Marts 2023

# Comments to chlorophyll-a in RBMPIII

Authors: Flemming Gertz, Karsten Dollerup Møller both SEGES Innovation

Please cite: Gertz F, Møller K D. 2022. Comments chlorophyll-a in RBMPIII. Technical note from SEGES Innovation.

## Ecological status - Chlorophyll-a

The status of the different coastal water bodies concerning chlorophyll-a has changed from RBMPII to RBMPIII (Ref1). The overall picture is that there is less variation between neighboring water bodies in RBMPIII than in RBMPII, but there are still examples of neighboring water bodies changing 2 or 3 status classes.

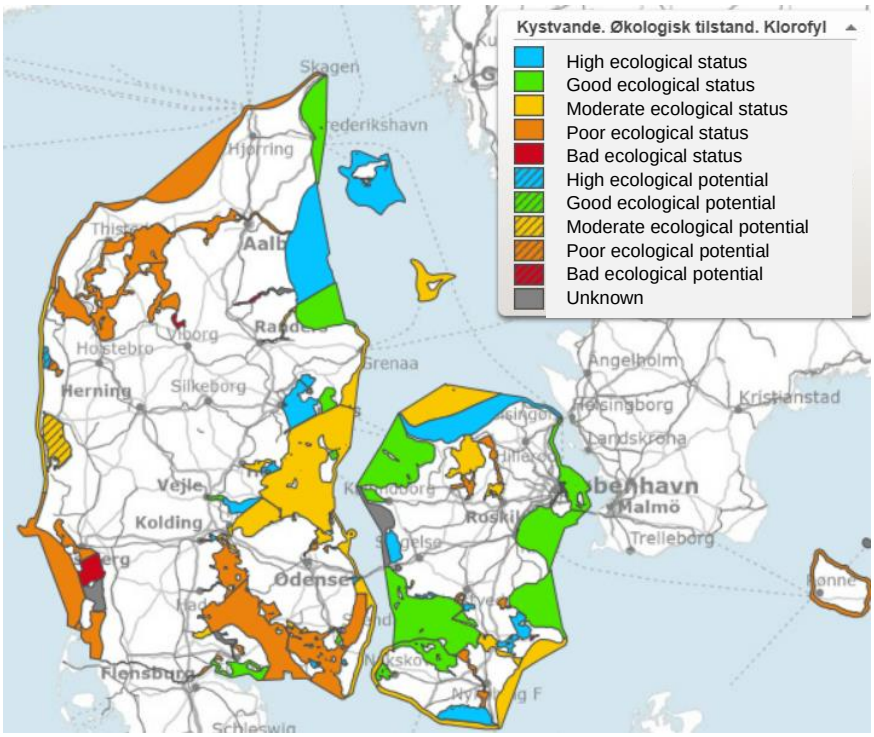


Figure 1. RBMPII. Coastal water bodies. Ecological status – Chlorophyll-a. (Ref1)



SEGES Innovation P/S
Agro Food Park 15, DK 8200 Aarhus N
+45 8740 5000 info@seges.dk
seges.dk CVR 42909769

