

## Diu island: A paradise for tourists and seaweed biologists

While working on *iota* and *lamda* carrageenophytes of Gujarat coast, we got an opportunity to study the seaweeds of Diu island, west coast of India (Figure 1 *a*). Floristic studies on Indian seaweeds divulge that only a few places on the mainland have been worked out extensively according to the exigencies of travel and convenience of the collector; however, the islands have been neglected greatly. The island of Diu<sup>1</sup>, an erstwhile Portuguese colony, is situated off the Saurashtra coast of Gujarat bordering Junagadh district, with geographical area of only 38.5 km<sup>2</sup> and coastal stretch of 21 km. The summer temperature goes up to 32°C, while in winter it declines down to 15°C; annual average rainfall is 70 cm. With pleasant climate throughout the year, the island affords unprecedented peace and tranquility to tourists.

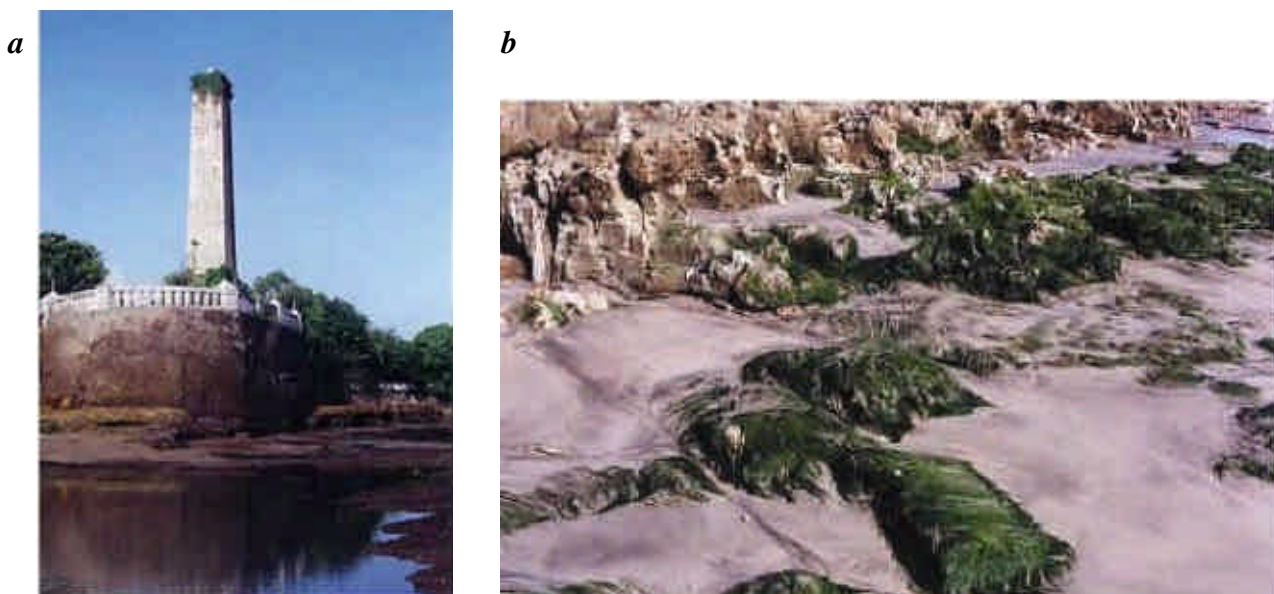
The Saurashtra region is of special interest not only to seaweed biologists of India, but also those from abroad due to its diverse marine algal flora. However, such studies for Diu island are meagre and fragmentary<sup>2-5</sup>. The northern side of the island facing Gujarat is all tidal marsh and salt pans, while the southern coast alternates between limestone cliffs, rocky

caves and sandy beaches harbouring a variety of seaweeds.

