OSPAR COMMISSION

Condition of Benthic Habitat Communities: Assessment of some Coastal Habitats in Relation to Nutrient and/or Organic Enrichment

Common Indicator Assessment

OSPAR

QUALITY STATUS REPORT 2023

2023

OSPAR's Quality Status Report 2023

Condition of Benthic Habitat Communities: Assessment of some Coastal Habitats in Relation to Nutrient and/or Organic Enrichment

OSPAR Convention

The Convention for the Protection of the Marine Environment of the North-East Atlantic (the "OSPAR Convention") was opened for signature at the Ministerial Meeting of the former Oslo and Paris Commissions in Paris on 22 September 1992. The Convention entered into force on 25 March 1998. The Contracting Parties are Belgium, Denmark, the European Union, Finland, France, Germany, Iceland, Ireland, Luxembourg, the Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and the United Kingdom.

Convention OSPAR

La Convention pour la protection du milieu marin de l´Atlantique du Nord-Est, dite Convention OSPAR, a été ouverte à la signature à la réunion ministérielle des anciennes Commissions d´Oslo et de Paris, à Paris le 22 septembre 1992. La Convention est entrée en vigueur le 25 mars 1998. Les Parties contractantes sont l´Allemagne, la Belgique, le Danemark, l´Espagne, la Finlande, la France, l´Irlande, l´Islande, le Luxembourg, la Norvège, les Pays-Bas, le Portugal, le Royaume- Uni de Grande Bretagne et d´Irlande du Nord, la Suède, la Suisse et l´Union européenne

Contributors

Lead Authors: Anna Lizińska, Laurent Guérin

Supported by: OSPAR Benthic Habitat Expert Group (OBHEG), Intersessional Correspondence Group on the Coordination of Biodiversity Assessment and Monitoring (ICG-COBAM), OSPAR Biological Diversity Committee (BDC).

Delivered by

This work was co-funded by the European Maritime and Fisheries Fund through the project: "North-east Atlantic project on biodiversity and eutrophication assessment integration and creation of effective measures (NEA PANACEA)", financed by the European Union's DG ENV/MSFD 2020, under agreement No. 110661/2020/839628/SUB/ENV.C.2.

Co-funded by the European Union

Citation

Lizińska, A. J. and Guérin, L. 2023. *Condition of Benthic Habitat Communities: Assessment of some Coastal Habitats in Relation to Nutrient and/or Organic Enrichment*. In: OSPAR, 2023: The 2023 Quality Status Report for the Northeast Atlantic. OSPAR Commission, London. Available at: https://oap.ospar.org/en/ospar-assessments/quality-status-reports/qsr-2023/indicator-assessments/condition-benthic-hab-enrich/

Contents

Key Message

Coastal water bodies were assessed for only 72% (invertebrates), and 59% (vegetation) of the total area of three OSPAR Regions. From those, the Water Framework Directive quality status was good or high for 79% (invertebrates) and for 86% (vegetation). However, local eutrophic impacted areas were highlighted for 2010 and 2016 reporting cycles.

Background

Benthic habitats are essential for marine life because many marine species rely directly or indirectly on the seafloor to feed, hide, rest or reproduce. Benthic habitats are characterised by animal and plant communities with no or slow mobility compared to fish or marine mammals. The whole benthic community is therefore exposed when a pressure occurs. As a result, the condition (quality status) of benthic habitats as indicated by total community descriptors reflects the combined effects of all the pressures to which they are subject.

OSPAR agreed that a common indicator for the condition of benthic habitat-defining communities should be applied in the Greater North Sea, Celtic Seas and the Bay of Biscay and Iberian Coast. It is recognised that the indicator should be based on a series of multimetric indices, each assessing the impact of different pressures on different benthic habitat-defining communities. No single metric for benthic habitats can achieve this given the diversity and complexity of benthic habitats and their communities.

This assessment considers the impact of nutrient and/or organic enrichment on benthic habitats in coastal waters, where land-based and riverine inputs can be important pressures. This assessment takes advantage of the progress made in assessing benthic invertebrates and macroalgae through the implementation of the European Union Water Framework Directive (WFD). Data on these elements of the WFD status classification have been compiled to be presented in the context of the OSPAR benthic habitats Quality Status assessment.

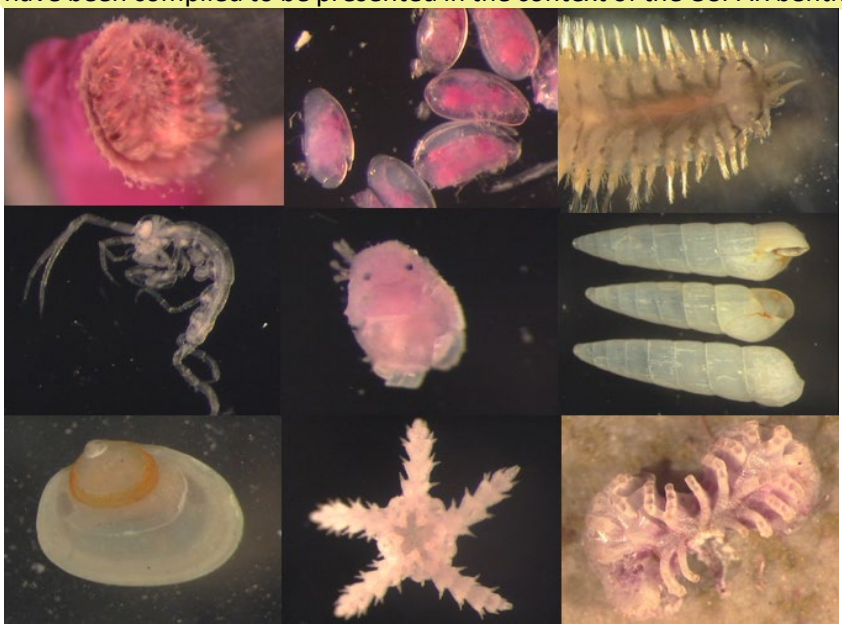

Figure 1: Some marine benthic invertebrates (© Laurent Guérin)

Background (extended)

Coastal waters represent the interface between land and ocean and are defined under the European Union Water Framework Directive (WFD) as extending one nautical mile from a baseline defined by the land points where territorial waters are measured. 'Water bodies' are defined by European Union Member States by sub-dividing these coastal waters according to their hydrological characteristics. Some coastal waters of OSPAR Contracting Parties have, to a varying degree, been affected by nutrient and/or organic enrichment (either as a direct or indirect effect of nutrient inputs or of organic enrichment) and this may be a cause of nuisance and toxic algal blooms, loss of benthic vegetation due to shading, and modification of benthic fauna communities due to specific sensitivities.

Assessment Method

Detailed monitoring and assessment methods are provided in annex 2 of the BH2 CEMP guidelines.
The biological quality elements required for the integrated assessment of ecological status (European Union Water Framework Directive (WFD), Annex V) of coastal waters are phytoplankton, macroalgae, angiosperms and benthic fauna (European Parliament, 2000; Solheim *et al.,* 2012).
The WFD requires that standardised methods are used for monitoring biological quality elements and that the good status class boundaries for each biological quality element are intercalibrated across EU Member States sharing similar types of water bodies (Neto *et al.*, 2018; Wilkes *et al.,* 2018; Van Hoey *et al.,* 2019; Salas Herrero *et al.,* 2020).
The WFD requires that the overall ecological status of a water body is determined by the results for the biological or physicochemical quality element with the worst class determined by any of the biological quality elements. This is called the 'one out - all out' principle. The rationale for this is to avoid averaging the impacts on different quality elements due to different pressures and therefore overlook some significant pressures, and also to provide sufficient protection for the most sensitive quality element to significant pressure.
By definition, the WFD aims to assess the "water quality" of water bodies through quality elements such as benthic invertebrates or macrophytes. Benthic habitat communities are thus mainly assessed for the WFD to reflect the main pressures in the coastal zone, such as direct or indirect effects of nutrient and/or organic enrichment as a result of nutrients inputs from land-based sources and through riverine inputs. Contaminants are generally assessed in sediment. For these reasons, WFD monitoring and related indices were generally designed to focus on the effects of nutrient and/or organic enrichment, and other pressure types are not directly or not at all assessed (Poikane *et al.*, 2020). However, this does not mean that the indices used are not themselves sensitive to other pressure types. Currently several statistical indices that are used, notably those including a species sensitivity classification, have been developed and calibrated to assess nutrient and/or organic enrichment. The European Union Marine Strategy Framework Directive (MSFD) requires a reconsideration and adaptation of monitoring, to consider and assess other pressure types (both inshore and offshore; Poikane *et al.,* 2020; Salas Herrero *et al.*, 2020).
Diversity indices and species richness indices, as well as sensitivity / tolerance species classification systems, have long been used to assess the qualitative state of benthic habitat communities. The development of Benthic Indices (BI), combining these indices and classifications, was made mandatory by the WFD. Species composition and relative abundance of the benthic habitat community are basic common metrics. Multi-metric BI classically contain diversity indices, species richness indices and / or the proportions of sensitive, tolerant and opportunistic species. Species sensitivity is a proxy used to quantify disturbance for some pressures on a benthic habitat community: either as a direct or indirect effect of nutrient or organic enrichment, oxygen depletion or hydrological changes. This requires a good knowledge (for the communities and species assessed) of natural spatial and temporal scales of variation and sensitivity to a specific pressure gradient.
Multi-dimensional deviation in community structure from a reference condition, aims to link pressure (for management issues) and pressure-impact calibration of indices (level of disturbance / resilience). This is set up with various pressures types at the community level, by combining biological and pressure data. Analysis of sensitivity is then elaborated at community level rather than species level. This is an important distinction and a point of attention for further development by experts and implementation for management issues (i.e., specific parameters / metrics to be monitored). These principles, commonly agreed at OSPAR level, are detailed and illustrated in OSPAR (2017a, 2018).
The first OSPAR assessment results (OSPAR 2017b; McQuatters-Gollop et al., 2022) or the Biological Quality Elements 'Benthic Invertebrates' and 'Macroalgae and Angiosperms' in coastal waters were requested through a formal data call to OSPAR Contracting Parties and notably WFD national contacts. In addition, information on the indices used and the monitoring stations in coastal water bodies was requested. Information on the methodology of the various benthic indices (sampling strategy, data evaluation, reference conditions, detected pressures) were mainly derived from the WISER methods database and intercalibration

reports (Birk *et al.*, 2010; Van Hoey *et al.*, 2015). This assessment was done for three of the five OSPAR regions.

The current (2023) OSPAR assessment data (WFD assessment results) were obtained directly from the WISE Water Framework Directive Database , in early 2022, which includes available national information under WFD 2010 to 2015 reporting cycle (as reported in 2016) as well as data from the previous WFD cycle, as reported in 2010. A formal data call was done by OSPAR to encourage Contracting Parties to update or make their data available under the WISE database. Data for the next (2016 to 2021) reporting cycle were not available from any Contracting Party.

The data about coastal water bodies and monitoring stations were uploaded from WISE WFD reference spatial data sets and, for the UK, from official reporting sites (England, Northern Ireland, Wales, Scotland).

Information on the methodology of the various benthic indices was mainly derived from intercalibration reports (Birk *et al.*, 2010; Van Hoey *et al.*, 2015; Neto *et al.*, 2018; Wilkes *et al.*, 2018; Van Hoey *et al.*, 2019; Salas Herrero *et al.*, 2020). The intercalibration of the ecological quality status and assessment methods were carried out for benthic invertebrates (Van Hoey *et al.*, 2019), opportunistic macroalgae (Wilkes *et al.*, 2018) and seagrasses (Neto *et al.*, 2018) in the coastal waters of the North-East Atlantic. As a result, the values of the boundaries between classes of Ecological Quality Ratio of the Member States were established (European Commission, 2018).

In 2022, WFD assessment results for benthic invertebrates were provided from all OSPAR Contracting Parties' coastal water bodies, in the whole OSPAR maritime area, but published only for three OSPAR Regions (II – Greater North Sea, III – Celtic Seas, IV – Bay of Biscay and Iberian Coast) where this indicator was adopted as common (Table a). The assessment results for macroalgae, angiosperms and other flora were available from nine countries. For the Netherlands and Belgium, this quality element is not present, thus not relevant nor assessed in their coastal waters.

Table a: Coastal water bodies' WFD quality status national availabilities, per quality element for the reporting years 2010 and 2016 (from the River Basin Management Plan database)

Reporting year	WFD quality element (qe WISE code)	BE	DE	DK	ES	FR	IE	NL	NO	PT	SE	UK
2010	Benthic invertebrates (qe 1.3)											
	Macroalgae (qe 1.2.1)											
	Angiosperms (qe 1.2.2)											
	Other aquatic flora (qe 1.2)											
2016	Benthic invertebrates (qe 1.3)											
	Macroalgae (qe 1.2.1)											
	Angiosperms (qe 1.2.2)											
	Other aquatic flora (qe 1.2)											

reported and assessed | reported and not assessed | not reported

Detailed assessment methods and intercalibration exercises are available at:

https://ec.europa.eu/environment/water/water-framework/facts_figures/guidance_docs_en.htm
https://www.eea.europa.eu/themes/water/european-waters/water-quality-and-water-assessment/water-assessments
Details on metrics and indices used by Contracting Parties to assess and provide results for the WFD are described in the annex 2 of the BH2 CEMP guidelines.

Results

The results are presented as the proportion (percentage) of the surface of the coastal water bodies, initially in square kilometers (km²), for the OSPAR Regions II, III and IV and their benthic habitats' assessment units (**Table 1**).

Table 1: OSPAR benthic habitats' assessment units, for Regions II, III & IV, and proportional area covered by all WFD coastal water bodies (2016)

OSPAR Regions II, III & IV (100%)	OSPAR benthic habitats' assessment unit	Proportional area of all coastal water bodies (%)
II Greater North Sea (38,9%)	Central North Sea	4,9
	Norwegian Trench	11,4
	Kattegat	5,3
	Southern North Sea	15,3
	Channel	2,5
III Celtic Seas (46,4%)	Northern Celtic Sea	36,3
	Southern Celtic Sea	9,7
IV Bay of Biscay and Iberian Coast (14,7%)	Gulf of Biscay	5,1
	North - Iberian Atlantic	3,5
	South - Iberian Atlantic	5,1
	Gulf of Cadiz	0,8

In 2010, more than 58% (for benthic invertebrates) and 55% (for the benthic vegetation) of coastal waters quality status was not available (**Figure 2**). In 2016, respectively 27,6% and 41% of the area were not assessed (**Figure 3**). The detailed proportions (**Figure, 4 Figure 5, Figure 6** and **Figure 7**) and distributions (**Figure8, Figure**) per assessment units show that almost all sub-regions increased in 6 years their number and total areas of coastal water bodies assessed, except the western part of the North Iberian Atlantic coast, which decreased for benthic invertebrates (stable for the vegetation). In 2016, the highest proportion of assessed coastal water bodies were in the Greater North Sea, the South Iberian Atlantic, the Northern Celtic Sea and the Kattegat. The lower proportion was in the Gulf of Cadiz, the Norwegian Trench and the North Iberian Atlantic.