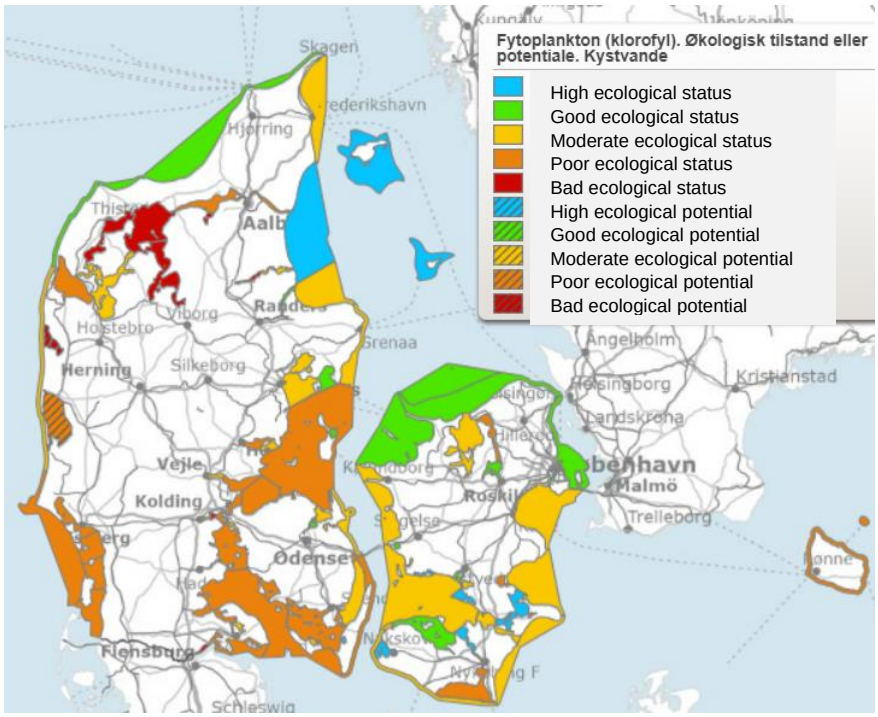


Figure 2. RBMPIII. Coastal water bodies. Ecological status – Chlorophyll-a. (Ref1)

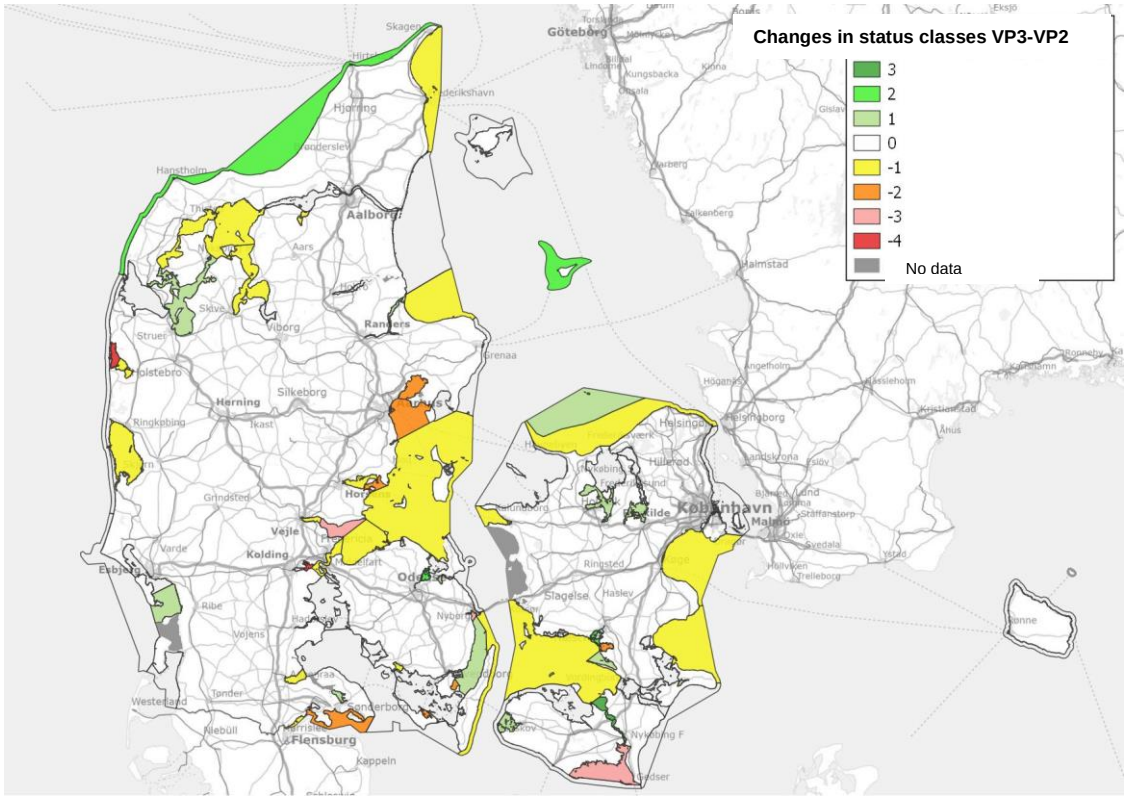


Figure 3. Changes in status classes between RBMPII and III - chlorophyll-a. Green colors indicate water body have moved from worse to better status. Red colors indicate water body have moved from better to worse status.

