

A contribution to the algal phytogeography of the southern African west coast - a case study at Elizabeth Bay, Namibia

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ABSTRACT

The diversity of the macroalgal flora at Elizabeth Bay was determined at relatively undisturbed sites to serve as baseline data for further monitoring of a possible impact of mine tailings disposal. Twenty-two species had never been recorded at Elizabeth Bay before, which is attributed to the poor sampling record.

INTRODUCTION

The Namibian coastline is known for its diverse fauna and flora, caused by the cold Benguela current and regular upwelling (Andrews & Hutchings 1980; Branch & Griffiths 1988). Although the general biogeography of the Namibian seaweed flora has been studied (Lawson *et al.* 1990; Engledow *et al.* 1992), detailed surveys are lacking for most of the coastline (Bolton 1986; Molloy 1990). The area south of Lüderitz is of special interest, since it is (a) affected by a centre of strong upwelling and (b) because of the abundance of diverse rocky habitats with different degrees of exposure to wave action which offer a variety of niches for seaweed species (Molloy 1990; Engledow *et al.* 1992). Seaweed species had been collected in 1957 at Elizabeth Bay, about 30 km south of Lüderitz (Lawson *et al.* 1990), but only 45 species were identified. Today, the bay is used to dispose fine tailings (1.4 mm) remaining after extracting diamonds. There has been considerable concern that the tailings affect the marine flora and fauna in the vicinity of the bay. The aim of this study was to describe the seaweed flora in relatively undisturbed habitats with exposure to different degrees of wave action similar to those in the impacted bay. This survey focuses on the diversity of the macroalgal flora, thus complementing a study of intertidal rocky shores at Elizabeth Bay (Bustmante *et al.* 1993). In addition, the algal collections provide phytogeographical data to contribute to the ongoing discussion whether or not the west coast flora of southern Africa is cold temperate (Brown & Jarman 1978) or warm temperate (Bolton 1986).

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MATERIALS AND METHODS

The study was undertaken at three sites near Elizabeth Bay (26°55'S and 15°15'E). Two sites were semi-exposed, one was sheltered. The semi-exposed sites were located on the west side of the northern headland (Elizabeth point), the sheltered site in a small bay 5 km northwest of Elizabeth Bay. The rocky outcrops consist of medium- to fine-grained granites of the Sinclair Series (Geological Survey 1980).

The survey and collections were undertaken on three days in September 1993 at the end of a spring tide. For this purpose, at each site three transect were located randomly perpendicular to the shore and 0.5 x 0.5 m quadrates were placed at 3 m intervals as far as accessible from land. Within the quadrates all algae species were identified and cover was recorded per species according to a Braun-Blanquet scale (Mueller-Dombois & Ellenberg 1974). The height difference between the quadrates was determined and a habitat description given for each quadrat. In addition, algae species which were not recorded in the quadrates were selected at each site for later identification. The same sites were sampled in November 1993 again during a spring tide. Voucher specimens of all species are kept at the reference collection of the Botany Department at the University of Namibia. Articulated corallines such as *Corallina*, *Jania* and encrusting algae such as *Lithothamnion* species are currently under revision. Thus identifications to genus level were included, where possible (Simpson 1976).

The zonation patterns of all transects were analyzed in kite diagrams and summarised in a table (Appendix I). The transects were divided into high intertidal (= supra littoral and supra littoral fringe) and mid- and lower intertidal (= mid littoral and sublittoral fringe) according to the distance from the high water mark (Brown & Jarman 1978).

RESULTS

Distribution

A total of 58 species was encountered, although only 29 species were recorded on the transects. Collections in the vicinity of the transects revealed an additional 27 species (see Appendix I). *Callithamnion* sp., *Carpoblepharis flaccida*, *Ceramium capense*, *Ceramium diaphanum*, *Corallina* sp., *Ectocarpus* sp., *Gigartina bracteata*, *Gigartina clathrata*, *Gelidium capense*, *Gymnogongrus complicatus*, *Gymnogongrus corymbosus*, *Gymnogongrus polycladus*, *Gymnogongrus vermicularis*, *Hypnea spicifera*, *Jania* sp., *Lithothamnion* sp., *Nothogenia erinacea*, *Nothogenia* cf. *ovalis*, *Papenfussiella gracilis*, *Plocamium comutum*, *Plocamium rigidum* and *Pterosiphonia cloiophylla* are new records for Elizabeth Bay, but have their normal distributional range in the west coast area.

Zonation

Semi-exposed rocky shore

Enteromorpha sp. and *Porphyra capensis* were the two species dominating in the high intertidal zone (Fig. 1).

The mid- and lower intertidal was dominated by *Cladophora capensis*, *Chordariopsis capensis* and *Enteromorpha* sp., which occurred mainly in pools. *Caulacanthus ustulatus*, *Cladophora contexta*, *Codium fragile* subsp. *capense*, *Corallina* sp., *Gigartina stiriata* and *Lithothamnion* sp. also occurred in pools, but in lower quantities. Recorded in this zone outside pools were *Aeodes orbitosa*, *Ceramium capense*, *Ceramium diaphanum*, *Champia lumbricalis*, *Ectocarpus* sp., *Leathesia difformis*, *Nothogenia* cf. *ovalis*, *Porphyra capensis* and *Ulva* species (Fig. 1).

Sheltered rocky shore

In the high intertidal *Cladophora capensis*, *Cladophora contexta*, *Enteromorpha* sp. and *Ulva* sp. were recorded in rock pools (Fig. 2). Only *Porphyra capensis* occurred also outside the pools.