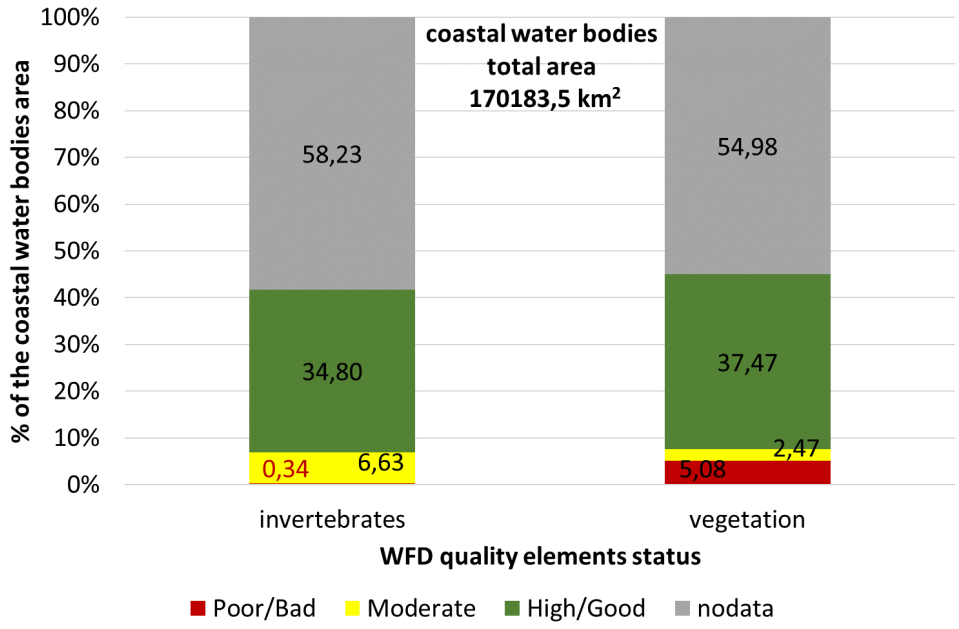

Figure 2: Proportion (area) of the 2010 WFD quality status of benthic invertebrates (left side), and the benthic vegetation (macroalgae / angiosperm / other flora; right side), of the coastal water bodies for OSPAR Regions II, III and IV

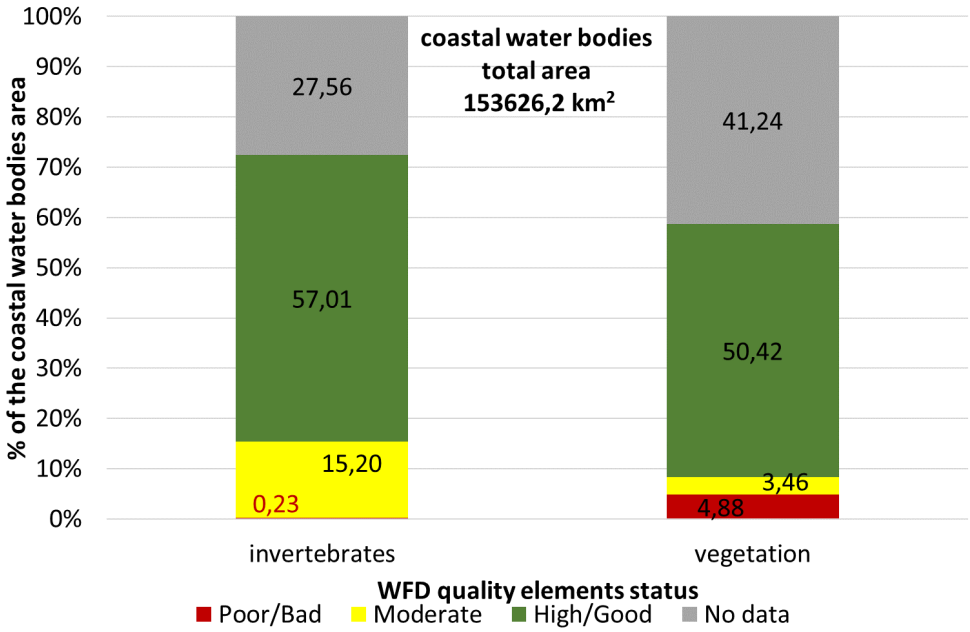

Figure 3: Proportion (area) of the 2016 WFD quality status of benthic invertebrates (left side), and benthic vegetation (macroalgae / angiosperm / other flora; right side), of the coastal water bodies for OSPAR Regions II, III and IV

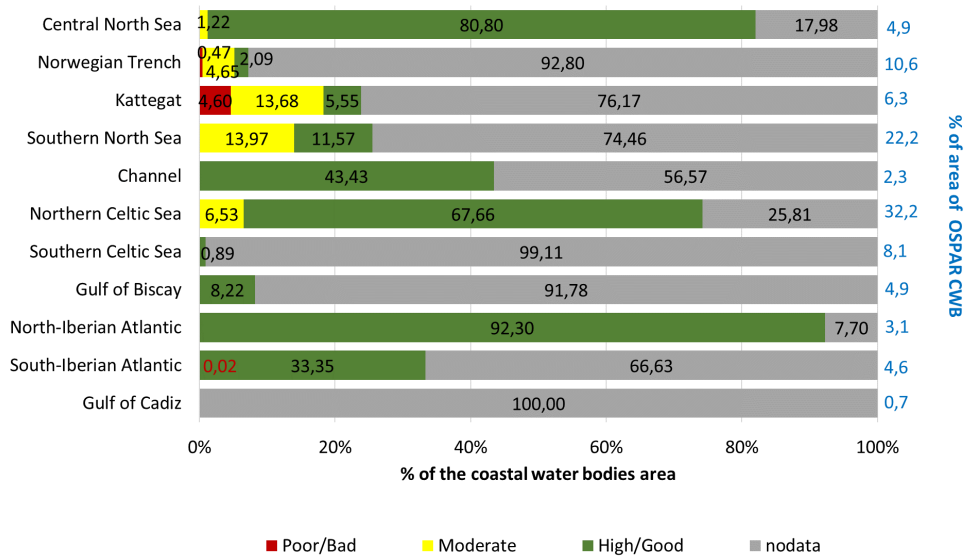

Figure 4: Proportion (area) of the 2010 WFD quality status of benthic invertebrates of the coastal water bodies for each benthic habitats' assessment units of OSPAR Regions II, III & IV

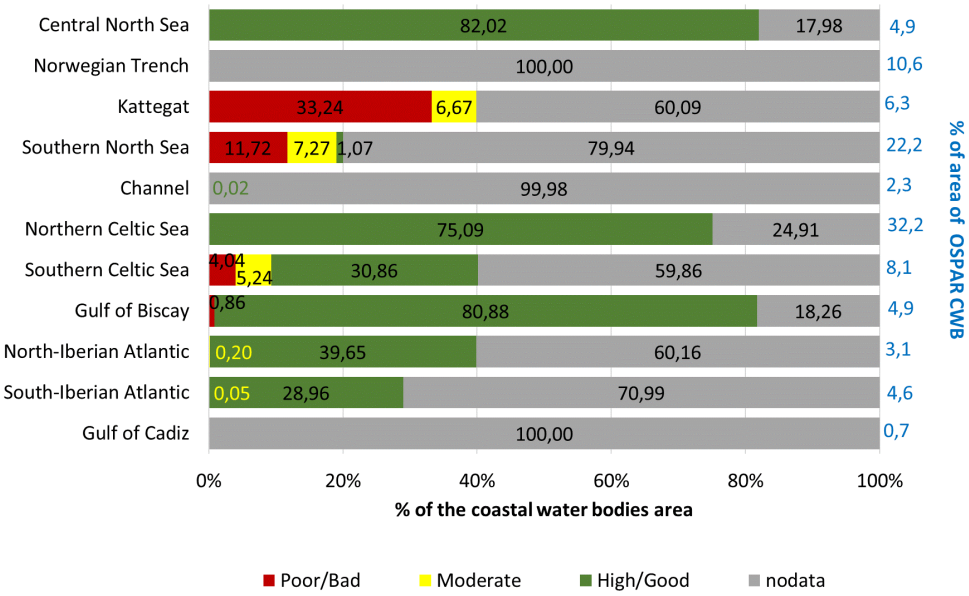

Figure 5: Proportion (area) of the 2010 WFD quality status of the benthic vegetation of the coastal water bodies for each benthic habitats' assessment units of OSPAR Regions II, III & IV

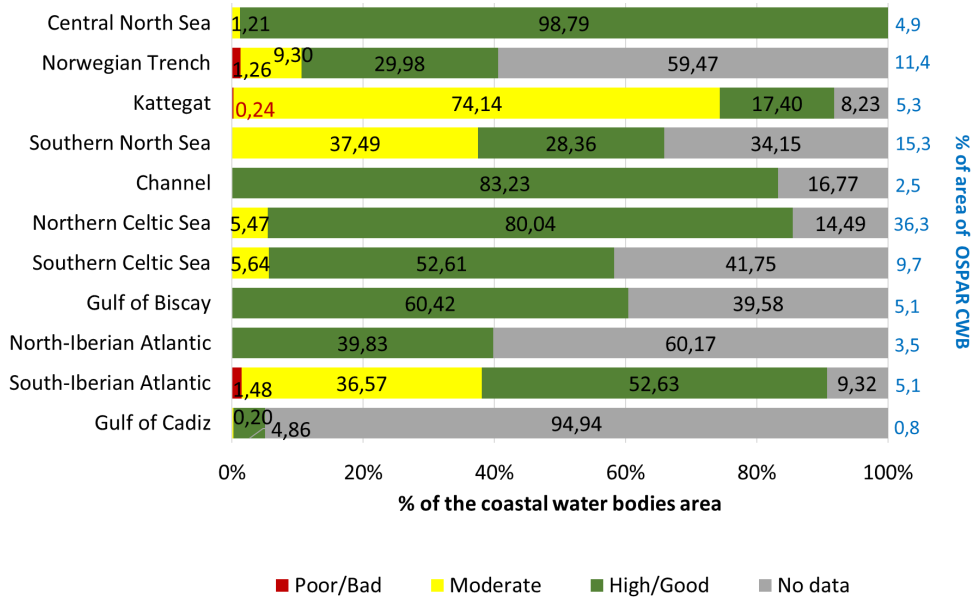

Figure 6: Proportion (area) of the 2016 WFD quality status of benthic invertebrates of the coastal water bodies for each benthic habitats' assessment units of OSPAR Regions II, III & IV

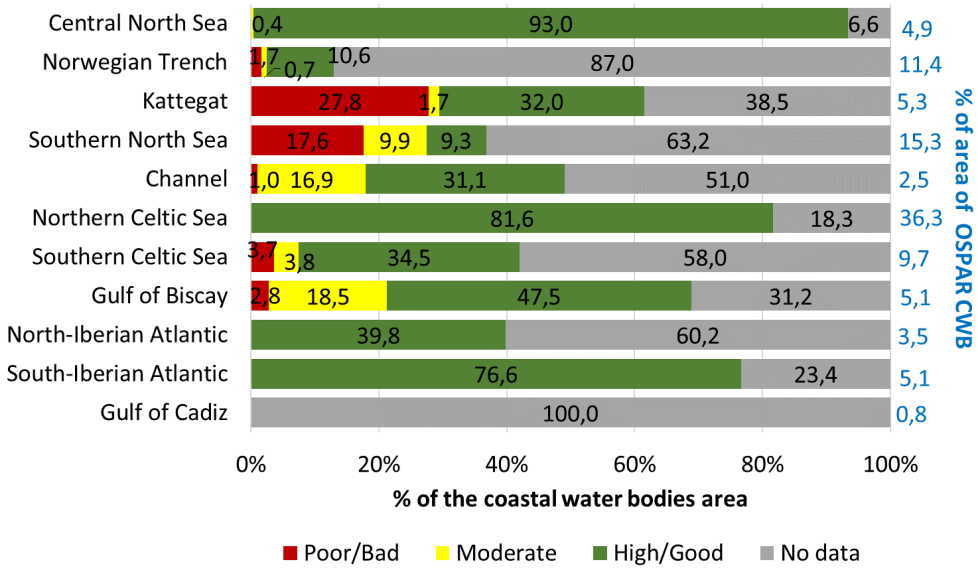

Figure 7: Proportion (area) of the 2016 WFD quality status of the benthic vegetation of the coastal water bodies for each benthic habitats' assessment units of OSPAR Regions II, III & IV

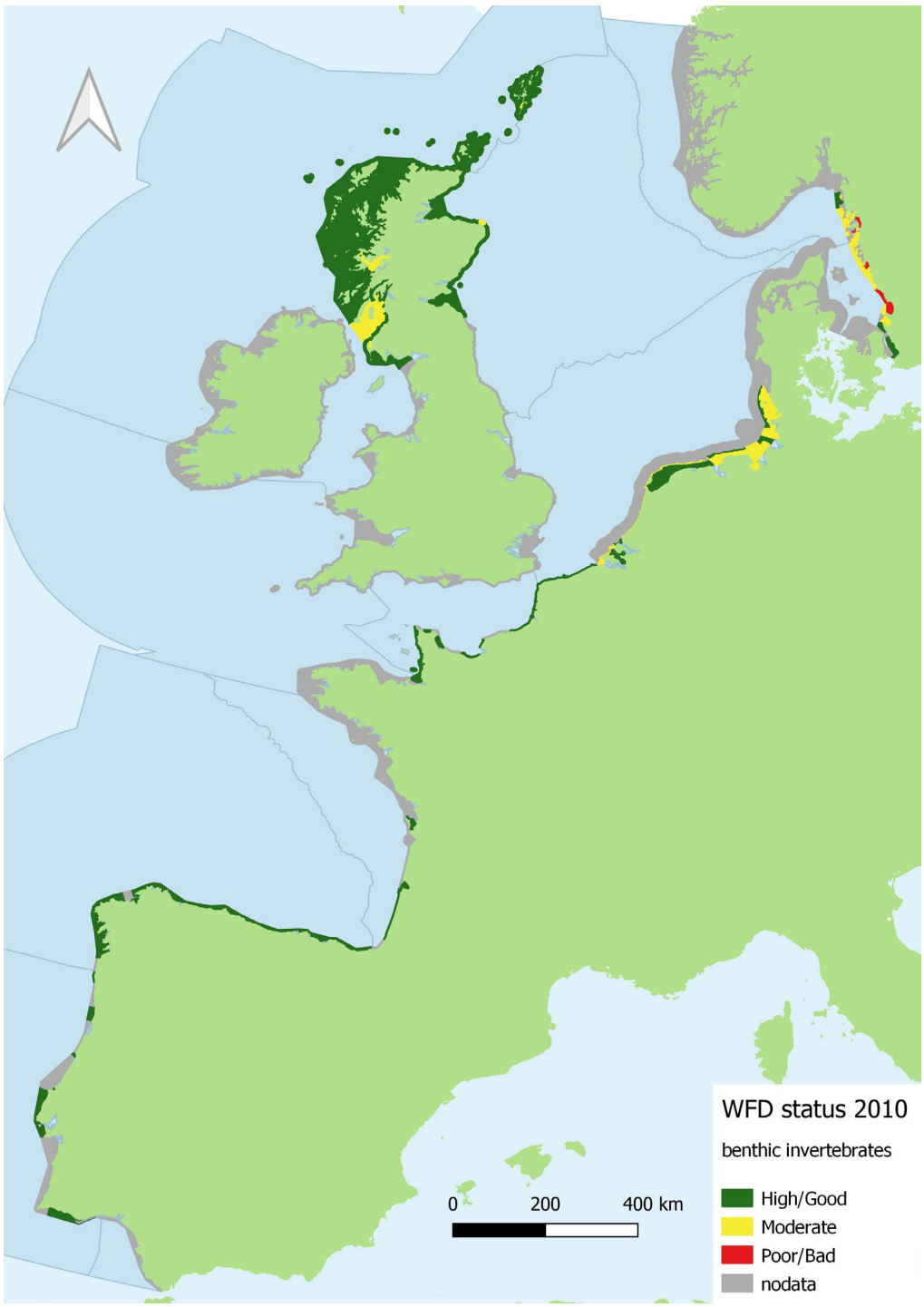

Figure 8: Distribution of the 2010 WFD quality status (condition) of benthic invertebrates in intertidal and subtidal sediments, in response to the (direct or indirect) effects of nutrient and / or organic enrichment, for OSPAR Regions II, III & IV

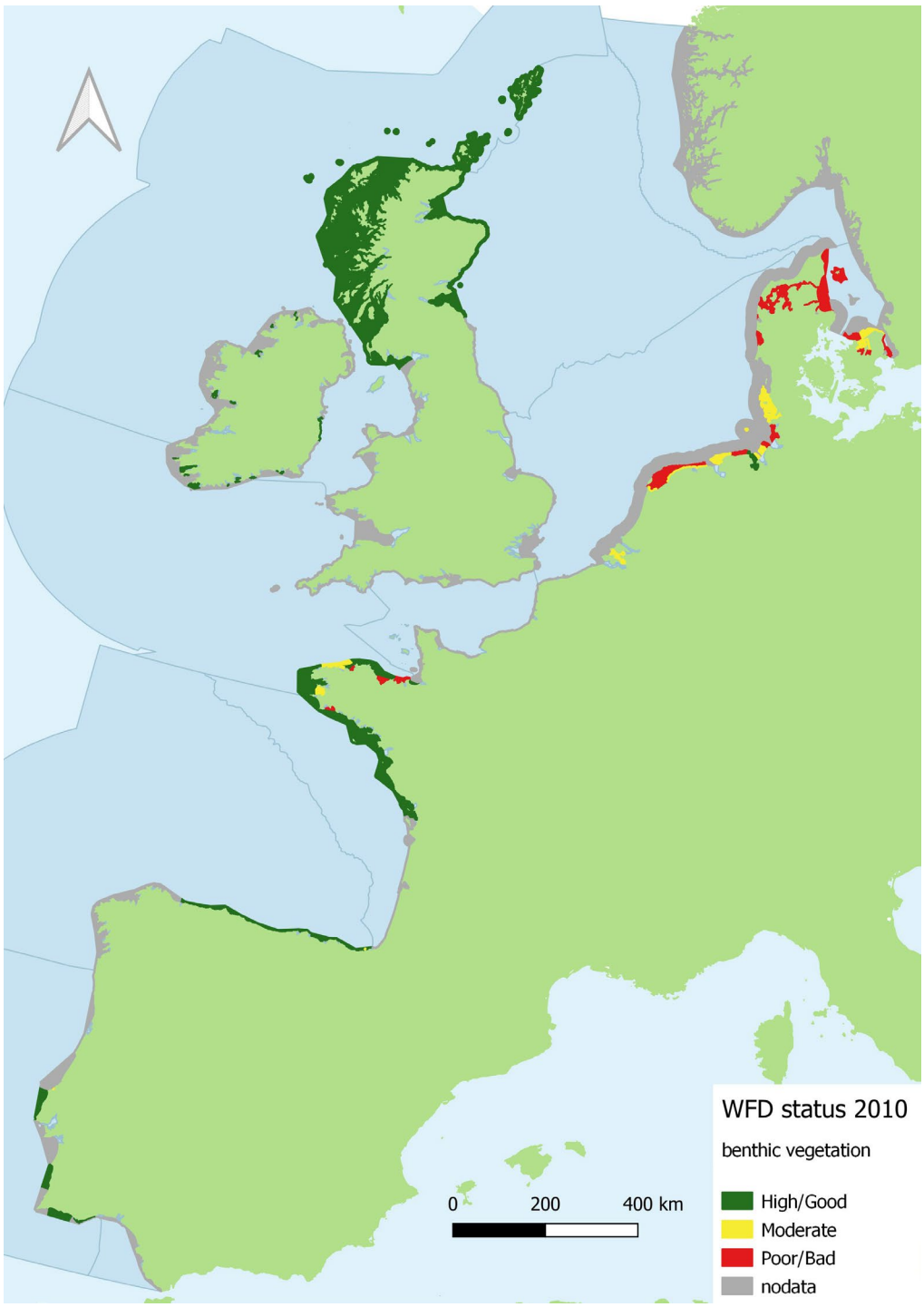

Figure 9: Distribution of the 2010 WFD quality status (condition) of the benthic vegetation (macroalgae, angiosperms and other flora), in response to the (direct or indirect) effects of nutrient and / or organic enrichment, for OSPAR Regions II, III & IV