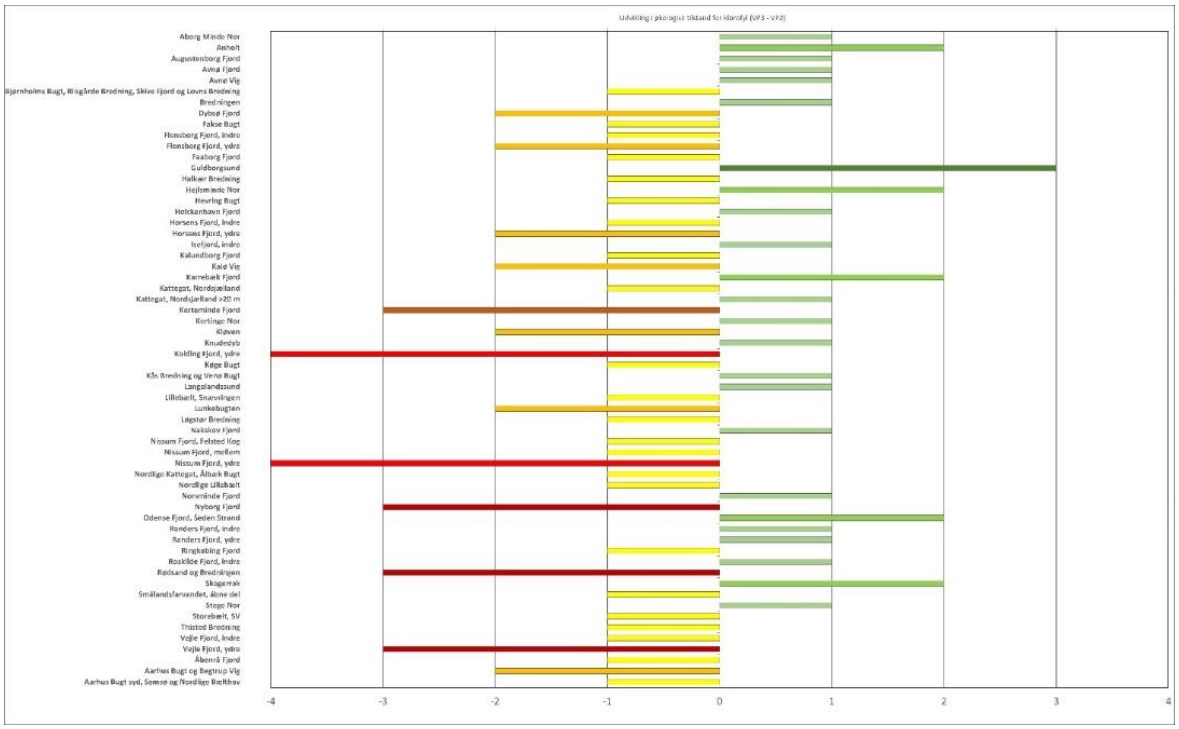

Figure 4. Changes in status classes between RBMPII and III - chlorophyll-a. All water bodies with changes in status classes included in figure. Green colors indicate water body have moved from worse to better status. Red colors indicate water body have moved from better to worse status. See appendix 1 for larger figure.

As seen on the figure 4 (or Appendix 1) 60 water bodies have changed status. 36 water bodies have gone from better to worse and 24 waterbodies have gone from worse to better. Total summed up 57 status classes move from better to the worse and total 31 status classes move to the better. Most, if not all, of these changes in classes from RBMPII to RBMPIII are not due to real changes in chlorophyll-a concentration but due to changes in calculating the reference value and therefore changes for the boundary value between good and moderate status.
2 water bodies have moved maximum 4 classes from “high” status to “bad” and other 4 water bodies have moved 3 status classes in the direction of worse and 7 water bodies have moved 2 classes to the worse and 23 water bodies have moved 1 class to the worse. 1 water body have moved 3 status classes in a better direction and 5 water bodies have moved 2 classes to the better and 18 water bodies have moved 1 class to the better.

**Chlorophyll-a – boundary between good and moderate status**

Figure 5 illustrates the boundaries between good and moderate status for the 109 Danish coastal water bodies in RBMP 3 (Ref1).