Estimates<sup>6</sup> of the total number of species on earth vary from 5 to more than 50 million and the rates of species extinction are massive. Many of these taxa are becoming extinct even before they are being recorded. Therefore, it becomes imperative to enumerate our existing diversity. Keeping this in mind, a qualitative seaweed survey was carried out for floristic studies at Diu island, which was unfortunately neglected in the past by seaweed biologists. During April 2002 to March 2004, extensive collections were made along Diu coast regularly for existing seaweeds, covering all seasons, i.e. pre-monsoon (March–April), monsoon (July–August) and post-monsoon (November–December) from Fort area reef (20°42.730'N, 70°55.485'E) and Nagoa reef (20°42.357'N, 70°58.224'E), during the lowest low tide of the *chart datum*. The herbarium specimen as well as wet repository have been given accession numbers and deposited at the National Facility for Marine Algae Herbarium, Central Salt and Marine Chemicals Research Institute (CSMCRI), Bhavnagar. Seaweed taxa were identified using standard literature available<sup>7-10</sup>, categorized

and recorded as dominant, common and sparse elements based on their occurrence in nature. Floristic account of seaweed species encountered during the study period is provided in Table 1.

During the study period 70 species of seaweeds were recorded from this coast. Species – area relation<sup>11</sup> is important in any kind of floristic study. About 397 seaweed species have been so far recorded from 3216 km stretch of the west coast (species number arrived from the data compiled by Sahoo *et. al.*<sup>12</sup>). The beauty of this tiny island is centred around rich floristic diversity of seaweeds. Seaweed composition of Diu island represents about 17% of the total flora of the west coast. However, the coastal land mass is only 0.6%. This high diversity of seaweeds along the Diu coast may be due to the un-polluted and clean intertidal environment available for their growth (Figure 1 *b*). However, detailed and round-the-year collections, including the subtidal regions may add many more species from this unexplored island. The economy of the island mainly relies on tourism. Hence, we recommend that the Diu administration set up a seaweed information and herbarium centre along with an aquarium



**Figure 1.** *a*, Fort area reef, Diu island. *b*, Exposed *Enteromorpha* bed at upper intertidal region, Fort area reef.