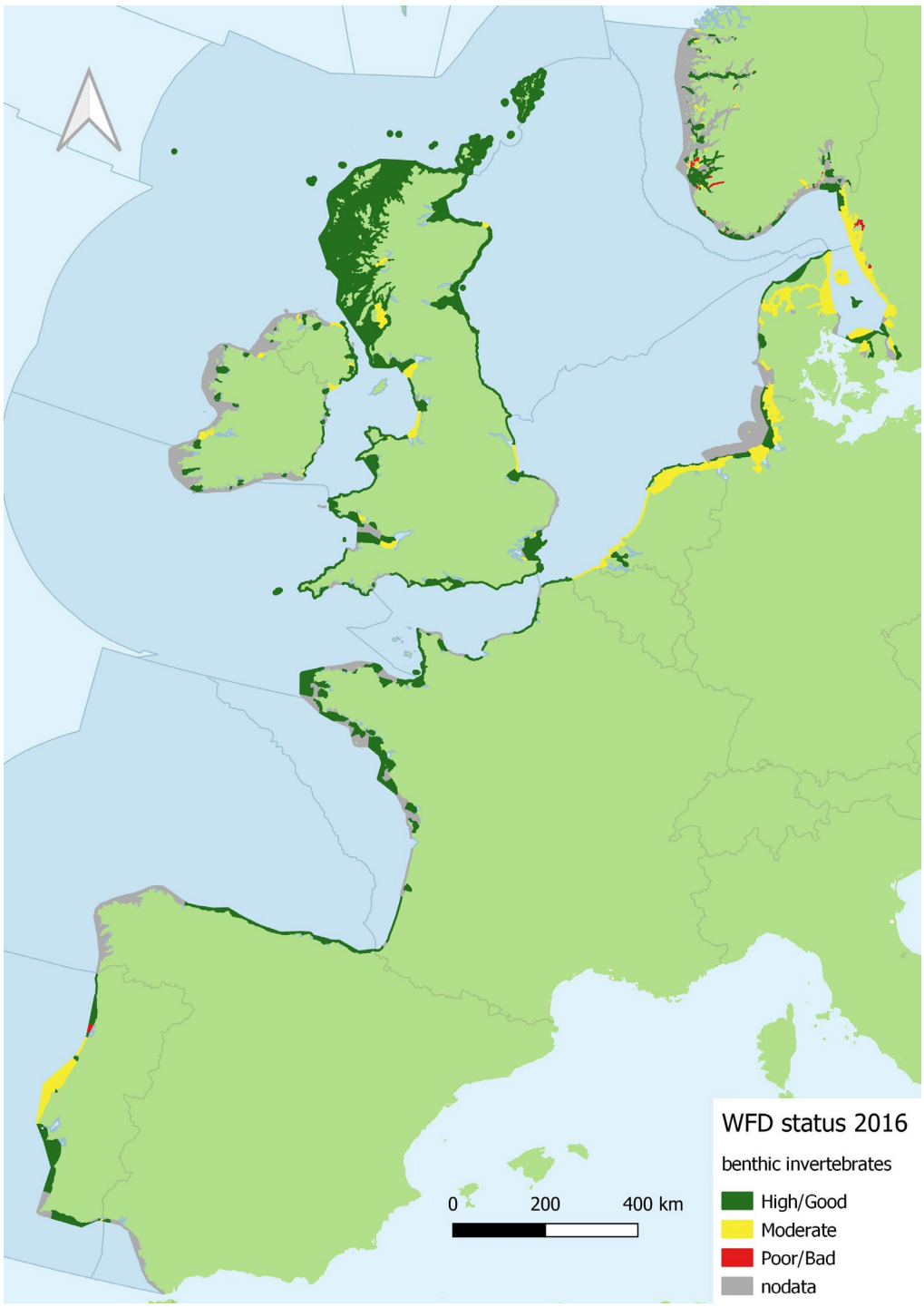

Figure 10: Distribution of the 2016 WFD quality status (condition) of benthic invertebrates in intertidal and subtidal sediments, in response to the (direct or indirect) effects of nutrient and / or organic enrichment, for OSPAR Regions II, III & IV

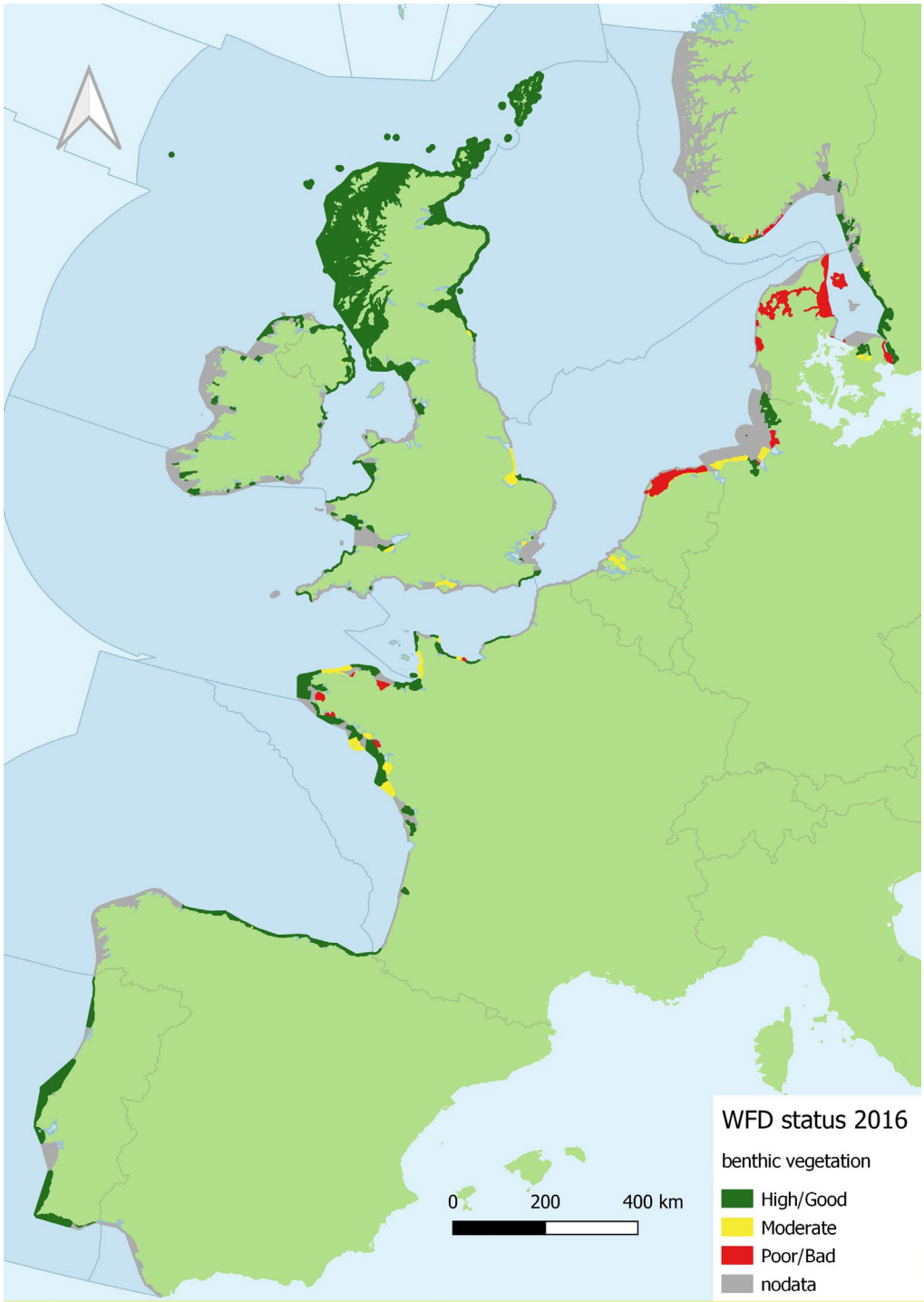

Figure 11: Distribution of the 2016 WFD quality status (condition) of the benthic vegetation (macroalgae, angiosperms and other flora), in response to the (direct or indirect) effects of nutrient and / or organic enrichment, for OSPAR Regions II, III & IV

For benthic invertebrates, the proportion of "High / Good" WFD quality status increased from 34,80 to 57,1% between 2010 and 2016, but also the "Moderate" from 6,63 to 15,2%. The proportion of "Poor/Bad" quality status was maintained at around 0,3%. The detailed proportions and distributions per assessment unit highlight the main impacted areas (Moderate / Poor / Bad) in the Kattegat, Norwegian Trench, and Southern Iberian Atlantic, which increased almost proportionally with the assessed area, in several local sectors all along these coasts. For other assessment units, no "Bad/Poor" status occurred, and the low "Moderate" proportions increased moderately and proportionally to the total area of the assessed coastal water bodies.

For the benthic vegetation, the proportion of "High / Good" WFD quality status increased from 37,47 to 50,42% between 2010 and 2016, but the "Moderate" also slightly increased from 2,47 to 3,4%. The proportion of "Poor / Bad" quality status decreased slightly from 5,08 to 4,88%. The detailed proportions and distributions per assessment units highlight the main impacted areas (Moderat e/ Poor / Bad) situated in the Kattegat and Southern North Sea (from the Dutch to the Danish coasts), and in a lower proportion, the Southern Celtic Sea and the Gulf of Biscay (in the Bretagne region of the French area) and Norwegian Trench and more recently, in a newly reported part of the Channel (in the Normandy region of the French area). Most of the main impacted sectors were persistent between 2010 and 2016. But there were also newly assessed waters in an impacted status and newly assessed waters with High / Good status.
In both cases, the changes were caused by:
- the differences in the total area of coastal water bodies between the cycles;
- an increase in the proportion of the total assessed area from 41% for benthic invertebrates and 45% for benthic vegetation in 2010 to 72% and 58% in 2016;
- a change in the ecological status of some coastal water bodies (**Figure 8, Figure 9, Figure 10** and **Figure 11**).

For these reasons, it was not possible to statistically compare the quality status per individual water bodies. However, the results here enabled identification of sub-regional and local variations in the proportion and distribution of coastal waters quality status, both for benthic invertebrates and vegetation communities. Smaller scale investigation would be needed (between or within water bodies) in future WFD reporting cycles and if water bodies shapes are stabilised, to refine the spatial distribution of quality status and sources of pressures.

There is a medium confidence in the assessment methodology (despite the intercalibration, and due to the different indices used and their various sensitivity to different pressure types) and medium confidence in data availability (see extended results).

Results (extended)

Sub-regional assessment outcomes and locally impacted areas, according to available data at the time of writing, are presented in **Figurea, Figure b, Figure c, Figure d, Figure e, Figure f, Figure g, Figure h, Figure i, Figure J**.

All Contracting Parties from OSPAR Regions II, III and IV reported to the WISE database, through the WFD engagement for European Union Member States, or voluntarily for others.

Confidence Assessment:
The assessment methodology has been applied over successive WFD cycles. However, the inter-calibration of results between EU Member States is not fully solved and therefore underpins moderate confidence. Some regional and local variations of the quality status assessment may be biased by the use of different indices or monitoring/assessment methods.
For the data, there is generally quite good coverage, but with many gaps in several areas, for most assessment units. There was no information available, in the time and resources dedicated to this assessment, to gather details on the reasons for these gaps, and the potential bias implied in proportional results. Therefore, there is moderate confidence in the data for this assessment, at a sub-regional level.

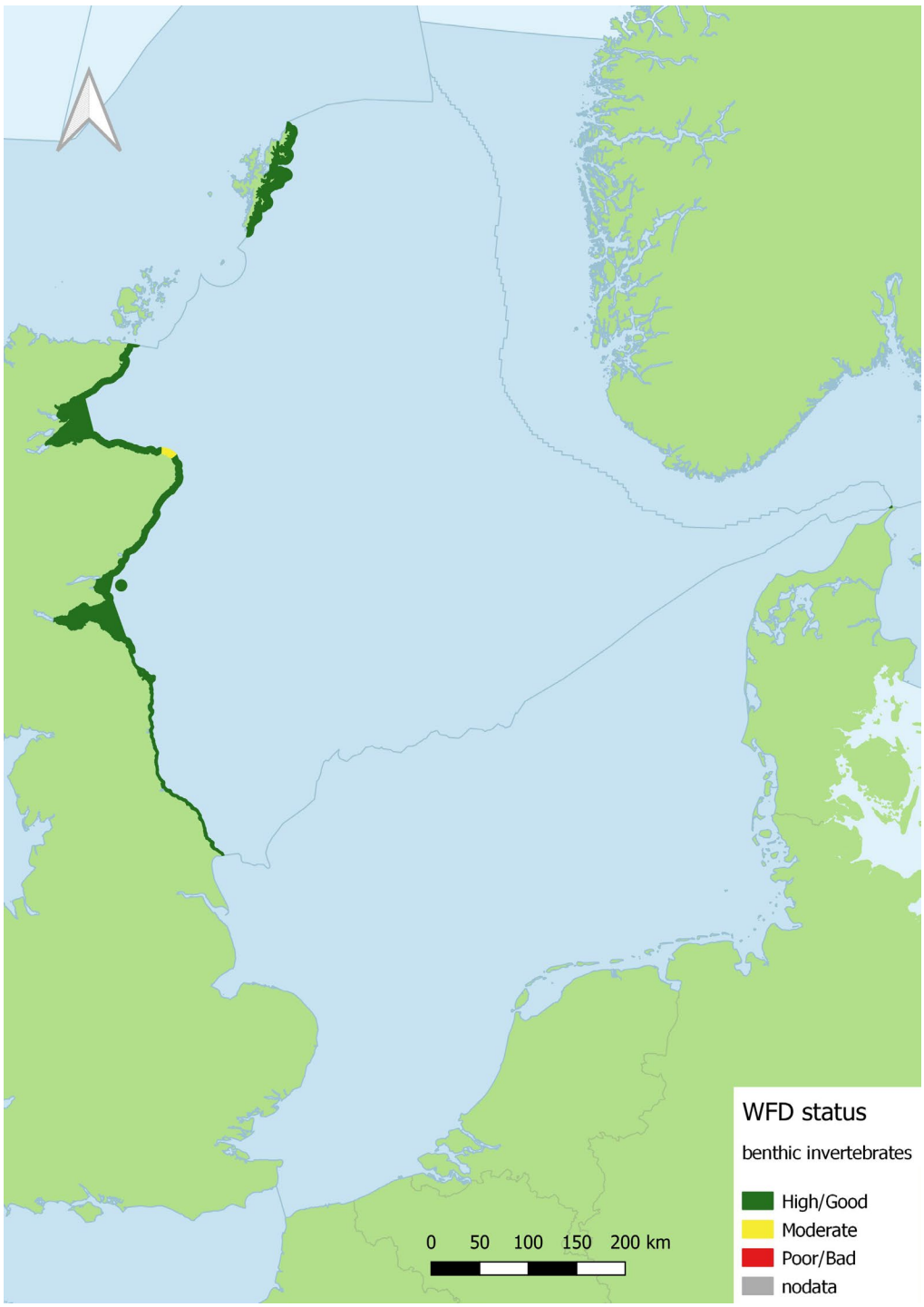

Figure a: Sub-regional distribution of the 2016 WFD quality status (condition) of benthic invertebrates (Central North Sea)