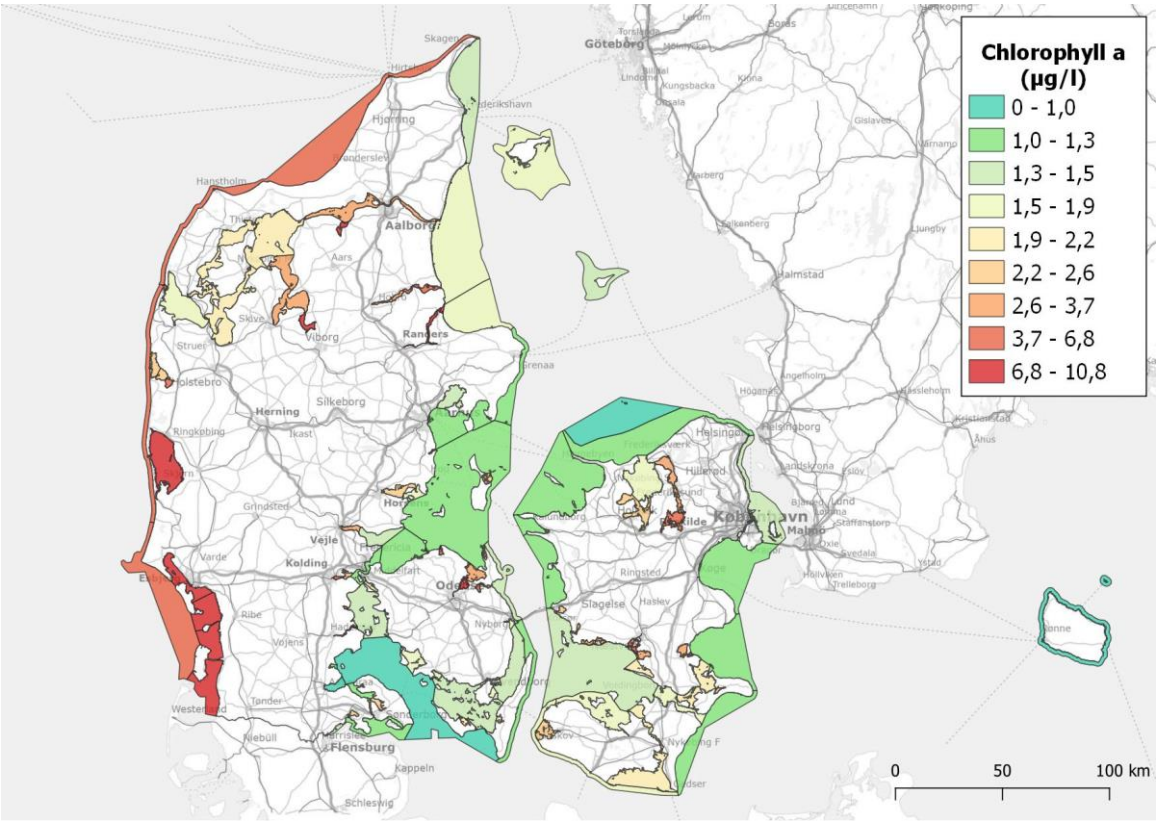


Figure 5. Chlorophyll-a concentration for the boundary between good and moderate ecological status, RBMPIII

