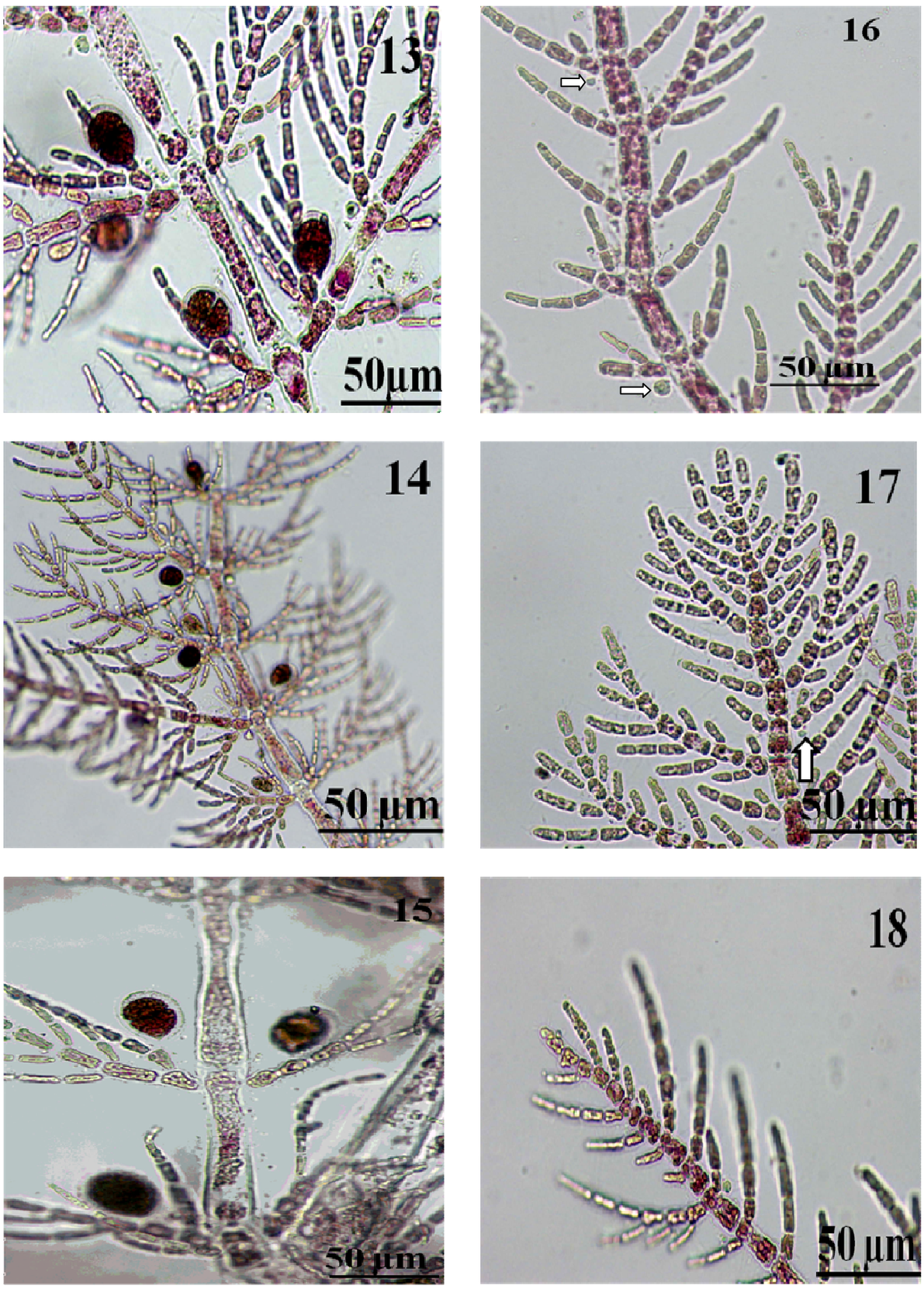








Figs. 7-12. *Balliella shameelii*: **7.** Showing opposite lateral branches. **8-12.** Basal portions of filaments with prostrate system and rhizoids encircling the main axes.