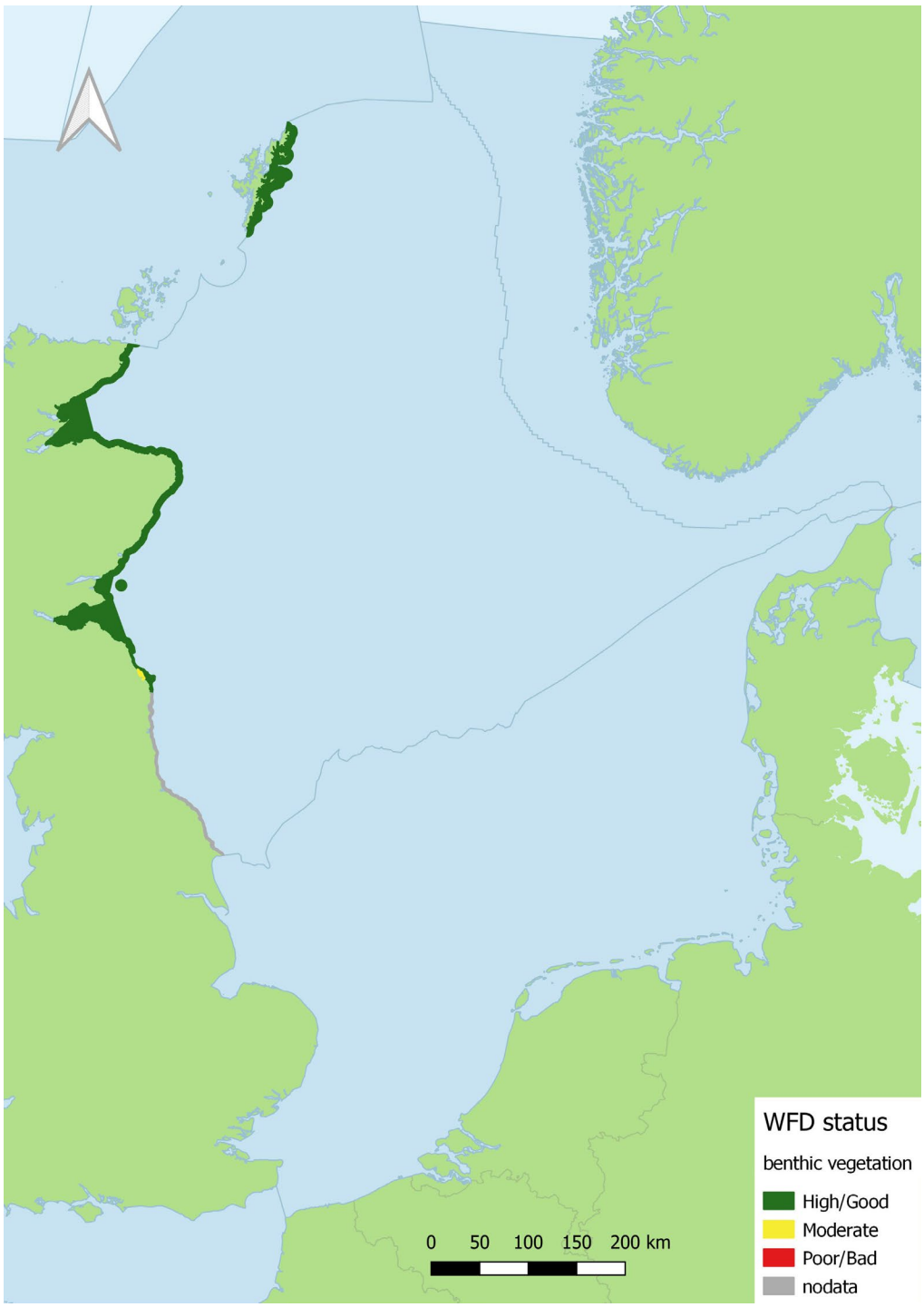

Figure b: Sub-regional distribution of the 2016 WFD quality status (condition) of the benthic vegetation (Central North Sea)

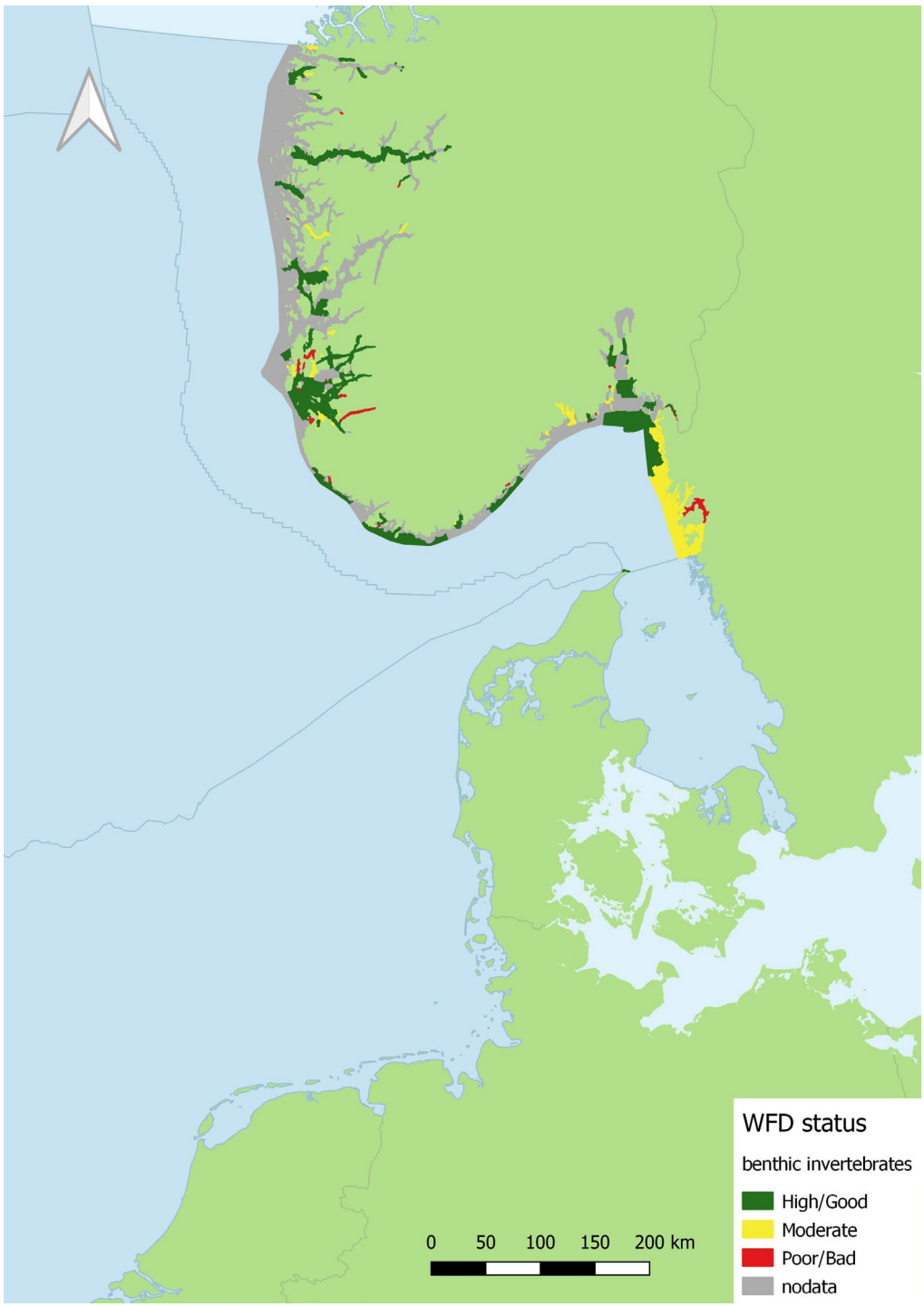

Figure c: Sub-regional distribution of the 2016 WFD quality status (condition) of benthic invertebrates (Norwegian Trench)

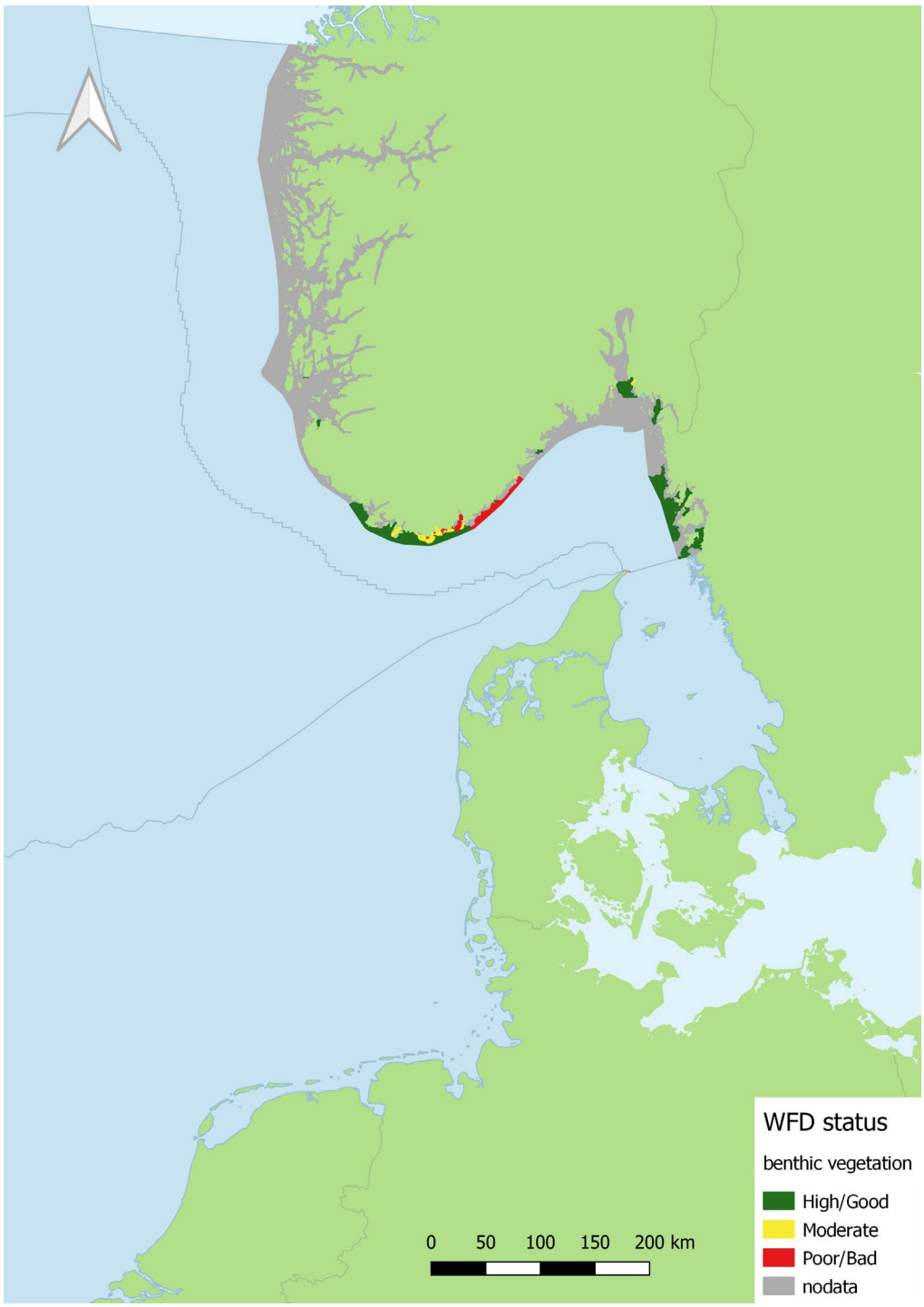

Figure d: Sub-regional distribution of the 2016 WFD quality status (condition) of the benthic vegetation (Norwegian Trench)

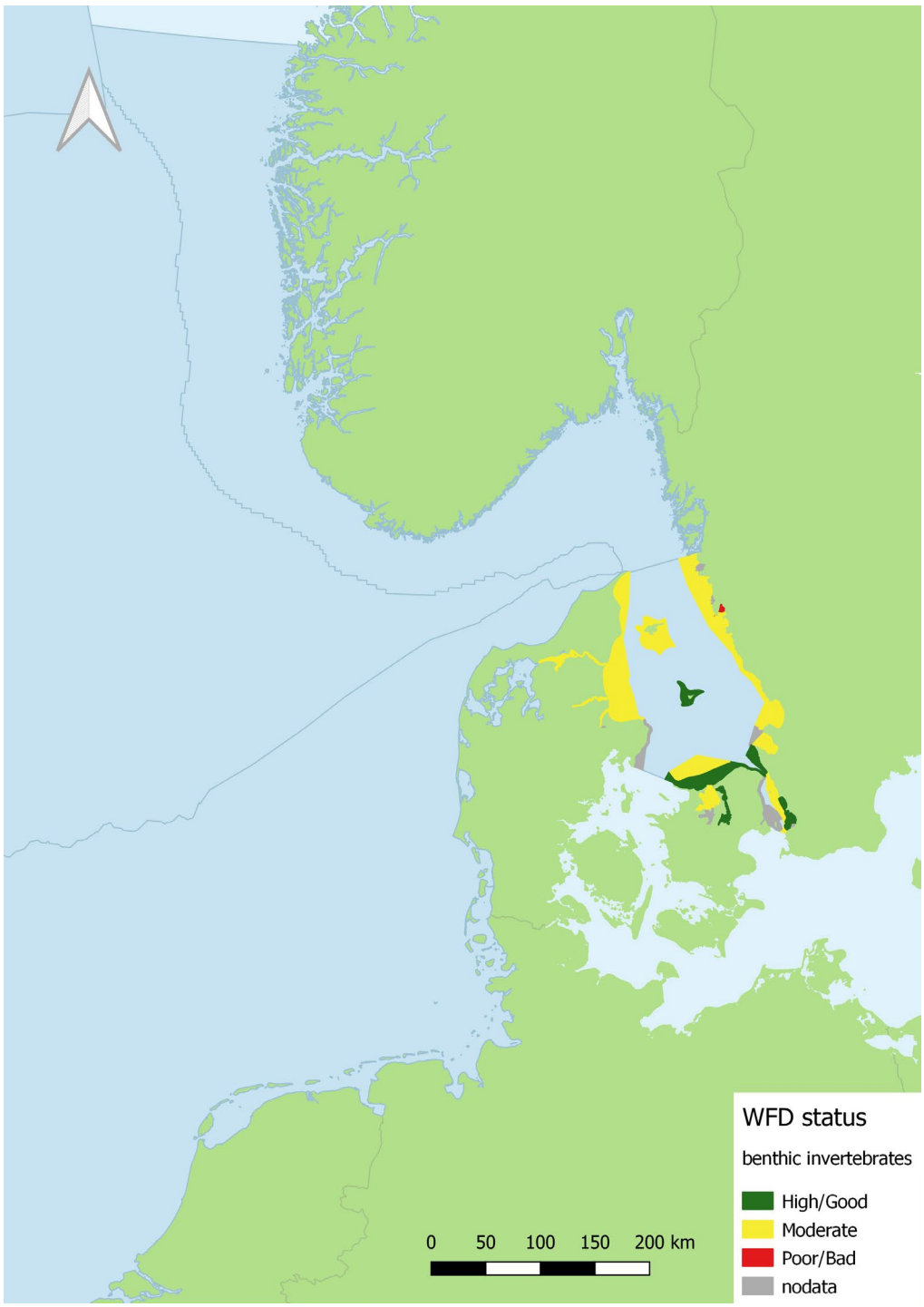

Figure e: Sub-regional distribution of the 2016 WFD quality status (condition) of benthic invertebrates (Kattegat)

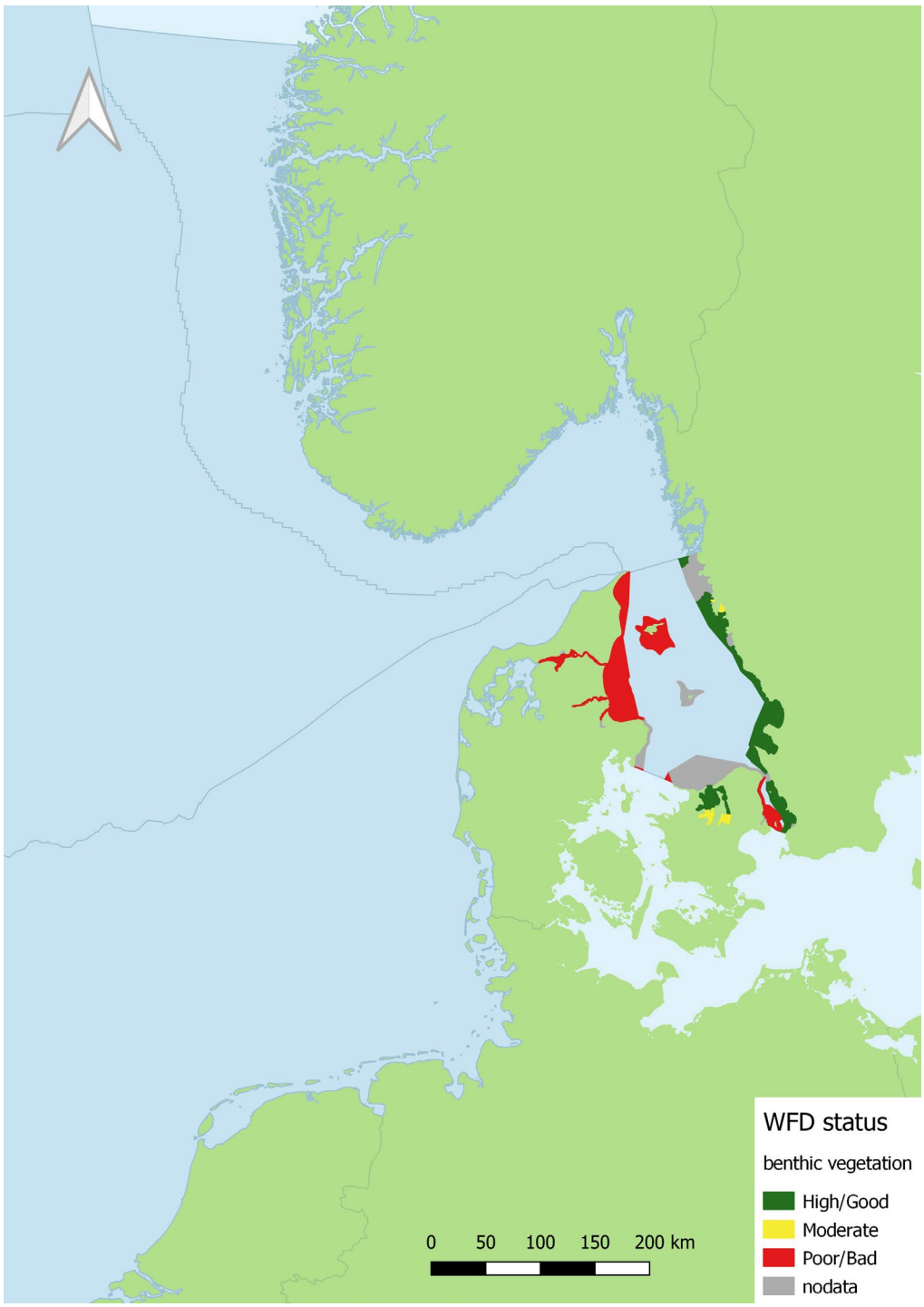

Figure f: Sub-regional distribution of the 2016 WFD quality status (condition) of the benthic vegetation (Kattegat)