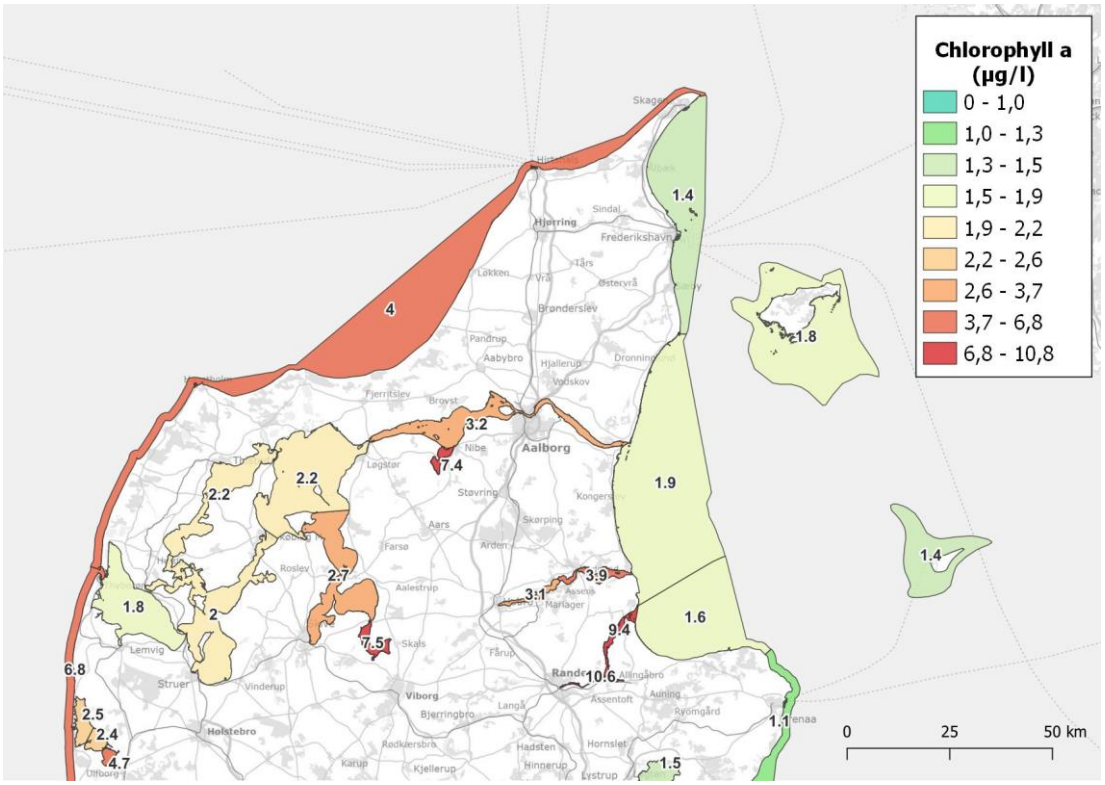


Figure 6. Chlorophyll-a concentration for the boundary between good and moderate ecological status, RBMPIII. North Jutland.

