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New distributional record of two marine macro-algae from Larsemann hills, East Antarctica.

S.K. Das* and Devendra Singh

Cryptogamic unit, Central National Herbarium, Botanical Survey of India, Howrah – 711 103, West Bengal.

* Corresponding author e-mail: sudiptaalgae@gmail.com

Abstract

Macro-algae (Seaweeds) are important component of Antarctic marine subtidal assemblages. They are not only the principal primary producers but also are nutrient source for aquatic and terrestrial herbivores of this extreme region. Two marine algal species *Callophyllis variegata* (Rhodophyta) and *Durvillaea antarctica* (Phaeophyta) are recorded as new distributional records from Larsemann Hills, East Antarctica which have high economic value.

Key words – *Callophyllis variegata*, *Durvillaea antarctica*, Larsemann Hills, Antarctica

Introduction

The Larsemann Hills (60°20′–69°30′S and 75°55′–76°30′E) is a 50 km^2 stretch ice-free coastal oasis, second largest of only four major ice-free oases of Antarctica, located between the Vestfold Hills and the Amery Ice Shelf on the South-eastern coast of Prydz Bay, Princess Elizabeth land, East Antarctica, bordered by two main Peninsula, Broknes and Stornes. Several Islands of varying dimensions and some unnamed promontories are present between these two peninsulas. Persistent katabatic winds blow from north-west direction during summer days which contribute to high rates of sea ice formation resulting in the formation of very dense Antarctic bottom water. This pushes the Southern Ocean's nutrient rich water towards the surface, helping to create high primary productivity in Antarctic waters (Griffiths, 2010). Algae predominate in the biome of Antarctica comprising of mostly cryptogams due to their ability of abiotic stress tolerance (Vincent, 1988).

Macro-algae (Seaweeds) though are not adequately diverse but still the principal component of the benthic marine communities of Antarctic waters (Wiencke *et al*., 2007). The physiological features like, fluidity maintenance of biological membranes by unsaturated fatty acids, molecular adaptation of the enzymes to maintain the rate of metabolism, evolution of cold shock and antifreeze proteins and adaptation of photosynthetic electron transport chain to colder conditions, allow the polar algae to successfully complete their life cycle (Breeman, 1988; Wiencke and tom Dieck, 1989; Morgan-Kiss *et al*., 2006). Further, the Antarctic Circumpolar and Humboldt currents help in the appearance of some taxa of Australia, New Zealand and South Africa coasts at marine habitats of Antarctica (Hommersand *et al*., 2009). About 130 species of marine macro-algae so far documented from Antarctica (Wulff *et al*., 2011) with their maximum richness in peninsular part and lowest in the southern most part of Ross Sea (Wiencke and Clayton, 2002). About 44 % of Phaeophytes, 36 % of Rhodophytes and 18 % of Chlorophytes are endemic to Antarctica (Wiencke and Amsler, 2012).

Himantothallus grandifolius, *Palmaria decipiens* and *Desmarestia* sp. were recorded as the dominant taxa in the East Antarctica region, covering about 80-90 % of the sea bed at the depth of 6-12 m (Irving *et al*., 2005; Johnston *et al*., 2007). In the present work, two macro-algal species *Callophyllis variegata* (Bory) Kütz (Rhodophyta) and *Durvillaea antarctica* (Cham.) Har. (Phaeophyta) are recorded as new distributional records from Larsemann Hills, East Antarctica.

Materials and methods

The specimens were collected from the rock substrate in the subtidal splash zone of Prydz bay from Easther Island, Larsemann Hills (69°22.309′S, 76°14.136′E) (Fig. 1), during the XXXV Indian Scientific Expedition to Antarctica in 2015–2016 by one of the author (DS). After thorough cleaning and washing with the seawater the specimens were preserved with 4 % Formaldehyde solution. The preserved samples and herbarium sheets were deposited in Central National Herbarium of Botanical Survey of India, Howrah (CAL). Detailed morphological study of

the taxon was made under Nikon microscope Ni – 11 fitted with Nikon Digital Camera DS – Ri1 – U3 and operated by Nikon Imaging Software NIS – D + EDF.