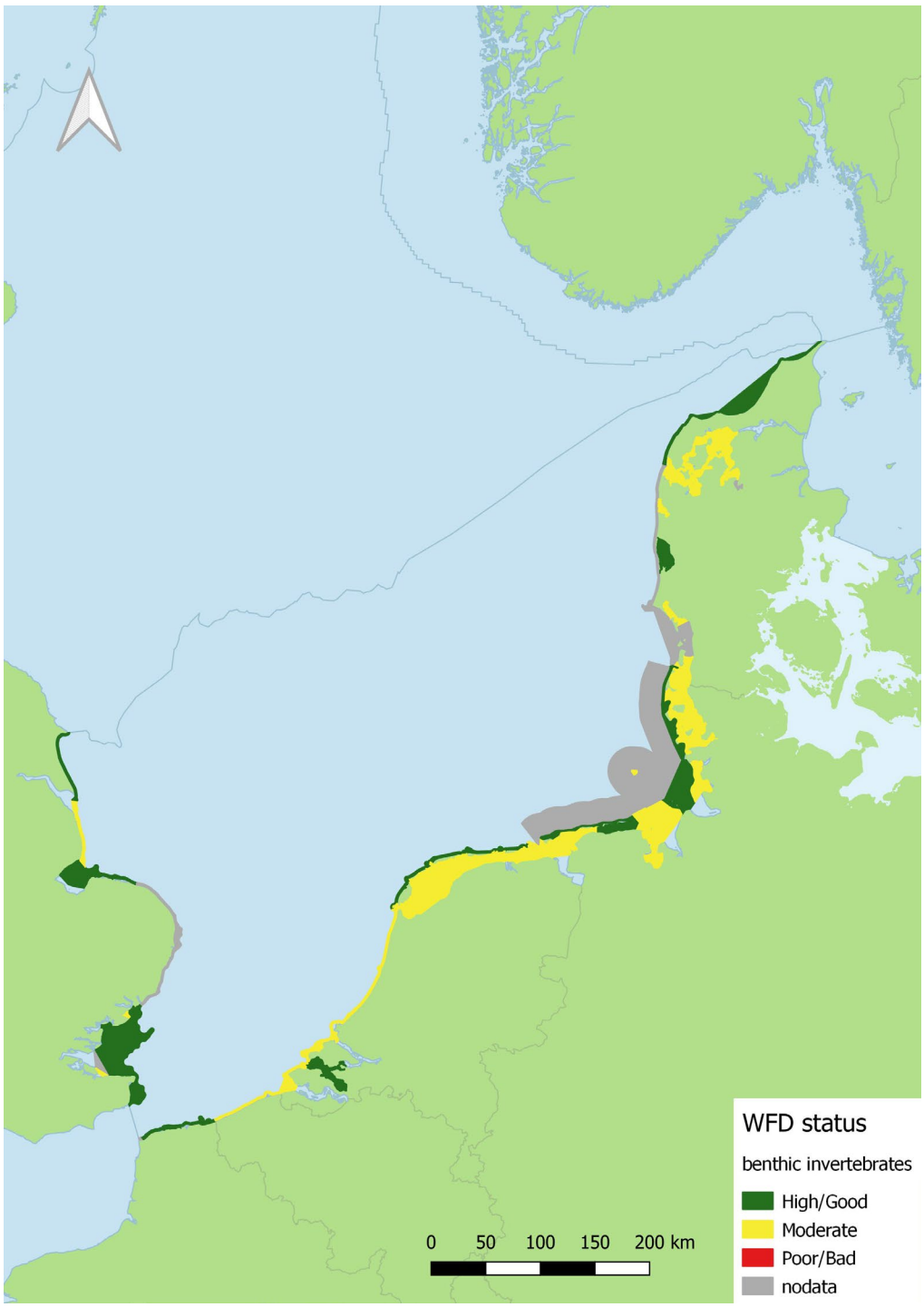

Figure g: Sub-regional distribution of the 2016 WFD quality status (condition) of benthic invertebrates (Southern North Sea)

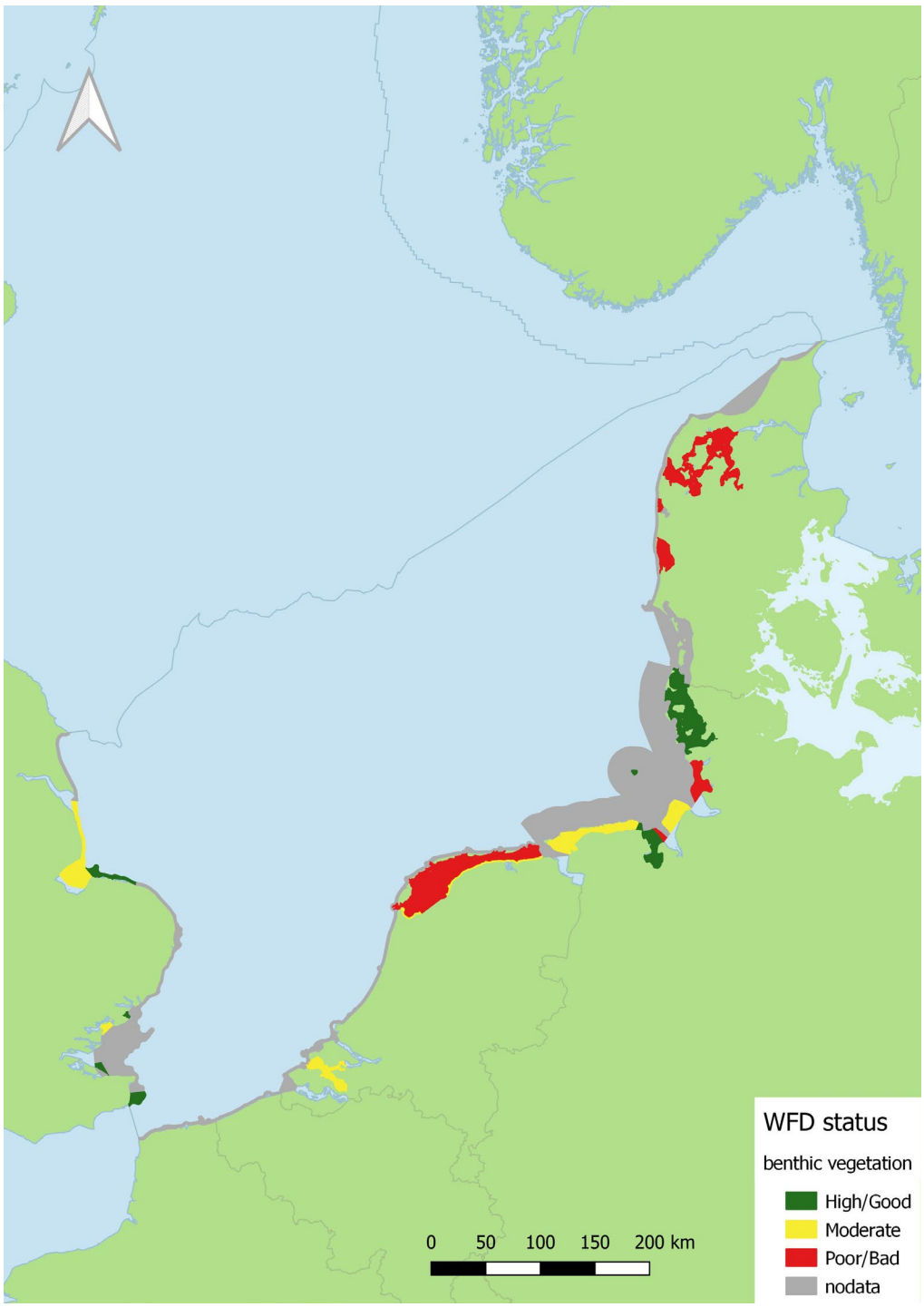

Figure h: Sub-regional distribution of the 2016 WFD quality status (condition) of the benthic vegetation (Southern North Sea)

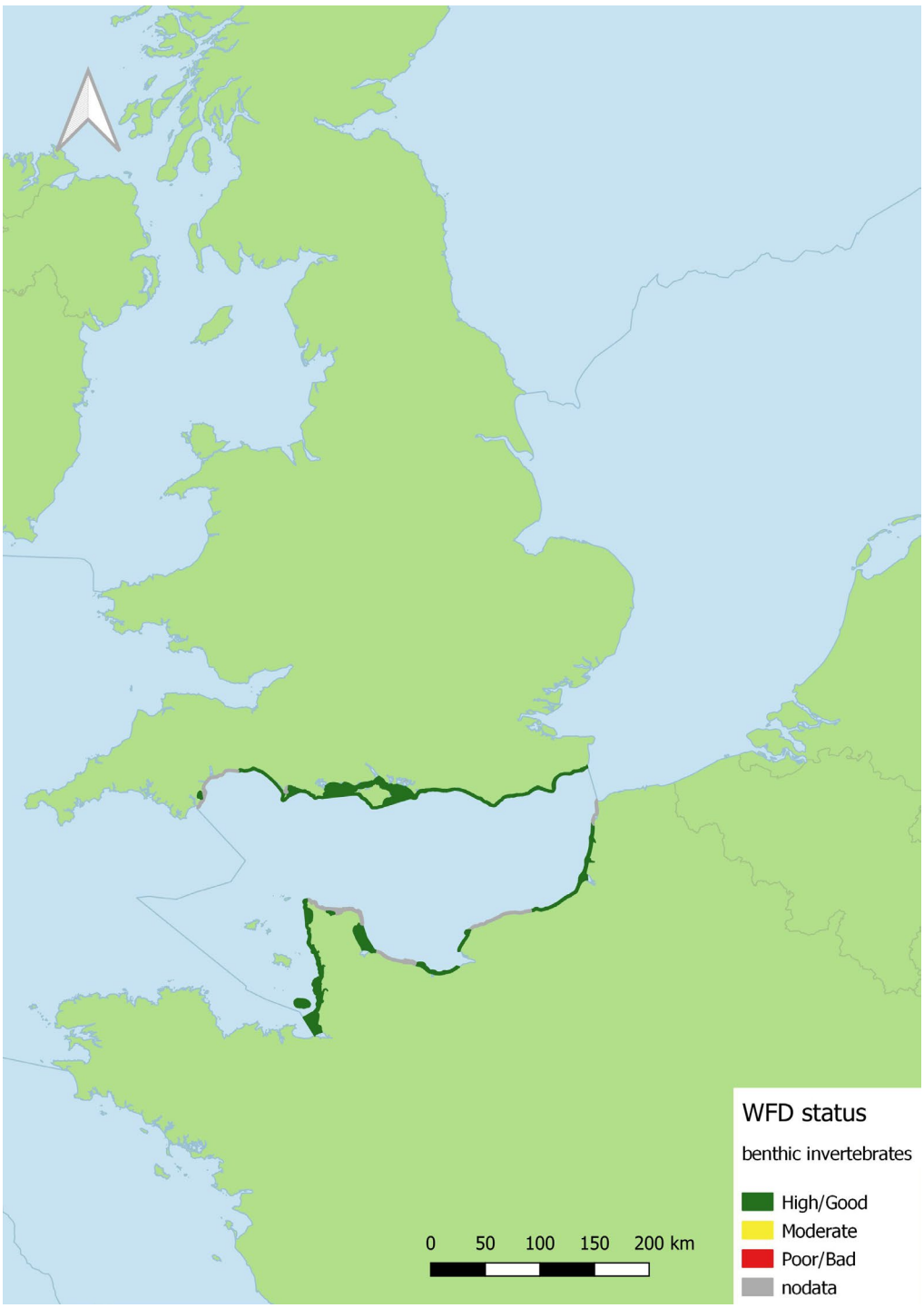

Figure i: Sub-regional distribution of the 2016 WFD quality status (condition) of benthic invertebrates (Channel)

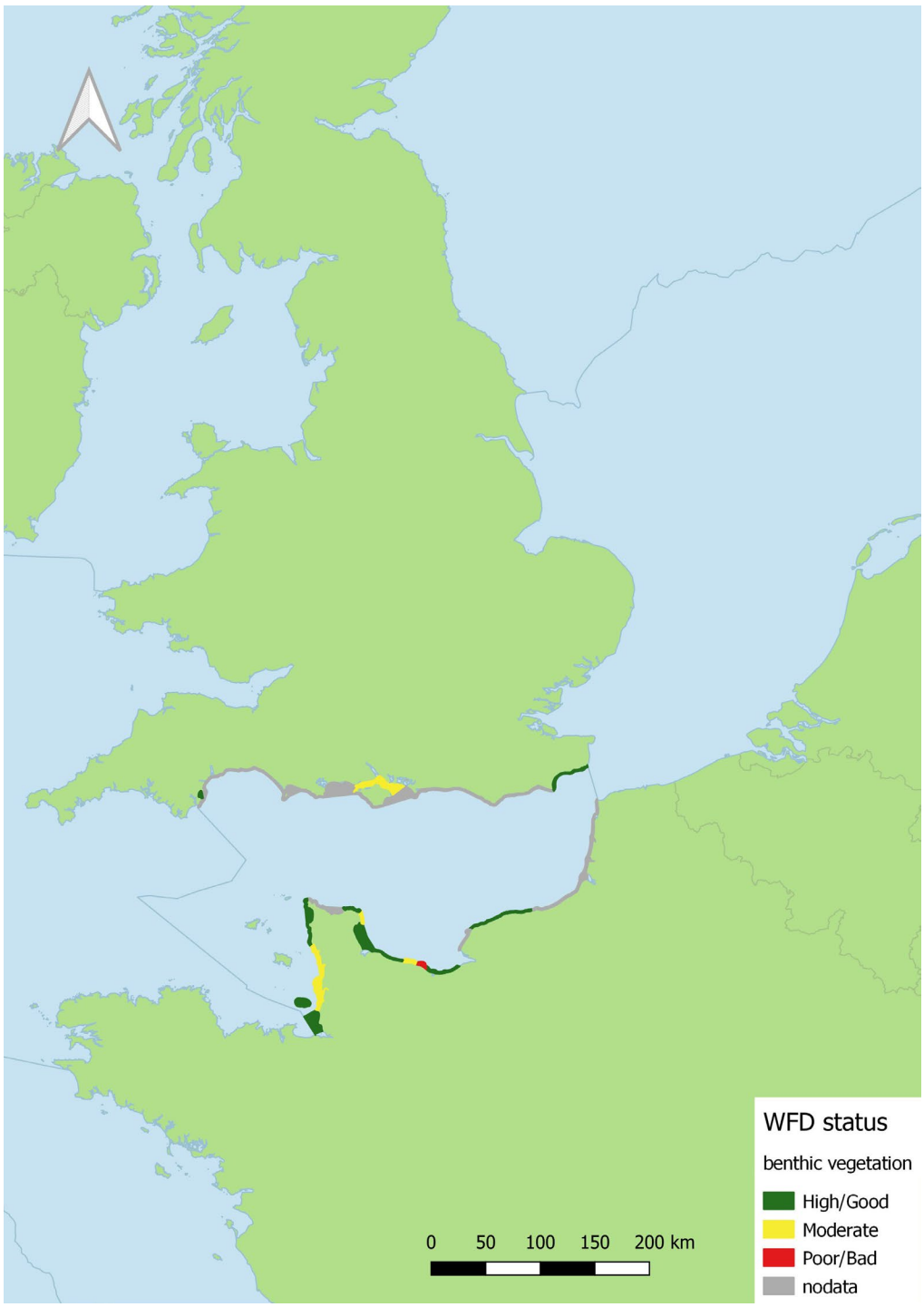

Figure j: Sub-regional distribution of the 2016 WFD quality status (condition) of the benthic vegetation (Channel)