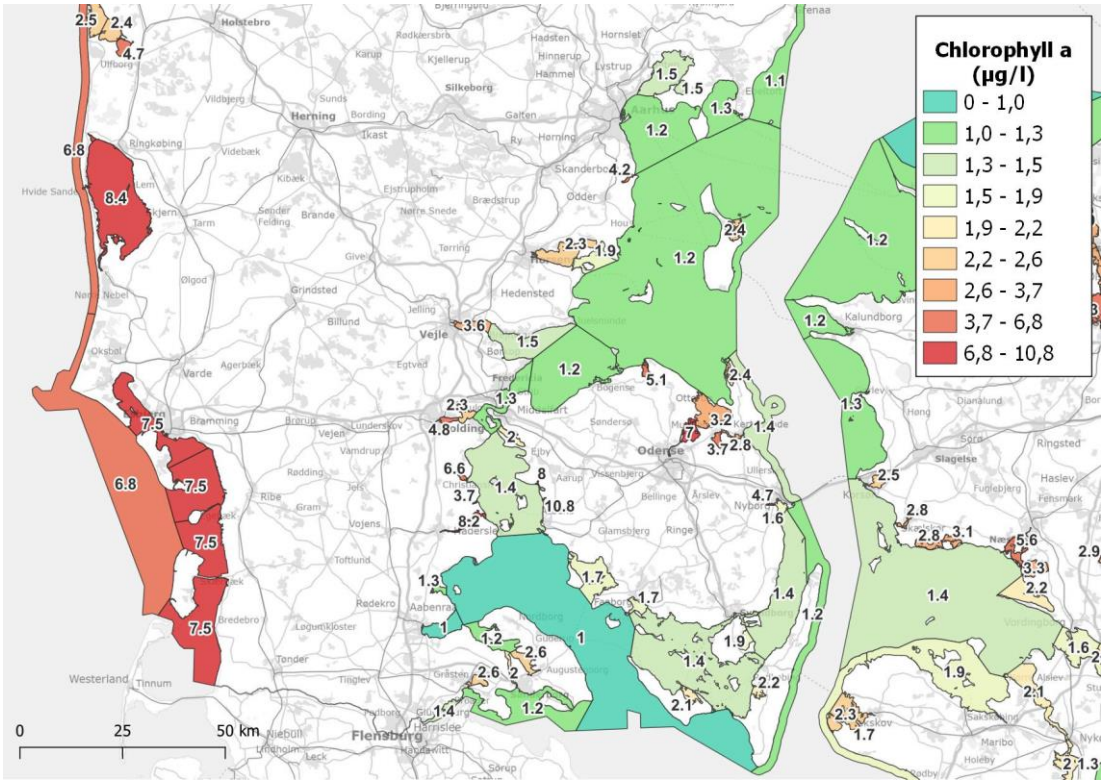


Figure 7. Chlorophyll-a concentration for the boundary between good and moderate ecological status, RBMPIII. Southern Jutland and Funen.

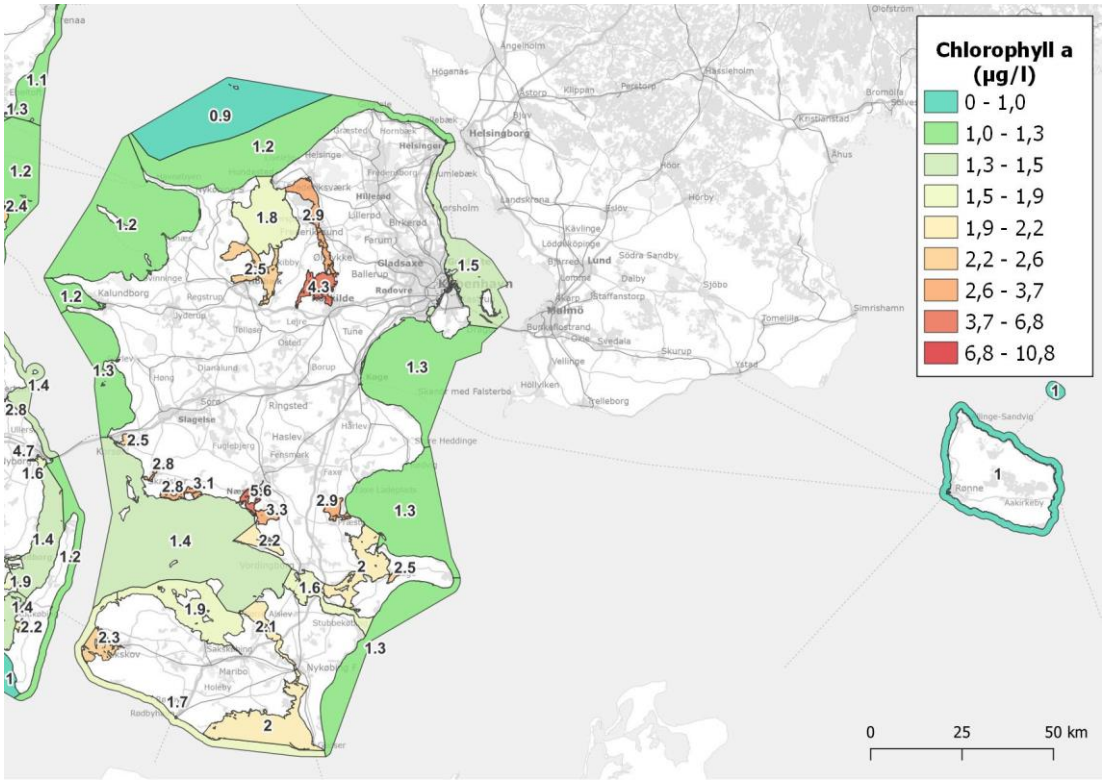


Figure 8. Chlorophyll-a concentration for the boundary between good and moderate ecological status, RBMPIII. Zealand.

