

Marine benthic algae of North East Herald Cay, Coral Sea, South Pacific

Alan J. K. Millar

Royal Botanic Gardens Sydney, Mrs Macquaries Rd, Sydney, NSW 2000 Australia

Key words: Australia, Coral Sea, marine algae, taxonomy, biogeography.

Abstract

The marine benthic algae from North East Herald Cay, Coral Sea, South Pacific, are listed with taxonomic, bibliographic and biogeographic details. The checklist includes 66 species of which 23 are green, 2 are brown, and 41 are red algal species. The almost complete absence of brown algae from what is seemingly a typical tropical reef environment on which a true coral cay has developed is noteworthy. All samples were from the lagoon, which forms the concave side of a crescent-shaped reef and which ranges in depth from 0–30 m. The endemic Caribbean green alga *Chamaedoris peniculum* is recorded for the Pacific for the first time, and a possibly undescribed species of the genus *Rhipiliopsis* was also discovered. Although only preliminary, the survey shows that the marine flora is seemingly typical of coral cays for the general region of the Great Barrier Reef.

Introduction

North East Herald Cay ($16^{\circ} 56' \text{ S}$; $149^{\circ} 11' \text{ E}$) is a semi-circular, crescent-shaped coral cay with its long axis oriented NE-SW. The cay itself is approximately 34 ha, 1200 m long and 500 m wide, and has a maximum elevation of 5 m, with a broad moderately sloping sandy beach with some beachrock slabs towards its centre, and a fringing coral reef. It is part of the Coringa-Herald National Nature Reserve, which lies in the central region of the Coral Sea Plateau in the Western Coral Sea, approximately 440 km due east of the city of Cairns on the north Queensland coast of Australia. The Plateau is separated from the Great Barrier Reef by the Queensland Trough, and is flanked by the Coral Sea Basin to the north-east and by the Townsville Trough to the south (Orme, 1977). The Herald Cays are bathed by the East Australian Current, which has its origins in the South Equatorial Current, and sea-surface water temperatures rarely drop below 24 °C in winter. Because it is a National Nature Reserve, it has been the subject of intensive, multi-disciplinary scientific expeditions (mostly by the Australian National Parks and Wildlife Service - NPWS), the most recent of which was in June 1997, when some 20 scientists and volunteers spent 14 days researching the cay. This was organized by the Royal Geographical Society of Queensland with various logistical support from NPWS. Part of this team included the author and Karlene L. Christian, and our principal task was to collect, document and describe the marine benthic algae of the entire cay. However, due to prevailing weather conditions, only the extensive lagoon area, which forms the entire, concave north west side of the cay, was examined in detail. This lagoon, however, is very extensive in area and has many (ca. 30) large, and often cavernous bommies (large coral and rock pinnacles), rising out of the surrounding coral-sand seabed, which is 2–30 m deep. This offers a wide range of habitats for the algae; so a reasonable indication of the marine flora was possible.

Methods

All collections were made using SCUBA and preserved in 4% formaldehyde, stored in a 30 l black plastic barrel, then transported back to Sydney for sorting, pressing, and hand-sectioning. The collections are filed in the Royal Botanic Gardens Sydney, National Herbarium of New South Wales (NSW). Herbarium abbreviations follow Holmgren et al. (1990).

List of species

Chlorophyta Ulvales Ulvaceae

Enteromorpha Link

Enteromorpha intestinalis (Linnaeus) Nees 1820:, index 2. Type locality: 'in Mari omni'. Voucher: west side of Lagoon, A. J. K. Millar & K. L. Christian, 24.vi.1997, NSW Slide 20–79.

Cladophorales Anadyomenaceae Anadyomene Lamouroux

Anadyomene stellata (Wulfen) C. Agardh, 1822: 400. Type locality: Adriatic Sea. Voucher: south-west side of lagoon, A. J. K. Millar & K. L. Christian, 25.vi.1997, NSW 418137.

Microdictyon Decaisne

Millar & Kraft (unpublished) have determined that the genus may be represented by only four of its 18 included species. These are differentiated by the anatomy of the anastomosing cell wall segments and certain stable differences in primary filament branching patterns. Characters defined by Setchell (1929), by which the majority of species are separated today (mesh size, filament width, frond and cell-wall colour, and stellate vs cruciate primary filament branching patterns), have been found to be untenable. The four species can be separated as follows:

- 1. Anastomosing segments of thickened wall rings.2
- 3. Crenellated walls on unmodified cells
- 3. Crenellated walls on modified cells, tenaculae

Microdictyon montagnei was transferred to the genus *Boodlea* by Egerod (1952), primarily because of its tenaculae, which are attachment cells (with crenellated walls) considerably smaller than the joined parental cells. This single feature also links it with the genera *Chamaedoris* (Okamura, 1932), *Cladophoropsis* (Egerod, 1952), *Struvea* and *Phyllodictyon* (Kraft & Wynne, 1996), which are otherwise separated on major morphological differences, as well as the occurrence of segregative cell division in the former three. *Boodlea* species are defined by their cell divisions, which occur in random planes giving the resultant plant a three-dimensional habit. *Microdictyon montag*- *nei* would be unique in the genus *Boodlea* because of its cells that are branched strictly in a single plane, which thus form flattened blades typical of the genus *Microdictyon*.

Microdictyon setchellianum Howe, 1934: 38. Type locality: Hawaii. Voucher: north side of lagoon, *A. J. K. Millar & K. L. Christian*, 22.vi.1997, NSW 418073.

Siphonocladales Siphonocladaceae Chamaedoris Montagne

Chamaedoris peniculum (Ellis & Solander) Kuntze, 1898: 400. Basionym: *Corallina peniculum* Ellis & Solander, 1786: 127, pl. 7, Figures 5–8, pl. 25, Figure 1. Synonyms: *C. annulata* (Lamarck) Montagne, 1842: 261. *Penicillus annulatus* Lamarck 1813: 299. *Nesea annulata* (Lamarck) Lamouroux, 1816: 256. *Scopularia annulata* (Lamarck) Chauvin 1842: 122. Type locality: Florida. Voucher: north side of lagoon, *K. L. Christian & A. J. K. Millar*, 26.vi.1997, NSW 415041.

The felt-like capitulum is generally peltate but occasionally may be acentrically placed on the stalk. In all plants, however, the capitulum is flat and curved downwards like an umbrella, and the plants are found only in deep water (18 m plus). This differs from Caribbean material in that the capitulum is cup-shaped, ie. curved upwards, and plants are said to be restricted to shallow water (above 10 m; Littler et al., 1989: 84). The Herald Cay specimens are similar to the West Indian species in that both have simultaneously produced whorls of capitulum filaments arising from distal ends of the distal stalk-cells (Børgesen, 1912: Figure 17). This same capitulum filament production also occurs in the Indian species C. auriculata Børgesen, and the Japanese species C. orientalis Okamura & Higashi (Okamura, 1932: 68, pl. 284, Figures 8–15) and thus differs substantially from the other species of the genus [C. delphinii (Hariot) Feldmann & Børgesen] in which capitulum filaments arise randomly from a single, terminal stalk-cell and are not cut off as separate cells (Børgesen 1940: 16, Figure 5). Since even the stalk is seemingly of one cell (i.e. monosiphonous), the generic placement of C. delphinii is questionable. Lastly, tenaculae used to attach neighbouring filaments are present in all but C. delphinii. Critical study is required to ascertain the specific differences between species of Chamaedoris. If the identity of our plants is confirmed, this would constitute the first record for the Pacific.