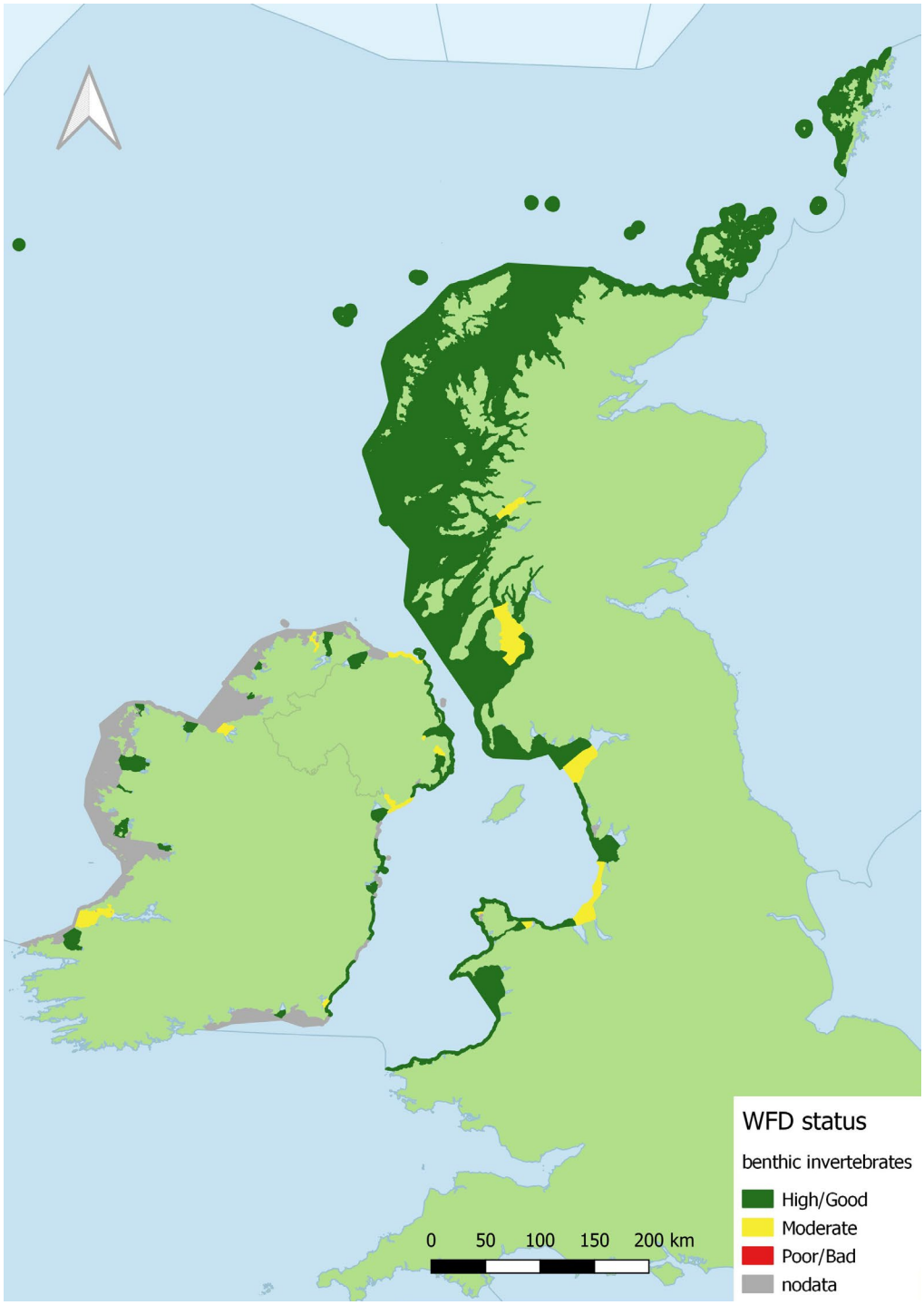

Figure k: Sub-regional distribution of the 2016 WFD quality status (condition) of benthic invertebrates (Northern Celtic Sea)

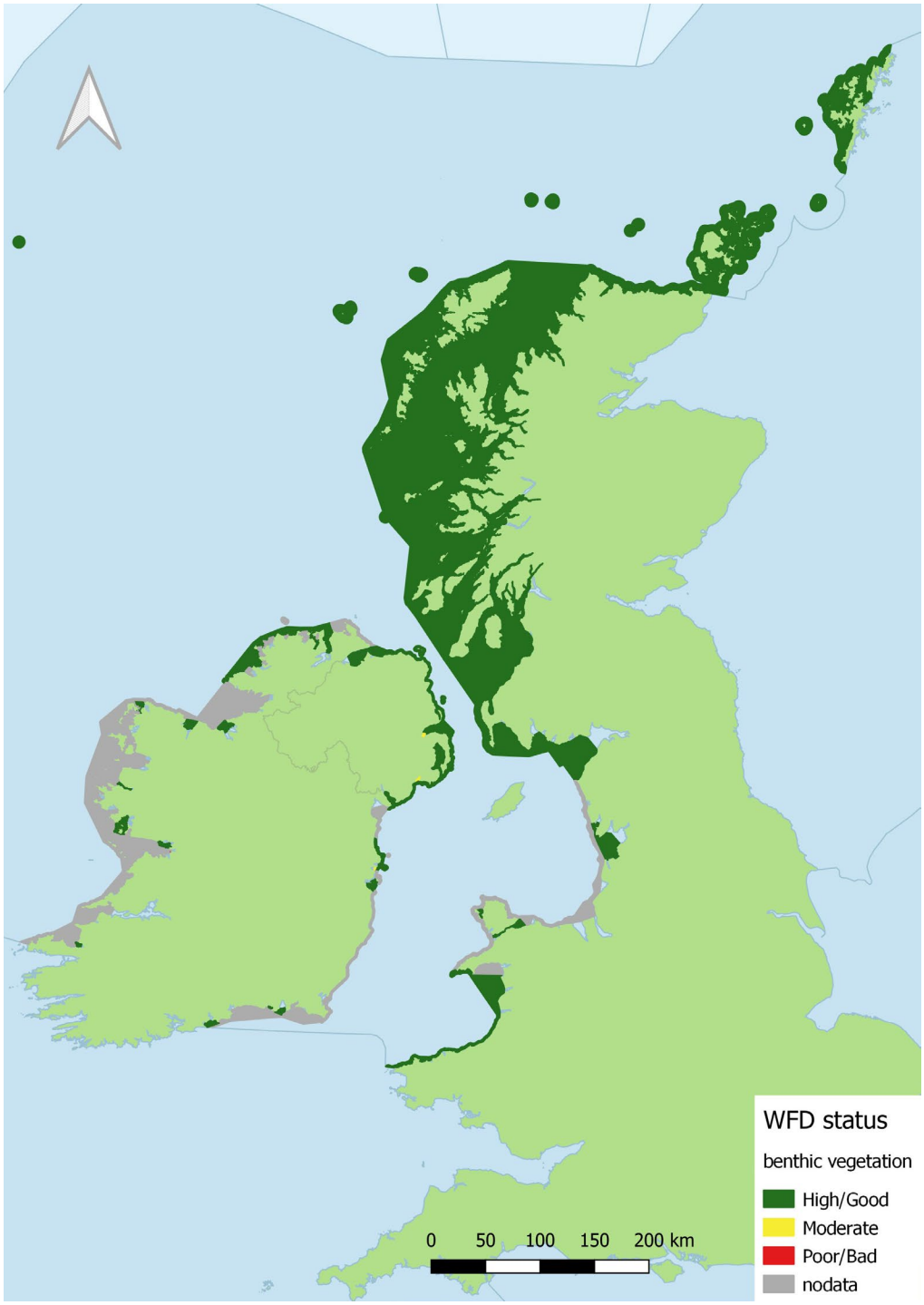

Figure l: Sub-regional distribution of the 2016 WFD quality status (condition) of the benthic vegetation (Northern Celtic Sea)

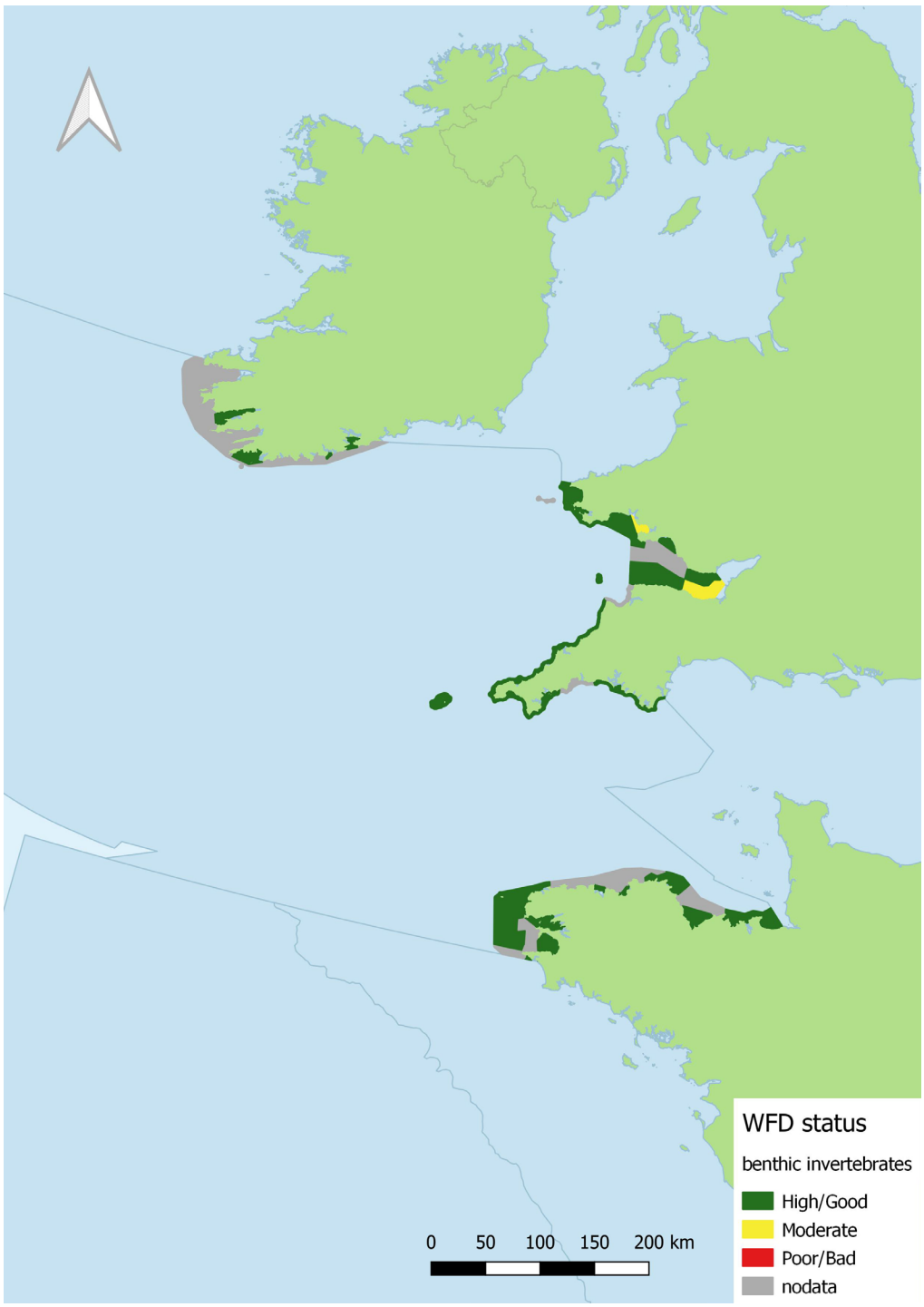

Figure m: Sub-regional distribution of the 2016 WFD quality status (condition) of benthic invertebrates (Southern Celtic Sea)

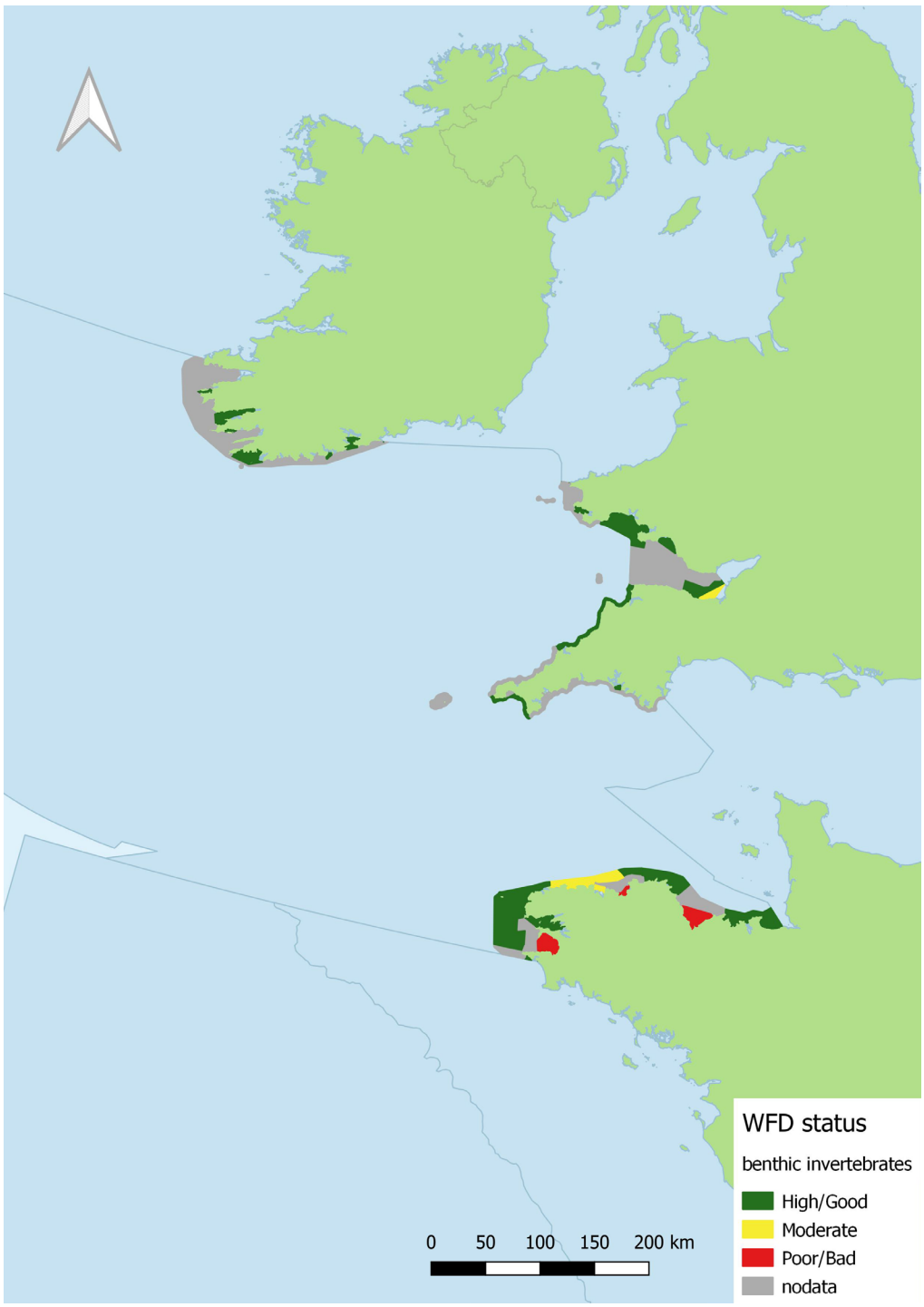

Figure n: Sub-regional distribution of the 2016 WFD quality status (condition) of the benthic vegetation (Southern Celtic Sea)

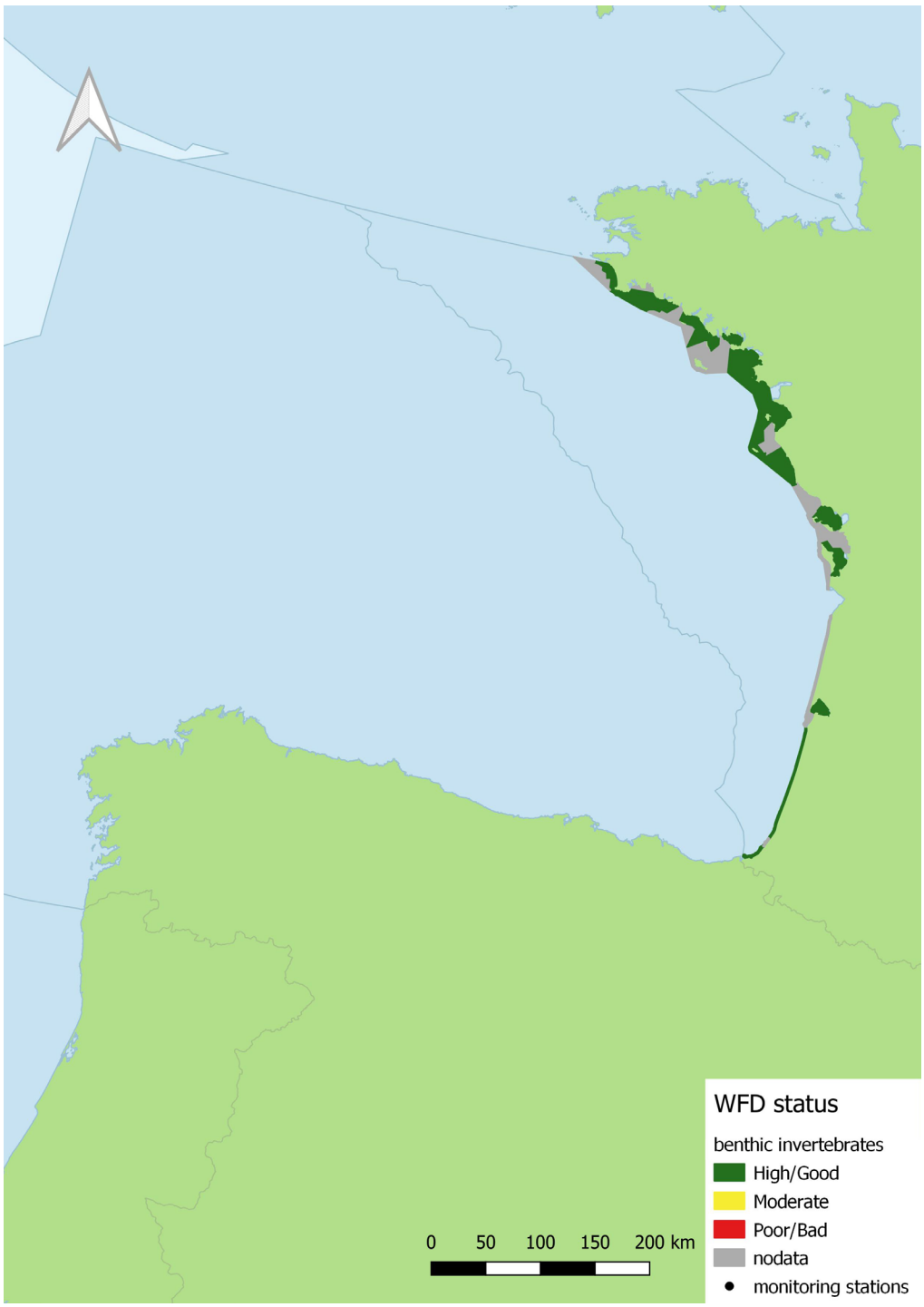

Figure o: Sub-regional distribution of the 2016 WFD quality status (condition) of benthic invertebrates (Gulf of Biscay)