**Intercalibrated Chlorophyll-a concentration**

Most of the Danish coastlines are defined under the North East Atlantic (NEA) Geographical Intercalibration Groups (GIG):

Type NEA1/26c phytoplankton: Germany, Denmark: Enclosed seas, enclosed or sheltered, partly stratified.
Boundary good/moderate: 7,5 µg/l (ref2)

Type NEA1/26d phytoplankton: Denmark: Scandinavian coast, exposed or sheltered, shallow
Boundary good/moderate: no values (ref2)

Type NEA8b: Denmark, Sweden: Skagerrak Inner Arc Type, polyhaline, microtidal, moderately sheltered, shallow
Boundary good/moderate NEA 8b (The Sound): 1,63 µg/l (ref2)
Boundary good/moderate NEA 8b (The Kattegat and Great Belt): 1,58 µg/l (ref2)

Some parts are defined in the Baltic Sea GIG

Type BC6: Sweden, Denmark: Sites along the Western Baltic Sea at the southern Swedish coast and the southeastern Danish coast
Boundary good/moderate: 1,72 µg/l (ref2)

Type BC8: Germany, Denmark: Danish and German coasts in the Western Baltic Sea
Boundary good/moderate: no values (ref2)

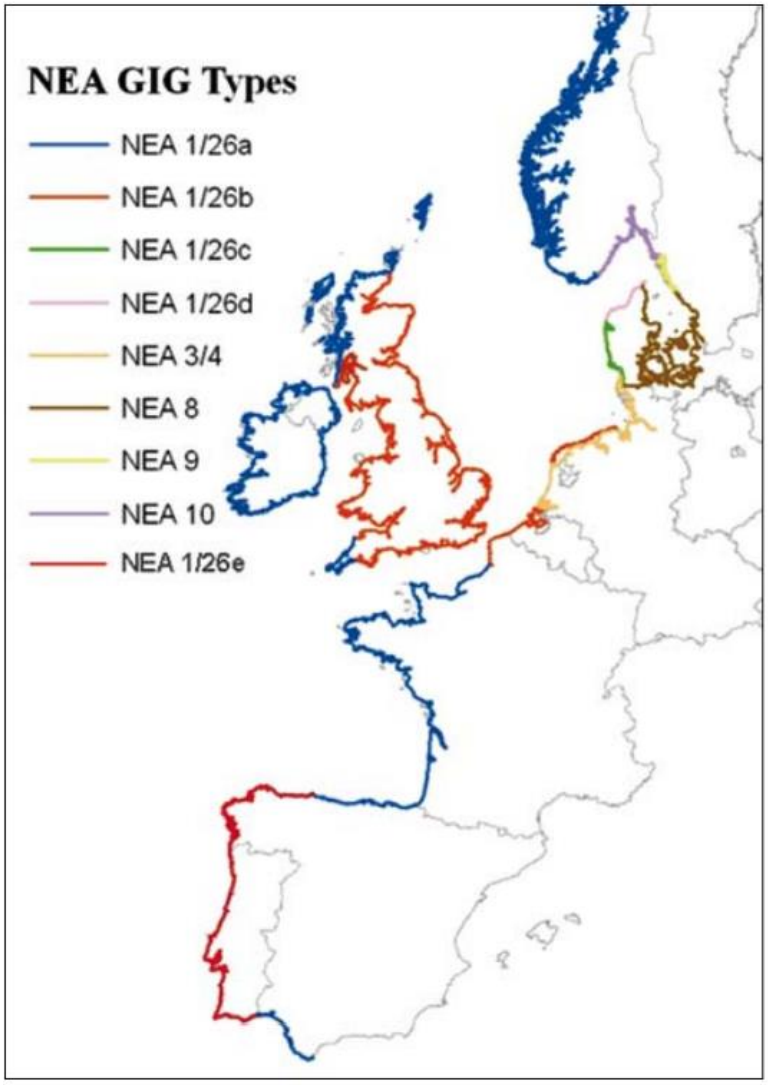


Figure 9. Early definition of the NEA GIG types (Ref3).

**Comments to the Chlorophyll-a boundary between good and moderate status**

In general, the lowest chlorophyll concentrations (boundary between good/moderate) are in the open waters and highest numbers are typically in the estuaries apart from the open boarder coast along the North Sea with relative high numbers compared to open Kattegat and Baltic Sea coast-lines.