Figs. 13-18. *Balliella shameelii*: **13-15.** Tetrasporangia produced laterally on first or occasionally on second cell of lateral branches. **16-18.** White arrows showing the spherical gland cells found just beneath the basal cell of lateral branches.

Gland cells: Spherical in shape, 5-15 µm in diameter, always found beneath the basal cell of a lateral branch (Figs. 16-18).

Tetrasporangia: Oblong, occasionally spherical, cruciately divided, 176-205 µm long, 140-164 µm broad, usually found laterally on the first or second cell of the lateral branches, occasionally on second cell of a short branchlet (Figs. 13-15).

Branching pattern: Opposite, in most young axes the new laterals (of unlimited growth) develop alternatively from every 2nd axial cell, a few times from every 3rd axial cell (Fig. 7). In older parts of thalli there may be longer intervals of axial cells (Figs. 4-6). In older parts, the branching pattern of laterals is opposite at right side but may be of secund type at left side of the main axis (Figs. 8-10).

Type locality: Offshore from Buleji, Karachi, Pakistan (Holotype No. KUH-SW- 3274, *Leg.* L. Shahnaz 03 Feb. 2012), deposited in Seaweed Herbarium, MAHQ-BRC, University of Karachi, Pakistan (a sub-herbarium of Karachi University).

Specimens examined: Buleji, Karachi (*Leg.* L. Shahnaz 03 Feb. 2012, 02 March 2012).

Habitat: Sub-littoral, drift.

Etymology: Named after Prof. Dr. Mustafa Shameel (Late), Department of Botany, University of Karachi, for his enormous contribution on marine benthic algae of Pakistan.

Discussion

Balliella shameelii Shahnaz is a new species of the family Ceramiaceae (order Ceramiales, class Ceramiophyceae, phylum Rhodophycota; *fide* Shameel, 2012). Itono & Tanaka (1973) assigned *Balliella* to the tribe Delesseriopseae, but Moe & Silva (1980) disagreed, stating that it had strong affinities with the Antithamniae. This taxonomic opinion was supported by many (Huisman & Kraft, 1984; Huisman, 1988; Wynne & Schneider, 2010).

The salient features of *Balliella shameelii* are: 1) the latent growth of the lateral filaments which progressively function as indeterminate axes, 2) the development of new laterals alternatively every 2nd or 3rd axial cell, 3) the absence of adventitious axes from periaxial cells, and 4) the development of gland cells on axial cells with subsequent growth on periaxial cells following the lateral division of the axial cells. However, the development of procarps on axial cells is not recorded here. It generally resembles the type species *B. crouanioides* (Itono) Itono *et* Tanaka and *B. subcorticata* (Itono) Itono *et* Tanaka but differs from them in the pattern of initiation of new axes. Although it was not described in the protologue of *B. crouanioides* but was later said that the thallus is irregularly branched and regularity in the arrangement of the lateral branches is totally absent (Itono & Tanaka, 1973; Athanasiadis, 1996). The thallus in *B. crouanioides* was originally described as composed of prostrate and erect axes (Itono, 1971).

No doubt, the development of lateral axes from every 2nd cell was described in *B. subcorticata* (Itono, 1977), but this name is still invalid because a Latin diagnosis was never provided by Itono (1969) for the basionym or later (Itono & Tanaka, 1973). While *Balliella richardsii* (Wynne & Schneider, 2006) has close positioning of its determinate and indeterminate branches, thalli reach only 18 mm high. Gland cells are produced abundantly and formed adaxially from proximal cells of whorl branchlets. Tetrasporangia are also arranged adaxially on cells of whorl branchlets and small in size. In this way our specimens differ from *B. richardsii*.

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