

III. Red List of Marine Macroalgae of the Wadden Sea*

CONTRIBUTORS:

Denmark: R. Nielsen

Germany: D. Schories**, W. Härdtle, K. Reise

The Netherlands: W. J. Wolff

INTRODUCTION

Within the last 100 years, the macrophytobenthos of the Wadden Sea has undergone an even more dramatic change than can be documented momentarily in a Red List. Since the beginning of the century, two opposite trends have occurred. In the 1980s red algae were found to be rare in the sublittoral zone, whereas green algae of the intertidal zone (i. e. *Chaetomorpha*, *Cladophora*, *Enteromorpha*, *Ulva*) exhibited a massive increase, compared to the situation at the turn of the century (Reise, 1994).

Seagrass which was abundant throughout the Wadden Sea, decreased dramatically in the 1930s. Almost the entire population of *Zostera marina*, growing at or just below the low-tide line, was affected (den Hartog, 1987). In the intertidal zone, a more gradual decline of seagrass started in the 1960s, proceeding from the Southern Wadden Sea. The loss of seagrass beds is supposed to have altered the abundance of macroalgae greatly, compared to the period before the 1930s (van Goor, 1921).

Data source

Despite evident changes in the macrophytobenthos of the Wadden Sea, potential threats to certain algae species are difficult to predict, because of the limited data from the past.

For example, findings in the Königshafen Bay (Sylt, North Frisian Wadden Sea) of approximately 100 species of macroalgae in this century have been reported in various unpublished data sets. But information on the distribution or variability of abundances is sparse, if available at all. Species which are not listed for certain areas of the Wadden Sea, are not necessarily absent there, but possibly they have not been carefully enough loo-

-
- * This list forms part of the Report on the RED LISTS OF BIOTOPES, FLORA AND FAUNA OF THE TRILATERAL WADDEN SEA AREA. For basic information concerning, for example, function of these lists, species taken into account, structure of the lists and abbreviations used, see also the general introduction to the Red Lists.
 - ** Author of the introductory text.

ked for. Differences in the distribution patterns along a north-south gradient in the North Sea cannot be taken into consideration here, due to the lack of information. Also, almost nothing is known about the depth distribution of macroalgae growing in the intertidal or shallow subtidal area of the German and Danish Wadden Sea, and in particular on where they occur on secondary hard substrata. Thus, the Red List will hopefully initiate and encourage more detailed research on macroalgae, and it will represent a basis for further discussion. Therefore, persons who can provide any more information on macrophytobenthos or published and unpublished checklists of macroalgae are strongly urged to contact the contributors of the Red List.

Future research should be of assistance in distinguishing between natural fluctuations, as caused by varying grazing pressure or substrate availability, and long-term changes due to anthropogenic impact. With regard to comparative purposes, the lack of data from the last century is a key problem. But even if we had a complete up-to-date checklist of today's intertidal macroalgae, we would have to consider that nowadays the Wadden Sea is massively influenced by human activities (de Jonge et al., 1993).

Threats

Besides the above mentioned decline in the seagrass beds, two important factors have changed during the last 50 years. Proceeding from the estuaries, enhanced loadings of nitrogen and phosphorus increase the nutrient concentrations in intertidal waters during winter. In addition, reduced light transparency of the tidal waters may be responsible for the temporal and spatial decrease in submerged red algae. In contrast to the red algae, green algae grow in large amounts in the upper intertidal zone, where light conditions are better.

Light limitation may result from a combination of excessive phytoplankton blooms, as a consequence of eutrophication, and of elevated loads of suspended sediment particles, as a consequence of coastal engineering, such as dredging activities and the progressive embankment of deposition areas (de Jonge et al., 1993; Reise, 1994).

Assuming that a decline of macrophytobenthos can be attributed to eutrophication and turbidity, caused by coastal constructions, the perspectives of endangered algae species in the Wadden Sea are rather dim.

Monitoring

For future monitoring programmes, it is recommended that biological monitoring concentrate more on macroalgae and seagrass, since the macrophytobenthos reflects better than any other group the changing life conditions in the Wadden Sea.

Based upon detailed macroalgae checklists of various habitats (including the small multicellular species), two or three locations per country should be selected for long-term observations. In addition, aerial mapping of green algal mats should be done at least once during summer. Depth distribution of macroalgae should be investigated, also verifying the hypothesis of light limitation by turbidity. Due to taxonomic difficulties, it must be emphasized that the surveys should be performed by well-trained marine botanists.