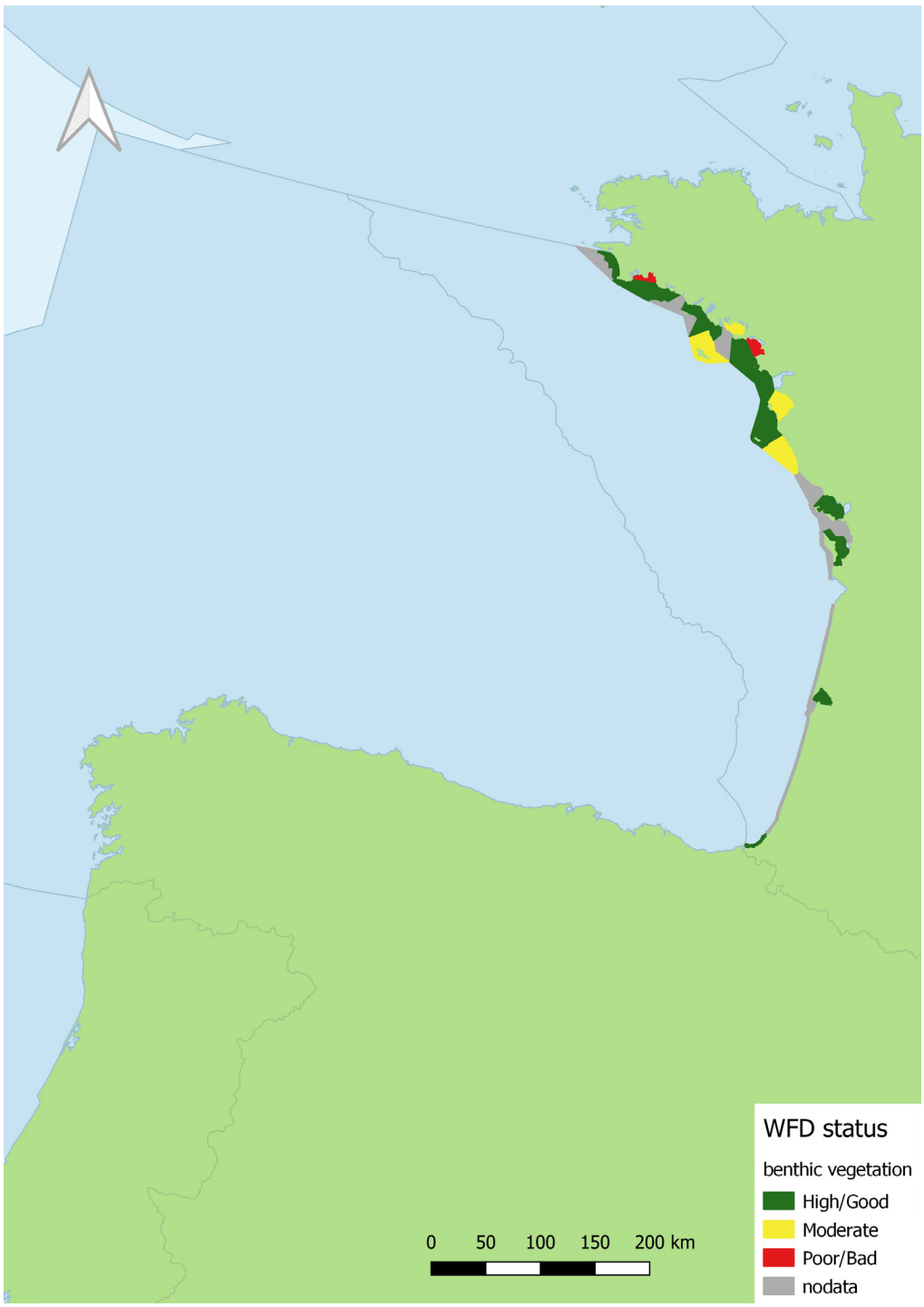

Figure p: Sub-regional distribution of the 2016 WFD quality status (condition) of the benthic vegetation (Gulf of Biscay)

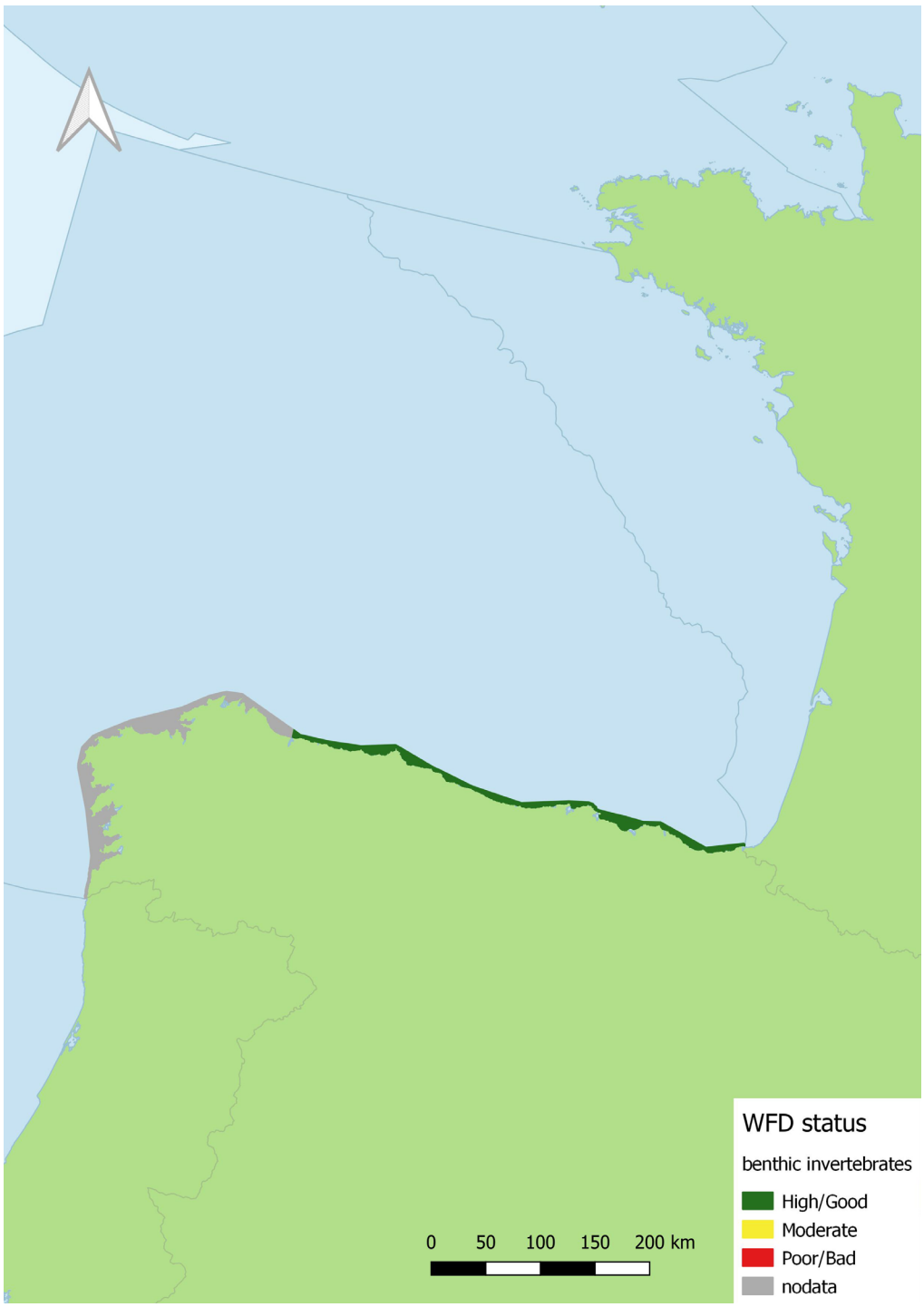

Figure q: Sub-regional distribution of the 2016 WFD quality status (condition) of benthic invertebrates (North Iberian Atlantic)

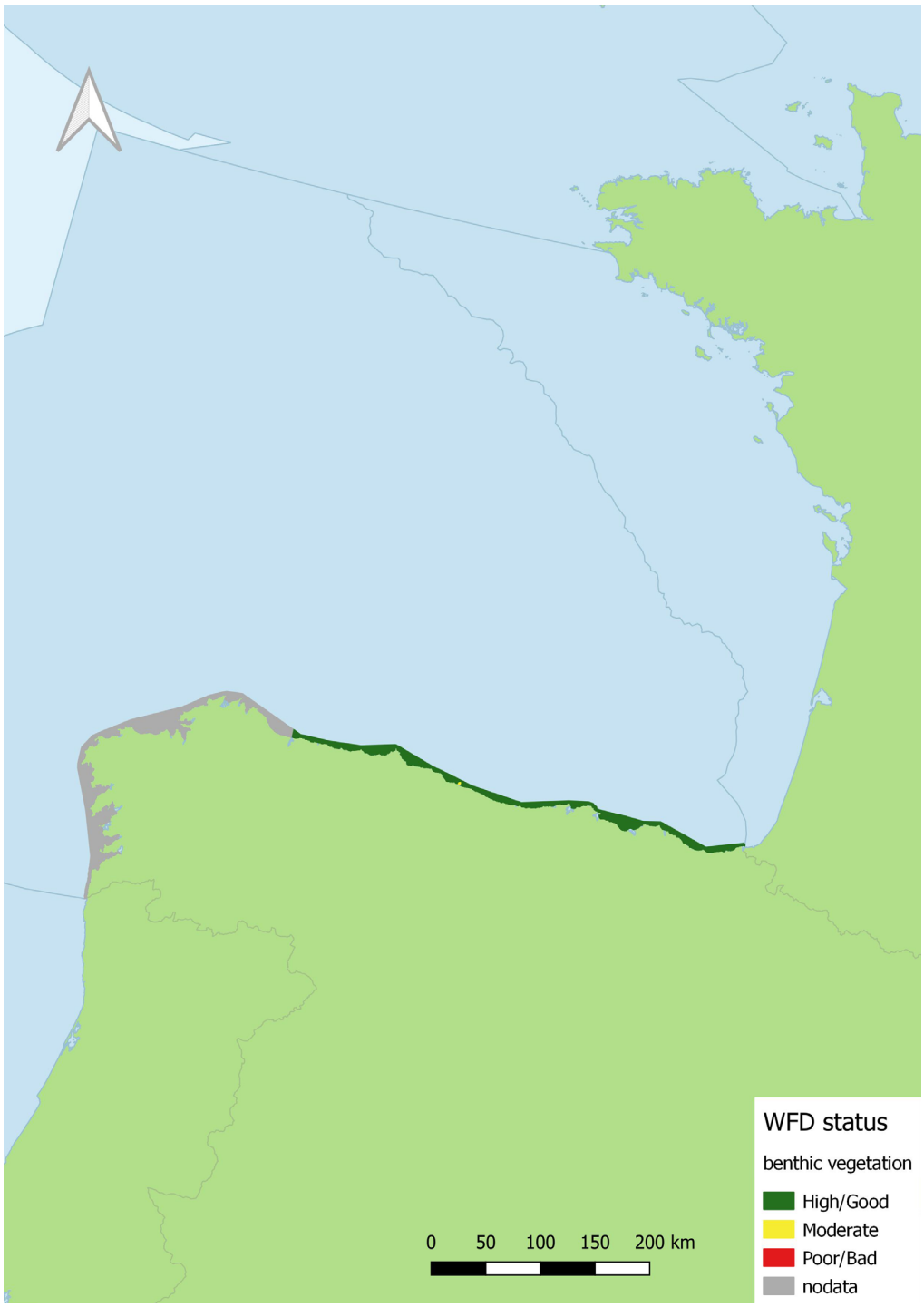

Figure r: Sub-regional distribution of the 2016 WFD quality status (condition) of the benthic vegetation (North Iberian Atlantic)

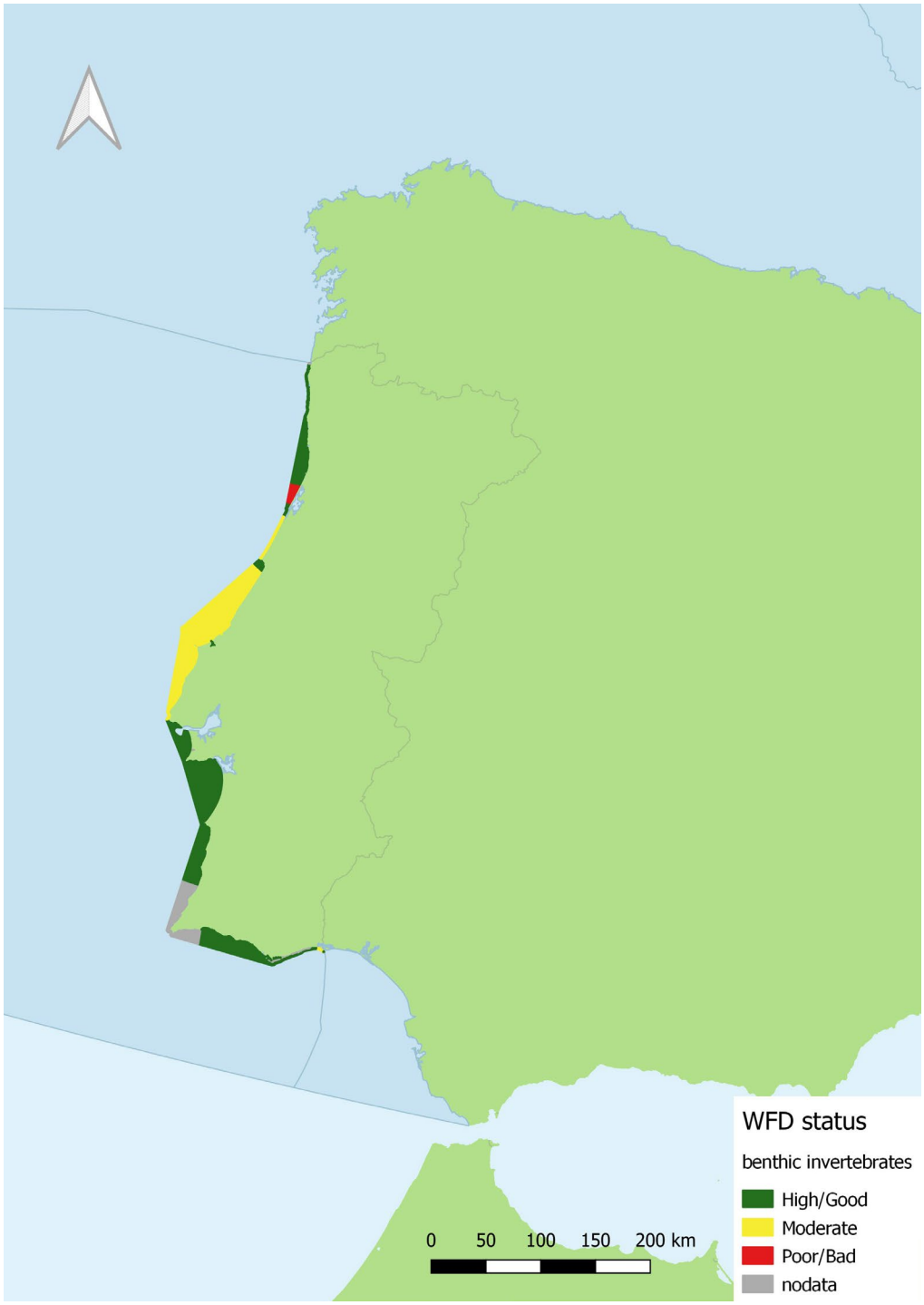

Figure s: Sub-regional distribution of the 2016 WFD quality status (condition) of benthic invertebrates (South Iberian Atlantic)