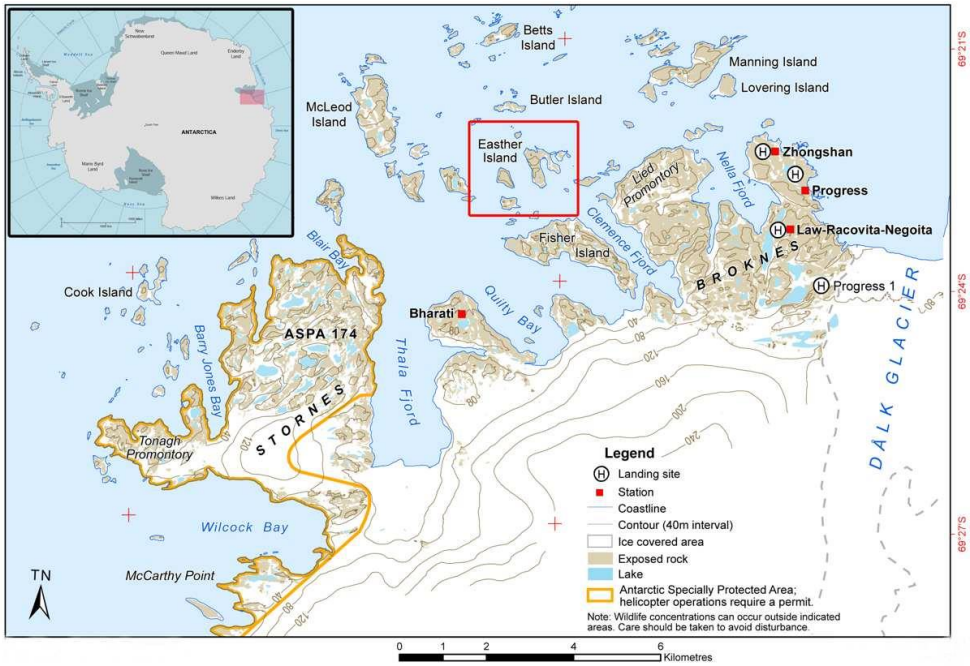

Figure 1: Map of Larsemann Hills indicating the location of Easther Island (in red box), map of Antarctica (inset)

Results and discussion

Class – Rhodophyceae

Order – Gigartinales

Family – Kallymeniaceae

Callophyllis variegata (Bory) Kütz., Phycol. General.: 401. 1843. *Halymenia variegata* Bory in Duperrey, Voy. Coquille: 179. 1828. (Fig. 2 a–f)

Intensely red coloured flattened fronds; smooth in texture with variable morphology, up to 30 cm long, sub-dichotomously branched; segments 3–5 mm wide, 200–250 µm thick; apex of the branches subtruncate; medulla of 1–2 layers of somewhat irregular, polygonal cells, becoming progressively smaller into outer medulla of 1–2 cells and grading into cortical layers of 2–4 small cells; reproductive structures not seen.

Specimens examined: East Antarctica, Larsemann Hills, Easther Island, 69°22.309′S, 76°14.136′E, c. 23 m, 28.01.2016, *D. Singh* 69851 (CAL).

Class – Phaeophyceae

Order – Fucales

Family – Durvillaeaceae

Durvillaea antarctica (Cham.) Har., Notarisia 7: 1432. 1892. *Fucus antarcticus* Cham. in Choris, Voy. Pittoresque aut. mond. 1822: 7. 1822. (Fig. 2 g–j)

Thallus attached to the substratum with a circular compact disc from which a thick cylindrical stipe originates followed by thick flattened tape like fronds, dark greenish to light yellowish brown in colour with smooth surface, up to 15 m long, 70 – 90 cm wide, margin entire to zig-zag, 0.8–1.0 mm thick in transverse section; medulla of several layers of rectangular cells, becoming progressively smaller into outer medulla of 3–4 cells and grading into cortical

layers of several small cells; reproductive structures not seen. Specimens examined: East Antarctica, Larsemann Hills, Easther Island, 69°22.309′S, 76°14.136′E, c. 23 m, 28.01.2016, D. Singh 69852 (CAL).