# SCIENTIFIC CORRESPONDENCE

**Table 1.** Floristic composition of seaweeds along Diu coast

Seaweed	Pre-monsoon	Monsoon	Post-monsoon
<b>Chlorophyta</b>			
<i>Enteromorpha clathrata</i> (Roth) Greville	+	+++	++
<i>E. compressa</i> (Linn) Nees	++	+	+++
<i>E. intestinalis</i> (Linn) Nees	++	-	++
<i>E. linza</i> (Linn) J. Agardh	-	-	+++
<i>Ulva fasciata</i> Delile	++	-	+++
<i>U. lactuca</i> Linn	++	+	++
<i>U. reticulata</i> Forsskål	-	+	++
<i>Acrosiphonia orientalis</i> (J. Agardh) P. Silva	-	-	+++
<i>Chaetomorpha spiralis</i> Okamura	-	+++	+
<i>Cladophora crystalline</i> (Roth) Kützing	+	-	++
<i>C. vagabunda</i> (Linn) van den Hoek	-	-	+
<i>Rhizoclonium tortuosum</i> (Dillwyn) Kützing	-	-	+
<i>Boodlea composita</i> (Harvey) Brand	+	-	-
<i>Boergesenia forbesii</i> (Harvey) J. Feldman	++	+	+++
<i>Chamaedoris auriculata</i> Børgesen	+	+	-
<i>Dictyosphaeria cavernosa</i> (Forsskål) Børgesen	+	-	+
<i>Struvea anastomosans</i> (Harvey) Piccone & Grunow ex Piccone	-	+	+
<i>Valonia aegagrophila</i> C. Agardh	++	++	++
<i>Valoniopsis pachynema</i> (G. Martens) Børgesen	-	-	+
<i>Bryopsis plumosa</i> (Hudson) C. Agardh	+	-	++
<i>Caulerpa racemosa</i> (Forsskål) J. Agardh var. <i>macrophysa</i> (Sonder ex Kützing) W.R. Taylor	++	-	++
<i>C. scalpelliformis</i> (R. Brown ex Turner) C. Agardh	++	-	+
<i>C. sertularioides</i> (S. Gmelin) Howe	+	+	+++
<i>C. taxifolia</i> (Vahl) C. Agardh	+	-	++
<i>C. veravalensis</i> Thivy & Chauhan	+++	+	+++
<i>Halimeda tuna</i> (Ellis & Solander) Lamouroux	++	+	+++
<i>Udotea indica</i> A. Gepp & E. Gepp	+	-	+
<b>Phaeophyta</b>			
<i>Dictyota alternans</i> (J. Agardh) Horning, Schnetter & Prud' homme van Reine	-	-	+
<i>D. bartayresiana</i> Lamouroux	-	+	++
<i>D. ciliolata</i> Kützing	-	+	+
<i>D. dichotoma</i> (Hudson) Lamouroux	+	++	+++
<i>D. hauckiana</i> Nizamuddin	+	-	-
<i>Lobophora variegata</i> (Lamouroux) Womersley ex Olivera	-	-	+
<i>Padina gymnospora</i> (Kützing) Sonder	-	++	+
<i>P. tetrastromatica</i> Hauck	-	+	++
<i>Spatoglossum asperum</i> J. Agardh	-	-	+
<i>Stoechospermum marginatum</i> (C. Agardh) Kützing	-	+	++
<i>Colpomenia sinuosa</i> (Mertens ex Roth) Derbés & Solier	-	+	++
<i>Rosenvingea intricata</i> (J. Agardh) Børgesen	-	+	++
<i>Cystoseira indica</i> (Thivy & Doshi) Mairh	-	-	+
<i>Sargassum tenerrimum</i> J. Agardh	+	-	++
<b>Rhodophyta</b>			
<i>Scinaia hatei</i> Børgesen	-	-	+
<i>Gelidium pusillum</i> (Stackhouse) Le Jolis	+	+	+
<i>Gelidiella acerosa</i> (Forsskål) J. Feldmann & G. Hamel	-	+	++
<i>Gracilaria corticata</i> (J. Agardh) J. Agardh	+	++	+++
<i>G. foliifera</i> (Forsskål) Børgesen	-	+	+
<i>G. textorii</i> (Suringar) De Toni	-	-	+
<i>G. verrucosa</i> (Hudson) Papenfuss	-	++	-
<i>Grateloupia lithophila</i> Børgesen	++	+	+++
<i>G. wattii</i> Holmes	-	-	+
<i>Amphiroa anceps</i> (Lamarck) Decaisne	-	+	+
<i>A. fragilissima</i> (Linn) Lamouroux	+	-	+
<i>Cheilosporum spectabile</i> Harvey ex Grunow	-	-	+
<i>Jania rubens</i> (Linn) Lamouroux	+	+	-
<i>Catenella impudica</i> (Montagne) J. Agardh	++	++	++
<i>Hypnea musciformis</i> (Wulfen) Lamouroux	+	-	++
<i>H. spinella</i> (C. Agardh) Kützing	+	-	-

(Contd...)

Table 1. (Contd...)

Seaweed	Pre-monsoon	Monsoon	Post-monsoon
<i>H. valentiae</i> (Turner) Montage	++	–	+++
<i>Sarconema filiforme</i> (Sonder) Kylin	+	+	++
<i>S. scinaoides</i> Børgeesen	–	–	+
<i>Champia compressa</i> Harvey	–	–	++
<i>C. globulifera</i> Børgeesen	–	–	+
<i>Centroceras clavulatum</i> (C. Agardh) Montagne	+	–	++
<i>Ceramium rubrum</i> Auctorum	+	+	++
<i>Wrangelia argus</i> (Montagne) Montagne	++	–	–
<i>Caloglossa leprieurii</i> (Montagne) G. Martens	++	++	++
<i>Bostrychia tenella</i> (Lamouroux) J. Agardh	++	++	++
<i>Chondria dasyphylla</i> (Woodward) J. Agardh	+	++	++
<i>Laurencia papillosa</i> (C. Agardh) Greville	+	–	–
<i>Polysiphonia platycarpa</i> Børgeesen	+	–	+

+++ Dominant; ++ Common; + Sparse; – Absent.

exhibiting live seaweeds, which could boost the ecotourism industry, and ultimately lead to the conservation of these species.