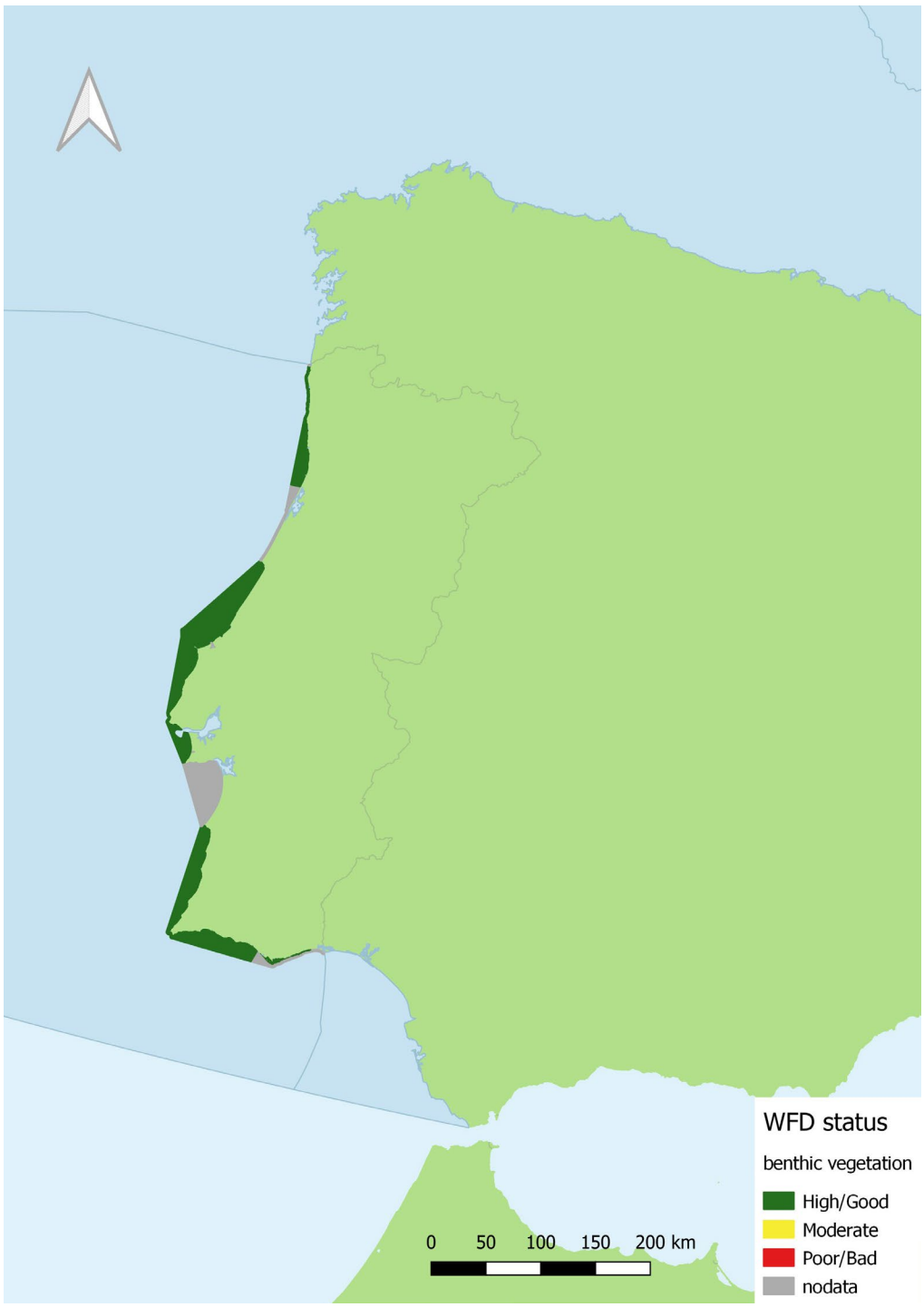

Figure t: Sub-regional distribution of the 2016 WFD quality status (condition) of the benthic vegetation (South Iberian Atlantic)

Figure u: Sub-regional distribution of the 2016 WFD quality status (condition) of benthic invertebrates assessment (Gulf of Cadiz)

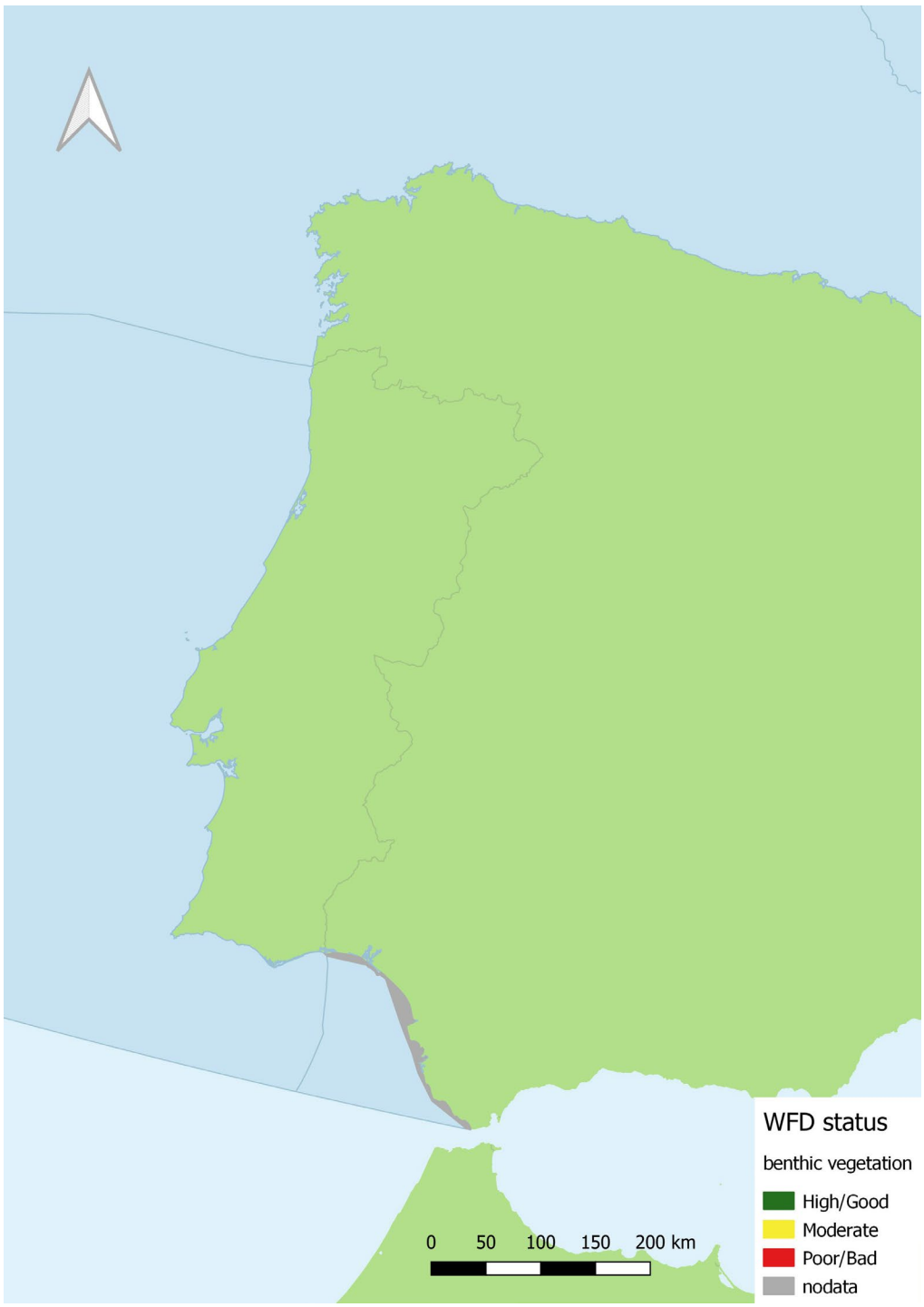

Figure v: Sub-regional distribution of the 2016 WFD quality status (condition) of the benthic vegetation assessment (Gulf of Cadiz)

Conclusion

These results indicate that most of the water bodies for which data were provided, in the OSPAR Regions II, III and IV, have benthic habitats classified as good biological status, according to the European Union WFD. However, despite the data gaps for many water bodies, this fine-scale assessment (sub-regions and coastal water bodies) enabled the identification of regional variations and the main locally impacted areas for benthic invertebrates and vegetation communities. The main impacted areas, notably on the benthic vegetation, are persistent between 2010 and 2016, all along the Dutch and Danish coasts, and on the North-

West coasts of France. The total area of assessed/reported water bodies increased significantly between 2010 and 2016 in most regions (except the Northern Iberian Atlantic) and led to better representativity, with both new good and bad WFD quality status areas.

The extension and standardisation of the assessed and reported coastal water bodies' WFD quality status should be further encouraged for the next cycles, as this provides important and relevant information to guide measures and notably identify their effects on targeted areas. This information can successfully be used for several policies, notably OSPAR, MSFD and the Habitat Directive (HD), for the coastal habitats exposed to nutrients and/or organic enrichments.

Conclusion (extended)

This assessment focused on the status of coastal habitats in relation to nutrient and/or organic enrichment, as one component of a more comprehensive indicator of the condition of benthic habitat defining communities (Condition of Benthic Habitat Communities) and as part of the OSPAR North-East Atlantic Benthic Habitat thematic assessment.

Knowledge Gaps

For OSPAR assessment of coastal benthic habitats in relation to nutrient and/or organic enrichment, the use of the already implemented WFD monitoring and assessment programme is relevant and improves coherence and data flow.

However, even with this already implemented regional scale monitoring programme, some issues with the coherence and exhaustivity of data were highlighted. Data flow and availability have been improved since the 2017 OSPAR intermediate assessment, including quality assurance and quality control, as data were downloaded easily from a unique and certified European database.

Knowledge Gaps (extended)

Most OSPAR Contracting Parties undertake large-scale marine benthic monitoring, at least for the European Union Water Framework Directive (WFD) and other national programmes. Finer-scale networks of state-pressure relationship assessment areas are more heterogeneous and should be further investigated. Developing coordinated monitoring (or even better, joint monitoring) would be more cost-efficient and would ensure coherence and robustness for an assessment at (sub)regional scale.

Each country currently stores its monitoring data and common methodology (and tools), but improvement to achieve coherence and data availability is still needed. Development of data flow arrangements to access and analyse data has improved since 2017, but heterogeneities between indicators and assessment methods limits inter-calibration and comparison of results at wider regional and European scales. The need for these steps should be anticipated and relevant work should be coordinated at a (sub)-regional scale to ensure coherence and facilitate the data flow for this OSPAR specific assessment to be used also for EU Member States' reporting requirements (WFD, MSFD and HD).

By targeting an increased coherence and complementarity between the different indices used, the development of methods, monitoring and data flow to assess other pressures types, and ultimately the cumulative effect of pressures, should facilitate interpretation of results and guidance for targeted response measures (notably through Regional Seas Conventions and EU policies; see Carvalho *et al.*, 2019; Lizińska & Guérin 2022). Until then and after, the use of experts' judgment is recommended with adapted methods and scales (McQuatters-Gollop *et al.*, 2022)

References

Birk S., Strackbein J. & Hering D. (2010). WISER methods database. Version: March 2011. Available at http://www.wiser.eu/results/method-database/

Carvalho, L., Mackay, E. B., Cardoso, A. C., Baattrup-Pedersen, A., Birk, S., Blackstock, K. L., Borics, G., Borja, A., Feld, C. K., Ferreira, M. T., Globevnik, L., Grizzetti, B., Hendry, S., Hering, D., Kelly, M., Langaas, S., Meissner, K., Panagopoulos, Y., Penning, E., Rouillard, J., Sabater, S., Schmedtje, U., Spears, B.M., Venohr, M., van de Bund, W. & Solheim, A. L. (2019). Protecting and restoring Europe's waters: An analysis of the future development needs of the Water Framework Directive, Science of The Total Environment, Volume 658, pp. 1228-1238, ISSN 0048-9697, doi.org/10.1016/j.scitotenv.2018.12.255.

European Commission, (2018). 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 (notified under document C (2018) 696). https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32018D0229&from=HU

European Parliament, (2000). Directive 2000/60/CE of the European Parliament and the Council of 23 October 2000. establishing a framework for Community action in the field of water policy. Official Journal of the European Communities. L. 327/1. https://ec.europa.eu/environment/water/water-framework/index_en.html

Lizińska A. & Guérin L., (2022). Analysis of the main elements of the "Good Environmental Status" from the 1st and 2nd MSFD cycles, reported by the European Member States for the Descriptor 6 (sea floor integrity), and links with Regional Seas' Conventions and D4 (food webs integrity) and D5 (eutrophication). August 2022. Nea Panacea European project. PatriNat joint unit (OFB, MNHN, CNRS). Station marine de Dinard. http://dx.doi.org/10.13140/RG.2.2.16732.46728

McQuatters-Gollop A., Guérin, L., Arroyo, N.L., Aubert, A., Artigas, L.F, Bedford, E., Corcoran, V., Dierschke, S.A.M., Elliott, S.C.V., Geelhoed, A., Gilles, J.M., González-Irusta, J., Haelters, J., Johansen, M., Le Loc'h, F., Lynam, C.P., Niquil, N., Meakins, B., Mitchell, I., Padegimas, B., Pesch, R., Preciado, I., Rombouts, I., Safi, G., Schmitt, P., Schückel, U., Serrano, A., Stebbing, P., De la Torriente, A. & Vina-Herbon C. (2022). Assessing the state of marine biodiversity in the Northeast Atlantic, Ecological Indicators, Volume 141, 109148, ISSN 1470-160X, https://doi.org/10.1016/j.ecolind.2022.109148 (https://www.sciencedirect.com/science/article/pii/S1470160X22006203)

Neto, J.M., Salas Herrero, F., Best, M., Buchet, R., Heiber, W., Juanes, J.A., Kolbe, K., Recio, M., Ruiter, H., Scanlan, C. & Wilkes R. (2018). Coastal and Transitional waters North-East Atlantic Geographic Intercalibration Group. Seagrasses ecological assessment methods, EUR 29591 EN, Publications Office of the European Union, Luxembourg, ISBN 978-92-79-98477-8, doi:10.2760/86847, JRC115082.

OSPAR (2017a). BH2: Condition of Benthic Habitat Communities: the Common Conceptual Approach, in: OSPAR (Ed.), OSPAR Intermediate Assessment 2017. OSPAR, London, UK. Available at: https://oap.ospar.org/en/ospar-assessments/intermediate-assessment-2017/biodiversity-status/habitats/condition-of-benthic-habitat-defining-communities/common-conceptual-approach/.

OSPAR (2017b). BH2a: Condition of Benthic Habitat Communities: Assessment of Coastal Habitats in relation to Nutrient and/or Organic Enrichment, in: OSPAR (Ed.), OSPAR Intermediate Assessment 2017. OSPAR, London, UK. Available at: https://oap.ospar.org/en/ospar-assessments/intermediate-assessment-2017/biodiversity-status/habitats/condition-of-benthic-habitat-defining-communities/condition-benthic-habitat-communitites-assessment-coastal-habita/.

OSPAR (2018). OSPAR CEMP Guideline. Common indicator BH2: Condition of Benthic Habitat Communities: the Common Conceptual Approach. 60 pp. Available at: https://www.ospar.org/documents?v=39000.

Poikane S., Salas Herrero, F., Kelly, G. M., Borja, A., Birk S. & van de Bund W. (2020). European aquatic ecological assessment methods: A critical review of their sensitivity to key pressures, Science of The Total Environment, Volume 740, 140075, ISSN 0048-9697, doi.org/10.1016/j.scitotenv.2020.140075.

Salas Herrero F., Aráujo R., Claussen U., Leujak W., Boughaba J., Dellsaea J., Somma F. & Poikane, S. (2020). Physico-chemical supporting elements in coastal waters: Links between Water and Marine Strategy Framework Directives and Regional Sea Conventions. EUR 30383 EN, Publications Office of the European Union, Luxembourg, ISBN 978-92-76-22418-1, doi:10.2760/444388, JRC121759.

Solheim, A.L., Peterlin, M., Kodeš, V., Spiteri, C., Collins, R.P., et al. (2012). Ecological and chemical status and pressures in European Waters – Thematic assessment for EEA Water 2012 Report. EEA/NSV/10/002. 146p.

Van Hoey G., Bonne W. & Salas Herrero F. (2015). Intercalibration report for benthic invertebrate fauna of the North East Atlantic Geographical intercalibration group for Coastal Waters. (NEA 1/26), ILVO MEDEDELING 191.

Van Hoey G., Bonne, W., Muxica, I., Josefson, A., Borgersen, G., Rygg, B., G., Borja, A., Phillips, G., Miles, Al., Dubois, S., Desroy, N., Buchet, R., Ximenes, M.C., O'Beirn, F., Witt, J., Heye,r K., van Loon, W., Ruiter, H., Neto, J., Marques, J.C., Garcia, E., Puente, A. & Salas Herrero, F. (2019). Coastal waters North East Atlantic Geographic Intercalibration Group. Benthic invertebrate fauna ecological assessment methods; EUR 29640 EN, Publications Office of the European Union, Luxembourg, ISBN 978-92-79-99232-2, doi:10.2760/16318, JRC115475.

Wilkes R. et al. (2018). Coastal and Transitional waters North East Atlantic Geographic Intercalibration Group. Opportunistic macroalgae ecological assessment methods, EUR 29594, Publications Office of the European Union, Luxembourg, ISBN 978-92-79-98481-5, doi:10.2760/167718, JRC115074.

Assessment Metadata

Field	Data Type	
Assessment type	List	Indicator Assessment
Summary Results (template Addendum 1)	URL	https://odims.ospar.org/en/submissions/ospar_cond_ben_habs_nut_msfd_2022_06_001/
SDG Indicator	List	14.1 By 2025, prevent and significantly reduce marine pollution of all kinds, in particular from land-based activities, including marine debris and nutrient pollution
Thematic Activity	List	Biological Diversity and Ecosystems
Relevant OSPAR Documentation	Text	OSPAR Agreement 2018-06 CEMP Guideline: Common indicator Condition of benthic habitat communities (BH2) – common approach
Date of publication	Date	2023-06-30
Conditions applying to access and use	URL	https://oap.ospar.org/en/versions/1239-en-1-1-0-data-policy/
Data Snapshot	URL	https://odims.ospar.org/en/submissions/ospar_cond_ben_habs_nut_dsnap_2022_06_001/
Data Results	Zip File	https://odims.ospar.org/en/submissions/ospar_cond_ben_habs_nut_dres_2022_06_001/
Data Source	URL	https://www.eea.europa.eu/data-and-maps/data/wise-wfd-4 https://www.eea.europa.eu/data-and-maps/data/wise-wfd-spatial-3

OSPAR's Quality Status Report 2023

OSPAR Secretariat
The Aspect
12 Finsbury Square
London
EC2A 1AS
United Kingdom

t: +44 (0)20 7430 5200
f: +44 (0)20 7242 3737
e: secretariat@ospar.org
www.ospar.org

Our vision is a clean, healthy and biologically diverse North-East Atlantic Ocean, which is productive, used sustainably and resilient to climate change and ocean acidification.

Publication Number: 946/2023