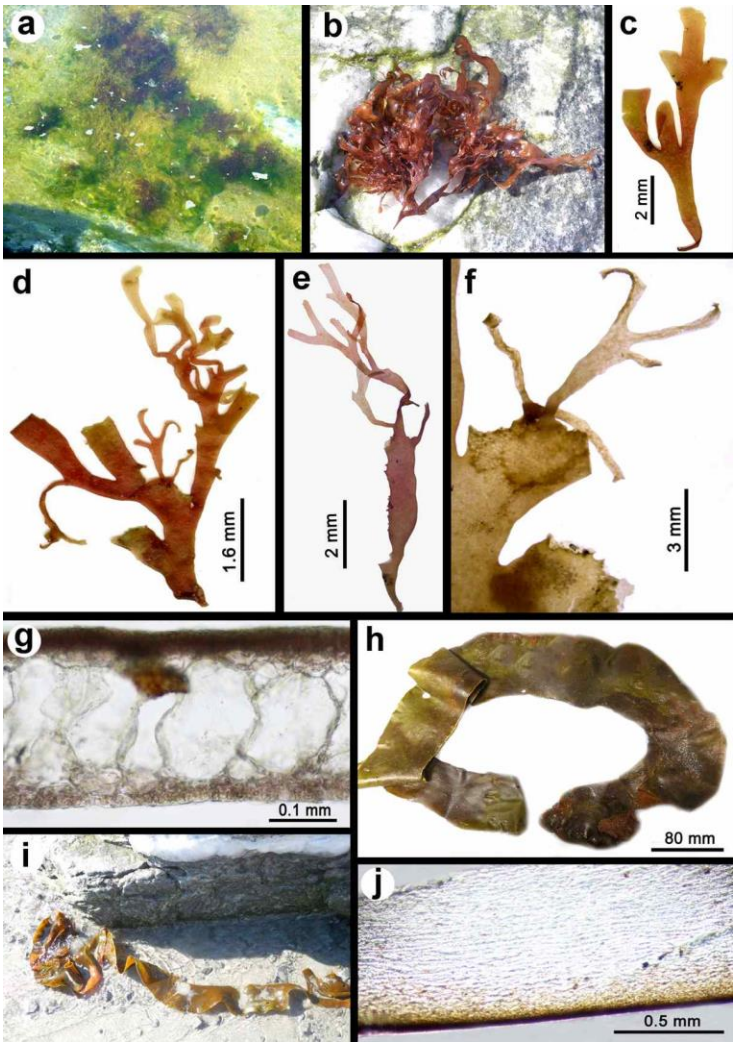

Figure 2: a. Macroalgal habitat in Larsemann Hills, b–f. morphological features of *Callophyllis variegata*, g–j. morphological features of *Durvillaea antatctica*

Antarctic seaweeds have relatively high tissue nitrogen and protein level though have a relatively low carbon to nitrogen (C:N) ratio in comparison to the seaweeds from other tropical and temperate regions, which is probably due to high nitrogen and nutrient content in the Antarctic coastal water (Dhargalkar *et al*., 1987; Weykam *et al*., 1996; Peters *et al*., 2005). Thus these algae are more valuable food for herbivores than the seaweeds from other region. *Callophyllis variegata* is widely distributed in the coasts of Australia, New Zealand, South Africa, South America and other Antarctic and sub-antarctic regions. Due to its high mineral and vitamin content, it is directly directly consumed for nutrition. *Durvillaea antarctica*, is also recorded from New Zealand coast apart from the marine Antarctic waters. It is used as forage for cattle and as a rich source of alginate (Kelly and Brown, 2000).

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