It seems, for some reason, the numbers in the RBMPIII are lower than the intercalibrated values for the water bodies that are intercalibrated. The Øresund (sound) - waters between Denmark and Sweden - values set in RBMPIII is 1,3 µg/l and 1,5 µg/l and the intercalibrated value is 1,63 µg/l.

In the Kattegat and Great Belt Area, the intercalibrated value is 1,58 µg/l and the value in these areas varies between 0,9 µg/l and 1,4 µg/l in the RBMPIII.

In the Danish part of the Vadehavet (mudflats of Jutland west coast) the values are 7,5 µg/l in the RBMPIII and the same as the intercalibrated values.

Some of the Danish water bodies seem to have relatively low values compared to similar water bodies. This is for example the case for Nissum Fjord, at the west coast of Jutland with values between 2.4 µg/l and 4.7 µg/l while a similar lagoon fjord, Ringkøbing Fjord has a value of 8.4 µg/l, and also the open west coast sea has a higher number (6,8 µg/l). (Both lagoons have relatively large sandy catchments and a sluice to the North Sea)

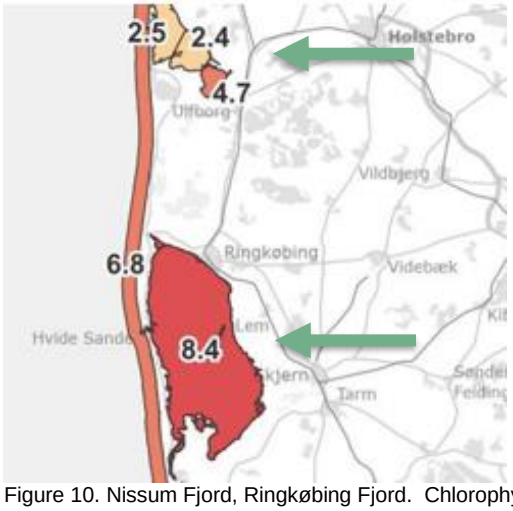


Figure 10. Nissum Fjord, Ringkøbing Fjord. Chlorophyll-a concentration for the boundary between good and moderate.

Another example is the Lillebælt (Little Belt) southern part with a value of 1 µg/l which is lower than the other open coastal water bodies and lower than intercalibrated values.

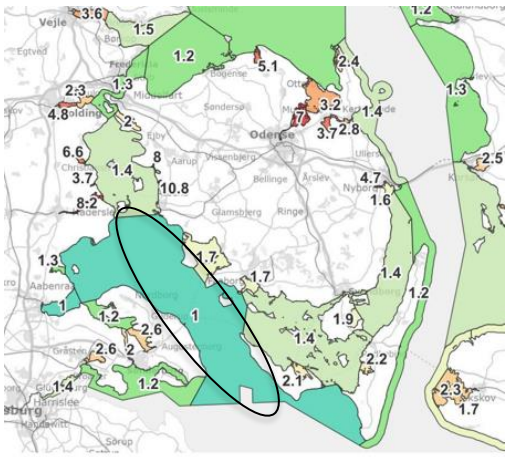


Figure 11. Lillebælt (Little Belt) southern part. Chlorophyll-a concentration for the boundary between good and moderate.

## References

Ref1: Forslag til vandområdeplanerne 2021-2027, december 2021. Miljøministeriet. https://mst.dk/natur-vand/vandmiljoe/vandomraadeplaner/vandomraadeplanerne-2021-2027/vandomraadeplanerne-2021-2027/

Ref2: COMMISSION DECISION (EU) 2018/229 of 12 February 2018 establishing, pursuant to Directive 2000/60/EC of the European Parliament and of the Council, the values of the Member State monitoring system classifications as a result of the intercalibration exercise and repealing Commission Decision 2013/480/EU https://eur-lex.europa.eu/legal-content/EN/TXT/HTML/?uri=CELEX:32018D0229&qid=1669798473911&from=DA

Ref3: JRC Scientific and Technical Reports Water Framework Directive intercalibration technical report Part 3: *Coastal and Transitional waters* Edited by Alessandro Carletti and Anna-Stiina Heiskanen, 2009. https://apambiente.pt/dqa/assets/intercalibration-2003-2007-technical-report---coast.pdf

SEGES INNOVATION

# Appendix 1