1. [http://bhagirath.faihtweb.com/daman\\_diu.html](http://bhagirath.faihtweb.com/daman_diu.html)
2. Sreenivasa Rao, P. and Trivedi, M. K., In *Taxonomy of Algae* (eds Desikachary, T. V. and Raja Rao, V. N.), University of Madras Publication, 1980, pp. 255–260.
3. Srinivasan, K. S., In *Phycologia Indica: Icones of Indian Marine Algae, Vol. – I*, BSI Publication, Calcutta, 1969, p. 52.
4. Srinivasan, K. S., In *Phycologia Indica: Icones of Indian Marine Algae, Vol. – II*, BSI Publication, Calcutta, 1973, p. 60.
5. Mantri, V. A., Joshi, H. V. and Zaidi, S. H., *Seaweed Res. Util.*, 2004, **26**, 231–236.

6. May, R. M., *Science*, 1988, **241**, 1441–1449.
7. Tylor, W. R., In *Algae of the Eastern Tropical and Subtropical Coasts of the Americas*, University of Michigan Publication, 1960, p. 662.
8. Desikachary, T. V., Krishnamurthy, V., and Balkrishnan, M. S., In *Rhodophyta – II. Taxonomy Part – II A*, Madras Science Foundation Publication, 1990, p. 279.
9. Mishra, J. N., In *Phaeophyceae in India*, Indian Council of Agricultural Research, New Delhi, 1967, p. 203.
10. Krishnamurthy, V., *Algae of India and Neighboring Countries – Chlorophycota*, Oxford and IBH, 2000, p. 210.
11. Singh, J. S., *Curr. Sci.* 2002, **82**, 638–647.
12. Sahoo, D., Nivedita and Debasish, In *Seaweeds of Indian Coast*, A.P.H. Publishing Corporation, New Delhi, 2001, p. 283.

ACKNOWLEDGEMENTS. We thank the Director, CSMCRI, Bhavnagar for encouragement. Thanks are also due to the Head, Marine Algae and Marine Environment Discipline, CSMCRI for providing facilities.

Received 23 December 2004; revised accepted 16 October 2005

VAIBHAV A. MANTRI  
P. V. SUBBA RAO\*

*Marine Algae and Marine Environment Discipline,  
Central Salt and Marine Chemicals Research Institute,  
Bhavnagar 364 002, India*  
\*For correspondence.  
e-mail: pvsubarao@csmcricri.org

## A new *Orontobryum* Mitt. ex Fleisch. from Darjeeling, eastern Himalayas

Genus *Orontobryum* Mitt. ex Fleisch. was established by Fleischer<sup>1</sup> from Sikkim, eastern Himalayas with its type species *Orontobryum hookeri* (Mitt.) Fleisch. At the time of institution of this genus, Fleischer was little reluctant whether it should be separated as new genus because of its close affinity with genus *Macrothamnium* Fleisch. belonging to family Hylocomiaceae (order Hypnobryales), which was also the view of Brotherus<sup>2</sup>. However, Brotherus<sup>3</sup> revised his opinion and placed the *Orontobryum* in the family Hookeriaceae (order Hookeriales). The status of the genus given by Brotherus<sup>3</sup>

has been followed by Gangulee<sup>4</sup> and the same is maintained during the present study. Genus *Orontobryum* was earlier represented in India by two species, i.e. *O. hookeri* (Mitt.) Fleisch. and *O. recurvulum* Gangulee known from Sikkim, and Sikkim and Bhutan respectively, and is endemic to eastern Himalayas. During the recent study on the bryophytes of Rim-bick, Darjeeling some specimens approaching to genus *Orontobryum* have been encountered. A critical and comparative study has revealed that these specimens are clearly distinctive from the hitherto known species of the genus. Hence it is

described here as *Orontobryum darjeelingensis* sp. nov., which is new to the science.

*Orontobryum darjeelingensis* Nath, Asthana & Sahu sp. nov. (Figure 1)

Folia late cordata  $\pm 1$  mm longa et  $\pm 1$  mm lata, margineum serrata–dentata ad basa. Ramorum folia ovata–oblonga 0.064–0.7 mm longa et  $\pm 0.35$  mm lata, margineum dentata ad mediana. Foliorum cellulae apica 32–40  $\times$  8–12  $\mu$ m, mediana 40–44  $\times$  4  $\mu$ m, cellulae alares 30–32  $\times$  25–37.5  $\times$  12.5–20  $\mu$ m, pale-light brown. Ramorum foliorum cellulae apica 34–40  $\times$  4–7  $\mu$ m, mediana 40–68  $\times$  4  $\mu$ m,