Lithothamnion sp. were dominant in the mid- and lower intertidal. Less abundant were *Aeodes orbitosa*, *Centroceras clavulatum*, *C. capensis*, *C. ustulatus*, *C. contexta*, *Corallina* sp., *Gigartina radula*, *G. scutellata*, *Gymnogongrus vermicularis*, *Grateloupia filicina*, *Iridaea capensis*, *Leathesia difformis*, *N. cf. ovalis*, *Porphyra capensis*, *Ralfsia expansa*, *Splachnidium rugosum* and *Ulva* species.

Aeodes orbitosa, *C. clavulatum*, *C. lumbricalis*, *Corallina* sp., *Ecklonia maxima*, *Epymenia obtusa*, *G. radula*, *G. stiriata*, *Lithothamnion* sp. and *Ulva* sp. occurred in the infratidal zone (Fig. 2).

DISCUSSION

Distribution and diversity

Although 22 species were new records for Elizabeth Bay, they do not extend beyond their normal distributional range. The total of 58 species at Elizabeth Bay is a good representation of the 82 species reported for the entire southern Namibian coast, but is certainly not ranging as a hot spot of diversity compared to Lüderitz with 80 species alone (Lawson *et al.* 1990). Thus Elizabeth Bay is not a unique site in terms of diversity of the macroalgal flora of the southern African west coast. However, the proposed decline in algal species northwards is attributed to lack of collections and published records (Hommersand 1986) and should be corrected accordingly with more collections taking place.

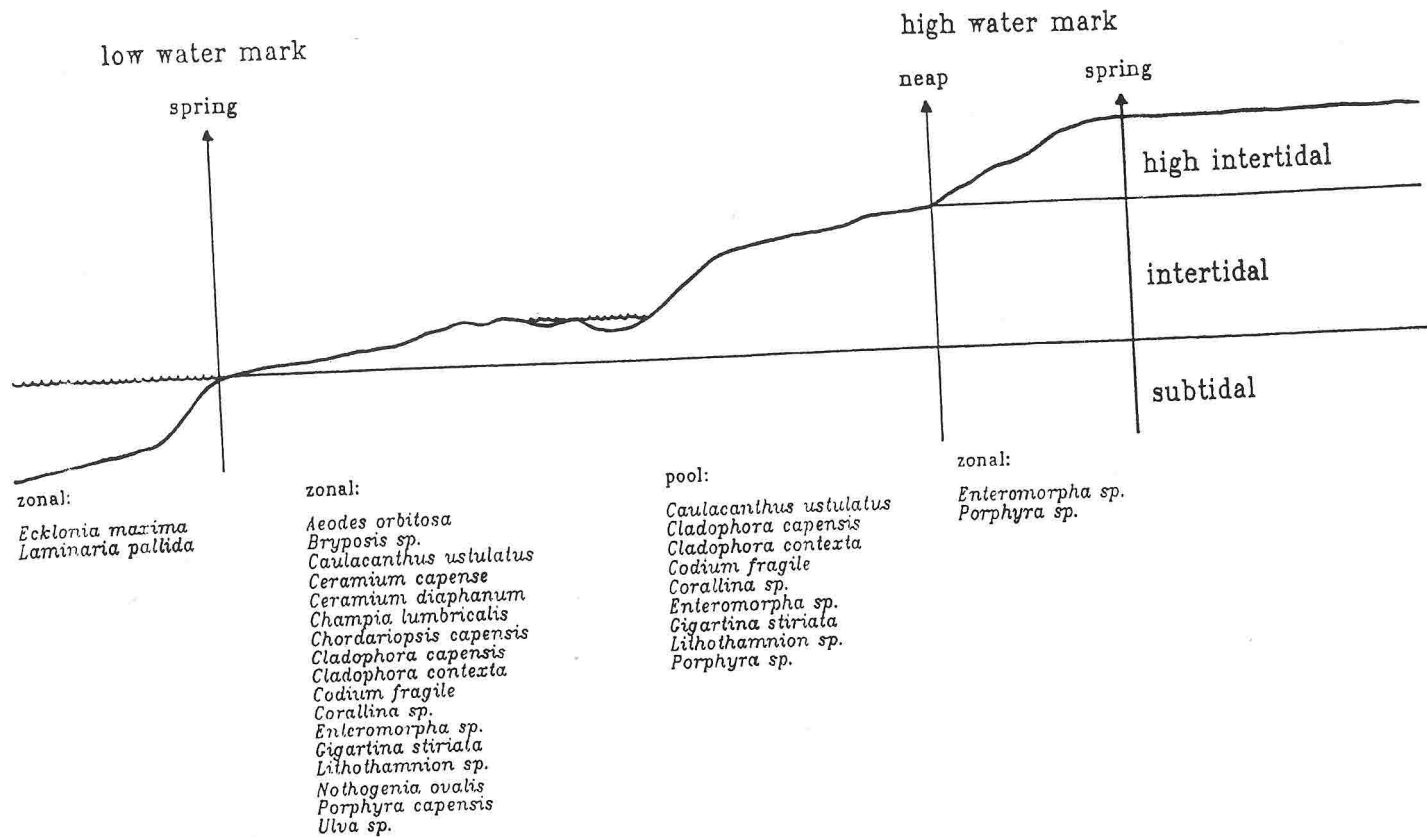


Figure 1: Zonation of macroalgal species at semi-exposed rocky shore at Elizabeth Bay (adapted from Brown & Jarman 1978).