REFERENCES

- Goor, A. C. J. van, 1921. Die Zostera-Assoziation der holländischen Meeresalgen. - Recl. trav. bot. néerl. 18, 103-123.
- Hartog, C. den, 1987. 'Wasting disease' and other dynamic phenomena in Zostera beds. - Aquat. Bot. 27, 3-14.
- Jonge, V. N. de, Essink, K. & R. Boddeke, 1993. The Dutch Wadden Sea: a changed ecosystem. - Hydrobiologia 265, 45-71.
- Reise, K., 1994. Changing life under tides of the Wadden Sea during the 20th century. - Ophelia 6, 117-125.
- Stegenga, H. & I. Mol, 1983. Flora van de Nederlandse zeevieren. KNNV, Hoogwoud, 263 pp.

RED LIST OF MARINE MACROALGAE OF THE WADDEN SEA

For the marine macroalgae **no** Red List was compiled because for the Dutch part of the Wadden Sea, but not for the Danish and German parts, species were considered that grow on artificial hard substrate (e.g. sea walls, piers).

LIST OF THREATENED MARINE MACROALGAE OF THE WADDEN SEA

	Red List (trilateral)	Status of threat in the subregions of the Wadden Sea Area		
		NL ¹	Nds+SH	DK
CHLOROPHYCEAE				
<i>Bryopsis plumosa</i> (Huds. 1762) C. A. Ag. 1832		SU	*	(*)
<i>Enteromorpha ralfsii</i> Harvey 1851		SU?	*	-
<i>Spongomorpha aeruginosa</i> (L. 1753) van den Hoek 1963		SU	-	(*)
PHAEOPHYCEAE				
<i>Acinetospora crinita</i> (Carmich. ex Harv. in Hook. 1834) Kornmann 1953		CR?	*	(*)
<i>Asperococcus fistulosus</i> (Huds. 1762) Hooker 1833		EX?	(*)	(*)
<i>Chorda filum</i> (L. 1753) Stackh. 1816		*	SU	(*)
<i>Isthmoplea sphaerophora</i> (Carm. ex Harv. in Hook. 1833) Kjellm. 1877		EX	-	(*)
<i>Laminaria digitata</i> (Huds. 1762) J.V.Lamour 1813		EX	-	(*)
<i>Laminaria saccharina</i> (L. 1753) J.V.Lamour 1813		VU	-	(*)
<i>Pogotrichum filiforme</i> Reinke 1888		CR?	(*)	(*)
<i>Punctaria latifolia</i> Grev. = <i>P. hiemalis</i> Kylin 1907		CR?	-	-
<i>Sorocarpus micromorus</i> (Bory) P.C.Silva (= <i>Botrytella micromora</i> Bory de St.Vincent 1832)		SU	(*)	(*)
<i>Sphacelaria radicans</i> (Dillw. 1809) C.A. Ag. 1824		CR?	-	(*)
<i>Spongonema tomentosum</i> (Huds. 1762) Kütz. 1849		CR?	-	(*)

	Red List (trilateral)	Status of threat in the subregions of the Wadden Sea Area		
		NL ¹	Nds+SH	DK
RHODOPHYCÉAE				
<i>Ahnfeltia plicata</i> (Huds. 1762) Fries 1835		CR?	-	(*)
<i>Bostrychia scorpioides</i> (Huds. 1762) Mont. 1849		SU	(*)	-
<i>Callithamnion corymbosum</i> (J.E. Smith) Lyngb. 1819		EX?	VU	(*)
<i>Catenella caespitosa</i> (With.) Dixon & L. Irvine		SU	(*)	-
<i>Compsothamnion thuyoides</i> (J.E. Smith 1810) Nägl. 1862		EX	(*)	-
<i>Corallina officinalis</i> L. 1761		EX?	-	(*)
<i>Gloiosiphonia capillaris</i> (Huds. 1828) Carm. in Berkeley 1833		EX?	-	-
<i>Gracilaria verrucosa</i> (Huds. 1762) Papenf. 1949-50		*	EN	-
<i>Jania rubens</i> (L. 1766) J.V.Lamour. 1812		EX	-	-
<i>Nemalion helminthoides</i> (Velley in With.) Batters 1902 (= <i>N. multifidum</i> (Weber et Mohr 1804) J. A. Ag. 1841)		EX	-	(*)
<i>Polysiphonia denudata</i> (Dillw. 1809) Grev. ex Harv. in Hook. 1833		SU	(*)	-
<i>Polysiphonia lanosa</i> (L. 1767) Tandy 1931		EX?	(*)	-
<i>Polysiphonia nigra</i> (Huds. 1762) Batt. 1902		SU	SU	(*)

¹ For the Dutch part of the Wadden Sea, but not for the Danish and German parts, species were also considered that grow on artificial hard substrate (e.g. sea walls, piers).

Status of threat:

EX = Extinct; CR = Critical; EN = Endangered; VU = Vulnerable; SU = Susceptible; * = not endangered; ? = status of endangerment is not exactly known; - = species does not occur; -(?) = species probably does not occur; (*) = it is unknown if or if not this species occurs.

For more detailed descriptions see the general introduction to the Red Lists.